Global NEST Journal, Vol X, No X, pp XX-XX

Public concerns and behaviors towards solid waste minimization using composting in Kampar district, Malaysia

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Received: 18/01/2018, Accepted: 17/02/2018, Available online: 28/06/2018

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Abstract

Municipal solid waste generation in Malaysia has increase significantly. Organic materials continue to be the major portion of solid waste generated in Kampar, Malaysia. As a result of increasing rate of waste generation and population growth, land area will become more demanding causing the increment of the cost in solid waste management. As a result, solid waste management will become more expensive in the future. Waste separation and organic composting can provide good solution in reducing waste disposal. Nevertheless, public awareness is an important key to improve solid waste management issue. During this study, questionnaire was designed to test out public general knowledge regarding waste management, and their willingness to do composting. 270 questionnaires were distributed to the public. Data analysis of the questionnaire shows that only a few of the respondents (24 numbers) have good awareness. Likert scale was applied to prioritize the factors that discourage waste separation and organic composting practices in Kampar District. This paper concluded that public education and awareness toward solid waste minimization using composting is crucial.

Keywords: MSW, Waste management, Public awareness, composting, SPSS

1. Introduction

Malaysia is a tropical nation which consists of total landmass of 329,847 km^2 (Abd Manaf *et al.,* 2009). According to Department of Statistics of Malaysia (DSM, 2010), population of Malaysia has been estimated to be around 28,334,000 in the year of 2012 and 80% of population are living in Peninsular Malaysia while 20% are living in East Malaysia. In year 2012, total daily municipal solid waste (MSW) generation of 33,000 tons was recorded which had exceeded the projected waste generation (The Malaysian Times, 2013). In view of that, Malaysia disposes of 28,500 tonnes /day of MSW directly into landfills (Agamuthu and Fauziah 2011). Consequently, the need for sustainable landfills is very vital to avoid unwanted impacts to human health and the environment. Regrettably, economic development, which has been given higher priority than the concept of sustainable waste management, has resulted in the environment being sacrificed for the sake of economic targets (Agamuthu and Fauziah, 2011). Ministry of Housing and Local Government (GHLG, 2012) indicated that total 290 landfill sites have been built by Malaysian Government. About 176 of them are in operation and 114 have closed due to insufficient capacity. Based on Abd Manaf *et al.,* (2009), there are only 8 landfill sites have met the standard requirement. It means that the rest of the landfill sites are polluting the environment in varying degrees such as ground water pollution, air pollution, health and sanitary problem (Kalanatarifard and Go, 2012; Bashir *et al.*, 2015; Aziz *et al.,* 2015).

In developing countries, organic waste usually contributes highest percentage to the total waste generation. According to MHLG (2012), 50% of total generated waste in Malaysia is organic waste. Organic waste disposal in a landfill may create anaerobic process to environment. Emission of methane gas would be occurred during the process of anaerobic digestion. According to Johari et al. (2012), total 310,220 tons of methane gas was generated from the landfill site in Peninsular Malaysia in year 2010. It was estimated that the figure would be increased until 350,000 tons in year 2015 and 37,000 tons in year 2020 (Johari *et al*., 2012).

To overcome organic waste problem, composting as a simple and cost-effective alternative method of organic waste management can be employed. However, the main issue which is needed to be addressed is the awareness and attitude of the public. Shaping public awareness and attitude are often a hard task especially when they have to change their perspective to accept a new solid waste disposal method. In addition, time and financial aid are needed for setting up action plan and policies, giving talks to the public, conducting campaign and etc. In Malaysia, effort for promoting waste composting is not sufficient, while public always claims that they are not given an opportunity to take part in these activities. Indeed, most of the public in Malaysia are not doing waste separation while most of the waste segregation works are done by scavenger in landfill site (Tan *et al.,* 2013). Local authorities claimed that the public within their administrative boundary would not give full cooperation regarding to their

rules and policies (Tan *et al.,* 2013). On the other hand, some of the residents claim that it is hard for them to follow the policies because of the insufficient facilities provide by the local authorities. For example, the level of willingness to practice waste separation would be higher if there is proper recycling bin or recycling station is provided by local authority in their area.

In light of the above mentioned, organic waste compositing is a major concern in this study and Kampar District was chosen as a case study area. In average, Kampar District Council has spent 50% of the operating budget on municipal solid waste management (Goh, 2011). To implement a successful composting programme in Kampar District, it is important test public waste management attitude and knowledge toward composting. If they have negative thought toward composting (such as it is time consuming, it generates a lot of waste etc.) they would not try it. Unfortunately, there is a lack of general information regarding solid waste management in Kampar District such as public awareness and willingness to do waste separation, recycling, composting, and etc. Thus, this study investigated the public knowledge and awareness regarding waste separation and composting. Community practice and awareness towards organic composting in Kampar District was discussed.

2. Waste Management in Malaysia

Solid wastes management in Malaysia are categorized into three categories namely municipal solid waste management, scheduled waste management and clinical waste management. Each category is under different government agencies i.e Ministry of Housing and Local Government takes the responsibility to supervise municipal solid waste management; Department of Environment manages the scheduled waste generation and disposal matters; and Ministry of Health control clinical waste management.

In Malaysia, municipal solid waste management was used to be under the responsibility of different local authorities (Local Governments) which clearly stated in Section 72 of the Local Government Act 1976 (Abd Manaf *et al.,* 2009). Under provision of LGA 1976, local authority was responsible to provide services including directly or through contract public cleansing to all urban and semi urban communities under its jurisdiction, municipal waste should be disposed in sanitary manner. However, revenue of local authorities was facing deficit due to high operation cost associated with waste collection and transportation. Although 50% of the operating cost was spent for the solid waste management, only 76% of the generated wastes were collected. In order to reduce the burden of local authorities, solid waste services were privatized in year 1996. There are three solid waste concessionaries which have their own operating zone namely Idaman Bersih Pte. Ltd. for northern regions, Alam Flora Pte.Ltd. for central regions and Southern Waste Management for southern regions. However, local authorities are still having their responsibility in monitoring the cleanliness their jurisdiction. Besides, Malaysian Federal Government had established two new agencies under *Solid Waste and Public Cleansing* Management Act 2007. National Solid Waste Management Department was set up as a policy making and regulatory body to supervise solid waste services based on local administration boundary. Solid Waste and Public Cleansing Management Corporation was established to complement and ensure the successful implementation of the national solid waste management policy. In general, the policy aims to provide a comprehensive, integrated, cost-effective, and sustainable solid waste management system in line with society's demand for environmental conservation and public well-being (Abd Manaf *et al.,* 2009). Although new solid waste management structure was in place, illegal solid waste disposal and environmental pollution couldn't be addressing effectively (Moh and Abd Manaf., 2014). There is a lack of enforcement capacity by National Solid Waste Management Department. Moreover, coverage of the solid waste services in Malaysia is still not sufficient especially in rural area which cause illegal disposal activities e.g opened air burning, open dumping and disposal by dumping into river (Moh and Abd Manaf., 2014).To overcome this issue, a better MSW management system which takes into consideration waste compositions, separation, recycling, and public awareness are essentially required. To extend, annual waste generation in Malaysia has reached 33,000 tons/day or about 12 million tonnes per year with more complicated compositions principally with organic waste (55%), paper (13%) and plastic (19%). So far, about 95% of the waste collected (which is 75% of waste generated) was landfilled. Figure 1 shows the typical composition of MSW in Malaysia (Agamuthu and Fauziah, 2011). As can seed from Figure 1, Organic waste had occupied a highest portion i.e., 55. 0%. Unfortunately, composting of food waste was not employed at a large scale in Malaysia (Tan *et al.,* 2013). The illustrated information provides a clear picture about the recyclable material and their amounts.

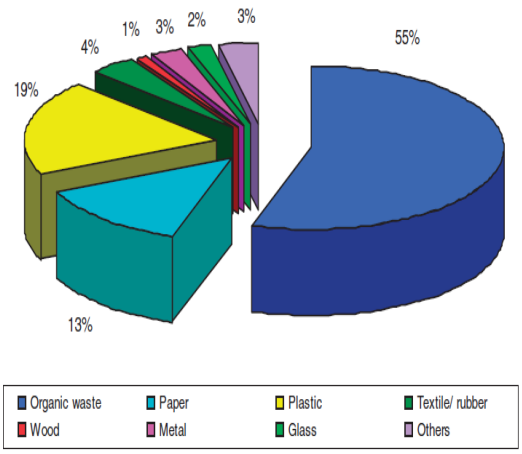

Figure 1. MSW composition in Malaysia (Agamuthu and Fauziah, 2011).

3. Public Awareness

Public awareness measures public's level of understanding of importance of some issues such as environmental,

health, etc. Public awareness on environment means the ability of the public to emotionally understand the world, which includes laws of the natural environment, cause and effect relationship between quality of environment and behavior of human, and etc. Public awareness is influence by many factors such as general education, cultural, organization, organization, and etc. Awareness shapes a hierarchy of values, which at the same times influence the sense of responsibility when a person is having inappropriate choices or having some wrong doings. Therefore, a better public awareness will also shape better public behavior. If people have higher level of awareness on environment, they might understand more on the relationship between their behavior and the quality of environment, they might probably behave or chose a better way to reduce the environmental impact (UNEP International Environmental Technology Centre 2000).

A social experiment conducted by Refsgaard and Magnussen, (2008) confirmed that public awareness can be influence by the waste management system used. According to their study, people who are living in a district that adopt composting waste management system express a negative feedback on composting "disgusting". According to waste management specialist Theng Lee Chong, a look at discarded food in Malaysia would show 10-15% is untouched and still edible. Food wastage awareness has increased over time, but specific waste treatment is still low in households (Jaswa, 2017). Waste management is a social phenomenon which people who engage in it are concern for their action may impact to environment and on other people (Tonglet *et al.,* 2004). According to Saiful (2010), there are several ways to establish environmental awareness society behavior which include:

- Starting from individual effort towards environmental friendly: start doing small things by individual, environmental behavior can be built by forcing individual to start with small and simple things such as using water wisely, unplugged electric appliances and etc.

- Environmental education activities: it is important for government to raise public awareness by environmental education. Environmental education is in concern with knowledge, values, and attitude which has an aim towards responsible environmental behavior (Aisyah and Zainora, 2012). Government is responsible to support the education which involving school children to learn about a healthy environment both at local and regional (Aisyah and Zainora, 2012). Although promoting environmental awareness with formal education is important, but informal education is also needed to spread the knowledge and awareness among the public. Environmental education should not be narrowed and restricted to school but also tools for manager, civil servants, and community group.

- Campaign and mass media: Campaign can be held by civil society organization, as the participant of the campaign may gain knowledge, attitude, behavior, skill, and value of life towards developing a sustainable environment. Role of mass media such as radio, television, newspaper and so on are also important which reaching information to public, creating knowledge and disseminate information, and encouraging good attitude and behavior (Aisyah and Zainora, 2012).

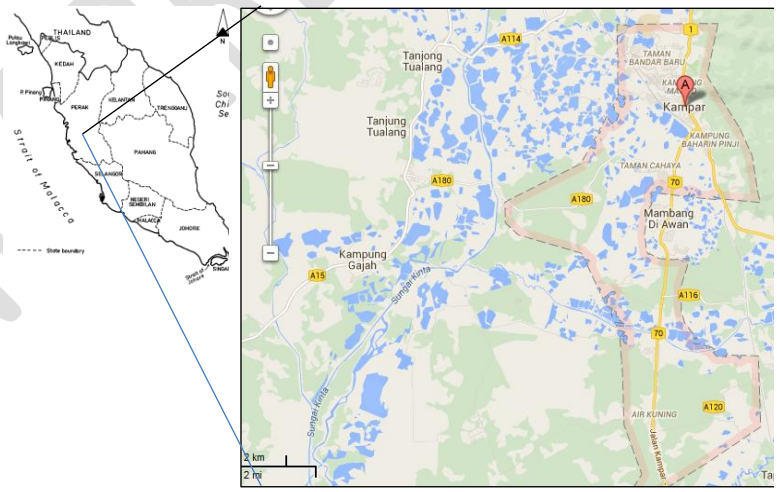

Figure 2. Location of Kampar District (Source: Edited from FAO, Google Maps, 2017)

4. Methodology

4.1 Study Area

Kampar District has been chosen for this case study. it is located in the middle of State of Perak with a total land area of 39,000 hectares and total 101,183 populations is recorded in year 2010 (Goh, 2011). Towns which are included in Kampar District are Kampar, Gopeng, Malim Nawar, Tonoh Mines, Kuala Dipang, Jeram, Sungai Siput Selatan, Lawan Kuda, Kopisan, and Kota Bahru. Figure 2 shows Kampar District location. Total waste generation in Kampar District had been increased to 100 tons during the

year of 2013 (Bashir *et al.,* 2017). A total of 39.6% of daily waste generation is contributed by food waste.

4.2 Opinion Survey

In order to determine the public knowledge and awareness regarding waste separation and composting, closed ended questionnaire was developed. The questionnaire was divided into 3 parts (i) general information, which question about age, sex and family size, (ii) Public knowledge and awareness toward composting and solid waste management, (iii) willingness to practice composting and factors discourage public to do composting. Random sampling approach was adopted and total of 270 respondents were interviewed in this study as shown in Table 1.

Table 1. Location of sampling township

Location	No. of respondents
Kampar township	75 +68
Malim Nawar	56
Jeram	28
Mambang Diawan	43

The sampling method which was used is random sampling which only participant who interested took part in the opinion survey.

Table 2. General information of respondents

Categories	No.	Percentage %
Sex		
Male	108	40.0
Female	162	60.0
Age		
Less than 20	89	33
20-40	100	37
More than 40	81	30

Table 2 shows general information of respondents. Total of 108 males (40%) and 162 females (60%) were interviewed. Likert scale was applied to prioritize the factors to practice organic composting. Besides, Conbrach's alpha test for Likert scale was conducted by using Statistical Package for the Social Sciences (SPSS) software to check the internal consistency for the Likert scale. Microsoft Excel and SPSS software were used to analyze opinion survey data.

5. Result and Discussion

5.1. Attitude of public toward solid waste management

As illustrated in Figure 3, a total of 72.19% of respondents don't understand best practice of solid waste management. Besides, respondents don't have attempt to minimize their daily waste. About 72.60% of respondents dispose their food waste directly into rubbish bin without concerning to minimize daily solid waste generation. However, 27.40% of respondents dispose their food waste in serveral alternative ways such as treat it as pet feed (17.4%), bury it (5.9%) and food waste composting (4.1%) as shown in Figure 4. Thus, it is important to let the public to understand how the food waste being composted and the negatives impact of their disposal practice. The public might be more responsible when dealing with their daily waste if they understand the impact of untreated food waste into environment (Sharma et al., 2011).

Figure 5 show that only 63 respondents had taken part in awareness activities which were relevant to solid waste management. Total of 207 respondents (76.70%) have never participated in any activities which related solid waste management. The result shows that majority of respondents lost their interest in attending any activities regarding to environmental issues. Lack of time and knowledge may be the main factors causing this problem in Kampar District. Nevertheless, 168 (62.22%) of respondents are willing to do waste separation (Figure 6). Due to financial benefit and charity purpose, Kampar community is willing to practice waste separation and send the recyclable waste to recycle center. A study on public responses toward solid waste management in urban areas was recently introduced (Boating *et al.,* 2014) and concluded that public education concerning solid waste reduction, reuse and recycling is required.

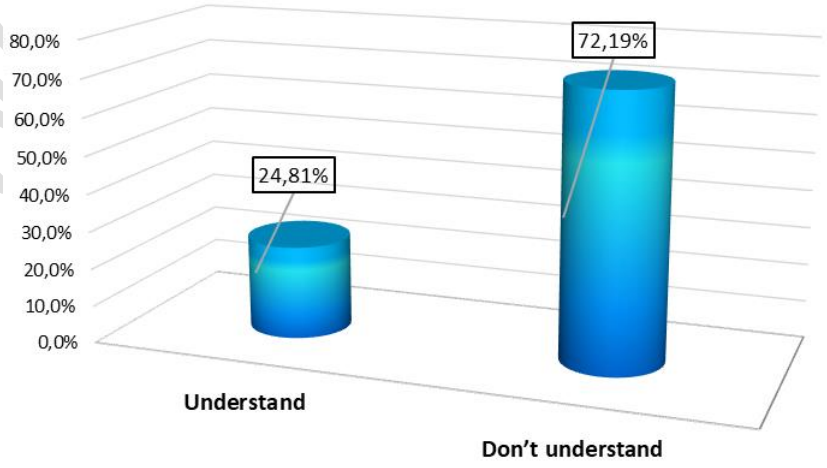

Figure 3. Understanding of respondents toward solid waste management

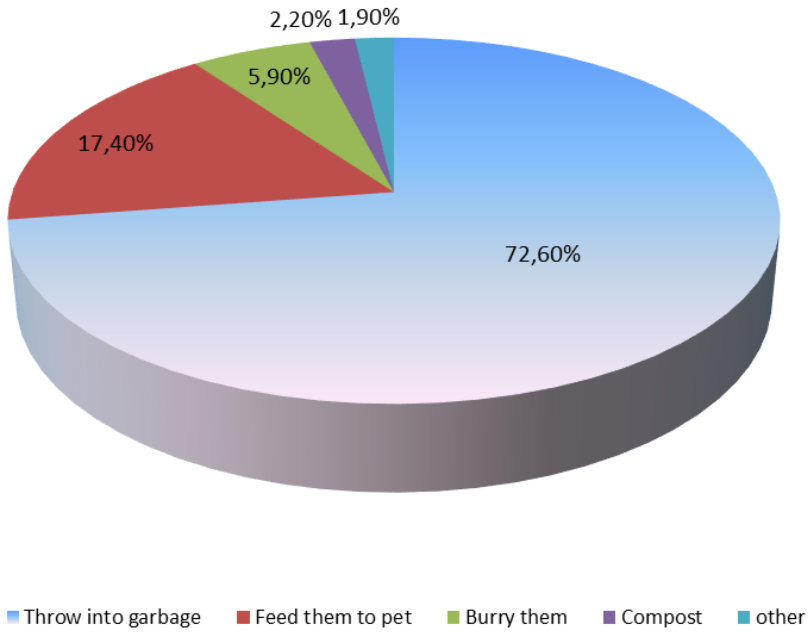

Figure 4. Organic waste handling in Kampar

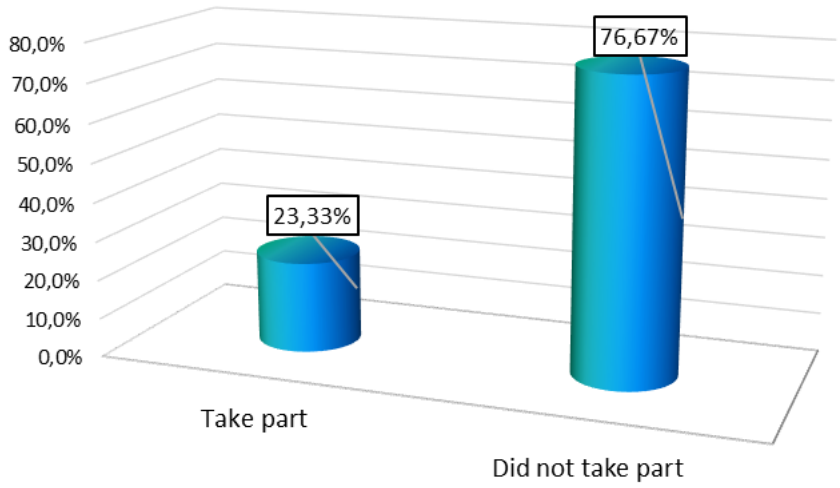

Figure 5. Participation in environmental activities related to solid waste management.

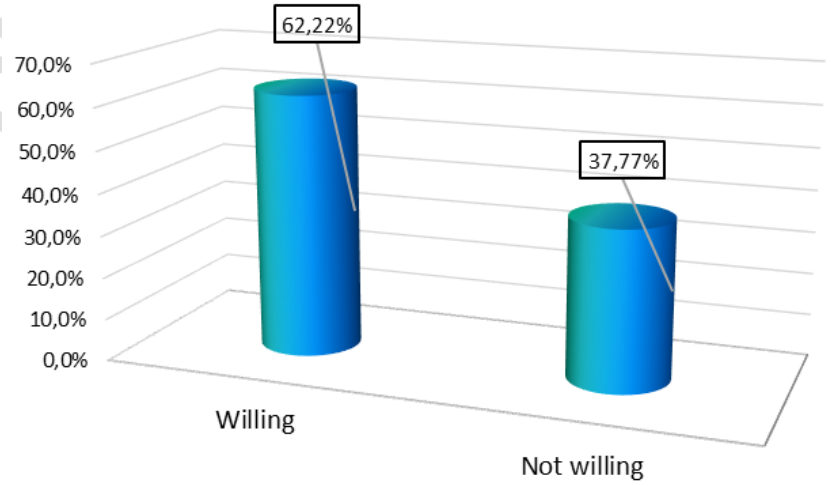

Figure 6. Willingness of respondents to practice waste separation and recycling

5.2 Public interest and attitude toward composting

Composting is considered as one of the main options to solve problems associated with solid waste management (Rubasinghe *et al.,* 2013). Figure 7 shows that about 76.30% of respondents know about composting method in order to reduce food waste. Regrettably, only 33.5% of respondents have practiced the organic composting. In order to prioritize the factors of not willing to practice composting, Likert scale was used in this study. Table 3 illustrates statements of respondents on different organic composting factors. The statements were divided into 5 scales which are strongly agreed, agreed, undecided, disagreed, and strongly disagreed. There were six statements given by respondents namely composting requires plenty of time, composting needs extra efforts, composting requires a lot of space, composting need a lot of food waste, composting will attract flies and vermin, and composting bin are unsightly. The Likert scale outcome shows that respondents have positive attitude and awareness if their response tends to disagreement e.g., Statement 1, if respondent disagree that organic composting requires a plenty of time, respondents may have more positive thought on composting. Thus, it may lead higher tendency for them to try out organic composting.

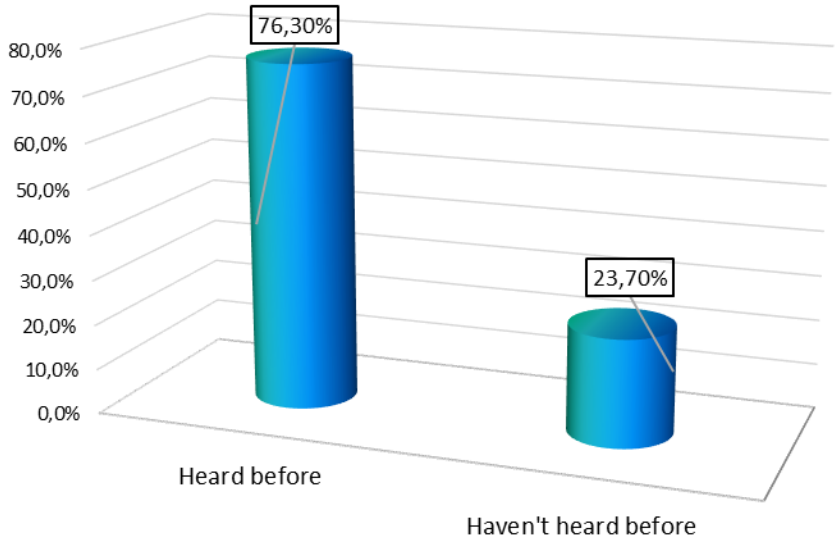

Figure 7. No. of respondents who understand organic composting practice

Table 3. Likert scale and respondent's Statement

Statements	Agree strongly	Agree	Undecided	Disagree	Disagree strongly
1. composting requires plenty of time	13	85	56	91	25
2. Composting needs a lot of efforts	7	102	65	86	10
3. Composting needs a lot of space	21	102	58	83	6
4. Composting needs a lot of food waste	1	78	94	85	12
5. Composting will attract flies and vermin	21	120	70	54	5
6. Composting bin are unsightly	16	87	95	59	13

For statement 1: composting requires plenty of time, 42.96% of respondents disagreed or strongly disagreed with this statement, which indicates most of respondents would not mind giving time to practice organic composting. 40.37% of respondents agreed or strongly agreed that composting needs a lot of effort in terms of cost and knowledge. However, composting can be easy if convenience method of composting is introduced to the public.

For statement 3, composting needs a lot of space, 45.56% of respondent agreed or strongly agreed with the statement. Most of respondents face difficulty as they don't have space for doing composting especially those are staying in apartment. Furthermore, total 35.93% of respondents disagreed or strongly disagreed the composting needs a lot of food waste. It shows that respondents understand the composting requires flexible amount of organic waste. However, total 34.81% of respondent did not decide on this statement. This may due to lack of knowledge about composting method. For statement 5, there is significant different of response for this statement. Total 52.22% of respondents agreed or strongly agreed that composting can attract flies and vermin. This might be an observation during the composting exercise. Total 38.15% of respondents agreed or strongly agreed that composting bin is unsightly it may become an important reason that Kampar community resists to practice composting in living place.

Conbrach's alpha test for Likert scale was conducted by using SPSS. The aim was to check the internal consistency

for the Likert scale. Result of the Cronbach's Alpha was 0.751, which indicate that the Likert scale is valid in this study. Table 4 shows the corresponding item and Conbach's Alpha value if the item is deleted. The initiated Conbach's Alpha value was 0.751 and there is no value will be higher than 0.751. Thus, there is no need to remove any of items in order to improve the Cronbach's value.

Table 4. Conbrach's value if item deleted

Items	Scale Mean if Item Deleted	Scale Variance if Item Deleted	Corrected Item-Total Correlation	Cronbach's Alpha if Item Deleted
1. Compost needs plenty of time	8.63	17.886	0.458	0.725
2. Compost needs a lot of effort	8.80	17.588	0.527	0.706
3. Compost needs a lot of space	8.84	17.369	0.594	0.689
4. Compost needs a lot of waste	8.98	16.695	0.533	0.704
5. Compost attract flies and vermin	9.04	19.136	0.402	0.738
6. Composting bin is unsightly	9.13	17.863	0.439	0.731

The scale range from 1 to 4 was indicated according to the level of agreement on the six predefined statements. The corresponding ranking is shown in Table 5. All of the ranking was summed out and transfer into a scale of 10 in order to represent the awareness of respondents. Afterward, the level of awareness was divided into three groups i.e. negative (0-4.0), moderate (4.1 - 7.0) and positive (7.1 - 24.0). Figure 8 shows that total 138 respondents shave moderate awareness, while 103 respondents presented negative awareness. There are only 29 respondents who showed positive awareness. The analysis outcome indicates that the majority residents in Kampar District have insufficient knowledge and awareness about organic composting. Besides, respodents show less concern towards their daily waste minimization.

Table 5. Level of agreement and corresponding ranking

Degree of agree/disagree	Ranking
Agree strongly	1
Agree	2
Undecided	0
Disagree	3
Disagree strongly	4

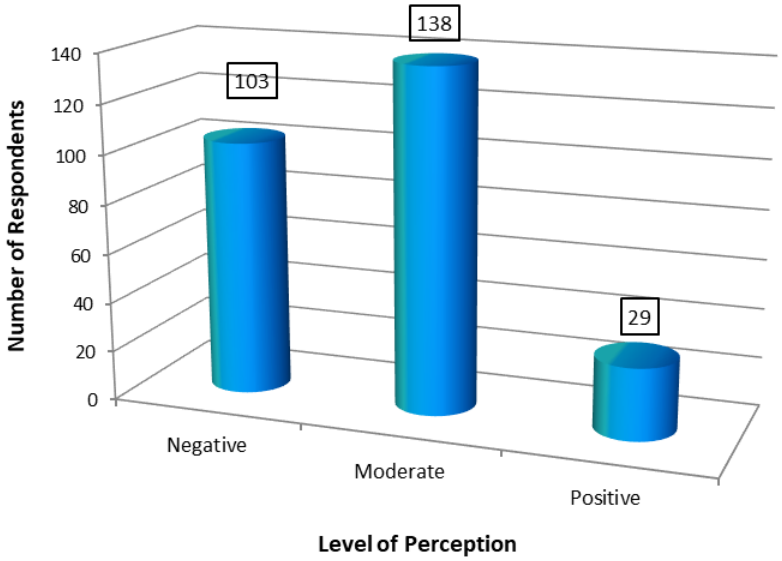

Figure 8. Number of respondents with different perceptions

6. Conclusions

Despite the high potential for household solid waste recycling, wastes are still simply being, dumped in an open area of ground without any effort for recycling. This study has highlighted solid waste management practice in Malaysia and investigated the public knowledge and awareness regarding waste separation and composting. Kampar district was selected as a study area. In conclusion, knowledge and public awareness are major issues during

waste separation and composting promotion. Shaping public awareness is always a hard task. In order to let the public to accept composting, proper method of composting training is required to be conducted. Although MDK has been trying a lot of effort promoting waste separation and composting, but according to the current study outcome, about 76.67% of the public have not attended any activity regarding to composting. Furthermore, about 72.6% of respondents through their waste into garbage directly without practicing any waste separation or composting. The analysis outcome indicates that the majority residents in Kampar District have insufficient knowledge and awareness about organic composting.

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