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Training on Vegetable Cultivation Using the Hydroponic Method to Increase Household Income in Timbuseng Village

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Abstrak

The limited availability of land, low financial capacity, and minimal agricultural investment are significant challenges faced by young farmers. In response, hydroponic vegetable cultivation presents an innovative and efficient solution, allowing crops to be grown without requiring large areas of land or substantial capital. This method is particularly advantageous for urban and semi-urban communities where space constraints limit traditional farming practices. This community service program aims to enhance household income by promoting simple hydroponic vegetable farming as a sustainable agricultural practice. The implementation method consists of structured training and practical application, where participants learn fundamental hydroponic concepts, including seed sowing, nutrient management, and plant maintenance. Through hands-on experience, participants gain the necessary skills to establish and manage small-scale hydroponic systems in their home environments. The results of the program show a positive response from the community, with many participants successfully applying their newly acquired knowledge to start home-based hydroponic vegetable cultivation. This initiative contributes to household food security while also creating opportunities for additional income generation. By efficiently utilizing available space, community members can produce fresh vegetables for both personal consumption and local markets, supporting economic resilience and sustainable agricultural development.

Keywords: hydroponics, vegetables, training

1. Introduction

The rapid growth of the population has led to an increasing demand for food, particularly vegetables and fruits. However, this rising demand is not matched by the availability of agricultural land, which continues to decline, especially in urban areas. This poses a significant challenge in ensuring food security. In response to this issue, hydroponics—an innovative method of soilless farming—offers an efficient and environmentally friendly solution for agricultural production in limited spaces.

The agricultural sector, like many other industries, has undergone significant advancements, including the development of hydroponic farming. Hydroponics is a cultivation technique that uses alternative growing media such as water, gravel, sand, or other materials instead of soil (Zahra et al., 2023). This technique provides a sustainable solution to land scarcity and changing environmental conditions (Izzuddin, 2016). Moreover, hydroponic farming can serve as an educational tool for modern agriculture, promoting clean and healthy agricultural practices from an early age (Wijaya et al., 2021).

One of the key advantages of hydroponic farming is its efficiency. It requires less labor, is more hygienic, and has lower operational costs compared to traditional farming methods. Additionally, hydroponics allows for food production in small spaces with minimal water usage, reduced fertilizer dependency, and decreased environmental

pollution. Vegetables such as lettuce, spinach, and kale are commonly grown using hydroponic techniques due to their adaptability to controlled environments (Mahardika & Hasanah, 2020).

Beyond its environmental benefits, hydroponics also creates economic opportunities, especially for households. By utilizing small spaces such as home yards or rooftops, families can produce fresh vegetables for personal consumption or commercial sale. Despite its potential, many people remain unaware of the practical techniques of hydroponic farming or its economic benefits. Limited knowledge of simple technology, suitable plant varieties, and effective marketing strategies are among the key barriers preventing households from adopting hydroponic cultivation.

To address this gap, community training programs play a crucial role in introducing and promoting hydroponic farming. Such programs provide both theoretical knowledge and hands-on experience, enabling participants to implement hydroponic techniques independently and sustainably. The training not only contributes to household income generation but also strengthens food security at the community level.

Community service activities, as part of academic contributions, aim to advance knowledge, educate society, and improve overall well-being through the application of science and technology (Syaifullah et al., 2019). By implementing hydroponic training, this program seeks to empower communities with sustainable agricultural skills, helping them maximize the potential of small-scale farming in limited spaces.

2. Research Methods

This community service activity is carried out through training and mentoring on vegetable cultivation using hydroponic techniques. The target of this PKM activity is the Timbuseng village community, Gowa Regency, totaling 25 people who also act as PKM partners. The stages of the activity consist of four stages, namely: (1) preparation stage, (2) training stage, (3) mentoring stage and (4) evaluation stage. The preparation stage includes the location observation stage, interviews, permits and preparation of training materials, tools and materials. At the observation stage, a situation analysis is carried out in the form of a survey to the partner's location to find out the conditions there. The solution offered to partners is in the form of training and mentoring on plant cultivation using the hydroponic system. The next stage is training on the hydroponic system that is implemented. The training stage is in the form of providing material on the hydroponic system by the PKM team. The third stage is mentoring on the practice of cultivating plants with hydroponics carried out by the Timbuseng village community. Mentoring activities are carried out for about a month because they wait until the hydroponic vegetables grow. The last stage is evaluation. Evaluation is carried out on PKM activities starting from preparation, during the implementation process until the end of the activity.

3. Results and Discussion

The implementation of the community service program in Timbuseng Village began with a theoretical session where participants were introduced to basic hydroponic knowledge. The topics covered included an introduction to hydroponic planting media, different hydroponic systems, and fundamental concepts of hydroponic nutrition. This session aimed to provide a foundational understanding before engaging in hands-on training. To assess the participants' comprehension, the team conducted an interactive discussion and question-answer session. This approach helped identify knowledge gaps and allowed the team to clarify key concepts before moving to practical implementation. Following the theoretical session, the program transitioned into practical training, focusing on step-by-step hydroponic vegetable cultivation. Participants were guided through the process, starting with equipment preparation. The required materials included hydroponic containers such as PVC pipes or hydroponic trays, a water pump and timer for circulation systems, net pots, and suitable planting media. The importance of each component was explained, highlighting their role in ensuring successful hydroponic farming.

The next stage involved preparing the nutrient solution, a crucial factor in hydroponic farming. Participants learned how to measure the correct nutrient concentration using an EC/TDS meter and adjust the pH level using a pH meter. The session emphasized maintaining optimal nutrient balance to promote healthy plant growth. Participants were given hands-on experience in mixing and adjusting nutrient solutions according to plant needs. After preparing the nutrient solution, participants were introduced to proper planting techniques. The process began with seed sowing, where they used moistened rockwool as a growing medium. Seeds were placed in rockwool and kept in a dark place until germination. Once the seedlings reached an appropriate stage, they were transplanted into the hydroponic system, usually after two to three weeks. Participants learned the significance of monitoring seedling growth to ensure successful transplantation.

Plant maintenance was a key aspect of the training, covering essential practices such as monitoring water pH and nutrient levels, ensuring system cleanliness, and providing sufficient light exposure. Participants were encouraged to check their plants regularly and adjust nutrient solutions when necessary. The training also covered the importance of adequate lighting, whether from natural sunlight or artificial grow lights, to support optimal plant development. Pest and disease management in hydroponic farming was another critical component discussed. Participants were introduced to organic control methods such as using neem oil or natural predators to manage pests. Additionally, they were taught pruning techniques to encourage healthy plant growth and maximize yield. Proper maintenance and disease control methods were emphasized to ensure sustainable hydroponic farming.

The final stage of the training focused on harvesting techniques. Participants learned that hydroponic vegetables can typically be harvested within three to six weeks after transplanting, depending on the crop type. The training emphasized proper handling during harvest to maintain the quality and freshness of the produce. Participants were excited to see the progress of their cultivated plants, demonstrating a strong understanding of the hydroponic process. As a result of the training, several key outcomes were observed. First, participants' knowledge and understanding of hydroponic farming significantly

improved. They gained insights into the benefits of hydroponics, different cultivation systems, and the best vegetable varieties suited for hydroponic growth, such as lettuce, kale, spinach, pak choi, and tomatoes. Furthermore, they learned the importance of nutrient and pH management to optimize plant yield.

Second, participants developed technical skills that enabled them to set up and maintain their own hydroponic systems. They successfully created simple hydroponic models such as the Wick System and Nutrient Film Technique (NFT). Additionally, they learned to sow seeds in appropriate growing media, prepare nutrient solutions, and manage plant health by monitoring pH levels and controlling pests. These skills equipped them to start their own hydroponic farming projects. Lastly, the practical implementation resulted in visible progress. Participants successfully grew vegetables in simple hydroponic setups, demonstrating their ability to apply the knowledge gained. Some participants even developed small hydroponic system prototypes using locally available materials such as PVC pipes and plastic trays. These prototypes served as valuable learning tools and practical applications of hydroponic farming techniques.

Overall, the community service activity achieved its objectives by increasing participants' awareness and technical capabilities in hydroponic farming. The successful application of hydroponic techniques by participants indicates the potential for sustainable small-scale agriculture in Timbuseng Village. With continued guidance and practice, hydroponic farming can contribute to improving food security and generating additional household income in the community.

Figure 1 Vegetable seeds are sown first

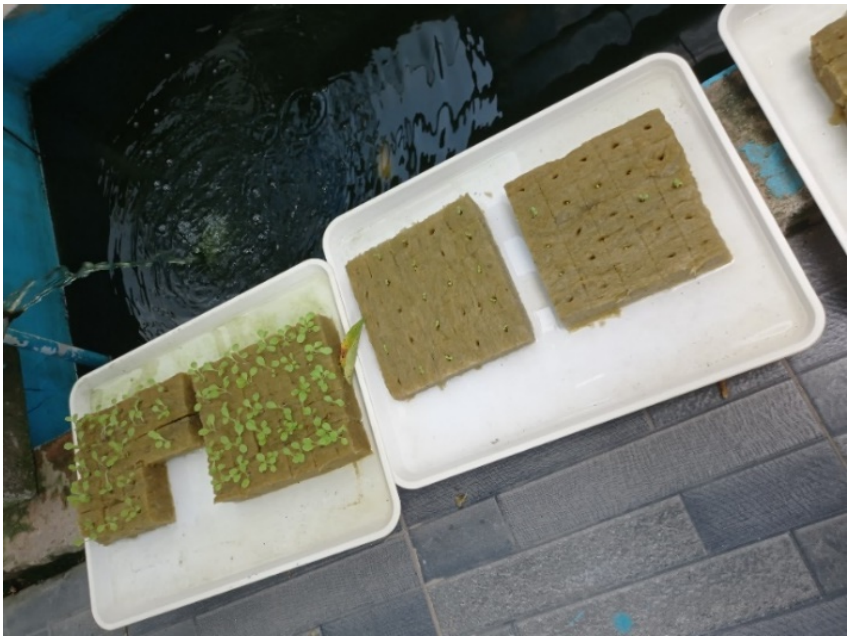

Figure 2 Making a Hydroponic Installation

4. Conclusion

Conclusion

The vegetable cultivation training using the hydroponic method was successfully implemented and received positive responses from all participants. The program effectively increased community awareness and technical skills in hydroponic farming, demonstrating the potential of this innovative agricultural method to enhance food security and economic opportunities. Participants gained fundamental knowledge about hydroponics, including the types of vegetables suitable for this method, such as lettuce, kale, spinach, pak choi, and tomatoes. Additionally, they successfully applied their learning by constructing hydroponic planting media using PVC pipes and other locally available materials.

The hands-on approach allowed participants to directly engage with hydroponic techniques, from seed sowing and nutrient preparation to plant maintenance and harvesting. Through this training, participants not only acquired new agricultural skills but also recognized the benefits of hydroponic farming, such as efficient land use, reduced water consumption, and the ability to grow fresh vegetables in limited spaces. The successful implementation of simple hydroponic systems by participants indicates the feasibility of hydroponic farming as a sustainable agricultural solution for households and small-scale farmers in the community.

To further develop and sustain hydroponic farming in the community, the following recommendations are proposed:

1. **Continued Training and Mentorship** – Organizing follow-up training sessions to deepen participants' knowledge and refine their hydroponic farming techniques. Providing mentorship and guidance will help participants overcome potential challenges and improve their success rates.

2. **Expansion of Hydroponic Systems** – Encouraging participants to expand their hydroponic setups and explore different vegetable varieties to diversify their produce. This can increase productivity and offer more opportunities for household consumption and market sales.
3. **Market Access and Business Development** – Assisting participants in connecting with local markets, restaurants, and food vendors to sell their hydroponic produce. Training on business development, branding, and digital marketing can help turn hydroponic farming into a profitable venture.
4. **Community-Based Hydroponic Farming Initiatives** – Establishing community hydroponic farms where multiple participants can collaborate and share resources. This initiative can strengthen community engagement, enhance productivity, and create sustainable agricultural practices.
5. **Integration with Educational Institutions** – Collaborating with schools and community learning centers to introduce hydroponic farming as an educational tool for students. This will foster agricultural awareness from a young age and encourage innovation in urban and rural farming.
6. **Support from Local Government and NGOs** – Seeking partnerships with local authorities, agricultural organizations, and non-governmental organizations (NGOs) to secure funding and technical support for expanding hydroponic farming projects in the region.

By implementing these recommendations, hydroponic farming can be further developed as a sustainable and scalable agricultural practice in Timbuseng Village. The success of this training demonstrates that with proper guidance and support, hydroponic farming can contribute significantly to improving food security, generating income, and promoting environmentally friendly agricultural solutions.

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success of this program. Your support has strengthened efforts to enhance food security and household income through hydroponic farming. Lastly, we appreciate all individuals and stakeholders who contributed in various ways to this initiative. We hope that the knowledge and skills gained from this training will continue to benefit the community, foster sustainable agricultural practices, and improve household income.

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