COMPOSTING AS A SUSTAINABLE METHOD TO MINIMISE WASTE AT SOURCE IN MALAYSIA

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ABSTRACT

Waste has become a major environmental concern that needs to be seriously addressed immediately. Annually, a total of 1.3 billion tons of waste was produced countries across the world. By 2100, this amount is projected to reach 4 billion tons. Experts reckon that the waste issue globally has reached a crisis level, however more than half of the world's population is unable to access regular garbage collection. Overconsumption comes hand in hand with the issue as it portrays evidence that there is inefficient use of materials, thus reducing the Earth's future capacity to supply of new natural resources. Waste management initiatives are largely targeted at local government level and is usually dependent on inefficient and expensive methods such as landfill or incineration. Not only are these methods not feasible, but it produces high environmental costs such as negative impacts on habitat, wildlife and biodiversity. Therefore, alternative methods are explored to minimise waste that goes into landfill or incineration. Recycling is proven predominant for recyclable waste. However, there is a larger amount of residual waste that is being discarded daily. Based on the data by the Ministry of Housing and Local Government, food waste in Malaysia comprises the highest percentage of municipal solid waste (MSW). In efforts to enable the reduction of 40% MSW from landfill disposal to strengthen the Solid Waste and Public Cleansing Management Act 2007, composting of organic waste has been identified as one of the strategies to be implemented. This paper discusses the current situation of separation of waste at source and explores composting as a sustainable method to minimise waste at source in Malaysia.

Keywords: compost, Malaysia, separation at source, waste.

INTRODUCTION

Increase in population has led to an increase in consumption pattern, thus causing an enormous amount of waste being generated in households. In Malaysia, household wastes contribute majorly towards municipal solid waste being produced. According to World Bank report, the daily global average solid waste production is 1.2kg [1] yet this amount is lower than the amount generated in Malaysia, which is 1.64kg per day. Out of this daily amount, only 5% is recycled [2]. Municipal solid waste produced in Malaysia constitutes largely of organic matter, specifically food waste. It is estimated materials such as papers, aluminums, plastics, glass and metals make up 55% of municipal waste, while the bulk 45% of municipal waste comes from food waste [3].

Many states across Malaysia such as the Federal Territory of Kuala Lumpur, Putrajaya, Melaka, Johor, Negeri Sembilan, Kedah and Perlis has implemented mandatory solid waste separation on September 1, 2015 in efforts to minimize the amount of solid waste sent to landfills. The implement upholds the regulations under Solid Waste and Public Cleansing Management Act 2007 (Act 672). It is common for households to segregate recyclables, however that is not the case for food waste. This is mainly due to lack of food waste recovery, low awareness among the populace and low demand for products derived from food waste, such as compost [4].

There is an escalating rate of organic waste in Malaysia as the population increases, especially in urban households which make up more than 65% of Malaysia's population. This large urban population has affected the generation of organic waste. This is due to the rapid rate of development in urban areas, large increases in per-capita income, migration trends preferring urban areas and increased patterns of consumption [5]. As waste in Malaysia is dominated by food waste, it is important to adopt proper planning and management. Although the significance of productive use of waste materials such as composting have been identified, the practice is rather disappointing.

SCENARIO FOR SEPARATION OF WASTE AT SOURCE IN MALAYSIA

Fundamentally, the practice of separation of waste at source is conceptualized under the Act 672, which functions to provide guidelines for management of controlled solid waste and public cleansing as a means for maintaining proper sanitation. The waste needs to be separated at source according to different categories such as recyclable waste, garden waste and residual waste [6]. Waste that has been separated will then be collected weekly based on schedules. A fine of between RM50 and RM500 will be charged for non-compliance [7].

The suggested method to separate the three main categories of waste is by placing the organic waste such as food waste, diapers and sanitary napkins into the bin, inorganic recyclables such as newspapers, magazines, boxes, plastics, bottles, aluminum cans, glass and electronic items into a separate bag next to the bin, and garden waste on the road shoulder next to the house [8]. The practice is not easy as it seems but impressively some local residents are permanent and active in adhering to the policy. According to The Star (2016), some communities, like a gated-and-guarded community in Kepong, had amazing efforts of setting up a composting center within their neighborhood vicinity, as well as improved recycling rates [8].

Even though the separation of waste at source is newly introduced on September 1, 2015, some communities already had a head start in terms of separating their waste almost a decade ago. Despite figures showing urbanites producing more household waste, residents in areas like Putrajaya, Bangsar and Damansara are aware of the situation and have been practicing separation of waste at source even before the policy was introduced [8]. However, this is only the case for a certain few areas and does not reflect the majority. According to Hazilah Gumri, the Director of Public Cleansing

Management Corporation (SWCorp), there are still areas that are performing poorly in terms of waste management, and the progress will be monitored via data collection from every township.

Willingness to recycle is perceived as social moral obligation being embedded in a person who understands the environmental implications of non-biodegradable items or the over capacity of current landfills [9]. This pro-environmentalist attitude that is portrayed by recyclers prove that the awareness campaigns such as 3R (Reduce, Reuse, Recycle) does play an important role in shaping characteristics of a society. Malaysians are more familiar with identifying and separating recyclable items. Based on data from SWCorp, recycling initiatives has increased from 5% to 17% within five years, and the cooperation is positive that it could attain the target set by the Government, which is 22% by 2020 [8].

However, in terms of recycling, we still have a long way to go if we compare ourselves to the European countries. Che Osmi et. al. (n.d.) posed a contrasting view that there is still a lack of management and public awareness when it comes to recycling in Malaysia [10]. There is still a large amount of recycled waste being thrown away in dustbins. This is not only due to lack of management and awareness, but poor legislation as well. In Germany, there is a "Dual System" being implemented and every house is provided with recycling bins. On the other hand, in Malaysia, recycling bins are very scarce and there is improper and inefficient recycling management system. This is turn provides an opportunity for scavengers to collect vendible materials from garbage bins or landfills and sell them for manufacturing purposes [10]. This act is risky as lack of hygiene precautions in handling recyclable waste poses health issues and hazards.

It is a different situation for organic waste, particularly food waste. Data has shown that from 1975-2005, there is an increase of generation of food waste in a dominant collective from 40-64% in municipal solid waste in Malaysia [11]. Statistics from the Sun Daily (2014) has shown that more than 30 million of the population in Malaysia generates 8,000 tonnes of food waste per day [12]. This is due to the evolving eating habits that is interrelated with the increasing living standards over the years, enabling more people to afford more food products as compared to before [5]. Not only that, the booming population growth and rapid urbanisation are major contributing factors [13] resulting in overconsumption and vast amounts of food waste.

Although we have not reached an ideal stage of recycling management, the recycling method has somewhat been established and laid out in Malaysia. Unfortunately, there is no proper disposal method for food waste in the country. The rate of food waste being reused and recycled is relatively low, which is 5%, as opposed to paper, 60% and plastic, 15% [14]. Despite the fact that over 90% of food waste is considered biodegradable and easy to be reused and recycled, many Malaysians lack awareness on reduction of food waste [15]. This is probably due to limited options to separate food waste at source and lack of large scale composting practice [14]. There is still a long way to go until a proper food waste management system is established [13].

COMPOSTING AS A SUSTAINABLE METHOD TO MINIMISE WASTE

Major constraints have been identified with regards to waste management in Malaysia. Besides improper management and lack of enforcement, inadequate funding is considered as one of the main challenges. With the introduction of separation of waste at source under Act 672, the government has shown commitment to aligning handling of food waste in a sustainable food waste disposal model, thus shifting from a conventional food waste disposal model [11]. To coherently support the sustainable model and practicing food waste handling methods at a more financially savvy scale, nature-friendly food waste handling methods are most ideal, especially composting.

Composting of food waste can be perceived as one of the most suitable methods for treating biodegradable waste composition [16, 17]. There are many benefits of practicing composting at home. For example, applying organic compost onto soil helps to increase the amount of organic matter, which is then applicable to restore and preserve the environment [18]. The by-product of composting is highly favourable as a soil conditioner, thus enhancing the growth of plants as it increases soil fertility. In some countries, home composting is greatly encouraged as it is in line with the policy that aids in reducing the waste collection fee [19]. The purpose of this is to prevent a significant amount greenhouse gases (GHG) to be emitted as compared to land filling without energy recovery [20].

At research capacity, Universiti Sains Malaysia is recognised as one of the leading local tertiary institutions to address food waste with the introduction of the Simple Composting System. The Simple Composting System, also known as *Sistem Kompos Mudah* (SKM), is a basic decomposition method for organic waste. Spearheaded by the School of Industrial Technology, under the Ecoprocess Technology (ECOPRO) team, the composting method has been practiced successfully by the university and replicated in various projects in schools and higher learning institutions. A 200 litre bin is used to collect the compost materials. The SKM is an integrated application of the conventional heap or pile composting method, and comprises of both lawn and food waste. Lawn waste refers to dried leaves etc, which is the "brown layer" and source of carbon (C), whereas food waste is identified as the "green layer" and is the source of nitrogen (N). Both lawn and food waste is placed alternatively in the bin, and it generally takes two months to degrade.

To increase the composting productivity, microbes are sprayed at every two layers. It is important to maintain the C-N ratio in order to control odour and create the best environment for composting to take place. However, despite the ratio, decomposition still occurs but the length to create the compost varies as it affects the production of compost. The SKM is easy to maintain. It consists of three main components to ensure proper maintenance to take place, which are bacteria, temperature and moisture. In situations where there is a large aggregate of food waste, inoculants are added in the form of solids. Effective microorganisms (EM) can be used as well. This is because more food waste requires more energy to break down and decompose. Malaysia's temperature is ideal for composting as it is hot and humid. The moisture content can be monitored easily via observation or checking the texture. If it is too dry, more water is added.

There are various food waste composting methods and can be categorised into systems such as the in-vessel system and the windrow system [21, 22, 23]. The in-vessel system is a closed system where food waste is covered, which includes silo, agitated bed, drum and closed container for composting [24]. This system is considered to be more effective than the windrow system as is does not take up a large area and presents a more proper management in regards with gas and leachate discharge [21]. Therefore, it is suitable to be implemented in dense, urban areas, including high rise buildings. Many countries have already practiced composting at various scales. For example, the Taiwan government incorporated

food waste composting in their national programme, "Total Recycling for Kitchen Garbage," to produce bio-fertiliser [25, 26]. Whereas in Thailand, a total of 15% of food waste was decomposed into bio-products from municipal solid waste [27]. The bio-products consist of biogas and bio-fertilisers. Though the positive implications of composting is recognised, the progress of practicing composting in local households, especially in developing countries, are relatively poor due to improper separation of food waste at source and lack of food waste management framework [28].

In spite of this, lessons can be learnt from countries that have successfully implemented and practiced composting, such as Austria, Germany and other countries [10]. Among the strategies that have been developed and could be adopted include banning biodegradable and organic waste from being disposed to the landfill. In Germany, the Pay as You Throw (PAYT) and Dual system has greatly assisted the reduction in waste production as well as enhance separation of waste at source. Education plays a significant role in conveying the composting benefits and steps to properly carry out composting to local residents. Besides that, composting provides a nature-based business opportunity for its by-products. Therefore, this could entice those who are interested in venturing into the business aspect and generate income.

CONCLUSIONS

The implementation of separation of waste at source in Malaysia is timely and will hopefully improve the effectiveness of her waste management system, while taking into account the environmental aspects. In recognising the enormous amount of food waste generated in an average Malaysian household, there is a need to address this issue at hand before it hits a critical stage. Home composting have been identified as one of the most suitable methods in tackling this problem, as not only does it consist of many environmental benefits, but it is also a cost effective way to upcycle food waste and turn it into useful by-products. Lastly, it is highly essential for Malaysia to develop related policies and regulations of food waste management to reduce the amount of waste sent to the landfill. Preliminary models can be adopted from other countries that are already practicing food waste management, such as Japan, South Korea, Austria and Germany.

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