

Training on the utilization of banana pseudostems for manufacturing liquid organic fertilizer

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ABSTRACT

Tanjung Durian Pasar Baru village, Bayang subdistrict, Pesisir Selatan district is one of the location for the Students Community Service - Community Empowerment Learning Ekasakti University in 2019. This location is an agricultural area, one of the commodities is the banana plant. The habits of the farmers during this time, banana stems have been cut down are left to rot in the banana groves (waste). Even though banana stem can be used, one of which is for liquid organic fertilizer. Therefore this community service aims to; (1) to increase the farmer's motivation to make liquid organic fertilizer from the fake banana stem, (2) to improve the farmer's knowledge and skills about liquid organic fertilizer from the fake banana stem, and (3) to encourage the farmers to use liquid organic fertilizer from the fake banana stem, to reduce the use of inorganic fertilizer. In order to achieve this objective, the method used is counselling, practice, monitoring and evaluation. The results achieved show that community service activities are going well, and the community is eager to participate in the training and has a high desire to continue making POC, as seen from the activities of making POC which are carried out again by farmers. Farmers' knowledge increased about the understanding, advantages, disadvantages, benefits of POC and dexterity in making and using POC from fake banana stalks above 70%. The community implements the use of POC on peppers and tomatoes, thereby minimizing the use of inorganic fertilizers. In addition, POC can be marketed, thereby increasing farmers' income.



KEYWORDS

Waste
Banana stem
Liquid organic fertilizer



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1. Introduction

One of the 17 Nagari villages in Bayang Sub-district, Pesisir Selatan Regency, is Tanjung Durian Pasar Baru village, with an area of 3.03 km². The distance taken from the Bayang District government centre to Tanjung Durian Pasar Baru village is approximately 3 km, while the distance to Painan City is about 15 km. In general, the condition of Tanjung Durian Pasar Baru village is a lowland, dry and rainy climate that is balanced, so it affects the cropping pattern. Agricultural products in this village include rice fields, peppers, cucumbers, tomatoes and bananas. In order to produce satisfactory crops, farmers in this village provide fertilizer. Angelo states that fertilizer is a material needed by plants for growth and development, containing one or more nutrients [1]. The fertilizers given in general are; (a) inorganic fertilizers, (b) organic fertilizers (only a small number of farmers use them). Popular farmers currently use inorganic fertilizers and farmers in Tanjung Durian Pasar Baru village. However, if the application of inorganic fertilizers is not in accordance with the rules, it can cause a decrease in soil quality. If it is not addressed, it will cause damage to the physical, chemical and biological quality of the soil [2]. The remnants of inorganic fertilizers left in the soil, when exposed to water, will bind to the soil like cement. After drying, the soil will stick together and become hard. To overcome those problems, organic fertilizers are used. Chen et al. stated that organic fertilizers could improve the soil structure, which was originally solid to

lose, making it easier to cultivate the soil [3]. One of the organic fertilizers that can be used is POC. Liquid organic fertilizer is a solution made from the decomposition of organic materials derived from plant waste, animal and human waste with more than one nutrient element [4]. The advantage of POC is that it can overcome nutrient deficiency quickly, it does not matter with nutrient leaching, it can provide nutrients quickly when compared to inorganic liquid fertilizers. The frequently used Liquid organic fertilizer generally does not damage the soil and plants [5]. One of the POCs comes from the banana plant stem. The farmers in Tanjung Durian Pasar Baru village stems decompose in clumps. This can damage the landscape and pollute the environment. However, banana stems can be used as POC. There are two kinds of banana stems, namely: (a) real stems (bumps) and (b) pseudostems (false stems). The hump at the base of the pseudo-stem and position below the soil surface has many buds (potential tillers) and areas for root growth. The pseudostem consists of leaf sheaths that cover each other, grow straight and stocky and are positioned above the ground [6]. Banana stems contain elements of N, P, and K [7], mostly water and fibre (cellulose), mineral materials potassium, calcium, phosphorus, iron [8]. Furthermore, POC banana stems contain elements of N 238.04 ppm, C-organic 7.59 ppm, P 63.88 ppm, K 88.21 ppm, pH 3.45 [9]. Community service activities in manufacturing POC are to support the cultivation of food crops, and horticulture has been carried out in various places, including Liquid Organic Fertilizer from Vegetable Waste and Animal Manure for lunar orchid plants in Jegu Village, Penebel, Tabanan [10]; Development and Utilization of Plant Extract Organic Fertilizers in Organic Agricultural Cultivation in South Lampung given to vegetable farming [11]. Making POC from Banana stems applied to lowland rice in Mulyajaya Village, Telukjambe Timur District, Karawang [12]; and Utilization of Agricultural Waste (including banana stems) as Liquid Organic Fertilizer (POC) which is practised on lowland rice and chilli in Dutohe Barat Village, Kabila District, Bone Bolango Regency [13]; furthermore, the Making of Vegetable Waste POC is utilized for rice production in Lapang Village, Johan Pahlawan District, West Aceh Regency [14].

The Community Service Team from the Faculty of Agriculture, Ekasakti University has held "Training on the Utilization of Banana Pseudostems for Making Liquid Organic Fertilizer in Pesisir Selatan Regency". This service benefits farmers can make POC independently by utilizing banana pseudostem waste. From the results of observations and interviews with the village head, Mrs PKK and the people of Tanjung Durian Pasar Baru village, Bayang District, Pesisir Selatan Regency, farmers are generally still complaining about the low income of farmers due to the lack of productivity and inefficient use of natural resources around them. The problems identified by the farmers were: (1) The lack of using banana stems for POC, despite the potential of banana stems in their yards and fields. If the pseudo banana stem is processed, it can be used as a source of fertilizer for plants, (2) Human resources are still low, especially for processing banana pseudostem into POC, insight and knowledge in operating the technology requires training, and (3) The price of inorganic fertilizer is high. The price of non-subsidized urea fertilizer reaches Rp. 367,500, - / 50 kg. Meanwhile, subsidized urea fertilizer is difficult to obtain during COVID-19. Farmers who are involved in farmer groups can get subsidized fertilizer, but the amount is limited, namely one sack (50 kg), whereas farmers need urea fertilizer of 100 - 200 kg/ha. In addition, the continuous use of inorganic fertilizers can result in inefficient fertilization, damage to soil structure, poor soil microbiology and imbalance of nutrients in the soil. The use of liquid fertilizer can anticipate the imbalance of soil nutrients so that plants get sufficient and balanced nutrients. The purpose of this service is to: (1) increase the motivation of farmers to make POC from banana stems, (2) increase farmers' knowledge and skills about POC from banana stems, and (3) encourage farmers to use POC from banana stems to reduce fertilizer use in the inorganic.

2. Method

The service is carried out to the community in Tanjung Durian Pasar Baru village, Bayang District, Pesisir Selatan Regency. This service was held on 26 August 2019 (Counseling and Application) and Monitoring on 9 and 23 September 2019. This service activity involved 20 KKN-PPM students from the

Faculty of Engineering, Agriculture, Economics, Social politics and Law, Ekasakti University. Methods of training for community service activities by means of counselling, implementation, monitoring and assessment. Prior to the implementation of the outreach activities, coordination was carried out with the village head of Tanjung Durian Pasar Baru to discuss the implementation process, and a service activity banner was made.

2.1. Counselling

Counselling is carried out in the form of lectures (presentations) and discussions to explain to all the target partners about various things that will be applied, including: (1) the manufacture and application of POC from banana pseudostems, and (2) knowledge about the meaning, advantages, disadvantages, and benefits of POC and explain how to make POC from banana pseudostem. The speaker was from a lecturer at the Faculty of Agriculture, Ekasakti University, Padang, who was assisted by the KKN-PPM student in that village.

2.2. Application

First, prepare the materials and tools used. Ingredients used: 1 kg of the pseudo banana stem (white inside), 200 g of sugar, three tablespoons of EM4, 3 litres of groundwater, a bucket with a lid and an old sack. The equipment used were: hoe, machete, 1000 ml measuring cup, porcelain cup, 1000 ml beaker glass, bucket and stirrer. How to make: (1) Chop the pseudo banana stems into small pieces, then put them in an old sack; (2) Mix water with EM4 in a bucket until well blended. Put the sack containing the chopped banana pseudostem into it (until the sack sinks). Close the bucket tightly and put it in a shady place (not exposed to direct sunlight); (3) 7-10 days, POC is ready to use, marked by the smell of tape. Remember to open the bucket once a day (to release gas) while stirring it, then close the bucket again; (4) Lift the sack containing the chopped banana pseudostem, water in a bucket (POC). The former chopped banana pseudostem can be made into compost; (5) The use of this banana stem POC solution is 1:15 (one-part POC is dissolved with 15 parts groundwater); (6) Use banana stem POC 2 times a week (spray on plants).

2.3. Monitoring

Monitoring is carried out periodically (1 x 2 weeks) 2 times. Discussions and consultations during monitoring were held to find solutions to problems faced both in terms of technical production and application of POC banana pseudostems. The implementing team monitors KKN-PPM students who are accompanied by a team from the Ekasakti University Research and Community Service Institute.

2.4. Assessment

At the beginning and the end of the activity, an assessment will be carried out. Furthermore, a final report is prepared as accountability for the activities that have been carried out.

3. Results and Discussion

At the counselling activity stage, the event was guided by representatives of KKN-PPM students (Figure 1 a). Then the event was opened by the village head secretary (Figure 1b), then a speech from the head of community service (Figure 1c). The number of partners who came was 28 people, consisting of community leaders and farmers. Then there was an enlightenment event on the use of banana pseudostems for POC, which the Community Service Team delivered. After the explanation of the topics related to the activity, there was a discussion and implementation of making POC from banana pseudostems. The implementation activity of the use of banana pseudostems for POC was carried out according to the method described earlier. To speed up the fermentation process of banana pseudostem, EM4 was added. The advantage of EM4 is the ability to accelerate the occurrence of organic fertilizer, and its quality is better. According to Hardi that EM4 is a mixture of beneficial microorganisms [15].



Fig. 1. Counselling event guided by KKN-PPM students (a), the event was opened by the village head secretary (b) and the counselling event by the community service team (c)

The number of fermenting microorganisms in EM4 ranges from 80 species. These microorganisms are selected which can work effectively in fermenting organic matter. There are five main groups among many microorganisms: photosynthetic bacteria, *Lactobacillus* sp., *Streptomyces* sp., yeast (yeast), and Actinomycetes. For more details about the implementation of making POC from bananas, pseudostems can be seen in [Figure 2](#).



Fig. 2. The activity of making POC from banana pseudostem, 1 kg of banana pseudostem is chopped (a), put in a sack (b), mix water with EM4 in a bucket until well mixed (c) and put a sack containing chopped banana pseudostem into it, until the sack sinks, close the bucket tightly. 7-10 days POC is ready to be used for plants (e).

As explained in the method, 1 part of POC is dissolved in 15 parts of groundwater and sprayed on plants. From the monitoring results, farmers gave POC from banana pseudostems to pepper and tomato plants (Figure 3 a). Liquid organic fertilizer is provided by using ready-to-use POC, namely POC provided by the community service team. It was symbolically handed over to the participants, represented by the village head of Tanjung Durian Pasar Baru (Figure 3 b). It can be seen that the growth of the plants given POC banana pseudostems was good. This is because plant growth will obtain better results if the concentration of fertilization is in accordance with plant needs and will have an impact on the absorption of macroelements needed for plant growth and production. In addition, Patnaik et al. described that liquid organic fertilizer passing through the leaves provides better plant growth and yield than through the soil; the higher the concentration or dose of fertilizer given, the higher the absorption of nutrients received by plants, as well as the frequency applied in the foliar fertilizers on plants, the absorption of nutrients will also be higher [16]. However, giving excessive doses will actually cause symptoms of wilting in plants. Furthermore, Schlüter stated that the application of organic fertilizer into the soil could improve soil structure. As a result, the soil is looser, so the root system develops better, and the nutrient uptake process is more optimal [17].



Fig. 3. POC from banana stems given to tomato plants (a), the KKN-PPM Team handed POC from pseudo banana stems to Mr Edison, the village head of Tanjung Durian Pasar Baru (b)

In the final stage of community service activities, an evaluation (assessment) is carried out on the participants (Table 1). In Table 1, it can be seen that before the community service activities were carried out, the training participants knew about 21.42% of organic fertilizers; have attended training on making POC, understood the meaning of POC and the shortcomings of each POC, and the participants also know the materials and tools needed to make POC banana pseudostems about 28.57%. Meanwhile, participants have bought about 50% of POC. Only 21.42% of the participants knew how to make POC from banana pseudostems. Thus, the partners really need training in making POC from banana stems. This community service activity received a good response from farmers. The most prominent thing can be seen from the desire to make POC from banana pseudostems and apply it to the plants they cultivate, with an increase of about 82%. The average increase of partner knowledge about the meaning, advantages, disadvantages, benefits of POC and skill in making and using POC from the banana pseudostem is above 70%. Farmers give the POC to peppers and tomato plants, and of course, it will reduce the use of chemical fertilizers (inorganic). Community service can increase participants' knowledge and skills about POC from banana pseudostems ranging from 71.43% - 82.15%. The increase obtained varies; this condition is in accordance with the seriousness of the participants in participating in the service event and participants' knowledge. According to Singh et al., the lack of public knowledge about waste management becomes something useful and needs continuous socialization [18]. Thus, if banana waste is used for new products, such as banana weevil for the manufacture of Local Micro-Organisms (MOL) and chips, pseudo banana stems are used as chips, and organic fertilizer and banana peels are made into organic fertilizer, it will increase the added value of the waste. As a result, it will increase the selling value of the useless waste, become profitable and increase the farmer's income so that farmers' lives could be better.

Table 1. The questionnaire summarize before and after the activity

Questionnaire	Response (%)		
	Before	After	Enhancement
Knowledge of organic fertilizers	21,42	100	78,58
POC making training	28,57	100	71,43
Definition of POC	28,57	100	71,43
Advantages of POC	25,00	100	75,00
Lack of POC	28,57	100	71,43
POC Benefits	21,42	100	78,58
Ever bought POC	46,42	100	53,58
Materials and tools needed to make POC from pseudo banana stems	28,57	100	71,43
How to make POC from banana pseudostem	21,42	100	78,58
Partners make POC from banana pseudostems back at home	17,85	100	82,15
Partners use POC from banana pseudo stems on plants	17,85	100	82,15

4. Conclusion

The community service activities went very well. The community was eager to participate in the training and had a high desire to continue making POC, as seen from making POC activities carried out again by farmers. Farmers' knowledge increased about the understanding, advantages, disadvantages, benefits of POC and agility in making and using POC from banana pseudostems above 70%. The community implements the use of POC on peppers and tomato plants, thus reducing the use of inorganic fertilizers. In addition, POC can be marketed so that it can increase farmers' income.

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