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The Role of Environmental Knowledge and Mediating Effect of Pro-Environmental Attitude towards Food Waste Reduction

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Abstract

In the contemporary world towards sustainability, it is indubitable that food security has alarmed a huge concern among many countries. Besides that, one of the great challenges towards food security is food waste. Like many other countries, Malaysia is also facing the issue of the food waste and it is expected to continuously aggravate in years to come. Even with the efforts and campaigns being made by Malaysian government and non-governmental organizations (NGOs), the number of food waste is still escalating from year to year. This issue comes into a question whether Malaysian consumers do possess an adequate environmental knowledge or not, as several previous studies suggested that consumers who display higher levels of environmental knowledge tend to demonstrate pro-environmental behaviour which includes the food waste reduction. Thus, this paper besides reviewing the constructs and dimensions which associated with the food waste reduction, proposed the conceptual study framework for empirical investigation in the Malaysian context.

Keywords: Food Waste, Environmental Knowledge, Pro-Environmental Attitude, Pro-Environmental Behaviour, Food Waste Reduction

Introduction

It is undeniable that recently, food security has grabbed an attention among many countries. This is because one of the agenda in food security is to ensure that all people at all times have access to sufficient food (Food & Agriculture Organization [FAO], 2006). Subsequently, there comes food security challenge to implement the ability to deal with sufficient food, caused by a combination of expanding world population and food waste (McCarthy et al., 2018). Food waste relates to all edible food materials produced for human consumption but left uneaten, either lost or discarded during food supply chain and from its

early production down to final consumption (Chen, Jiang, Yang, Yang, & Man, 2017). Besides, FAO defines food waste as food which was initially produced for human consumption but was not consumed by humans, instead it was directed into a non-food use other than humans, feed for animals or waste disposal (FAO, 2015).

In line with the above notion, food waste is currently recognized as a major problem and becoming a serious matter in both developed and developing countries. Garrone, Melacini, and Perego (2014) noted in the United States alone, food waste at the retail and consumer levels have amounted to 188 kilograms per capita per year, with overall value of $165.6 billion. They further stated that in Europe, it is estimated as high as 280 – 300 kilogram per capita per year. Looking into Southeast Asia, Yang et al. (2016) noted that it is anticipated an average of 33% food waste in the region. In addition to the existing data recorded pertaining food waste throughout the world, Malaysia is no exclusion. Food waste is a growing problem here, and Solid Waste Management and Public Cleanliness Corporation (SWCorp) Malaysia revealed in their report that Malaysians generate about 15,000 tons of food waste per day, in which 8,000 tons is avoidable food waste, with 3,000 tons of it going to landfills being edible and enough to feed around two million people (Maher, 2017). Not only that, Jereme, Siwar, Begum, and Talib (2016) in their study on solid waste composition from the year 2002 to 2010 reported that food waste is the largest contributor to overall solid waste in Malaysia which constitutes 56.3 percent. Furthermore, Abdul Hamid, Ahmad, Ibrahim, and Nik Abdul Rahman (2012) found that around 4.404 million tons of food waste was generated in 2005 and this situation is estimated to be worsened in 2020 with 6.54 million tons. This increasing numbers of food waste from year to year are projected as a result to the nation's economic development and population growth (Manaf, Samah, & Zukki, 2009). According to Department of Statistics Malaysia (2016), Malaysia's population is projected to increase from 28.6 million in 2010 to 41.5 million in 2040.

Responding to the above matters on food waste, Malaysian government and many NGOs has worked continuously in implanting environmental knowledge towards people with several strategies, frameworks and plans. These can be seen in multiple initiatives such as Action Plan for a Beautiful and Clean (ABC) Malaysia, The Solid Waste Management Policy, and 3R Program (Reduce, Reuse, Recycle) (Manaf et al., 2009). Even with all the efforts and campaigns being made, surprisingly, the number of food waste is still escalating from year to year. Besides, the underpinning effect of environmental knowledge towards pro-environmental attitudes and food waste reduction remains poorly understood in Malaysian context.

Issues

It is unquestionable that food waste has become increasingly visible in policy and academic debates. Throughout recent years, there have been a plethora of articles on environmental concerns, specifically addressing food waste. It is due to its several negative impacts, and one of them is on environmental problem (Gustavsson, Cederberg, Sonesson, & Emanuelsson, 2013). Gökdere (2005) posited that the underlying reason of the current environmental problems is lack of environment knowledge by an individual. It is an accepted fact that when a person did not possess sufficient environmental knowledge, effective and sustainable policies will be hard to achieve and even their pro-environmental behaviour will

be very difficult to develop (Clay, 2005; Latif, Omar, Bidin, & Awang, 2018; Schultz, Oskamp, & Mainieri, 1995). In this context, food waste reduction is being established as one of pro-environmental behaviour as reducing waste will definitely be beneficial for the environment. Therefore, it is not harsh to say that adequate and sound environmental knowledge leads to food waste reduction as a result of understanding of its effects on the environment.

In addition to the direct impact of environmental knowledge towards food waste reduction, several researchers noted that attitudes somehow do play an important role between them. Arcury (1990), Barber, Taylor, and Strick (2009), Flamm (2009) and Jay, Romana, and Stacy (2011) noticed how attitudes tend to be positively changed in accordance with higher levels of environmental knowledge. They also suggested that environmental knowledge, along with attitudes, denotes a catalytic factor in promoting pro-environmental behaviours. Jay et al. (2011) similarly support this fact by affirming that when consumers gain more information about environmental issues, they tend to modify their attitudes in relation to the matters, which in turn, lead them to make changes to their behaviours.

Linking with the above concept, it comes into question whether Malaysian consumers do possess adequate environmental knowledge or not, as several previous studies suggested that consumers who display higher levels of environmental knowledge tend to demonstrate pro-environmental behaviour, which includes food waste reduction. To be simplified, does environmental knowledge plays an important role in developing pro-environmental attitude thus affecting food waste reduction is not known. Therefore, it is hypothesized that the underlying reason of food waste reduction is being predetermined by environmental knowledge and pro-environmental attitude. In a nutshell, this paper proposed a conceptual framework on the role of environmental knowledge and mediating effect of pro-environmental attitude towards food waste reduction among Malaysian consumers. In fact, there has been lack of study in Malaysia addressing on the issue at hand.

Literature Review

Food Waste

Looking into the term, FAO defines food waste as food which was initially produced for human consumption but was not consumed by humans. Instead, it was directed either into a non-food use (for humans), feed for animals, or waste disposal (FAO, 2015). Based on Quested, Marsh, Stunell, and Parry (2013) and Papargyropoulou, Lozano, K. Steinberger, Wright, and Ujang (2014), food waste is grouped into three categories which are; (1) Avoidable food waste refers to food that could have been eaten at some point prior to being thrown away, even though much of it would have been inedible at the point of disposal. (2) Unavoidable food waste refers to the fraction of food that is not usually eaten, including items such as banana skins, apple cores, egg shells and chicken bones. (3) Possibly avoidable food waste refers to food that is eaten in some situations but not others, such as potato skins. Additionally, Chen et al. (2017) posited that food waste relates to all edible food materials produced for human consumption but left uneaten, either lost or discarded during food supply chain, from farm to fork. They further stated that it is organic waste discharged from various sources including food processing plants, domestic or commercial kitchens, cafeterias, restaurants and many others. Some peoples referred food waste as food loss, bio-waste, and kitchen waste (Thyberg & Tonjes, 2016) and this is occurring through the supply

chain, from its early production down to final consumption. In this study, the researchers are focusing on avoidable and possibly avoidable food waste, as they could be controlled and reduced with appropriate measures.

Food Waste Behaviour among Malaysian Consumers

Malaysia is well known of being a food heaven, where foods are commonly accessible at most of the times. Food is closely attached to its identity, and tied to Malaysians belief of warm hospitality. This proclaimed statement could be observed especially in the festive seasons when people are celebrating together with plenty of food. Regrettably, this unique identity and belief is also turning into a culture of food waste because most of the time it is being thrown away due to the amount being served is usually more than needed. As a result, it is not surprising when SWCorp found that food waste can increase by up to 50 percent during the festive seasons. Moreover, SWCorp further stated that Malaysians in average generate about 38,000 tons of solid waste daily, and food waste constitutes around 15,000 tons of it. Besides, nearly 60 percent (8000 tons) found to be avoidable food waste and out of that, it is sadly reported that 3000 tons of it are edible (Naidu, 2017). As a matter of fact, according to Hayati Ismail, Director of the Food Aid Foundation, the number one source of food waste is domestic waste from the household, followed by '*pasar malam'* (night markets) and Ramadan bazaars, after that waste from the food courts, and then comes the food and beverage sector (as cited in Naidu, 2017).

Environmental Knowledge

Fryxell and Lo (2003) described environmental knowledge as general knowledge regarding the facts, concepts or relationships concerning the surrounding environment and its ecosystems. Additionally, Mostafa Mohamed (2007) supplemented this sort of knowledge also encompasses the understanding that individuals have towards the fundamental relationships that may initiate impacts on the surrounding environment. In fact, Paço and Lavrador (2017) noted that those consumers displaying greater levels of environmental knowledge also show the utmost tendency to act positively on environmental issues. Furthermore, Majid, Zahari, and Yusoff (2016) posited that human knowledge is related with the experience of knowing something that relates to the understanding of the new topic and the capability of using it for specific purposes and improvement.

Conversely, Landreth, Grau, Polonsky, and Garma (2011) debated that consumers do not act in accordance with their levels of knowledge. They further detailed that it is due to the argument initiated around these environmental issues and the information usually involves complex scientific explanations that the average consumer may experience difficult to understand. Bulkeley (2000) also supported the statement that consumers may not be able to fully understand either the full extent of questions relating to climate change or the way in which their actions have impact on environmental issues, as a result of the complexity of issues involved.

Responding with the above ideas and arguments, it can be assumed that none of the general public can be expected to have a deep understanding of scientific knowledge on environment complexities, specifically connecting them to environmental issues. However, for people to exhibit pro-environmental behaviour, they require some extent of

environmental knowledge. The content of environmental knowledge must be drawn upon in order to respond proficiently in regard of environmental issues. A review of the content from existing standards and frameworks for environmental knowledge provided the basis for this framework. There are three primary dimensions for the framework which are knowledge of physical and ecological systems, knowledge of environmental issues, and knowledge of multiple solutions to environmental issues.

Knowledge of physical and ecological systems

The fields of ecological and physical systems have advanced in recent times, and both systems are essential to environmental knowledge. This area of knowledge comprises of humans as variables in ecosystems, which includes concepts associated with the ecosystem services and natural capital on which dependencies of human life to these systems, adverse human impacts to them, and humans as agents in the protection and restoration of these systems (Berkowitz, Ford, & Brewer, 2005; Costanza et al., 1997). Evidence on the relationship of this knowledge component to behaviour has been investigated by Hines, Hungerford, and Tomera (1987) and Zelezny (1999).

Knowledge of environmental issues

Hollweg et al. (2011) depicted knowledge of environmental issues as issues that arise from human conflicts about environmental problems and solutions including the causes and effects of those conflicts, for instance; differences in access to resources, beliefs and values, and voice and power. They further stressed that distinguishing causes and factors that adversely affect environment is an important aspect of environmental knowledge. Based on chronological trends since the late 1800s, environmental issues have been apparent in such areas as natural resources; environmental quality and environmental health; human population growth, migration, and settlement; land use; biodiversity; climate change; and sustainability (Hollweg et al., 2011). Several researchers such as Bamberg and Möser (2007), Hines et al. (1987) and Zelezny (1999) examined evidence on the correlation of this knowledge component to behaviour.

Knowledge of multiple solutions to environmental issues

Knowledge in this dimension consist of knowledge of past, ongoing, and current efforts, along with proposed future alternatives, intended at helping to solve environmental problems (Hollweg et al., 2011). This kind of knowledge includes the legacy of efforts, both success stories and failures that aimed at solving environmental problems. Information regarding such efforts is usually accessible in the form of case studies of environmental protection and restoration efforts on the part of governmental agencies and various sectors of society (Bardwell, 1991; Caldwell, Hayes, & MacWhirter, 1976; Monroe & Kaplan, 1988).

Pro-environmental Attitude

Bang, Ellinger, Hadjimarcou, and Traichal (2000) in their case study to discover the willingness of consumers to pay more for renewable energy, determined that there was a positive relationship between environmental knowledge and environmental attitudes, and this influences a greater level of willingness to purchase renewable energy regardless of its higher cost. Arcury (1990), Barber et al. (2009), Flamm (2009) and Jay et al. (2011) noticed how attitudes tend to be positively changed in concurrence with higher levels of knowledge

and that environmental knowledge, along with associated attitudes, denotes a catalytic factor in promoting environmental friendly purchasing behaviours. Jay et al. (2011) similarly support this fact by affirming that when consumers gain more information about environmental issues, they tend to modify their attitudes which in turn will lead them to make changes to their purchasing behaviours.

Albeit the majority of studies reporting such relationships between knowledge, attitudes and behaviours, other researchers such as those by Ger (1999) and González, Centeno, Castaño, Carrete, and Felix (2012) asserted that many consumers only attribute a low level of importance in protecting the environment although the information today are widely available on environmental matters. Additionally, Fotopoulos and Krystallis (2002) obtained equal inferences in a study made of Greek and Indian consumers that holding high levels of knowledge about organic food production did not guarantee to increase the levels of organic produce purchase and consumption. Furthermore, Barbaro-Forleo, Laroche, and Bergeron (2001) reinforce this statement in suggesting that attitudes, to the contrary of knowledge, are the most significant indicators to the willingness of consumers to pay more for environmentally friendly products. On the other hand, Cleveland, Laroche, and Kalamas (2005) found that general environmental attitudes tend to be poor predictors of behaviour. Corresponding to the aforementioned argumentation, it clearly makes sense to continue investigating on the mediating effect of pro-environmental attitudes between environmental knowledge and food waste reduction.

Pro-Environmental Behaviours

Over the previous years, many researchers have debated and still exploring the solution to the questions of why do people act environmentally, and what are the barriers to pro-environmental behaviour. It is undeniably a complex subject to discuss with no simple 'yes or no' answer. In addition, environmental behaviour is found to be a criterion at countering the environmental issues. Ostman and Parker (1987) clarified environmental behaviour as overt and observable actions manifested by a person in response to knowledge of environmental issues to which he or she had a reaction. Seemingly, the point that poor environmental behaviour can destroy environmental quality has progressively grown an attention among researchers and policy makers (Klöckner, 2013). For that reason, environmental behaviour and the affecting determinants that impact it should be evaluated since behavioural patterns can considerably affect the environmental quality and the effectiveness of environmental strategies (Singhirunnusorn, Donlakorn, & Kaewhanin, 2017). For policy makers, detecting the changes in attitude and behaviour among the general public enables them to recognize what effort can be taken to improve the environment. Furthermore, environmental behaviour is not just established but predicted by environmental attitude that could be obtained through adequate environmental knowledge that affects environmental behaviour. According to Kollmuss and Agyeman (2002), pro-environmental behaviour is recognized as behaviour that consciously seeks to minimize the negative impact of one's actions on the environment. In this study context, it regards on food waste reduction.

Conceptual Study Framework

Based on the literatures and the issues highlighted, the conceptual framework is proposed in Figure 1. This conceptual study framework which is also referred to hypotheses

diagrammed portrays the role of environmental knowledge towards pro-environmental attitudes, henceforth contributing to food waste reduction.

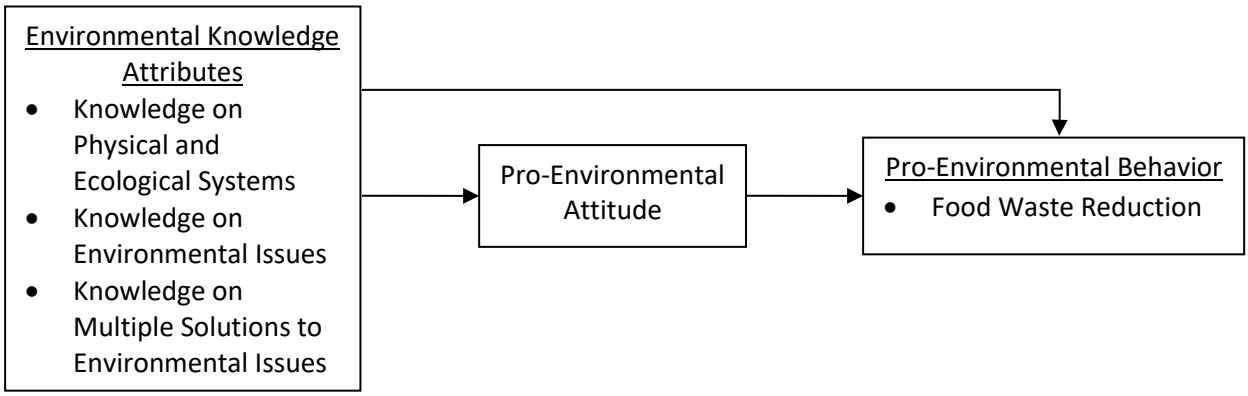

Figure 1: Conceptual Framework

Methodology

Research Design

The design is dependent upon the nature of the study. Since this study proposed to empirically investigate the role of environmental knowledge and mediating effect of pro-environmental attitude towards food waste reduction among Malaysian consumers, a causal research design using a quantitative through cross sectional approach will be used for data collection as it is able to explain the relevant attributes (Sekaran & Bougie, 2016). In the context of this study, consumers from '*pasar malam'* (night markets) will be chosen as sample and the study setting will be in the non-contrived setting as it is dealing with the psychological changes. The reason of choosing the consumers from night markets is due to the fact that according to Hayati Ismail (director of the Food Aid Foundation), food waste from night market is the second largest contributor of food waste after household (as cited in Naidu, 2017). Additionally, the researchers will choose night market as study setting instead of household because of the extent of the study on night market's food waste is not known as none of the literature specifically looks at this issue to date.

Sampling Procedure

Nonprobability sampling, specifically judgment sampling will be chosen in this study as its sampling design. This is due to judgment sampling involves the choice of subjects who are in the best position to provide the information required (Sekaran & Bougie, 2016). In this study, consumers from night market who bought food products will be the sample to provide relevant information concerning to the research subject on food waste. In terms of sample size, the exact population size of night market consumers is difficult to be determined. Therefore, it is estimated that the sample size will be in between 30 to 500 of night market consumers as Roscoe (1975) declared that sample size larger than 30 and smaller than 500 are appropriate for most of the studies. In addition, some statistical experts suggest that a data range between 5 to 10 times the numbers of items used in the scale is accepted (Hair, Black, Anderson, & Babin, 2018). Thus, it is forecasted that the number of samples will be 10 times of the number of items in the instrument as well as within the range of 30 to 500.

Instrument Development

This study will utilize the quantitative methodology in its data collection. Survey questionnaire will be developed to gather the response from the respondents and it will consist of several sections that will measure the constructs and dimensions used in the study. Most of the items in the survey questionnaire will be adapted from the previous research that dwells on the topic and a few modifications will be made to the questions to achieve the objective of this study. The first section will be dealing with the demographic information of the samples, such as gender, age, marital status and education background. Section B will be established to examine the independent variable which is environmental knowledge attributes (knowledge on physical and ecological systems, knowledge on environmental issues, and knowledge on multiple solutions to environmental issues). The next section C will be created to examine mediating variable which is pro-environmental attitude. Finally, the last section D will be developed to measure the dependent variable which is pro-environmental behaviour, specifically food waste reduction. 5-point Likert scale will be chosen to gather the response from the respondents with 1 represents "strongly disagree" and 5 represents "strongly agree". Considering the respondents' profile, questions that will be used should be simple and understandable with the least reading and writing. In other words, respondents should be able to read all items quickly and select an answer without any difficulties. In addition, all items will be formulated as clearly as possible with simple words and language to reduce any possible ambiguities and dual language (Malay and English) version of the questionnaire will be employed.

Plans for Data Analysis

Although the researcher at this stage has limited knowledge on the statistical analysis, SPSS which refers to the Statistical Package for Social Sciences will be used in the data analysis process. However, the preliminary test like reliability (Cronbach Alpha) and exploratory factor analysis will be undertaken beforehand. The descriptive which looking at mean score and standard deviation, together with inferential statistics like Pearson Product Moment Correlation Coefficient, Linear Regression looking at the relationship between variables, and Multiple Regression looking at the mediating variables will be then used whenever appropriate to suit the objectives, research questions and hypotheses of the study.

Conclusion

Academic literatures and research on the role of environmental knowledge and mediating effects of pro-environmental attitude toward food waste reduction especially on night market setting is still limited and the available information on food waste is centrally highlighted to household food waste. Therefore, the scarcity has directly creating vast gaps for academicians to explore the issues in this night market setting. Furthermore, the significant contributions of this proposed study will therefore be accomplished by way of testing the hypotheses model and confirming whether they are supported or rejected. In other words, the originality of this research will contribute to a new body of knowledge in Malaysia and extending the body of literature. This study will also most likely be leading the other potential researchers to look more in depth or in broader scope related to the food waste studies.

From the practical perspectives, it is hoped that this study will provide essential information to policymakers, governments, industrial practitioners, and environmental organizations on the significance of environmental knowledge as antecedent toward pro-environmental attitude and food waste reduction. In a simpler mean, understanding this phenomenon will aid them for better strategies in confronting the issues of food waste among Malaysian consumers. In a nutshell, recommendations and information that will flow from this study will facilitate abovementioned parties with valuable information so they can be more efficient in performing suitable actions since food waste does contribute to several negative impacts on environment.

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