

APPLICATION OF SOLID ORGANIC FERTILIZER TECHNOLOGY FROM COFFEE WASTE

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ABSTRACT

This study reveals the problems faced by the Harapan Group in the field of agricultural production, namely the availability of organic fertilizer processing technology from coffee waste. So far, farmers have only relied on chemical fertilizer technology (inorganic), becoming a basic need and determining factor for the production and productivity of the plantation sector. The methods used to solve this problem are Observation, technology design, Evaluation, Assistance, Participation. Based on the results of the application of solid organic fertilizer manufacturing technology, it can be explained that the technology of solid organic fertilizer (POP) from coffee waste. The potential of coffee waste greatly supports the production (yield) of plantation crops. This POP coffee waste technology package as an alternative to chemical fertilizers realizes sustainable agriculture with various components of local resources, especially coffee waste and other agricultural waste that can provide added value for the Harapan Farmer Group. Expertise on this technology is very well mastered by the activity assistants.

KEYWORDS: Solid Organic Fertilizer, Mentoring, Robusta Coffee Waste

1. INTRODUCTION

Harapan Rempek Darrussalam Farmers Group, Gangga District, North Lombok Regency is a farmer/planter group that cultivates various types of plantation crops with robusta coffee (*Coffee canephora*) as a superior commodity, and processes coffee into coffee powder with various flavors. Harapan Group is included in the priority area of Kosavabangsa in the category of underdeveloped areas and extreme poverty priority areas. The program scale is an area located in North Lombok Regency, Most of the people work as plantation farmers (planters) who are indicated to have a low level of welfare so that they need priority assistance in the field of coffee commodity production and post-harvest processing to produce coffee processing businesses. Based on the survey results, farmers' income is still below the Lombok UMR.

Based on the situation analysis above, it is necessary to provide assistance with the following innovation technology: first, the application of solid organic fertilizer (POP) technology from coffee waste. (Nashruddin, et al (2022); Sukanteri, et al (2019); Sukanteri, et al (2020); Sukanteri, et al (2023); Yuniti, et al (2023); Afrizon, (2015)). second, online marketing training (digital marketing); and third, group administration and financial management (accounting) training.

The technology and innovation that will be applied to target partners are in line with the RPJMD KLU and RPJMD Des Rempek Darussalam Village, namely village development involving active participation and empowerment of community members aimed at improving the quality of life, community welfare, eradicating poverty and increasing plantation production in the North Lombok area. Therefore, a collaboration was carried out between the Rempek Darussalam Village Government and the Kosambabangsa team of Gunung Rinjani University (UGR) - Mahasaraswati University Denpasar (UNMAS) to provide assistance to two target partners, namely the Harapan Group and Mentari Darussalam and responsible production, partnerships to achieve goals.

The priority problem faced by the Harapan Farmers Group in the agricultural production sector is the availability of organic fertilizer processing technology from coffee waste. So far, farmers have only relied on chemical fertilizer technology (inorganic), which is a basic need and determining factor for production and productivity in the plantation sector. The government's policy of limiting chemical fertilizer subsidies (inorganic) can reduce the quantity of crop production, resulting in a decrease in farmers' income. Although non-subsidized chemical fertilizers are available, farmers' purchasing power is very limited so that productivity decreases which can threaten farmers' welfare. Another problem faced by the Harapan Farmers Group is the administrative and financial management of the farmer group. The weak managerial ability of the group has resulted in the slow development of the Harapan Farmers Group, this is also triggered by the relatively low level of education. Production technology and farmer group management are the focus of activities agreed upon by the Kosabangsa team and target partners (Yuesti and Sumantra (2017); Yuesti and Kepramareni (2019)).

SOLID ORGANIC FERTILIZER TECHNOLOGY

Fertilizer technology is a basic production factor in determining the productivity and efficiency of agricultural production, the use of chemical fertilizers and pesticides has damaged the quality of the soil and environment so that alternative solutions need to be sought in the form of compost from agricultural waste. The use of agricultural waste has economic added value, is beneficial for environmental sustainability, and health if processed appropriately by involving community groups as target partners. Composting technology through the use of agricultural biotechnology as an effort to reduce agricultural input costs, namely by fermenting agricultural waste. The provision of organic fertilizer obtained through composting coffee waste has been proven to increase plant growth rates and increase production, its macro elements are equivalent to 46% N in Urea fertilizer and P, K, Cl by 60% in SP-36 and KCl fertilizers, the C/N ratio value is between 9.75 - 15.99 [4,5]. Increasing community knowledge, especially farmer groups, can be done through various empowerment activities, the transfer of knowledge adds insight and skills to manage resources for economic welfare; managerial skills in community groups can increase profits (Nasrudin, et al (2022); Sukanteri, et al (2019); Sukanteri, et al (2020); Sukanteri, et al (2023); Yuniti, et al (2023); Afrizon, (2015)).

2. METHOD

The program implementation procedure includes several stages, including:

1. Observation and coordination to target partners, village governments, and cooperation partners discuss and make joint agreements that are stated in the form of activity cooperation contracts. Activity approaches (Intensive Communication, Knowledge Transfer, Technology Transfer (TT), Science and Technology Diffusion, and Entrepreneurship Capacity Building.
2. Design of solid organic fertilizer technology coffee waste: *Technology Transfer*: At this stage the Kosabangsa team designs and builds the technology system POP coffee waste consisting offrom the technology of a local multifunctional grinding and flouring machine plus a 7PK engine and decomposer which is used to produce solid organic fertilizer from coffee waste and other agricultural waste.
3. Coffee waste POP manufacturing practice: 1) Knowledge Transfer: This stage is carried out by socialization and training to target partners (Poktan Harapan) on how to use technology and coffee waste POP manufacturing practices; 2) Group management and online marketing training.
4. *Mentoring, evaluation, sustainability*: This stage is carried out by mentoring on site and online, evaluating the achievement of indicators at each stage, then making conclusions and agreeing on follow-up or program continuation. Mentoring and evaluation are guided by a checklist and pre-test and post-test instruments.

Partner Participation in Program Implementation

The participation of the Harapan Farmers Group partners in implementing this program is: preparing equipment and solid organic fertilizer raw materials, determining the location of POP demonstration plots, providing a place for socialization and training, and actively participating in participating in technical guidance activities for the use of technology. solid organic fertilizer Coffee Waste, In addition, partners also participate in providing coffee waste materials and other agricultural waste as basic materials for making solid organic fertilizer. This kosabangsa activity is carried out using the Participatory Action Programs approach method where members of the target partner group apply technology directly to the object of the activity of making solid organic fertilizer from coffee waste.

Program Evaluation and Sustainability

Program evaluation is carried out in stages at the end of each implementation stage according to the achievement indicator table for each activity. Internal and external monitoring of the entire series of activities from preparation, implementation to the final report stage. Internal monitoring will be carried out by the mentoring

team and LPPM UNMAS Denpasar online and offline. Monitoring techniques are carried out by visiting partners periodically and on a scheduled basis to ensure that the activity program is in accordance with the achievement indicators or targeted outputs. Indirect monitoring through the BIMA system for daily, progress and final reports. Sustainability of the post-activity program, namely planning a follow-up program in accordance with the results of monitoring and evaluation to prepare a development activity plan through a series of grant proposal submissions or funding proposal submissions, procurement of facilities, and training to related agencies for the development of robusta coffee cultivation in Rempek Darussalam Village.

The potential for credit recognition obtained by students is a minimum of 6 credits. Achievement of Higher Education IKU in IKU 2 students have off-campus learning experience "students have off-campus learning experience of at least 6 credits" and IKU 3 lecturers who participate in national competitions that meet the definition of competition criteria "and the achievement of SDGs, namely: decent work and economic growth, industry, innovation, and infrastructure, responsible consumption and production, partnerships to achieve goals. The Rempek Darussalam Village Government participated in the form of location permits and easy access to administration, DUDI cooperation partners "Etnic Lombok Coffee" helped providing facilities, resource persons, and field assistance.

3. RESULTS AND DISCUSSION

Coffee Waste POP Technology

The processing of solid organic fertilizer from Robusta coffee waste has the main function of suppressing coffee waste that can pollute the environment. This processing technology is one of the efforts in recycling waste into organic fertilizer that can be used as input in production, which is environmentally friendly without risk so that it does not cause poisoning to plants or humans who apply the organic fertilizer (Nasrudin, et al (2022); Sukanteri, et al (2019); Sukanteri, et al (2020); Sukanteri, et al (2023); Yuniti, et al (2023); Afrizon, (2015)). Organic fertilizer from coffee waste has N, P, K content to increase coffee production in Rempek Darussalam Village, Gangga District, North Lombok Regency. In addition, the use of waste as fertilizer can reduce the cost of purchasing chemical fertilizers and the return of soil nutrients is more optimal based on materials organic. The expertise in this technology is very well mastered by the activity assistants, this is proven by (1) the implementation of a similar system by the assistant team at the Suka Mandiri Farmers Group, in Megati Village, Tabanan Regency, Bali. (2) HKI from the solid organic fertilizer processing system by the assistant team.

The following is a schematic image and photo of the implementation of the system that will be implemented:

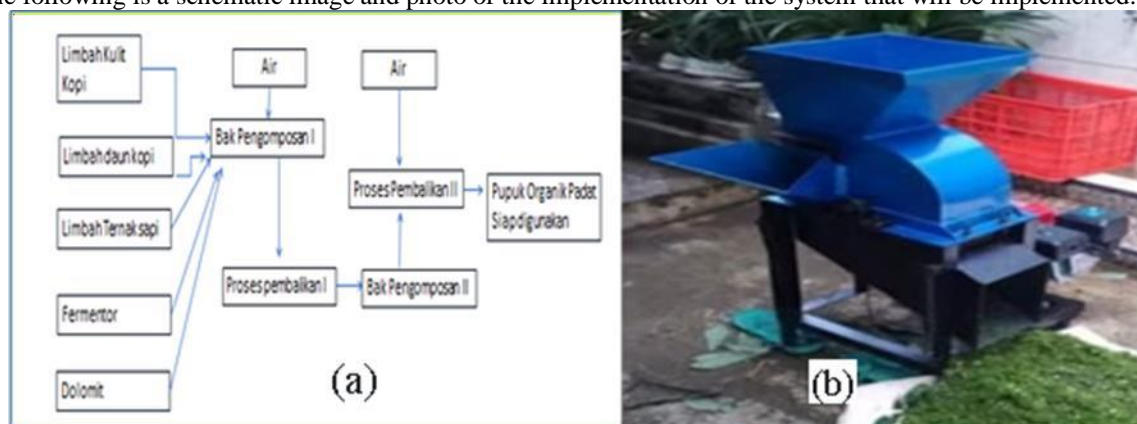


Figure 1 Multifunction Shredder Machine

The making of solid organic fertilizer from coffee waste using local resources aims to enable farmers who are members of the Harapan Farmers Group to have the knowledge and skills to make solid organic fertilizer. The technological tools used are a Local Multifunction Grinding Machine Plus Engine 7PK which functions to chop solid organic fertilizer raw materials such as: coffee skin waste, coffee leaf waste, tree branches, and others which are useful for reducing the size of solid organic fertilizer raw materials. The small size of the raw materials can speed up the fermentation process with the help of local decomposers (microorganisms). The specifications of the machine used are: height 100 cm, length 70 cm and width 60 cm, 4 x 4 cm elbow. 1.2 mm plate, Vanbel type B.38, 1.5 mm sieve weight, 1 sieve, 2 steering wheels, 2 wheels, 2 legs, 3 funnels (the upper funnel is for grains and re-grinding so that the process is easier, the side funnel is for long stems and passes through 2 knives to speed up the process and the lower funnel is where the chopped organic fertilizer raw materials come out), Rpm 1450, 2 blades 7 mm thick and 12 hemermills 5 mm thick.



The making of solid organic fertilizers described in the training activities uses a formulation with a composition consisting of: coffee skins, rice husks, dry leaves, EM4, dolomite and molasses. Each component in the solid organic fertilizer formula has its own function and benefits. Coffee skin waste contains organic materials and nutrients that have the potential to be reused by plants in the form of compost because they contain Nitrogen, Phosphorus and Potassium (Melisa, 2018). Rice husks can loosen the soil because of their nutrient content. Dry leaves function as bioactivators to help the fermentation process in making solid organic fertilizer. EM4 bioactivator is a mixture of cultures of various microbes such as photosynthetic bacteria, lactic acid bacteria, actinomycete yeast and fermentation fungi such as cellulose decomposing fungi and *Trichoderma* sp which can contribute to increasing the types of soil microorganisms made to help in the decomposition of fertilizers so that they can be used in the process of making organic waste processing faster and more efficiently.

The next stage is to provide training on how to make solid organic fertilizer from coffee skin waste to the partners of the Harapan Farmers Group in Rempek Darussalam Village, Gangga District, North Lombok Regency, which was held on Sunday. The person in charge of this stage is the head of the implementation and is assisted by a team of assistants from Mahasaraswati University in collaboration with the village government.



Figure 3 Solid Organic Fertilizer Making Training

Cow dung has a high content of N, P and K as a solid organic fertilizer can supply nutrients needed by the soil and improve soil structure to be better and can increase plant production. Ash from burning wood is a good soil conditioner for soil that is too acidic and rich in calcium, potassium, phosphorus, magnesium, and aluminum. In addition, it also functions to increase the pH of solid organic fertilizer so that it is not too acidic. The stages carried out in the process of making solid organics are (1) making a mixture of water and EM4 with a ratio of 10:0.5:1 which is stirred evenly, (2) waste materials that have been chopped such as coffee skin (50%), rice husks (10%), and dry leaves (10%) are mixed evenly (3) The mixture of agricultural waste materials is sprinkled with the previously prepared EM4 mixture evenly and stirred so that a homogeneous mixture is formed, (4) The mixture of materials is sprinkled with dolomite and stored in a closed and shady place such as a sack or tarpaulin, (5) After one week the mixture of fertilizer materials is turned over and stirred until evenly mixed, (6) Every week the mixture is turned over, if the mixture is very dry it can be sprinkled with water, (7) After 4 weeks the fertilizer produced can be packaged and used.



Figure 4 Stages of Fermentation

In the implementation of the initial fermentation stage, it takes 2-3 weeks, intensive decomposition will occur which produces a fairly high temperature in a relatively short time and organic materials are easily decomposed and converted into other compounds. This stage is also called pre-mature with the result being fresh fertilizer. In the final fermentation stage of around 2-4 weeks is the conversion stage where the main maturation process occurs. At this stage, materials that are difficult to decompose will decompose and decompose to form a complex bond of clay-humus (Achyani et al., 2018; Simanungkalit et al., 2006). The resulting product is mature fertilizer with the following characteristics: odorless, crumbly and non-clumping texture, blackish brown in color, contains nutrients available to plants, and has high water binding capacity (Ubaidillah et al., 2018). The results of the composting of solid organic fertilizer obtained in this community service activity show physical characteristics that are in accordance with the criteria, namely black fertilizer, does not clump, and does not cause an unpleasant odor.

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4. CONCLUSION

Solid organic fertilizer technology from coffee waste. The potential of coffee waste greatly supports the production (harvest) of plantation crops. This solid organic fertilizer technology package from coffee waste as an alternative to chemical fertilizers realizes sustainable agriculture with various components of local resources, especially coffee waste and other agricultural waste that can provide added value for Poktan Harapan. Expertise on this technology is very well mastered by the activity assistants.

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