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Establishing A Greenhouse For Melon Cultivation: A Community Service Program To A Farmer Group In Lamongan Jawa Timur

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ABSTRACT

The demand for fresh and high-quality melon has been steadily growing over the years. Certainly, supply chain challenges significantly impact farmers' ability to produce and distribute their products efficiently for some reasons. Moreover, melon crops are vulnerable to changes in weather and climate. Support in the form of climate-resilient farming practices, weather forecasting, and access to drought-resistant or heat-tolerant varieties can help farmers mitigate risks. Hence, melon farmers, like farmers of any other crop, require support for various reasons due challenging industry, and farmers often face a range of factors that can impact their performance. This article aims to explore how a community service program support a farmer group in Lamongan Jawa Timur by establishing a greenhouse for melon cultivation. The primary focus of a community development report is to document the planning, implementation, progress, and outcomes of a specific community development program. Data collection for a community development report involves qualitative approaches such as surveys, interviews, focus groups, and observations. The method follows the sequential step: The initial step is gathering information about the community's needs, challenges, and aspirations by conducting online interviews, and offline focus group discussion to understand the specific areas that require improvement. The second step is stakeholder mapping, which includes community members, local leaders, local university partners, and local business partners who have a vested interest in the program. The third step entails assessing potential risks and challenges that could hinder the development process. This includes identifying economic, social, environmental, or cultural risks. Based on the information gathered in the previous steps, the design of the community development program was to set clear goals, objectives, strategies, and action plans by tailoring to address the specific needs and circumstances of the community. Last, putting the program into action involves executing the strategies and action plans outlined in the program design, which includes organizing workshops, training sessions, and infrastructure development. The results show that community development is a dynamic and iterative process. Flexibility and adaptability are key qualities as the situation on the ground may change, and new insights may emerge. Additionally, involving the community at every stage of the process fosters ownership, empowerment, and sustainability of the development initiatives.

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1. Introduction

Melon is a popular and refreshing fruit in Jawa Timur Indonesia. Melon is a popular and refreshing fruit in Jawa Timur Indonesia. Selling the watermelons on the roadside is a common practice among Indonesian farmers to directly connect with consumers and earn income. The case includes farmers in East Java after having a watermelon harvest, especially during the dry season. However, drought conditions can pose challenges for melon production, making it important for farmers to adapt and find ways to Xu sustain their livelihoods (Pratono et al., 2020; Ulrich et al., 2022).

The demand for fresh and high-quality melon has been steadily growing over the years. As people become more health-conscious, they are seeking out nutritious and hydrating foods. Watermelon is not only delicious but also has a high-water content, making it a refreshing choice for hydration. Moreover, Watermelon is low in calories and a good source of vitamins, especially vitamin C and vitamin A. It also contains antioxidants like lycopene, which is associated with various health benefits, including heart health and potential anti-cancer properties.

With the growing emphasis on staying hydrated, melon's high-water content (over 90% of its weight) makes it an appealing option, especially in warm climates or during the summer months (Jiang et al., 2022). Watermelon is not only enjoyed on its own but can also be incorporated into various dishes, both sweet and savory. It's used in salads, smoothies, salsas, and even cocktails. Chefs and food enthusiasts are experimenting with watermelon in innovative ways, including pickling, grilling, and blending into soups. This culinary creativity is sparking interest in watermelon.

Certainly, supply chain challenges significantly impact farmers' ability to produce and distribute their products efficiently for some reasons. First, melon has seasonal production cycles, which can lead to imbalances in supply and demand. Farmers need to manage their harvests to meet market demands without oversupplying or undersupplying. The limited seasonal availability of watermelon in some regions creates anticipation and demand during peak harvest times, making it a seasonal treat.

Connecting farmers to markets can be challenging. Support in terms of market information, transportation logistics, and access to local and international markets can help farmers sell their produce at fair prices. In some cases, intermediaries between farmers and consumers hold more information about market dynamics, giving them more bargaining power. This can lead to unfair prices for farmers (Oh, 2022).

Secondly, ensuring consistent quality across different batches of melons is quite challenging due to variations in factors like size, ripeness, and flavor. Quality control measures must be in place to meet consumer expectations. Meeting quality standards required for domestic and international markets become a challenging issue among the farmers. Inconsistent quality leads to rejected shipments, financial losses, and reputational damage. Melons are perishable and have a limited shelf life. Maintaining their freshness and quality during transportation and storage is crucial to prevent spoilage and waste.

Melon crops in Lamongan are vulnerable to changes in weather and climate. Melon crops can be susceptible to various pests and diseases. Farmers might need support in terms of integrated pest management strategies, pest-resistant varieties, and access to safe and effective pesticides. Supporting in the form of climate-resilient farming practices, weather forecasting, and access to drought-resistant or heat-tolerant varieties can help farmers mitigate risks (Xu et al, 2022).

Thirdly, the agriculture system calls for sustainability in which the three pillars of sustainability, often referred to as the Triple Bottom Line, are social, environmental, and economic sustainability. These pillars represent the interconnected aspects that need to be balanced for achieving long-term sustainable development. Each pillar addresses a distinct dimension of sustainability and contributes to holistic and responsible decision-making.

Figure 1. Germination and transplanting

Research institutions and extension services can provide farmers with valuable information on melon crop management, disease prevention, and new varieties. Support in terms of research-backed recommendations can lead to improved yields and quality (Kuczyńska et al., 2022). Farming practices are constantly evolving. Farmers might need support in terms of training and education to stay updated on the latest techniques, technologies, and best practices for melon cultivation. This can help them improve yields, quality, and sustainability.

This article aims to explore how a community service program supports melon farmers by providing them with the necessary tools, resources, and knowledge to improve their

melon cultivation practices and overall profitability. The primary focus of a community development report is to document the planning, implementation, progress, and outcomes of a specific community development program or project. This report showcases how the program has contributed to positive changes within the community.

2. Method

Community development programs typically follow a structured methodology to address the needs and aspirations of a community, enhance its well-being, and promote sustainable growth (Pratono & Wong, 2019). A structured methodology ensures that community development programs are well-planned, evidence-based, inclusive, and focused on creating sustainable improvements. Here is an outline of the methodology for a community development program:

2.1. Need assessment.

The method of implementing community service activities describes the steps and implementation stages of the previously planned solutions (Pratono et al., 2019). The first step is conducting a need assessment for melon farmers involving gathering information about their specific challenges, requirements, and aspirations. We interview the key stakeholders, who are the farmer community and the local leader. This assessment helps tailor support and interventions to meet their needs effectively.

The idea to help the farmer community came from a series of discussion on a social media. It began with the third author who participated in online agricultural groups, forums, and communities on Facebook followed by WhatsApp Group. The third author invited the rest of the authors to engage in discussions and sought advice from experienced growers and greenhouse enthusiasts. The intense discussion brought the idea to apply for community service grands from the Ministry of Education, Cultural, Research and Technology.

2.2. Stakeholder mapping

The offline first focus group discussion took place in July 2023 to identify suitable spaces for planting fruit trees in targeted environments. However, the farmers still focused on sugarcane plantation, which was about to be ready for harvest. Harvesting was typically done using specialized machines that cut the stalks close to the ground. Hence, we noticed that the melon cultivation would be in an area where sugarcane had just been harvested, but there were several factors to consider before doing so, such as soil preparation, crop rotation benefits, disease management, and weed control.

We noticed the middlemen and companies that purchase the harvest from melon farmers and then sell the produce to supermarkets are crucial stakeholders in the agricultural supply chain. These intermediaries purchase large quantities of melons from farmers and then distribute them to retailers, supermarkets, and other buyers. They often have established networks and logistics to efficiently move produce from farms to various markets.

Some companies specialize in supplying supermarkets with fresh produce, including melons. They ensure that supermarkets have a consistent supply of quality melons to meet consumer demand. These companies buy melons from farmers, process them (clean, sort, package), and then sell the processed produce to supermarkets and retailers. These companies have years of experience in the agriculture and food industry. They have established relationships with farmers, growers, and distributors, allowing them to source fresh melons efficiently.

2.3. Identifying risk and various solutions

Following the need assessment, we decided to adopt a greenhouse system, which allowed the local farmers to get involved. In this step, we began with visiting the greenhouse at different villages. The ninth author focused on managing soil quality and fertilization. She proposed to adopt the container gardening model by arguing that melon varieties were ideal as they would fit well in pots and had manageable growth. Hence, the third and fourth author concern to enhance the water pump automatization.

The proposal entails a comprehensive plan that outlines the objectives, strategies, activities, timelines, and resources needed for the program. We define achievable goals in which the program should be accomplished by November 2023. The proposal contains the identified challenges and leverages the community's strengths. We calculated the size of the greenhouse based on farmers' production needs and available space, which are 6x15. We also consider factors like crop rotation, aisles, and workspace.

2.4. Program design

Building and equipping a greenhouse requires a significant upfront investment in materials, technology, infrastructure, and labor. Securing funding for this initial cost can be a challenge for many farmers, particularly small-scale ones. Hence, this project allows resource sharing between farmers and the donor.

At this step, we decided to build a greenhouse from bamboo, which was expected to be a cost-effective option compared to using traditional materials like steel or aluminum. We believe that bamboo was a versatile and renewable resource that can provide a sturdy framework for a greenhouse. Hence, it is important to balance the cost savings with the long-term durability and functionality you need for your specific growing requirements.

We decided to adopt automatic drip irrigation systems. Automatic drip irrigation is a method of watering plants by delivering water directly to the root zone of each plant through a network of tubing, pipes, and emitters. The water source comes from a municipal water supply to have consistent water pressure to ensure proper functioning of the system.

2.5. Project implementation

Putting the program into action involves executing the strategies and action plans outlined in the program design. This might include organizing workshops, training sessions, infrastructure development, community engagement activities, and more. Regular monitoring and evaluation

during implementation help track progress and make necessary adjustments.

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Building an automatic drip irrigation system involves a few key steps. Drip irrigation is a water-efficient method that delivers water directly to the root zone of plants, minimizing water wastage. An automatic drip irrigation system is designed to deliver water directly to the root zone of plants in a controlled and efficient manner. It uses a network of tubing, emitters (drippers), valves, and a controller (timer) to automate the irrigation process.

Establishing an automatic drip irrigation system involves careful planning, selecting the right components, and proper installation. First, the team determined the area to irrigate and the layout of plants. The farmers considered factors like plant spacing, water requirements, and terrain. Hence, the local partners calculated water flow and pressure requirements based on the number of plants, emitters, and elevation changes. The team planned the location of the water source (faucet, water tank, etc.) and the mainline.

In August 2023, the team purchased the necessary components, including mainline tubing, lateral lines, emitters (drippers), connectors, stakes, filters, pressure regulators, a controller/timer, and any additional fittings. Hence, the local farmers began to install the water source by connecting the irrigation system to a water source using a backflow preventer and a pressure regulator.

The next step was to install emitters (drippers) by inserting emitters into the lateral lines at the desired spacing, ensuring they are close to the base of each plant. We used a hole punch or insertion tool to create holes in the lateral tubing for the emitters.

Attaching fittings and connectors use tees, elbows, and other fittings as needed to create a network of tubing that delivers water to all plants. Hence, the farmers installed filters by attaching a filter to the system to prevent debris and particles from clogging the emitters. Filters are typically installed upstream of the mainline. Next step is installing a controller to automate the system. We just needed to follow the manufacturer's instructions for installation and programming.

Figure 2. Testing the automatic drip irrigation system

Last step was testing the system. After turning on the water supply and test the system for leaks, proper water flow, and emitter functionality, the team adjusted as needed to ensure even water distribution and coverage. Hence, they covered the tubing and emitters with mulch or soil to protect them from sunlight and minimize evaporation. The farmers need to program the controller/timer turned the system on and off according to the water needs of your plants. We encouraged the farmers to regularly monitor the system for clogs, leaks, and proper functioning.

2.5. Planting melons in a greenhouse

Planting melons in a greenhouse requires careful planning and attention to create an optimal growing environment. Greenhouses allow for an extended growing season, enabling farmers to start planting earlier in the spring and continue growing later into the fall. This can result in multiple harvests per year.

First, we selected Cucumis melon var. Inthanon variety that is suitable for greenhouse cultivation. Cucumis melo var. inthanon, commonly known as Inthanon melon, is a specific variety of melon. "Cucumis melo" is the scientific name for the melon species that includes a wide range of melon types, including cantaloupe, honeydew, and other variations. The "var. inthanon" indicates a particular cultivar or variety within the species.

Figure 3. The transplanting process

Secondly, the farmers cleaned the greenhouse thoroughly to prevent the spread of pests and diseases by ensuring proper ventilation, temperature control, and humidity management within the greenhouse. The local partner also made sure to use well-draining and nutrient-rich soil mix. Melons prefer slightly acidic to neutral soil with a pH around 6.0 to 7.0. The preparation incorporated organic matter like compost to improve soil structure and fertility.

The next step is the germination and transplanting process, which marks the beginning of a plant's life cycle and involves the activation of the dormant embryo within the seed. Germination is triggered by favorable environmental conditions, primarily water, oxygen, and appropriate temperature. We started melon seeds indoors in trays or pots a few weeks before the desired planting date and transplanted seedlings into the greenhouse when they have at least two true leaves and the threat of frost has passed.

Farmers started melon seeds indoors in trays or pots a few weeks before the desired planting date. They used a well-draining seed-starting mix and kept the trays in a warm and well-lit location or used supplemental lighting if needed. Before transplanting, farmers gradually acclimate the seedlings to outdoor conditions. This process is known as hardening off. Gradually expose the seedlings to increasing amounts of sunlight and outdoor temperatures over a period of several days to a week.

The next step is planting seedlings. Plant seedlings are young plants that have been grown from seeds to a stage where they have developed roots, stems, and leaves. Seedlings were grown in a controlled environment, such as a nursery or greenhouse, before being transplanted into their final growing location, whether it's a garden, field, or greenhouse. Hence, farmers planted seedlings at the same depth they were growing in their containers.

The farmers began to set up an automatic drip irrigation system to ensure consistent and efficient watering. Melons need regular, even moisture. Ensuring that an automatic drip irrigation system works properly requires regular monitoring, maintenance, and attention to various factors to avoid overwatering, which can lead to disease issues (Rodríguez et al., 2022). The activities include routinely inspecting the entire system, including emitters, tubing, filters, valves, and connections, for any signs of damage, clogs, or leaks.

One of the main mechanisms of automatic drip fertigation is tailoring the water and nutrient needs of crops by enhancing root characteristics. This approach focuses on optimizing the delivery of water and nutrients directly to the root zone, which can lead to more efficient and effective nutrient uptake and plant growth. Hence, it is essentially to observe the water flow from the emitters. Uneven or reduced flow might indicate clogs or pressure issues that need to be addressed. As plants grow, farmers need to adjust the spacing and number of emitters around each plant to match their changing water requirements. Regularly review and adjust the programming of the controller to match the water needs of your plants and changing weather conditions (Jiang et al., 2022).

3. Result and Discussion

3.1. The Greenhouse system

Greenhouses provide several solutions to farmers by creating controlled and optimized environments for plant growth. These controlled environments offer various benefits that can address challenges faced in traditional open-field farming. First, greenhouses allow farmers to extend the growing season by creating a sheltered environment that protects plants from adverse weather conditions, such as frost, extreme temperatures, and heavy rain.

Secondly, the greenhouse enables precise control over temperature, humidity, and light, allowing farmers to create optimal conditions for various crops regardless of external weather fluctuations. This control enhances plant growth, leading to higher yields and improved quality. Thirdly, greenhouses act as a physical barrier between plants and pests, reducing the need for chemical pesticides. Additionally, controlled environments limit the spread of diseases, as pathogens have limited access to the enclosed space. In addition, Greenhouses often incorporate advanced irrigation systems that allow farmers to use water more efficiently. Drip irrigation, hydroponics, and other methods reduce water wastage and help conserve this valuable resource.

Creating a self-sustaining ecosystem within a greenhouse presents challenges related to maintaining the balance of various organisms and environmental factors. This could involve incorporating plants, animals, and microorganisms to create a complete ecosystem. Effective greenhouse management requires a good understanding of climate control, irrigation systems, pest and disease management, and other specialized practices. Farmers may need training to learn these new skills.

Secondly, building and setting up a greenhouse requires a significant upfront investment in infrastructure, materials, equipment, and technology. This financial barrier can be a challenge, especially for small-scale farmers or those with limited access to credit. Hence, farmers need to consider whether the market demand for greenhouse-grown produce justifies the investment. Overproduction or lack of demand can lead to financial losses.

Thirdly, greenhouses require consistent maintenance to ensure proper functioning. This includes monitoring and adjusting temperature, humidity, ventilation, and irrigation systems. Farmers need to commit time and effort to daily operations. Greenhouse suitability depends on the local climate. In extremely hot or cold climates, maintaining the desired internal temperature can be challenging and may require additional investment in climate control systems.

Future program should modernize the intelligent drip fertigation by advancing irrigation and fertilization technique that combines drip irrigation with precise and automated nutrient application, often using technology-driven systems. intelligent drip fertigation. The advanced technology can provide real-time data and analysis, allowing for more precise control over water and nutrient delivery. This leads to greater efficiency in resource usage, reducing water and fertilizer wastage. However, a feasibility study for new technology is essential to assess the viability, potential benefits, risks, and challenges associated with adopting and implementing that technology.

3.2. Measuring the impact

On the contrary, measuring the social impact of community development programs and social enterprises is indeed a complex and challenging task due to various factors. The nature of social impact involves multifaceted outcomes that extend beyond simple financial metrics. Different stakeholders have varying expectations and interpretations of social impact. It can be challenging to capture and integrate the diverse perspectives of beneficiaries, funders, communities, and other stakeholders (Pratono et al., 2023).

The challenge of attributing changes in social outcomes solely to a specific program, especially when considering long-term impacts, is often referred to as the "attribution problem" in social impact measurement. This challenge arises

because social outcomes are influenced by a multitude of factors, both internal and external to the program, making it difficult to isolate the program's direct contribution to observed changes (Chakma et al., 2022).

Social outcomes are influenced by a multitude of external factors beyond the control of a specific program. These external factors can include economic trends, government policies, cultural shifts, and natural disasters. It's challenging to isolate the impact of a program from these external influences. In some cases, it may be unethical or impractical to create control groups for program evaluation. For instance, it's unethical to deny potentially life-saving medical treatment to a group of individuals for the sake of a control group (Oei & Pratono, 2021).

4. Conclusion

Greenhouses provide a controlled environment where factors like temperature, humidity, and light can be adjusted to suit the specific needs of melon plants. Creating an optimal growing environment can result in healthier plants and higher yields. Environmental and social responsible practices across all stages of a product's lifecycle occur from raw material extraction to production, distribution, consumption, and disposal. This approach considers the impact of a product or service on the environment, society, and stakeholders throughout its entire journey, regardless of geographic location. Collaboration with suppliers, partners, and stakeholders to align them with the sustainability initiative is not overnight movement. The engagement process in dialogue, share goals, and jointly develop strategies for sustainable practices is a long journey and high-risk activities.

This article reports a community service activity for melon farmers by supporting them to establish a greenhouse. The activities still focused on planting Cucumis melo var. Inthanon variety. Future studies should explore a harvest system that allows the farmers to gain benefit from the supply chain. When farmers see direct benefits from the supply chain, they are motivated to focus on producing high-quality crops. This can lead to improved agricultural practices, better crop management, and increased yields.

A harvest system that benefits farmers encourages them to adopt sustainable farming practices. They are more likely to invest in practices that promote soil health, water conservation, and reduced chemical use when they see a direct link between their efforts and financial returns. Empowering farmers with benefits from the supply chain can have positive effects on rural economies. It helps create economic opportunities, reduce rural poverty, and improve the overall well-being of farming communities.

Future community service has an opportunity to adopt another intelligent drip fertigation. The technology-driven systems can tailor irrigation and nutrient application based on plant growth stages, weather conditions, and soil moisture levels. This optimization promotes healthier plant growth, better yield, and improved crop quality. Hence, a feasibility study for new technology is essential to assess the viability, potential benefits, risks, and challenges associated with adopting and implementing that technology. It provides valuable insights to help stakeholders make informed decisions about whether to proceed with the technology development and deployment.

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