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Implementation of Tajurhalang Village Aquaponics: Land Unilization Efforts and Increasing Independent Food

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Abstract**—** *This research assesses the efficacy of aquaponics training in bolstering food security within Tajurhalang Village. The training program equipped community members with the skills to construct and operate basic aquaponic systems. Findings indicate a significant enhancement in community understanding of aquaponics and a robust inclination towards its adoption. The implementation of aquaponics systems holds promise for elevating food productivity, mitigating waste, and furnishing alternative income streams for the community.*

Keywords**—** *Aquaponics, sustainble, organic farming*.

I. INTRODUCTION

Tajurhalang Village is an emerging village located in Cijeruk District, Bogor Regency, West Java, Indonesia. Through this emerging category, Tajurhalang Village continuously strives to achieve equality with other developing and more advanced villages. Situated at the foot of Mount Salak, Tajurhalang Village covers an area of 390.527 hectares with an elevation of 600-700 meters above sea level, an average rainfall of 3,328 mm per second, a minimum temperature of 9°C and a maximum temperature of 23°C. The village is divided into 3 hamlets, 6 RW (community units), and 22 RT (neighborhood units). Tajurhalang Village is bordered by Palangsari Village to the north, Tanjungsari Village to the east, Gunung Halimun Salak National Park (TNGHS) to the south, and Sukaharja Village to the west. The village has a population of approximately 9,429, consisting of 4,916 males and 4,513 females, with 3,217 households.

Tajurhalang Village has several potential resources that can be developed, including waste banks, maggot and catfish cultivation, herbal plants, waterfalls, and camping grounds. However, the village also faces several challenges, such as suboptimal management of waste banks, maggot cultivation land, and catfish ponds.

Based on the potential and challenges faced by Tajurhalang Village, through the Student Organization Capacity Building Program (PPK Ormawa) of the Student Executive Board (BEM) of the Faculty of Economics and Business, Pakuan University (BEM Unpak), the implementing team conducted an innovation by utilizing existing potential as a solution to these problems by holding a technical guidance session on aquaponics systems.

Aquaponics is a cultivation system that combines aquaculture (the cultivation of fish or other aquatic organisms) with hydroponics (cultivation of plants without soil). Simply put, aquaponics is an alternative way to grow plants and raise fish in a single container, where plants utilize nutrients from fish waste that, if left in the pond, would become toxic to the fish. Simply put, the basic concept of aquaponics is that waste produced by fish, for example fish waste, will become a source of nutrients for plants, then the plants will take these nutrients, clean the water, and return it to the aquaculture system to be reused by the fish (Setiawan, Styawati, and Alim 2024)

This technical guidance session on aquaponics in Tajurhalang Village aims to optimize the management of waste banks, maggot cultivation land, and catfish ponds for more effective utilization and as a source of independent food. Additionally, aquaponics offers many advantages, including the need for a small amount of land, relatively low capital, easy maintenance, and the absence of pesticides.

II. MATERIALS AND METHOD

This community service was carried out through various structured activities. The planning of these activities was based on coordination and consultation between the entire implementation team and the supervising lecturer. The following methods were planned and agreed upon:

1. Survey and Planning

An initial survey at the activity site was conducted to determine the elevation of the land in the local village and select the appropriate fish species. This survey was essential for the successful implementation of the activity, ensuring high effectiveness. The survey also served as an initial opportunity to get acquainted with the community and relevant stakeholders, such as village officials or local government, at the activity site.

2. Development of Technical Guidance Materials

The technical guidance materials were developed based on the problems faced by the community. The materials presented were well-structured and adapted for easy understanding by the general public. The technical guidance involved all members of Tajurhalang Village, especially the Village Tourism Awareness Group (Pokdarwis).

3. Implementation of Aquaponics Technical Guidance

The aquaponics technical guidance was attended by 17 participants, including representatives from each RW (community unit) and the Village Tourism Awareness Group (Pokdarwis) of Tajurhalang Village. All participants listened

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attentively to the material from beginning to end, as the subject matter was still considered new to most of them (Wahab 2022).

4. Evaluation and Regular Follow-up

To ensure the success of this activity, regular follow-up will be conducted by some members of the implementation team. More intensive follow-up may be scheduled if special circumstances require more in-depth handling.

III. Results and Discussion

Simple aquaponics technical guidance session was conducted on Tuesday, July 16, 2024, precisely at the Tajurhalang Village Hall.

Fig. 1. Aquaponics technical guidance workshop held at the village office.

Based on the image above, this simple aquaponics technical guidance session ran smoothly, with a series of activities introducing the simple aquaponics plant system, such as its purpose, benefits, tools, and methods of creating aquaponics that can be used as a growing medium, as well as catfish cultivation. After the material presentation, a practical session on creating simple aquaponics followed, attended by 17 participants, who were representatives from each RW (community unit) and Pokdarwis (tourism awareness group) of Tajurhalang Village.

Fig. 2. An aquaponics model produced from the technical training session.

As shown in the image above, the result of the aquaponics practice conducted during the technical guidance session is presented. The construction of a simple aquaponics system began with building a pond using durable hebel blocks and lining it with a tarp, based on available space. The pond was then filled with clean water and left to stand for 1-2 days to neutralize the pH and remove any chemicals from the new tarp.

The next step involved designing the water flow system by selecting PVC pipes with diameters suitable for the water volume and the number of plants to be cultivated. The pipes were measured and cut according to the desired flow system design. A non-parallel arrangement of the pipes was used to ensure even water distribution to all plants. The pipes were connected using pipe connectors, ensuring a tight and leak-free seal. Holes were drilled in the pipes to accommodate net pots, and a water pump was installed in the pond to circulate the water from the pond to the pipes and distribute it to the plants.

After completing the pond and water flow system, the aquaponics frame was constructed using PVC pipes of appropriate diameter to form a plant growth medium structure. The pipes were arranged in a non-parallel manner to create a dynamic water flow and prevent water stagnation. The aquaponics frame was placed securely on top of the pond.

Seeds, such as water spinach, lettuce, and bok choy, were selected for sowing. The seeds were soaked in water for several hours to accelerate germination. They were then sown in rockwool growing media and kept in a shaded area to maintain moisture. After 1-5 days, the germinated seeds were transferred to net pots filled with a growing medium like gravel. The net pots were placed In the holes drilled in the pipes, ensuring that the roots were submerged in water but the top of the net pot remained above the waterline.

Maintenance was relatively simple, involving monitoring the water's pH, temperature, and ammonia levels. Regular water changes were performed to maintain optimal water quality. Fish were fed high-quality food appropriate for their species and size. Pests and diseases were controlled by regularly monitoring the plants and using environmentally friendly methods. Additional nutrients, such as iron or calcium, were added, especially when plants began to grow larger, although fish waste provided many nutrients for the plants. The final step was harvesting the plants when they reached the desired size and maturity, along with the fish.

Aquaponics offers a dual harvest of fish and vegetables from a single production unit, making it highly advantageous, especially in areas with limited water and land resources. By combining aquaculture and hydroponics, this system creates a sustainable cycle of life. Fish waste, rich in nutrients, serves as a natural organic fertilizer for plants, resulting in high-quality organic produce. The floating system allows for denser planting, increasing productivity by up to 10 times. Abundant nutrients in the water stimulate faster root growth in plants. Moreover, maintenance is easy, free from soil-borne pests, and does not require watering.

The community of Tajurhalang Village showed great enthusiasm for the Aquaponics Training: Symbiosis between Fish and Plants for a Sustainable Food Future, demonstrating their readiness to apply this knowledge in their daily lives.

Based on the research, participants' responses indicate a significant potential for developing aquaponics as an alternative solution to meet the community's food needs. The benefits extend beyond food security, positively contributing to the local economy, especially for small and medium-sized enterprises. With creativity and basic knowledge, people can easily set up simple aquaponics systems at home. The availability of various

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plant species suitable for aquaponics further facilitates its adoption. Aquaponics has proven to be an innovative solution to address various environmental challenges.

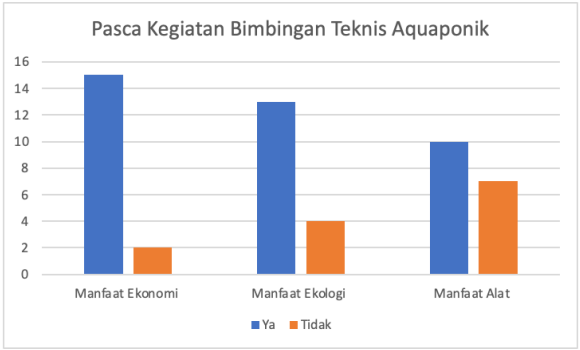

Fig. 3. Comparison of Aquaponics Knowledge Before and After Training

Research suggests that this cultivation system makes a significant contribution to environmental conservation. Through the symbiotic relationship between fish cultivation and plant growth, aquaponics transforms organic fish waste into nutrients for plants, reducing water pollution and improving overall water quality. Additionally, aquaponics reduces the use of harmful chemical fertilizers.

IV. Conclusion

Based on the results of the technical guidance on aquaponics systems conducted in Tajurhalang Village, Cijeruk District, Bogor Regency, West Java, it can be concluded that:

1. The simple aquaponics technical guidance ran smoothly and received a positive response from the community, as evidenced by their high enthusiasm and awareness of the potential of aquaponics in improving food self-sufficiency and the community's economy, as well as supporting the creation of a healthier and more sustainable environment.
2. Aquaponics has great potential for development in Tajurhalang Village given its demographic conditions and available resources. Aquaponics can be a solution to the problems faced by the community, such as suboptimal management of waste banks, maggot cultivation land, and catfish ponds.
3. Continued mentoring is still needed so that the community can implement aquaponics optimally and independently. The necessary mentoring includes aspects of cultivation techniques, marketing, and the formation of business groups.

V. Suggestion

Based on the conclusions of the research results and discussion regarding training and practice in making aquaponics with the Tajurhalang village community in order to improve the community's economy, namaly as follows:

1. Organizing workshops and seminars to share best practices and address emerging challenges.
2. Exploring opportunities to scale up aquaponic systems to meet the growing demand for sustainable food production.
3. Regularly assessing factors such as water quality, plant growth, fish health, and overall system efficiency.
4. Conducting a comprehensive environmental impact assessment to evaluate the potential ecological benefits and risks associated with aquaponics.

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