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MINI GREENHOUSE: EFFORTS TO IMPROVE ENVIRONMENTALLY FRIENDLY AGRICULTURAL SKILLS FOR STUDENTS OF PONDOK PESANTREN AL ASROR

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ABSTRAK

Pondok pesantren semakin memperhatikan isu lingkungan, keberlanjutan, dan promosi SDGs serta berupaya memberikan keterampilan hidup bagi santri melalui pelatihan dan pengembangan diri. Artikel ini menjelaskan dampak pemanfaatan rumah kaca mini untuk meningkatkan keterampilan pertanian bagi santri melalui program pengabdian kepada masyarakat di Pondok Pesantren Al Asror Semarang dengan target 15 santri. Kegiatan dilakukan selama 5 bulan (Mei hingga September 2025) berupa pelatihan dan pendampingan pemanfaatan rumah kaca mini. Pelatihan diberikan untuk memperkenalkan mini greenhouse dan manfaatnya, kemudian santri bekerja sama menyiapkan dan membangunnya di lingkungan pondok pesantren. Kegiatan selanjutnya adalah budidaya tanaman dimulai dari menabur benih, menanam, dan merawat hingga masa panen, dengan bimbingan dan supervisi tim pengabdian masyarakat. Para siswa sangat antusias dan termotivasi memanfaatkan rumah kaca mini, serta mendapat dukungan pengasuh pondok untuk peningkatan keterampilan hidup. Selanjutnya santri melanjutkan pemanfaatan mini greenhouse untuk budidaya sayur organik mulai dari penyemaian hingga panen.

ABSTRACT

Pondok pesantren are increasingly paying attention to environmental issues, sustainability, and the promotion of the Sustainable Development Goals (SDGs), as well as striving to provide life skills for students (Santri) through training and self-development activities. This article explains the impact of utilizing a mini greenhouse to improve students' agricultural skills through a community service program at Pondok Pesantren Al Asror Semarang, targeting 15 students. The activities were carried out over five months (May to September 2025) in the form of training and assistance in using the mini greenhouse. The training introduced the mini greenhouse and its benefits, after which the students worked together to prepare and build it within the pondok pesantren environment. The next activities included plant cultivation, starting from seed sowing, planting, and caring for the plants until harvest time, under the guidance and supervision of the community service team. The students were highly enthusiastic and motivated to make use of the mini greenhouse, and they received support from the pondok pesantren leaders to enhance their life skills. The students then continued using the mini greenhouse for organic vegetable cultivation, starting from sowing to harvest time.

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INTRODUCTION

Pondok pesantren, as traditional Islamic educational institutions, play a strategic role in forming a generation that is characterful, independent, and environmentally conscious. Pondok pesantren have the potential to be movers, motivators, and strengtheners in supporting community independence (Gunawan & Alfarisi, 2023). Along with the advancement of science, technology, socio-cultural dynamics, and the changing needs of the workforce, the role of Pondok Pesantren has also undergone a transformation. Currently, pondok pesantren not only function as places for learning religion and general knowledge, but also act as centers for economic empowerment, both within the pondok pesantren circles and the surrounding community. Therefore, in Pondok Pesantren, an environmentally friendly agricultural approach is also introduced, which is now increasingly in demand as an effort to build a sustainable agricultural system and reduce the negative impact on the ecosystem (Islami et al., 2025).

Innovation in the field of agriculture is a strategic solution that can be applied in pondok pesantren, especially for those that have the potential for optimal utilization of land and natural resources. The application of modern agricultural technology, optimal land management, and environmentally friendly cultivation methods are the main factors in increasing agricultural output and its economic value in Pondok Pesantren (Hidayati et al., 2025). Entrepreneurship training for hydroponic vegetable agricultural products can increase knowledge and skills in hydroponic farming and awaken, increase insight, creativity, and realize independence to develop further, so as to improve the economy of students (Wulansari et al., 2025). However, not all Pondok Pesantren have entrepreneurship programs or life skills that are oriented towards environmental conservation and food independence. Environmentally friendly agriculture is one of the strategic solutions in supporting economic independence and environmental conservation in Pondok Pesantren (Widiyanto et al., 2025).

Greenhouse farming is a method that is land-saving, water-efficient, and capable of increasing productivity sustainably. The use of greenhouses helps maintain a stable number of plants and protects them from pests, and increases the efficiency of maintenance costs by reducing the need for fertilizers and pesticides (Adiaksa et al., 2025). Greenhouse is a farming method designed to increase crop yields efficiently. With a transparent structure, greenhouses maximize sunlight and protect plants from extreme temperatures and pest attacks (Priono & Putro, 2024). Greenhouses function as a solution to regulate plant growth conditions in a more controlled manner (Nurhasanah et al., 2025). In addition, the agroedutourism concept that will be developed includes a cultivation environment as well as educational facilities about organic plant cultivation techniques (Djunaedy et al., 2025). Supporting facilities provided include a volleyball court as a recreation area and a greenhouse that functions as a learning medium for visitors.

In addition to the greenhouse concept, hydroponic technology is currently being introduced as an effective alternative solution to utilize limited land. This method allows someone to grow plants without requiring a large space (Dewi et al., 2024). Compared to conventional farming methods, hydroponic technology offers several advantages, including being more

environmentally friendly and producing clean and hygienic products. Plants grow faster, maintaining harvest quality and increasing production volume (Yusuf et al., 2024). The selection of planting media in the hydroponic method must be able to meet the plants' needs for water, nutrients, and oxygen to support their growth and development. The essence of hydroponic techniques lies in providing the nutrients plants need (Wulansari et al., 2025).

Hydroponic vegetables have quite a prospective market potential, especially for consumer groups who prioritize quality, high nutritional value, and a clean and hygienic production process (Karman et al., 2022). Vegetables grown with a hydroponic system are also healthier because they are free from heavy metal contamination that is usually found in the soil, stay fresh longer, and are easy to digest (Yusuf et al., 2024). In addition, through organic vegetable cultivation activities at the Al-Ikhsan Beji Pondok pesantren, students gain knowledge about organic farming, its positive impacts on health and the environment, and the business potential that can be explored and developed (Bayyinah et al., 2025).

The phenomenon observed at Pondok Pesantren Al Asror indicates that life skills development activities in the agricultural sector are not yet optimal. The land owned is quite extensive, with potential for students and university students to be given additional provisions in the agricultural sector. Students need to be introduced to greenhouse and hydroponic technology to increase the spirit and attitude of entrepreneurship in the agricultural sector. Currently, agropreneurship is also one of the popular industrial fields among the community and young people. The FEB UNNES community service team addressed this problem through a mini greenhouse development program at Pondok Pesantren Al Asror. The hope is that students can have practical skills in the agricultural sector that are oriented towards environmental sustainability.

The objectives of this community service activity include improving students' understanding and skills about environmentally friendly agriculture, encouraging the creation of a green and productive Pondok pesantren environment, developing mini greenhouses as a medium for learning and practicing entrepreneurship, and instilling environmental values in Pondok pesantren culture. This community service activity is a continuation of previous community service activities that support efforts to achieve eco-Pondok pesantren, such as maggot cultivation and waste management (Fachrurrozie, Martono, et al., 2024; Fachrurrozie, Widiyanto, et al., 2024; Mukhibad et al., 2025; Nurkhin, Martono, Fachrurrozie, Mukhibad, Kardoyo, et al., 2024; Nurkhin, Martono, Fachrurrozie, Mukhibad, Rohman, et al., 2024).

METHOD

The method of implementing community service activities is training and practicing plant cultivation through mini greenhouses. The training aims to provide students with knowledge about environmentally friendly agriculture, greenhouses, hydroponics, and other relevant topics. The training activities are continued with the construction of mini greenhouses and the practice of cultivating hydroponic vegetables. Community service activities end with monitoring and evaluation. The implementation of these activities is detailed in the following table.

Table 1. Details of Activity Implementation

Activity Stages	Execution time	Output Form
Coordination and location identification	The first week	Determining the location and participants of the activity
Environmentally friendly farming training	Second week	Training modules, training documentation
Mini greenhouse construction	The third week	One mini greenhouse unit was built
Plant cultivation practices	Fourth week until harvest	Horticultural plants in a greenhouse
Monitoring, evaluation, and documentation	The third week is until finished	Activity reports, partner/student testimonials

The community service activity's partner is Pondok Pesantren Al Asror, located in Patemon Gunungpati Village, Semarang City. The partner of the community service activity is an educational institution based in Pondok Pesantren Salafiyah. Cooperation has been established with partners, and this partnership has become a platform for implementing various activities. The role of the partner is to provide the location, participants (students), and to support the sustainability of the program.

The output of community service activities is (1) the construction of a mini greenhouse unit in the Pondok pesantren environment, (2) students skilled in environmentally friendly agricultural techniques, (3) Pondok pesantren-based green farming training modules, and (4) reports and publications of community service activities on social media or campus media. The short-term impact of the activities is that students understand the concept and practice of green farming. In the long term, it is hoped that Pondok Pesantren will be able to manage mini greenhouses independently and become models of sustainable agriculture in Islamic educational environments.

RESULTS

Community service activities have been carried out since April 2025 at Pondok Pesantren Al Asror through several stages, starting with coordinating the community service team and partners, and then monitoring and evaluating the community service activities. Details of the implementation of community service activities are as follows.

Implementation of Environmentally Friendly Agricultural Training

The activity was attended by 15 male students and by the caretaker, KH. Al Mamnuhin Kholid. The service team conveyed the intent and purpose of the activity, then proceeded with a speech and directions from the boarding school's caretaker. The next event was the presentation of material by the service team. The environmentally friendly agricultural training activity was conducted in several sessions that combined

theoretical aspects with practical examples, provided through videos and simulations. This training was designed to provide students with an in-depth understanding of the concept of sustainable agriculture, while also training technical skills that can be applied directly in the boarding school environment. The following are the details of the training activities:

1. Introduction and Basic Understanding Session
   Explanation of the importance of environmentally friendly agriculture in maintaining the sustainability of natural resources. The negative impacts of excessive chemical use in agriculture on health and the environment. Introduction to the basic principles of organic farming, integrated farming systems, and agroecology.
2. Organic Plant Cultivation Techniques
   Land preparation and organic seed selection. Organic vegetable planting techniques (chili, spinach, kale, tomatoes, and others). Natural weed management and plant maintenance.
3. Simple Hydroponics Introduction and Practice
   Basic theory of hydroponics and its benefits for narrow land. Making a simple hydroponic installation (using PVC pipes or used bottles). Planting and caring for hydroponic vegetables such as lettuce, mustard greens, and kale.
4. Introduction to Mini Greenhouse
   a) Basic Greenhouse Concepts: Definition of greenhouse and mini greenhouse, Purpose and benefits of using greenhouse in agriculture, Differences between conventional greenhouse and mini greenhouse.
   b) Mini Greenhouse Functions: Microclimate control (temperature, humidity, light), Plant protection from pests, heavy rain, and strong winds, Extension of the growing season and increase in crop yields, and Efficiency in the use of water and fertilizers.
   c) Mini Greenhouse Components and Structure; Building frame (bamboo, wood, PVC pipe, or light iron), Transparent cover (UV plastic, glass, or polycarbonate), Ventilation system (natural or mechanical), Irrigation system (manual, drip, or mist), Planting table or vertical rack
   d) Types of Plants Suitable for Planting in Mini Greenhouses: Leafy vegetables (lettuce, mustard greens, spinach, kale), Short fruit plants (chili, tomatoes, peppers), Herbal plants (mint, basil), and Plant seeds that need protection.
   e) Cultivation Techniques in Mini Greenhouse; Selection of planting media (organic soil, cocopeat, burnt rice husk mixture), Seeding and transplanting seedlings, Plant care (watering, fertilizing, natural pest control), and Harvesting and post-harvesting
   f) Introduction to Hydroponic Systems in Mini Greenhouses; Basic concepts of hydroponics, Simple systems: wick system, NFT, or DFT, Making small hydroponic installations with recycled materials.
   g) Advantages and Challenges of Mini Greenhouse; Advantages in terms of operational costs and small scale; Challenges: excessive temperature, air circulation, and structural maintenance; Tips for maintaining a mini greenhouse so that it lasts a long time

Figure 1. Community Service Team Delivering Environmentally Friendly Agricultural Training Materials for Students Accompanied by Caretakers of Pondok Pesantren

Figure 2. Students and Community Service Team Build Mini Greenhouse

Mini Greenhouse Construction

A mini greenhouse has been built next to the dormitory, behind the pondok, by involving students and craftsmen from the pondok. Preparation of materials was carried out by the community service team, such as iron frames and nets. Bamboo and other supporting materials were prepared by the pondok. After the mini greenhouse was built, the community service team prepared the growing media for organic vegetables, including PVC pipes and water pumps. The Pondok pesantren provided assistance by preparing supporting media in the mini greenhouse, including wood and other materials. Figures 2 and 3 illustrate the process of building a mini greenhouse, which involves students and craftsmen, alongside the community service team.

Figure 3. A Mini Greenhouse That Has Been Built

Plant Cultivation Practices

The next stage of community service activities involves cultivating vegetables after the mini greenhouse is completed. The hydroponic vegetable plants chosen are red lettuce, kale, and chili. These three plants are considered relatively easy to cultivate, from sowing seeds to transferring them to the planting medium in the greenhouse and maintaining the cultivation of hydroponic vegetable plants. For approximately 2 weeks, the sown seeds showed readiness to be transferred to the hydroponic planting medium in the greenhouse. Figures 4 and 5 illustrate the activity of sowing and transferring vegetable seeds into the planting medium. The community service team, along with the students, attempted to understand the characteristics of vegetable plants and the

properties of the hydroponic planting medium. Nutrients have been prepared in water according to the needs and number of vegetable plants. No less than 300 glasses are used as planting media in the mini greenhouse.

Figure 4. Sowing Practices for Red Lettuce, Water Spinach, and Chili Seeds

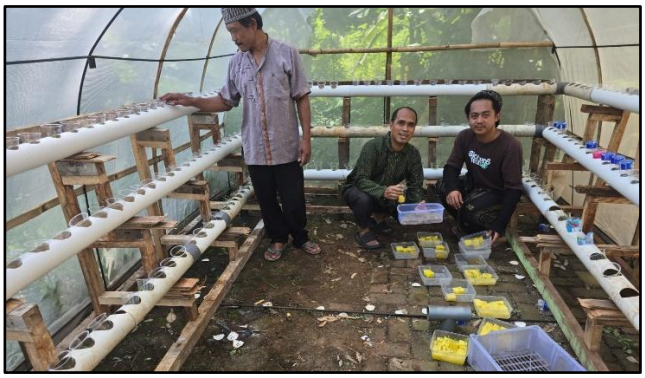

Figure 4. Plant Cultivation Practices by Students in the Mini Greenhouse

Monitoring, Evaluation, and Documentation

The community service team carried out monitoring, evaluation, and documentation activities as the final stage. Monitoring and evaluation were conducted to ensure that the implementation of community service activities progressed smoothly and in accordance with the predetermined plan. The community service team also carried out documentation (photos and videos) to capture the process of each stage of community service implementation. Based on monitoring and evaluation, it was found that the students and caregivers of Pondok Pesantren Al Asror showed great enthusiasm and fully supported the community service activities, enabling the program to run smoothly and effectively. The students were able to follow the training activities well and continue the implementation of the next stages, such as building a mini greenhouse, sowing seeds, and practicing hydroponic vegetable cultivation. The students also did not hesitate to communicate with the community service team to obtain accurate information on the practice of cultivating hydroponic vegetables, which was a new concept. The support of the caregivers at the boarding school was also positive, and they hoped that the community service team could provide full assistance to the students so that the benefits could be felt continuously.

CONCLUSION

This community service activity is conducted through agricultural training and mentoring, utilizing mini greenhouses to enhance farming skills among students at Pondok Pesantren Al Asror in Semarang. This program lasts for five months, from May to September 2025. In the initial stage, training was conducted to introduce the concept of mini greenhouses and their benefits. After that, the students were actively involved in building mini greenhouses within the Pondok Pesantren environment.

The next stage involves plant cultivation practices, starting from seed sowing and planting, through to plant care and harvest time. The community service implementation team continues to provide guidance and assistance, enabling students to manage the mini greenhouse optimally. During the activity, the students showed high enthusiasm and were motivated to utilize the facility. The results obtained from this community

service activity are the increased ability of students to utilize mini-greenhouses for organic vegetable cultivation. Support also came from the boarding school supervisor, who hopes that this program can contribute to improving the students' life skills.

This community service activity is expected not only to increase the capacity of students in the field of environmentally friendly agriculture but also to make a real contribution to the sustainability of pondok pesantren as independent, productive, and environmentally conscious educational institutions. This community service activity is expected to be sustained with broader goals, such as the contribution of pondok pesantren in supporting the campaign to achieve the Sustainable Development Goals (SDGs).

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