



## UTILIZATION OF HOUSEHOLD ORGANIC WASTES FOR COMPOSTING IN SUBURB TAMALANREA JAYA CITY OF MAKASSAR

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### ABSTRACT

City waste management is facing a challenge related to limiting spaces for waste disposal in the location of Final Waste Disposal (FWD). Land filling of organic waste in the FWD can be reduced by empowering households to manage organic waste such as food residues. One alternative for household organic waste management is to use it as raw material for composting. The purpose of this community service activities are 1) to increase public knowledge in waste management, 2) provide knowledge to the community about how to compost from organic waste and 3) increasing the availability of compost and composter in the neighborhood residential community. The method used in this program of science and technology for the society was workshop with a participatory learning includes sorting of household waste into organic and inorganic waste categories and Takakura composting method. In addition an evaluation of the program in the target communities was carried out. Participants of the training consisted of 20 units of community household representatives residing in the suburb of Tamalanrea Jaya, district Tamalanrea, Makassar city. From the activity, it can be concluded that there is a large potential in the utilization of organic waste from the household waste based on the simplicity of techniques and materials that easily be available at any time. Some factors to consider in making compost is the condition of the raw material and the process of composting.

**Keywords :** *Organic waste, Compost, Waste management*



## I. INTRODUCTION

Based on the law on waste management article 18 of 2008 definition of waste is the rest of the daily activities of human and / or natural processes in the solid form. Garbage is an unwanted waste material after the end of a process. (Ministry of Environment, 2008). Poor waste management in urban areas due to low public awareness of the importance of waste management, especially in urban areas caused some impacts. Problems include soil and water pollution, bad odor, and increased risk of diseases caused by unclean environment like cholera, dysentery and others. The city government has provided waste management scheme that includes segregation, collection, transport to Temporary Waste Disposal (TWD) and transfer to the Final Waste Disposal (FWD). However, the management is facing problems in terms of limited landfill capacity, causing a massive landfill at the existing waste disposal location.

This problem can be overcome by organic waste management at the household level. With management at the household level, the volume of organic waste, especially waste that transferred to landfill will be reduced. Data from research of Zubair and Haeruddin (2012) shows that from the total waste collected at the FWD Tamangngapa in Makassar city, there were about 80.71% of organic wastes. The collected organic waste is largely derived from household organic waste which if managed would reduce the amount of waste disposed to the landfill. Household waste can be managed by doing composting. Composting is an organic waste processing techniques with the aim of outlining the garbage with the help of microorganisms or worms (vermicomposting) resulting in a process of decay (Suwahyono et al., 2014). By composting, the biodegradable organic matter can be converted into materials that are more stable without reducing the volume of its mass. According Suhartini (2003) in addition to the process of decomposition, composting is also a biological stabilization of organic substrates so that the final result achieved is safe to be stored or used directly on the ground without causing a negative impact on the environment. The resulting compost is excellent for improving soil structure, increase nutrient content by utilizing nutrients contained in waste to the maximum as nitrogen, phosphorus and potassium. Also, it can increase the ability of soil to hold water (Safira, 2011).

Composting of household organic waste needs to consider several things such as the selection of the raw materials used from the household organic waste. Raw materials used will determine the degree of decomposition of organic matter that will ultimately determine the success of the composting process. Moisture content of the waste that is good to be used as raw material for composting is around 50-60% (Zubair and Haeruddin, 2012). The household organic waste consists of green organic waste and animal organic waste which has different structure, composition and moisture content. The green organic waste is organic waste from plants such as vegetables while the rest of the animal organic waste materials derived from animals like the rest of the bones or spines that are not consumed. In addition of vegetable food waste, green organic materials also derived from garden waste such as remnants of leaves and twigs of trees.

The green organic waste generally has more soft structure and higher moisture content than that of animals organic waste therefore for composting process, green material is recommended for raw material as it is easier to decompose when broken down by bacteria. In addition to the structure and moisture, the composition of the raw materials used must also be considered. In contrast to the green waste materials, materials with a high fat content such as the remains of flesh, bones and spines of fish is not recommended because fat can inhibit fermentation by



bacteria while the rest of the meat and fish spines can cause a bad odor during the composting process. (Editor of AgroMedia, 2007).

A household level composting has advantages such as raw materials are available at all times, easy and simple process. The resulting compost can be used as a growing medium for the plants in the yard or on an organic vegetable garden. Nevertheless, the success rate of domestic utilization of organic waste as compost material depends on the understanding of the family members in the manufacturing process. Taking into account the above description we need to hold a science and knowledge transfer activities to the community as a part of community services from higher education institution aimed to 1) increase public knowledge in waste management, 2) provide knowledge to the community about how to compost from household waste and 3) improving availability of compost and composter in the neighborhood residential community. This activity is expected to be a solution to overcome the problems of urban waste management.

## II. METHOD OF ACTIVITIES

### **Activity Method of the Science and Technology Transfer to Community (IbM)**

The activity of utilization of household organic waste as raw material for composting is a part of the Science and Technology Transfer to Community (IbM) titled 'Household Empowerment in Waste Management and Environmental Based Utilization of Yard'. Participants of the training consisted of 20 representatives of the community household within the territory of the Suburb Tamalanrea Jaya, District Tamalanrea, Makassar, South Sulawesi.

### **Implementation of the IbM**

This community service activities and workshops were conducted using participatory learning methods (participative learning) with the following steps:

1. Training on household waste sorting. The waste segregation training aims to provide knowledge to the public related to the need for waste segregation at household level to be used as composting material.
2. Training on Takakura composting system. Carried out in several steps include making EM4 starter liquid for decomposition and composting.
3. Evaluation of the program. Success implication was measured from the increased community knowledge and interest in household organic waste management shown by success composting process and the increasing number of household composter that produce compost.

From observation made on overall conduction of the activities the trainees were actively involved in activities such as waste separation, dilution of EM4 solution, chopping of the raw materials, and the placement of raw materials into the basket and periodically stirring to compost. Basket contains compost material was then submitted to each household to be stored in their homes which will then be checked every two weeks. The success of composting process was when organic materials are transformed into blackish material and not sticky when held in the hand.

### III. RESULT AND DISCUSSION

The suburb of Tamalanrea Jaya is part of District Tamalanrea located on the outer edge of the city of Makassar with the average of the community being in the middle class to the lower levels of livelihood. Most of the population is daily laundry workers, construction workers, and rickshaw drivers or bentor (motor rickshaw). Others are teachers and retired employees. Interests of participants in following the training activities are large shown by the eagerness of the people to be involved in the activity and asking questions. Utilization of organic wastes for composting household is very likely to be done at each household unit. These activities do not require a large space and the necessary raw materials can be easily obtained. Fulfillment activities including household cooking is generally done every day so that organic waste can be collected in accordance with the waste disposal process. In addition, yard waste can also be collected and used as raw material for composting.

The steps performed in this activity can be described as follows:

#### 1. Sorting of Household Organic Waste

The success of composting using raw materials of organic household waste largely depends on the type of material used. The raw material for composting can be either the remains of the kitchen waste, garden, livestock and industry are shown in Table 1 (Editor AgroMedia, 2007). Organic waste commonly generated by households (kitchen waste) may not necessarily meet the criteria for a good raw material for fermentation by bacteria. Materials that contain fat such as meat offal, bones and spines of fish need to be separated from the existing pile of food residues in the kitchen organic waste.

Table 1. Residual material for compost raw materials

Kitchen waste	Garden waste	Livestock waste	Industrial waste
Sorted vegetables	Fresh leaves	manure	Sawdust
Fruit peels	Dried leaves	grass	Bagasse
Leaf wrapper	Fruit peels	straw	Organic waste from industry such as the plant residues
Non-fat foods residues	Vegetables remains	Residual feed leaves (jackfruit leaves, mahogany leaves, peanut leaves, corn leaves) and bekatul leaves.	

Source: Redaksi AgroMedia (2011)

Sorting the rest of the kitchen aims to separate the organic matter and organic matter of animal forage. Thus the raw materials used are raw materials that fit the criteria well as humidity 50-60% and do not contain high fat (Figure 1).

In addition there are several other factors that can affect the formation of compost, among others, the content of C / N of raw materials, size and temperature of the composting material (Suwahyono et al, 2014). Low C/N ratio of the raw material at the beginning of composting will



result in low quality compost. However C/N ratio that is too high can also become a limiting factor for the growth and development of microorganisms (Nursyokia, 2012).



Fig. 1 The remains of vegetables from household organic waste for composting

## 2. Preparation of EM4 Solution

EM4 is a brown liquid with a pH of 3.5-4.0 which contains a mixture of several live microorganisms that act as biodekomposer. The content of EM4 consists of photosynthetic bacteria, lactic acid bacteria, Actinomycetes, yeast and fungal fermentation. Photosynthetic bacteria form a beneficial substances that produce amino acids, nucleic acids and bioactive substances derived from harmful gases and serves to fix nitrogen from the air. Lactic acid bacteria is used to ferment the organic material so lactic acid, accelerating reform of organic matter, lignin and cellulose, and suppress pathogens by lactic acid produced. The ability of bacteria contained in EM4 in fermenting organic material can assist composting becomes shorter, easier, and produce high quality compost.

EM4 used in this activity in the form of a ready-made solution that is sold in the market at affordable prices. To save costs, the purchased solution can be diluted (Suryati, 2014) so can be used composting in large quantities and without prejudice to its role as a bio-activator or biodekomposer (Figure 2). EM4 solution was diluted with mixing 1 bottle cap EM4 solution with approximately 500 ml of water. The diluted solution then packaged in old bottles and stored in a cool place.

## 3. Takakura Composting Method

Takakura composting system is created and developed by Koji Takakura a chemist from Himeji Institute of Technology in Japan. The main concept of this method is the use of a basket designed by Takakura to process organic waste of household food residues, vegetable, or dried leaves. In the method known as the Takakura method, the materials and tools used are from simple materials, such as baskets that can be purchased in the supermarket or a public sale, cardboard, two pads containing husks, cloth cover and compost from citizens organic waste. In this recent training on composting the materials used were organic household waste and composting materials such as cardboard, EM4, compost, and chaff. The tools used were machetes, baskets with lid (dimensions 45 × 50 × 60 cm), black cotton cloth, sacks made from hemp materials, used mineral water bottle and stirrer.

Christopher J. Starbuck, a horticulture expert from the University of Missouri explained, compost is organic matter that has decayed some parts (partially decomposed) so dark, crumbly (crumbled), and has a scent like the ground (earthy). Compost is made through biological processes, such as decomposition of the plant tissue by organisms present in the soil (soil). When the decay process is complete, the compost will become blackish brown and powdered material called humus.



Fig. 2 Dilution of EM4 solution purchased in the market

Composting steps are as follows:

1. Cardboard former put into the basket around the inner sides of the basket. Cardboard serves to protect the compost material that is not seeping out of a small hole in the basket. In addition cardboard serves to absorb excess water contained in the organic matter (Figure 3a).
2. At the bottom of basket put pads hemp sacks containing husks that have previously been prepared. Bearing function is similar to the cardboard to absorb excess water from organic materials and compost to keep the temperature from getting too high.
3. Compost be purchased in the market put on pads to the bottom of the basket in the husk to a height of approximately 5 cm (Figure 3b) after the household organic waste included partly to a height of approximately 5 cm. After the organic material sprayed EM4 solution while stirring until the ingredients are well blended with fluid and somewhat wet after re-inserted above the compost organic material to a height of approximately 5 cm. This layer is then repeated until a basket filled about  $\frac{3}{4}$  full.
4. At the top of the pile and compost organic materials back cushion laid jute sacks containing rice husk after it closed basket black cotton cloth and covered with a lid basket (Figure 4).
5. Compost is then stored in the corner of the room and stirred once a week. If the material looks dry then re-sprayed liquid can EM4. Stirring is intended to speed up the process of fermentation by bacteria.

The fermentation process typically lasts for 7-14 days. Successful composting of the compost looks blackish-colored black and has turned into humus. According to Suryati (2009) the characteristics of good compost, among others, blackish brown, odorless, crumb structure and a high content of fine material.

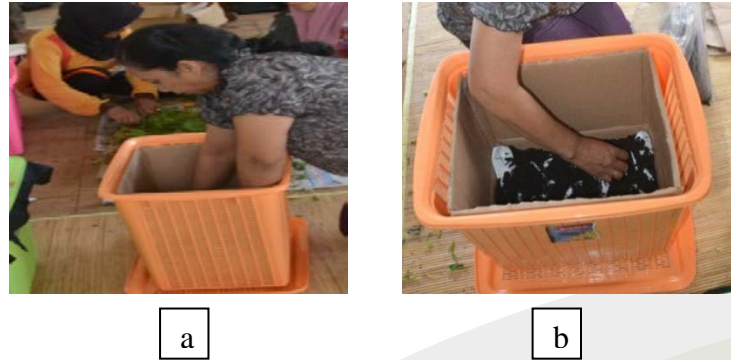


Figure 3 The process of composting

- (a) Placement of cardboard to cover the inner side of the basket.
- (b) Filling the basket with compost and organic materials over a hemp pillow filled with rice chaff.

Composting of household organic waste can have benefits both for households and the surrounding environment. Compost can be used as fertilizer for healthier organic gardens. In addition to the benefits as fertilizer for plant growth, Suryati (2014) described some of the benefits of the utilization of domestic organic waste as compost material, among others, can reduce organic waste piles scattered around the neighborhood, helping early and faster waste management, reducing the need of landfill for final disposal and save the environment from damage caused by such disturbances of garbage odor, bad gutters, flooding and diseases transmitted by insects and rodents.



Fig. 4 Composter (basket) containing compost materials sealed with black cotton cloth and basket cover.

Evaluations performed on these community service activities showed a huge interest from households designated as a representative for the composting training using the Takakura composting method. This is shown by the seriousness of the household members in checking and stirring the compost during the process resulting in ready-to-use compost. Use of compost is either for use as a growing medium mixture of an organic vegetable garden and scaled up as a source of family income.



#### IV. CONCLUSIONS AND RECOMMENDATIONS

From the activity of the utilization of household organic waste as a raw material for composting it can be concluded as follows:

1. Household organic waste has the potential to be used as raw material for composting which bring benefits to help reduce the need for land disposal site in an increasingly limited.
2. Improved knowledge in making compost from household organic waste will increase community's awareness in being actively involved in waste management especially in the city.
3. For successful composting of household organic waste need to consider several factors such as composition, structure and moisture of raw materials, composting temperature and suitability of conditions in the microclimate of the composter to process organic materials.

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