Elaboration Factors of Success in The Application of Community-Based Solid Waste Management and Composting Technology

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Abstract. This study aims to describe the elaboration of success factors in community-based waste management in Waste Bank and composting technology in Flamboyan Indah RW 05 Kelurahan Rawa Badak Selatan, Koja in 2020. This study uses descriptive qualitative methods using primary data to become research objects in RW 05, Desa Rawa Badak Selatan and secondary data from sources and literature. We conduct field studies, including observations and interviews. Koja area is an area with a high population increase accompanied by an increase in organic and inorganic waste. This condition requires community involvement to help manage and reduce waste by processing waste directly from the source. The action taken is to divide the two forms of garbage, inorganic waste is processed by the Community-Based Waste Management System (CBSWM) or waste bank and organic waste with composting technology. Composting technology uses a fermentation process in it. The results of this study concluded that the successful implementation of the CBSWM system and composting technology invited active community involvement by providing economic benefits. But on the other hand this system has weaknesses such as limited land and economies of scale that have not made it possible for technology investments that require large funds.

1. Introduction
Jakarta as the capital of the country has a population density that is high enough. Residents must be accompanied by the number of waste/garbage. Solid waste is any solid unwanted or useless produced in the human population [4]. Because it takes community involvement to help manage and reduce waste by garbage processing directly from the source. How to make organic and inorganic waste separation. In this research study site located in RW 05 residents, Rawa Badak, North Jakarta. The choice of location on Waste Bank flamboyant, based on the achievements in the form of an award from the government of Jakarta adipura and as the mascot of Jakarta in the race on the environment. Waste management is done by the system Sold Community-Based Waste Management (CBSWM) systems that involve public participation in the process of composting. This method aims to reduce waste from the axis point to the place of final disposal, as well as economic value because it can help the community in terms of economic and efficient.

CBSWM system is the concept of using a garbage bank. Flamboyan Indah garbage Bank was established from 2013, using the Community-Based Method of Sold Waste Management
(CBSWM) systems with an integrated system to manage all types of household waste with the concept of 3R (Reduce, Reuse, Recycle). These systems include participation by sorting the waste that is inorganic such as plastic waste, paper waste metal / aluminium cans, trash that is shard / glass and organic waste such as household garbage results.

According to Nisak et al [6] CBSWM or community-based waste management has four characteristics namely: First Independent, not entirely dependent on local government services; Second, productive, produces several other benefits such as income for households and cost efficiency of waste management; Third is integrated, managing all types of household waste with the concept of 3R (Reduce, Reuse, Recycle), and Fourth, environmentally friendly, using safe and healthy both for humans and the environment.

In addition to DKI Jakarta, one of the provinces implementing the CBSWM or Community-Based Waste Management system is the Palu area. Based on the results of [3] of waste generation in South Palu District can be seen that the production of waste is quite large, while the capacity of the Palu City Government is very limited.

Then it needs efforts from the community for the distribution process in the landfill. The waste generation reduction program is carried out by applying 3R (reuse, reduction and recycling) to the process from the source of waste and must involve community participation. In addition, the managers at TPS from the local community by recycling inorganic waste and environmental composting. This is similar to the conditions in Rawa Badak RW 05 North Jakarta. So that the contribution and role of Rawa Badak RW 05 residents in managing waste becomes a very important thing to do to help the government reduce waste in DKI Jakarta. Scientific contribution from this study is the CBSWM has inherent risk of not being sustainable in long run, especially when the membership not longer offer economic benfits. Besides that, another contribution related to science is that it can help the community in the process of managing compost based on technology. In this day and age, especially in the city of Jakarta, it is very rare for people who manage and utilize waste to become compost.

2. Research Method
This study aimed to describe / explain about community-based waste processing, (CBSWM) systems using the composting process, which will be useful for the community. Engineering research conducted open interviews along with some of the informant. The first guest speaker along with Mr. H. Purnomo as Director of Management of Waste Bank Structure Flamboyan Indah RW 05 Rawa Badak Selatan urban village. The second resource person along that Mr. Junaidi as representative of RW 05. The third resource persons namely Joseph Donner Dwiantama Founder Stalls As Trash Indonesia. Data obtained in the form of waste management in the village of Rawa Badak, North Jakarta, using a system of Community-Based Sold Waste Management (CBSWM) systems with the manifold garbage sorting inorganic and organic waste will be processed into compost using composting technology. The different thing in this research is the process of compost management in RW 05 Rawa Badak, is the process of compost management that uses sunlight energy in the sun so that compost management does not cause unpleasant odor.

2.1. Research Data
Rawa Badak Selatan Urban Village has an area of 146.66 km$^2$ or reaches 22.14% of the total area of Jakarta. Since it is located close to the sea, the area of North Jakarta City Administration has a higher temperature than other areas of Jakarta which is an average of 27°C. The population density Jakarta reached 15 938 inhabitants per square kilometer (sq km), the highest compared to other provinces in Indonesia. The density of population of the city is certainly accompanied the amount of waste / garbage both in terms of volume and type. This research data in the form of qualitative data from case studies conducted in Rawa Badak Selatan Urban Village RW 05
North Jakarta City District managed to establish a bank of garbage. During this time the city working with the city of Bekasi in landfills (TPA). However, not all waste can be transported to a waste disposal (TPA) Bantar Gebang in Bekasi. Therefore, to reduce the volume of waste discharged to the place erected Bank Waste landfills. Here are a number of production and the volume of waste from the Special Capital Region 2017-2018 as well as the amount of waste transported.

Table 1. Estimated Production and Waste Volume Transported Per Day Jakarta City, 2017-2018

| Production Waste Volume Percentage of Waste | Trash Per day ($m^3$) | Transported per day ($m^3$) | Transported (%) |
|--------------------------------------------|------------------------|-----------------------------|-----------------|
| 2017                                       | 7.164.531              | 6.872.181                   | 95.92           |
| 2018                                       | 7.164.531              | 6.872.181                   | 95.92           |

Meanwhile, the results of data reduction of inorganic waste in the garbage bank Flamboyan Indah Housing RW 05 Rawa Badak Selatan urban village of Koja Sub- district, North Jakarta Administration City in 2017 to 2019 showed an increase of the average amount of garbage from various kinds, ranging from paper, plastic and metal. Indeed, if viewed in passing the increase in waste paper from 2017 to 2019 did not increase significantly, but it showed that an organic waste reduction showed no change.

Table 2. Un-organic Waste Reduction in Waste Bank Flamboyan Indah RW 05 Rawa Badak Selatan Urban Village District of Koja North Jakarta

| Year | Customer | Metal | Paper | Bottle | Gabruk | Plastic |
|------|----------|-------|-------|--------|--------|---------|
| 2017 | 812      | 11120 | 20408 | 0      | 7208   | 15579   |
| 2018 | 1272     | 8635  | 37503 | 310    | 7708   | 33583   |
| 2019 | 1516     | 8235  | 15550 | 2750   | 2505   | 10870   |

Source: Data Informant 2020

Figure 1. Development of Waste Reduction Process From 2017-2019
2.2. Stage Research
Data obtained from the existing problems in the field about the importance of community-based waste management, through interviews, observation and documentation study. Waste management here in addition to involving the community is also a special institution that receives garbage from the public through the clerk PSR (Household Waste Picker).

Data were then verified, before it was analysed using descriptive method by describing the state of the subject or object in the research can be a person, institution, community and others which are now based on the facts that appear or what it is. The people here are involved from planning to implementation. The results are expected will increase the awareness of the importance of healthy concern for the environment.

3. Results and Discussion
Public participation in waste management from year to year has increased, judging from the amount of garbage bank customers is growing. Public participation in waste management, starting from the selection of organic and inorganic. For the organic waste that is biodegradable garbage such as waste vegetable former will be broken down into compost. 05 diligence and accuracy of citizens in waste management has disuport by the Environment Agency in the form of organizing training and socialization. Meanwhile, the garbage that is inorganic such as plastic, bottles, iron, aluminum, tin, Cans Garbage will be collected to Bank Flamboyan Indah RW 05.

3.1. System Community Based Solid Waste Management (CBSWM) Systems
Community-based waste management (Community Based Solid Waste Management/ CBSWM) systems is an approach to the needs and demands of society, planned, executed, controlled, and evaluated with the community (Environmental Services Program (ESP) Establishments, 2006). The approach in question include social approach, economic, technical and environmental. Based society as the main producer is the public so that people should be responsible for the production of public garbage. This CBSWM goal is self-reliance in maintaining the cleanliness of the environment through eco-friendly waste management basis with rubbish bank aims to sort garbage. The garbage sorting process is a very important first, before the garbage is processed to the next stage. In conducting the approach above course must involve all components of society such as non-governmental organizations engaged in environmental management or waste management, working with the community components such as assemblies Taklim, PKK, RT, RW and conducting reforestation, race hygiene between RT and the important to disseminate culture of a clean environment.

Trash unorganik already disaggregated in terms of the type, nature and number, is then placed in a garbage bank. After that bank staff will be sent to trash-plant used for stomach contents doll, after plastics is destroyed by thrasher.

Plastic enumeration is not carried out by residents of RW 05, but by the factory. RW 05 only perform garbage collection an organic phase. Limited land and the high investment amount needed for modern machine hinder modern waste treatment.

3.2. Composting Technology
Trash manifold is organic waste from household wastes that are biodegradable, such as vegetables, cassava skins, fruit skins and others. Organic waste that has been collected will later be made into compost, liquid and solid compost. Each of these types of organic waste will be produce a measure of weight that varies between compost and liquid compost, depending on the type of organic waste, as described in Table 3 below.

The decomposition of organic waste into compost through several stages. First of organic waste that has been collected in advance will be weighed to determine how much waste is used for composting. The compost produced in the organic waste can be composted solid and liquid
compost. Waste to be used for compost used up to 5 Kg, but after the fermentation process it will shrink to 2-3 Kg. After that the next stage is the drying process prior to entry into the vat. Garbage that has been rather dry inserted into the barrel for settling for 2-3 months. Within the deposition of garbage in the cans is a process of fermentation. The technology used in the management of organic waste into compost using simple technology, namely the process of decomposition (fermentation). The fermentation process is basically the decomposition of organic waste are let stand for two to three months in the barrel. After settling for two to three months ago, the waste will be dried in the drying process of 2-3 days depending on the weather, because the drying process requires a very hot weather.

### Table 3. Organic Waste Reduction Report 2019

| No | Organic garbage is processed per month | Kg | Compost produced Solid (Kg) | Liquid (Kg) |
|----|----------------------------------------|----|----------------------------|-------------|
| 1. | Protective plant leaves                | 270| 251.1                      | 18.9        |
| 2. | Productive plant leaves               | 450| 418.5                      | 31.5        |
| 3. | Vegetable                              | 20.250| 10 125                    | 10 125      |
| 4. | Leftovers                              | 10 125| 7.593.75                  | 2.531       |
| 5. | Sawdust                                | 75 | 68.25                     | 6.75        |
| 6. | Rice husk                              | 0  | 0                         | 0           |
| 7. | Whey liquid waste                      | 62.34| 61 093                    | 1,246       |
| Amount |                                     | 825| 375                       | 496 875     | 69 806 |

Source: Data from informants, 2020

3.3. Sustainability

Table 2 clearly indicate that growing number of customer caused by economic benefits offered by membership as customer. However, this number will not exceed population in RW 5, while amount of unorganic waste continues to decline. Meaning revenue from sale of these waste should also decline and shall impact to the benefit, unless modern waste treatment implemented. We were unable to collect nominal value of the revenue, due to the informant reluctant to disclose it.

4. Conclusion

Waste management with community-based (Community Based Solid Waste Management) and the composting process is very potential to be the cutting edge of waste reduction, especially in RW 05 Rawa Badak, and in general, if done thoroughly integrated throughout the city of Jakarta, in addition to reduce waste going to create clean environment and reduce pollution. This waste management been proven motivate other residents around to do the same so they can provide benefits both economically and help environmental preservation. However, community involvement in waste management needs to be improved, and should be done continuously, and need modern approach. Modern unorganic waste treatment is hinder by the availability of land and the high price of the machine. So it is not economical to be done independently. It is suggested that the Government to actively find solutions to both of these, such as grants. It is suggested for next researchers to conduct feasibility studies to recommend best scheme of the grant, including but not limited to equipment, and training.
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