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Land Optimization for an Educational Greenhouse Through the Family Welfare Empowerment of Pengatigan Village, Rogojampi District, Banyuwangi

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ABSTRACT

Background : Pengatigan Village aims to repurpose vacant land behind the Village Office into a productive greenhouse, addressing land use challenges and empowering the community through the PKK.
Contribution : The greenhouse will combine sustainable plant cultivation with education and empowerment, enhancing agricultural skills and fostering community development.
Metode : The project involves coordination between village leaders and the PKK, integrating modern agricultural technologies like automated irrigation. Socialization programs will train PKK members in greenhouse operations.
Results : The greenhouse transforms the land into an economic and educational resource, promoting sustainability, community empowerment, and serving as a model for other villages.
Conclusion : The project creates a thriving community greenhouse, boosting local knowledge, economy, and sustainability efforts.

1. Introduction

Pengatigan Village is one of the villages located in Rogojampi District, Banyuwangi Regency, East Java. The village has a population of 5,353 residents and covers an area of 313.741 m², with land use predominantly devoted to agriculture (313.741 Ha) and plantations (39.16 Ha) [1]. Therefore, based on available data, Pengatigan Village has substantial natural resources in the agricultural sector. The predominant agricultural product is rice, with vegetables being the least produced. Currently, vegetables yield approximately 5 tons per hectare, including crops such as tomatoes, chilies, cucumbers, and

others [2]. This aligns with the significance of agriculture as a crucial component of Indonesia's economy, highlighting the necessity for important steps to develop this sector [3] - [8]. Effective land utilization is essential for agricultural development [9] - [12].

A greenhouse is a structure resembling a house that is utilized for plant cultivation [13] - [19]. Its distinguishing features include walls and roofs that allow light penetration [16]. Greenhouses offer several advantages, such as protecting plants, maintaining their quality, and controlling growth schedules [20] - [23]. To support sustainable horticultural cultivation efforts, appropriate technology can be employed, utilizing a drip irrigation system, thereby facilitating the maintenance of these plants [24] - [26]. The advantages of drip irrigation include water conservation, labor and operational cost savings, more efficient fertilizer use, energy savings, and the ability to control plant diseases [22] - [25]. This system is also well-suited for uneven and narrow plots of land [31].

In this context, the village government can act as a facilitator in promoting the development of community farming, particularly in the construction and management of greenhouses. This can be achieved through community organizations, such as the Family Welfare Empowerment organization (PKK) in Pengatigan Village. Consequently, this organization will play a significant role in enhancing the village's economic sector. However, it is noteworthy that the empowerment programs within the PKK are currently lacking. Therefore, to support the educational greenhouse program, it is essential to provide knowledge and skills for its management.

Given these issues, this community service effort is presented under the title "Optimization of Land as an Educational Greenhouse through PKK Empowerment in Pengatigan Village, Rogojampi District". It is envisaged that the installation of this greenhouse would turn space into productive agricultural land. The plants cultivated can include those that are commodities in Pengatigan Village, alongside empowering the PKK in the construction and management of the educational greenhouse in Pengatigan Village.

2. Method

The Land Optimization Program as an Educational Greenhouse through the Empowerment of PKK in Pengatigan Village, Rogojampi District, is expected to serve as a concrete solution to address the partner's challenges. The Pengatigan Village Office is located approximately 4.7 km from the Banyuwangi State Polytechnic campus, as shown in Figure 1. Based on the results of surveys and coordination with the partner, it was found that the partner faces limitations in the production sector, particularly in the utilization of vacant land, as well as management issues related to the lack of empowerment programs within the PKK of Pengatigan Village. The implementation of this community service will be carried out from May to October 2024. To provide an effective solution for the partner, this community service program is implemented using an Integrated Assistance and

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Empowerment Model approach. The flowchart of the community service activities can be seen in Figure 2.

Figure 1. Community Service Location(Source : Google Maps, August, 15th 2024)

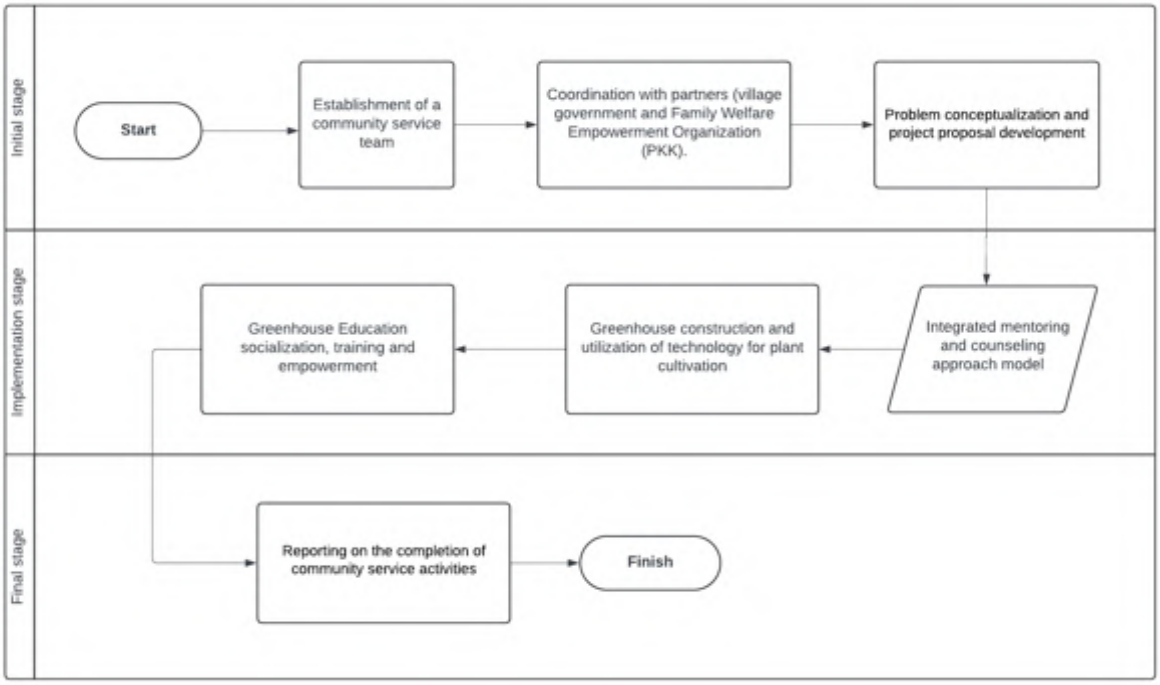

Figure 2. Flowchart of The Community Service

2.1. Initial Stage

The preparation phase includes the formation of the community service team. The distribution of roles and responsibilities among the team members is based on their respective educational backgrounds. Following this, coordination is carried out with the Head of Pengatigan Village and PKK to determine a relevant theme that can benefit the

village. Once the theme is established, the next step is problem formulation and the drafting of a community service proposal.

At this stage, the activities are carried out using the Integrated Assistance and Empowerment Model approach, which is divided into four phases, which consists of:

a. Constructing an educational greenhouse in partnership with the partner and utilization of the technology for plant cultivation
   - Land clearing phase
   - Land leveling phase
   - Phase of preparing tools and materials
   - Greenhouse construction phase

   After the greenhouse installation, which takes one week, the next step is the application of appropriate technology to support plant cultivation, specifically through a drip irrigation system. Drip irrigation is a method that utilizes a network of water flow with the aid of gravity. As one of the latest innovations in the irrigation industry, this method is now widely used in various locations [32].

b. Socializing the educational greenhouse to the partner
   The outreach program's participants were village officials and members of Family Welfare Empowerment (PKK) in Pengatigan Village.
c. Training and empowerment for the partner

Training and empowerment focused on chili cultivation with drip irrigation system was carried out for one day. The cultivation materials covered the process from selecting seeds for planting to the harvesting stage.

2.2. Final Stage

The final stage of this activity is reporting the results of the community service program. In this context, a report can contain a summary of the key takeaways from the project, reinforcing its overall impact and success. This section also emphasizes the value of the community service program in contributing to the well-being and development of the target community

3. Results and Discussion

3.1. Greenhouse Construction

In the initial phase of the community service project, a site survey and land measurement were conducted for the location designated for the greenhouse. The survey aimed to determine the precise location and position of the greenhouse to be constructed, Figure 3. shows the survey implementation. The dimensions were determined based on the availability of sufficient land area. This stage faced difficulties due to uneven land terrain, which made it challenging to determine the exact location for the greenhouse. The uneven

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surface required careful measurement and re-evaluation of the land's suitability. The team performed multiple measurements and adjusted the greenhouse's planned dimensions accordingly to ensure it would fit within the available land area. Based on the measurements, a greenhouse with a width of 3 meters, a length of 5 meters, and a height of 3 meters was planned.

Figure 3. Survey implementation

Based on field measurements, a greenhouse model was designed. In addition to considering the available land area, the design also took into account the requests of our partners. The greenhouse is designed to be semi-permanent, using bamboo as the main material, and covered with UV plastic to prevent direct sunlight and maintain stable conditions inside the greenhouse. The design process utilized the 3D SketchUp software to facilitate visualization of the three-dimensional model. The more detailed greenhouse design process can be seen in Figure 4, while Figure 5 illustrates the greenhouse blueprints.

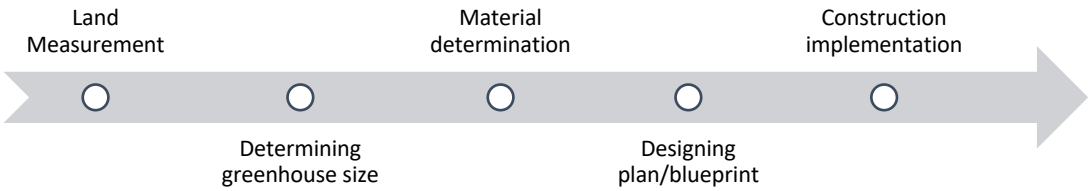

Figure 4. Greenhouse design process

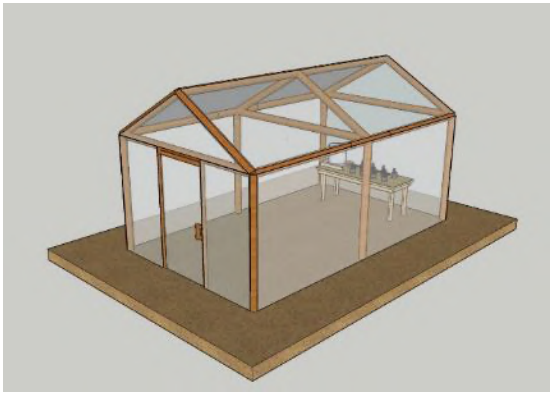

Figure 5. Greenhouse blueprints.

Subsequently, a discussion and review of the greenhouse design were conducted based on the proposed model. The discussion and review were carried out in collaboration with the partner, in this case, the Head of Pengatigan Village. Based on the partner's review, the greenhouse model was approved. Figure 6 shows the discussion process for greenhouse plan design.

Figure 6. The discussion process for greenhouse plan design.

The construction of the greenhouse was carried out directly at the designated location, as shown in Figure 7. The greenhouse was designed following a gable structure type, or saddle roof model. It was divided into two sections: one for preparation and the other for plant care, designed without partitions to optimize movement within the greenhouse. The construction process began with the installation of the main greenhouse framework. The main frames were connected using nails and reinforced with wire bindings. Additional frames were added to further strengthen the primary structure. After all the frames were in place, UV plastic was installed, which also serves as both the walls and roof of the greenhouse. While the greenhouse building can be seen in Figure 8.

Figure 7. Greenhouse construction process.

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Figure 8. Greenhouse

The next step was the installation of the drip irrigation system. To support the operation of the drip irrigation system, a water storage container and plant racks were required. The drip irrigation system was chosen for the greenhouse due to its significant benefits in promoting sustainable water usage and efficient plant care. This irrigation method delivers water directly to the plant roots through a network of tubing and emitters, ensuring that water is applied precisely where it's needed. An illustration of the drip irrigation system used in this greenhouse can be seen in Figure 9.

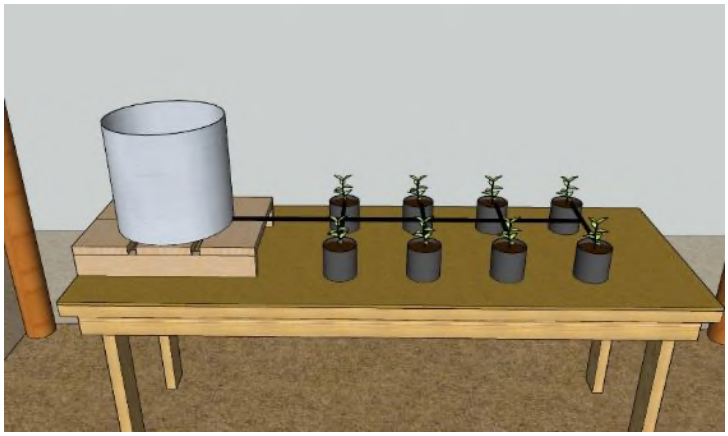

Figure 9. Drip irrigation system

3.2. Socializing the educational greenhouse

After the construction of the greenhouse and the preparation of the necessary facilities for cultivation, the next step is to conduct socialization. This aims to enhance the community's knowledge, particularly among the members of the PKK in Pengatigan Village, regarding the greenhouse through socialization activities. Furthermore, this also ensures that new agricultural technologies and practices can be accepted and implemented effectively by the community. The activities conducted during the socialization can be observed in Figure 9. The resources given to the participants included:

- Introduction to greenhouses

- Introduction to educational tourism
- Benefits of educational greenhouses

Figure 10. Socializing the educational greenhouse

3.3. Training and empowerment

The training and empowerment of the PKK members in Pengatigan Village was conducted following a socialization session related to greenhouses. In this context, the training focused on the cultivation of crops, particularly chili plants. The preparatory material provided before field practice included several stages, starting from seed sowing and seedling preparation, cultivation, maintenance of chili plants, and ending with the harvesting of chili plants. Figures 9-10 show the implementation of the training. The results indicate that the participants demonstrated a high level of enthusiasm, as evidenced by their active engagement during the discussion sessions with the speakers.

This training is expected to have significant long-term impacts on the community. First, it promotes the sustainable use of greenhouses by equipping PKK members with the skills needed to maintain and operate them effectively, ensuring that the greenhouse remains productive for years. Secondly, the program will enhance the agricultural skills of PKK members, making them more capable of growing a variety of crops efficiently, which can lead to increased local food production and income generation. Finally, the project holds future tourism potential, as the greenhouse, with its emphasis on sustainable agriculture, could serve as an educational and eco-tourism hub, attracting visitors interested in learning about modern farming techniques and promoting the village as a model for sustainable agriculture.

Furthermore, monitoring and evaluation aim to assess the extent of success in the implementation of the community service program. Additionally, it seeks to identify any challenges or obstacles that may hinder the smooth execution of the program, ensuring it remains beneficial for the Family Welfare Empowerment (PKK) of Pengatigan Village.

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Figure 11. The question-and-answer session

Figure 12. The implementation of chili plant cultivation practice.

4. Conclusion

The land optimization program for an educational greenhouse in Pengatigan Village, which involved the empowerment of PKK members, was successfully implemented. The program aimed to enhance the use of vacant land by introducing modern agricultural technologies, including the construction of a greenhouse equipped with a drip irrigation system. Key activities included building the greenhouse, socializing its purpose, and providing training on chili plant cultivation for PKK members.The program's outcomes were highly positive, with participants showing strong enthusiasm, particularly during discussions and hands-on field activities. The training not only increased knowledge and skills in sustainable agriculture but also empowered PKK members to take an active role in the village's development. In the long term, the program is expected to bring significant benefits to the community, particularly by boosting the local economy through sustainable agriculture. The establishment of the greenhouse also holds potential for developing agricultural-based educational tourism, attracting visitors interested in learning about sustainable farming practices.The success of this program could serve as a model for other villages facing similar challenges, promoting both community empowerment and economic growth. To ensure continued success, future steps could include additional

training sessions, community-led management of the greenhouse, and regular monitoring of its productivity.

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