

Food Waste in Malaysia: Trends, Current Practices and Key Challenges

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INTRODUCTION

Wasted food is a considerable component of the world's food system challenges. Food waste can be described as all edible food materials produced for human consumption but left uneaten, either lost or discarded throughout the food supply chain, from farm to fork. It is organic waste discharged from various sources including food processing plants, and domestic/commercial kitchens, cafeterias and restaurants (Chen *et al.*, 2017). Other terms have been used interchangeably, such as food loss, biowaste, and kitchen waste (Thyberg & Tonjes, 2016). According to FAO (2015), approximately one-third of food produced for human consumption is lost or wasted globally. That amount is about 1.3 billion tonnes per year. Food is lost or wasted throughout the supply chain, from initial production down to final household consumption.

Food waste is recognized to be a huge problem worldwide, and is particularly severe in developed countries. For examples, in the United States, food waste and losses at the retail and consumer levels have amounted to 188 kg per capita per year, or an overall value of \$165.6 billion. Among Europe and the North America, the food waste was estimated as high as 280 – 300 kg per capita per year (Garrone, Melacini, & Perego, 2014). In Southeast Asia, it is estimated that 33% of food is wasted in the region (Yang *et al.*, 2016). It was reported that in average a household in Malaysia throw away around 0.5-0.8kg uneaten food per day (Chien Bong *et al.*, 2016). This problem is expected to increase in a few years while corresponding to economic development, population growth, and urbanization as Malaysia's population is expected to reach 33.4 million by year 2020 and 37.4 million by year 2030. Figure 1 shows global food wastage in consumption phase (retailers and consumers) according to the regions reported by FAO (2015).

Food waste negatively affects the availability of food to others. When over one third of globally produced food is wasted, ironically, there are 868 million people who still suffer by starvation and malnutrition. All citizen must keep in mind that the food waste issue is not only associated with social, economic, environmental aspects, but it is also an ethical problem, that needs to be seriously considered (Thi, Lin, & Kumar, 2016). Thus, reducing food waste has attracted a growing public attention at the international, regional, and national levels (Liu *et al.*, 2016). Governments, research institutions, producers, distributors, retailers and consumers are now seriously concerned about how to tackle this issue.

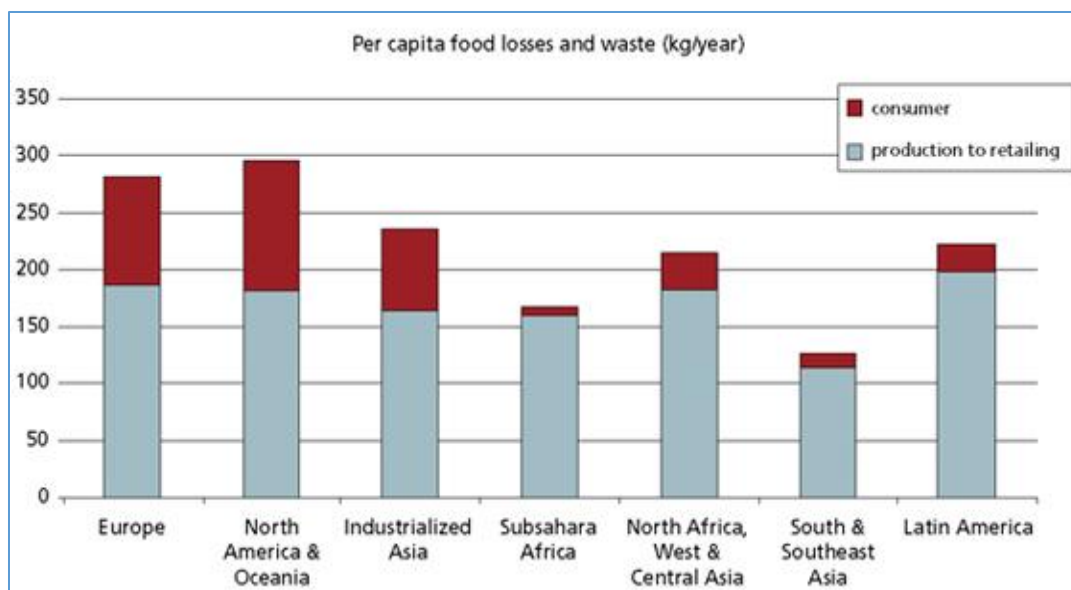


Fig. 1. Per capita food losses and waste, at consumption and pre-consumptions stages, in different regions
 Source: FAO, 2015

Food Waste Trends in Malaysia

It is hard to find any scholarly article regarding food waste statistics in Malaysia since most published papers would consider food waste as part of the Municipal solid waste (MSW). Hence, the term MSW is used where it is applicable throughout this paper.

Malaysia is well known for its great food. We are proud of the diversity and tastiness of our food – all things that we Malaysians are quick to brag about. Unfortunately our unique food culture is also turning into a culture of waste. Statistics from Solid Waste Corporation of Malaysia (SWCorp) showed that in 2015 the food waste in Malaysia reached 15,000 tonnes daily, including 3,000 tonnes that was still fit for consumption and should not have been discarded (Malaysia Kini, 2016). The study also found that a household of five spent an average of 210 USD a month on food and that a quarter of that food was wasted during preparation, cooking and usage. Literally about 53 USD goes into the dustbin every month, which amounted to 631 USD a year.

In 2012, it was reported that Malaysians produced 33,000 tonnes of solid waste daily and will exceed the projected production of 30,000 tonnes by 2020. According to Moh and Abd Manaf (2014), the overall waste composition in Malaysia is dominated by municipal solid waste (MSW) (64%), followed by industrial waste (25%), commercial waste (8%) and construction waste (3%). MSW generally consist of around 20 different categories which are food waste, paper (mixed), cardboard, plastics (rigid, film and foam), textile, wood waste, metals (ferrous or non-ferrous), diapers, newsprint, high grade and fine paper, fruit waste, green waste, batteries, construction waste and glass; these categories can be grouped into organic and inorganic. Generally, MSW in Malaysia consists of 50% of food waste, and 70% as disposed at the landfill sites (Nadzri, 2013) and households are the primary source of MSW in Malaysia.

Food Waste Management in Malaysia

In order to increase efficiency further, the government has delegated waste management to private consortiums. The privatization of urban solid waste management in Malaysia was initiated in 1993 with the objective of providing an integrated, effective, efficient, and technologically advanced solid waste management system. It was also expected to resolve the problems of solid waste management faced by the local authorities (LAs) such as financial difficulty, lack of expertise, illegal dumping, open burning, and a lack of proper solid waste disposal sites. The steady increase in MSW over the years has prompted government-funded public information campaigns to establish awareness and to create environmental consciousness among the general public (Agamuthu, 2009).

Currently, there are a few types of technologies applied in the Malaysia waste management system. Table 1 presents the types of waste management used and the percentage of waste disposed in different years.

Table 1: Method of waste disposal in Malaysia

Treatment	Percentage of waste disposed		
	2002	2006	Target 2020
Recycling	5.0	5.5	22.0
Composting	0.0	1.0	8.0
Incineration	0.0	0.0	16.8
Inert landfill	0.0	3.2	9.1
Sanitary landfill	5.0	30.9	44.1
Other disposal sites	90.0	59.4	0.0
Total	100.0	100.0	100.0

Source: Agamuthu, (2009)

At present, landfilling is the main method of waste disposal (80% usage) in Malaysia. This method is expected to reach down to 65% in 2020. In European countries, only those that cannot be recycled will be taken to the landfill, whereas in many of developing Asian countries such as Malaysia, Thailand, Vietnam, India and Indonesia, all types of wastes (e.g. municipal waste, industrial waste, construction waste) are disposed in landfills without any pre-treatment (Ismail and Manaf, 2013).

Most landfills in the country are in bad conditions, and operated without proper protective measures, such as lining systems, leachate treatment and gas venting (Ismail & Manaf, 2013). Statistics show that there are 186 waste disposal sites that are in operation, out of which only eight (8) are considered sanitary, while many of the others are open dump sites (UPM, 2006). In Terengganu, three of the seven waste disposal sites in the state were in critical condition with overflowing garbage, which is environmentally hazardous (The Star, 2016). This dependency on landfill as waste disposal method is estimated to increase the emission of GHG to 50% by 2020 (MEAKO, 2015). Landfills also created various environmental problems such as leachate, groundwater contamination, potential release of toxic gases and odor. A big part of these problems comes from organic waste and solid waste. As available landfill space decreases and the cost of siting and building new landfill increases, the government struggled to develop

alternative means to meet the demand of waste disposal. It has emerged as a potentially viable means by which local governments can reduce the volume of waste entering landfills.

Diverting food waste from landfills will not only conserve limited landfill space, but also help to reduce greenhouse gas emissions. Anaerobic digestion was recognized as an economic and environmental friendly solution to food waste. In the anaerobic digestion process, organic matter is broken down in a zero-oxygen (anaerobic) atmosphere to form a gas mixture known as biogas, which consists of methane (50–70% volume), carbon dioxide (25–50% volume) and other small quantities of hydrogen, hydrogen sulphide, ammonia and other trace gases. This method has a lot of qualitative benefits such as reducing the amount of MSW, transportation cost of carrying MSW to land fill, emissions and leachate of landfill, increasing life span of landfill and reducing land use (MEAKO, 2015). The sewerage industry in Malaysia can be technologically advanced by implementing an anaerobic digestion system in the mechanized treatment plants which is a promising source for biogas production from the waste generated in the sewage treatment plants (Kumaran *et al.*, 2016). The production of biogas such as biomethane has a great potential to be used as biofuel (Jerry *et al.*, 2013). Another study by Chain *et al.*, (2016) also stated that the usage of biomethane as a natural gas for pipelines and vehicles is increasing.

According to a previous study, Malaysian municipal solid waste stream contains approximately 40–60% of retrievable materials (Agamuthu *et al.*, 2009), including food waste, paper, plastics, glass, ferrous metal and aluminum. Plastics are probably the most common recyclable materials with potential application in Malaysia as they are widely used and being disposed indiscriminately to the landfills. It is essential to understand that not only strengthening recycling initiatives extend the life span of landfills but also supporting the economy as recycling provides profitable opportunities of business. (Moh & Abd Manaf, 2014). The government has been promoting the “3Rs program”: “reduce, recycle and reuse”. However, it is regarded to be still in an early stage (Sin *et al.*, 2013).

Over the decade, the Malaysian government has gradually established several MSW incineration plants, meanwhile emphasizing the 3Rs programme (reduce, reuse, and recycle). A proper and well defined policy and relevant technologies were used in managing wastes production. For instance, the construction activities are required to reduce the adverse effects addressing environmental, social, and economical aspects (Sin *et al.*, 2013).

Policies, measurements and initiatives on food waste in Malaysia

The steady increase in MSW over the years has resulted in government-funded public information campaigns to establish awareness and to create environmental consciousness among the general public. In 1988, the government introduced the Action Plan for a Beautiful and Clean (ABC) Malaysia, and a series of recycling campaigns followed in consecutive years. The campaigns were not successful due to minimal responses from the general public, although the environmental awareness and knowledge on waste management among the public did increase slightly (Agamuthu *et al.*, 2009).

The National Policy on Municipal Solid Waste Management, commonly known as the National Strategic Plan (NSP) succeeded the ABC Plan when it was formulated in 2002 and later adopted in 2005. Sustainable waste management through reduction, reuse and recycling with the use of appropriate technologies, facilities and equipment to provide a sustainable and comprehensive solid waste management service became the key strategies in NSP.

Basically, the waste management adopted under this strategic plan aimed to;

- (i) reduce waste through effective management of resources at levels of raw materials utilization, production, distribution, marketing and consumption;
 - (ii) increase the number of sanitary landfill facilities;
 - (iii) reuse products and materials;
 - (iv) recycle reusable elements of waste through separation at source, separation during waste collection and recovery at materials recovery facilities;
 - (v) implement intermediate treatment of waste;
 - (vi) generate the value of the waste (through composting or waste to energy)
- (Moh and Abd Manaf, 2014).

Then, the Malaysian government implemented The Solid Waste and Public Cleansing Management (SWPCM) Bill in 2007. The money was used in managing the amenities from roads and toilets to drains, food courts, and grassed areas by the roadside, and covered the management of solid waste from commercial centers, public sites, construction sites, households, industrial zones, and institutions, as well as imported solid wastes.

The Malaysian government has put an effort in pursuing environmentally sustainable development, which can be seen in various strategies, frameworks and plans. For example, The Third Outline Perspective Plan (OPP3) constitutes the second decade of development under Vision 2020, from 2001 to 2010, focusing on reducing energy, materials, pollution and waste intensity of urban and industrial activities. The Eighth Malaysian Plan (MP 8) covers the initial phase of OPP3 from 2001 to 2005 which introduces the comprehensive waste management policy highlighting issues of waste reduction, reuse and recycling whereas the Ninth Malaysian Plan (MP 9) reassures the continued effort in 3Rs awareness raising campaigns despite ongoing efforts resulting in very low recycling rate of 5%. As for the Tenth Malaysian Plan (MP 10), operationalizing National Policy on the Environment (2002), the National Green Technology Policy (2009) and the National Climate Change Policy (2009) are implemented as the key to sustainability in conserving and preserving the environmental resources, besides improving solid waste management (Sin *et al.*, 2013).

Recently, in the Eleventh Malaysia Plan (MP 11) (2016-2020), the government revisited the Solid Waste & Public Cleansing Management Act 2007 (Act 672) in order to strengthen the institutional framework and to reinforce coordination among relevant ministries and agencies. As stated in the MP 11, the Government target was to achieve a 22% recycling rate among households in Malaysia by 2020. While the Government are putting in place systems that enable better waste management, getting households to practice recycling is more challenging as it requires mind-set and social behavioral change. Malaysians will certainly have to inculcate better consumption and waste disposal behavior- a prerequisite for a developed nation by 2020 (EPU, 2015).

The National Biomass Strategy 2020 was launched in 2013 to assess how Malaysia develops new industries by utilizing agricultural biomass waste for high value products, including those for exports. The Government has been encouraging Malaysians to tap on their creativity and innovativeness on how to best divert the wastes towards productive use, generating economic value and reducing landfills problems. The industries were encouraged to reduce the dependency on natural resources when wastes become valuable resources, either by conversion of biomass and food waste to power generation or other products (Globoforce.com, n.d.).

Currently in Malaysia, the MSW management is under the responsibility of the Ministry of Housing and Local Government (MHLG). The Department of Environment (DOE) is in charge of hazardous waste, whereas clinical waste is under the management of the Ministry of Health (MOH). Basically, it is Malaysia's National Solid Waste Management Department (NSWMD) that formulates and proposes policies, plans and strategies in respect of solid waste management and public cleansing. It sets standards, specifications and codes of practice exercising regulatory function and grants licenses and approval under Act 672. On the other hand, the Solid Waste Management and Public Cleansing Corporation (PPSPPA) implements the formulated policies, plans and strategies proposed by NSWMD, monitoring the compliance of standards, specifications and code of practices implementing the solid waste management, and enforcing public cleansing laws and recommends reform to such laws (Moh & Abd Manaf, 2014).

Future Demand and Current Initiatives

Despite the Master Plans and Action Plans, as well as the NSP, the strategies only focused on recyclable materials. Innovative strategies for proper management of the food wastes are still very limited and under-developed (Nadzri, 2013). A strategic plan particularly focused on food waste management is crucial, which should emphasize the concepts of 3Rs (Reduce, Reuse and Recycle) in order to address the challenge of the overall waste management in Malaysia. At the moment, the government is working on a National Strategic Plan for Food Waste Management in Malaysia, which is a collaborating project between the Ministry of Housing and Local Government Malaysia (MHLG) and the Ministry of the Environment Japan (MOEJ).

The objectives of the project are:

- i. To develop a National Strategic Plan for Food Waste Management in Malaysia
- ii. To learn from Japan the good practices of food waste management, including the technical and legal perspectives,
- iii. To gather information about the current practice of food waste management in Malaysia, including residential, commercial and industrial waste,
- iv. To conduct pilot projects and, judging from the results, to determine the best possible solutions for food waste management for different waste generators in Malaysia

The implementation of the strategic plan will be done in stages and in line with the current act and regulations. As for now, MOEJ is preparing the Action Plans and Guidelines, drafting out Food Waste Regulation, planning of centralized treatment facilities, assessing targets and data collection approaches, as well as decisions on possible incentives.

Malaysian government and many NGOs are embarking on campaigns to reduce food waste. Some NGOs have always been mindful of and worried about the situation, advocating against throwing the leftovers straight into the dustbin. Food Aid Foundation is one of them. They act as a food bank where manufacturers, distributors, wholesalers, retailers, companies or individuals are encouraged to donate their discarded foods, which would be collected and allocated to welfare institutions, refugee communities, poor families, as well as soup kitchens, among others. All must strive to be conscientious when it comes to the way they treat food and basically cannot afford to waste it. All are also urged to share food with the poor – not only from leftovers, but on the same day it is harvested.

As the Global initiatives, FAO collaborates with donors, bi- and multi-lateral agencies and financial institutions and private sector partners (the food packaging industry and others) to develop and implement the program on food loss and waste reduction. They introduced the SAVE FOOD initiative that aimed at encouraging dialogue between industry, research institution, policy makers, and civil society on food losses. For this purpose, the initiative regularly brought together stakeholders involved in the food supply chain for conferences and projects, and supported them in developing effective measures. Another goal is to raise public awareness of the impact of food waste. The SAVE FOOD put the issue of global food losses onto the political and economic agenda (FAO, 2011).

Malaysia also participated in this initiative by establishing MYSavefood network. The Malaysian Agricultural Research and Development Institute (MARDI) and the Ministry of Agriculture and Agro-based Industry (MOA) are the coordinators of the MYsavefood program, which promoted the reduction of food loss and food waste in Malaysia. There are many stakeholders participated in this network as many realized the importance of the initiative. The network constantly updated information from local and international sources on ways of reducing food loss and food waste and advocating the voluntary approach through awareness, persuasion and education, appealing to public and stakeholders in the food and beverages industry (Malaysia Kini, 2016).

The policy makers in Malaysia can also consider adopting the French way of dealing the food waste. Under a recent law passed by the French senate, supermarkets are banned from throwing away or destroying unsold food. They have to donate these to charities and food banks instead. It would be good if a similar law was introduced to this country. Besides preventing food waste, Malaysians can also become a leader in combating the problem of food waste in the region (Muzaffar, 2016).

CONCLUSION

Malaysia faces the challenge to provide food security, food safety and sustainable development in agricultural sector. Yet more than one third of the food produced today is lost or wasted. This kind of food waste represents a missed opportunity to improve food security. The first solution to food waste problems involves changes in consumers' behavior and massive shifts of industrial procedures (such as food processors, etc.) and retailers. In order to meet the challenge of constructing a sustainable food supply, it requires everyone's involvement along the food supply chain, including policy makers, food producers and suppliers, and food consumers.

There are some drawbacks including poor public participation, lack of efficient indicators to monitor performance, and uncertainty regarding policy outcomes since there is no one-size-fits-all solution to food waste, policy measures to address it should be custom tailored for each individual situation, integrate community needs, and involve a package of several measures. Holistic approaches which integrate education, financial aspects, and logistical improvements across food and waste systems are ideal. To achieve the national goal, the government needs to focus on the research, development and innovation in this particular area. Appropriate planning and implementation approaches need to be strengthened to prevent failure. In the future, relevant research is needed to enhance and develop the specific policies such as National Strategic Plan for Food Waste Management in Malaysia.

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Date submitted: July 5, 2017

Reviewed, edited and uploaded: July 6, 2017