Feasibility study of microbial organic waste processing business in Sukasari district, Bandung city

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Abstract. Modern waste management systems must be carried out comprehensively and provide economic benefits. Many business opportunities for processing inorganic waste have been carried out such as recycling paper and plastic, while conventional organic waste is made into organic fertilizer / compost. The demand for organic fertilizer / compost is increasing along with the development of organic agriculture. This research was conducted to analyze the business opportunities of microbial organic waste which is a breakthrough in making compost fertilizer. The location of the study was conducted in Sukasari District Bandung City with the method used was descriptive method with SWOT analysis. SWOT analysis is used to analyze strengths, weaknesses, opportunities and obstacles in processing organic waste so that direction or recommendations are obtained. The stages are by analyzing IFE (Internal Factor Evaluation) and EFE (External Factor Evaluation) and strategy analysis using the SWOT matrix. Based on the results of the IFE calculation get a score of 3.25 and the EFE score gets 3.10. Strategy analysis based on the SWOT matrix includes the importance of increasing the quality and quantity of production, recruitment of workers, addition of land area and marketing using information technology.

1. Introduction

All community activities in urban areas will definitely produce waste. Definition of waste based on the Law of the Republic of Indonesia No. 18 of 2008 is the rest of everyday human activities and / or natural processes in the form of solids. Population growth and changes in consumption patterns give rise to increasingly diverse volumes, types and characteristics of waste. Therefore, waste is a national problem, especially in big cities in Indonesia, one of which is Bandung City. Based on data from [1] the production of waste produced is 1,603.2 m³ / day. Based on the sources of waste, the most are from settlements, markets, commercial areas, offices, public facilities and others. From this type of waste, organic waste has a higher percentage of inorganic waste.

Processing inorganic waste, especially those that have selling value (such as plastic from packaging bottles, bottled drinking water, used buckets, etc.) is collected by scavengers from residents to be sold to recycling sites or Waste Banks. While for processing organic waste so far it has been done by conventional composting. The conventional composting process takes as fast as 14 days, requires a large space, and is still on a small scale.

Based on these conditions, serious attention necessary to overcome the existing waste problems and most importantly, direct community involvement in planning or implementing waste management. In Law No. 18 of 2008 also regulates the role of the community, namely in article 28 paragraph 1 which states that: "the community can play a role in waste management organized by the government and or the regional government". In paragraph 2, what is meant by participation in paragraph 1 can be done
through: a) giving proposals, considerations and suggestions to the government and / or regional government; b) formulation of waste management policies; and / or c) giving advice and opinions in the resolution of waste disputes. Based on the law, the community has the opportunity to take part in waste management, including waste processing business opportunities.

Business opportunities from processing organic waste need to be done, because it not only helps overcome the problem of waste in urban areas, but also can open new business opportunities in the field of agriculture in the form of product output that has selling values such as planting media (solid) and biological soil enhancers in liquid form.

Processing microbial organic waste was made by Kastolani, W (2018) [7], where the processing of organic waste does not require a long time to become a planting medium, namely by adding cow manure and local microorganisms. This process is a breakthrough in the process of conventional composting of organic waste which requires a long time to be shorter.

The business opportunity for making microbial compost is a strategic choice in overcoming the problem of organic waste in Bandung City, because the process is fast and the demand for organic fertilizer is still not fulfilled. The pattern of life of the community to "return to nature (back to nature)" by consuming food with organic ingredients such as vegetables, fruits and organic meat. Organic farming that continues to grow rapidly causes demand for organic fertilizer (compost) to also increase. Based on this, this paper aims to analyze the development of microbial organic waste processing business in Sukasari Subdistrict, Bandung City.

1.1 Definition of Waste
Based on Law No. 18 of 2008 concerning waste management, the definition of waste is the rest of human daily activities or solid natural processes. Whereas according to [4] what is meant by waste is all waste produced by human and animal activities in the form of solid, mud (sludge), liquid or gas which are disposed of because they are not needed or are not desirable anymore.

Waste is a material that is wasted or disposed of from the results of human and natural activities that do not have economic value. Waste is classified into two based on the source, namely the first comes from life activities (household) and the second comes from business activities [2]. Next according to the definition of the World Health Organization (WHO) in [3] that waste is something that is not used, not used, is not liked or something that is discarded that comes from human activities and does not happen by itself.

1.2. Types of Waste
Based on Law No. 18 of 2008 [11] concerning Waste Management, the type of waste consists of:

Household waste, which is solid waste originating from the rest of daily activities in the household, does not include specific feces and garbage and from natural processes that originate from the household environment. This waste is sourced from home or from a housing complex.

Household-like waste, namely household waste originating not from households and the household environment but from other sources such as markets, trade centers, offices, schools, hospitals, restaurants, hotels, terminals, ports, industries, city park, and others.

Specific waste, namely household waste or household-like waste which due to its nature, concentration and / or amount requires special handling, including, garbage containing B3 (hazardous and toxic materials such as used batteries, toner waste, etc.), garbage containing B3 waste (medical waste), disaster-caused waste, debris debris, garbage that is technically not yet able to be processed, garbage that arises in a period (garbage produced by community service).

Whereas based on origin, solid waste can be classified into 2 (two), namely as follows:

Organic waste, is garbage produced from biological materials that can be degraded by microbes or are biodegradable. This garbage can easily be broken down through natural processes. Most household waste is organic matter. Including organic waste, such as garbage from the kitchen, food scraps, wrappers (other than paper, rubber and plastic), flour, vegetables, fruit peels, leaves and twigs. In
addition, many traditional markets also donate organic waste such as vegetable waste, fruits and others.

Inorganic waste is garbage produced from non-biological materials, both in the form of synthetic products and the results of the process of processing mining materials. Inorganic waste is divided into: metal waste and processed products, plastic waste, paper waste, glass and ceramic waste, detergent waste. Most inorganics cannot be decomposed by nature / microorganisms as a whole (unodegradable). Meanwhile, some others can only be described for a long time. This type of garbage is at the household level such as plastic bottles, glass bottles, plastic bags, and cans, [5].

In general, we also know the type of waste based on its form, namely: liquid waste, solid waste, and gases. Examples of liquid waste are laundry water, soapy water, leftover cooking oil, and others. Examples of solid waste are snack packs, used tires, drinking water bottles, and others. Examples of waste gases are carbon dioxide (CO$_2$), carbon monoxide (CO), methane gas (CH$_4$), HCl, NO$_2$, SO$_2$ and others.

1.3. Waste Management

Based on Law No. 18 of 2018 states that what is meant by management is a systematic, comprehensive and sustainable activity which includes the reduction and handling of waste. The modern waste management phase consists of 3R (Reduce, Reuse, Recycle) which are then destroyed. The process starts from the use of various products that are used to meet human needs and then produces unused residues (waste) then in the initial stages of waste management carried out with 3R (Reduce, Reuse, Recycle) then at the end of the processing step is enter to the landfill with processing sanitary landfill, incenaration and open dumping. Based on the findings of [4], it is estimated that only about 60% of waste in major cities in Indonesia can be transported to Final Processing Sites (TPA), whose main operations are landfiling.

1.4 Composting of organic waste

According to [6] compost is the final form of organic materials (organic waste) that has undergone a weathering process because of the interaction between microorganisms (decomposing bacteria) that work in it, both aerobically and anaerobically or in other words compost is the result of fermentation or decomposition of organic materials such as plants, animals or other organic waste. Efforts to compost municipal waste have several benefits that can be reviewed both in terms of technology, economy, environment and health. Compost is the result of fermentation from organic ingredients so that it changes shape, has a blackish color and does not smell.

Composting applied in Indonesia is still simple, such as by windrowing, or manually reversing compost piles. In the open environment, compost can occur on its own. The decay process occurs naturally but not in a short time, but gradually. The duration of the decay process is approximately 5 weeks to 2 months. But if we want a shorter time, 2 weeks, the process can be accelerated by using organic material biodegradable bioactivators, such as Trichoderma sp.

The model of microbial composting in this paper is a mixture of cow manure and a local consortium microorganism as a biodegradable bioactivator of organic material which speeds up the composting process. According to [7] the use of the consortium's local microorganisms has advantages, namely (1) planting media can be planted directly, (2) does not cause heat, (3) does not cause odor, (4) can be fish feed and animal feed.

2. Research methods

The method used in this research is descriptive method. According to [9] the purpose of descriptive research is to make a description or depiction of systematic, actual and accurate facts, characteristics and relationships between phenomena that will be investigated. Description analysis aims to define the vision, mission and objectives of the business unit, product characteristics, sales targets, marketing activities, human resources, and others. The data processing technique used is the SWOT analysis technique from [10]. The SWOT analysis aims to determine the potential (strategic factors) that affect
the development of microbial compost business units. The SWOT analysis is based on the Internal Factor Evaluation (IFE) / External Factor Evaluation (EFE) Matrix and the Internal-External (IE) Matrix.

3. Results
To find out the strategic factors for the development of microbial organic waste processing business in Sukasari Subdistrict, Bandung City was carried out based on an analysis of internal and external environmental factors. The internal environment is the factors that influence the business units that originate from within the strengths and weaknesses of the business unit itself. Whereas the external environment of external factors becomes opportunities and threats to the business unit.

Based on the results of identification of internal factors, there are several things that become the strengths and weaknesses of the business unit. These factors are as follows.

3.1. Internal factors

3.1.1. Strength Business unit vision and mission. The vision of the business unit includes: (1) as a pioneer in the processing of urban organic waste that is environmentally friendly and sustainable. (2) as a research center and training in processing organic waste for planting media, fish feed and livestock.

   The mission of the business unit includes: (1) processing microbial urban organic waste into a fast, environmentally friendly and sustainable planting medium. (2) the product produced has economic value. (3) make research on processing microbial organic waste into fish and livestock feed.

   Product excellence: Microbial processing of organic waste has advantages in the speed of the process of being a growing medium, not hot and does not cause odor. If you use the conventional composting process, it takes between 5 weeks to 2 months, while microbial waste treatment can be a growing medium at that time.

   Product prices: The microbial organic waste processing unit produces probiotic compost weighing 5 kg and costs Rp. 15,000 per package.

   Production and operation facilities: The production facilities and operations of the organic waste processing business units are relatively complete starting from chopper machines, stirrers, storage containers, bottles and plastic packaging and others.

   Raw material: Raw materials for compost and biological soil enhancers are very abundant. The main raw materials are organic waste, cow dung and local microorganisms.

3.1.2. Weakness Location of business units: Finding locations for processing organic waste in cities is not easy. The location for processing waste must be far from the settlement and access must be easy. The location of the business unit is at the Student Regiment Command Headquarters of the University of Indonesia which is administratively located in the Isola Sub-District of Sukasari District, Bandung City.

   Land area: The microbial organic waste processing business unit is behind the Indonesian Education University Student Regiment Headquarters (Mako) in the form of open land with a size of approximately 200 m², with a boundary wall. For production rooms and storing products, they still use non-permanent buildings.

   Human Resources: Human resources in a microbial organic waste processing business unit consist of a research team of 3 people and assisted by 5 students.

   Product marketing: Product marketing results from microbrial processing units of organic waste processing in the form of probiotic compost are still limited in marketing. While this marketing is done if there is an order, campus activities are related to community service and during training or workshops.

   Production capacity: The microbial organic waste processing unit is capable of processing organic waste on the campus of the University of Education in Indonesia. Based on the research of
Kastolani, W (2019) the volume of campus organic waste reaches 6 m³, equivalent to 240 kg in wet conditions.

3.2. External Factors

3.2.1. Opportunities

Product Innovation: The products produced by microbial organic waste processing business units are probiotic compost. If the process of making conventional compost takes 5 weeks to 2 months, then making compost in a microbial manner only takes 1 day, it can even be planted immediately. The material is a mixture of organic waste, cow dung and local microorganisms.

Development of Information Technology: The development of information technology is a good opportunity for expanding product marketing. Information technology in the form of online sales applications such as bukalapak, tokopedia, lazada and others makes it easier for the promotion and marketing of probiotic compost products.

Trend of urban farming in urban communities: Urban communities are beginning to realize that limited land is not an obstacle to farming. Urban communities can farm using small pots, arranged on walls and pots hanging around. The trend of urban agriculture requires large amounts of planting media or compost.

Development of organic agriculture: The lifestyle of the people with the slogan "back to nature" is an awareness of the importance of health by consuming food with organic ingredients such as vegetables, fruits and organic meat. Organic farming that continues to grow rapidly causes demand for organic fertilizer (compost) to also increase.

People's purchasing power for products: The trend of urban farming and organic products opens opportunities for business units to become producers of compost. People who are aware of the importance of organic products certainly have good purchasing power.

3.2.2. Threats

Rise in fuel prices: Although the current fuel price is relatively stable, it is still a threat because the means of production use BBM. Transportation costs to bring in raw materials will also increase.

Product price competition: The price of products pegged by microbial organic waste processing business units is a price with a relatively small production capacity. If there are companies that have greater production capacity then the price can be cheaper.

Increase in prices of raw materials and plastic packaging: The main ingredients of compost in the form of organic waste from leaves and organic waste from canteens on campus certainly do not experience price increases, but for mixed materials such as cow dung, local microorganisms (MOL) and packaged plastic purchased from outside of course the price can increase.

Replacement products: Lay people still like to use chemical fertilizers, because compost requires a decomposition process before it can be absorbed directly by plants, so the process is rather long than chemical fertilizers.

Changes in weather and climate: Weather and climate affect the process of reducing water content in compost products. The maximum water content in compost is 50%, so weather and climate factors determine the productivity of this business unit.

3.3. Internal Factor Evaluation (IFE) and External Factor Evaluation (EFE) Matrix

After knowing the internal factors of microbial organic waste processing business units which are the strengths and weaknesses of its development activities, the next step taken is the granting of ratings and weights for each factor. This rating and weighting function is to compile the Evaluation Factor Internal Matrix (IFE) and to know the business unit's internal strategic factors relating to strengths and weaknesses that are considered important. The score obtained can give an overview of strategic factors that are the main strengths and main weaknesses of the business unit.

Against external factors that become threats and opportunities, the same thing is done, namely giving ratings and weighting to each factor. This rating and weighting function is to compile the External Matrix of Evaluation Factor (EFE) and find out the external strategic factors of microbial
organic waste processing business units relating to opportunities and threats that are considered important. The value of the score obtained can give an idea of the strategic factors that are the main opportunity and the main threat for the business unit. The following is the IFE and EFE matrix table.

**Table 1. Internal Factor Evaluation (IFE) Matrix**

| Key Internal Factors                  | Weight | Rating | Score |
|---------------------------------------|--------|--------|-------|
| Strength:                             |        |        |       |
| - Business Unit Vision and Mission    | 0.20   | 4      | 0.80  |
| - Product excellence                  | 0.15   | 4      | 0.60  |
| - Product prices                      | 0.15   | 3      | 0.45  |
| - Production and Operation Facilities | 0.10   | 3      | 0.30  |
| - Abundant Raw Materials              | 0.05   | 2      | 0.10  |

| Weakness:                             |        |        |       |
| - Location of Business Units          | 0.05   | 2      | 0.10  |
| - Land area                           | 0.10   | 3      | 0.30  |
| - Availability of Human Resources     | 0.05   | 3      | 0.15  |
| - Product marketing                   | 0.10   | 3      | 0.30  |
| - Production capacity                 | 0.05   | 3      | 0.15  |

| Total                                 | 100%   | 1.00   | 3.25  |

Source: Researcher, 2019

Based on table 1, the total score of internal factors is 3.25. This value shows that the microbial processing unit of organic waste is feasible and has the potential to be developed based on the business unit's vision and mission and product superiority. While the weakness is the area of land and product marketing. Next is a table of external factors that affect microbial compost processing business units.

**Table 2. External Factor Evaluation (EFE) Matrix**

| Key External Factors                   | Weight | Rating | Score |
|----------------------------------------|--------|--------|-------|
| Strength:                              |        |        |       |
| - Product innovation                   | 0.20   | 3      | 0.60  |
| - Development of Information technology| 0.10   | 4      | 0.40  |
| - Trend of urban farming in urban communities | 0.10 | 3      | 0.30  |
| - Development of organic agriculture   | 0.10   | 3      | 0.30  |
| - The purchasing power of the community towards the product | 0.10 | 2 | 0.20 |

| Threats:                               |        |        |       |
| - Rise in fuel prices                  | 0.05   | 3      | 0.15  |
| - Product price competition            | 0.10   | 3      | 0.30  |
| - Increase prices of raw materials and plastic packaging | 0.05 | 3 | 0.15 |
| - Replacement products                 | 0.10   | 3      | 0.30  |
| - Changes in weather and climate       | 0.10   | 4      | 0.40  |

| Total                                  | 100%   | 1.00   | 3.10  |

Source: Researcher, 2019

Based on table 2, the total score of external factors is 3.10. Factors of product innovation and the development of information technology are opportunities that can be utilized. Whereas weather factors, product prices are a threat that must still be anticipated by microbial organic waste processing
business units. After the scores from the internal and external matrices are known, the next is to combine them into internal and external matrices as follows.

![The IFE Total Weighted Scores](image)

**Figure 1. Internal-External Matrix**

### 3.4. SWOT Matrix

| Internal Faktor | Strength (S) | Weakness (W) |
|----------------|--------------|--------------|
| 1. Business Unit Vision and Mission | 2. Product excellence | 1. Location of Business Units |
| 3. Product prices | 4. Production and Operation Facilities | 2. Land area |
| 5. Abundant Raw Materials | | 3. Availability of Human Resources |

| Eksternal Faktor | Opportunities (O) | Strength-Oportunity (SO) Strategy |
|-----------------|------------------|----------------------------------|
| 1. Product innovation | Strength-Oportunity (SO) Strategy | - Develop innovations in fish and livestock feed products from microbial organic waste |
| 2. Development of Information technology | - Maximizing product marketing with information technology |
| 3. Trend of urban farming in urban communities | | |
| 4. Development of organic agriculture | | |
| 5. The purchasing power of the community towards the product | | |

| Threats (T) | Weakness- Opportunity (WO) Strategy | Weakness- Threat (WT) Strategy |
|-------------|-----------------------------------|-------------------------------|
| 1. Rise in fuel prices | - Increase land area and recruit employees to increase production capacity |
| 2. Product price competition | - Product marketing by utilizing online trading applications |
| 3. Increase prices of raw materials and plastic packaging | | |
| 4. Replacement products | | |
| 5. Changes in weather and climate | | |

- Hold training to promote product excellence
- Giving discounts for certain purchases
- Cooperate with partners so that raw material supply and production capacity can increase.
- Using appropriate technology to overcome the effects of weather and climate so that production capacity is maintained.
4. Conclusion
Based on the results of the analysis of microbial organic waste processing business units in Sukasari District, Bandung City, it can be concluded that the business is feasible to be developed. The total internal factor scores reach 3.25 and the external total score reaches 3.1 is in quadrant I which shows the strategy needed for the current unit is to grow and build. Intensive strategies are market penetration, market development and product development.

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