EVALUATION OF OPTIONS FOR FOOD WASTE MANAGEMENT IN METRO MANILA USING AHP

ABSTRACT

Food waste management has been explored to contribute to sustainability actions. However, developing countries like the Philippines have no specific actions on food waste. Food waste is collected and disposed of along with other solid waste with no further waste treatment. This study evaluated different scenario alternatives on food waste based on the criteria financial viability, social acceptability, environmental sustainability and technical enforceability using AHP The most preferred option by the experts was the scenario on food donation.

Keywords: food waste management, AHP, food donation

1. Introduction

1,717 metric tons of food is wasted each day in the Philippines according to a study of the Food and Nutrition Research Institute of the Department of Science and Technology. Food wastage occurs even when 23.7% of the population lived below the national poverty line in 2021. One way to address hunger is through food waste reduction. Developing countries like the Philippines lack specific policies on food waste. Food waste is treated along with other biodegradable wastes unlike other Asian countries with food waste management (FWM) like South Korea and Hong Kong. There are methods like awareness programs and quantity-based charging for food waste reduction which can be effective with policy implementation and participation by stakeholders.

The World Wide Fund for Nature (WWF) stated that food waste is linked to behavior. Participation of the citizens is essential for effective food waste management. This study aimed to capture which food waste management method can be applied to the Philippines through the use of Analytical Hierarchy Process (AHP). The results of the study can be used to identify the FWM method that will receive high participation from stakeholders.

2. Literature Review

Lee et al. (2018) conducted a study on FWM in Hong Kong through the use of system dynamics. The goals set in their program Food Wise Hong Kong was checked through running different scenarios in the system dynamics model. Among the scenario runs, the scenario with the installation and use of an Organic Waste and Treatment Facility combined with the implementation of the quantity-based volume charging scheme showed the 5.11% reduction of food waste sent to landfills.

Meanwhile, in the Philippines, food waste is managed under the law on solid waste. Bernardo (2008) studied the solid waste management practices of households in Manila, Philippines. Only 48% of the

households segregate their waste. The segregated waste is collected and combined in one truck so the rest of the citizens do not see the value in waste segregation. The study showed the importance of awareness and strict implementation of policies for a successful waste management.

Different FWM methods may be explored and one way to choose the most preferred method is AHP. AHP was used by Sasikumar et al. (2022) in the assessment of collection and transportation of waste in India. Based on the criteria including collection means, cost and public participation, the collection by the compact truck from collection point to landfill was the most preferred method.

3. Hypotheses/Objectives

Considering the scenario that will gain the highest public participation, this study aimed to determine the most preferred FWM of stakeholders through AHP.

4. Research Design/Methodology

Based on the literature review of waste management studies, the criteria considered for FWM are financial viability (C1), social acceptability (C2), environmental sustainability (C3) and technical enforceability (C4). Financial viability refers to the cost to implement and maintain the FWM, social acceptability refers to the extent of participation from public and private sector, environmental sustainability refers to the reduction of food waste along every step of the waste hierarchy and technical enforceability refers to the ease-of-doing of the FWM. The scenario alternatives were (1) a multi-sectoral implementation where excess food was donated, food waste were composted in public and private sectors and awareness programs were in place (2) food waste is composted and (3) excess food is donated instead of discarded. The structure is seen on Figure 4.1

The expert opinion was gathered by conducting a survey (see appendix for segments of the questionnaire) among FWM stakeholders: a resident from Metro Manila, a representative from the food manufacturing industry, a representative from the hotel industry and a representative from a policy-making body. The data collected were analyzed using the methods of Saaty.

5. Data/Model Analysis

The responses were presented in a matrix shown on and iterated repeatedly until a consistent weight is obtained. One sample of the resulting matrix from a respondent is shown on Table 5.1. This process was repeated for the pairwise comparison of the criteria and the pairwise comparison of the scenario alternatives in terms of the criteria. Geometric mean was computed to get the overall weight of each criteria and each scenario. The final weights of the C1, C2, C3 and C4 are 0.0990, 0.1941, 0.3190 and 0.2481 respectively. Scenario 3 got the highest final weight of 0.4435 followed by scenario 2 with 0.3305 and scenario 1 with 0.2360.

6. Limitations

This study was limited to the activities in Metro Manila. Different behavior and situations might be observed across the country.
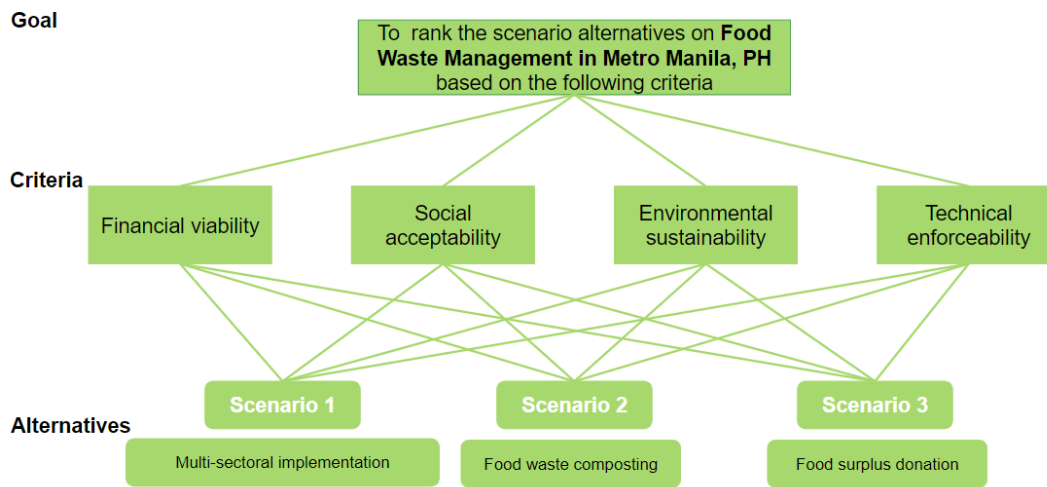
Figure 4.1. AHP Structure of the Model

Table 5.1. CSummary of Decision Weights

	Financial viability	Social acceptability	Environmental sustainability	Technical enforceability
Scenario 1	0.1551	0.3695	0.2951	0.1413
Scenario 2	0.3404	0.2255	0.2486	0.4478
Scenario 3	0.5045	0.4050	0.4563	0.4109

7. Conclusions

Through AHP, scenario 3 where excess food is donated instead of discarded was the most preferred option among the participants of this study based on the criteria financial viability, social acceptability, environmental sustainability and technical enforceability. The application of AHP was a useful tool in capturing the opinions of the possible stakeholders of FWM.

8. Key References

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9. Appendices

Sample survey:

Soft Systems Modelling of Food Waste Management in a Circular Economy Framework		
Code	**Criteria**	
C1	Financial viability	
C2	Social acceptability	
C3	Environmental Sustainability	
C4	Technical Enforceability	

Instruction

In ranking the scenario alternatives for the food waste management in the Philippines, which criteria do you think should be more important?

Is financial viability (C1) more important than social acceptance (C2)?

C1	Very strongly more important	Strongly more important	Moderately more important	Slightly more important	Equal	Slightly more important	Moderately more important	Strongly more important	Very strongly more important	C2
PLEASE TICK ONLY ONE BOX	5 ☐	4 ☐	3 ☐	2 ☐	1 ☐	2 ☐	3 ☐	4 ☐	5 ☐	

Is financial viability (C1) more important than environmetal sustainability (C3)?

C1	Very strongly more important	Strongly more important	Moderately more important	Slightly more important	Equal	Slightly more important	Moderately more important	Strongly more important	Very strongly more important	C3
PLEASE TICK ONLY ONE BOX	5 ☐	4 ☐	3 ☐	2 ☐	1 ☐	2 ☐	3 ☐	4 ☐	5 ☐	

Soft Systems Modelling of Food Waste Management in a Circular Economy Framework

Code	Scenario
A1	Multi-sectoral implementation
A2	Composting
A3	Food surplus donation

In ranking the scenario alternatives to addres the food waste management in the Philippines, which scenario should be prioritized over the other in terms of financial viability?

In terms of financial viability (C1), is multi-sectoral implementation (A1) preferred over Food surplus donation (A3)?

A1	Very strongly more important	Strongly more important	Moderately more important	Slightly more important	Equal	Slightly more important	Moderately more important	Strongly more important	Very strongly more important	A2
PLEASE TICK ONLY ONE BOX	5	4	3	2	1	2	3	4	5	
	☐	☐	☐	☐	☐	☐	☐	☐	☐	

In terms of financial viability (C1), is multi-sectoral implementation (A1) preferred over Composting (A2)?

A1	Very strongly more important	Strongly more important	Moderately more important	Slightly more important	Equal	Slightly more important	Moderately more important	Strongly more important	Very strongly more important	A3
PLEASE TICK ONLY ONE BOX	5	4	3	2	1	2	3	4	5	
	☐	☐	☐	☐	☐	☐	☐	☐	☐	