

[OT 4] GARDEN WASTE MANAGEMENT: PROCESS AND COST

Mohd Mustaki Zakareta¹ & Shafini Mohd Shafie²

¹⁻²*School of Technology Management and Logistics, College of Business, Universiti
Utara Malaysia, 06010 UUM Sintok, Kedah
Mustakizakareta93@gmail.com¹*

ABSTRACT

Garden waste is a blend of organic such as flowers, grass clippings, branches and wood and non-organic such as soil that is produced during the maintenance of public parks and small gardens. Garden waste generation and constantly changing depending on location and season. In Malaysia, garden waste management managed by Municipal Council as well as private companies. This study will be obtained qualitatively by seeking information through interviews with company Enviroment E-Idaman Sdn Bhd which manages garden waste all areas of Kedah. Therefore, this study was able to identify the processes that are carried out to manage the garden waste as well as evaluate the cost of each of these processes. Expected result may show the cost of process garden waste are high.

Keywords: *garden waste, process, cost*

INTRODUCTION

Garden waste is waste generated during the process of implementation of private gardens, public parks and gardens around the house. It is composed of organic and inorganic. Organic garden waste such as grass clippings, twigs, flowers, leaves, and wood. Example inorganic is rock and soil. Garden waste generation rates are often variable and composition depending on factors such as season and location (e.g. climate, municipal and waste management strategy). By definition, garden waste only exists when waste collected.

In many European countries mixed with food waste collected garden waste generation and data rate for both the residual fraction, thus, often confusing (Eurostat, 2005). In the European Union (EU), compost has become the first choice of treatment for garden waste. From about 2000 large commercial composting plants in the EU, only 40% are cared for garden waste (Barth, 2008). Garden waste composting in open windrows are state-of-the-art in all the countries in the European Union and almost the only composting technology only in Finland, France, Ireland, Denmark, and the UK (Barth, 2008). Official statistics on the quality of garden waste generation in the EU is limited. This is partly because some countries did not report the generation of garden waste and in some countries, garden waste and household food waste is collected as a mixture called "bio waste" or FVG (fruits, vegetables, and garden) waste. However, a rough estimate shows that the quantity of compost garden waste each year has increased significantly over the past decade (ECN, 2008), People's Republic of China known to the general population of people for example, various initiatives have been undertaken to establish the quantity of garden waste reduction projects such as introducing

packaging deed, carbon emissions reduction program, composting and marketing program.

In Malaysia, the management of solid waste including garden waste managed by the municipalities and private companies. The company is Alam Flora Sdn Bhd, Environment E-Idaman Sdn Bhd and Southern Waste Management Sdn Bhd. In the state of Kedah, solid waste management company managed by Environment E-Idaman Sdn Bhd in collaboration with the district council. Environment E-Idaman will manage all the solid residues throughout Kedah and the waste of reuse to various uses.

In the garden waste management, the main factor is the bottleneck is the high cost. Start of citations, collection, to transport waste to the landfill. The situation worsened when there is a malfunction in the system of management and labor shortages in executing any tasks that have been given. Failure to comply with the schedule of planned polling also resulted in increasing the amount of waste collected and give a bad impression to the public.

This study aimed to find out the processes garden waste management, carried out by the company Environment E-Idaman Sdn Bhd and evaluate the cost of each process. This is done because there are no previous studies which conducted the study of processes and costs. This is done by interviewing the Environment E-Idaman Sdn Bhd at Alor Setar, Kedah.

PROBLEM STATEMENT

For garden waste management, management process is a little different from other solid waste management. It differs from a generation up to garden waste is disposed. Therefore, many do not know about the rest of it is processed and managed by the company Environment E-Idaman Sdn Bhd. Processes garden waste management is also important to know how the garden waste is managed. The cost for each stage of the process should also be used to evaluate and calculate the cost of managing the garden waste.

In addition, many are not aware of other methods used by Environment E-Idaman Sdn Bhd to arrange for recycling garden waste from the diversity of other materials to be used.

In this study, a few objectives that form the basis for research studies conducted so that the goal can be achieved, namely:

- 1) To study the process in gardens waste management.
- 2) To determine and calculate the cost of each process in gardens waste management.
- 3) To study the potential for reuse of waste garden.

SIGNIFICANT OF PROJECT

In Malaysia, the main problem of solid waste management from waste the garden is written off, and had not applied for the costs incurred because reprocessing technology. The government through the Ministry of Energy And Green Technology has proposed

and encourage companies and government agencies that solid waste from gardens is not written off. In fact, waste is reused into other materials, especially as a source of energy.

One of the best ways to manage garden waste is reused as an energy source and to apply to other materials. Therefore, this study will be able to learn about the processes and methods used to manage waste garden. In addition, it can also determine a cost for each processing costs incurred them. As a result, we will know the cost of doing management work for waste the garden.

LITERATURE RIVIEW

Garden waste is one of the remaining components solids contained in municipal solid waste. The garden waste is usually refers to remnants of vegetation based produced through the work of gardening, cleaning work parks and residential areas, landscaping and so on. Components garden waste consists of leaves, branches and twigs of trees resulting from the work of felling and cutting parts off or unwanted, grasses, agricultural residues such as vegetables and fruits rotten and so on. The rest of the park is the most convenient and easiest to use as the source for the composting process because the carbon and nitrogen content high in it. Between garden waste components frequently used in the process composting leaves, grass, weeds and plant parts that have been downsized (Tchobanoglous et al., 1993).

Management garden waste proses in Malaysia

In Malaysia garden waste management system is very simple compared with other countries that are advanced. Garden waste management process in Malaysia there are five processes only waste management process begins when the garden waste is generated. The garden waste generated in a variety of places such as parks and areas around the house and a small garden. Next, the waste will be collected in an area or in containers that have been provided. Then, the waste will be collected and transported by transportation provided. Next the waste will be collected in an area to be recycled. Last, garden waste that cannot be recycled will be disposed of onsite disposal or burned. Figure 1 below shows the garden waste management system process in Malaysia.



Figure 1
Garden Waste Management system process in Malaysia (JPSPN, 2006)

Management garden waste process in Japan

Japan is a country that thrives on all aspects including garden waste management system. Waste management in Japan is different from Malaysia. Use of equipment and waste management system that systematically show they are better than the waste management carried out in Malaysia. Management process in Japan is divided into six processes. It is different with garden waste management process carried out in Malaysia. Japanese garden waste management process is divided into generation,

collection, transportation, treatment and recovery, recycling and disposal. The first process is the generation of waste in the flower gardens, vegetable gardens and houses. After the rest of the garden is generated it will be collected in the containers or the like before the waste is collected. The garden waste is collected and transported by the transport garbage collector. After that, the rest of the garden will be processed for recovery. The garden waste where it will be dismantled and sorted before being crushed and recycled into other materials. After going through the process of treatment and recycling of waste, garden waste will be disposed of in landfills. Figure 2 below shows the process of waste controlling at the National Japanese garden.

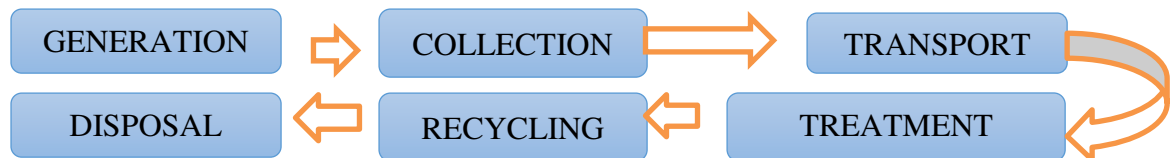


Figure 2
Landscape of Waste Management in Japan (Adapted from Watanabe, 2014)

RESEARCH METHODOLOGY

Interview with the company E-Idaman Environment

Interviews are aimed at getting more useful information from the company Environment E-Idaman Sdn Bhd as well as more detailed information about the processes undertaken to manage the garden waste. Also aims to identify and assess the costs for each process.

The purpose of this interview is also to achieve the objectives of further research can help readers and the public know about the processes garden waste and manage the cost of each process conducted by Enviroment E-Idaman more accurately.

Interviews will begin with identification of the researchers with some of the company's employees Envinroment E-Idaman interviewees who will next get the background of the company and the issue of garden waste. The employees will also be questions in their definition of the definition or the type of garden waste from various perspectives. Next, the main topic will be addressed as the objectives of the processes undertaken to manage the garden waste and cost for each process. Also how garden waste is recycled into other materials.

Questions designed

- 1) What processes used to manage garden waste?
- 2) What the level of the process?
- 3) What is the cost for each process?
- 4) How garden waste is recycled into other materials?
- 5) What technology and transportation are used?

Steps interviews

Several steps need to be done before running this interview. Among the measures to be taken during the interview is conducted is as follows:

- 1) Identify who to interviewees and make an appointment;
- 2) Identify the overall title that will be discussed and listed the facts that will be needed in the interview;
- 3) Prepare the questions to interview in order to avoid wastage of time and conversation that is not relevant;
- 4) Respondents will be provided feedback to the interviewer who will run next ready to give information clearly in the interviews conducted during the session;

Researchers will take notes and ask permission to record discussions are ongoing and destined for the question if the information obtained is not clear.

RESULT

Process

After undergoing an interview with the company's operation department Environment E-Idaman Sdn Bhd, information about the process of managing the garden waste made by Environment E-Idaman Company can be obtained. There are five stages of the process undertaken by the Environment E-Idaman to manage garden waste. The process is the generation, collection, transportation, recycling and ending with disposal. Figure 3 show above garden waste management by Environment E-Idaman.

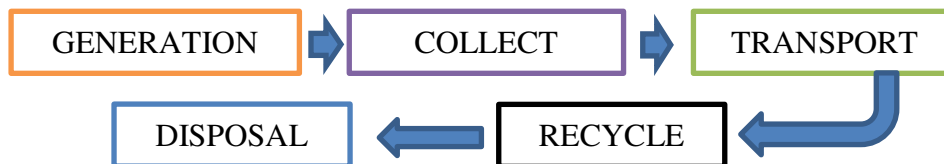


Figure 3

Garden waste management by Environment E-Idaman

Generation

The beginning of the process of managing the garden waste is the waste generated and collected. Garden waste is generated in various areas throughout Kedah, especially in the area of residential gardens, public gardens and trees at the roadside.

Collect

When garden waste is generated, it will be collected in a place or in a container provided. The collection will take place once a week. If a tree is cut roadsides, then it will be collected as soon as possible. Garden waste will be collected in one place before being transported to a collection centre for the recycling process.

Transport

After being quoted, garden waste will be transported to one place before being transported to a collection centre for the recycling process. The carrier is Muliti Purpose Arm Roll. This vehicle is capable of lifting up to 3 tons of garden waste.

Recycle

After garden waste is collected and transported to an area. Garden waste will be collected in one area for recycling. Garden waste will be processed into compost.

Before compostable garden waste will undergo several processes. Figure 4 below shows the process garden waste into compost.



Figure 4
The recycling process of garden waste into compost

Disposal

Garden waste that cannot be processed into compost will be collected in one place. After collected garden waste that is not processed, it will be transported and disposed of in landfills Jabi at Pokok Sena.

Cost

Cost is important to assess which of the costs involved. Costs assessed is the costs used to produce compost from garden waste. The cost starts with the transportation costs for the garden waste to the collection centre. Subsequent processing costs for the recycling of garden waste to produce product compost. Figure 5 below shows about costs assessed to produce the product.



Figure 5
Costs assessed to produce the product

Cost for Transportation garden waste to collection centre

The transport cost (CT) from the collection place to collection Centre is given by equation, which is related to transport distance, lorry capacity and personal cost for driver truck (CP). The distance of collection centre (da, T1) in previous study. The time is per hour. The distance is taken from collection place in each district to collection centre at Alor Setar. The driver commission is based on the weight of garden waste tons (WGW), which is RM 20 per tons. It is assumed that that a one lorry is used for translation to the collection centre, in which the diesel consumed is 0.105 litre/km. The average capacity of a truck is only 3 tons of garden waste. The diesel price is RM1.80 per litre. The total transport cost CT1 includes the cost required for conducting the overall process of moving out the garden waste to the collection centre.

$$CT_1 = ((0.105 * F * da_{T_1} / L_{T_1}) + (CP_{T_1})) * WG W$$

Table 1
Cost for Transportation garden waste to collection Centre

District	Transport distance (KM)	Fuel (RM)	Time (hour)	Total cost transport (RM)
Baling	107.89	20.39	1.36	562.14
Bandar Baru	137.82	26.05	2.07	603.71
Kubang Pasu	28.59	5.40	0.43	173.10
Kulim	115.86	22.81	1.75	532.99
Padang Terap	37.24	7.02	0.55	207.05
Pendang	22.55	4.27	0.33	149.21
Sik	61.82	11.7	0.93	304.97
Sungai Petani	70.28	13.3	1.05	337.77
Yan	28.69	5.41	0.43	173.90
All total cost transport				3044.83

The table above shows the actual cost of transportation of garden waste to a collection center for the process. The service is done once for a week. Means the cost of transportation for a month RM12179.32.

The cost of the recycling process

This process is done by once a month. Before the recycling process is done, waste is collected in advance. The cost of this process is RM0.50 / kg. This includes employees who were 3 people and the use of machinery and equipment. Approximate weight for garden waste to once a process is 108 tons or 108000kg (3 ton * 9 lorry * 4 times a month). Below shows the calculation for the recycling of garden waste into compost.

$$\begin{aligned} \text{Cost recycle process} &= \text{RM } 0.50/\text{kg} \\ &= \text{RM } 0.50/108000\text{kg} \\ &= \text{RM } 54000.00 \end{aligned}$$

The recycling process includes all garden waste in area state of Kedah for 1 month. The result of this process, approximately 90% of garden waste into compost. While another 10% cannot be composted and will be disposed of in a landfill.

The result of the recycling process, as many as 90000 to 100000 thousand packets compost can be produced for every month. Each packets contains 1 kg of compost and will be sold at a price of RM1.00 per unit. This product will be sold on Environment E-Idaman office in each district and sold during a campaign.

SUGGESTIONS AND CONCLUSION

Review summary

This study is to identify the processes involved in managing garden waste and the costs incurred. The objective of the study was successfully achieved through co-operation department interview Environment E-Idaman Sdn Bhd. Among the objectives of the research is to study the process in gardens, waste management, determine and calculate the cost of each process in gardens, waste management, study the potential for reuse of waste garden.

Although the process of managing the garden waste is considered to be easy to manage, but it would cost a little high for each process as it involves the use of labor, transportation and machinery to process it to produce compost.

Suggestions

Among the suggestions for improvement are as follows:

1. Studies in the future must be implemented comprehensively in respect of costs for each process involved in managing the garden waste.
2. Suggestions to the Environment E-Idaman to open more centre for the collection of garden waste the recycling process so that the cost of transportation can be reduced.
3. Expand the market for compost like sales in supermarkets, grocery stores and to farmers in Kedah.

Conclusion

The results of the study, we can find each stage of the process of managing the garden waste. The costs of transport and the recycling process can also be calculated and assessed. Therefore, the cost to produce compost is also known. The relatively high cost for the production of compost. In conclusion, there is not much research has been conducted regarding the process and the costs of managing waste garden. Therefore, this study is to identify the processes involved, and the production cost of compost. Through interviews that have been conducted, we can identify more closely in respect of stage of the process carried out, the cost of transportation and the recycling process of garden waste into compost that is made by the Environment E-Idaman Sdn Bhd

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