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Counseling of Automation-Based Hydroponic Planting System in Ciparay Village

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ABSTRACT

The people in Ciparay Village faced economic problems due to layoffs by companies during the pandemic, so they had to change professions, one of which was to become a farmer. In 2014, the Ciparay Village's Woman Farmer Group developed a hydroponic system but it was failed due to lack of knowledge. This PKM activity aimed at: 1) increasing partners' knowledge on good and effective farming methods, 2) increasing partners' knowledge on how to manufacture and work an automation-based hydroponic system, as additional knowledge for the people in Ciparay Village. By achieving these goals, it is hoped that the Ciparay Village community are able to develop the system of which results can become their own food source or be sold as their main or additional income. The method used in this activity was the approach and participation of partners, in which the team with the partners were directly involved proactively, and used solution-based approach in the form of training, mentoring and automation-based hydroponic system simulation as a solution to the main problems of partners.

Keywords*: economic problems, hydroponic, automation, additional income*

1. INTRODUCTION

The mission of a tertiary institution is reflected in the activities of the Tri Dharma of Higher Education and supporting activities, in accordance with the government-mandated philosophy for this institution, namely: Education and Teaching, Research, Community Service as well as Supporting activities, which relate to institutional development.

In order to improve the quality of people's lives, it is vital to strive for long-term performance, which can be achieved by employing various development models and patterns. Community service activities (PKM) involve attentively observing the community's problems and potentials by undertaking research in every sector of social life.

The conditions of the Covid-19 pandemic which gave birth to the government's restrictive policies have had an impact on the sustainability of the world's business, especially for companies with a lot of production activities involving labours. It is an indisputable thing that the health-crisis situation has been accompanied by a decline in people's purchasing power. Even the national economy has also experienced a very drastic decline. As the result, many companies could not survive the pandemic covid-19 so that layoff was a difficult choice but a

must. In these situation and conditions, it can be stated the covid-19 pandemic has started an extraordinary domino effect that has the ability to paralyze the continuity of various business sectors, impacting the occurrence of layoffs.

Ciparay Village is one of the communities which were affected by the situation. According to field data surveys, almost 75% of factory workers lost their job as the result of factories closing or reducing production, forcing the community to shift professions, one of which became a farmer. This shift was possible as around half of the land in Ciparay Village could be used for agricultural purposes. Moreover, a portion of the remaining land was an undeveloped space that could be suitable for hydroponic cultivation.

Hydroponics, or soilless culture refers to the practice of cultivating plants in a medium that does not contain soil **(Masduki, 2018)(Diki, et al, 2020)(Roidah, 2015).** According to (**Yulanda, et al, 2019)(Sari, & Zahrosa, 2017)**, hydroponics is a method of growing plants, which is beneficial to the environment, and offers many benefits such as taking little space and water, lowering pollution levels, and keeping costs down. This farming method commonly produces small plants or veggies with high quality as it does not utilize any chemicals.

Hydroponics is a farming approach that uses water as a nutrient media that is directly taken by plants as a support for plant growth. It can be used in both urban and rural regions, where it saves water, is easy to manage, and can be harvested all year. The advantages of growing plants in a hydroponic system are that the plants' cleanliness is easier to maintain, there is no need for land preparation or weed control, the growing media is sterile, the use of water and fertilizer is very efficient, the plants can be cultivated continuously regardless of the season, it can be done on narrow land, and it is protected from rain and direct sunlight **(Silvina & Syafrinal 2008)**. Meanwhile, according to **Rochintaniawati (2016)**, hydroponic farming is beneficial because pests and diseases can easily be controlled, plants grow faster with higher crop production, fertilizers can be used more efficiently, plants yields continuous results, the system is easier to work on without the need for manual labor, plants can grow in places which are originally not suitable for planting, there is no risk of being dependent on local natural conditions, and it can be done in places where there is a lack of natural resources.

An attempt to create a hydroponic system in the undeveloped place of the Ciparay Village by woman farmer group in 2014 was unsuccessful owing to lack of understanding. Based on the problems experienced by the Ciparay Village's community, the Electrical Engineering Study Program Community Service Team offered a solution to provide counseling entitled "Counseling on Automation-Based Hydroponic Planting Systems in Ciparay Village" to the community groups regarding how to manufacture, use methods of work, and develop automation-based hydroponic systems as additional knowledge for the community in Ciparay Village. By doing so, it is hoped that the Ciparay Village community can develop it to become their own food source, or that the results can be sold as main or additional income

2. METHODS

2.1 Method of Activities

The following is the procedure that was utilized for carrying out these tasks:

1. Lecture Method
   The information that had been prepared by the facilitator was often presented through the lecture presentation technique. This method taught the skills necessary to produce, operate, and develop hydroponic systems that were based on automation.

2. Q&A Method
   The question and answer method was used to determine the level of comprehension that the PKM participants had regarding the content that was presented by the facilitator.
3. Simulation Method
   The Simulation approach was used to explain how to create and work from an automation-based hydroponic system so that PKM participants could see firsthand how this automation-based hydroponic system was implemented. This allowed PKM participants to have a more comprehensive understanding of the system.
4. Determining the level of knowledge and expertise possessed by participants in relation to the implementation of an automation-based hydroponic system.

2.2 Schedule of Activities

The schedule of activities was divided into three stages:

1. The preliminary stage

Site inspection, interviews, permissions, and the creation of training materials, tools, and materials are all part of the preparatory phase. During the observation stage, a scenario analysis in the form of a survey was spread to partner locations to ascertain the conditions there. In December 2021, survey activities were conducted. The next activity was an interview with the local village chief. Several difficulties that happened in partner sites were discovered after collecting data through observations and interviews. Next, together with the village chief, the team sought the best solution to the challenges that occured. The solutions provided to the partners included training and support in plant growing using hydroponics and automation technologies.

2. Stage of Training

The training stage consisted of hydroponic system instruction offered by the PKM team in January 2022 from 09.00 - 15.00.

3. Evaluation Stage

Evaluation Stage was carried out in this PKM activity starting from planning, continuing to the execution phase until the completion of the activity.

3. RESULTS AND DISCUSSION

Twenty-two participants were PKK members with a background as a group of female farmers in Ciparay Village. The activity was commenced with an introduction from the organizing committee and words from the representatives of the Ciparay Village Head. It was followed by the presentation of materials by the facilitator, and concluded with a question-and-answer session between the facilitator and the participants. Figure 1 shows the documentation during the presentation session, whereas Figure 2 shows the realization of automation-based hydroponic planting.

Figure 1. Presentation Session

Figure 2. Realization of Automation-Based Hydroponic Planting

The production of a prototype of an NFT-based hydroponic system that uses an automation system to measure all parameters that affect plant growth is the system's realization **(Diki et al, 2020)(Hamid, Suryawinoto, & Afandi, 2016) (Fuad, & Zuhrie, 2018).** This technology can assist the Ciparay village people in learning about hydroponic gardening.

Fiberglass is utilized on the roof to allow sunlight to reach the plants. Because fiberglass is often damaged by extreme heat, paranet is used to minimize the amount of light intensity that reaches the fiberglass. Furthermore, excessive light intensity can have an impact on plant growth. There are still leaks in some portions of the completed water installation channel, but the water circulation has been satisfactory. Blockages continue to form at the nutrition channel's input in each pipe, necessitating regular inspection.

All sensors and actuators are good to go, but regular monitoring is required. The monitoring feature is used to confirm that all sensor devices are functioning properly. This is because environmental conditions can have an impact on the performance of the sensors employed. After the facilitator delivered the material, the participants saw firsthand the realization of the automation-based hydroponic system that had been installed in an empty area on the 2nd floor of the Ciparay village office.

Figure 3 shows the participants who are directly observing the realization of an automation-based hydroponic system.

Figure 3. Observing the Realization of an Automation-Based Hydroponic System

The number of training participants reaching a minimum of 80% of the target PKM participants. They actively participated during discussion sessions and were able to answer questions prepared by the PKM team during the question and answer session. The participants were also able to practice hydroponic planting with the automation system that had been exemplified by the PKM Team. All of those are the indicators for the success of this PKM activity.

With the help of this counseling, it is hoped that in addition to understanding the hydroponic system that is based on automation, the participants will also be able to apply it in the available spaces in their village and then spread the information about it to the people who are close to them, or the residents of the Ciparay village.

The participants' passion for researching knowledge and skills was considerably high. It is known from the questionnaire that the participants had not known about hydroponic production based on automation prior to the PKM activity. Figure 4 shows that none of the participants had previously received similar instruction.

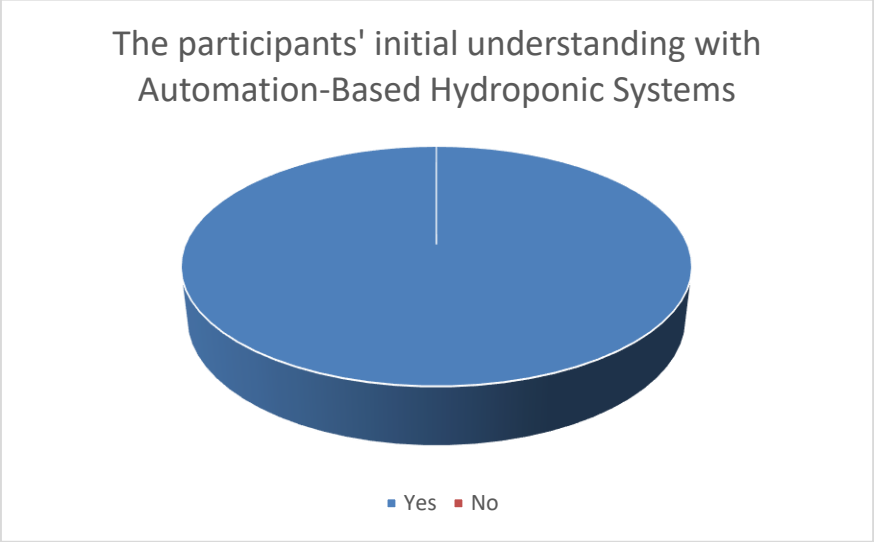

Figure 4 The participants' initial understanding with Automation-Based Hydroponic Systems

The impact of this activity is expected that 60% of the participants understand and are able to make their own hydroponic vegetable cultivation based on automation. Figure 5 depicts the participants' level of comprehension during the training. The findings of the questionnaire as an evaluation of the training process indicate that 10% of participants slightly comprehend the topic, 75% understand it, 15% grasp it thoroughly, and no one does not understand.

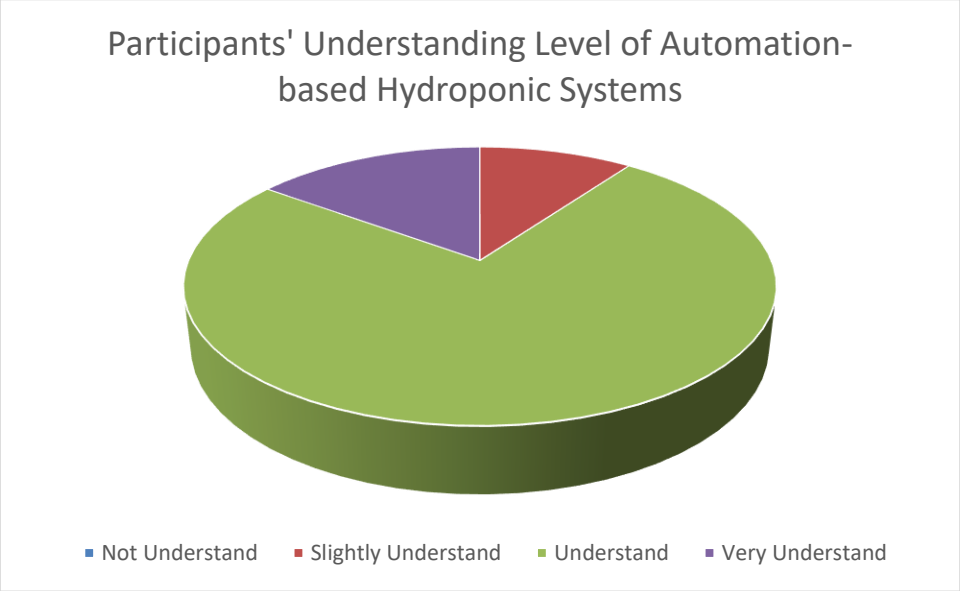

Figure 5. The Percentage of Participants' Understanding Level of Automation-based Hydroponic Systems

This activity is expected to continue to help increasing family income. Figure 6 shows that 30% of the participants are going to continue, 70% participants express an intention to try and none has no intention of continuing this activity.

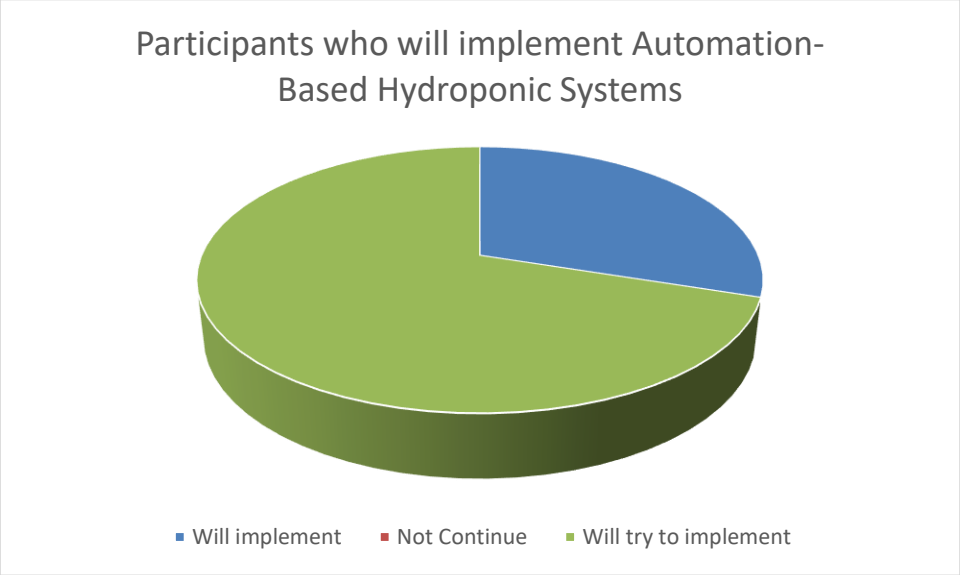

Figure 6. Percentage of Participants who will implement Automation-Based Hydroponic Systems

Following the presentation of the information and the demonstration of the functioning of the hydroponic system, Itenas provided each participant with a gift bag including a selection of

fun and useful items as shown in figure 7. In addition, Itenas presented the Ciparay Village Office with a plaque as a token of appreciation as shown in figure 8.

Figure 7. Photo Session of Participants and Facilitators

Figure 8. Partner Awarding Session

4. CONCLUSIONS

The conclusions that are obtained from PKM activities with Ciparay Village Woman Farmer Group in the context of empowerment community through an automation-based hydroponic system are as follows:

1. Training on the construction of automated hydroponic systems has the potential to raise public knowledge regarding the potential for unoccupied space to be converted into land that can be used for productive and lucrative hydroponics.
2. This PKM activity is considered successful because the number of training participants reached a minimum of 80% of the target, the participants were active during discussion sessions and able to answer questions prepared by the PKM team during the question and answer session, and the participants were able to do automation-based hydroponic planting that had been exemplified by the PKM Team.

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