

Melon Hydroponic Cultivation Based on Smart Farming Technology to Improve the Creative Economy

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ABSTRACT

Indonesia is an agricultural country that has a variety of agricultural commodities that can be developed in the horticulture sector. One of the agricultural products that comes from horticulture commodities and has a high selling value is melon. Rejosari Village is a developing village in Kudus Regency and has a large rice field area of 60% of the total area. This is utilized by Rejosari Village to implement a hydroponic melon farm program as an effort to support the SDGs of food security and sustainable agriculture in Indonesia. One of the problems faced in the hydroponic melon cultivation process in Rejosari Village is the lack of appropriate technology in the cultivation process and the lack of optimal utilization of the melons produced. The methods used in this community service activity are preparation, implementation, and evaluation. The results of this community service activity are the application of smart farming technology, the formation of a mini greenhouse, the existence of the Paguyuban Melon group, an increase in the productivity of smart farming businesses by 20%, and an increase in efficiency and effectiveness in hydroponic melon cultivation.

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INTRODUCTION

The state of Indonesia is a country that has a large agricultural land. Based on data from the Central Statistics Agency in 2019, for plantation land covering an area of 18 million ha. Indonesia is an agrarian country that has a diversity of agricultural commodities, this diversity is a potential that can be developed, one of which is in the horticultural sector [1]. The horticulture sector plays an important role in the development of the agricultural sector. Because of its role as the main component in food security in Indonesia [2]. According to [3] Melon, it is one of the largest types of horticultural plants in Indonesia.

Melon is one of the horticultural commodities that has a high selling value [4]. This is evidenced by the Central Statistics Agency in 2021 saying that the increase in melon production in the last 3 years was 16.4% of the total melon production in 2018. However, along with the increase in melon production and market demand for melons, it turns out that it is not balanced with optimal handling and care during harvest and post-harvest melons [4]. Therefore, to meet the needs of melons in the market, it is necessary to pay attention to melon farmers, both private and farmers under the auspices of the government [5]. Fruits is world famous as a fruit export commodity from tropical regions [6]

Melon (*Cucumis melo* L) is one of the seasonal plants that grows vines, has soft stems, has leaves that are in the shape of a menja. Melon is a fruit that is widely loved by the public, because of its high nutritional

content, and contains 14% water when consumed [7]. Melon cultivation is supported by using a hydroponic cultivation system. This hydroponic system is carried out inside Greenhouse to support fruit yields with a relatively faster harvest time and produce maximum fruit quality. In addition, the nutritional needs of melons can be met and controlled according to the growth phase of the melon plant. And also pest and disease attacks on cultivation inside Greenhouse can be much easier to control compared to cultivation in open land [8].

At this time, technology is developing rapidly almost all over the world and its role in human life is undeniable. Technology has a strong appeal through its various benefits and functions to make human life easier. The development of technology from time to time cannot be limited by any factors, whether social status, age, or income level, is not an obstacle for a person to utilize technology [9]. One form of application of technology that is very beneficial for human survival is in the agricultural sector. This is because Indonesia is a tropical country where some of its people make a living as farmers. Even so, it is undeniable that some Indonesia people still use conventional methods and have not applied the role of technology in agriculture. This is evidenced based on the analysis of the level of IoT utilization in the agricultural sector, the results are still low [10].

Rejosari Village is one of the developing villages in Kudus Regency. The Regional Development Planning Agency of Kudus Regency released data that Rejosari Village has an area of 3.83 km². Rejosari Village has a plantation land area of 60% of the total area, one of which is melon plantations. According to the Central Statistics Agency of Dawe District, in Rejosari Village in 2021 the number of farmers in Rejosari Village amounted to 330 people who have potential in the field of agriculture that can be developed (BPS, 2021). To support the SDGs of food security and sustainable agriculture in Indonesia, Rejosari Village created a melon hydroponic farm program.

Based on the results of interviews and observations that the implementation team has conducted to one of the managers greenhouse It turns out that there are still several problems faced during hydroponic melon cultivation, these problems include the quality standards desired by supermarkets have not been met so that only 50% of the harvest can be sold and the rest is wasted. In addition, the hydroponic cultivation process of melon also does not have the tools to maintain the humidity and temperature in the greenhouse and also watering melon plants which are still done manually. Another problem that is also felt by the Head of Rejosari Village is the lack of expansion of melon cultivation due to the lack of public interest in melon hydroponic cultivation caused by cost factors, melon care that is too difficult and the absence of modern cultivation technology, knowledge about melon hydroponic cultivation is still very low and there is no marketing and innovation of processed melons into typical processed foods in the Rejosari area.

Based on the above problems, we the implementation team of the Student Organization Capacity Strengthening Program (PPK ORMAWA) of the Mathematics Education Student Association (HIMATIKA) of Muria Kudus University has a program solution, namely Smart Melon Park as an Effort to Empower the Community of Rejosari Village, Kudus Regency. Later in the program, there will be several assistance activities such as the manufacture of automatic watering equipment with temperature detectors and solar panel powered blowers, assistance in making seedling, education on the use of nutrients in melon plants, the formation of new farmer groups, assistance in processing melons into processed products that have high selling value, marketing assistance, and packaging assistance.

METHOD

This community service activity was carried out in Rejosari Village, Dawe District, Kudus Regency, precisely at the Rejosari Melon Hydroponic Greenhouse Farm. With this activity, it is hoped that it can help solve problems related to hydroponic melon cultivation and improve the welfare of the people of Rejosari Village.

This activity was carried out in three stages, namely preparation, implementation and evaluation. The division in the implementation activities is as follows:

a. Preparation

This stage consists of several activities, namely:

1. Observation

The first activity carried out by the team before carrying out service activities is to conduct observations or site surveys. This activity aims to be able to find out information directly related to the problems experienced by the village and so on through interviews. This interview was carried out with the Head of Rejosari Village and also the manager of the Rejosari Melon Hydroponic Greenhouse Farm.

2. Problem Identification

After conducting observation activities and interviews with partners, the next stage of preparation is to identify the problems that exist in Rejosari Village. Based on the results of interviews and observations, it can be identified that the problems faced by Rejosari Village are the hydroponic cultivation process of melons that is not yet modern and the application of appropriate technology, the utilization of hydroponic melon crops has

not been maximized, and the cultivation of melon plants using hydroponic methods has not been widespread by the community. That way, we will provide several solutions to overcome these problems with various training activities, mentoring and application of technology in the process of melon hydroponic cultivation.

b. Implementation

1. Literature Studies

After the problem identification activity was carried out, the next was the literature study activity which was used as a basis for finding solutions to the problems obtained. This literature study activity is obtained from various guidebooks, journals and articles both national and international, previous research theses which are used as a source of reference and information in working on proposals and also the implementation of programs in partner villages.

2. Program Planning

After carrying out the previous stages of activities, the next is to plan the program that will be carried out in partner villages as a solution to overcome the problems experienced by partners. The planning of the tang program that will be carried out by the team in Rejosari Village is as follows:

- a) Program Socialization
- b) Planning and Installation of Smart Farming Tools
- c) Demonstration of the Use and Application of Smart Farming Technology
- d) Establishment of New Farmer Groups for Melon Cultivation and Creation of Mini Greenhouses
- e) Assistance activities for making seedlings, the use of melon cultivation nutrients, processing and packaging melon products, and online marketing through social media

c. Evaluation

At this stage, the service team evacuated from the activities that had been carried out by the method of giving questionnaires related to improving the knowledge and skills of partners in the field of melon hydroponic cultivation.

RESULTS

The service activity entitled Smart Melon Park as an Effort to Empower the Community of Rejosari Village, Kudus Regency was carried out from June to October 2024 with the target of the people of Rejosari Village and also the Melon Association Group, which is a new farmer group in Rejosari Village. This service activity includes a location survey which is carried out in February – March and the preparation of proposals in April. In this activity with the theme of Smart Farming, the service team provided equipment assistance from grants from the Ministry of Education and Culture of the Republic of Indonesia in the form of automatic sprayers and blowers for the Rejosari Farm Melon Hydroponic Farm Greenhouse and automatic sprayers powered by solar panels for the Greenhouse Mini. In addition, we also hold various kinds of assistance activities to support the maximum process of melon hydroponic cultivation and to empower the people of Rejosari Village. The following is a description of the stages of activities that have been carried out by the service team:

a) Preparation

The preparation stage consisting of observation and interview activities has been carried out by the implementation team before submitting a proposal and to find out the problems that exist in Rejosari Village. This interview and observation activity was carried out for approximately 3 times from February to March 2024 with the target of the interviewees being the Head of Rejosari Village and also the manager of the Rejosari melon hydroponic greenhouse farm.



Figure 1. Observation and Interview Stage with Partners

Thus, several problems were found that would be assisted to be solved by the PPK Ormawa Himatika UMK implementation team through several activities that would be carried out in a span of approximately 5 months.

b) Implementation

The implementation stage consists of various activities, which are as follows:

1. Program Socialization



Figure 2. Program Socialization Activities

At this stage, socialization will be carried out to the community, especially farmers. The socialization carried out was in the form of coaching and empowerment for a group of prospective melon cultivators regarding automatic watering tools. Prospective cultivators will also be explained about the importance of using nutrients and fertilizers in melon cultivation, the formation of new groups for melon cultivation, increasing selling value through packaging and online marketing.

2. Planning and Installation of Smart Farming Tools



Figure 3. Smart Farming Equipment Design and Installation Activities

At this stage, we have a discussion with a third party, namely the Smart Electro Workshop regarding the tools that we will apply in the Greenhouse. This stage begins with a Greenhouse location survey process to find out what needs and what needs to be considered before the installation stage. After that, the installation stage of the device was carried out at the location of the Sembaru partner providing an explanation related to how to install automatic watering devices and blowers and also automatic spraying devices powered by solar panels.

3. Demonstration of the Use and Application of Smart Farming Technology



Figure 4. Demonstration and Handover of Smart Farmung Equipment to Partners

After the design and installation stage of smart farming tools, the next step is a demonstration of the use of smart farming technology. In this activity, the service implementation team provided a demonstration of how to use and care for the alar that has been available to partners, namely a group of prospective melon cultivators and managers of the Rejosari melon hydroponic greenhouse.

4. Establishment of New Farmer Groups for Melon Cultivation and Creation of Mini Greenhouses



Figure 5. Formation of the Rejosari Melon Association Group

In this activity, the community service implementation team formed a new group of melon cultivation with the assistance of making installations and mini melon hydroponic greenhouses by implementing a smart farming system. Later this group will be guided by innovator farmers who already exist in Rejosari Village. This new farmer group has the name Paguyuban Melon which consists of several people from Rejosari Village and has an interest in the field of melon hydroponic cultivation. The Melon Association itself is divided into 3 divisions, namely the Cultivation Division, the Processing Division, and also the Marketing Division with a total of approximately 20 members.

5. Assistance activities for making seedlings, the use of melon cultivation nutrients, processing and packaging melon products, and online marketing through social media

a) Assistance in Making Seedlings



Figure 6. Assistance Activities for Making Seedlings

In this activity, the implementation team provided assistance to new farmers in Rejosari Village or called the Melon Association related to the skills of making melon seedlings until they grow into plants. This activity was held on July 18, 2024 which was located at the house of the Head of Rejosari Village. This activity was attended by approximately 25 people from Rejosari Village who are all members of the Melon Association and also the manager of the Greenhouse.

b) Assistance in the Use of Melon Cultivation Nutrients



Figure 7. Nutrition Assistance Activities

In this activity, the implementation team provided assistance to innovator farmers who already existed in Rejosari and new groups that had been formed in the form of education about the importance of using nutrients in hydroponic melon cultivation. In addition, one of the alternative nutrients used will also be given, namely AB mix, time of use and also how to provide nutrition. This activity was held on July 29, 2024 which was located at the House of the Head of Rejosari Village.

c) Assistance in Processing and Packaging Melon Products



Figure 8. Processing Assistance Activities and Product Packaging

In an effort to utilize melons that are not sold or do not meet modern market criteria, we provide assistance in processing melons into processed products in the form of melon crackers and also melon sticks that can be sold and last a long time. In this assistance, they will also be trained in packaging processed melon products that can attract customers. The target of this activity is the entire Melon Association, especially the Processing Division.

d) Online Mentoring for Marketers through Social Media



Figure 9. Raja Melon Social Media Accounts

In this activity, the implementation team will carry out assistance activities related to online marketing with the members of the Melon Association, especially the Marketing Division. The series of training that will be provided is related to how to create social media accounts, upload products with attractive descriptions, advertise, and create product catalogs with high appeal. That way the marketing reach will be wider so that it can increase revenue.

c) Evaluation



Figure 10. Monitoring and Evaluation

After the implementation of various activities to help solve the problems in Rejosari Village, then the implementation team conducted a review and evaluation related to several activities that have been carried out using discussion methods, sharing sessions and also distributing questionnaires to the people of Rejosari Village, especially the target of the activity, namely the Melon Association group and the entire Rejosari Village Government.

CONCLUSION

The ORMAWA PPK program, which is a community service in the field of smart farming on hydroponic melon plants in Rejosari Village, Dawe District, Kudus Regency, has provided significant positive impacts. The approach that has been implemented has not only increased crop yields through efficient and modern cultivation techniques, but also empowered new farmers with new knowledge and skills. Through training and mentoring activities, farmers can effectively implement technology and increase productivity and quality of crops.

In addition to the benefits of economics, this program can also strengthen the new farming community, namely the Melon Association, in combining collaborative actions in the field of cultivation, cultivation and marketing so as to provide opportunities in the development of agricultural technology and awareness of the importance of sustainable agriculture for the general public. Thus, community service activities carried out in Rejosari Village are not only an agricultural initiative, but also a movement to improve the social and economic welfare of the local community. The success of this program is expected to be a model for other regions in adopting innovative agricultural technology to improve food security and farmers' welfare.

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