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Utilization of Quality Organic Fertilizer at P4S Sari Sedana, Badung, Bali

Yohanes Parlindungan Situmeang[1], Ida Bagus Komang Mahardika[1], Ida Ayu Trisna Widyawati [2], Haris Rematwa [2]*

[1] *Master of Agricultural Science Study Program, Postgraduate Faculty, Warmadewa University, Denpasar, Bali,*
[2] *Student of Master of Agricultural Science, Postgraduate Program, Warmadewa University, Denpasar, Bali,*

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CORRESPONDING AUTHOR

*E-mail: *ypsitumeang63@gmail.com*

ABSTRACT

This Community Partnership Program (CSP) conducted in Desa Selat, Kecamatan Abiansemal, Kabupaten Badung, has achieved significant advancements in organic agricultural development. The program focused on the implementation of both hard and soft technologies. Hard technologies included the development of high-quality organic fertilizers using local waste materials such as livestock manure, biochar, Trichoderma, NPK fertilizers, and dolomite, processed with simple equipment. These innovations addressed local waste management issues and enhanced agricultural productivity. Soft technologies involved comprehensive training on production management, business operations, and marketing strategies, which empowered the P4S Sari Sedana Group with essential skills for sustainable operation. The program demonstrated high relevance to local needs, effectively transforming waste into valuable resources and introducing environmentally friendly production methods. It also fostered active community participation and generated substantial environmental and economic benefits, including increased soil fertility and reduced reliance on chemical fertilizers. The project produced several key outputs: high-quality organic fertilizer, enhanced community skills, scientific publications, intellectual property registration, and online media coverage. Future sustainability will be supported through institutional capacity building, market expansion, product innovation, and ongoing monitoring and evaluation.

1. INTRODUCTION

1.1. Background

The village, located in Abiansemal District, Badung, has significant potential in the agricultural sector. The village is surrounded by rice fields, drylands, and plantations, covering 200 hectares, much of which remains underutilized [1]. However, the use of organic waste as fertilizer is still not optimal, resulting in low agricultural productivity and a lack of community awareness regarding environmental sustainability. Through this Community Service Program (CSP), it is expected that enhancing understanding and implementation of high-quality organic fertilizer usage can boost agricultural productivity and positively impact the people of Selat Village.

This CSP activity focuses on developing simple technology for the production and utilization of high-quality organic fertilizers. In addition, it includes strengthening the business management of the P4S Sari Sedana farmer group, aiming to integrate existing natural resources more optimally [2-3]. The organic fertilizers produced through this initiative are expected to increase the farmer group's income and add value to organic waste by converting it into environmentally friendly fertilizer products. This effort also supports the green economy concept, a sustainable economic development model in agriculture [4-5].

Geographically, Selat Village has extensive farmland and drylands with significant potential for organic fertilizer production. However, the P4S Sari Sedana farmer group, consisting of 20 members, although already equipped with fertilizer processing facilities, has not yet been able to produce high-quality organic fertilizer. They still employ traditional methods in fertilizer management and crop cultivation, leading to the production of raw, suboptimal fertilizer for agricultural use [6]. Therefore, there is a need to enhance capacity and skills in producing high-quality organic fertilizer and in cultivating crops organically.

High-quality organic fertilizer offers substantial benefits to agriculture. It can improve the physical and chemical properties of the soil [7-8], and enhance plant growth [9-13]. By producing and utilizing compost from organic waste through simple fermentation techniques and nutrient addition, the farmer group in Selat Village is expected to increase sustainable agricultural production. Furthermore, this activity aims to add economic value for farmers by transforming organic waste into high-value fertilizer.

1.2. Objective

Given the existing challenges, the main objectives of this CSP activity are: (1) to empower the farmer group to increase the added value of organic waste processed into high-quality organic fertilizer; (2) to transfer technology for high-quality organic fertilizer production, thereby improving the group's understanding and skills; and (3) to strengthen the farmer group through training in business management and marketing of high-quality organic fertilizer products. By achieving these goals, Selat Village is expected to optimize its potential, support sustainable agricultural development, and enhance the well-being of the local community.

2. Methodology

2.1. Place and Time of Implementation

The implementation of community service was carried out in the P4S Sari Sedana Group, Selat Village, Abiansemal District, Badung Regency, Bali Province, at an altitude of 400 m above sea level. Taking place from April to August 2024.

2.2. CSP Method

The Participatory Action and Learning System (PALS) method is used in community service activities in Selat Village. This method aims to make partner groups the object of community service activities through various forms such as education, training, counselling, as well as coaching and mentoring [14]. The PALS method is implemented in several stages: awareness phase, capacity building phase, mentoring and institutionalization phase [15].

The awareness Phase is an initial activity that aims to raise awareness among the target audience of partner groups regarding the importance of formulating high-quality organic fertilizers to increase agricultural production and farmer income. The method used at this stage is the Focus Group Discussion (FGD) approach, namely discussions and questions and answers related to the manufacture of high-quality fertilizers and improving the fertility of agricultural land so that partners gain a complete understanding and awareness of the benefits of high-quality organic fertilizers to increase agricultural production. To determine the level of success of this CSP, before the FGD, questions related to the CSP topic were distributed to determine the insights of CSP participants, then at the end of the CSP activity, the same questions were given to determine the increase in understanding of CSP participants.

The Capaciting Phase is the stage of involves the active participation of partner groups in managing and developing their organic fertilizer businesses. At this stage, the preparation of tools and materials and the transfer of technology for making high-quality organic fertilizers, and their application to horticultural crops (vegetables, chilies, tomatoes, onions, etc.), as well as business management and marketing practices are carried out. The process of making high-quality fertilizers: a) Materials used: organic fertilizer from chicken manure waste, NPK fertilizer, rice husk biochar, Trichoderma, and dolomite. b) Tools used: scales, measuring cups, buckets, hoes, rakes, sprayers, tarpaulins, black and silver plastic mulch. c) Making 100 kg of high-quality fertilizer. 60 kg of organic fertilizer, 30 kg of rice husk biochar, 7 kg of NPK fertilizer, 1 kg of Trichoderma, and 2 kg of dolomite are required. d) High-quality organic fertilizer is ready to be packaged and applied as a planting medium for horticultural plants (vegetables, chilies, tomatoes, onions) on farmers' land to increase agricultural yields.

The mentoring phase (Scaffolding) is a mentoring activity for partners during the implementation of the program activities. At this stage, monitoring and evaluation will also be carried out related to the activities that have been carried out: a) Monitoring will be carried out by the Warmadewa University Community Service Institute. b) Evaluation is carried out by comparing the achievement of success indicators before and after the implementation of the program, analyzing deficiencies and obstacles during the program implementation process, and finding solutions to existing problems so that the program implemented is truly effective optimal, and synergistic.

3. RESULT AND DISCUSSION

3.1. Technology and Innovation Products

The Community Partnership Program (CSP) implemented in Selat Village has introduced various technologies and innovations to support the development of the organic farming sector. The technological products generated can be categorized into two main types: hard technology and soft technology.

Hard Technology: Hard technology focuses on producing high-quality organic fertilizers. This process utilizes local organic waste, including livestock manure, biochar, Trichoderma, NPK fertilizers, and dolomite. Using simple tools such as mixers, choppers, and fermentation devices, these materials are processed into nutrient-rich fertilizers. This technology is tailored to the local conditions, where organic raw materials are abundant but previously underutilized. The implementation of hard technology addresses waste management issues and provides a long-term solution for improving agricultural productivity in the region.

Fig 1. High-Quality Organic Fertilizer Products

Soft Technology: Soft technology includes a series of training and educational activities provided to the P4S Sari Sedana group. These sessions cover production management, business operations, and marketing strategies, all aimed at ensuring the sustainability of organic fertilizer production. Emphasizing soft technology is crucial as it enhances technical skills and prepares

the community to independently and effectively manage their business in the long term. This approach also significantly impacts human resource development in Selat Village, fostering a more empowered and self-reliant community in agricultural management.

Fig 2. Discussion of organic fertilizers and their applications

3.2. Application of Technology and Innovation to the Community

The application of technology and innovation in this program was tailored to the local conditions and needs of Selat Village, particularly for the P4S Sari Sedana group. This was achieved through several strategic steps to ensure that technology adoption matched the community's capabilities and circumstances.

Relevance: The technology for organic fertilizer production introduced is highly relevant to Selat Village's needs. The village has abundant natural resources that were previously not optimally processed. This technology transforms organic waste, previously seen as a problem, into valuable resources. The produced organic fertilizers not only enhance soil quality but also provide economic benefits by boosting agricultural yields. Additionally, these methods introduce more environmentally friendly and sustainable practices, aligning with the global push for greener and more efficient agriculture.

Community Participation: A key aspect of this technology application is the high level of participation from the P4S Sari Sedana group. Members were actively involved in all stages, from training to field application. They gained new knowledge and provided valuable feedback, which contributed to refining the technology. This engagement reflects their enthusiasm and commitment, ensuring that the technology meets local needs and conditions. Their active participation also enhances the likelihood of the technology's sustainability in the future.

Fig 2. Application of organic fertilizer on agricultural land

3.3. Impact

The implementation of technology and innovation through the CSP program has significantly impacted both the environment and economy of Selat Village. Benefits: The program has provided a concrete solution to the issue of organic waste in Selat Village. Once problematic waste is now processed into high-quality organic fertilizers. These fertilizers not only improve soil fertility but also reduce farmers' reliance on expensive chemical fertilizers that negatively impact the environment. Additional environmental benefits include improved soil structure and reduced water pollution from excessive chemical use. Moreover, the program has raised community awareness about the importance of organic waste management and sustainable agriculture, potentially benefiting environmental sustainability in the long term.

Productivity: The application of high-quality organic fertilizer technology has directly enhanced the productivity of the P4S Sari Sedana group's agriculture. This improvement is evident from increased horticultural crop yields, both in quantity and quality. The technology has not only boosted group income but also demonstrated its effectiveness in improving agricultural efficiency and effectiveness in Selat Village. This success opens opportunities for expanding this technology to similar regions, amplifying the program's positive impact on a broader scale.

3.4. Achieved Outputs

The CSP program at P4S Sari Sedana in Selat Village has resulted in several notable outputs that significantly benefit the local community. The primary output is the production of high-quality organic fertilizers using simple technology, which has the potential to be marketed more broadly, providing additional income for the group. The program also enhanced the skills and knowledge of the P4S Sari Sedana members through training in fertilizer production, business management, and marketing, increasing their competitiveness in the organic market. Scientific articles detailing the program's processes and impacts have been published, extending the knowledge gained and contributing to the field of organic resource management. Additionally, the results have been registered as Intellectual Property Rights (IPR), protecting the innovations and adding economic value. Online media publications have further increased the visibility of the products and expanded the group's business network.

3.5. Sustainability Plan

To ensure the ongoing success and benefits of the CSP program, several sustainability strategies have been developed and agreed upon by the P4S Sari Sedana group and the program team. Strengthening institutional capacity involves continuous training and development of organizational management, including creating Standard Operating Procedures (SOPs) for fertilizer production and marketing. Expanding market development and marketing networks will involve reaching out to local, regional, and online markets and forming partnerships with relevant organizations to boost product visibility and sales. Further research and product development will focus on enhancing the quality and variety of organic fertilizers and exploring new materials. Regular monitoring and evaluation will be conducted to assess program performance and impact, ensuring that it continues to provide maximum benefits and adapt to changing conditions.

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4. CONCLUSION

The Community Partnership Program at P4S Sari Sedana, Selat Village, Badung, Bali, has succeeded in increasing the capacity of groups to produce and utilize high-quality organic fertilizer. Through technology transfer, training, and mentoring, partner groups are now able to manage fertilizer production independently, improve soil quality, and expand economic opportunities. The outputs of this program include organic fertilizer products, skills improvement, and scientific publications. This program has also succeeded in fostering awareness of the importance of sustainable agriculture and the utilization of organic waste, thus contributing to environmental conservation and increasing agricultural productivity in Selat Village. If further development is desired, it is recommended that further training programs continue to be carried out to deepen group skills. Fertilizer product diversification and marketing network improvement are also needed to expand market reach. In addition, collaboration with investors, government, and non-governmental organizations needs to be strengthened to support the innovation and desires of this program. Regular monitoring and evaluation are also important to ensure that the positive impact of the program continues.

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