

Bokashi Application for Organic Farming in Manuk Mulia Village, Karo District

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Abstract. Berkah Mulia is a farmer group in Manuk Mulia Village, Karo Regency with 19 members. Livestock developments may cause several problems such as environmental pollution in the form of livestock manure which causes unhealthy environmental conditions. In addition, the unstable supply of chemical fertilizers and high prices are problems that are quite difficult to solve. The solution to this problem is the utilization of cattle feces in Bokashi which can improve the physical, chemical, and biological properties of the soil due to the use of excessive chemical fertilizers to improve soil quality. Bokashi is compost produced from the fermentation process or organic matter fermentation with EM4 technology. The method implemented in the community service is having interviews and discussions to find the solution for all problems. Then use teaching media in the form of banners and brochures about the method of making bokashi. Training, counseling, and mentoring are carried out by providing materials and practices for making bokashi using cow feces. The results of the activity show that this community service can increase the knowledge and skills of farmers by 84% related to making bokashi. This activity can also reduce environmental pollution and reduce the cost of purchasing chemical fertilizers so that horticultural crop production increases.

Keyword: Bokashi, Cow feces, Waste, Fermentation, Environment

Abstrak. Berkah Mulia merupakan kelompok tani di Desa Manuk Mulia, Kabupaten Karo dengan jumlah anggota 19 orang peternak. Sebagian anggotanya merupakan petani dan peternak sapi. Peternakan memiliki permasalahan yaitu pencemaran lingkungan berupa limbah kotoran ternak yang menyebabkan kondisi lingkungan yang tidak sehat. Selain hal tersebut pasokan pupuk kimia yang kurang stabil dan harga yang cukup mahal merupakan permasalahan yang cukup sulit diselesaikan. Solusi permasalahan tersebut adalah pemanfaatan feses ternak sapi menjadi Bokashi yang dapat memperbaiki sifat fisika, kimia dan biologi tanah akibat penggunaan pupuk kimia yang berlebih sehingga dapat meningkatkan kesuburan tanah. Bokashi merupakan pupuk kompos yang dihasilkan dari proses fermentasi atau peragian bahan organik yaitu EM4 dengan proses lebih cepat dibanding pupuk kandang. Metode yang dilaksanakan dalam program pengabdian masyarakat adalah wawancara untuk mengetahui permasalahan dan mencari solusi. Kemudian pelaksanaan praktik pelatihan menggunakan media ajar berupa baner dan brosur tentang metode pembuatan bokashi dari limbah feses sapi. Pelatihan, penyuluhan dan pendampingan dilaksanakan dengan memberi materi, sampel bokashi, praktik pembuatan bokashi dan aplikasi langsung dilahan pertanian. Hasil kegiatan menunjukkan bahwa pengabdian masyarakat ini dapat meningkatkan pengetahuan dan keterampilan peternak sebesar 84% terkait pembuatan bokashi. Kegiatan ini juga dapat mengurangi pencemaran lingkungan dan mengurangi biaya pembelian pupuk kimia sehingga produksi tanaman hortikultura meningkat.

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1. Introduction

Manuk Mulia Village is one of the villages located in Karo Regency, North Sumatra Province. The development of horticultural crop productivity in Karo Regency in 2020 was shallots at 8,216 tons, chili at 70,482 tons, potatoes at 70,367 tons, and cabbage at 134,718 tons [1]. High production of horticultural crops requires a large amount of fertilizer to increase crop yields. The number of beef cattle in three arrows spread over several villages, one of which is Manuk Mulia village with 1242 cows while 17 dairy cows and 114 buffaloes [1]. The population of livestock, especially cattle, is high, which has an impact on increasing income, however, existing farms leave various problems, especially in handling livestock manure. The rapid growth of the livestock business leaves problems, especially the pollution of feces that causes odors, and flies and has an impact on the health of farmers and their livestock.

The Farmers-Livestock Group "Berkah Mulia" is a Gapoktan (Farmers and Breeder Group Association) in Manuk Mulia Village with a chairman named Porton Tarigan. Berkah Mulia farmer group consists of farmers and beef cattle breeders who have a large area of horticultural crops. The problem faced by the "Berkah Mulia" group is the contamination of cow feces that has not been used optimally which causes environmental pollution so it has an unhealthy impact on farmers and their livestock. Cattle feces can be used to make compost, but it requires a long time. In addition, farmers also have horticultural crops that require fertilizer every month. Sometimes the supply of fertilizer is slow and the price is expensive. From these problems, one alternative is to integrate livestock and horticulture. Making Bokashi an alternative to solve these problems in addition to reducing environmental pollution, Bokashi can also reduce the continuous use of inorganic fertilizers as a cause of decreasing the balance of soil properties. Efforts to increase crop productivity using Bokashi [2]. Bokashi application can improve soil structure, increase water holding capacity, and reduce environmental pollution.

Bokashi is a composting method using an aerobic or anaerobic starter to compost organic matter. Bokashi can be made using cow dung, molasses, water, and rice husks. Bokashi is a ready-to-use organic fertilizer that can be used to fertilize the soil and increase plant growth and productivity [3]. The use of Bokashi fertilizers can also replace chemical fertilizers in increasing soil fertility and improving the physical, chemical, and biological qualities of the soil [4]. Several studies have shown that the microorganisms used for bokashi fermentation are bacteria that can decompose organic matter with the advantage of improving soil structure, suppressing the growth of disease-causing microorganisms such as starter EM4 [5]. Bokashi is made using very simple ingredients, such as EM4, granulated sugar, water mixed with molasses, cow dung, husk charcoal, and rice bran which are then mixed in a container until the water content is

between 30%-40% then tightly closed for 4 -7 days. Ripe bokashi is characterized by a blackish color, friable, and odorless [6]. According to [7] the nutrient content of cow dung bokashi is Nitrogen (N) of 0.92%. Phosphorus (P) 0.23%, Potassium 1.03% and contains Ca, Mg, and several other microelements namely Fe, Cu, Mn, Zn, Bo, and Mo which are useful for plant growth and development. Bokashi contains micro and macro nutrients needed by horticultural plants [8]. Bokashi can be applied to horticultural crops such as tomatoes [9]. Bokashi can also be applied to sweet corn plants [10].

The community service that will be carried out is the utilization of cow feces waste that is processed into Bokashi for horticultural crops in the Berkah Mulia farmer group. The objectives of this community service were 1) to introduce fermentation technology and the Bokashi application to improve the skills and insights of farmers/breeders by utilizing cow feces. 2) to provide education to farmers about the importance of processing livestock waste to improve environmental health; 3) to utilize cow feces to reduce the cost of purchasing inorganic fertilizers as a solution for fertilizer distribution and the price is quite expensive; 4) to increase soil fertility to increase crop productivity increase.

2. Method

The method used in community service began with finding information from various sources about the problems faced by the Berkah Mulia farmer group and breeder. The target of this community service activity is 19 breeders. After knowing the problem, the community service team found the solution with the farmers and breeder. The right and effective solution that is adapted to the carrying capacity of the environment in Manuk Mulia Village, Karo Regency. Interviews and discussions with farmers and breeders were carried out so that the application of technology regarding the Bokashi could be carried out on time. The approach to farmers carried out by the community service team consists of a) Initial survey and approach to farmer groups regarding the existing problems. The community service team is looking for potential resources as support for community service activities; b) Identify the problems in the Berkah Mulia farmer group through discussion. Discussion of the introduction and application of technology as a solution to the problems so that farmers are free from the shackles of backwardness and may increase innovation for mutual benefit; c) Participatory training and practice of farmer groups, namely the whole series of community service activities carried out using learning media and mentoring using adult learning methods, planning, and monitoring and evaluating activities; d) Counseling and education to increase knowledge related to applied technology; e) Assistance and guidance after practice.

The ingredients for making bokashi are 200 kilograms of goat and sheep feces, 60 kilograms of sawdust, 20 kilograms of bran, 40 kilograms of husk charcoal, and 400 ml of molasses, 400 ml of EM4, 10 kilograms of dolomite, and enough water. Making bokashi by dissolving 10 liters

of water, 400 ml of EM4 and 400 ml of molasses then mixed into goat and sheep feces, bran, dolomite, husk charcoal, and sawdust to a moisture content of 40%. After all the ingredients are mixed, place them in an airtight composter for up to 14 days. Once every 5 days stirring is done then the composter is closed again.

3. Results and Discussion

The community service team prepared bokashi samples and prepared the materials needed for training activities. The sample used is to show a figure about bokashi in a simple manufacturing process using materials available in nature such as cow feces, molasses, bran, and rice husks that can be replaced using a chopped straw.

3.1 Farmer skill improvement

The waste of beef cattle feces in the Berkah Mulia farmer group is usually not used in the first week, after training the waste was collected collectively. The activities carried out by the community service team in the form of practical activities and counseling then finally can convince farmers. Breeders attended a series of bokashi-making training and practice until they understood. During the practice of making bokashi, the service team helped farmers try to explain the process of making bokashi, starting by mixing solid materials such as goat and cow dung, sawdust, bran, dolomite, and EM4 solution, molasses, water. The material is then mixed and stored in a composter for 14 days. Theories and practices that have been implemented with the material about the benefits of bokashi to increase soil fertility had a fairly good impact. Questionnaire data from 19 members of the Berkah Mulia farmer group as participants showed as many as 16 people had been skilled in making bokashi, 2 people still need assistance because of the age factor and 1 person was still hesitant in the practice of making bokashi. It is reasonable because the adoption process can be influenced by various factors so that it may run quickly or slowly. Factors that affect the speed of adoption are the nature of the innovation applied, the target community, decision making, communication, and the community service team [11]. The service team can answer all questions from the farmers clearly and in detail so that in practice the farmers can make bokashi. The community service team also provided samples of ripe bokashi with a loose texture, odorless, and not hot so that farmers did not hesitate to apply. A sample of ripe bokashi is presented in Figure 1.



Figure 1. Samples of bokashi with a 14-day fermentation process

During the training practice, the process of adoption and innovation of breeders takes place, namely that breeders can practice and adopt the skills provided by the service team. The adoption process in the theory and practice of bokashi-making training takes place quickly because it is influenced by several factors, namely the willingness of farmers to change and utilize the potential of waste to make it more useful [12] [13]. The utilization of waste into useful materials can improve environmental sustainability and cleanliness [14]

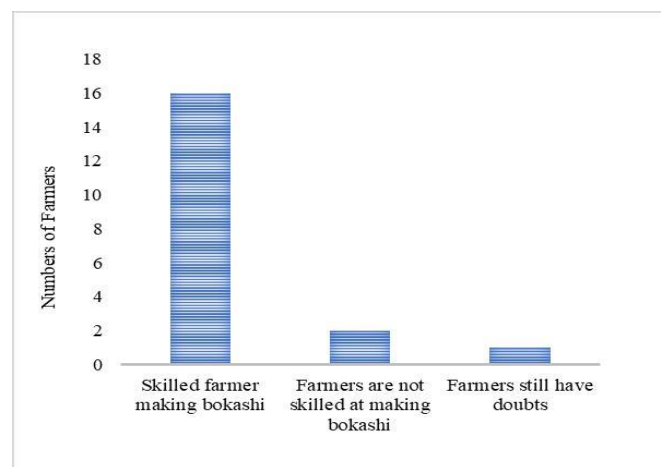


Figure 2. Number of skilled farmers in bokashi making

Improving the skills and knowledge of farmers through mentoring aims to identify farmers constraints and find solutions to accelerate the adoption of knowledge. The service team helps farmers and ranchers in the manufacture and application of bokashi on horticultural farms to improve farmers' skills. Based on the data in Figure 2 shows 16 skilled farmers making and applying bokashi. Improved skills for 16 farmers from a total of 19 farmers. Based on this community service questionnaire, is effective in improving the skills of farmers by 84% of the total number of farmers.

3.2 Procedure on making spincah extract (C)

Based on observations after the practical training activities, farmers began to make bokashi and apply it to organic-based horticultural farms. Application of bokashi on chili and tomato plants is done by sprinkling it on loosened soil. Based on data from the questionnaire that 19 farmers had applied the ripe bokashi that they learned from the training, while 1 farmer was still hesitant to apply it on agricultural land. Breeders who do not understand how to make bokashi will be accompanied again by the community service team. Observations are made periodically to farmers who have applied bokashi to organic-based horticultural crops. The method of making bokashi is relatively easy to apply because it requires simple ingredients and is available in abundance and is fast in the process. Ordinary compost takes between 30-40 days in the maturation process while bokashi takes between 7-8 days.

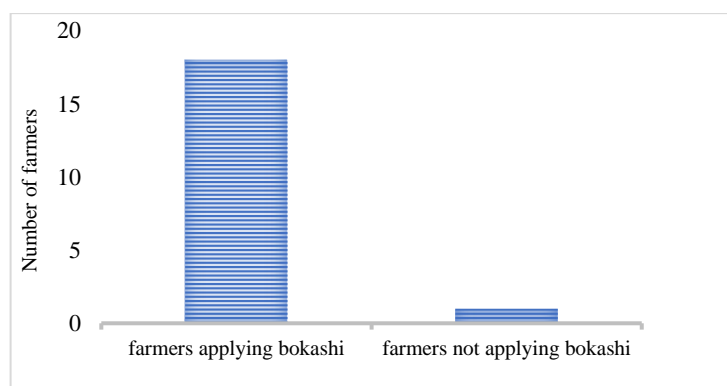


Figure 3. The increasing number of farmers applying bokashi

The fermentation process using EM4 can accelerate the decomposition process so that the preparation can be done quickly. In addition, excessive and continuous use of chemical fertilizers may damage the quality of the soil, it is expected that the presence of bokashi can improve the quality of the soil. Following [15] bokashi is an effective organic fertilizer in the production of natural crops compared to chemical fertilizers. Bokashi is an organic element used in sustainable soil management. Based on interviews after training, farmers have calculated that if chemical fertilizers are replaced with bokashi applications, it will have an impact on reducing the cost of purchasing fertilizers regularly [16]. Based on Figure 3 for 6 months of community service activities the number of farmers who applied bokashi was 18 farmers. The community service that has been carried out has achieved the target quite well.

3.3 Environmental hygiene improvement

Pollution due to cow feces waste can have an impact on the health of farmers and their livestock. Based on the questionnaire data as many as 19 people gave information that the use of cow feces in making bokashi can reduce odor and fly pollution. Cow feces were collected collectively and then made bokashi repeatedly in a composter or excavated soil covered with a tarpaulin. Interviews after training activities and farmers practicing bokashi making can provide

information about cleaner housing, less pungent odors, and reduced fly numbers, resulting in a healthier environment. The decrease in the number of flies and the reduction in the smell of livestock manure was caused by the fact that cow dung/feces were channeled into the sewer to be collected and made bokashi to the cattle barn in the form of excavated soil and covered with tarpaulin. After a 7-8 day fermentation process, the bokashi can be harvested and aerated before being applied to agricultural land.

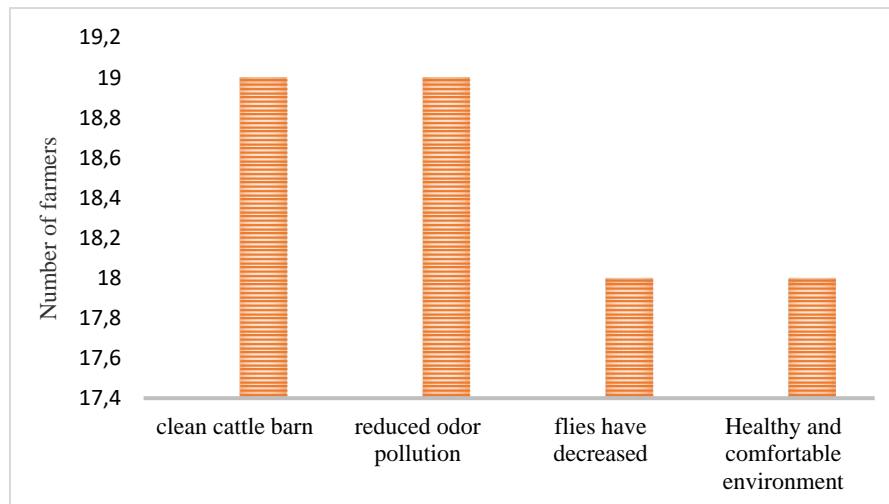


Figure 4. The statement farmer about environmental hygiene

Based on interviews and questionnaire data there was an improvement in the quality and cleanliness of the environment stated by 19 farmers, reduced odor pollution was stated by 19 farmers, a reduced number of flies started by 18 people, and a healthier environment stated by 18 farmers (Figure 4). The overall data obtained was quite good because the target of the service team was achieved.

3.4 Reducing fertilization cost

Fertilization conducted by farmers is usually done periodically using chemical fertilizers. The use of chemical fertilizers is because farmers do not want to use manure that is less practical but continuous and excessive use can damage soil quality [16]. One of the reasons that make farmers reluctant to use manure is the time and process of making it long. Bokashi is fermented manure with the process uses microbes in EM4 so that the process is faster. Berkah Mulia Farmers Group in Manuk Mulia village owns some organic farming land so the presence of bokashi helps in better fertilization of organic-based horticultural crops. Based on the questionnaire the use of bokashi can reduce the cost of purchasing chemical fertilizers for horticultural crops. In some fields, the use of bokashi can support organic vegetable growing activities.

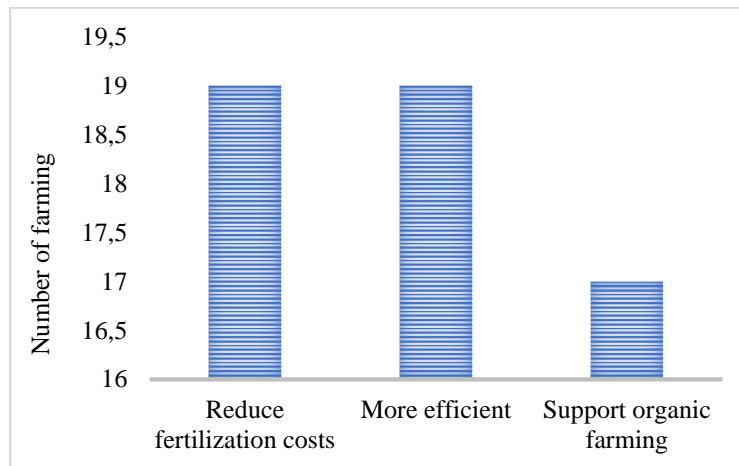


Figure 5. Bokashi may reduce fertilization cost

Farmers who usually used manure in the old manufacturing process switched to using bokashi because the ripening process is faster and more practical. The use of bokashi is also considered to be more efficient because the materials for making it are available in abundance so it is more efficient compared to buying chemical fertilizers. Based on Figure 5 during 6 months of community service activities the number of farmers who felt the benefits of bokashi could reduce fertilization costs and was efficient was 19 and farmers who felt that bokashi could support organic farming were 17 farmers. The community service that has been carried out has achieved the target quite well.

4. Conclusion

Community service activities utilizing cow feces in bokashi are effective in reducing the environmental pollution. Increased skills of farmers in applying and making bokashi 84% and the application of bokashi on plants have a positive impact on fertilization costs. The application of bokashi can reduce the cost of fertilization and improve the quality of soil fertility so that it can affect the productivity of horticultural crops.

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