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STRATEGY FOR IMPROVING LEMONGRASS AGRICULTURE BASED ON SMART FARMING IN JATIJEJER VILLAGE

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ABSTRACT

Lemongrass (*Cymbopogon citratus*) and citronella (*Cymbopogon nardus* L.) are flagship crops cultivated by farmers in Jatijejer Village. Lemongrass is commonly used as a culinary spice, while citronella is widely utilized for producing essential oil rich in citronellal, geraniol, and citronellol. The essential oil from citronella has high economic value due to its applications in the cosmetics and health industries. This community service activity aims to enhance local farmers' understanding and skills in proper lemongrass cultivation and the potential processing of essential oils as value-added products. The program focuses on strategies to optimize agricultural potential using proper cultivation techniques with organic farming systems based on smart farming technology. Farmers were educated on the stages of lemongrass cultivation, including land preparation, planting, crop maintenance, fertilization, pest and disease control, as well as harvesting and post-harvest handling. Participants were given pre-tests and post-tests to assess their understanding. The test results showed a significant improvement in participants' comprehension of proper lemongrass cultivation using smart farming methods, as well as the benefits and processing of essential oils. This activity successfully raised awareness of the importance of innovation in the agricultural sector and laid the foundation for the development of local businesses based on natural resources.

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INTRODUCTION

One of the villages in Trawas District, Mojokerto Regency, is Jatijejer. This village has around 2,100 people living in three hamlets: Jatijejer Hamlet, Tangkep Hamlet, and Urung-urung Hamlet. Most of the residents work as farmers. Jatijejer Village has great potential in the fields of agriculture and plantations. This village is mountainous with a stable climate and fertile soil. Located on the slopes of Mount Penanggungan and the slopes of Mount Welirang, with an altitude of 700 meters above sea level. With this potential, agriculture and plantations have room for greater growth. Lemongrass (*Cymbopogon citratus*) and citronella (*Cymbopogon nardus* L.) are superior plants cultivated by farmers in Jatijejer Village. One of the main agricultural commodities of the residents is lemongrass. Therefore, this type of seasoning plant will be developed as an educational object. A lemongrass agricultural park will be built on the village land. This educational tour discusses the process of cultivating lemongrass from planting to harvest, as well as its processed products. Lemongrass can not only be used as a seasoning, but can also be used as a health drink and essential oil fragrance (Khasanah et al., 2011; Wifek et al., 2016). It is hoped that the welfare of the population can be improved by increasing the production and economic sectors through the utilization of local potential.

Farmers in Jatijejer Village face challenges in growing lemongrass. One of them is the lack of knowledge and skills of farmers about good and efficient cultivation methods. Therefore, farmers must receive training and support from the local government and related institutions to maximize the potential of local lemongrass cultivation. To market lemongrass products from Jatijejer Village to local and international markets, effective promotion and marketing efforts are needed.

Overall, lemongrass cultivation in Jatijejer Village has promising potential to increase income and economic growth of local communities by utilizing local conditions. It is hoped that lemongrass cultivation in Jatijejer Village will benefit the surrounding community with support from the government and related institutions, as well as effective marketing efforts. Lemongrass has many benefits, including in the pharmaceutical and food industries, so farmers have many choices (Murni & Rustin, 2020). Most of the residents of Jatijejer Village are farmers who are very enthusiastic about working together to build the village. By increasing knowledge and understanding of profitable plant cultivation, village communities are expected to be able to maximize their agricultural potential.

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MATERIAL AND METHOD

Place and Time of Activity

Community service activities are located in Jatijejer Village. The implementation time is Tuesday, July 16, 2024. Participants involved in this community service activity were 30 participants consisting of 10 structural village government personnel, 5 representatives of farmer groups, 5 people from the Family Empowerment and Welfare (PKK) group, 5 people from the Village-Owned Enterprises (BUMDes) group, and 5 community service teams from the University of Surabaya (UBAYA).

Tools and Materials

The tools needed in this training activity are a sound system, an LCD projector, a hoe, a bucket, and gloves. The materials used in this training are lemongrass seeds, citronella seeds, water, and organic fertilizer.

Activity Stages

1. Preparation stage

Before the activity began, the team worked together with the Head of Jatijejer Village to communicate it. The purpose of the activity, participants, form of activity, and targets to be achieved were discussed at the meeting. In addition, efforts were also made to obtain support and permission from the Head of Jatijejer Village regarding the event to be held, such as borrowing a meeting hall for training activities and good lemongrass cultivation practice activities. Coordination was also carried out regarding the training participants who were the targets of the training. In addition, the University of Surabaya community service team coordinated with students to prepare the tools and materials used in the training.

2. Implementation stage

The training activity on good and correct lemongrass cultivation based on smart farming was carried out on July 16, 2024. This activity included delivering material to participants, then continued with training on good lemongrass cultivation practices based on smart farming. Before making the presentation, participants were given a pre-test on good lemongrass cultivation based on smart farming so that the team could determine the level of knowledge of the participants. The socialization material presented included land preparation, lemongrass planting, plant care, fertilization, pest and plant disease control, as well as harvesting and post-harvesting. After providing the material, participants were given training through direct demonstrations on how to cultivate lemongrass properly. The team conducted a direct practical

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demonstration by showing the steps in land preparation, lemongrass planting, plant care, fertilization, pest and plant disease control, as well as harvesting and post-harvesting. Participants were allowed to practice good lemongrass cultivation guided by the Community Service team. At the end of the session, a question-and-answer session was opened and closed with a post-test.

3. Evaluation stage

Evaluation of the level of understanding of participants before and after the presentation of the material and training is carried out by providing a pre-test and post-test (Banuwa & Susanti, 2021). Before starting the activity, participants who have filled in the attendance list are asked to fill out a questionnaire as pre-test data. After the presentation of the material and training is complete, participants are given a questionnaire again with the same questions as the initial questionnaire (pre-test). This data will be used as post-test data. There are 6 questions in the pre-test and post-test related to the material and training on good lemongrass cultivation based on smart farming. Participants are asked to answer "yes" or "no". The level of understanding of participants before and after the activity is assessed by comparing the percentage of "yes" answers in the pre-test and post-test.

Data Analysis

The results of the pre-test and post-test answers from the training participants were analyzed using the Mann-Whitney statistical test to test the differences in knowledge of the training participants before and after the training. P value <0.05 indicates a significant difference, which means that there was a significant increase in knowledge.

RESULT AND DISCUSSION

The implementation of the presentation of materials and training began with a welcoming speech by the Head of Jatijejer Village. The training participants numbered 30 participants consisting of 10 structural village government personnel, 5 representatives of farmer groups, 5 people from the Family Empowerment and Welfare (PKK) group, 5 people from the Village-Owned Enterprises (BUMDes) group, and 5 community service teams from the University of Surabaya (UBAYA). The delivery of socialization materials was carried out communicatively, both through oral and written communication. In addition to using PowerPoint presentations, other delivery methods such as interactive discussions, practical demonstrations, and the use

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of visual materials were also used. This approach aims to make it easier for socialization participants to understand the material presented more effectively.

Analysis of the Results

The analysis of the level of understanding of training participants was measured using the questions in Table 1. The results of the pre-test and post-test are presented in Figure 3. The pre-test results showed that an average of 35% of participants understood good lemongrass cultivation and the benefits of cultivating lemongrass as an essential oil producer. The measurement was carried out by percentageing the answers "Yes" from 25 participants with 6 questions. In question P1, the pre-test results showed that 40% of participants understood aromatic plants. The next question (P2) was about how to make essential oils; 32% of participants understood the conditions that must be considered in cultivating lemongrass. Of the total 25 participants who attended the training, 12 participants (48%) knew how to control pests and diseases without using chemicals (question P3). In the next question, namely the factors considered in determining the location of lemongrass cultivation (question P4), 36% of participants knew about it. Many training participants did not know the importance of preserving lemongrass plants that produce essential oils (question P5) with a percentage of 36% knowing about it. The pre-test results showed that 20% of participants knew examples of the application of smart farming in lemongrass cultivation (question P6).

Figure 1. Smart Farming-based lemongrass cultivation socialization activities

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Figure 2. Participants are involved in good lemongrass cultivation practices

The results of statistical tests on the pre-test and post-test showed a significant difference in the knowledge of the Jatijejer Village Community before and after the training. The test results showed that participants could understand the procedures and importance of lemongrass cultivation.

Table 1. Pre-test dan post-test questions

Question Code	Questions
P1	Do you know the meaning of aromatic plants?
P2	Do you know what conditions need to be considered in cultivating lemongrass?
P3	Do you know how to control pests and diseases in lemongrass plants without using chemicals?
P4	Do you know the factors that must be considered in selecting a location for cultivating lemongrass?
P5	Do you know the importance of preserving lemongrass plants that produce essential oils?
P6	Do you know about the application of smart farming in lemongrass cultivation?

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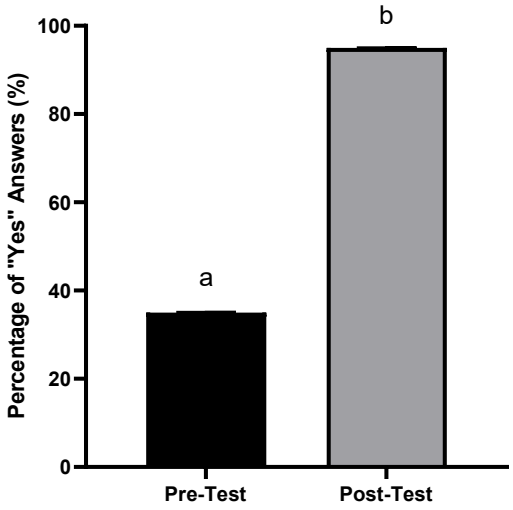

Figure 3. Pre-test and post-test results of training participants

*Data are presented as mean ± standard deviation. Statistical tests using the Mann-Whitney test ($p<0.05$). Differences in letter symbols (a and b) indicate significant differences.

Benefits of Activities

The training program has a positive impact on both individuals and organizations. Training will improve a person's abilities, such as improving skills or expertise (Ariyanto et al., 2023). The positive impact for training participants is knowledge about smart farming-based lemongrass cultivation, so that it can increase the enthusiasm of the community in planting lemongrass in Jatijejer Village.

After the lemongrass cultivation training was carried out, the Jatijejer Village Community could practice good lemongrass cultivation methods. The planting process is carried out at the beginning or end of the rainy season; in this case, it can avoid the watering process because when planting lemongrass plants, water is needed for good growth (Dagar et al., 2013). Lemongrass plants grow well, especially during the rainy season, as consistent soil moisture supports developing a healthy root system. Abundant rainfall ensures that the plants do not suffer from water shortages, allowing for the production of stronger leaves and stems (Tesfaye et al., 2017). The relatively lower temperatures and high humidity during this season also create a climate that is conducive to plant growth (Gawali et al., 2025). In the process of planting lemongrass seeds, soil processing is also considered, with the condition that after 2–3 days of soil processing, the land is ready to be planted with lemongrass seeds. Initially, planting is done by making a hole in the ground with a length of 30 cm, a width of 30 cm, and a depth of 30 cm. In each hole per planting, the ideal distance is 100 cm x 50 cm, so that per hectare

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there is enough for 4,500–5,000 seedlings (Atmaja et al., 2021).

This citronella plant is very important at the maintenance stage to get the best citronella growth results and obtain good oil, even high-quality oil. Citronella plants require care from the beginning of planting to the final maintenance. Citronella plants must go through several processes during their care, such as embroidery, weeding, hilling, and fertilization. There are several requirements for harvesting to get the desired harvest. One of these requirements is the age of the first harvest of citronella plants, which must be between 6 and 7 months and have a sufficient amount of essential oil elements (Billah et al., 2023).

In addition, pest and disease control is an important step in citronella cultivation to ensure healthy growth and optimal yields. Pests and diseases can reduce the quality and quantity of essential oil production. Common pests found in citronella include earthworms that dig into roots and stems, causing serious damage to the root system (Tripathi, 2018). In addition, some aphids and beetles can attack leaves and transmit viral diseases (Shivakumara et al., 2023). Common diseases that attack citronella include fungal diseases (*Fusarium* spp.) that can cause root rot and can be transmitted through the soil, and bacterial diseases that can cause wilting and tissue damage (Rohma & Wahyuni, 2022; Solekha et al., 2024).

This activity is expected to be sustainable to truly provide benefits to the Jatijejer Village Community. The community needs more comprehensive assistance related to lemongrass cultivation, proper processing, to the marketing process so as to improve the economy of the Jatijejer Village Community.

CONCLUSION AND RECOMMENDATION

The understanding of 30 Jatijejer Village training participants regarding the benefits and good methods of cultivating lemongrass based on smart farming, such as planning planting time, use of optimal planting methods, and planting distances, increased from 35% to 95% after socialization and training activities. After this community service activity is completed, assistance is still needed in the form of planting methods, post-harvest processing, production processes, and marketing techniques. This assistance should be touched upon through smart farming technology to increase lemongrass production and have an impact on the economy of Jatijejer Village.

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