RESEARCH REPORT

ANTASARI TRADITIONAL MARKET WASTE MANAGEMENT
BANJARMASIN CITY SOUTH KALIMANTAN INDONESIA

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1. INTRODUCTION

Banjarmasin City Government is currently trying to improve urban waste management. Most urban waste goes directly to the landfill. This causes waste segregation difficult to do. Waste reduction in landfill by the waste pickers is still limited. The city government should increase promotion and take a "sorting at source" approach. Separation of waste at the beginning source of waste before mixing will increase the value and allow further processing of waste. In this case, Antasari Market was chosen as the location to realize the "sorting at source" approach program. Most of the goods are organic products such as corn, jackfruit, coconut, meat and poultry. Market waste generated then processed for animal feed or composted fertilizer or disposed of in waste containers to take to Basirih landfill.

2. PURPOSE AND SCOPE
The purpose of this research is to point out that waste sorting at the source can reduce the amount of waste that is dumped into the landfill. This program is as a complement in waste reduction efforts that have been implemented by the Waste Bank Center (Bank Sampah Induk) and 3R (Reduce, Reuse, Recycle) Temporary Waste Disposal (TPS 3R). To implement this sorting of waste, the "two sacks" program will be introduced in one of the traditional market blocks, the first sack for organic waste and the second sack for non-organic. Organic waste will then be used for animal feed or compost while non-organic waste can be recycled, handled and sold by the Banjarmasin Waste Bank Center.

The expected achievements through this activity are:

i) The amount of waste reduction to landfill can be known.

ii) The increasing amount of organic and non-organic waste that can be utilized.

iii) Generate recommendations for Antasari Traditional Market waste management.
3. METHOD

This activity is carried out in several stages, namely:

1. Observe and disseminate the two sacks program to stakeholders, traders and cleaners. The details of the two sack program are as follows:
   a. Creating a form template for filling in weight data per composition of organic waste (for compost and animal feed, if there is a possibility of other uses can be added), and non-organic (composition can be adjusted to a composition that has a sale value and is purchased by the Waste Bank).
   b. Sampling is done to sellers in the antasari market in one of the market blocks. For compost in a chopped house in Pasar Antasari, recommendations are needed to increase the quality of compost so that it can be sold to the community.

2. Collecting waste data and analyzing composition in order to maximize waste collection that has been separated in the Antasari Market. Activities undertaken include:
   a. Facilitating communication with market management to obtain official permission for program implementation;
   b. Promote a two-sack program to sellers in the targeted market block;
   c. Conduct sample collection and composition analysis of waste collected from one of the market blocks for 14 consecutive working days, by following the following procedures:
   d. Each seller is required to separate waste into 2 different sack categories, namely:
   c. Organic (market waste which can be used for animal feed or compost)
   d. Non-organic (for example: plastic, metal or other organic materials which cannot be processed like wood pallets)
   e. The sorted waste is then analyzed and weighed using a digital scale according to the methodology prepared by Lambung Mangkurat University;
4. RESULTS AND DISCUSSION

4.1 Existing Condition of Waste Management in Banjarmasin Antasari Traditional Market

Banjarmasin City Antasari Market is managed by the Banjarmasin City Environment Office under the supervision of the Banjarmasin Antasari Market UPT. Organic waste produced by Banjarmasin City is quite large and most of it is organic waste. All this time, solid waste management in Antasari Market are included waste collecting in temporary waste container (it is called TPS in Indonesia) and collecting organic waste at the “Shredded House” (Rumah Cacah) to be chopped and sent to the Basirih Landfill for composting. The flow of waste collection starts from the source of waste at the merchant, the waste is collected by traders in certain containers and collected by officers collectively. However, there are some traders who throw their own waste directly into containers, this is because there is a payment system provided to officers for collecting waste to the TPS. Then the waste is put into the waste container (TPS Pasar) (Figure 1). A lot of waste littered in the aisles of the market and on the streets around the market, it looks very unhygienic. There are two janitors who sweep around the aisles and streets around the market, so the waste is mixed with inorganic and organic waste. Waste collected by traders is also mixed organic and inorganic without any separation. Only a small number of traders put their organic waste in the “Shredded House” (Rumah Cacah) (Figure 2). The management of organic waste at shredded houses faced many problems, broken chopping tools and only a small number of traders who wanted to deliver their organic waste to the shredded house.

![Diagram of waste management flow in Antasari Market](Figure 1. Trash Flow in Antasari Market)
Traders collect organic waste at the market chop

Organic waste is chopped by the officer

Results count transported to the landfill Basirih

Results chopped waste composted in home composting landfill Basirih

Compost ready to use

Figure 2. Antasari Traditional Market Organic Waste Management Flow

Figure 3. Pasar Antasari Banjarmasin temporary waste container

Figure 4. Organic waste collected by traders at the Antasari Market "Shredded House" Rumah Cacah
4.2 Composition of Antasari Market Waste

The types of waste in the antasari market namely: mustard greens, cabbage, onion skin, tomatoes, chillies, potatoes, lemongrass, pumpkin, cauliflower, leeks, spices, cassava leaves, etc. For the type of waste as a whole is not counted because the traders do not all throw the trash directly into containers or chopped houses but instead collect the rest of the waste and sell it to farmers or re-use it like chillies or cabbage. The types of waste calculated can be seen in Table 1 below with the amount of organic waste as much as 895.07 kg / day and inorganic waste as much as 36.34 kg / day.

Table 1. Estimated amount and composition of waste produced by Antasari Market traders

<table>
<thead>
<tr>
<th>No</th>
<th>Waste type</th>
<th>Number of traders</th>
<th>Weight (kg)</th>
<th>Total (kg/day)</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td>Organic</td>
</tr>
<tr>
<td>1.</td>
<td>Tomato</td>
<td>30</td>
<td>3,82</td>
<td>114,60</td>
</tr>
<tr>
<td>2.</td>
<td>Jackfruit</td>
<td>2</td>
<td>47,65</td>
<td>95,30</td>
</tr>
<tr>
<td>3.</td>
<td>Cabbage</td>
<td>18</td>
<td>31,89</td>
<td>574,02</td>
</tr>
<tr>
<td>4.</td>
<td>Onion</td>
<td>7</td>
<td>1,30</td>
<td>9,10</td>
</tr>
<tr>
<td>5.</td>
<td>Lemongrass</td>
<td>13</td>
<td>7,85</td>
<td>102,05</td>
</tr>
<tr>
<td></td>
<td><strong>Total</strong></td>
<td></td>
<td><strong>895,07</strong></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td>Non organic</td>
</tr>
<tr>
<td>1.</td>
<td>Plastic</td>
<td></td>
<td>12,36</td>
<td>12,36</td>
</tr>
<tr>
<td>2.</td>
<td>Paper / cardboard</td>
<td></td>
<td>19,47</td>
<td>19,47</td>
</tr>
<tr>
<td>3.</td>
<td>Newspaper</td>
<td></td>
<td>4,51</td>
<td>4,51</td>
</tr>
<tr>
<td></td>
<td><strong>Total</strong></td>
<td></td>
<td><strong>36,34</strong></td>
<td></td>
</tr>
</tbody>
</table>
Figure 6. Corn husk waste

One of the waste that is in the antasari market environment is the corn husk waste which is produced from several corn traders, very much if the waste is collected. There is an officer who collects the waste to be sold to cattle farmers who will be bought at a price of 25,000 per sack. Officers collect their own corn husk trash and bring their own sacks and can collect as many as 7-10 sacks of corn husk trash every day. And after being collected, farmers will buy it within 2 days, the waste will be transported using a pick up car and taken to cattle in peat areas as animal feed. So for this corn husk trash is not put into containers or chopped houses but sold because it has a high selling value.

Waste composition is an important aspect in waste management strategy. The composition is the basis for a waste management strategy with a system of waste recycling, composting, and transportation of waste. Can be seen from the results of the calculation of the amount of organic waste the potential is very large at 895.07 kg / day. So it is recommended that the main processing of Pasar Antasari waste is the organic waste sorting process from the beginning generated (traders) then composting is done. Compost processing is recommended to be carried out at Antasari Market because the large potential of organic waste will produce a lot of potential for compost as well as being an economic potential for the Antasari Market.
Antasari Market is managed by UPT Pasar from Banjarmasin City Government. These market managers or officers are generally tasked with maintaining cleanliness, quoting daily waste fees levies to traders. There is an officer in charge of sweeping and collecting waste from each trader and then put it in a container, if it is full it will be directly transported to the landfill site. Waste transportation is carried out twice a day, every morning and evening. Organic waste produced by this Antasari market is very large but has not been fully managed. Waste management in the Antasari market includes composting. The enumeration process is carried out at the Antasari market count house if there is a lot of organic waste obtained by the officers and after the enumeration is completed it will be transported to the Basirih landfill to be processed into compost. Inorganic waste produced by the Antasari market is directly collected by officers or scavengers to be sold to waste collectors.

4.3 Compost Quality Analysis for Basirih Landfill Composting Facilities

4.3.1 The process of making compost

- Organic waste originating from Pasar Sentra Antasari Banjarmasin Census House is transported by truck which is then placed in the Basirih landfill compost house. Composting is done by open windrow.
- The organic waste will then be piled up and allowed to stand for one week, during the piling process a sorting of non-organic waste can be seen on the top surface of the pile.

- Every week and up to 4 weeks, compost will be reversed.
Compost which is 4 weeks old is considered to be ripe and will then be put into a mixer that functions so that the lumpy compost can be seen to the surface.
- Then the clumped compost will be smoothed with a smoothing machine.

Figure 14. Smoothing Machine

- Then the compost will be sieved by a sieving machine and then put into a sack for storage in the warehouse.

Figure 15. Compost Sifting Process

Figure 16. The process of inserting compost into a sack weighing ± 10 kg

Some important points from observations and interviews with officers are:
- The transportation of organic waste from the Antasari Market is carried out once a week, this is because the operation of transport trucks can only transport organic waste from the census building on the time schedule.
- The amount of waste generated from Antasari Sentra Market is an average of 1.5 to 2 tons per week, so that if the average amount of waste processed is 285.7 kg/day.
- According to the official, compost produced is usually about 50% of the weight of the untreated organic waste, so if the organic waste is 1.5 to 2 tons per week, then the compost produced is 750 kg to 1 tons.

In the process of making compost at the Basirih Compost House currently does not use any additional ingredients in the composting process and only relies on natural processes. The obstacle felt by the officials when processing compost is that organic waste that is processed into compost is still mixed with inorganic waste, making it difficult for them to have to separate again so that the compost produced is clean without being mixed with inorganic waste.

No measurements have been made by the relevant authorized institutions regarding the quality of compost produced in the Basirih Landfill. Therefore, the ULM researchers checked the quality of the compost produced.

### 4.1.1 Compost Quality Analysis

<table>
<thead>
<tr>
<th>No</th>
<th>Sampel</th>
<th>C</th>
<th>N</th>
<th>P</th>
<th>K</th>
<th>C/N</th>
<th>pH</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Repetetion 1</td>
<td>3.42</td>
<td>1.54</td>
<td>0.42</td>
<td>2.38</td>
<td>2.21</td>
<td>7.26</td>
</tr>
<tr>
<td>2</td>
<td>Repetetion 2</td>
<td>2.78</td>
<td>0.95</td>
<td>0.40</td>
<td>2.37</td>
<td>2.93</td>
<td>7.27</td>
</tr>
<tr>
<td>3</td>
<td>Repetetion 3</td>
<td>0.97</td>
<td>1.59</td>
<td>0.45</td>
<td>0.61</td>
<td>0.61</td>
<td>7.45</td>
</tr>
<tr>
<td></td>
<td>Average</td>
<td>2.39</td>
<td>1.36</td>
<td>0.42</td>
<td>1.79</td>
<td>1.92</td>
<td>7.33</td>
</tr>
</tbody>
</table>

Discussion of C-Organic values

C-organic is one of the factors that play a role in determining fertility for plants. This is because there are organic materials that can increase chemical, physical and biological fertility. C-organic states the number of organic compounds which are sources of carbon elements present in the soil, including litter, fractions of light organic matter, biomass microorganisms, dissolved organic matter in water and stable organic matter or humus. The C-organic content in compost is influenced by the content of the initial amount of microbes and the composition of...
the composted material. The addition of an activator increases the initial number of microbes which results in an increased ability to overhaul the fiber. Based on the analysis of the average value of the C-organic content of the compost fertilizer sample variation is 2.39% which according to PERMENTAN 2019 regulations the C-organic value is a minimum of 15% and based on SNI 19-7030-2004 a minimum of 27% and a maximum of 58%. So that the TPA compost fertilizer in Basirih does not meet the standards of PERMENTAN 2019 and SNI 19-7030-2004. The value of C-organic in compost is influenced by the quality of organic matter and the activity of microorganisms involved in decomposing organic matter. Decomposition of organic matter occurs, the activity of microorganisms produces elements of C-organic so that the levels of C-organic increases. Then when the compost is cooked, the decomposers will die and the C-organic content will slowly drop.

Discussion of Nitrogen Values
N is one of the elements whose existence is needed by plants. N is elements that are included in the group of elements forming protein and plant protoplasm. The analysis showed that the average content of the element Nitrogen (N) from sample variation was 1.36%. The low content of N nutrients in compost is caused by a mixture of organic matter from which comes from vegetable waste. In the 2019 PERMENTAN regulation requires a minimum of 2% nutrient content of N in compost. All N nutrient analysis results in organic fertilizers from the composting process at the Basirih landfill have less than 2% content, so that all variations in this study do not meet the standards of PERMENTAN 2009. In SNI 19-7030-2004 regulations require nutrient content N in compost must be at least 0.4%. All the results of the analysis of N nutrients in organic fertilizer from the composting process at the Basirih landfill contain more than 0.4%, so that all variations in this study meet the standards of SNI 19-7030-2004.

Discussion of C / N ratio values
The value of C / N ratio of organic matter is an important factor in composting (Cahyani, 2013). If organic material has a C / N content close to or equal to soil C / N then the material can be used or absorbed by plants (Indriani, 2006). Based on 2019 PERMENTAN the value of the compost C / N ratio is ≤ 25 whereas according to SNI 19-7030-2004 which is a minimum value of 10 while the
maximum is 20. Based on the results of the analysis of the average value of all variations of the compost C / N ratio in the Basirih Landfill, 92 so that it does not meet the 2019 PERMENTAN standards and SNI 19-7030-2004. The C / N ratio in compost illustrates the level of compost maturity. The C / N ratio will affect the availability of nutrients if the value of the C / N ratio is high then the C / N ratio of the nutrient content is small for plants while the value of the C / N ratio is low so the availability of nutrients is high and available to plants.

Discussion of Phosphorus values
The element phosphorus (P) as an organic material has a very important role in soil fertility, photosynthesis, and the chemical physiology of plants. Phosphorus is also needed in cell division, tissue development and plant growth points (Widarti et al., 2015). Based on the results of the analysis of the average content of all variations of phosphorus nutrients from compost in the Basirih Landfill is 0.42%. Based on the 2019 PERMENTAN standard the minimum phosphorus content is 2%. The results of the analysis of TPA compost fertilizer in Basirih show that it does not meet the standards of PERMENTAN 2009. While according to SNI 19-7030-2004, the phosphorus content is> 0.10% which results of the analysis of the phosphorus value of the TPA compost fertilizer in Basirih already meet the standards according to SNI 19-7030-2004. Phosphorus is needed by microorganisms in building cells such as protoplasm and cell nuclei. The overhaul of organic material and the process of phosphorus assimilation occur because of the enzyme phosphatase produced by some microorganisms. If microorganisms in the composting process are lacking, the process of overhaul and the process of phosphorus assimilation will be less so if the number of microorganisms in the composting process is sufficient then the process of overhauling the organic material runs perfectly.

Discussion of the value of Potassium
Based on the results of the analysis of the average content of all variations of potassium nutrients in compost in Basirih landfill is 1.79%. Based on PERMENTAN 2019 the minimum potassium content is 2%. So that the compost in Basirih landfill does not meet the standards set by PERMENTAN 2019 but the potassium content in compost in Basirih landfill meets the standards according to SNI 19-7030-2004 because the value of potassium according to SNI 19-7030-2004 is> 0.20%.
Potassium nutrient elements used by microorganisms in the composting process as a catalyst, with the presence of bacteria and their activity, greatly affect the increase in potassium nutrient content. Potassium is bound and stored in cells by bacteria and fungi, if it decomposes again it will become available again (Mirwan and Rosariawari, 2012).

Discussion of pH values
Mature compost usually has a pH value that is near neutral (Cahyani, 2013). The average pH of compost in all variations is 7.33 which based on PERMENTAN 2019 the pH value is 4-9 and according to SNI 19-7030-2019 the pH value ranges from 6.80-7.49 so that compost in Basirih landfill has fulfilled the pH value standard of 2019 PERMENTAN and SNI 19-7030-2004. The pH value is in accordance with that states that the optimum pH conditions for bacterial growth are generally between 6.0-7.5 and 5.5-8.0 for fungi. In general, nutrients are easily absorbed by plant roots at neutral pH, because at neutral pH most nutrients are easily dissolved in water. Conditions that are too low pH (acid) will make macro nutrients can not be absorbed by plants, even otherwise micro nutrients will be available in abundant quantities. Excess micro nutrients and macro nutrient deficiency will be very detrimental to plants.

How to improve the quality of Antasari Market compost?

One effort to improve the quality of compost is to provide adequate aeration / reversal. Dalzell et al. (1987) stated that in the composting process required sufficient water to all parts of the pile to supply oxygen to microorganisms and remove carbon dioxide produced from the degradation process. The aeration process helps the degradation that requires oxygen in decomposing organic matter, so that the speed of decomposition of organic material takes place more optimum. Degradation activity in degrading organic matter is increasing so that the value of C / N, nutrients, humus, and energy from composting material is getting closer to the composting process which is expected to produce compost quality. Giving aeration also affects the process of impairment of C / N value.
In addition to increasing aeration / reversal, to improve the quality of compost, additional materials are needed in composting. In a study conducted by Rohim and Bagastyo (2016) compost was added, namely coconut fiber. Coconut coir has
a fairly high C / N ratio. Coconut coir also acts as a bulking agent in the composting process because of its porous nature so that aeration in the pile can continue to run (Nugroho et al., 2010). Good quality compost can improve soil structure and increase plant growth (Murbando, 2008).

4.4 Conclusion and Recommendation for Banjarmasin City Antasari Market Waste Management

The pattern of waste management in Indonesia including the establishment of a Waste Bank, increasing recycling, composting from organic waste, is a form of ecocentric management, where the form is not only focused on the impact of pollution on humans, but also on life as a whole (Keraf, 2010). Several studies in Indonesia have proven the high positive impacts resulting from waste management that focus on processing and reducing pollution and involving the community or community-based. Kardono (2009) recommends a waste management system in Indonesia to be based on community participation. Community-based waste management systems are very important to be developed because they only require a small fee, simple technology, easy to operate and involve community participation.

Although organic waste has the potential to be composted entirely (± 60% and the most is a type of organic mixture derived from the rest of the market vegetables). But the difficulty of separating organic waste in Antasari Market is quite high because organic waste has been mixed with inorganic. Compost produced by contaminated organic waste will be of low quality. Therefore, it is important to segregate organic and inorganic waste starting from traders or other activity centers in the market that produce waste. To improve the quality and amount of compost to be processed, the government uses a special transport truck for the Antasari Pasar organic waste so that organic waste can be directly processed at the composting facility at the landfill. However, composting facilities and processes will be more effective if done at many points that produce organic waste. This was confirmed by Hai and Ali (2005), making composting facilities would be effective if decentralized composting, close to waste sources, adopting low-cost composting technology and considering the socio-economic aspects of the community.
REFERENCES


