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Coffee Skin Processing Becoming Organic Fertilizer in Belantih Village, Kintamani District, Bangli

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ABSTRACT

Accelerated fermentation of coffee husk waste with the help of a fermenter and molasses solution for a certain time can produce compost which is an organic fertilizer product that provides added value and economic benefits for the community. Compost fertilizer when applied to soil can retain nutrients and water, increase the life of microorganisms in the soil and improve soil fertility and crop yields. This service in Belantih Village is carried out through training, counseling, mentoring, and technology transfer practices. The purpose of PKM is to obtain a composting technology package and strengthen group business management that is optimal and integrated with available natural resources. In this Community Partnership Program activity, the process of making compost based on coffee husk waste was introduced with simple fermentation technology. The community's response was very good to service activities at the Widya Pertiwi Women's Farmer Group. This can be seen from the enthusiasm of the participants or the number of questions submitted to the extension team regarding composting technology and its benefits for agriculture. The resulting compost can be applied to agricultural soils to improve soil physical properties which overall restore soil fertility. Considering the benefits and potential of coffee husk raw materials are very abundant, the prospect of developing organic compost fertilizer is very good in the future. The results obtained from this community service are in the form of a technology package for making compost organic fertilizer based on coffee skin waste and improving management through optimal group institutional strengthening and integration with available natural resources.

1. INTRODUCTION

1.1. Research Background

Belantih Village is one of 12 villages in the Kintamani District which is located 17 km from the District Capital, the distance to the district capital is 40 km, with an altitude of 1,250 m above sea level (asl). The average daily temperature ranges from 20 °C to moderate rainfall with an average of 18.6 mm/year. It has the following boundaries: to the north, it is bordered by the village of Selulung, to the east by the village of Daup, to the west by the village of Catur, and on the south by the village of Belanga. Belantih Village has 30 km of roads, with details of Provincial roads, 5 km, Regency roads, 6 km, Village roads, 4 km, hamlet/Banjar roads, 15 km long with 8 km asphalted conditions, and the rest is still a dirt road. From 2012 until now, the village head of Perbekel of Belantih Village has been held by I Nengah Wardana. The area of Belantih Village is 965 ha administratively. Belantih Village is divided into 8 (eight) Banjar Dinas/Dusun.

Land use in the Belantih Village Area is now divided into 4.5 ha of residential areas, 530 ha for dryland agriculture and plantations, and 106 ha for livestock and other uses (public facilities, temples, Setra, roads, and fields) covering an area of 326 ha.

The majority of Belantih villagers' livelihoods are engaged in agriculture/plantation. Problems that often arise related to people's livelihoods are limited employment opportunities following the level of population development as stated in the regional development planning of the Bangli Regency. Another thing that needs to be considered in village development is to make efforts to expand job opportunities by strengthening capital and facilitation as capital for business development, especially in the productive economy.

The poverty rate of Belantih Village, which is gradually decreasing to reduce poverty, must continue to look for other opportunities that can support the improvement of the community's economic level. The number of community organizing activities in Belantih Village is a useful village asset to be used as a medium for delivering information in every village

development process to the community. Related to this, in the era of the covid pandemic, until now the development of the agricultural sector is still the foundation of life for most of the Belantih village people. Agricultural and plantation commodities, such as arabica coffee and Kintamani oranges, are the mainstay of their farming. Kintamani coffee has been known internationally because of its distinctive taste with the aroma of spices and has been registered as a geographical indication product as a form of protection and utilization.

Stable price developments are highly expected by coffee farmers to ensure the sustainability of their farming. Coffee farming also produces a large amount of coffee husk waste in coffee processing, but it has not been used optimally to add to the economic value of the coffee product itself. The development of Arabica coffee prices at the Balinese farmer level continues to increase in line with the increase in prices in the international market but has not been in line with the creation of activities that can provide added value [1], [2], [3]. From the coffee processing process in Belantih Village, almost 50% of coffee husk waste is produced. This processing will produce 46-56% of coffee skin waste which can still be used [4]. The skin of the coffee fruit contains 1.27% nitrogen, 0.06% phosphorus, and 2.46% potassium [5]. Coffee husk waste, both produced from wet processing and dry processing has a fairly high nutritional content. Dried coffee rind contains 58-85% carbohydrates, 8-11% protein, 0.5-3% fat, and 3-7% minerals [6]. The coffee rind contains carbohydrates including fermentable sugars, polyphenols such as tannins, lipids, and various microorganisms including fungi that grow on coffee rind waste despite the presence of antimicrobial compounds [7]. The coffee rind has excellent potential as a substrate for value-added compounds [8]. Based on the abundant potential of waste and the high nutritional content of coffee skin waste, this waste has the opportunity to be the main raw material for making organic fertilizers and provide added economic value for coffee farmers in Belantih village, Kintamani Bangli.

Belantih Village has enormous potential, both natural resources, human resources, and institutions/organizations. Until now, the potential of existing resources has not been optimally utilized. One of the prominent natural resources in Belantih village is the agricultural sector. This is due to climatic factors and fertile soil. Coffee and citrus are the main crops cultivated in Belantih village. Generally, this coffee husk waste is distributed directly on the garden land without a fermentation process and is allowed to accumulate to rot so that it can pollute the environment. Opportunities and potential waste from the abundant coffee husks can be processed into organic fertilizers that are useful for improving soil fertility. The process of making organic fertilizer through simple composting techniques can be carried out by partners to packaging that is ready to be marketed so that it can increase group income and welfare while at the same time providing added value for products derived from waste into environmentally friendly products with economic value.

1.2. Research Objective

The purpose of this service is 1) to make the group aware of the added value and economic value of coffee husk waste which is used as environmentally friendly organic fertilizer, and 2) to transfer coffee husk waste composting technology into organic fertilizer to increase the understanding and skills of partner

groups, 3) to strengthen partner groups through business management training.

2. MATERIALS AND METHODS

This community service was carried out at the Widya Pertiwi Farmer Women's Group in Belantih Village, Kintamani District, Bangli Regency, Bali Province, at an altitude of 1250 m above sea level

The Participatory Action and Learning System (PALS) method is used in community service activities in Belantih Village. This method aims to make partner groups objects in service activities through various forms such as education, training, counseling, as well as coaching, and mentoring [9]. The PALS method is carried out in several stages: (1) awareness phase, (2) capacity phase, scaffolding phase, and (3) institutionalization phase [10]. The stages of the PALS method are as follows:

1. Awareness Phase, which is an initial activity that aims to raise awareness among the target audience of Belantih Coffee Farm about the importance of processing waste into organic fertilizer that has economic value while reducing environmental impacts. The method used at this stage is through a personal and institutional approach with discussions and questions and answers so that the target audience gets a complete understanding and awareness of the benefits of waste.
2. The Capacity Phase is the stage involving the active participation of partner groups in managing and developing their organic fertilizer business. At this stage, programs that have been agreed with partners will also be implemented through training, socialization, discussions, questions and answers, transfer of organic fertilizer manufacture, and group strengthening.
3. The mentoring phase (scaffolding) is a mentoring activity to partners during the implementation of the activity program. At this stage, monitoring and evaluation will also be carried out related to the activities that have been carried out. Monitoring will be carried out by the Warmadewa University Community Service Institute. While the evaluation is carried out by comparing the achievement of indicators of success before and after the implementation of the program, analyzing the shortcomings and obstacles during the program implementation process, and finding solutions to existing problems, so that the program implemented is truly effective and maximal and synergized.

3. RESULT AND DISCUSSION

3.1. Transfer of technology for composting based on coffee husk waste

In this activity, it was introduced and practiced how to process coffee husk waste into compost organic fertilizer. The activity was carried out at the partner location of the Widya Pertiwi women's farmer group in Belantih village which was attended by 20 participants from partners of 6 students of the Master of Agricultural Science Postgraduate Program at Warmadewa University. In this counseling, materials for making compost in the form of leaflets were also given. The transfer of technology for making compost organic fertilizer based on coffee husks took place according to plan and participants were able to accept and apply the manufacture of organic compost fertilizer.

The process of organic fertilizer production (Figure 1):

1. Materials used: coffee husk, coffee plant trimming waste, manure, fine bran, dolomite, Effectiveness of Microorganisms (EM4), and molasses. Tools used: scales, measuring cup, bucket, hoe, rake, sprayer, and tarpaulin

2. For composting 100 kg. A total of 60 kg of coffee pods from farmers were spread on a tarpaulin, then added 25 kg of manure, 10 kg of coffee trimming waste that had been chopped into small pieces, sprinkled with 5 kg of fine bran, and 2 kg of dolomite evenly. Then pour a mixture of 100 ml of EM4 and 100 ml of molasses which has been dissolved in 10 liters of water until it reaches a moisture content of 40% (when the fist is clenched it does not release water and when the fist is opened the compost media is not crushed or released) the material is then tightly covered with a tarp.
3. During the composting process, the temperature in the tarpaulin will rise $\pm 50^{\circ}\text{C}$ then the temperature will drop again. Once a week the material in the tarp is turned over and if it is too dry, watering is done. After 2-3 months the compost has matured. The characteristics of cooked compost are odorless, not wet, dark brown, and crumbly texture. After composting is complete, then reduce the size and sieve to get a uniform grain.
4. Compost is ready to be packaged and applied as a planting medium.



Figure 1. The practice of technology transfer for making compost made from coffee husk waste

3.2. Economic and Social Impact

The transfer of technology for making organic fertilizers through a simple composting process has been able to increase the understanding and skills of partners to innovate to turn coffee husk waste into organic fertilizer that is useful for improving soil fertility and crop yields and providing added value for partner groups. Knowledge transfer in the form of group strengthening and coffee business management is also carried out in partners through mentoring, counseling, training, and practice of making organic fertilizers by integrating farmer activities in the Widya Pertiwi Women Farmer Group, Belantih Village, Kintamani District in the process of making organic fertilizer products that are ready to be marketed and utilized by the community. Farmers to increase agricultural production and farmers' income.

The transfer of technology for making organic fertilizers to participants in partner groups was also covered by various print and online media: <https://diaribali.com/olah-limbah-kulit-kopi-jadi-kompos/> and <https://kabaribali.com/agro/pupuk-kompos-berbasis-limbah-kulit-kopi/>. In this training, material in the form of leaflets is also provided. The transfer of organic manufacturing technology can take place according to plan and farmers in partners have been able to accept and apply the technology for making organic fertilizers. In this case, we provide an innovation regarding the utilization of coffee husk waste which can be produced into organic compost. With the transfer of technology, it is hoped that the abundant coffee husk waste in the partners can be processed into organic fertilizer, as well as providing added value in efforts to develop group businesses and increase the

economic income of the Belantih village community. Documentation of the implementation of management service activities for processing coffee skin into organic fertilizer in Belantih Village, Kintamani District is presented in Figures 2 and 3.



Figure 2. Providing education on composting technology and its benefits for agriculture and the environment



Figure 3. Submission of a crop chopper and a photo with the Widya Pertiwi farmer group

3.3. Partner's Contribution to Implementation

The contribution of service partners, in this case, is to prepare places and materials for organic fertilizer for coffee husk waste for training and practice of making organic compost in the Widya Pertiwi Farmer Women's group in Belantih Village, Kintamani District. From the service team, apart from providing training, technology transfer practices, and mentoring, they also contributed to providing leaf and twig chopping machines. With this environmentally friendly tool, it is hoped that farmers can produce organic fertilizer from various agricultural wastes in a sustainable manner which has an impact on increasing farmers' income. Through this community service activity for making organic fertilizers, farmer groups are increasingly motivated and enthusiastic about increasing the natural resources around them to provide added value and increase farmers' income.

3.4. Inhibiting and Supporting Factors

In technology transfer, it takes time and conditions of farming practice habits that encourage changes in farmer behavior. Through continuous assistance by the service team, it is hoped that changes will occur for the better which in the end they can apply technology transfer in an effort to increase farmers' income.

The Widya Pertiwi Women's Farmer's Group in Belantih Village is a group that is open to change as long as it is for the progress of their group. This can be seen from the positive response during this PKM activity. The potential factor of natural resources is coffee husk waste produced from coffee processing

businesses and their agricultural land which is ready to improve soil fertility through the application of organic fertilizer.

3.5. Solution and follow-up

In this community service activity, the process of producing/making organic fertilizer with simple fermentation technology is introduced and practiced, and the importance of this organic fertilizer to improve nutrient-poor soil. The response of farmers during the extension, they were very enthusiastic. The solutions offered to partners according to the problems faced by partners as described above are carried out through various programs and the benefits obtained, namely: 1) Awareness of the group about the added value and economic value of coffee husk waste which is used as environmentally friendly organic fertilizer so that group awareness will environmentally friendly organic fertilizer products with increased economic value; 2) Transfer of technology for composting coffee husk waste into organic fertilizer to increase understanding and skills so that partners are able to produce compost organic fertilizer in the form of packaging; 3) Strengthening partner groups through business management training so that partners are able to manage organic fertilizer businesses in the group. Community service activities on how to make organic fertilizers have received a positive response from training participants so that hope that organic fertilizer (compost) produced by partner groups in the future can be applied to agricultural land to increase soil fertility and agricultural products as well as farmers' income.

3.6. Plans, Strategic Steps, and Further Realization

Based on the results of the activities that have taken place to date, it is necessary to carry out further program assistance in the form of monitoring and evaluation of technology transfer that has been practiced by partner groups. Through monitoring and evaluation, it is hoped that partner groups will be more skilled and motivated in producing organic compost fertilizers while making the most of coffee husk waste, which is very abundant around coffee processing plants.

The first strategic step is to maintain the good cooperation that has been established so far with the women's farmer group Widya Pertiwi to produce organic compostable fertilizers sustainably. The second strategic step requires support from local governments, local communities, entrepreneurs, and agricultural stakeholders to utilize agricultural waste to be produced into organic fertilizers for sustainable, environmentally friendly agriculture.

4. CONCLUSION

Community service activities carried out through training, technology transfer, and mentoring in women farmer groups have been able to make organic fertilizer based on coffee skin waste. Farmer groups have been motivated and able to accept and apply the transfer of technology for making organic fertilizers until they are ready to be marketed and used to improve soil fertility and agricultural production. Organic fertilizer products sourced from coffee husk waste can be used by local governments, agricultural stakeholders, and fertilizer makers for the development of environmentally friendly and sustainable organic fertilizer products.

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REFERENCE

- [1] A. Widia, W & Duniaji, "Laporan pelaksanaan rencana aksi pengembangan industri agro kopi di provinsi Bali tahun 2016," pp. 1–91, 2016.
- [2] U. Fauziah and A. Ikhwana, "Analisa Rantai Nilai Distribusi Kopi Di Kabupaten Garut," *J. Kalibr.*, vol. 13, no. 1, 2015, doi: 10.33364/kalibrasi/v.13-1.234.
- [3] dan M. I. H. Nuraini Lusi, Yeddid Yonatan Eka Darma, "Teknologi Pulper Biji Kopi Dalam Upaya Peningkatan Produktivitas Kopi X-Barue Pada Asosiasi Petani Kopi Desa Kalibaru Manis," *Semin. Nas. Terap. Ris. Inov.* 6, vol. 6, no. 3, pp. 261–268, 2020.
- [4] Afrizon, "Potensi Kulit Kopi Sebagai Bahan Baku Pupuk Kompos Di Propinsi Bengkulu," *Agritepa J. Ilmu dan Teknol. Pertan.*, vol. 2, no. 2, pp. 69–80, 2016, doi: 10.37676/agritepa.v2i2.179.
- [5] A. D. Nguyen, T. D. Tran, and T. P. K. Vo, "Evaluation of Coffee Husk Compost for Improving Soil Fertility and Sustainable Coffee Production in Rural Central Highland of Vietnam," *Resour. Environ.*, vol. 3(4), no. 4, pp. 77–82, 2013, doi: 10.5923/j.re.20130304.03.
- [6] L. Blinová, M. Sirotiak, A. Bartošová, and M. Soldán, "Review: Utilization of Waste From Coffee Production," *Res. Pap. Fac. Mater. Sci. Technol. Slovak Univ. Technol.*, vol. 25, no. 40, pp. 91–101, 2017, doi: 10.1515/rput-2017-0011.
- [7] S. S. Kumar, T. S. Swapna, and A. Sabu, "Coffee Husk: A Potential Agro-Industrial Residue for Bioprocess," in *Energy, Environment, and Sustainability*, Springer, 2018, pp. 97–109.
- [8] V. A. Bonilla-Hermosa, W. F. Duarte, and R. F. Schwan, "Utilization of coffee by-products obtained from semi-washed process for production of value-added compounds," *Bioresour. Technol.*, vol. 166, pp. 142–150, 2014, doi: 10.1016/j.biortech.2014.05.031.
- [9] M. N. Baharsyah, A. Kiswanto, Budiyo, and A. I. Benardi, "Peningkatan kemampuan membaca ruang melalui delta-net bagi siswa tunanetra SLBN kota Semarang," *Edu Geogr.*, vol. 5, no. 2, pp. 60–68, 2017, [Online]. Available: <https://journal.unnes.ac.id/sju/index.php/edugeo/article/view/15397>.
- [10] A. Shodikin, S. Sutardi, A. Muhajir, and ..., "Iptek Bagi Kewirausahaan Di Universitas Islam Darul Ulum," in *Seminar Nasional ...*, 2017, vol. 1, no. 1, pp. 316–321, [Online]. Available: <https://jurnalfti.unmer.ac.id/index.php/senasif/article/download/56/46>.