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Enhancing Coffee Farmers' Productivity through the Implementation of Huller Technology in Srigading Village

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Abstract

Purpose: This study explores the impact of introducing huller machines to address productivity and quality challenges faced by coffee farmers in Srigading Village, Malang Regency, Indonesia. It aims to evaluate how modern technology can improve coffee processing and economic conditions for farmers.

Method: The research involved providing and installing huller machines, followed by training and mentoring local farmers. Data was gathered through surveys and observations, assessing productivity and quality before and after implementation.

Practical Application: The huller machines significantly improved processing efficiency, resulting in a 20% increase in productivity and a 15% reduction in coffee breakage. This led to a 25% rise in farmers' income. These improvements demonstrate how technological interventions can enhance agricultural practices and economic welfare in rural settings.

Conclusion: The study confirms that huller technology effectively enhances coffee quality and productivity, offering a viable solution for similar agricultural challenges in other rural areas.

Introduction

The development of village potential is one of the key strategies in efforts to improve

the welfare of rural communities in Indonesia. Villages in Indonesia possess abundant natural resources (District, 2024) but are often not optimally utilized due to various challenges such as limited technology, market access, and lack of knowledge in managing agricultural products. Srigading Village, located in Lawang Subdistrict, Malang Regency, is a village with significant agricultural potential but still faces various challenges in efforts to increase productivity and community welfare (Agribusiness et al., 2024; A. K. F. Putri, Syarifudin, and Lisanti, 2022).

Srigading Village is situated at an altitude of between 600 to 900 meters above sea level, with a land slope of less than ± 35%. The average temperature in Srigading Village ranges from ± 21°C to 34°C, creating an ideal climate for various types of agriculture. These favorable geographic and climatic conditions provide Srigading Village with great potential in the field of agriculture. The fertile soil and relatively low land slope facilitate farming and irrigation activities (Taiyeb, 2023). Additionally, cool to moderate temperatures allow the growth of various types of crops, ranging from vegetables, fruits, to herbal plants (Rusdianti, 2024).

Figure 1. Map of Srigading Village

The majority of the village population is involved in agricultural activities, with most of them being coffee farmers. This potential is supported by geographical conditions suitable for coffee cultivation and stable market demand for coffee products. This is evidenced by the existence of the Serayu Coffee Village in Srigading Village, as shown in Figure 2.

Figure 2. Serayu Coffee Village

Farmers in Srigading Village face significant challenges in the coffee process, directly impacting on their productivity, coffee quality, and economic welfare. Low productivity is one of the main issues; the manual hulling methods used by farmers consume significant amounts of time and labor, limiting the amount of coffee beans that can be processed daily. The lack of access to modern technology makes the coffee processing slow and inefficient (Purwantini and Sunarsih, 2020), whereas the presence of technology should facilitate business progress (K. C. S. Putri, Sariani, and Wiradyatmika, 2024). The quality of the coffee produced is also inconsistent; manual hulling often results in coffee beans that are uneven in size and cleanliness, negatively affecting the final quality of the coffee. Variability in the drying and hulling process leads to inconsistency in the flavor of the produced coffee.

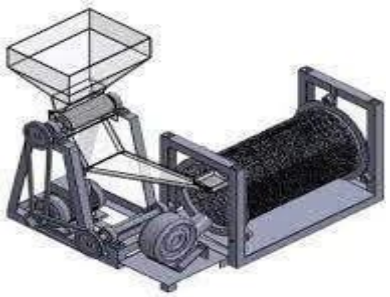
Inefficient processing is another issue, while the traditional tools used are often not durable and require intensive maintenance, adding to the workload and costs for farmers. These issues have a significant impact on the farmers' economic welfare. Low productivity and quality of coffee result in low coffee selling prices, so the farmers' income is not optimal (Sugiarti, 2019). Uncertainty in the quantity and quality of the harvest makes farmers' incomes fluctuate, complicating long- term financial planning (Bingawati, 2023). These problems result in unstable income and threaten the economic welfare of the farmers.

Figure 3. Manual Coffee Peeling

To address these issues, a community service program conducted by Universitas Negeri Malang in Srigading Village focused on providing huller machines to the village farmers' group. Huller technology was chosen as a solution to increase the productivity and quality of the coffee beans produced by farmers in Srigading Village (Erdianti, 2021). The huller machine is a tool used to peel the skin of coffee beans, thereby speeding up the post-harvest process and improving the quality of coffee beans ready for sale (Fajri, 2021). Before this project, farmers in Srigading Village still used traditional methods that were time-consuming and produced inconsistent output. Various literatures show that the use of huller technology can significantly increase the productivity and quality of agricultural products, especially coffee.

A previous study by (Solikhin and Wicaksono, 2022) showed that the implementation of this technology has the potential to increase farmers' income by producing high-quality products that are more competitive in the market. Furthermore, (Yusida, Qurrata, and Purnamasari, 2022) found that the use of huller machines not only reduces production costs and increases time efficiency but also significantly increases the productivity and quality of coffee beans produced. The provision of these huller machines is not just about providing tools but is also accompanied by training and assistance programs for farmers in their use, so that this technology can be utilized optimally (Siregar et al., 2022).

Figure 4. Huller Design



With the implementation of this huller technology solution, it is hoped that the farmers' group in Srigading Village can overcome the challenges they face and achieve increased productivity and quality of coffee. Thus, this service is expected to make a

significant contribution to the development of other villages in Indonesia, especially in utilizing technology to improve agricultural yields and community welfare (Andayani and Afandi, 2019).

Method

Srigading Village was chosen as the location for the community service activities conducted by the Community Service Team from the State University of Malang. This selection was based on Srigading Village's status as a Partner Village of the university. Additionally, recommendations from various sources and observations indicated that Srigading Village has a high urgency for developing coffee productivity, given its substantial potential if developed. The subjects of this community service are the Coffee Farmers Group in Srigading Village. The village partners will be responsible for participating in all the activities and supporting several aspects to ensure the success of the program. The activities were carried out from June to August 2024.

This community service program employed several methods to maximize the results achieved. The methods used included Needs and Village Potential Identification, Selection and Provision of Huller Machines, Installation and Training on Huller Machine Usage, Mentoring, and Evaluation. These steps are considered highly effective in addressing the issues. In the Needs and Village Potential Identification stage, an analysis was conducted to determine the needs and existing problems. The Selection and Provision of Huller Machines is the core part of this program, ensuring that the provided equipment matches the capacity and needs of the farmers' group. Installation and Training on Huller Machine Usage were conducted to ensure that all equipment was properly installed and used according to the Standard Operating Procedure (SOP). Mentoring was provided to ensure that the farmers could operate the equipment effectively, offering technical support and solutions to any issues encountered. The final stage was Evaluation, aimed at assessing the overall effectiveness of the program and identifying areas needing improvement. The sequence of activities is illustrated in the program plan shown in Figure 4.

Figure 5. Community Service Implementation Method

Needs and Village Potential Identification

The community service team conducted an initial survey to identify the needs of the farmers' group in Srigading Village related to the coffee processing process. This survey included an analysis of the challenges faced in coffee processing using traditional methods, including time, labor, and process efficiency.

Selection and Provision of Huller Machines

Based on the needs identification results, the team selected huller machines that match the capacity and coffee processing needs in Srigading Village. These huller machines were chosen according to the processing volume and technical specifications required by the farmers' group.

Installation and Training in Huller Machine Usage

The huller machines were installed in a strategic location within the village, and intensive training was provided for the farmers' group members on how to operate the machines. The training covered technical aspects of machine operation, maintenance, and care to ensure the machines function properly.

Mentoring

Ongoing mentoring was provided to ensure that the farmers could effectively operate the huller machines and understand the necessary maintenance procedures. The community service team also offered technical support and advice to optimize machine usage and addressed any issues that arose during operation.

Evaluation

An evaluation was conducted several months after implementation to assess the long-term impact of huller machine usage on coffee productivity and quality. This evaluation included an analysis of production data, coffee bean quality, and feedback from the farmers.

Result

Increased Productivity: The implementation of the huller machine has led to a substantial increase in coffee processing productivity, fundamentally transforming the efficiency of post- harvest operations. Farmers have observed a remarkable improvement not only in the speed but also in the volume of coffee beans processed, far surpassing the capabilities of traditional manual methods. This shift has enabled farmers to handle larger quantities of coffee beans within a shorter time frame, significantly optimizing the entire production cycle.

Enhanced Coffee Quality: The huller machine plays a critical role in elevating the quality of coffee by ensuring the production of more uniform and cleaner coffee beans. This consistency in bean quality directly contributes to an overall enhancement of the coffee’s flavor profile and aesthetic appeal. As a result, the coffee produced is more competitive in the market, leading to an increase in its market value and a stronger brand reputation for the farmers.

Time and Labor Efficiency: The introduction of the huller machine has led to a dramatic reduction in the time and labor traditionally required for coffee bean hulling. This efficiency gain allows farmers to redirect their time and energy towards other critical aspects of coffee cultivation, such as improving crop management practices or expanding their coffee plantations. The reduction in manual labor not only reduces physical strain on farmers but also contributes to a more sustainable farming practice by optimizing resource allocation.

Increased Farmer Income: The combination of higher productivity and superior coffee quality has translated into a tangible increase in farmers' income. This financial uplift is not just a temporary benefit but has a lasting impact on the economic stability of the farming communities. Additional income enables farmers to invest in further agricultural improvements, education, and healthcare, thereby enhancing their overall quality of life and contributing to the social and economic development of their regions.

Self-Reliance and Equipment Maintenance: The comprehensive training provided to farmers has been instrumental in fostering a sense of self-reliance and confidence in the operation and maintenance of the huller machine. This empowerment reduces their dependence on external technical assistance, which can often be costly and unreliable. By

mastering the skills needed to maintain the machinery, farmers can ensure its longevity and consistent performance, leading to sustained benefits over time. This self-sufficiency is a crucial factor in promoting long-term agricultural resilience and independence.

Discussion

At the beginning of the activity, the community service team from the State University of Malang (UM) conducted a field survey to identify the needs and potential of Srigading Village related to coffee processing. This activity began with a discussion with the village head to gain a general overview of the coffee farming conditions in the village. This discussion provided valuable insights into the challenges and opportunities faced by coffee farmers in Srigading.

Figure 6. Discussion with the Village Head of Srigading

Subsequently, the community service team, accompanied by the leader of the farmers' group, conducted a direct survey of the coffee plantations. The purpose of this survey was to observe firsthand the processes and conditions of coffee processing in the field. After visiting the plantations, the team was taken to the farmers' location, where coffee is still processed using traditional methods.

Figure 7. Survey of Coffee Plantations

Figure 8. Traditional Coffee Peeling Tools

The initial identification revealed that most farmers in Srigading Village still use traditional coffee milling tools that are inefficient. This results in lower quality milled coffee with a high breakage rate, leading to a decrease in the selling price. In interviews with the

farmers, most of them expressed difficulties in increasing yields due to limitations in post-harvest technology. Additionally, the village's vast agricultural potential has not been fully utilized due to the lack of knowledge about modern agricultural technology (Prasetyo et al., 2020).

This needs analysis suggests that the use of modern and efficient huller machines can be a solution to improve the quality and quantity of milled coffee. The potential of Srigading Village, which is situated at an altitude of 600-900 meters above sea level with an average temperature of 21°C to 34°C, supports optimal coffee productivity if backed by adequate technology.

Based on the identification results, the huller machine chosen has a milling capacity that meets the needs of the farmers' group and is capable of producing better quality coffee. The machine specifications include a production capacity of 150 kg/hour, with high energy efficiency and easy maintenance. This machine is also designed to minimize the breakage rate of coffee, thus increasing the selling value of the milled coffee.

Figure 9. Huller Selection Process

Figure 10. Huller Delivery

Figure 11. Huller Handover

The process of providing the huller machine went smoothly with the active

participation of the farmers' group. After installation, the machine was immediately operated by the farmers under the supervision of technicians from the community service team. The farmers stated that the huller machine provided met their expectations and has performed well from the start of its use.

Figure 12. Huller Installation Process

The huller machine was installed in a strategic location in the village, and intensive training was provided for the members of the farmers' group on how to operate the machine. The training covered the technical aspects of machine usage, maintenance, and care to ensure the machine functions properly. The goal was to enhance the farmers' group's ability to use the huller machine effectively and maintain the machine for optimal performance.

Figure 13. Mentoring on Huller Usage

The community service team from the State University of Malang (UM) conducted intensive mentoring to ensure that coffee farmers in Srigading Village could operate the huller machine effectively and understand all necessary maintenance procedures. This mentoring was not limited to initial training but also involved periodic visits to the village to provide direct technical support.

The community service team provided comprehensive guides and practical demonstrations on how to operate the huller machine, including troubleshooting technical issues that might arise during operation. Farmers were taught how to maintain the machine regularly to keep it in optimal condition and extend its lifespan. Additionally, farmers were encouraged to always check the machine's condition before and after use to ensure that no undetected damage occurs.

The community service team offered advice on optimizing machine usage, such as

adjusting the speed and pressure of the machine according to the type of coffee being processed. Technical support also included how to handle common issues that may arise, such as coffee bean buildup or component damage. This way, farmers gained the knowledge and skills necessary to overcome various operational challenges they might encounter.

The primary goal of this ongoing mentoring is to ensure the optimal and sustainable use of the huller machine. By understanding how to properly operate and maintain the machine, farmers can minimize operational disruptions that could affect the productivity and quality of the coffee. This mentoring also aims to boost farmers' confidence in using new technology and ensure that the investment in the huller machine brings long-term benefits to the coffee farming community in Srigading Village.

Continuous mentoring is crucial to ensure that farmers do not solely rely on initial training but also receive ongoing assistance when facing issues or needing adjustments in machine usage. With consistent support, it is expected that farmers can achieve maximum efficiency in coffee processing, improve the quality of the coffee beans produced, and ultimately increase their income and well-being.

The final evaluation showed that the provision of the huller machine has had a significant impact on farmers' productivity and well-being. In terms of productivity, there was a 20% increase in the amount of coffee produced per harvest season compared to previous milling methods. Additionally, the quality of the coffee produced improved, with a 15% reduction in coffee breakage rates, leading to a higher selling price for the coffee.

Figure 14. Evaluation Process

From an economic perspective, farmers' income increased by approximately 25% after the huller machine was used. Farmers also reported an improvement in family well-being, with the ability to set aside a portion of their income for savings and investments in better farming practices. This evaluation indicates that technological interventions, such as the huller machine, not only enhance productivity but also contribute to the overall economic and social well-being of the village community.

Conclusion

The implementation of huller technology in Srigading Village has proven effective in enhancing the productivity and quality of coffee harvests. Through this program, farmers can process coffee more efficiently, reduce waste, and significantly increase the market value of their products. However, to ensure the sustainability of this program and its long-term benefits, continuous support and guidance are essential. With consistent assistance, farmers will not only be able to operate the machines independently but also optimize the use of this technology to further improve their yields and overall well-being.

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