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Implementing a Technology for Agricultural Waste Processing: A Strategy for Providing High-Quality Sheep Feed in Sumberpucung

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Abstract

This program was implemented to address agricultural waste issues in Sumberpucung District, Malang Regency, while meeting the demand for sheep feed at a more cost-efficient rate. The program's background highlights the utilization of previously underutilized agricultural waste, such as corn cobs, cassava stems, and coffee husks, as raw materials for livestock feed. Using appropriate technology, this waste is processed to enhance its nutritional value and shelf life, reducing dependence on relatively expensive commercial feed. The methods employed include community outreach, training, monitoring, and evaluation. Partner farmers were trained to use provided equipment to process waste into high-quality livestock feed and were equipped with packaging skills to create new entrepreneurial opportunities in agropreneurship. The program successfully enhanced the partners' skills in producing independent livestock feed while supporting local food security and fostering sustainable economic development in the region.

Key words: Agricultural Waste, High-Quality Sheep Feed, Technology

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INTRODUCTION

Analysis of the Situation

Sumberpucung, located in Malang Regency, is characterized by extensive topography and vast plains. The district serves as a popular transit route for travelers heading south towards Kediri and Blitar Regencies. Despite its abundant natural resources, the potential of this region has not yet been fully optimized (Sholeh et al., 2020). However, with effective utilization, the economic potential of the area could be significantly enhanced (Rahayu et al., 2022). Agriculture represents the district's most prominent asset. The total agricultural land spans 2,313.4 hectares, including rice cultivation (1,753.4 hectares) yielding 15,152.94 tons, maize farming (500 hectares) producing 6,501.6 tons, coffee plantations (60 hectares) generating 120 tons, and cassava production amounting to 150 tons.

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Figure 1. Rice Cultivation in Sumberpucung, Malang Regency

Nevertheless, the substantial agricultural output in Sumberpucung District generates a correspondingly large amount of agricultural waste (Afsyah et al., 2021). This waste includes corn cobs and cassava that fail to meet market standards due to defects or small sizes. Typically, this waste is left in open spaces or burned without being converted into more useful products. According to (Susanti & Marhaeniyanto, 2016), a mixture of corn cobs, cassava, and coffee husks can be utilized as sheep feed to improve the quality of both their wool and meat. Therefore, processing agricultural waste is essential to address the agricultural waste issues in Sumberpucung, Malang Regency.

The Challenges

Figure 2. Sheep Farming at PT Sumber Mendho Nusantara

In Sumberpucung, there is an organization named PT Sumber Mendho Nusantara that relies on livestock farming as its primary source of income. Currently raising 34 sheep, the organization successfully markets over 20 sheep annually to consumers, making it the largest sheep farming organization in the district. Consequently, the daily feed requirement for the livestock reaches 68 kilograms. However, according to the organization, the livestock feed currently used is

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purchased from factories, leaving the pricing dependent on the manufacturers and significantly impacting operational costs. The organization recognizes the potential of utilizing local agricultural resources to produce more affordable, high-quality feed but lacks the necessary equipment to process agricultural waste into effective livestock feed.

Solution and Objectives

Given the significant potential of Sumberpucung, the challenges faced by the partner organization regarding high-quality sheep feed can be addressed effectively. A suitable solution involves providing appropriate technology equipment to facilitate the efficient processing of livestock feed from cassava stems, corn cobs, and coffee husks. To ensure the sustainability of the program, the outreach team has designed a comprehensive training program to guide the partner in the step-by-step use and maintenance of the equipment (Bramantya et al., 2025; Flinders et al., 2013). Furthermore, the team will provide training on feed production methods (based on the formulations by (Marhaeniyanto & Prasetyo, 2009) and (Susanti & Marhaeniyanto, 2016)) techniques to create opportunities for agropreneurship.

METHOD

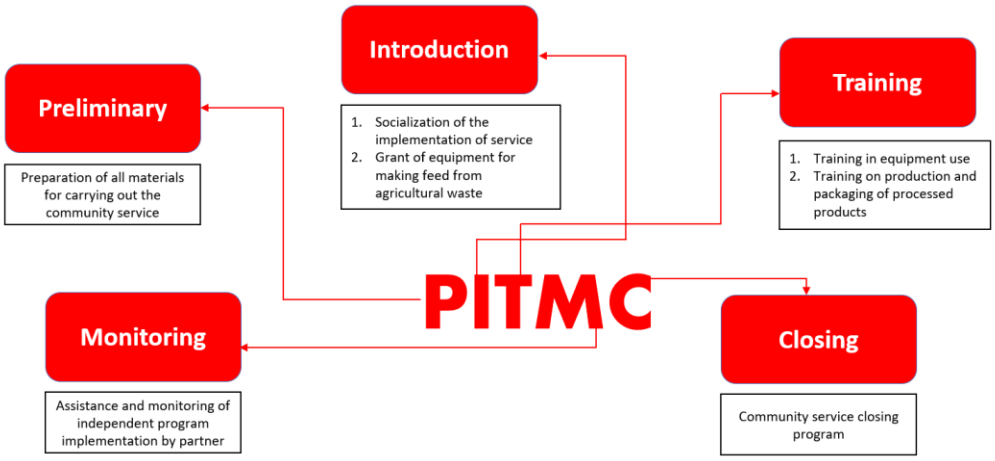

Figure 3. Method of Community Service

The implementation method for this outreach program consists of five key components, referred to as PITMC: (1) Preliminary; (2) Introduction; (3) Training; (4) Monitoring; and (5) Closing. Detailed explanations for each component are provided below.

Preliminary

During the preparation phase, the team conducted initial coordination meetings aimed at determining the schedule and location of the program's activities in collaboration with the partner organization. The goal of these initial coordination efforts was to establish a clear schedule and venue for each activity, providing a foundational reference for program implementation.

Subsequently, the outreach team prepared the necessary materials and tools to

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ensure that they align with the program's requirements. A program manual was also developed as a standardization guide for implementing the outreach program. This manual includes detailed instructions on the proper use and maintenance of the provided equipment. The contents of the manual cover the program's background, step-by-step guidelines for using and maintaining the tools, as well as procedures for producing and packaging livestock feed from agricultural waste.

Introduction

The outreach program's socialization phase was conducted with the target audience, consisting of livestock farmers at PT Sumber Mendho Nusantara. This stage involved providing an overview of the program's overall implementation. During the socialization phase, the livestock feed processing equipment for agricultural waste was handed over to the partner organization. The objective of this stage was to ensure that the target audience understood the program's implementation, as demonstrated by their attendance at all meetings and the provision of the appropriate technology equipment.

Training

The training sessions were designed to enable livestock farmers to produce livestock feed from the agricultural waste generated in Sumberpucung District. These sessions aimed to equip farmers with the skills to independently produce their own livestock feed, laying the groundwork for future mass production. To support this, the team also provided training on the packaging of the processed products. The goal of this phase was to enhance the cognitive skills of the farmers concerning the program.

Monitoring

Throughout the program's implementation, all activities were monitored and accompanied by mentoring to maximize results. Monitoring efforts ensured that program execution aligned with the needs of the partner organization and optimized the outcomes of the training sessions. Additionally, the team conducted evaluations of the program's activities. Process evaluations were carried out after each training session to inform improvements for subsequent sessions, while a final program evaluation was conducted as a basis for the program's sustainability by the partner organization.

Closing

Before concluding the program, the team prepared measures to ensure the program's sustainability. The objective of this phase was to establish a marketing team and a product development team to support the continuity of the program and to explore agropreneurship opportunities from processed agricultural waste products.

RESULTS AND DISCUSSION

Program Implementation at PT Sumber Mendho Nusantara

The implementation of this program involved a series of training sessions and mentoring activities aimed at enhancing the skills and knowledge of the partner

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organization in processing agricultural waste into high-quality livestock feed. The outreach activities comprised two primary training sessions: technical training on agricultural waste processing and business management training to support program sustainability.

The initial activity following the preparation phase was the socialization stage, which aimed to provide comprehensive understanding to the partner organization and the community of Sumberpucung Village about the program to be implemented. This socialization involved meetings with community leaders, livestock farmers, and representatives of local farming groups. Through these sessions, all stakeholders were given a clear overview of the program's objectives, benefits, and steps to be undertaken.

The community's response to the socialization was highly positive, demonstrated by their enthusiasm during discussions and their constructive feedback. Furthermore, this stage successfully fostered a shared commitment between the outreach team and the partner organization to ensure the smooth execution of the program.

Figure 4. Program Introduction at PT Sumber Mendho Nusantara

The socialization phase resulted in the establishment of an agreed-upon schedule for program implementation, delineation of the roles of each stakeholder, and a mechanism for periodic monitoring and evaluation. Consequently, this phase not only enhanced the community's understanding but also strengthened collaboration between the outreach team and the partner organization to achieve shared objectives.

One of the pivotal components of this outreach program was the provision of agricultural waste processing equipment. The appropriate technology tools were handed over to the partner organization in Sumberpucung Village to support the production of high-quality livestock feed. The handover ceremony was conducted as an official event attended by representatives from local farming groups, community leaders, and livestock farmers.

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Figure 5. Grant of Agricultural Waste Processing Equipment

The outcomes of the equipment grant were highly encouraging. The availability of this equipment has opened opportunities for new business ventures in the agropreneurship sector, enabling the partner organization to market the produced livestock feed to local markets.

Following the handover, the outreach team conducted a live demonstration of the equipment's operation and maintenance. Participants displayed significant interest and actively engaged in the training sessions, indicating their readiness to optimize the use of the equipment.

During the first training session, livestock farmers from Sumberpucung Village were introduced to techniques for processing cassava stems, corn cobs, and coffee husks using the provided appropriate technology tools. The training aimed to enhance the partners' understanding of the potential of agricultural waste as a raw material for livestock feed, while also teaching efficient and effective equipment use. Participants demonstrated a high level of engagement, as evidenced by numerous questions and discussions about processing techniques and the economic benefits of the process. Awareness of the significant potential of agricultural waste was notably increased among the participants.

Figure 6. Training on Equipment Use

Following the delivery of instructional material, a hands-on agricultural waste processing session was conducted using the learning by doing method. Participants practiced using the appropriate technology tools, learning step-by-step how to convert agricultural waste into high-nutrient livestock feed. The outcomes of this

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training revealed that participants successfully produced feed of higher quality compared to traditional methods. Additionally, they gained new skills in operating and maintaining the provided technology.

The stages of production and packaging training formed a crucial part of this outreach program, aiming to ensure that the partners could effectively and efficiently produce livestock feed from agricultural waste and package it to an acceptable standard. During the production training session, participants were provided with an in-depth understanding of the feed production process using substitute materials. Employing the learning by doing approach, participants actively engaged in the production process, practicing the instructed steps under direct guidance from the outreach team (Thomas, 2024). The results demonstrated that participants were able to produce livestock feed consistently meeting quality standards, showcasing their ability to apply the skills effectively.

Figure 7. Training on Production and Packaging Processed Products

The second training session focused on the packaging of processed feed. Participants were trained in packaging techniques designed not only to ensure product durability but also to enhance market appeal. The material covered included appropriate packaging types. During this session, participants actively practiced packaging feed using various recommended methods and materials.

Overall, this outreach program successfully achieved its primary objectives: enhancing the community's ability to process agricultural waste into high-quality livestock feed and creating new economic opportunities through agropreneurship. With the success of the training and the implementation of appropriate technology, Sumberpucung is expected to serve as a model for developing agricultural waste-based livestock feed in other regions.

Impact of the Community Service Program

An effective community outreach program is one that produces tangible impacts and fosters a shift in the mindset of the target community. In the program for implementing appropriate technology to process agricultural waste as a strategy for providing high-quality sheep feed in Sumberpucung, the impact on the partner organization was assessed through a questionnaire distributed before and after the activities. This questionnaire comprised nine items designed to measure the extent of mindset changes among the partners. The results of the pre- and post-program

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questionnaires are summarized in the following table:

Table 1. Results of Pre- and Post-Program Questionnaires

No	Questions	Pre-Program					Post-Program				
		SA	A	N	D	SD	SA	A	N	D	SD
1	I understand the appropriate technology for processing agricultural waste into sheep feed.			6	4		9	1			
2	Agricultural waste in Sumberpucung is sufficiently available to be used as sheep feed.	5	5				10				
3	This agricultural waste processing technology is effective in improving the quality of sheep feed.		5	5			8	2			
4	Using feed made from agricultural waste can enhance the productivity of my sheep.		4	6			9	1			
5	I possess adequate knowledge and skills to apply this agricultural waste processing technology.			4	6		8	2			
6	The tools and materials needed to process agricultural waste into livestock feed are easily accessible in Sumberpucung.		8	2			9	1			
7	The village government provides sufficient support for the implementation of this agricultural waste processing technology.		6	4			7	3			
8	I am satisfied with the livestock feed produced from agricultural waste processing.		5	5			8	2			
9	Processing agricultural waste helps reduce waste-related issues in Sumberpucung.		6	4			9	1			
10	I am committed to continuing the use of this agricultural waste processing technology in the long term.		2	8			8	2			
Total		**5**	**41**	**44**	**10**	**0**	**85**	**15**	**0**	**0**	**0**

***Information:**
SA=Strongly Agree; A=Agree; N=Neutral; D=Disagree; SD= Strongly Disagree

Based on the results obtained from the questionnaire, there was variability in the responses provided by participants for each evaluation point. Thus, it can be concluded that the implementation of the outreach program, *Implementation of*

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Technology for Agricultural Waste Processing: A Strategy for Providing High-Quality Sheep Feed in Sumberpucung, has led to a significant transformation in the mindset and practices of livestock farmers in the village. To illustrate this substantial change, the evaluation data are presented in the graph below.

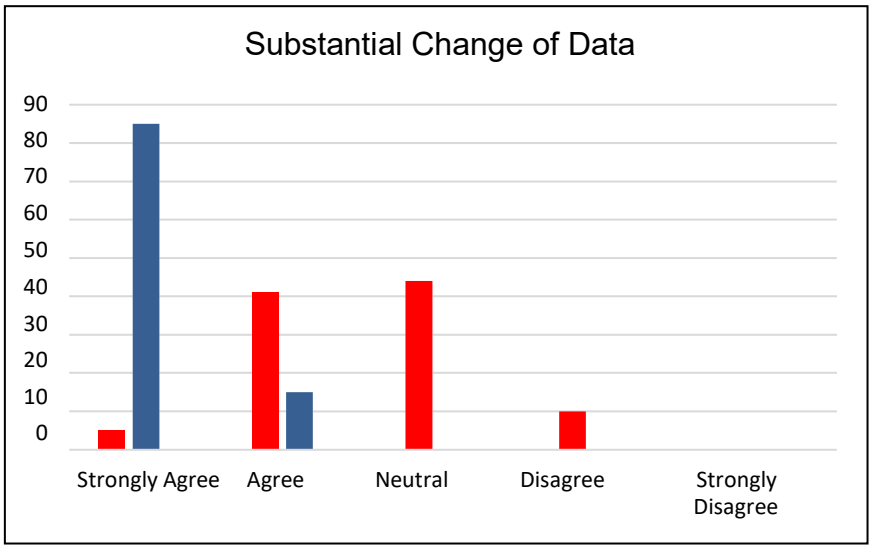

Figure 8. Substantial Change Data Chart

From the presented results, it can be concluded that the implementation of the program has successfully enhanced *the* knowledge and skills of the livestock farmers in Sumberpucung Village. The significant improvement in their understanding and application of appropriate technology is expected to serve as a foundation for the sustainable development of high-quality sheep feed.

With this positive initial step, it is hoped that the potential of agricultural waste in Sumberpucung can be maximized, contributing to community welfare and creating new opportunities in agropreneurship. The graph below illustrates the changes in farmers' perceptions and skills before and after the program's implementation.

CONCLUSION

The community service program implemented successfully achieved its objectives effectively. This program transformed previously unused agricultural waste into high-quality sheep feed. Through the application of appropriate technology, the feed production process became more efficient and cost-effective, reducing the operational expenses of the livestock farmers. The training and mentoring activities provided during the program significantly enhanced the partners' knowledge and skills in feed processing, enabling them to independently produce and package livestock feed. Furthermore, the program created new opportunities in agropreneurship, contributing to the economic development of Sumberpucung Village.

It is recommended that the program continues by providing additional training to enhance the partners' skills, particularly in marketing and business management. This would enable the livestock feed products to reach a wider market. In addition,

to maximize the program's impact, sustained support from the village government and related agencies is necessary to facilitate easier access to raw materials and appropriate technology equipment. Collaboration with private sectors could also provide opportunities for better funding and marketing channels. Furthermore, given its potential and benefits, this program could be replicated in other areas with similar conditions. The outreach team is advised to develop a more comprehensive training module to enable other regions to implement this agricultural waste processing technology independently. With these recommendations, it is hoped that the program's sustainability and positive impact will be further realized, encouraging continued innovation in the utilization of agricultural waste.

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