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Izzah Nadhirah Mohamed Zain, Haliza Abdul Rahman

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Food Waste Management and Green Purchasing Behaviour Among Youths in Malaysia

Izzah Nadhirah Mohamed Zain, Haliza Abdul Rahman

Institute for Social Science Studies, Universiti Putra Malaysia, 43400 Serdang, Selangor, Malaysia
Department of Environmental and Occupational Health, Faculty of Medicine and Health Sciences,
Universiti Putra Malaysia, 43400 Serdang, Selangor, Malaysia
Email: gs56985@student.upm.edu.my, dr.haliza@upm.edu.my

Abstract

Malaysia still produces an estimated around 37,890 tonnes of waste per day and 16,687 tonnes of it is food waste in 2019. This figure gives the impression that Malaysians are still not trying to reduce waste as higher amount of waste can reflect the quantity purchased by Malaysians. This situation occurs because it has become a habit to purchase items that cannot be recycled or reused without feeling bad for the environment. The aims of this paper are to highlight the issues and strategies in food waste reduction in Malaysia. Secondary data are collected regarding “food waste”, “waste management” and “environment friendly food purchasing” scope matters. There are several categories of food waste in Malaysia, food losses from production in the food supply chain, unavoidable, and avoidable food waste. Food waste does affect the environment through the greenhouse gas emissions, climate change, land occupation footprint and water footprint. The strategies to overcome the problem of food waste disposals in Malaysia are through composting, recycling, and anaerobic digestion treatment. Green purchasing is an influential driver in almost all the beginning movement of sustainability in the supply chain, which also included food processing until the disposal phase.

Keywords: Environment Friendly Food Purchasing Behaviour, Food Waste, Waste Management, Sustainability, Consumers.

Introduction

Food waste is a global problem that contributed by many sectors, including farmers, food distributors, food outlet or restaurant, households, and individuals. The problem of food waste is considered complicated throughout the supply chain. The food supply chain can be defined as a series of interactions between producers and customers, associated with various food processing and distribution firms (Ocicka and Raźniewska, 2018). In 2020, the food waste in Malaysia increase drastically by 100% and with this increase, the planning to make Malaysia a garbage-free country dump into a failure. This situation is not in line with the recommendations and hopes of the Malaysian government to reduce 44% waste by 2020. In upper middle-income developing countries like Malaysia, the problem of increasing food waste among consumers or households is a serious

problem. Increased income gives consumers higher purchasing power, and this allows them to spend including buying food in better quantity and quality. However, due to indifference to the negative impact on the environment and food purchasing behaviors that are not environmentally friendly, the food purchased ends up in landfills.

Global Food Waste Generation

According to Schanes et al. (2018) the scientific production of food waste-related articles has more than doubled over the last five years, scholarly interest in consumer food waste has gradually grown in European countries. Worldwide, concerns on food waste generation have drawn considerable interest from the academicians, industry sectors, non-profit organisations, as well as government bodies as policymakers. The fear of running out of food supply and perceiving having less food therefore stockpiling more than needed, panic buying among the consumer due certain uncertainty condition for example during lockdown cause by the pandemic COVID-19 in turn producing higher waste (Brizi and Braglia, 2021). This show that over purchasing food products without thinking will produce much waste at the end. Hence, food waste is largely the fault of customers and their lifestyles. This is because during normal time, a consumer engages in common meals practices, such as food preparation, ordering, storing, cooking, eating, and finally recycling the leftover food or waste (Brizi and Braglia, 2021). Study by Jeswani et al (2021) indicates that about a quarter 13.1 Mt of the 58.7 Mt of food consumed in the UK is wasted and almost half of the waste (46%) arises in the consumption stage. In developing a sustainable food market, food consumption plays a key role (Hyland et al., 2017). Consumers are the final link in the food supply chain, and their food preferences and eating behaviours can influence the environment, the economy, and society's well-being (Borsellino et al., 2020). Thus, consumers need to have a basic knowledge that the product they are buying does not actually come in a simple way. In order for consumers to get the final product, it will undergo many processes ranging from agricultural processes that include the use of harmful chemicals such as herbicides, pesticides, pesticides and many more that can pollute the environment and human health (Zepeda and Nie, 2012; Rezai et al., 2012). This process will be continued by factory production such as packaging and delivery process before it can be marketed to consumers. All processes may vary depending on the company that may be paying attention to environmental problems. Thus, changed their food purchase behaviour with sustainable food purchasing, wasting less food will eventually decrease the amount of food waste. Many people now have positive attitude about sustainable food, but there is still a substantial difference between favourable attitudes and the real purchasing and consumption of more sustainable food products (Vermeir et al., 2020).

Food Waste Issues in Malaysia

Food and beverages are considered a basic necessity that account for more than fifty percent of daily consumer purchases by Malaysian. According to Household Expenditure Survey Report by Department of Statistics (2019), this amount divided into two categories, the first category is the purchase of non-alcoholic food and beverages such as fresh vegetables, fish and raw meat and the second category of food expenditure is cooked food in restaurants and ready to be eaten by customers. In Malaysia, the average waste composition results indicated that food wastes serve as the main waste component with 32%, followed by paper and plastics, 21% and 14% respectively (Ramdzan et al., 2018). Food waste generation is expected to increase rapidly in the coming years, while landfill space is getting shorter supply. As in 2018, there were only 146 operated landfills in Malaysia, with only 18 operated landfills were classified as sanitary landfills (SWCorp, 2019; Moh and

Abd Manaf, 2017). The poor management of production of agricultural sector that bring negative changes to the ecosystem and deteriorate human wellbeing have increased the world's concern for the better environment. Over the past few decades, in European countries green agriculture has also experienced a steady increase and has shown increasing consumer interest in the use of environmentally friendly products to reduce the negative impact on ecosystems (Mokthsim and Salleh, 2014). Literacy factors in environmental knowledge as well as awareness of current global environmental issues, making Asian countries such as Malaysia becoming increasingly rapid in environmental movement. Various organizations including governments, non-governmental organizations (NGOs) and other internal groups are stepping up their efforts to preserve the environment.

Methodology

This review paper involved with secondary data which are collected from journal and proceedings using the keywords of “food waste”, “waste management” and “environment friendly food purchasing”. A thorough search of Web of Science, Scopus, Google Scholar and PubMed for articles published mainly in 2010-2021 was done to find articles of food waste management in Malaysia. As preliminary study, only 30 relevant articles were referred.

Results and Discussion

Categories and Stages of Food Waste Production

According to Thi et al (2015); Lim et al (2016) there are several categories of food waste. The first category of food waste which are food losses whether from the stage of preparation, processing and production in the food supply chain. Second category of food loss an unavoidable food waste such as fruit peel and the third category of food loss which are avoidable food waste which means that the food is still an edible food but being wasted intentionally. Gunders (2012) stated that about 10% of food waste come from the restaurants including the fine dining, take away, buffets and quick services. As typical restaurant operation starts from purchases of food in addition to its preparation, cooking, storing and serving, continuing with activities that include the workers and customer behaviour (Coskun and Özbük, 2020). Thus, each activity significantly contributes to food waste from the early raw food materials until the individual consumed the cooked meal as a final product.

According to Jeswani et al (2021) the waste production can be divided into three different stages consistently based on the food supply chain. The first stage is in the primary production stage that can be categorised into pre-harvest and post-harvest production. Second stage happen during the distribution process, where the processing and manufacturing of the food products happens. In this second stage also include the delivery comprises distribution facilities, wholesalers, dealers, and related transportation between them. Spoilage of perishable goods is the principal source of pollution during shipment and storage. The third stage in food waste production is at the consumption part by the consumers. Food is squandered all through the supply chain, from starting agricultural stages down to conclusive individual utilization. Consequently, the involvement of all stakeholders in the food chain is needed in order to halve avoidable food waste (Calvo-Porall et al., 2015). However, packaging will at some point go to waste, either in the supply chain or at the point of consumption, so excessive packaging is to be avoided (Mena et al., 2011). In this way, one initiative developed by food retailers to meet customers' needs is the strategy of selling food products without any packaging. Many food retailers realized that part of their product range could be offered and sold unpackaged and this strategy would encourage customers to buy food in accordance with their actual

needs, purchasing single products instead of large packs (Kranert et al., 2012). Other interesting initiative is to develop better packaging to reduce these damages. In fact, new packaging technologies have provided significant advances in reducing spoilage and food contamination, thereby extending shelf-life, and reducing waste.

Drivers and Factors of Food Waste Production

The drivers of food waste include the modernisation, economic growth, urbanization, globalisation, cultural factors, and socio-demographic factors (Pearson et al., 2013; Thyberg and Tonjes, 2016; Mc Carthy and Liu, 2017). As food consumption shifts from local to global food sources in terms of globalization, for instance, Asian diets are transitioning more towards Western foods, which are more fragile, foods with shorter shelf-life thus produce more food waste and greater drain on environmental resources (Lundqvist et al., 2008). Other than that, fewer locally produced foods and more imported and processed foods, particularly animal products also the be a driver in producing more food waste. In Malaysia the urbanization factor makes the purchase of ready-to-eat food increase based on spending on food purchases in restaurants much higher for households in urban areas (11.4%) compared to households in rural areas (9.8%). Instead the percentage of purchases of raw food and non-alcoholic beverages in urban areas recorded a lower percentage of group spending only (16.1%) compared to the higher percentage of purchases of raw food and (24.4%) non-alcoholic beverages for rural households (DOSM, 2019). This shows that rural households prefer to prepare their own food at home by buying raw food items. This raw food purchase is a great way to avoid wastage of food as well as if the consumer practices the environment friendly food purchasing, not using non-biodegradable products it will give an advantage in their decision to purchase.

There has been a growing food waste generation in recent years, not only from household, but also from business activities such as catering services. School food services are designed to provide students with an adequate and nutritious lunch. Study by Kasavan et al (2021) shows that school food services also considered as one of the biggest generators of food waste when waste generation of unavoidable food at the post-consumer level compared to the amount of unconsumed food considered edible such as rice, noodles and vermicelli, as well as vegetables, fruits and bread, is higher, whereas unavoidable food waste consists of chicken and fish bones lesser found in the waste bin. The staff behaviour and kitchen culture such as over preparation of food and improper storage of food contribute to the waste of food (Gunders, 2017). According to Alias et al. (2017), a case study was conducted in the cafeterias in Universiti Tun Hussein Onn Malaysia, more food waste were collected in March (390.4kg per day) compared in April (35.9kg per day) because many students and staff come to have meal at the cafeteria due to the several factors such as strategic place, diversity of food choices and reasonable price while, while in April lesser waste being produced due to the mid semester break for the students.

As studied by Jalil et al (2019) indicated that there are two main factors contributed towards food waste behaviour among students and staffs in public university which are knowledge and experience, and accessibility and availability of the food itself thus shows it is essential to promote sustainable behaviour at the tertiary level. Study by Grasso et al (2019); Stancu et al (2016), show that socio-demographic influences, such as family size, education level, career type, age, or ethnicity, often influence the amount of food waste by households. Among the attitudes and behaviours of consumers who have encouraged food disposal is not practicing good planning in managing food menus, purchasing and storing food stocks. Without good planning, consumers tend to over-buy or buy unnecessary food. According to Audrey et al (2020) vegetables and fruits represent 31.2% of food

waste due to many consumer habits that preferably bought too many fruits and vegetables as it always has been forgotten at the bottom of the fridge, at last it will become rotten vegetables and fruits that cannot be edible anymore. Without proper shopping lists, consumers tend to over purchase or over estimate the amount they should be purchase and this action will link with another bad habit of overbuying due to the excitement on sales and promotions that encourage consumer bulk food purchase (Gunders, 2017). Discarding food is a common practice once food reaches its expiry and then subsequently replaced with a fresher product. This has typically been a comfortable occurrence in recent decades for people in developing countries, and has persisted due to food overproduction (Farr-Wharton et al., 2014).

Finally, there is also a perception problem among consumers where they do not know or are aware of the difficulty of producing food. The separation of consumers in the process of food production causes them to not know the origin of food and not to feel guilty about throwing it away. Study by Amirudin and Gim (2019) found that most waste was thrown as it was left over from a meal and foods that are stored outside the fridge had a very low throw rate due can be kept longer than fresh foods. While some consumer in Klang Valley also threw food away because it was not to their liking. This situation shows that in fact that they already know the impact of food waste on the environment or on the economy and social of a country but their behaviour towards food waste still relatively in a bad condition.

Impact of Food Waste

In recent years, food waste has become a critical global problem that has substantial environmental, economic, and social impacts (Food and Agricultural Organization, 2015). Food waste impacts are categorised under environmental, social and economic that all three is equally important, although the impact on the environment and economy is considered relatively more than the impact on society. Food waste does affect the environment through the greenhouse gas emissions, climate change, land occupation footprint, water footprint and biodiversity (Food and Agricultural Organization, 2019). According to Porter et al. (2016) food waste in landfills produces methane, a potent greenhouse gas (GHG), which is further related with GHG emissions to the environment and climate change.

In terms of economic impacts, according to Food and Agriculture Organization (2019) about one-quarter to one-third of food waste produced globally is lost or wasted across the food supply chain, comprising approximately 1.3 billion tons of edible food per year. As stated by Zeng et al. (2021) in Canada, 40% of food is being wasted, producing estimate \$31 billion in economic losses annually. Waste and Resources Action Programme in UK reports suggest 7.1 million tons of food is wasted in the UK every year and of this amount 70% are edible foods worth an estimate of £15 billion (Kim et al., 2019). The land, water, and other natural resources used for producing food waste significantly contribute to both environmental and economic losses (Zamri et al., 2019). As studied by Papargyropoulou (2019) on the food waste production in the hospitality and food service sector, the food waste represented a substantial economic loss amounting to approximately 23% of the value of the food purchased while the preparation waste was the largest contributor, followed by buffet leftover and then customer plate waste, demands that the consumer is to blame for the majority of the food waste.

Social impact of food loss is also significantly high as this situation may result healthy foods less available in market, which in turn forces customers to eat unhealthy foods and will result in increased health problems such as obesity (Ponis et al., 2017). By donating food not only benefits

those in need but can also benefit those who participate in the redistribution process and the community. Reduction in food waste in developed countries can also reduce prices in developing countries and this is evident that economic and social impacts are interrelated (Bhattacharya et al., 2021).

Strategy in Food Waste Reduction in Malaysia

There are several measures to prevent the occurrence of excess food waste. In a global aspect, food waste prevention approach through education to promote the importance of food waste prevention and behavior change, encourages food donation policies, promotes food redistribution for animal feeds, incentives on food waste prevention, change waste collection design and legislation to ban landfill organic waste (Thyberg and Tonjes, 2016). In Malaysia, National Waste Minimization Master Plan and Action Plan, as well as National Strategic Plan (NSP) are available, but strategies are focusing only on recyclable programme such as 3Rs Activities, awareness on waste minimisation and enhancement of institution to strengthen government policies on waste (Ministry of Housing and Local Government, 2006). As indicated by Wahidah (2017) innovative methods are also very minimal and under-developed for the proper management of food waste. There are several studies conducted to overcome the problem of waste disposal such as studying the relationship between the level of consumer knowledge about the importance of recycling activities in reducing the percentage of waste. In addition, social and personality influence are factors that motivate consumers to reduce waste. However, in Malaysia, the amount of waste production hardly be reduced even though the study of public knowledge on environmental is relatively high.

There are several ways which are natural and non-natural way to reduce food waste. Naturally, recycling of the food waste can be made in order to reduce the food waste by composting. It is a method of returning organic matter to nature, which means that food taken from plants will be returned to the soil. In addition, composting also prevents the production of methane gas and greenhouse gases due to burning or dumping of garbage to landfills (Abdul Jalil, 2010). According to Ramdzan et al., 2018, composting is a method of restoring organic matter to nature, but there are challenges associated with food compost is to provide a suitable area to collect food waste to avoid unpleasant odours during the process of collecting the waste. According to Ong et al. (2017) huge amounts of wastes are usually generated from pineapple canning industry since it is one of the major agricultural products which generates high food waste volumes in Malaysia. Pineapple waste can be turn into valuable products such as liquid pineapple waste was also used to produce bioethanol by immobilized Bakers' yeast *Saccharomyces cerevisiae* (Zain et al., 2012). Other than production of bioethanol, pineapple waste also can be made as bacterial growth medium for *Lactobacillus* species (Pyar et al., 2014). Moreover, as studied by Fadzil et al (2020) food waste from UTHM cafeteria was thermally treated and use as an anaerobic digestion and is a method to manage food waste due to high bio-methane potential.

Various ways are being done by the Malaysian government to reduce food waste problems such as being actively involved in coordinating food waste initiatives over the last five years, by developing successful awareness strategies along with educational programs where households can reduce food waste disposal and increase community awareness on food waste issues (Abd Razak et al., 2018). Using the public awareness initiative, through the campaign program, knowledge of food waste reduction will be increased among households in Malaysia. No plastic bag campaign in Malaysia and the policy implications suggest that shoppers are more positive of the supermarket plastic bag ban, but unfortunately this does not extend to other forms of public markets (Zen et al.,

2013). This is supported by Zamri et al (2019), shows that there are several projects have been done in order to reduce food waste in Malaysia such as radio broadcast, media, local articles, magazine, journal research, media education that to delivered awareness as well to increase knowledge of Malaysian on the importance of reduction of food waste.

Sadly, the campaign with a lot of allocation from Malaysia government still cannot be able to reduce waste management problem. Generally, Malaysians still have a very low awareness of the importance of such programs benefiting the protection of the environment and their own wellbeing. According to Jereme et al (2017) there is also a need to have some aggressive media campaign to deliver awareness on the need to reduce food wastes and the impacts on the environment. In terms of waste minimization at household level shows that Malaysia's household level of knowledge is not tandem with their attitude on waste reduction, which derivatively low attitude towards the waste minimization behaviour (Ali and Siong, 2016). Therefore, it would be very crucial to identify whether the environment attitudes and perceptions of Generation Z in Malaysia towards the purchasing behaviour of environmentally friendly food relation to reduce the problem of food waste. It is clear that consumer attitudes and behaviours contribute to the increase in food waste. This can be overcome through awareness education but efforts to change these attitudes and behaviours will take a long time. Taking advantage of the high awareness among consumers in the purchase of environmentally friendly food, this measure was found to reduce the ratio of waste disposal of both the food itself and the food wrapping material. By applying the behaviour of purchasing environmentally friendly food is also able to reduce the problem of overuse of plastic that is non-biodegradable.

The reduction of food waste is focused on influencing individual level behaviour to reduce food waste production. As many countries are interested in expanding the ban on organic waste disposal as one of the more systemic interventions, proposals to support programs of purchase and use of environment friendly products and environment friendly food as one of the methods to reduce food waste and solid plastic waste packaging. In addition to focusing on healthier eating behaviours for balanced nutrition, environment friendly food purchase management is estimated to be able to encourage the community to eat the food they have purchased, and thus reduce food waste. Therefore, we can assume that the more not environmentally friendly food products are sold in Malaysia the more waste production. Consumer behaviour towards food product selection needs to change to ensure environmental sustainability. Especially the younger generation should be educated and trained from an early age when purchasing food at school or for campus goods they should prioritize the purchase of local food products, sustainable and plant-based food. Table 1 shows several strategies of food waste reductions in Malaysia.

Strategy	Type of food waste	Method	Authors
Landfill	Household, night market, restaurants and institutional food waste	Main method of waste disposal in Malaysia by dumping all the waste at the landfill.	Siti Wahidah, (2017).
Anaerobic digestion	Solid food waste from UTHM cafeteria	Thermally treated and use as an anaerobic digestion and is a method to manage food waste due to high bio-methane potential.	Fadzil et al., (2020).
Recycling	Pineapple waste	Liquid pineapple waste was also used to produce bioethanol by immobilized Bakers' yeast <i>Saccharomyces cerevisiae</i>	Zain et al., (2012).
Composting	Household food waste	Food waste being process by using the machine and be able to be use as a compost within two weeks.	MAIWP, (2018).
Awareness and Educational Talk	Household food waste	Education and programs where households may acquire behavioural prevention techniques and increase attitude towards the issue of food waste.	Abd Razak et al., (2018).
Campaign program	Household food waste	No plastic bag campaign day in Malaysia and the policy implication shows that the consumers are more supportive of the plastic bag ban in the supermarkets but not its extension to other types of public markets	Zen et al., (2013).
Implementation of enforcement and regulation	Restaurant's food waste in Subang Jaya	By creating the law and strategic planning "Developing a National Strategic Plan for Food Waste Management in Malaysia" can reduce amount of food waste	Salehudin et al., (2020).

Table 1: Strategy of the food waste reduction in Malaysia by 2021

Environment Friendly Food Purchasing Behaviour

The impact that environment friendly food purchasing on food waste generation is significant. Study by Sawasdee et al. (2020) concluded that green marketing reduces the food waste generation and put forward by the past studies as well. According to the study of Chaiyasut et al. (2017) it can be concluded that green marketing reduces the food waste generation to a great extent. It is supported by the past studies that green marketing promotes high environmental concerns and promotes the selling and producing methods that cause minimum harm to the environment. As mentioned by Jarjusey and Chamhuri (2017), consumer's limited awareness about food waste could lead to higher

amounts of food waste and the pre-shopping activities can adversely affect the food waste behaviour. Study by Ogiemwonyi et al (2020) shows that the Malaysian respondents' majority have purchased the environmentally friendly home item (26.4%), followed by environmentally friendly organic food (13.2%). In terms of reasons why consumer purchase green products (40.7%) have purchased green products because of environmental benefits, while (33.9%) because of health benefit while only (25.4%) because of both environmental and health benefit. As stated by Vermeir et al (2020) there are some significant instances of environment friendly food incorporate expanding utilization of plant-based (Lea et al., 2006) or insect-based nourishments (Megido et al., 2016), while diminishing meat consumption (Hoek et al., 2013) and selecting seasonal foods (Macdiarmid, 2014). In some but not all instances, buying locally produced food products (MacGregor and Vorley, 2006) or organically produced food (Hughner et al., 2007) may also be more environmentally sustainable.

According to Schanes et al (2018), the theory of planned behaviour by Ajzen in 1991 is the paradigm that is most often used when analysing food waste behaviour in the area of environmental psychology. This theory elaborate that the individual behaviour is determined by the intention to perform the respective behaviour, and thus, the motivation and willingness to act certain behaviour (Ajzen, 1991). Studies employing this socio-psychological framework provide large-scale findings of a great number of people as well able to establish causal relationships between cognitive as well as socio-demographic variables and actions. This framework also provided insights into the role of cognitive processes and determinants of behaviour that are internal to the individual such as attitudes, norms, knowledge and intentions. According to Zhang and Dong (2020) other than Theory of Planned Behaviour, there are also several consumer theory that used by researcher to describe the behaviour towards purchasing eco food products such as Model of Value Attitude Behaviour (VAB), that mostly focus on the study of environmental behaviour from psychological aspects, while the Attitude Behaviour Condition Model (ABC) focus on green purchase behaviour from both social and psychological aspects. There are number of determinants of green purchase that can be divided into different categories.

Several types of green food products as well as factors that influence the intention of Malaysian's consumers to purchase green products constructed based on the results reflected in selected papers. The factors that contribute to Malaysian youth green food purchasing behaviour are environment and health factors (Hasan et al., 2015 and Ayub et al., 2018), willingness to pay, green advertisement and trust (Leong and Mariadass, 2019) and food safety concerns (Lian and Yoong, 2019). Though Diaz-Ruiz et al (2018) found an indirect correlation between environmental awareness and waste minimization, Stancu et al. (2016) found no link between food waste and environmental awareness. Two studies in the United State have found a modest role of environmental concerns about 22% of respondents stated that environmental concerns were not at all important motivations. The younger generation focus more on the financial dimensions of food waste compare to older people that indicate more concern about its social and environmental consequences (Neff et al., 2015; Qi and Roe, 2016). According to Yogananda and Nair (2019), perceived behavioural control contribute among the strongest link towards the green food purchasing behaviour among youth as the study took into the price concern, availability of the products in the market and perceived control thus perhaps later will encourage Malaysian marketers to increase their green food purchase intention even with increase of price compared to the convenient food as this group of consumer generally already have interest in the market sector. As green food purchasing behaviour always being in ties with the health consciousness, it thus shows strong link towards the green purchase intention as people are more concern towards their health will purchasing more healthy food (Yadav

and Pathac, 2016). Study by Yogananda and Nair (2019) also shows that health concern gives third strongest relationship to green purchase intention among youth in Malaysia. Purchasing sustainable food thus a powerful driver in almost all sustainability movement along the supply chain indeed which included from the production of the food until the disposal phase.

Conclusion

In conclusion, there are several methods of waste reduction and management already being develop in Malaysia such as sanitary landfill management, anaerobic digestion, composting, awareness and educational talk, campaign also the implementation of enforcement and regulation by the government. Environment friendly purchasing behaviour promotes high environmental concerns and increase the selling and producing methods that cause minimum harm to the environment. Thus, this current method to reduce the food waste problem can be significant with the behaviour of purchasing environment friendly food products as the green food purchasing relatively seen to give many benefits for consumer as a society in terms of long term financial saving, improve consumer health and wellbeing, and numerous environmental and climate protection benefits.

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