Engineering for Making Commercial Compost Fertilizer of Oyster Mushroom Waste Baglog Using Molasses Activator in Efforts to Implement Green Economy

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Abstract. Bleberan Village, Gunungkidul Regency, Yogyakarta has an oyster mushroom farming business that has been working with Korea since 2016. The problem experienced by oyster mushroom farmers in Bleberan village is that there is no use of unused baglog waste so that it pollutes the environment. So that efforts are needed so that the baglog waste does not pollute the environment, namely by utilizing it into compost that is of selling value. The method of taking materials is a method of taking directly where the composting material is taken in the farmer's coup. The measured parameters are Temperature, pH, C-Organic, N Total, C/N Ratio to the weight of baglog raw materials which is constant 2 kg and varied on the addition of cow dung. The results showed that the average content of C-Organic content was 60% and N Total 1% and C/N the average ratio was 40, this shows that the compost for oyster mushroom baglog waste has not met the quality standards of SNI 19–7030–2004. The sale of baglog waste compost has a good selling value with an estimated production of 1200 kg per year with a BEP of 446.2 kg, which when farmers can sell around 446.2 kg per year, it will already reap profits. With this, farmers have been able to implement the Green Economy in oyster mushroom production activities where unused baglog waste can be resold by converting it into compost.

Keywords: Green Economy, Oyster Mushroom Waste, Compost.

1 Introduction

Gunungkidul Regency is one of the regencies in the Province of Yogyakarta Special Region, with its capital city Wonosari. The area of Gunungkidul Regency is 1,485.36 km^2 or about 46.63% of the area of the Yogyakarta Special Region Province. As a tourism city, industry, trading and service center Gunung Kidul regency certainly has many businesses both at the home level to the large industrial level, one of which is the oyster mushroom trading business in Bleberan Gunung Kidul village. This oyster mushroom business in Bleberan village has been cooperating with Saemaul Undong South Korea, this cooperation has been established since 2016.

This oyster mushroom business has become one of the main livelihoods in the village. Products from this mushroom have been sold in markets such as indomaret in the form of crackers and to be raw sold in local markets. Kalurahan Bleberan,

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Kapanewon Playen Gunungkidul Regency has 48 mushroom cultivation groups spread across 11 villages, each group has its own kumbung and each kumbung contains 500 – 750 baglogs. Baglogs can be harvested about once every 3 – 4 months and in 1 harvest can produce 36,000 baglog waste.

The main problem faced by residents from Bleberan village is that there is no use of baglogs that are no longer used. Based on observations in the field, some residents only collect the baglog waste around their homes and then burn it if they feel that it is quite a lot or accumulated.

Old baglog waste still has nutritional content N (0.6%), P (0.7%), K (0.02%), and C-organic (49.0%). Meanwhile, contaminated baglogs have a relatively higher nutritional content, namely N (0.8%), P (0.8%), K (0.16%), and C-organic (52.0%). This is because the nutrients in old baglog waste have mostly been utilized by fungi for the growth process [1]. So to find out how much potential baglog waste becomes compost and efforts to implement the Green Economy, this research was conducted.

2 Bibliography Review

The average weight of one baglog is 1.2 kg [2]. Oyster mushroom baglog waste has porous properties, which is one of the conditions in the manufacture of hydroponic media. Porous properties easily absorb and store water, as well as drain large amounts of water.

Compost is organic matter, such as leaves, straw, reeds, grasses, rice bran, corn stalks, tendrils, carang-carang and animal manure that have undergone a decomposition process by decomposing microorganisms, so that they can be used to improve soil properties. Compost contains mineral nutrients that are essential for plants [3].

Composting is the biological decomposition of organic matter in thermophilic temperatures with the final result being compost that is good enough to be reapplied to plants and not even harm the environment. Composting is very appropriate and effective to be done on organic waste such as vegetables, leaves and even on the remnants of cooked food. Proper composting activities are expected to be an alternative for waste handling, especially in urban areas, and can even advance agricultural business and the cultivation of crops both annuals and annuals such as forestry plants [4].

Molasses is a by-product derived from the manufacture of cane sugar (Saccharum officinarum L). Molasses is a viscous liquid resulting from the separation stage of sugar crystallization. Molasses can no longer be formed into sucrose or sugar, but still contains sugars with high levels of 50-60%, amino acids and minerals. Molasses contains sugar levels to produce ethanol by fermentation process at pH between 5.5-6.5. Molasses can be utilized and used by various industries such as alcohol factories, animal feed factories, soy sauce factories, sweetener factories, flavorings and is also the raw material for making products such as MSG, Ethanol, Pellets, Soy Sauce, Lysin, animal feed and also Biofuels (natural fuels). In addition, molasses is also used as a mixture of EM4 for making compost as food for microorganisms [5].

Cow dung is a waste from cow digestion, cow dung has a color that varies from greenish to blackish, depending on the food eaten. After exposure to air, the color of

cow dung tends to darken. Cow dung in fresh condition can damage the grass growing on the lawn and have an unpleasant smell. Cow dung (Cletong) is a waste manure from cattle farms that has a high fiber content, because there is high levels of fiber or cellulose in this manure both in solid form and cow urine, it is a carbon chain compound that can undergo a more complex weathering process. the natural weathering process by various types of microbes requires the element Nitogen (N) contained in the cow dung in large quantities. For this reason manure in fresh or still new conditions is not recommended to fertilize any plants. However, when the cow dung is composted, this material can be a safe and good natural fertilizer to use. The process of making compost from cow dung can remove most odors, reduce the risk of fertilizer damage, and kill weed seeds and bacteria [6].

interprets the Green Economy approach as a model approach to economic development without overexploiting natural resources and the environment, abandoning economic practices that bequeath environmental problems so that industrial activities and creativity, and environmentally sound knowledge from the community are needed [7].

Break Even Point (BEP) analysis is an analytical technique to study the relationship between sales volume and profitability. This analysis is also known as break-even analysis, which is a method to determine a certain point where sales can cover costs, as well as show the amount of a company's profit or loss if sales exceed or are below the point. Break-even analysis (Break Event Point) is also a way to find out the minimum sales volume so that a business does not suffer losses, but also has not made a profit (in other words, the profit is equal to zero). In the break even point analysis, information about sales and costs incurred. Net profit will be obtained if the sales volume exceeds the costs that must be incurred, while the company will suffer losses if the sales are only enough to cover part of the costs incurred, which can be said to be below breakeven. Break even point analysis not only provides information about the company's position in a breakeven state or not, but break even point analysis is very helpful for management in planning and decision making. The purpose of break-even analysis is to find out the level of activity at which the revenue from sales is equal to the sum of all variable costs and their fixed costs. The amount of variable costs in totality will change according to changes in production volumes, while the amount of fixed costs in totality does not change even if there is a change in production volume. The costs that belong to the variable cost group are generally raw materials, direct labor wages, sales commissions. Meanwhile, those that include the fixed cost group are generally depreciation of fixed assets, rent, debt interest, employee salaries, leadership salaries, research staff salaries, and office costs. Break Even Point analysis is useful if some basic assumptions are met. In actual reality more assumptions cannot be met. However, this change in assumptions does not reduce the validity and usefulness of BEP analysis as a decision-making tool. It's just that a certain modification is needed in its use. The benefits of break even point analysis are many, but in general it is to find out the main return point of an effort. With the main point of return known, management can know what quantity to produce or sell in what quantity of units so that the company does not suffer losses [8].

3 Methods

The object to be studied consists of baglog waste and cow dung that has been mixed according to a predetermined ratio and added with molasses as much as 40 ml in 1000ml of water. The free variables used in this study are a mixture of baglog waste mass and cow dung and for bound variables are C-Organic, N Total, C/N Ratio, temperature and pH. The data collection method is direct data collection which is carried out during the implementation of the study. The data collected is in accordance with the predetermined parameters.

$$r = \frac{n\sum xy - \sum x \sum y}{\sqrt{\{n\sum x^2 - \sum x^2\}\, x\, \{n\sum y^2 - \sum y^2\}}}$$

Where: n as Multiplecity of X and Y data pairs; Σx as Total Sum of Variables X; Σy = Total Sum of Variable Y, Σx^2 as Square of Total Number of Variables X, Σy^2 as Square of Total Number of Variables Y, Σxy as Multiplication Result of Total Number of Variables X and Variable Y

The next method is the method of determining the price of compost products using the BEP calculation method

BEP = Fixed cost/Selling Price per kilogram – Variable cost per kilogram.

The next method is the interview method where the researcher interviews 5 farmers (representing all oyster mushroom farmers) where the topic to be interviewed is about the Green Economy where the interview results obtained are used to be able to conclude as far as the application of the Green Economy that has been applied in the village (farmer group)

4 Results And Discussion

After conducting research for 30 days, it was found that the levels of each of the parameters that had been set were in Table 1 Carbon parameters, in Table 2 the temperature parameter and in table 3 the pH parameter.

Table 1. C-Organic and N Total Test Results

Sample	C Organic (%)	N Total (%)	C/N Rasio
A0	64.87	1.31	49.519
A1	64.29	1.30	49.453
A2	60.69	1.36	44.625
A3	62.55	1.30	48.115
A4	60.98	1.38	44.188
A5	61.90	1.94	31.907
A6	60.18	2.06	29.213
A7	60.91	1.89	32.227
A8	68.77	1.60	42.981
A9	66.04	1.40	47.171

Based on the results of checking from each existing sample, it can be that the C-Organic content in each sample can be said to be still very high, because the average C-Organic content in each sample is 60% and has exceeded the quality standards set based on SNI, the maximum C-Organic content in the compost is 32%. This is due to the poor working of microorganisms during the composting process, other factors that also affect are the height of composting which is not too high which causes the material to lose heat faster and the non-use of bioactivators in this composting process. This depends on the type of microorganism present, the nature of the substrate, and the environmental factors that support it. The longer it takes, the less organic carbon content in the soil. The N value obtained has met the quality standards set by SNI 19 - 7030 - 2004 where the minimum total N is at 0.40 while the total N obtained after examination from each sample the smallest level is at 1.30 and the largest is at 2.06.

For the C / N ratio obtained has exceeded the set quality standard this happens because of the high levels of Carbon contained in each sample which also affects the ratio of C / N. The C-Organic content in the baglog is 49% [9].

The C/N ratio is highly dependent on C-oganics and N-total in compost. The C/N ratio of compost can be seen from these 2 indicators, if the C-organic value is higher than the N-total then the C/N ratio will be high, on the other hand, if the C-organic is lower than the N-total then the C/N ratio will be low. But if the C/N is too high, it can cause the microbes to lack N for protein synthesis so that decomposition is slow, but too low a C/N ratio will also cause ammonia gas to form, so nitrogen is easily lost to the air [10]. So, it can be seen in this study that the existing C / N content is very high which causes microorganisms to experience a lack of N for protein synthesis so that the pumping runs slowly.

Table 2. Temperature Check Results

Sample	Temperature
A0	29ºC
A1	29ºC
A2	29ºC
A3	30ºC
A4	29ºC
A5	29ºC
A6	29ºC
A7	30ºC
A8	29ºC
A9	29ºC

Based on the results of the examination during the composting process, the average temperature of the composting process of each sample for 1 month is 30ºC. On the first day of the composting process the average temperature of each sample is at 29 – 30°C. It can be seen that in the following days there began to be a rise in temperature, especially in A4 -A9 samples which on day 6 there was a rise in temperature which indicates the activity of microorganisms adapting and multiplying and decomposing existing waste. Whereas in Samples A0-A3 there are not too many temperature changes that occur during the composting process.

Compost is declared mature if it has reached a groundwater temperature of ≤30°C, we can see that the final temperature of each sample shows a figure of 29 – 30°C. Weather conditions during the composting process also affect the temperature of the composting process where during the composting process the weather that is happening is hot weather [11].

Table 3. pH Examination Results

Sample	Ph
A0	7.00
A1	7.00
A2	7.00
A3	7.00
A4	7.00
A5	7.00

Based on the results of observations during the composting process, the pH during the composting process is in the range of 6.5 – 7.8 and during the composting process the increase and decrease in pH occurs fluctuatingly where this is due to the decomposition process carried out by microorganisms.

The increase in pH that occurs because in the composting process ammonia and nitrogen gas will be produced so that the pH value turns into an alkaline due to increased bacterial activity [12]. At the beginning of composting, the average pH of the sample was at a value of 7.5 which indicates that the waste to be composted is more alkaline, after the decomposition process by microorganisms the pH of each sample changes fluctuatingly where it is at 6.5 to 7.0 where at the end of composting all pH values in each sample are worth 7.0. The increase in soil pH from sour to neutral is related to the availability of macronutrients that increase in the soil so that nutrients become available and easily absorbed by plants [13].

4.1 BEP (Break Even Point)

Table 4. Cost of Goods Produced by Baglog Waste Compost

No	Cost Description	Cost Per Day(Rp)	Cost Per Month (Rp)	Cost per Year (Rp)
	Fixed Cost			
1	Tool Cost	-	-	1.540.000,00
	Miscellaneous fees	2.500,00	75.000,00	900.000,00
	Variable Cost			
2	Baglog Waste	-	10.000,00	120.000,00
	Water	-	-	-
	Molasses	-	15.000,00	180.000,00
	Cow Dung	-	-	-
	Direct Labor		100.000,00	1.200.000,00
	Total Cost of goods produced			**3.940.000,00**

$$\textbf{HPP per kilogram} = \frac{\text{HPP per year}}{\text{Production Capacity per Year}}$$

$$\text{HPP per Kilogram} = \frac{\text{Rp 3.940.000,00}}{\text{1200 kg}}$$

HPP per Kilogram = Rp 3.283,33 per Kg

So, the selling price of the product per kilogram is:

HJP = Capital raw materials + (Capital raw materials x *Markup*)

HJP = 3.283,33 + (3.283,33 x 30%)

HJP = 3.283,33 + 985

HJP = Rp 4.268.33

BEP

$$\text{BEP} = \frac{\text{Fixed Cost}}{\text{Selling price per kilogram} - \text{Variable costs per kilogram}}$$

$$\text{BEP} = \frac{\text{Rp 2.440.000}}{\text{Rp 4.268,33 per kg} - \text{Rp 1200 per kg}}$$

BEP = 446.2 kg

From the results of the HPP and BEP association above, it can be seen that the cost of goods produced by baglog waste compost per kilogram is IDR 4,268.33 where researchers determine the selling price per kilogram by taking a markup or profit of 30%. This is done after assuming that the compost product produced per month is 100 kg so that the product produced per year is 1200 kg, with this assumption the researcher can calculate the cost of goods produced per year by estimating the price of each existing variable. So that by determining the cost of goods produced, the BEP of compost sales is 446.2 kg.

The purpose of break-even analysis is to find out the level of activity at which the revenue from sales is equal to the sum of all variable costs and their fixed costs. If a company only has variable costs, there will be no break even problems in the company. The break-even problem only arises when the company in addition to having variable costs also has fixed costs. The amount of variable costs in totality will change according to changes in production volumes, while the amount of fixed costs in totality does not change even if there is a change in production volume. The cost of goods produced shows that the sale of oyster mushroom baglog waste compost is relatively cheap and affordable and with sales with a profit of 30% sellers have already made a profit in the sale per kilogram of baglog waste compost. This shows that there is a potential for sustainability of the baglog waste compost process from an economic point of view and also from an environmental point of view with the use of baglog waste into compost this can reduce environmental pollution due to baglog waste itself [14].

4.2 Contribution To Green Economy

For the implementation of the Green Economy itself, it can be seen that making compost from baglog waste raw materials can generate profits or economic value for the community. And by utilizing Baglog waste into compost, this can increase the economy or income of the community and reduce wasted waste. This is included in the

application of the Green economy in question which carries out economic practices that do not exploit the environment.

From the results of the interviews that have been conducted, all groups of oyster mushroom farming communities have carried out activities related to the concept of the Green Economy when it has been explained what the Green Economy is, especially in oyster mushroom baglog waste, oyster mushroom farmers use a lot of oyster mushroom waste that is no longer used by selling it to organic fertilizer and plastic mills collectors, even though the utilization itself has not been maximized and has been stopped for a long time.

5 Conclusion

1. The application of the Green Economy concept is very likely to be applied to the oyster mushroom farming area of Bleberan Gunungkidul Yogyakarta village, this may be done after calculating the BEP and the profit that will be generated from the use of baglog waste into compost.
2. From the results obtained, each variable (C-organic, N Total, C/N Ratio, and pH) has a small or almost non-existent relationship in the mass mixture of baglog waste and cow dung while for the pH variable it has a strong and significant relationship
3. Based on the results of observations, it can be said that the C-Organic and C/N Ratios do not meet the quality standards of SNI 19-7030-2004 and N Total, temperature, pH meet the quality requirements of SNI 19-7030-2004
4. Baglog waste compost has good sustainability potential where the cost of making waste itself is not large and the seller will also receive profits from the sale of compost later.
5. The use of bio-activators to make the composting process easier because it utilizes exogeneus microorganisms
6. Composting time is increased so that the compost is fully ripe when harvested
7. The need for further socialization about the Green Economy to the community.

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