Utilizing Cow Manure Waste (Bos Taurus) As Organic Fertilizer In Labuan Lelea Village, Labuan District, Donggala Regency, Central Sulawesi

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Abstract.

This community service activity has been conducted in Labuan Lelea Village, Labuan District, Donggala Regency, Central Sulawesi Province, in collaboration with the local farming community. They face challenges regarding how to utilize cattle manure waste as environmentally friendly organic fertilizer. The objective of this community service is: 1) To provide knowledge to the farming community in Labuan Lelea Village on how to utilize cattle manure waste as organic fertilizer, as a substitute for inorganic fertilizers, which are known for their chemical content, scarcity, and fluctuating prices annually; 2) To promote organic fertilizers as an environmentally friendly alternative to inorganic fertilizers in agricultural lands; 3) To enhance the knowledge of farming communities regarding the effective utilization of cattle manure waste as organic fertilizer for both food crops and horticultural plants. The method employed in this activity is a participatory approach, wherein a team including Community and Student Service Learning Program (KKN) participants and local community members actively collaborate in fostering good cooperation between extension workers and farmers. The primary target audience of this training is farming communities engaged in plantation, food crops, and horticultural cultivation. The outcomes of this community service activity include increased awareness of how to utilize cattle manure waste (Bos Taurus). This process requires minimal investment as cattle waste, sawdust, and rice husks are all freely available materials, thus serving as a substitute for inorganic fertilizers which contain chemical substances and are environmentally unfriendly.

Keywords: *Bos Taurus, sewage waste, Food Security, Community Participation, and Welfare.*

I. INTRODUCTION

Donggala Regency consists of 16 districts, one of which is Labuan District. Labuan District has 7 villages and is an area that produces beef cattle amounting to 2,903 head in 2015 [1].This is quite potential for obtaining cattle waste, as the agricultural activities pursued by the community still partly rely on Inorganic fertilizers. Thus, they sometimes face challenges due to the scarcity and high cost of Inorganic fertilizers used. Therefore, the Department of Agricultural Socioeconomics, Agribusiness Study Program, Tadulako University, conducted an outreach and training program on the utilization of cattle manure to produce solid organic fertilizer, which can be used as fertilizer for plantation crops, food crops, and horticultural plants for farmers in Labuan Lelea Village. It is also expected to serve the purpose of every farming community in the fertilization process for their crops. Thus, it can reduce capital expenditure on the purchase of chemical fertilizers, which are scarce and subject to price fluctuations every year. One effort to optimize plant growth and productivity is through the application of organic fertilizer. Organic fertilizer is derived from plant residues and animal waste that have undergone decomposition or decay processes Making organic fertilizer (compost) can be done either aerobically or anaerobically[2], [3] The composting process is aimed at reducing the C/N ratio of organic matter to match the C/N ratio of the soil[4], [5]The advantages of organic fertilizer are its environmental friendliness, its ability to increase farmers' income, and its ability to improve soil fertility by repairing the physical damage to the soil caused by excessive use of inorganic (chemical) fertilizers[6], [7] As the basic material for organic fertilizers, both in liquid and solid forms, every organic material has different physical and chemical properties, potentially affecting plant growth to varying degrees.

The use of organic fertilizers is expected to enhance growth and production in plantation crops, food crops, and horticultural plants, replacing the use of inorganic fertilizers still employed by farmers[8], [9]Several solid organic fertilizers that can be used in crop cultivation include compost, vermicompost, guano fertilizer, and manure. These organic fertilizers have sufficiently high nutrient content to support plant growth[10], [11]. In addition to their high nutrient content, these solid organic fertilizers also have

advantages in improving the chemical, physical, and biological properties of the soil [12], [13]According to the American Plant Food Control Officials (AAPFCO), organic fertilizer is defined as a material containing carbon and one or more essential nutrients besides hydrogen and oxygen necessary for plant growth [14], [15]Meanwhile, according to the USDA National Organic Program, organic fertilizers are all fertilizers that do not contain prohibited substances and are derived from natural materials such as plants or animals, and sewage sludge, excluding non-organic materials. According to the USEPA, organic fertilizer is manure or compost applied to plants as a source of nutrients[16], [17]Organic fertilizer is derived from dead plants, animal manure, and/or other organic waste that has undergone engineering processes, either in solid or liquid form, which can be enriched with mineral substances and/or beneficial microbes to enhance soil nutrient content and organic matter, as well as improve the physical, chemical, and biological properties of the soil (Minister of Agriculture Regulation No. 70/Permentan/SR.140/10/2011).Organic carbon (C-organic) is the main component of organic matter. Soil organic matter consists of complex organic compounds that are undergoing or have undergone decomposition processes, either in the form of humus resulting from humification or inorganic compounds resulting from mineralization[18], [19]

Table 1. Nutrient content of various types of manure in dry oven conditions

	Nutrient Content					
	Total-N	P	K	Ca	Mg	S
	…… kg t^{-1} ……					
Cow	6	1.5	3.0	1.2	1.0	0.9
Horse	7	1.0	5.8	7.9	1.4	0.7
Chicken	15	7	8.9	3.0	8.8	0.3
Sheep	13	2	9.3	5.9	1.9	0.9

*Source: Setyorini et al. 2006 (Adapted from Myung and Lee 2001); *Dried in an oven at 60°C for 12 hours*

The nutrient content of organic fertilizers serves as a soil conditioner. Besides containing essential nutrients for plants, organic fertilizers also contain humic acids, fulvates, plant hormones, and other compounds that stimulate plant growth, thereby enhancing nutrient uptake by plants.The purpose of conducting community service activities for farmers in Labuan Lelea Village is to teach them how to utilize animal waste as a substitute for chemical fertilizers, which are environmentally unfriendly and subject to price fluctuations every year. This aims to reduce the high expenditure of farmers on purchasing chemical fertilizers[22], [23] The activities also involve hands-on practice for farmers in making organic fertilizer from cattle manure, so that in the future, they can personally produce organic fertilizers for their own agricultural needs[24], [25].

II. RESULT AND DISCUSSION

This activity represents a Community Service Program carried out by the Department of Agricultural Socioeconomics, Agribusiness Study Program, Faculty of Agriculture, aimed at the farming community in Labuan Lelea Village, Labuan District, Donggala Regency.The implementation of this Community Service activity began with the preparation of the venue for the counseling process with the community, with the village office of Labuan Lelea being utilized as the venue for these activities.

1. Implementation Stage of Face-to-Face Counseling.

Fig 1. Counseling Process with Farmers

Figure 1 above illustrates the process of the activity outcome, where efforts are made to provide materials related to how to enhance knowledge and understanding among farmers on utilizing animal waste as organic fertilizer in plantation crops, food crops, and horticultural crops. This is aimed at reducing the use of inorganic fertilizers in agricultural land. The counseling conducted in Labuan Lelea village received significant enthusiasm from the community, as some farmers were unaware of the process of making organic fertilizer using animal waste. The community service activity was conducted on October 16, 2021, at 10:00 AM WITA in the Hall of Labuan Lelea Village Office, Labuan Tengah District, Donggala Regency. Participants included village officials and farming communities. The activity was opened by Mr. Arifin.,SP the Head of Labuan Lelea Village, and Dr. Ir Abdul Muis, the Chairman of the Department of Agricultural Socioeconomics at Untad, who served as the speakers, along with Dr. Ali Akrab SP.MM and the local Agricultural Extension Officer. It was also attended by the Head of the Agribusiness Study Program and some faculty members from the Faculty of Agriculture, Tadulako University, who participated in the community service activity.

Fig 2. Extension Officer Providing Guidance to Farmers

In Figure 2, the Extension Officer is seen guiding farmers on the correct method of mixing sawdust powder and animal waste media to ensure that the resulting organic fertilizer can be used effectively in the planting media they intend to use.

Fig 3. Mixing Sawdust Powder and Animal Waste Media

In Figure 3, the process of mixing sawdust powder and cow dung, guided by the extension officer and directly carried out by the farmers in Labuan Lelea village, is depicted. This is aimed at enabling farmers to independently or collectively engage in the production of organic fertilizer in the future. Essentially, they have gained both theoretical knowledge and hands-on experience in the field of organic fertilizer production.

Quoting Setyorini, Saraswati, and Anwar (2006), the requirements for making good compost are as follows:

1) Raw material size: The smaller the particle size of the material, the wider the surface area, making it easier for microbes to break down the materials. The optimal particle size for effective decomposition by microbes is around 5-10 cm.
2) Temperature and pile height: Decomposing material piles will increase in temperature up to 65-75°C due to fermentation activity by microbes. The temperature increase is beneficial for killing fungi, pathogenic bacteria, and weed seeds carried in the material. The optimal pile height for compost-making ranges from 1.25-2 m at the beginning of the composting process.

3) C/N ratio: Decomposing microbes requires carbon and nitrogen from the original material. Carbon is needed as an energy source, while nitrogen is needed to form protein. The ideal C/N ratio for composting materials is between 20:1 and 35:1.
4) Moisture: To keep microbes active, materials to be composted should always be moist with a moisture content of 50-60%. Excess or insufficient moisture will hinder the composting process. Therefore, dry materials should be moistened with water, while overly wet materials may need to be supplemented with other materials such as sawdust or rice husks to absorb excess water.
5) Air circulation (Aeration): Microbes need oxygen to break down organic matter. Therefore, turning is necessary during the composting process to ensure proper aeration.
6) pH value: The pH value of organic materials that can be composted ranges from 3-11, but decomposer bacteria work optimally at pH 5.5-8.0. Lime can be added to adjust the pH during the composting process.

2. Tools and Materials Used in Making Organic Fertilizers

Tools:

1) Bucket
2) Ladle
3) Shovel
4) Hoe
5) Tarpaulin

Materials:

1. Cow dung
2. Decomposer microbes (MOL/EM4/Stardec)
3. Water
4. Rice husk charcoal
5. Lime
6. Sawdust

1) Mix (MOL/EM4/Stardec): Molasses: Water in a ratio of 1:0.5:25. Use well water, then boil it, let it cool down, and mix it with other ingredients. Seal tightly and let it sit for 3 days. The decomposer microbes are ready for use.
2) Prepare the main ingredient, which is cow dung with a maximum moisture content of 60%. Then add other materials such as sawdust, rice husk charcoal, and lime. Mix all the ingredients thoroughly until they are evenly distributed.
3) Add the decomposer microbes to the mixture of animal waste materials. Then pile up all the materials with a maximum height of 1.6 m. Let it sit for 4 weeks.
4) The compost-turning process can be done every week. The purpose of turning is to increase air circulation.

3. Final Process: Covering the Animal Waste with Tarpaulin.

Fig 4. The process of covering organic fertilizer with tarpaulin

Fig 5. Covering properly to prevent air from entering.

Characteristics of Animal Waste Successfully Converted into Organic Fertilizer:

1) Its form has changed from its original state.
2) The odor has decreased and is not pungent when sniffed.
3) Its temperature has become neutral, neither cold nor hot when touched.
4) The texture is dry and easily crumbles when held.
5) Not wet or watery.

III. CONCLUSION

The process conducted aimed to directly inform the farming community about the utilization of cattle manure in Labuan Lelea village as organic fertilizer, thereby reducing the reliance on inorganic fertilizers with fluctuating chemical contents and prices. This alleviates the financial burden on farmers due to limited capital for farming activities. Collaboration with the local authorities of Labuan Lelea village and the Department of Agricultural Socio-Economics facilitated the production of organic fertilizer for crops, plantations, food crops, and horticultural plants. The production cost of organic fertilizer is relatively low since the primary ingredients, namely cattle manure, sawdust, and rice husk ash, can be obtained free of charge. One of the advantages of organic fertilizer is its chemical-free composition, contributing positively to environmental sustainability.

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