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TRAINING ON APPLICATION OF MYCORRHIZAL BIOFERTILIZER IN EDAMAME PLANT AT PAMULIHAN VILLAGE, TANJUNGSARI DISTRICT, SUMEDANG REGENCY, WEST JAVA

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ABSTRACT

Mycorrhizal biofertilizer is increasingly recognized as an eco-friendly soil amendment capable of improving nutrient uptake, plant resilience, and overall crop productivity. However, knowledge and utilization of mycorrhiza among smallholder farmers—especially housewives involved in home-scale farming—remain limited in many rural areas in Indonesia. This community service program aimed to enhance the knowledge, skills, and willingness of 20 housewives in Pamulihan Village, Tanjungsari District, Sumedang Regency, regarding the use of mycorrhizal biofertilizer for edamame cultivation. The training employed participatory learning methods, including lectures, demonstrations, hands-on practice, and discussions. Pre- and post-training assessments were conducted to evaluate changes in participants' understanding and readiness to adopt the technology. Results showed significant improvement across all indicators. Knowledge of the term "mycorrhiza" increased from 0% to 100%, ability to apply mycorrhiza increased from 0% to 100%, understanding of its benefits rose from 0% to 100%, and willingness to use mycorrhiza increased from 12.5% to 100%. Additionally, 68.75% of participants reported direct experience using mycorrhiza after the program, compared to none before. These results indicate that hands-on field-based training is highly effective in empowering rural communities—especially women—to adopt sustainable agricultural technologies. The program contributes to improved soil health, increased productivity potential for edamame, and enhanced environmental literacy in the village. The findings support the need for continued capacity building and community-based demonstrations to promote long-term adoption of biofertilizers.

Keywords: Mycorrhiza, edamame, biofertilizer training, community empowerment

INTRODUCTION

Agriculture in rural Indonesia continues to rely on chemical fertilizers to achieve high productivity, particularly in vegetable crops such as edamame (Setiawati et al., 2017). While these inputs have contributed to increased yields, their continuous use without balanced soil management often leads to declining soil fertility, nutrient imbalance, and reduced soil biological activity. In recent years, there has been growing awareness of the need to integrate environmentally friendly technologies such as biofertilizers, into smallholder farming systems to enhance long-term sustainability (Youseff and Eissa, 2014).

One of the most promising biological technologies is mycorrhizal biofertilizer, a natural inoculant containing spores of arbuscular mycorrhizal fungi (AMF) that form mutualistic associations with plant roots (Smith and Read, 2008). Mycorrhiza enhance phosphorus solubilization, increase water uptake, improve root architecture, strengthen plant resistance to environmental stress, and contribute to soil structure stabilization (Begum et al., 2019). Numerous studies indicate that crops inoculated with AMF show improved growth and yield while requiring lower doses of inorganic fertilizer. For nutrient-demanding plants such as edamame (*Glycine max* L. Merrill), the presence of mycorrhiza plays a key role in supporting early root establishment and nutrient uptake.

Despite its documented benefits, adoption of mycorrhizal biofertilizer among smallholder farmers remains low (Rillig et al. 2019). The barrier is particularly evident among housewives

involved in home-scale or family farming, who often face limited access to technical information, training, and agricultural extension services (Hart et al., 2017). In many rural communities, agricultural roles are shared between male farmers and female household members; however, women often have fewer opportunities to participate in capacity-building programs. As a result, their potential contribution to promoting sustainable agricultural practices is underutilized.

Pamulihan Village, located in the Tanjungsari District of Sumedang Regency, is home to a community of households engaged in small-scale vegetable farming. Many families grow edamame as a source of food and supplemental income. Prior to this program, the community had minimal exposure to biological fertilizers, including mycorrhiza. Informal interviews conducted before the intervention revealed that most housewives had never heard the term “mycorrhiza,” were unfamiliar with its benefits, and had never applied it to their crops. This lack of knowledge prevents them from accessing sustainable solutions that could improve crop health and reduce dependence on chemical fertilizers (Nurbaity et al., 2023).

Several previous community-based studies emphasize the effectiveness of training and hands-on demonstrations in improving the adoption of biofertilizer technology. Programs that combine explanation, demonstration, and practice have been shown to significantly increase participants' understanding, confidence, and readiness to apply innovations in their own farming systems. The empowerment of women through agricultural training further contributes to improved household well-being, strengthened food security, and enhanced environmental stewardship (Nurbaity et al., 2024).

In line with these findings, this community service activity was designed to introduce mycorrhizal biofertilizer to 20 housewives in Pamulihan Village through structured training and field demonstrations. The objective of this article is to present (1) the implementation of the training program, (2) the scientific interpretation of training outcomes based on pre- and post-assessment data, and (3) the role of mycorrhiza-based education in supporting sustainable edamame cultivation and soil health improvement.

The novelty of this program lies in its focus on empowering housewives—a group often overlooked in agricultural extension—by providing them with practical knowledge and hands-on experience in mycorrhizal application. This initiative contributes to the development of environmentally conscious farming practices at the household level and supports the village’s long-term goal of transitioning to more sustainable agricultural systems.

MATERIALS AND METHODS

Time and Location

The training was conducted on August, 5th 2025, at Pamulihan Village, Tanjungsari District, Sumedang Regency. This is an upland agricultural area characterized by mixed cropping systems dominated by vegetables, including edamame, chili, and leafy greens.

Participants

A total of 20 housewives voluntarily participated in the program. These participants are actively involved in home gardens and small family farms, making them a strategic group for the adoption of sustainable agricultural innovations.

Materials

The primary materials and equipment used in the training included: Mycorrhizal biofertilizer containing spores of arbuscular mycorrhizal fungi (AMF), Edamame seeds (local variety commonly grown in the village, Polybags and planting media (soil and compost mixture), Demonstration plots located in participants' home gardens, Presentation materials (posters, slides) and Assessment tools (pre-test and post-test questionnaires).

Training Design and Approach

The program employed a participatory training model, combining theoretical and practical components to ensure effective knowledge transfer. The training consisted of four stages:

Stage 1: Initial Survey and Pre-Assessment

A preliminary survey was conducted to understand participants' baseline knowledge. This assessment served as the reference for evaluating the effectiveness of the training. A structured questionnaire evaluated five indicators: Knowledge of the term "mycorrhiza; Previous use of mycorrhiza; Knowledge of how to apply mycorrhiza; Knowledge of its benefits; and Willingness to use mycorrhiza biofertilizer in the future.

Figure 1. Pre-Assessment of Training Participants

Stage 2: Lecture and Discussion

A round-style outdoor session was held at one of the participants' house. The topics included: Introduction to biofertilizer, benefits of AMF for plant growth, soil health, and environmental sustainability, applicability of mycorrhiza to edamame cultivation. definition and biology of mycorrhiza, comparison between chemical and biological fertilizers

Participants were encouraged to ask questions and share experiences from their home gardens. This interactive format aimed to enhance comprehension and stimulate interest.

Stage 3: Demonstration and Hands-On Practice

A practical session on edamame planting with and without mycorrhiza was conducted in a Group Demonstration Plot – A shared field area was prepared where participants observed the correct technique for applying mycorrhizal inoculant. Key steps demonstrated included correct dosage of mycorrhizal inoculant, placement of mycorrhiza near seed or root zones, watering techniques that support mycorrhizal colonization, and early monitoring of plant responses.

Figure 2. Lecture on Mycorrhizal Biofertilizer

Figure 3. Demonstration and Hands-On Practice of Mycorrhizal Application and Watering

Stage 4: Post-Assessment and Reflection

Following the completion of training activities, participants filled out the same questionnaire used in the pre-assessment. This allowed comparison of changes in knowledge, skill, and willingness to adopt mycorrhiza. A reflection session was held to reinforce learning outcomes and gather feedback on the training experience. After training, the participants report the condition of the plants they treated at the training. After 60-70 days, it shows good plant growth and yield.

Figure 4. Post-Assessment and Reflection of Training

Data Analysis

Descriptive statistics were used to summarize the pre- and post-training data. Results were presented in percentage form and interpreted scientifically to determine the magnitude of improvement and the effectiveness of training activities. Qualitative feedback from discussions was incorporated to support quantitative findings.

RESULTS AND DISCUSSION

Results

Before the intervention, participants showed minimal understanding of mycorrhizal technology. The pre-test data illustrate the baseline as shown in the figures below. This result aligns with trends in many rural farming communities, where access to biological fertilizer technologies remains limited. Lack of exposure often results in reliance on synthetic fertilizers and traditional methods.

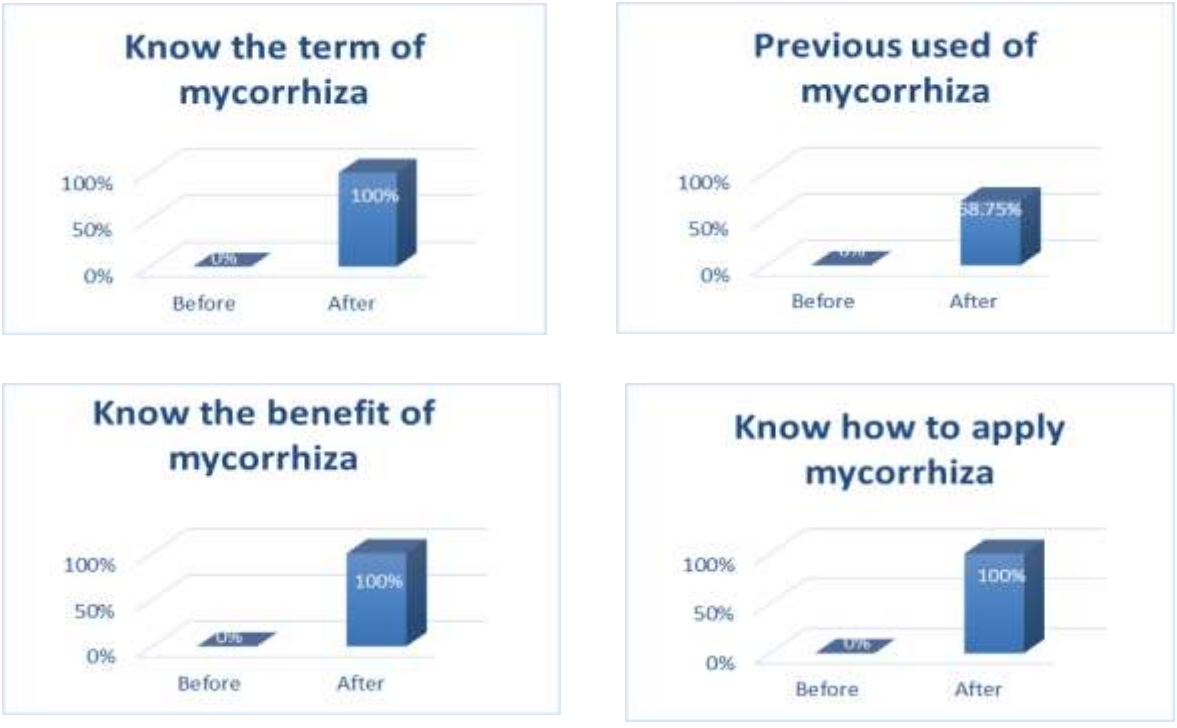

Figure 5. Understanding of Participants on Mycorrhizal Biofertilizer Before and After Training

After participating in lectures, demonstrations, and hands-on practice, participants showed significant improvement. The post-training assessment demonstrated substantial improvements across all indicators, confirming the effectiveness of the participatory learning approach. Knowledge of the term *mycorrhiza*, its application techniques, and its agronomic benefits reached 100%, indicating complete conceptual understanding among participants. Notably, 68.75% had already practiced using mycorrhiza, reflecting rapid translation of knowledge into action. The dramatic increase in willingness to adopt the technology—from 12.5% to 100%—suggests that hands-on experience and direct observation of its practicality strongly influenced participants' attitudes. These findings highlight that targeted, experiential training can successfully overcome knowledge barriers and promote adoption of sustainable biofertilizer innovations. These results also demonstrate the effectiveness of participatory training in knowledge transfer.

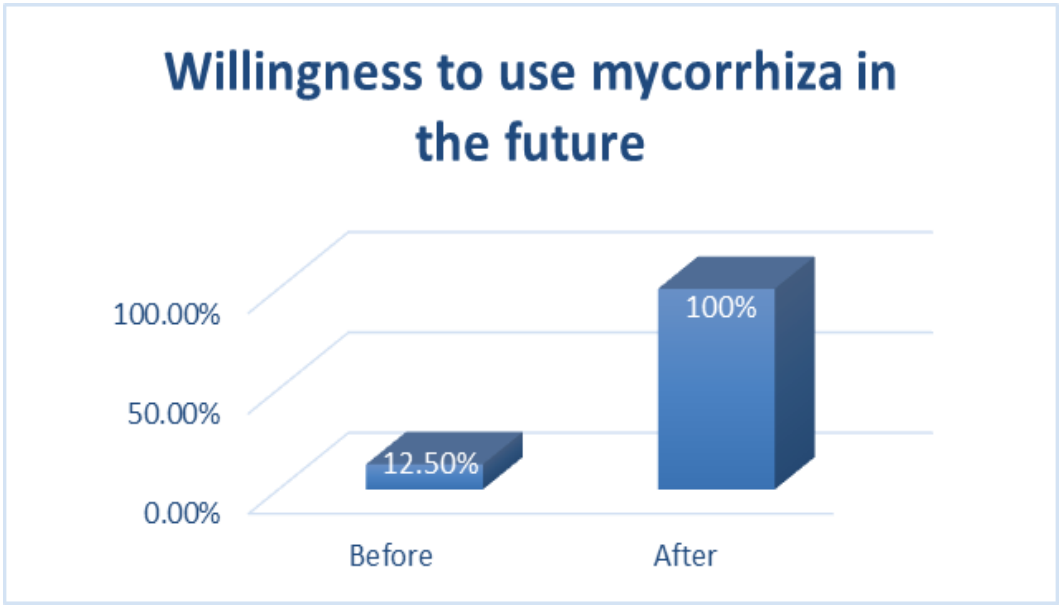

Figure 6. Willingness of Participants on Mycorrhizal Biofertilizer Before and After Training

Discussion

The shift from 0% to 100% demonstrates complete acquisition of fundamental scientific terminology. This outcome is expected given the structured lecture format and visual aids. When unfamiliar biological concepts are explained using simple analogies such as describing mycorrhiza as "plant helpers", participants find it easier to understand (Nurbaity, 2021).

The increase to 68.75% reflects the proportion of participants who began using mycorrhiza immediately after the training through hands-on practice. Practical demonstrations have been shown in previous studies to accelerate behavioral change because participants directly observe the material, its texture, placement, and effects on plants.

Training increased technical competency to 100%. Participants developed the ability to: measure proper doses; mix inoculant with soil; apply inoculant close to seed or root zones; and void environmental conditions (e.g., excessive heat) that may harm fungal spores. Such skill-based learning is crucial because improper application can reduce the effectiveness of AMF colonization.

Understanding reached 100% because the lecture connected biological processes with visible plant outcomes. Participants learned that AMF improve nutrient uptake, especially phosphorus (Rillig et al, 2019). The connection between scientific explanation and observable plant response fosters deeper learning.

Increasing willingness from 12.5% to 100% reflects strong acceptance of the technology. Motivating factors included: Perception of mycorrhiza as natural and safe, hope for increased edamame productivity, interest in reducing dependence on chemical fertilizer, and hands-on confidence gained from practice (Hart et al., 2017). High willingness indicates potential for long-term adoption if supported through follow-up mentoring.

Findings from this program align with literature showing that targeted training improves adoption of sustainable soil technologies. Studies emphasize that women-centered agricultural training significantly increases household knowledge and sustainable farming decisions.

CONCLUSION

The community training program successfully enhanced the knowledge, skills, and readiness of 20 housewives in Pamulihan Village regarding the application of mycorrhizal biofertilizer in edamame cultivation. All indicators showed substantial improvement, demonstrating the effectiveness of participatory teaching methods. The program not only increased scientific literacy but also provided practical competencies that empower women as key contributors to sustainable agricultural development. Continued support, mentoring, and demonstration plots are recommended to ensure long-term adoption and to expand the program to other communities.

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