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Optimization of Coffee Hatchery in Sumber Rejo Village, Rejang Lebong District in Improving Productivity through Participatory Training

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ABSTRAK

This community service program aimed to improve coffee productivity in Sumber Rejo Village, Rejang Lebong Regency, through participatory training on superior seedling technology. The program emerged from the challenges faced by local farmers, particularly the low quality of coffee seeds that resulted in poor yields and vulnerability to pests and diseases. The goal was to empower farmers with knowledge and skills to select, propagate, and manage high-quality coffee seedlings adapted to the local agroecological conditions. The training was conducted using a participatory approach that combined technical workshops, field practice, mentoring, and evaluation. Farmers were introduced to the characteristics of superior coffee varieties, effective nursery management, soil preparation, and pest control methods. The use of pre-test and post-test evaluations helped measure learning outcomes, showing a 55% improvement in farmers' understanding of superior seedling techniques and a noticeable increase in their ability to identify and mitigate pest and disease threats. Beyond technical improvements, the participatory model fostered collaboration, collective problem-solving, and mutual learning among participants. Farmers became more confident and independent, leading to the formation of farmer groups that could sustain nursery activities autonomously. These groups also functioned as peer-learning centers, spreading knowledge across the community. Overall, this program not only enhanced agricultural productivity but also strengthened farmers' organizational capacity and long-term resilience. The initiative serves as a replicable model for other agricultural regions seeking to increase crop quality and improve livelihoods through participatory and sustainable approaches.

Keywords: coffee, superior seedlings, participatory training

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. INTRODUCTION

Coffee is one of Indonesia's leading commodities with high economic value. As one of the coffee-producing regions, Rejang Lebong Regency has excellent potential to improve the community's economy through coffee farming. Sumber Rejo Village, located in the district, is one of the most productive coffee plantation centers. However, although this great potential has been recognized, the productivity of the resulting coffee harvest is still not optimal. This is due to the low quality of seeds used by farmers, which impacts the quality and quantity of the harvest. Studies have shown that high-quality seeds are crucial to increasing coffee plant productivity. Using superior seeds can increase plant resistance to disease and produce higher-quality fruit. Unfortunately, in Sumber Rejo Village, farmers' knowledge of good coffee seedling technology is still limited, so the seeds used often come from local seedlings whose quality is not guaranteed. Therefore, intervention through community service activities is needed to improve farmers' understanding and ability to select and use quality coffee seeds.

The central problem farmers face in Sumber Rejo Village is the low quality of the seeds used, which causes coffee yields to not be maximized in quantity and quality. Although local coffee seeds are still widely used due to their availability, the low genetic quality of these seeds is a significant obstacle to increasing productivity. Research shows low seed vigor can significantly reduce crop yield due to poor germination rates and seedling establishment (TeKrony & Egli, 1991). Furthermore, the inadequate regeneration of coffee seeds impacts the overall crop quality, as seen in the variations in coffee bean characteristics linked to genetic factors (Waters et al., 2015). In addition, farmers' lack of knowledge about good seedling technology contributes to improper cultivation practices, ultimately affecting productivity (Ali et al., 2022). To overcome this problem, efforts are needed to optimize seed quality through training and assistance to farmers. These measures can include education on selecting superior seeds, correct propagation techniques, and better agricultural practices to increase yields. Research highlights that training programs like Farmer Field Schools (FFS) have effectively improved farming practices and increased yields through participatory learning approaches (Waddington et al., 2012). Additionally, targeted agricultural training that includes referrals by current trainees has been shown to improve the adoption of recommended practices and enhance farm productivity (Fafchamps et al., 2020).

Previous studies have shown that the use of certified improved seeds significantly impacts coffee productivity. High-quality seeds produced through proper selection and propagation techniques can increase yields by up to 30% compared to ordinary seeds. Research indicates that training programs and certifications can significantly boost productivity and farmer incomes, especially when aligned with sustainable practices (Sarirahayu & Aprianingsih, 2018). Moreover, implementing agricultural accreditation, such as Fair Trade, enhances the quality and marketability of coffee, leading to better prices for smallholder farmers (Bray & Neilson, 2017). Additionally, comprehensive training and field assistance are crucial for improving seed multiplication practices and disease management, increasing productivity by up to 25% in highland areas (Jawo et al., 2022). Learning from the success of these programs, a similar approach can be applied in Sumber Rejo Village. This involves intensive training and providing local farmers access to improved seeds, which is expected to have a tangible impact on the productivity and quality of coffee harvests in the area. Although various interventions have been carried out in other areas to improve coffee seed quality, in Sumber Rejo Village, there have not been many development programs focusing on improving seed quality as a whole. Continuous technical assistance and access to improved seeds have been shown to significantly boost productivity in coffee farming, as demonstrated in Ethiopia, where smallholders are linked to cooperatives, which improve yields and market access (Anguko, 2015). Research also highlights that sustainable management practices and technical support increase climate resilience and coffee yield quality (Bracken et al., 2023). Moreover, a critical review of improved seeds in Ethiopia shows that access to high-quality seeds and farmer training can enhance productivity and welfare, reducing poverty in rural communities (Agazhi & Meda, 2022).

In addition, while the literature shows the importance of a community-based approach for successful seed quality improvement programs, implementation is often inconsistent. The success of seedling programs relies heavily on the active participation of the farming community. A noticeable gap in Sumber Rejo Village is the lack of collaboration between farmers, academics, and local government in developing a sustainable program. This community service program aims to improve the quality and quantity of coffee yields in Sumber Rejo Village by optimizing the use of quality coffee seeds. The program educates and trains farmers on superior seed propagation techniques and sustainable coffee cultivation practices. The program's strength lies in its participatory approach, where farmers are actively involved in every stage, from training sessions to field practices. This approach ensures that knowledge transfer is theoretical and supported by hands-on field experience relevant to local farming conditions.

The novelty of this program lies in the integration of sustainable, interactive training methods, which differentiates it from similar training programs in other regions. Unlike conventional approaches focusing on delivering theory, this program uses a learning-by-doing approach where farmers actively practice seed sowing, treatment, and management on demonstration plots. In addition, this program utilizes high-quality seeds specially selected for the geographical and climatic conditions of Sumber Rejo Village, which have never been applied before in this region. The program includes intensive mentoring and regular monitoring for three months after training completion. This ensures that the knowledge farmers acquire is actually applied, and the impact on productivity can be measured. Not only does the program focus on improving technical skills, but it also builds community capacity through the formation of independent farmer groups that serve as local knowledge hubs. Thus, the program generates short-term impact and creates a sustainable empowerment model that can be replicated in other areas with similar challenges.

The scope of activities includes theoretical training, hands-on field practice, and comprehensive monitoring and evaluation sessions. With this holistic approach, it is expected that the program will increase coffee yields and contribute significantly to improving the economic welfare of farmers in Rejang Lebong Regency.

METHODS

The materials used in this community service activity include training modules on coffee seedlings, educational posters, superior quality coffee seeds, planting media (soil, compost, and husks), agricultural tools (hoes, polybags, and sprinklers), and presentation equipment such as laptops and projectors. This approach aligns with evidence that hands-on, practical training improves farmers' skills and agricultural practices (Houndolo et al., 2020). Additionally, providing organic fertilizers, soil pH measuring instruments, and soil moisture test kits helps farmers monitor soil conditions, which is critical for improving crop yields (Bray & Neilson, 2017). The selection of high-quality seeds is essential for maximizing productivity. Studies have shown that seeds with high germination rates and disease resistance significantly improve the success rate of crop cultivation (Agazhi & Meda, 2022). During the training, participants prepared planting media using a 2:1:1 mixture of soil, compost, and husks, which has been proven to enhance soil fertility and seedling growth (Bracken et al., 2023). The practical component, where participants practiced seeding with polybags, was crucial for reinforcing the theoretical knowledge provided during the training.

The training was conducted at the village hall and demonstration plot in Sumber Rejo Village. The activity began with a counseling session in the classroom to provide a basic understanding of the importance of seed quality. After the theoretical session, participants were divided into groups for hands-on practice in the field. Each group was given a planting area and the tools needed to sow, plant, and care for the coffee seedlings. A team of experts assisted in ensuring that participants understood all procedures well. The parameters evaluated in this activity include the participants' increased knowledge of seedling techniques, practical skills in preparing planting media, and their ability to care for coffee seedlings. Evaluation was also conducted on the level of technology adoption by farmers after the training, which was measured through surveys and interviews. Data were collected

before and after the training to assess the program's effectiveness in improving farmers' capacity.

Data analysis was conducted to evaluate the effectiveness of the training program using a pre-test and post-test approach. The paired t-test statistical test was used to compare the level of knowledge. In addition, descriptive analysis was used to assess participants' responses to the service program. Qualitative data from interviews were analyzed using the content analysis method to identify changes in behavior and adoption of new practices by farmers.

RESULTS AND DISCUSSION

To improve the quality and quantity of coffee yields in Sumber Rejo Village, this community service activity is carried out through several structured stages, from preparation to closing, with a focus on empowering and assisting local farmers.

Preparation Stage

The preparation stage is an essential foundation for implementing this community service program. This stage begins with a field survey to understand coffee farmers' problems in Sumber Rejo Village, especially those related to low productivity due to using poor-quality seeds. Through direct interviews with farmers, information was obtained on technical constraints and limited knowledge of coffee seedling techniques. The information collected then became the basis for the service team to design a relevant program for the community's needs. After obtaining data from the survey, the next step is to coordinate with the village government and local community leaders. This is important to ensure support and active participation from all community levels. Support from village officials is also needed to facilitate the program's implementation, including providing training venues and disseminating information to villagers.

The team developed a training module tailored to local conditions and farmers' needs based on the survey results. The module includes technical guidance on selecting superior coffee seeds, preparing planting media, and effective seedling and seedling care techniques. The module is equipped with visual illustrations such as educational posters and interactive presentations to facilitate understanding. In addition, the service team also prepared various materials and tools that would be used during the training, such as quality coffee seeds, planting media consisting of a mixture of soil and compost, and agricultural equipment such as polybags and sprinklers. Providing superior seeds is the main focus because quality seeds will increase the productivity of coffee plants in the future. With this careful preparation, the entire series of community service activities is expected to run smoothly and achieve the goal of improving the quality and quantity of coffee yields in the village.

Socialization Stage

The socialization stage is a crucial step in ensuring the active participation of the Sumber Rejo Village community in this service program. Socialization began with a counseling session at the village hall, where community leaders, farmer groups, and local farmers were invited to attend. In this session, the service team introduced in detail the objectives of the program, namely optimizing the quality of coffee seeds to increase crop productivity. The counseling was conducted with a communicative approach so the community could easily understand the importance of using quality coffee seeds. The main focus was to provide insights into how superior seeds can influence more abundant and quality harvests. To strengthen the information delivered, the team also provided supporting materials in the form of educational brochures. The brochure contains easy-to-understand technical guidelines on selecting good coffee seeds, seeding techniques, and proper maintenance. By using simple language and attractive illustrations, the brochure is expected to be a reference for farmers after the extension session is over. Research indicates that well-designed brochures, particularly those utilizing visuals and simple text, can significantly enhance knowledge retention among farmers and improve the adoption of recommended practices (Young & Witter, 1994). Moreover, distributing educational materials as part of agricultural training initiatives has effectively improved farming practices and productivity (Azizi-Khalkheili, 2017).

Figure 1. Socialization of Optimization of Coffee Seeding in Sumber Rejo Village

After the extension sessions, the next step was to form small farmer groups. This group formation aims to ensure that the training and field practice can be more structured and efficient. Each group consists of several farmers who will work together and support each other during the training activities. This group also makes it easier for the service team to conduct ongoing mentoring and monitoring. With the division of groups, it is expected that the implementation of training can be more focused and the results more optimal because participants can learn and practice together intensively in smaller groups. This socialization stage is expected to build community awareness and enthusiasm for the importance of innovation in coffee seedlings, which will ultimately improve the welfare of farmers in Sumber Rejo Village.

Training and Counseling Phase

The training and counseling stage is the core of this service activity, where the main focus is to provide practical knowledge and skills to coffee farmers in Sumber Rejo Village. The activity began with the delivery of theoretical material covering superior coffee seed selection techniques, ideal planting media preparation, and efficient seedling sowing and care methods. The material was delivered interactively in the classroom, using presentation tools and training modules that had been prepared previously. The aim was for participants to understand the importance of quality seeds and how they affect coffee productivity. After the counseling session in the classroom, participants were immediately taken to the demonstration plot to participate in the field practice session. At this stage, participants were invited to apply the theory they had learned by sowing seeds directly. Each participant was given a polybag and superior coffee seeds provided and guided to prepare planting media using a mixture of soil, compost, and husks. This hands-on approach enhances participants' practical skills and retention of agricultural techniques (Pourjavid et al., 2020). Participants were also taught proper watering techniques and how to identify and manage common issues like pests and diseases during the early stages of seedling growth, which is crucial for improving crop survival rates (Smith et al., 2008).

Figure 2. Training and Counseling to Optimize Coffee Seeding

A team of experts was actively present during the practical sessions to ensure optimal knowledge transfer, providing intensive mentoring and answering participants' questions directly. This hands-on approach is highly effective in reinforcing learning, as direct engagement with experts can significantly boost participants' confidence and problem-solving abilities (Waddington et al., 2012). Additionally, farmers are equipped with technical skills by utilizing a participatory learning method. Still, they are also empowered to implement new practices independently on their farms, which has been shown to increase agricultural productivity and sustainability (Azizi-Khalkheili, 2017). This comprehensive approach aims to build practical expertise and self-reliance among farmers, thereby improving the quality and quantity of coffee yields in their communities.

Monitoring and Evaluation stage

The monitoring and evaluation stage is essential to ensure the training program's success and assess its impact on farmers in Sumber Rejo Village. Regular follow-up visits by the service team to farmers' fields after training have proven effective in reinforcing the

practical application of techniques learned during training sessions (Prasad et al., 2016). This hands-on approach evaluates growth indicators like seedling height and plant health and helps identify challenges farmers face in real-world conditions, which is crucial for refining future training sessions (Hitzhusen, 1989). As part of the evaluation, a pre-test and post-test were administered to the participants to measure the extent of their improved knowledge and skills related to coffee seedling techniques. The pre-test was administered before the training began to determine participants' initial level of understanding. In contrast, the post-test was administered after the training to assess the effectiveness of knowledge transfer. In addition, the team also conducted surveys and in-depth interviews with the farmers to obtain feedback on the benefits they felt after the training. The survey included questions on changes in their farming practices, difficulties in adopting new technologies, and suggestions for future program improvements.

The results of this monitoring and evaluation stage are significant and can be used to improve and develop future service programs. The team can design follow-up strategies to provide additional assistance if obstacles are found in applying the techniques taught. Thus, it is hoped that this program will not only improve farmers' knowledge and skills in the short term but also have a sustainable impact in increasing the productivity and welfare of coffee farmers in the village. Below is a table of pre-test and post-test results to evaluate farmers' understanding of quality coffee seedlings in Sumber Rejo Village:

Table 1. Results of pre-test and post-test of farmers' understanding of quality coffee seeds in Sumber Rejo village.

No	Assessment Aspect	Pre-Test Score	Post-Test Score	Change (%)
1	Knowledge of superior seeds	60	85	41.67%
2	Seed selection technique	55	80	45.45%
3	Proper preparation of planting media	50	75	50.00%
4	Correct seeding technique	45	78	73.33%
5	Seedling care and maintenance	52	82	57.69%
6	Pest and disease identification	48	77	60.42%
7	Implementation of sustainable agricultural practices	50	80	60.00%

Based on the results of the pre-test and post-test evaluations conducted on farmers in Sumber Rejo Village, there was a significant improvement in farmers' understanding of quality coffee seedling techniques after implementing the intensive training program. The data showed low baseline scores on essential aspects such as seeding techniques and pest identification, with the lowest pre-test score recorded on "Correct seeding techniques" (45). After the training, there was a consistent improvement in all aspects assessed, with the highest post-test score reaching 85 on "Knowledge of improved seeds." The most significant improvement occurred in "Correct seeding techniques," which increased from 45 to 78 (about 73.33%). In addition, farmers' understanding of pest and disease identification also increased by 60.42%. Overall, there was an average improvement of 55%, indicating the effectiveness of the training in improving farmers' competencies.

These results align with previous literature showing the importance of field practice-based educative approaches. For example, Setiawan et al. (2020) found that practice-based training can increase technology adoption by up to 30%, while Nurhayati et al. (2021) reported a 50% increase in technical skills with a hands-on approach. In the context of Sumber Rejo Village, these results are even higher, suggesting that methods that combine theory and hands-on practice are highly effective for improving agricultural skills.

This program's long-term impact is expected to increase farmers' economic resilience sustainably. With improved skills, farmers can select and sow high-quality seeds suited to local conditions, thereby enhancing

crop productivity and disease resistance. Research indicates that training programs that focus on skill development and sustainable practices significantly impact agricultural productivity and farmers' income, contributing to their long-term economic stability (Wanjiku et al., 2010). Moreover, by promoting environmentally sustainable practices, these initiatives boost agricultural output and support biodiversity conservation, fostering ecological sustainability in farming communities (Stone-Jovicich et al., 2019).

In addition, the success of this program confirms the importance of a participatory approach to community empowerment. Actively involving farmers in the entire training process ensures that the knowledge gained is more easily adopted and applied. Research indicates that participatory approaches significantly increase the adoption of new agricultural practices, as they encourage farmers to take ownership of the techniques learned and use them in their fields (Kraaijvanger et al., 2016). Additionally, studies show that involving participants in practical and hands-on sessions enhances their motivation and commitment to implement the skills acquired during training (Kim et al., 2017).

The potential for replication of this program in other regions is high, especially in areas with similar challenges related to low coffee productivity. Critical success factors that can be adapted include the hands-on approach, community-based training, and ongoing monitoring and evaluation support. Evidence suggests that participatory training programs are more effective when they incorporate continuous follow-up and adaptation to local contexts, leading to better long-term outcomes (Knook et al., 2018). Additionally, leveraging collaborations between academic institutions, local governments, and communities ensures that the training is tailored to address specific regional needs, thereby maximizing impact (Aw-Hassan, 2008).

In the long term, successful replication of the program will support the improvement of food security nationally and make a significant contribution to rural economic development. Thus, the success of this program in Sumber Rejo Village will not only have a local impact but also have the potential to improve the welfare of farmers throughout Indonesia, especially in areas with similar geographical conditions and agricultural challenges. Farmers can be more adaptive to climate change and market fluctuations with better skills, thus maintaining productivity and community welfare in the long run.

Closing and Follow-up Stage

The last stage of the program was closed with a small seminar involving all training participants, community leaders, and the village government. This seminar not only aims to summarize the results of the activities but also provides a space for participants to share experiences and feedback related to the training they have undergone. Research shows that seminars are effective platforms for reinforcing learning, allowing participants to reflect on their experiences, and improving the retention of knowledge gained during training (Gbadegesin & Popoola, 2020). Additionally, creating opportunities for feedback and discussions can enhance the program's overall impact by identifying areas for improvement and ensuring the sustainability of the training outcomes (Prasad et al., 2016).

As part of the program's sustainability, independent farmer groups were formed to continue the good practices taught during the training. These farmer groups have training modules and the necessary farming tools to continue the seeding process independently. The group is also expected to serve as an information and training center for other farmers in the village so that the knowledge and skills disseminated do not stop with the training participants alone but extend to the entire community. In addition, the implementation team worked with the village government to design a regular monitoring program in which the formed farmer groups would receive regular mentoring and evaluation. This aims to ensure that the seeding techniques taught are implemented and impact the productivity of coffee farms. With this sustainability initiative, it is hoped that this service program will provide short-term benefits and contribute to the sustainable improvement of farmers' welfare in Sumber Rejo Village.

CONCLUSION

The community service program in Sumber Rejo Village that focuses on improving

the quality and quantity of coffee yields through quality seeds has shown significant results. Based on the pre-test and post-test evaluation results, there was an increase in farmers' understanding of various aspects, especially seeding techniques and pest identification, with an average increase of 55%. This shows that the participatory and hands-on training approach effectively improves farmers' competencies.

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