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Processing Solid Waste from Cabbage Vegetables and Cow Rumen Contents into Liquid Organic Fertilizer (LOF) in Semangat Village, Merdeka District, Karo Regency

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ABSTRACT

The manufacture of Liquid Organic Fertilizer (LOF) has been carried out with simple methods and equipment in the Semangat Village, Merdeka District, Karo Regency. LOF is made by utilizing waste produced by farmers at the time of post-harvest vegetables such as cabbage, cabbage, carrot leaves and other vegetables. These vegetables can be used because 90% is a liquid. The chopped cabbage waste is mixed with cow rumen and fermented for two weeks, the resulting leachate is fermented again by adding coconut water and LOF is produced which is ready to be used by farmers. With this LOF, farmers can be helped in reducing chemical fertilizers which are quite expensive, so that the costs needed by farmers are less and LOF can increase nutrients in the soil.

Keyword: Cabbage, Cow Rumen, Liquid Organic Fertilizer



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1. Introduction

Farmers usually collect the vegetables before being marketed to nearby cities and sort the yellow and old vegetables. This sorting will produce (waste) solid vegetables, which generally consist of leaves or petals that cannot be consumed (parts that cannot be eaten). The volume of cabbage solid waste is very large. The average result of sorting cabbage vegetables in Berastagi, Karo Regency, is around 1.5–2.0 tons of rubbish or trash. Cabbage waste is usually piled up around fields or people's houses and in temporary rubbish dumps (TPS) by open dumping and is not transported daily. Accumulation for too long can result in pollution, namely the emergence of sulfide acid gas and ammonia gas, which cause an unpleasant odor from rotting waste and can become breeding grounds for disease germs [1].



Figure 1. Cabbage waste in front of the house and in the farmer's field

Several ways of handling and processing vegetable waste have been implemented to overcome the accumulation that takes too long, including using it as a compost material. However, not all vegetable waste is suitable for use as raw material for compost. Generally, solid waste that is good for use as compost material is vegetable waste, which contains much fiber. In contrast, plants that contain much water are unsuitable for compost material use. Vegetables such as cabbage and Chinese cabbage contain much water, so they are not suitable for use as compost because the components included in cabbage are 90% water [2]. Therefore, one alternative technology that might be applied is fermentation to deal with vegetable waste, which contains water. This fermentation technology is like composting technology in general; the difference is that the final product is a liquid. One is to use cabbage waste in liquid organic fertilizer filled with cow rumen.

Various consequences accompanied the development of agricultural businesses. The availability of fertilizer greatly influences the success of farming businesses. Until now, most farmers in Semangat Village, Merdeka District, and Karo Regency still use chemical (inorganic) fertilizers, even though their availability continues to decrease, and the price is relatively high. Unwise use also impacts balance. Ecologically, the environment's carrying capacity continues to decline, and the productivity of agricultural businesses becomes low [3].

As is known, excessive and continuous use of chemical (inorganic) fertilizers causes land damage and loss of nutrients. The soil becomes acidic as a result, and many nutrients are bound and cannot be mobilized to plants, causing low plant productivity and the quality of plant products. On the other hand, the economic conditions of most farmers are still low, and human resources are very limited, making it difficult for farmers to obtain fertilizer. Most farmers are very dependent on artificial (chemical) fertilizers, which can harm the development of agricultural production when there is a shortage of fertilizer and fertilizer prices rise because fertilizer subsidies are removed [4]. Based on the above, one-way farmers can do this is to increase the soil nutrients of agricultural land by reducing the use of chemical fertilizers and intensifying the use of organic fertilizers. Organic fertilizer can act as a "binder" of primary grains into secondary soil grains, forming stable aggregates. This situation has a big influence on porosity, water storage and supply, soil aeration, and soil temperature so that it can improve the physical and chemical properties of the soil.

Liquid organic fertilizer is a liquid form that dissolves easily in the soil and contains important elements for soil fertility. Liquid organic fertilizer is a fertilizer that can provide nutrients following the needs of plants in the soil because its liquid form means that if there is excess fertilizer capacity in the soil, the plants will naturally easily regulate the absorption of the required fertilizer composition. To reuse plant, vegetable, and livestock residues, a method for making organic fertilizer in both solid and liquid form has been developed using the contents of cow rumen, which is known to contain lots of bacteria and protozoa.

1.1. Community Service Test

The objectives of community service carried out in Semangat Village, Merdeka District, Karo Regency are: assist farmer groups in managing and utilizing vegetable waste into organic fertilizer, helping partners to process and utilize vegetable waste to produce liquid organic fertilizer (LOF). Increase the knowledge, skills, and expertise of partners in terms of utilizing vegetable waste from agricultural products into organic fertilizer products of high economic value and environmental friendliness, intensification of organic fertilizer in various agricultural activities, especially liquid organic fertilizer, to improve farmland quality and farming products.

1.2. Benefits of Community Service

From the results of this service, it is hoped that there will be benefits obtained by farmers in Semangat Village, including:

1. Farmers can make liquid organic fertilizer from vegetable waste around their agricultural land,
2. Farmers can increase agricultural soil nutrients by using liquid organic fertilizer,
3. Farmers do not depend on chemical fertilizers, which are quite expensive and difficult to obtain,
4. The funds needed by farmers to grow vegetables are lower than using chemical fertilizers

2. Method

The implementation of making Liquid Organic Fertilizer (LOF) is carried out in the following stages:

- 1) Design a tool that produces liquid organic fertilizer.

At this stage, designing the equipment used to produce liquid organic fertilizer will be carried out with a capacity adjusted to your needs.

- 2) Preparation of tools and materials

At this stage, the materials will be prepared according to the results of the tool design and the equipment and materials needed. The equipment and materials required are a 200-liter plastic drum, which has been given a divider and 1 set of taps, 2 m plastic hose, two plastic buckets, 1 set of Statives and Clamps, 1 set of drum supports, and the materials used are cabbage waste, vegetable waste, Distilled Water, Cow Rumen, Molasses

- 3) Manufacturing and Assembly of LOF-making tool components.

With the design results made and complete tools and materials, the assembly process is carried out until it becomes a single unit that can produce liquid organic fertilizer, as in Figure 2.

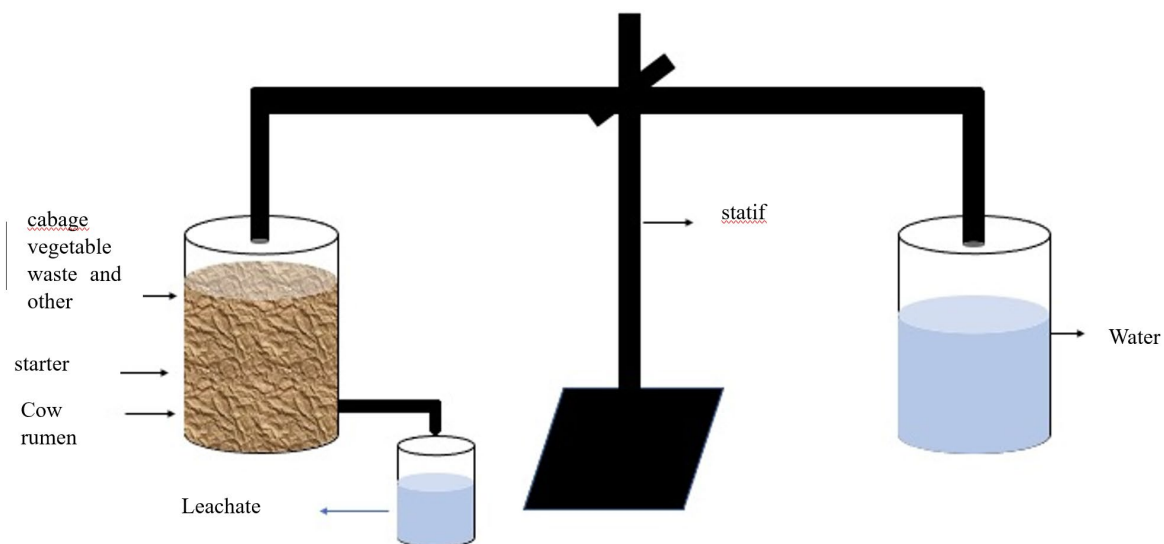


Figure 2. Design of tools used to create LOF

- 4) Making Cow Rumen starter

Provide a sterile plastic bucket and put in 2 liters of cow rumen juice, then add 0.5 liters of molasses and stir until homogeneous and leave for 24 hours.

- 5) Provision of cabbage and other vegetable waste Cabbage waste and other vegetables are taken randomly at collection points temporary cabbage delivery warehouses or in farmers' fields; cabbage vegetable waste and other vegetables are chopped/cut into the smallest pieces

- 6) Making Liquid Organic Fertilizer

Put the shredded cabbage waste into the assembled drum until full, and then add the beef rumen starter and let it cook. Cabbage waste becomes leachate (LOF) and is ready to be applied to plants.

- 7) Monitoring

The monitoring stage is needed to ensure that the Arih Ersada Farmers Group as a Partner can use liquid fertilizer-making equipment and utilize liquid fertilizer made from cabbage waste originating from the farmer group's fields.

8) Feedback

Feedback from partners is very valuable input for proposers. Input can be used to develop even better tools. Additionally, the input can also be in the form of criticism and suggestions regarding the service activities carried out. After all stages have been carried out, the output that partners will obtain is: equipment for making liquid organic fertilizer and training in making liquid organic fertilizer.

3. Result and Discussion

From the activities carried out in making Liquid Organic Fertilizer (LOF), a tool was made as in Figure 3



Figure 3. Socialization of how to create a LOF creation tool

Apart from making the tools, it was also demonstrated how to make a cow rumen starter where molasses is added and stirred evenly and stored for 24 hours and obtained as in Figure 4.



Figure 4. Leachate produced

The finished leachate is fermented by adding certain substances such as coconut water or rice water to obtain ready-to-use liquid organic fertilizer that can be sprayed on farmers' vegetable crops. The liquid organic fertilizer formed is as shown in Figure 5



Figure 5. Liquid Organic Fertilizer

Liquid organic fertilizer in fertilizer application is even, so there is no accumulation of fertilizer concentration in one place. This fertilizer is 100 percent soluble and evenly distributed. This liquid organic fertilizer has the advantage that it can quickly overcome nutrient deficiencies and has no problems in leaching nutrients; it can also provide nutrients rapidly. Liquid organic fertilizer does not damage soil humus even though it is used frequently. Apart from that, this fertilizer also has a solution-binding agent, so it can be used directly on the soil without requiring a time interval to plant plants.

4. Conclusion

Farming groups can utilize waste and process organic liquid fertilizer. Furthermore, the knowledge and skills of partners in utilizing vegetable waste are increasing. Liquid organic fertilizer in fertilizer application is more even, so there is no accumulation of fertilizer concentration in one place. Liquid organic fertilizer does not damage soil humus even though it is used frequently. Apart from that, this fertilizer also has a solution binding agent so it can be used directly on the soil without requiring a time interval to be able to plant plants. With this fertilizer, farmers can be helped in reducing chemical fertilizers which are quite expensive, so that the costs required by farmers are less and can increase the nutrients in the soil.

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