Food Waste Management in Malaysia- Current situation and future management options

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ABSTRACT

The high amount of food waste generated is the main cause to most issues related to landfills such as foul odor, toxic leachate, emission of greenhouse gases and vermin infestation. Although food waste issue is as critical as municipal solid waste issue, the condition is such that municipal solid waste management systems in Malaysia are also very poorly conducted. Thus, the aim of this paper is to discuss the possible options of food waste management systems that are suitable for implementation in Malaysia.

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1. Introduction

The problem of food waste (FW) is a global issue nowadays and even the developed countries are much concerned to find its appropriate management solution along with the municipal solid waste (MSW). Countries such as Korea and Japan separate FW from MSW due to food waste degradation, insufficient areas for landfills, problems with transportation of FW to disposal sites and problems arising from landfill and incineration (Kim and Kim, 2010). Malaysia on the other hand, is trying its best to solve the basic problem of municipal solid waste management only and finding the most environmentally friendly solutions which are acceptable by the public. The FW is treated as part of MSW and a separate FW management system does not exist in Malaysia. Thus together with efforts to solve MSW issues, Malaysia should also consider finding solutions for FW matter as MSW is highly related to FW as it constitutes approximately 60% of MSW (Kathrivale, et al. 2003, Saeed, et al. 2009, Hassan, et al. 2001).

In 2005, municipal solid waste generated was 7.34 million tons and is predicted to increase to 10.9 million tons in 2020 (Alias, 2010). Food waste content is about 60% of the MSW, thus the estimated amount of food waste generated in 2005 is 4.404 million tons and is estimated to increase to 6.54 million tons in 2020. The high amount of food waste generated is the main cause to most issues related to landfills such as foul odor, toxic leachate, emission of greenhouse gases and vermin infestation (Lee, et al. 2007). Although food waste issue is as critical as municipal solid waste issue, the condition is such that municipal solid waste management systems in Malaysia are also very poorly conducted (Hassan, et al. 1999). Thus, the aim of this paper is to discuss the possible options
of food waste management systems that are suitable for implementation in Malaysia.

2. Current food waste situation in Malaysia

Municipal solid waste generated daily in Malaysia range from 0.8-0.9 kg per household in general and about 1.62 kg per household in densely populated cities such as Kuala Lumpur with food waste constituting approximately 60% of the total solid waste (Saeed, et al. 2009, Kathrivale, et al. 2003). Kathrivale, et al. (2003) also stated that 85-90% of total solid waste are organic wastes. Table 1 shows the composition of Malaysian food waste.

Table 1: Composition (%) of food waste on wet weight basis.

<table>
<thead>
<tr>
<th>Components</th>
<th>Malaysian food waste</th>
<th>Japanese food waste (Ohkouchi &amp; Inoue, 2007)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Moisture</td>
<td>78.09</td>
<td>77.5</td>
</tr>
<tr>
<td>Ash</td>
<td>1.42</td>
<td>1.68</td>
</tr>
<tr>
<td>Total Sugar</td>
<td>10.36</td>
<td>9.85</td>
</tr>
<tr>
<td>Carbohydrate</td>
<td>8.05</td>
<td>7.79</td>
</tr>
<tr>
<td>Protein</td>
<td>3.50</td>
<td>3.99</td>
</tr>
<tr>
<td>Fats</td>
<td>5.22</td>
<td>5.41</td>
</tr>
<tr>
<td>Fiber (cellulose, lignin, hemicelluloses)</td>
<td>4.64</td>
<td>4.72</td>
</tr>
</tbody>
</table>

Note: Malaysian food waste data is taken from a laboratory work by the author to study food waste composition from a household in Malaysia. The above data is not regarded as representative of the whole countries’ food waste composition but only used as a sample reference.

Table 2: Food waste recycling methods

<table>
<thead>
<tr>
<th>Food waste recycling options</th>
<th>Description</th>
<th>Examples of countries applying recycling options</th>
</tr>
</thead>
<tbody>
<tr>
<td>Anaerobic digestion/Co-digestion</td>
<td>Food waste is collected and fermented to produce methane gas which is collected as renewable energy (Knipe, 2005)</td>
<td>Germany, Great Britain.</td>
</tr>
<tr>
<td>Composting</td>
<td>Home composting (food waste digesters) or in-vessel composting facility whereby the compost product can be used as fertilizers or soil amendment (Knipe, 2005, Kim and Kim, 2010).</td>
<td>Great Britain, Korea.</td>
</tr>
<tr>
<td>Dry or wet feed</td>
<td>Facility that processes and converts food wastes into safe animal feeds (Kim and Kim, 2010).</td>
<td>Korea</td>
</tr>
</tbody>
</table>

The data given shows chemical content in Malaysian food waste compared to Japanese food waste content. Nevertheless, this data is not representative of all Malaysian food wastes as there is no actual study on food waste composition collected from households or disposed at landfills. A study by Afizah (2006) shows that moisture content of municipal solid waste collected from Pulau Burung landfill contains 54.1% moisture and Kathrivale, et al. (2003) study showed moisture content of 55%. Nevertheless, home food waste moisture content is higher as shown in Table 1 and is in agreement to the food waste tested in Japan (Ohkouchi and Inoue, 2007). This increase in moisture could be due to the water from washing of plates and pots that were inevitably introduced to the waste mixture.

Food waste in Malaysia is not segregated at source nor separated from other solid wastes at landfill sites before disposal. At present there are 289 landfills in Malaysia and only 7 out of total landfills are sanitary landfills (Syed Ali, 2009). Solid wastes are not normally recycled by Malaysians either by composting or by other recycling methods. Separation of wastes such as papers, plastics, glass, rubber, ferrous and non-ferrous metals are usually done by garbage collection worker and scavengers at disposal sites (Hassan, et al. 2000).
Food wastes with other organic wastes such as garden waste and timber products are dumped directly into landfills without any treatment whatsoever. Nevertheless, a positive turn of events recently shows that Malaysian government is concerned about the ever rising solid waste issues in the country. The government will enforce Malaysians to separate solid waste at home according to category by giving free garbage bins by the year 2013. Datuk Nadzri Yahya, the Director General of the Department of Solid Waste Management, said that the Prime Minister, Datuk Seri Najib Razak demanded during the last cabinet meeting that Solid Waste Management Act and Public Cleansing 2007 to be executed as soon as early next year. For the execution of this act, 2 separate garbage bins will be provided for every household that is one for organic solid waste and one for recyclable waste material (Alzahrin, 2010).

3. Types of food waste management in the world

Food waste issue, although has always been frequently regarded as main contributor to greenhouse gasses, only recently received much attention even in developed countries. In order to assess management options, that option must have detailed health, safety, environmental, social, economic and operational risk to determine whether the waste management strategies are suitable for implementation (Knipe, 2005).

There are many types of food waste management. Basically, all waste management methods should follow the hierarchy shown in Figure 1. Waste prevention is set as the top priority because that is the source of waste generation. Reuse of waste includes using second hand goods but in the case of food waste, not many foods in its original form can be reused due to edibility issue. Recycling of food waste in Malaysia is rarely conducted. But the importance of recycling is at the third priority. Examples of food recycling methods that some countries have applied are as shown in Table 2. Recovery level usually in energy products from food waste. Currently, there are proven and applied technologies to produce methane (Han and Shin, 2004) and hydrogen (Kim et al. 2009). Other potential technologies include producing oil (Minowa et al. 1995), lactic acid (Sakai et al. 2000) and plastic (Sakai et al. 2004). Although most of these technologies are only available in lab scale, future interests and investment should be channeled to develop such beneficial technology into pilot scale project.

Nevertheless, this is the most difficult part to implement as it involves more human participation compared to the other three. Human attitude and behavior has always been the most difficult part to make a change to as shown in a study by group of researchers in United Kingdom on people’s waste prevention habits (Cox, et al. 2010). In order to produce change, steps to tackle this matter through education, campaigns and policies must be conducted continuously. The effect of waste prevention is enormous on the generation rate of food waste (Cox, et al. 2010). Thus, this is the ultimate step that Malaysians must take in order to reduce food waste generation as a whole.

One of the prominent recycling methods of food waste and municipal solid waste is by incineration and has been successfully applied in countries such as Japan. In Malaysia, however, the previous Blue Valley project to build a mega-incinerator in Broga, Pahang has led to many serious objections from the residents in that area and most environmentally-concerned non-government organization (The Sun, 2007). The government has finally decided to cancel the project (The Star, 2007). Recently, there have been articles in the newspaper that the government is planning to build mini-incinerators all over Malaysia such as in Melaka and Johor (Bernama, 2009). These new projects are bound to receive continuous protests as incineration ash by-product is highly toxic to the environment (Balifokus, 2006). Besides the hazardous ash by-product of incineration, the setup and running costs of such incinerator are also very expensive. The previously cancelled incinerator project costs 425 million US dollar.

Other potential food waste processing facility includes anaerobic digestion, dry or wet animal feeds and in-vessel composting (Table 2). The government should be opened to these technologies as the by-products are relatively safe, can be used as soil amendment or safe to be disposed at landfills as well as useful for energy recovery (Kim and Kim, 2010). The private sector should also take this opportunity to enter this field as not only it helps in recycling the abundant of food waste but also producing revenue from sale of biogas, animal feeds and agriculture compost.

There are also some other options that can be taken into consideration for example producing energy products from food waste. Currently, there are proven and applied technologies to produce methane (Han and Shin, 2004) and hydrogen (Kim et al. 2009). Other potential technologies include producing oil (Minowa et al. 1995), lactic acid (Sakai et al. 2000) and plastic (Sakai et al. 2004). Although most of these technologies are only available in lab scale, future interests and investment should be channeled to develop such beneficial technology into pilot scale project.

4. Food waste management option for Malaysia

Suitability of food waste management is highly dependent on the costs of setting up and running the system. Based on the hierarchy shown in Figure 1, normally the most expensive part of waste management is to set up highly advanced facility for recycling, recovery and safe disposal. The least cost used is for the first priority and the second priority that is waste prevention and reuse respectively.

5. Conclusion
Several food waste management options for Malaysia have been discussed. The most important part of waste management is to apply waste prevention and reuse to all Malaysians. Although this is undoubtedly the most difficult, the Malaysian government and non-government organizations should consider prompt implementation of this option due to its current and long term future benefits.

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References


