

Counseling on Processing of Waste into Solid Organic Fertilizer for GAPOKTAN Farmers Rukun Tani Segobang Village, Licin District, Banyuwangi Regency, East Java

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ABSTRACT

Cattle and sheep waste contain chemical elements that are beneficial to the environment. Livestock waste which is processed into fertilizer is very useful for the fertility of agricultural land. The processed livestock waste is organic compost or known as manure. Farmers generally use compost to improve soil productivity, so livestock processing businesses have good prospects as an alternative to providing fertilizer other than chemical fertilizers. Farmers in Segobang village have several livestock. The problem is that the waste is not treated and has polluted the environment. Farmers generally have limitations in disposing of livestock waste or manure. In community service activities, trying to introduce ways to use livestock waste to be processed into organic fertilizer. The goal is that it can be used by farmers to fertilize the soil and can reduce input costs for farmers. Community empowerment programs, namely facilitation and counseling for farmers, breeders members of Gapoktan Rukun Tani with animal waste processing materials, the process of making solid organic fertilizers, the urgency of using organic fertilizers, reducing the use of chemical fertilizers. The activity method begins with problem identification, prioritization and problem solving. This activity shows that there is an increase in knowledge, insight, awareness and skills of farmers processing waste into solid organic fertilizer, as well as increasing the use of organic fertilizer for paddy fields and plantations. Involvement requires farmers, Gapoktan officials in collecting waste, fermentation routines every week so they can produce organic fertilizer at 2 tons per 2 weeks. The users of organic fertilizers extend from members of the combined farmer groups to the general public. The success of the Gapoktan farmer institutional unit in organic fertilizer production was able to reduce input costs. This attracted the interest of various other farmer groups to adopt. The program for processing waste into organic fertilizer can provide benefits for increasing the economy, agricultural productivity, the environment and the formation of a new livestock waste processing business unit.

KEYWORDS

Group ;
Waste;
organic;
Fertilizer;
Cattle



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1. Introduction

1. Introduction

The involvement of Higher Education to play an active role in and support the government's program to build villages through community service tasks, of course, can help expedite the process of village development. One of the villages that is growing and developing, namely Segobang Village, Licin District, Banyuwangi Regency, shows the characteristics of a remote village with excellence in agriculture, especially organic. The existence of the COVID-19 pandemic has had a very significant impact on business slowdown. Villages experienced difficulties in implementing village programs. There are several internal and external village constraints. Some of BUMDes' problems include limited human resources, limited access to technology and information, decreased production, stagnant distribution networks, mastery of digital marketing and digitization of financial administration. Therefore, the collaborative role of academics and villages is strategic in efforts to solve village problems that have potential economic levels. Based on observations and interviews, and analysis of secondary data from

Segobang Village, the characteristics of Segobang Village are agricultural villages. As many as 1,035 farmers whose main production is rice, in 2019 the average production capacity is 6.4 tons per hectare from a paddy field area of 247 hectares. Horticultural and plantation production that stands out is oranges 30 tons/ha, tomatoes 10 tons/ha, sweet potatoes and wood 2.5 tons/ha, coconut 1 ton/ha. Horticulture and plantation products were obtained from 170 ha of dry land and 5 ha of yards. The number of breeders in Segobang Village is 124 people, with details of 105 cattle breeders and 119 buffalo breeders. The livestock potential that stands out are cows, goats, sheep with a population of 285, 280 animals and 60 animals respectively. Supported by 5 farmer groups with 2 advanced status and 3 beginner groups. One of the farmer groups that is actively engaged in the buffalo livestock business. The identified problem is the need for fertilizer inputs both for paddy fields, dry fields and yards which is high and its availability is not smooth and the price is high. Economically, high input costs will have an impact on the low income earned by farmers. While other problems, a lot of livestock manure that pollutes the environment, because farmers often accumulate for weeks on the edge of the pen. This has a huge impact on the health of animals and the environment in the surrounding community. In addition, livestock waste is often disposed of in rivers.

Research on livestock waste has been carried out by many previous researchers which are used as references in this community service. Fertilizers produced from abattoir waste can contribute to the sustainability of phosphorus, and the biofortification of plants with minerals was investigated by [1]. The solution to the problem of optimal control of the methanogenesis process based on the Pontryagin maximum principle was investigated by Korolev [2]. Alternative circular bioeconomy in organic farming with excess nutrients (Goat manure and arbuscular mycorrhizal fungi): A case study in Indonesia was researched by Kurniawati [3]. District-level estimates of ammonia emissions in China from 2013 to 2018 were investigated by Liao [4]. Biowaste Management in Italy: Challenges and Perspectives researched by Demichelis [5]. Stinky Anthropocene! Smell, influence, and the entangled politics of livestock waste in a rural Iowa watershed was investigated by Neubert [6]. Policy Impact on Regional Biogas Using Modular Model Tools was researched by Rozakis [7]. Animal Wastes Sustainable Use and Management: Assessment of Reuse and Valorization of Raw Sheep Wool was studied by Parlato [8].

The balance between capturing phosphorus from sewage and wastewater and demand for plant fertilizers in Italy was investigated by Caniani [9]. Evaluation of methane and carbon dioxide emissions from livestock waste, compost, and biogas sludge was investigated by Pertiwiningrum [10]. Improved inventory of tissue ammonia emissions in China was investigated by Li [11]. Monitoring the Dynamics of Nitrogen and Phosphorus Content during Pork Porridge Aerobic Digestion was investigated by Lee [12]. Ammonia exposure induces abnormal expression of cytokines and heat shock proteins through impaired glucose metabolism in chick neutrophils investigated by Wang [13]. Application of time variable, fixed rate from cow biogas waste to rice using leaf color chart: microcosm experiment in Vietnam studied by Minamikawa [14]. Spatiotemporal variation of nitrate concentrations in soil and groundwater in highly polluted agricultural areas was investigated by Nakagawa [15]. Assessing the role of emission sources and atmospheric processes in simulating using CMAQ (version 5.2.1) and ASAP (version 4.6) was investigated by Fang [16]. An on-site survey of household-scale anaerobic digestion in Sri Lanka was undertaken by Madusanka [17]. An inventory of ammonia emissions for agricultural sources in Hefei, China was investigated by HOU [18]. Hydrothermal Two-Step Pretreatment with Ammonia for Cattle: Pretreatment Characteristics, Anaerobic Digestive Performance and Kinetic Analysis investigated by X. Wang [19]. Simulating the spatial distribution of pollutant loads from a pig farm using an agent-based modeling approach was investigated by Ngo [20].

Biogas technology in commercial poultry farms and dairy farms in Bangladesh: current scenario and future prospects was investigated by Saha [21]. Mapping global inputs and impacts of human waste on coastal ecosystems was researched by Tuholske [22]. Biogas from food agriculture and agricultural waste can value agro-ecosystem services: A case study of the Emilia Romagna region was researched by Tamburini [23]. R and D spending on new technologies in livestock: Impact on GHG reduction in developing countries studied by Spada [24].

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Transfer of livestock waste processing technology into organic solid fertilizer in Segobang Village, Licin District, Banyuwangi Regency. Transfer of technology for making organic fertilizer from buffalo livestock waste, it is hoped that farmers and combined farmer groups will be able to be independent in procuring organic fertilizers at a relatively lower cost, in fact it can actually contribute to solving environmental problems for livestock from waste contamination, and contributing to preventing the behavior of throwing waste into rivers. The contribution of the community empowerment program is (1) counseling for breeders to utilize livestock waste into products that have added value. (2) educating breeders about the use of livestock waste as fertilizer for food crops, plantation crops. (3) providing training on livestock waste processing technology into solid organic fertilizer. It is hoped that after the technical guidance on processing livestock waste into organic fertilizer is carried out, the Segobang Village community's agriculture will develop towards organic farming, opening new jobs for breeders. improve the environment and environmentally friendly agricultural products, reduce pollution of the river environment, the environment around livestock, reduce the cost of agricultural inputs for food crops, plantations, horticulture.

2. Method

The location of the community service was carried out at the Gapoktan of Segobang Village, Licin sub-district, Banyuwangi Regency, East Java. The activity was carried out on November 23 2020 - January 25 2021. The target of the community service activity was cattle and buffalo breeders in Segobang Village, Licin District, Banyuwangi Regency.

The community service program approach is solving the problem of Gapoktan Rukun Tani through facilitation and counseling on understanding environmental hygiene from livestock waste, how to use livestock manure, programs to increase the added value of livestock waste, insight into the urgency of organic fertilizer in environmentally friendly agriculture.

The scope of community service activities is a demonstration of the manufacture/processing of livestock waste. The community service method is carried out with several stages of activity, namely:

(a) Problem solving activities. The initial step is to collect farmer data, the amount of waste produced, breeder institutions, the level of environmental awareness, the level of productivity of agricultural land.

(b). Joint discussion with cattle and buffalo breeders in Segobang Village, Licin District, Banyuwangi Regency. The programs presented included solid livestock waste processing techniques, farmer institutional development, and pioneering village livestock waste processing units.

(c). Extension activities which are non-formal educational activities that begin with the introduction of the situation and conditions of breeders. Educational activities to strengthen the capacity of breeders initiated the establishment of additional livestock business units, namely the business of processing cattle and buffalo waste owned by the Association of Farmer Groups in Segobang Village, Licin District. The waste processing business is managed by group administrators and employs farm laborers.

(d) meeting of opinions on the establishment of an institutional unit for processing livestock waste. The activity involved Gapoktan officials, breeder representatives, livestock processing workers who discussed the duties and roles of the new unit for processing livestock waste into organic fertilizer.

(e) activities to evaluate the success of the livestock waste treatment program. Assessed based on indicators of knowledge and insight and skills including environmental cleanliness, benefits and purposes of livestock waste processing, stages and processes of solid organic fertilizer production, technical mastery of organic fertilizer manufacture according to SOP, establishment of solid organic fertilizer production business units.

The activity instruments used in the activity are technical counseling material for the manufacture of solid organic fertilizer, material for institutional strengthening of farmer groups, breeders who are members of the Rukun Tani Gapoktan, equipment and supporting materials for the manufacture of solid organic fertilizer.

Stakeholder involvement, namely parties that contribute roles in community service activities, namely Polije students, Polije Postgraduate Supervisor team, Gapoktan Rukun Tan, groups of cattle and buffalo breeders, consumers or farmers who use solid organic fertilizer, Village government Farmer groups can take organic fertilizer which is processed by Gapoktan Rukun Tani as organic fertilizer for the plants while the Department of Agriculture and Food of Banyuwangi Regency as the counseling officer.

3. Results and Discussion

Community empowerment activities for processing cattle and buffalo waste owned by breeders who are members of Gapoktan, are carried out in stages. Here's an explanation.

Stages of Implementation of the Community Service Program

The implementation of the activity begins with submitting an application letter for the willingness of the location of the community empowerment program. Furthermore, the introduction and adaptation to the conditions in Gapoktan Rukun Tani, Segobang Village, Licin District, as well as digging up information and observing livestock waste handling activities. Followed by identification of the problems that exist in the Gapoktan Rukun Tani Segobang Village. The meeting between breeders, administrators and the community service team obtained a main problem of Gapoktan which was agreed to be solved. Based on the priority of these problems, Polije postgraduate students and community empowerment practice program supervisors develop stages or flow of problem solving, schedule activities, extension technology materials, prepare the tools and equipment needed.

Identification of Problem Priorities

The large number of breeders in Segobang Village, Licin District, resulted in livestock manure accumulating and contamination of the water flow, because some breeders disposed of their livestock waste into the river. With a large number of livestock, of course this can produce a lot of livestock waste, therefore the waste needs to be processed so that it does not pollute and damage the environment. Utilization of manure as organic fertilizer is a substitute for chemical fertilizers which is scarce at this time due to reduced fertilizer subsidies from the government. Farmers were initially not interested in processing livestock waste into organic fertilizer which was considered complicated. However, after facilitation and counseling, breeders are interested in utilizing the surplus livestock waste for the purpose of fertilizing their rice fields, their garden land.

Some farmers have started using organic fertilizers for rice and garden crops. The fertilizer needs of Segobang Village farmers have been facilitated by the Gapoktan Rukun Tani institution. Farmer institutions are very appropriate as livestock waste managers then distribute their livestock manure production to food crop farmers and plantation farmers. The availability of cheap organic fertilizers is very helpful for farmers who need organic fertilizers, besides that the availability of organic fertilizers is an alternative fertilizer substitute for conventional/semi-conventional farmers who are unable to afford the price of chemical fertilizers. The role of Gapoktan was reinvented, which originally only provided livestock manure to breeders in the surrounding environment who needed it, to become an active player in waste processing, making organic fertilizer and providing organic fertilizer for food crop farmers, plantations that need fertilizer.

Alternative Problem Solving

The source of the problem is the disposal of livestock waste polluting the environment and the scarcity of subsidized fertilizers, which is caused by a reduction in the amount of subsidized chemical fertilizers. If there is a supply of fertilizer sold in a shop, but farmers cannot afford it because the price of fertilizer has increased. Therefore, counseling is needed to make human resources aware of farmers to take advantage of surplus livestock waste to be processed into organic fertilizer. The goal is to reduce dependence on chemical fertilizers, reduce the cost of purchasing fertilizers. In addition, Gapoktan can increase income and increase the agricultural production of farmers. Solving problems with agricultural input factors, encourages the growth of new waste processing business units, as well as environmental improvement factors.

Infrastructure Requirements And Costs

The location of the stables and the manufacture of organic fertilizers is on the land of the Segobang Village Government which has collaborated with the Gapoktan Rukun Tani, with a cage area of 8 x 30 meters and with a holding capacity of 8-10 cows or buffaloes. The storage capacity of the fermented product is around 5 tons. One cow can produce an average of 10-25 kg of manure per day, so that every week the mixing and fermentation process of the manure can be carried out. The following are prices and materials needed in the processing of cattle and buffalo waste. Details of the costs incurred by waste processing breeders, in each production of organic fertilizer per 1,000 kg.

Table 1. The need for solid organic fertilizer production per 1,000 kg

No	Name of Goods	Amount of Goods	Unit	Price (Rp)	Total (Rp)
1	Gunny sack	20	piece	4000	80.000
2	Livestock Manure	700	Kg	-	-
3	Husk	100	/Kg	200	20.000
4	bran	50	Kg	1000	0.000
5	soil chips 1	1	Kg	50.000	50.000
6	Dolomite	50	Tablet	400	20.000
7	Cocopeat	1000	Kg	500	50.000
8	Drops/sugar	1	Liter	10.000	10.000
9	Water	enough			
			Sum		280.000

Organic Fertilizer Production Activities

The strategy for managing livestock waste/manure at Gapoktan Rukun Tani is carried out to increase the added value of livestock waste/manure into organic fertilizer so that it is hoped that it can increase local revenue (PAD) for farmers in Segobang Village, Licin District. The manufacture of organic fertilizer is shown in Figure 1. The figure describes the tools used for the manufacture of solid organic fertilizers, including: (1) gunny sack equipment as a final storage area, mortar/shovel, hoe, (2) cow or buffalo manure, husks, cocopeat, bran, chip soil, dolomite, molasses, water.

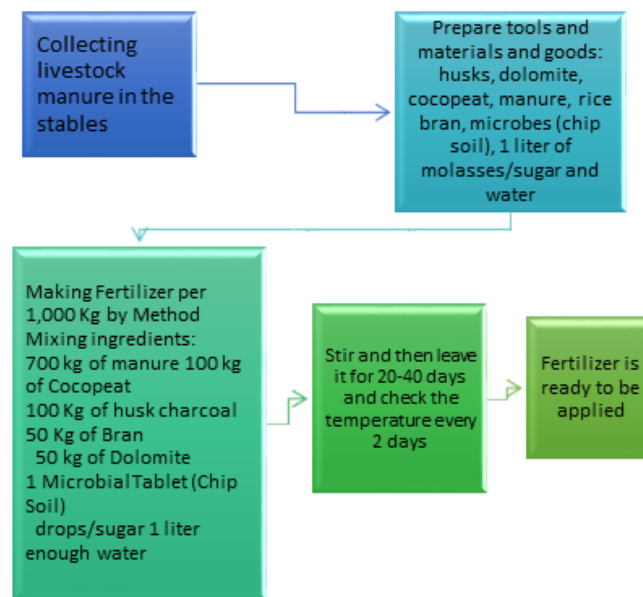


Fig. 1. Process Flow for Processing Livestock Waste into Solid Organic Fertilizer

The production process for the formation of Gapoktan Rukun Tani Organic Fertilizer is as follows:

1. Huts / stables managed by Gapoktan Rukun Tani, there are 2 cows and 8 buffaloes, producing \pm 200 kg every day
2. Every day the livestock manure is sprinkled with dolomite
3. The tools are well prepared
4. After 5 – 7 days mixing is held in the process of making organic fertilizer
5. The results of the process of making organic fertilizer are left for 20-40 days, temperature checks are held every 2 days
6. After 20-40 days the fertilizer is ready to use

Discussion

Waste processing farmers gain knowledge and skills on how to make organic fertilizer. According to the results of the post-test questionnaire for breeders who took part in making organic fertilizer, 74% of farmers were able to make and interested in making organic fertilizer. The more breeders who gain knowledge and skills, the more widely spread about how to make organic fertilizer in Segobang Village. Breeders are able to make organic fertilizer independently. Thus, with livestock waste processing activities, it can solve river environmental problems, high awareness of protecting the environment. The activity of disposing of livestock waste into rivers is decreasing because livestock waste is collected and needed to be processed into organic fertilizer. Every week the management of the Gapoktan waste treatment unit mixes and ferments the manure. After routine livestock waste processing production activities are mixed and fermented every week, Gapoktan is able to produce solid organic fertilizer every two weeks. The impact is that farmers can buy organic fertilizer in an easy and cheap way.

Gapoktan Rukun Tani livestock waste is processed into organic fertilizer by the Gapoktan management as shown in Figure 2. The figure shows that organic fertilizer can be produced approximately 2 tons/week. Organic fertilizers that are ready to be used are packed in plastic bags. Part of the production of organic fertilizers is used for self-organizing fertilizer purposes and some is sold to farming communities in need. Gapoktan will partner with farmers who will need organic fertilizer with a harvest payment system or can be paid with the harvest.



Fig. 2. The location of the cage and the manufacture of solid organic fertilizer

Utilizing livestock manure as organic fertilizer can reduce the negative environmental impacts in Segobang village and increase the income of Gapoktan and existing farmer groups. As subsidized chemical fertilizers from the government decrease, Gapoktan can use organic fertilizers that have been made. So that it can cut costs incurred by farmers for their crops. The farmer group has learned a lot and tried to make organic fertilizer from animal husbandry products so that it can be practiced by group members.

As was done by the Miranti farmer group which was carried out on the land of Mr. Samsul Hadi who happened to have 3 buffaloes, shown in Figure 3. The figure shows that the land / stables are close to the rice fields, so when the organic fertilizer is ready to be used, the application is easier. Likewise with the Manggis Sari farmer group which was applied to Jidin's brother's land, which has 2 cows. With the help of Gapoktan Rukun Tani in making huts/enclosures so that they can produce 1 ton per month. Steps for making organic fertilizer from the use of livestock waste can be widely disseminated if it is supported by awareness, willingness, institutional readiness of farmers to actively participate in making organic fertilizer and has succeeded in proving to the wider community that the use of organic fertilizer from livestock waste can be obtained easily, at a lower price, and reduce dependence on the use of chemical fertilizers whose prices are not affordable.



Fig. 3. Counseling waste treatment into solid organic fertilizer in farmers gapoktan farmers and adopted the manufacture of organic fertilizer by the Miranti and Mangosteen Sari group

4. Conclusion

GAPOKTAN can take part in counseling activities and be able to make organic fertilizer from cattle and buffalo waste. Institutional GAPOKTAN Rukun Tani, which specifically plays a role in processing livestock waste into organic fertilizer, is carried out by farmer group administrators and farm workers. Organic fertilizers that have been produced can be implemented in paddy fields and gardens belonging to group members and the wider community. Users of solid organic fertilizers include organic farmers, conventional farmers and semi-organic farmers. The purpose of using solid organic fertilizers is to reduce the cost of fertilizer inputs. GAPOKTAN will partner with farmers who will need solid organic fertilizer with a harvest payment system. The pay-for-harvest system has encouraged farmers to use and purchase solid organic fertilizers for the reasons that they are easy and cheap. Utilization of livestock

manure as organic fertilizer can reduce the negative impact on the environment around livestock and the river environment.

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Author Contribution

The community empowerment program is facilitation and counseling for farmers, breeders who are members of the Rukun Tani Gapoktan with livestock waste processing materials, the process of making solid organic fertilizer, the urgency of using organic fertilizers, reducing the use of chemical fertilizers.

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Conflict of Interest

The authors declare no conflict of interest.

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