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# AQUAPONIC TECHNOLOGY EDUCATION AS AN EFFORT TO INCREASE ENVIRONMENTAL LITERACY

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**ABSTRACT** The Community Service Program (PKM) aims to improve environmental literacy through aquaponic technology education as an integrated aquaculture system that is environmentally friendly. The activity was carried out by the method of lectures and interactive discussions to participants consisting of the community and students. The material included basic concepts of aquaponics, nutrient cycle principles, ecological benefits, and its potential application on a household scale. The results of the activity showed an increase in participants' understanding of the relationship between fish farming activities, plants, and environmental sustainability. This program contributes to fostering environmental awareness and encouraging the application of sustainable fisheries technology in the community.

**KEYWORDS:** *Aquaponics, Environmental Literacy, Community Service, Eco-Friendly Technology.*

## 1. INTRODUCTION

Environmental problems such as water quality degradation, land limitations, and low public awareness of environmentally friendly practices are challenges that must be addressed in an integrated manner. Environmental literacy, understanding, skills, and attitudes that enable individuals to act on environmental issues are important prerequisites for achieving sustainable development. In this context, an educational approach that combines practical knowledge and ecological awareness is indispensable.

Aquaponics is one of the integrated aquaculture technologies that combines aquaculture and hydroponics in a closed cycle. This system utilizes fish metabolic waste as a source of nutrients for plants, thereby reducing water requirements, reducing nutrient runoff into the environment, and increasing resource utilization efficiency. A number of recent studies confirm that aquaponics is

able to save water significantly compared to conventional agricultural systems, improve nutrient cycle efficiency, and offers the potential to be applied on a household to urban scale as an environmentally friendly food security solution.

In addition to technical benefits, aquaponics has high pedagogical value. Aquaponics systems provide an interdisciplinary learning context that touches on biology, water chemistry, ecology, technology, and entrepreneurship. Education and service programs involving aquaponics have proven to be effective in increasing participants' knowledge of nutrient cycling, water management, and sustainable aquaculture practices. Evaluation of educational programs in schools shows that an experiential learning approach with aquaponics modules encourages students' interest in sustainability issues, healthy eating behaviors, and environmental awareness in general.

In an effort to improve environmental literacy through technology, this service activity places aquaponics as an educational tool that not only explains technical aspects, but also fosters systemic thinking skills and environmental responsibility. The existence of empirical evidence from recent studies evaluating the implementation of aquaponics in educational and community environments supports the relevance of this intervention as a strategy to increase environmental literacy.

## 2. METHOD

This international community service (PKM) activity was held on April 19, 2026 with participants from Thailand's Nonthaburi Muslim community and on April 21, 2026 with participants from Thammislam Foundation School students. This PKM uses the method of interactive lectures and discussions without hands-on practice. This method was chosen to provide a strong conceptual understanding of aquaponics technology and its relevance to environmental conservation.

### Stages of Activity

1. Preparation: The preparation of educational materials includes basic concepts of aquaponics, working principles of the system, environmental benefits, and simple application examples.
3. Implementation: Delivery of material through lectures using presentation media, followed by discussions and questions and answers.
4. Evaluation: Evaluation is carried out qualitatively through observation of participant participation and feedback during discussions.

## 3. RESULT AND DISCUSSION

The implementation of community service activities showed a very positive response from the participants. This indicates that an educational approach based on environmentally friendly technology is able to attract interest in learning and increase active participant involvement. Cognitively, this educational activity contributes to increasing participants' understanding of the basic principles of aquaponics, especially related to nutrient cycling, the role of microorganisms, and the mutual relationship between fish, plants, and water quality. Participants who previously viewed fish and plant farming as two separate activities, after participating in this activity, were able to understand aquaponics as an artificial, integrated ecological system. These findings are in line with the reports of several studies that stated that aquaponics is effectively used as a learning medium to explain the concept of ecosystem and sustainability holistically.

From the aspect of environmental literacy, this activity not only increases knowledge, but also fosters awareness and positive attitudes towards environmentally friendly practices. Participants showed interest in applying the principles of water efficiency, the use of organic waste, and sustainable food production in daily life. According to the environmental literacy framework, changes in attitudes and intentions to behave are important indicators of the success of environmental education, especially in non-formal educational activities such as community service.

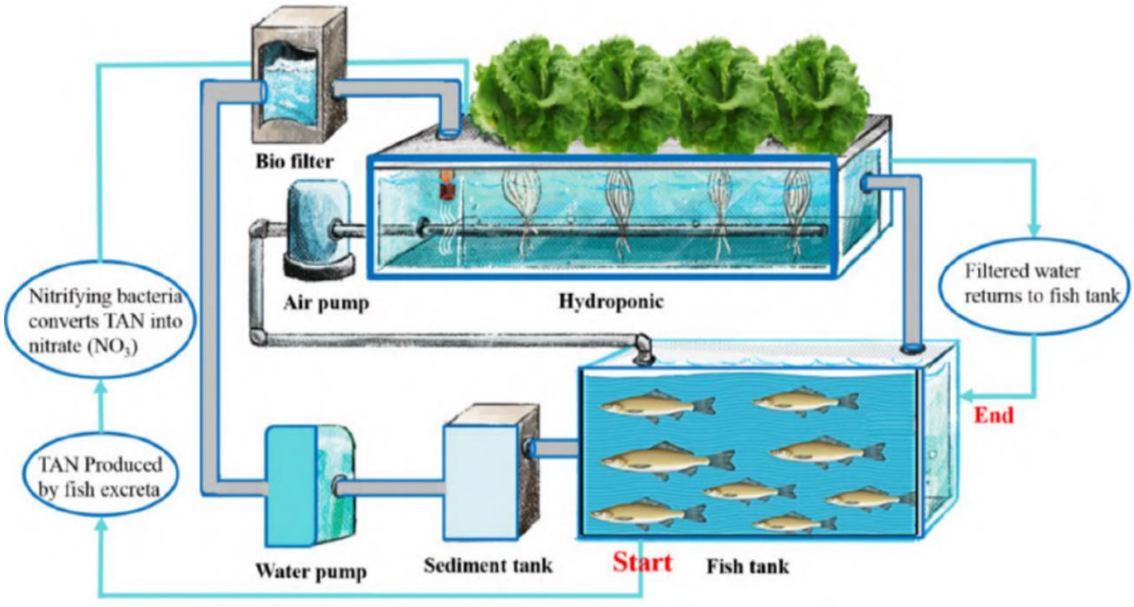


**Figure 1.** How aquaponics systems work


**Figure 2.** PKM Activities

In addition, aquaponics has proven to have strategic value as a contextual learning medium. This system allows participants to link global issues such as water crises, food security, and climate change with practical solutions that can be applied on a local scale. Several recent studies report that aquaponics education programs in communities and educational institutions are able to increase participants' understanding of the concept of sustainable development and encourage pro-environmental behavior.

However, this activity still has limitations, especially since the method used is only lectures and discussions without hands-on practice. A number of studies have shown that the integration of aquaponics practice or hands-on demonstrations can have a stronger learning impact, especially in improving the skills and confidence of participants to implement the system independently. Therefore, further service activities are recommended to combine the lecture method with simple field practice or simulation.

## 4. CONCLUSION

The Aquaponics Technology Education Program as an Effort to Increase Environmental Literacy has a positive impact on increasing participants' understanding and environmental awareness. Through lecture and discussion methods, participants gain knowledge about the concept and benefits of aquaponics as an environmentally friendly technology. This activity has the potential to be further developed with the addition of direct practices so that the impact of its application in the community becomes more real.

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