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Application of Si Pitem Technology in Sinarancang Village, Mundu District, Cirebon Regency

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Abstract

Agricultural development in dry land has constraints on water availability, especially in the dry season. Another problem is the limited mastery of technology that supports the increase and sustainability of agricultural production. Sinarancang Village, Mundu District, Cirebon Regency, which is a village with the most dominant potential for the agricultural sector, relies on rain-fed agricultural irrigation systems. In the dry season, a water pump is a basic need of farmers. The pump uses diesel fuel to be turned on. Therefore, community empowerment activities with SI PITEM (Solar Energy Irrigation System) Technology Applications are carried out. The purpose of the activity is to increase the productivity of partners to be more effective and efficient with SI PITEM Technology in the production of agricultural products. The method of activity is the socialization and application of SI PITEM Technology in the irrigation system. The result of the activity is the application of SI PITEM Technology can be used for irrigation systems for agricultural land during the dry season effectively because electricity comes from solar panels.

Keywords: dry land; irrigation; SI PITEM

Introduction

Water is a primary need in human life because it is used for various basic human needs such as bathing, cooking, washing, even irrigating rice fields, and so on (Totok Gunawan, 2019). Rain-fed rice fields and simple irrigated rice fields are generally constrained by inadequate water availability (Y. Apriyana, 2019). In rain-fed and simple irrigation rice fields, the availability of water to meet crop water needs is a determining factor for the sustainability of production and cropping intensity (N. Sutrisno, 2017), like the agricultural land around BUMDes Rancang Jaya.

This BUMDes is located in Sinarancang Village, Mundu District, Cirebon Regency. The agricultural land in this village is rain-fed rice fields with an area of about 97 hectares. During the rainy season, the need for water for agriculture is still sufficient.

However, during the dry season, the land experiences drought, which even results in crop failure (I.A. Irawan, 2019). Only about 15 percent of the agricultural land area can produce during the dry season.

(a) (b)

Figure 1. Agricultural land of Sinarancang Village (a) during the rainy season (b) during the dry season

During the dry season, agricultural land in Sinarancang Village experiences drought because it only relies on rain. However, there is potential and water resources that carrying capacity for the irrigation system, namely water sources from rivers (E. Refina, 2020) and or drilled wells. The condition of the river is very much needed by farmers during the dry season. They use river water to irrigate agricultural areas using diesel pumps. It takes fuel to run the machine, so it costs more.

Similarly, the water sources from the drilled wells that are used for irrigation, an electricity connection is needed. Thus, the irrigation system for agricultural land during the dry season in Sinarancang Village still requires more expenditure. It is necessary to apply technology for agricultural irrigation systems that are cheap and environmentally friendly (H. H. Sinaga, 2021).

BUMDes Rancang Jaya was established on February 25, 2021, with the inauguration of its office located at Kabarong Block, Sinarancang Village, Mundu District, Cirebon Regency, 45173. Currently, Mr. Supardi is the director of BUMDes. There are five business units implemented by BUMDes, namely: cafe business unit, village water management business unit, agricultural product management business unit, handicraft business unit, and industrial business unit. For village water management business units, BUMDes has potential water resources in the form of drilled wells. Then, from the management of agricultural products, the existing potential is in the form of agricultural products such as rice, corn, chilies, onions, and bananas.

Problems Facing Partners

The activities of partner business units have not been optimal, especially in village water management business units and agricultural product management business units. The lack of human resources and understanding in increasing the production of agricultural products is a partner problem. Agricultural products can only produce around 15 percent of the existing agricultural land area, with harvests occurring only once a year. In addition, there is no irrigation system technology that can increase agricultural production.

Solutions Offered

The availability of food supplies must be sought to maintain survival (M.B.R. Dudy, 2021). One of these supplies can come from the production of agricultural products in the form of rice. The decline in domestic rice production was caused by many chain factors, one of which was the rice planting season, which could only be done 2-3 times a year due to the long dry season, which resulted in crop failure (C.H.B. Apribowo, 2019). To overcome the shortage of water on rain-fed agricultural

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land in Sinarancang Village, Mundu District, Cirebon Regency, the Solar Irrigation Water System (SI PITEM) is a good choice of solution. To obtain clean water, water pumps with the help of solar power can be a solution to irrigation problems (O.I. Sanjaya, 2019). This system utilizes existing water resources, namely borehole water.

Research Method

The method used is advocacy; there are four stages to implementing this activity (Rindi, 2021). The stages of implementation are shown in Figure 2.

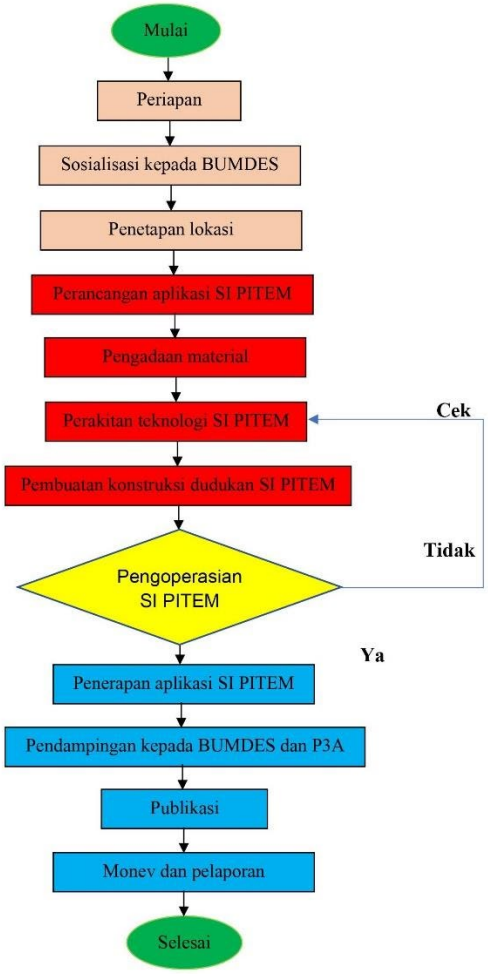

Figure 2. Stages of activity implementation

a) Observation or field survey. At this stage, the team carried out direct observations in the field to find out the condition of the location and the existing irrigation system, starting with the irrigation network and selecting the location and the available resources. To channel water to the rice fields, an irrigation network is needed, and irrigation water is used to irrigate the rice fields (a.w.Imam, 2019).
b) Socialization and use of SI PITEM Technology applications. The socialization was carried out by presenting the SI PITEM Technology to the people of Sinarancang Village, Mundu District, Cirebon Regency. An explanation of this basic principle is given by showing the principle slides and system assembly. Broadly speaking, socialization activities are divided into three categories: irrigation management using solar water pumps in rice fields; methods of using solar water pump systems as irrigation systems during the dry season; and technical handling, maintenance, and minor repairs to solar water pump systems.

c) Design and manufacture of SI PITEM Technology. The main design of the solar water pump system is made as simple as possible so that it is safe to use and requires low maintenance and operating costs (G. Widayana, 2012). A simple design is obtained by using three main components as an energy source, namely: solar cell panels, inverters, and pumps. The pump used in this PKM activity has a power capacity of 2 PK and a water distribution capacity of around 2 liters per second. For solar cell panels with a capacity of 330 WP, as many as 8 pieces are needed.
d) Evaluation of program implementation and program sustainability. Monitoring and evaluation are carried out by both internal and external parties (Kemdikbudristek) during the activity takes place, and the PKM is finished by measuring its level of success. The continuation of this PKM program in the future is to monitor the application of SI PITEM in the production of agricultural products and will be developed for irrigation systems with automatically controlled discharge and duration.

Location and Time of Implementation of Activities

The activity location is at BUMDes Rancang Jaya, Sinarancang Village, Mundu District, Cirebon Regency. The implementation of the activity takes place from March to October, 2022.

Results and Discussion

The design of the SI PITEM Technology tool is shown in Figure 3. The working principle of the SI PITEM Technology is that the water pump in the irrigation system is powered by solar power, which has a power of 2100 watts. The solar panel system consists of solar panels, controller boxes, inverters, and pumps. There are eight solar panels installed with a power of 330 watts each. So that, the total maximum power that can be generated by this solar panel is 2640 watts. The inverter in the system functions to convert AC voltage to DC voltage. The Box Controller functions as a regulator for the input voltage from the solar panel and is connected directly to the pump.

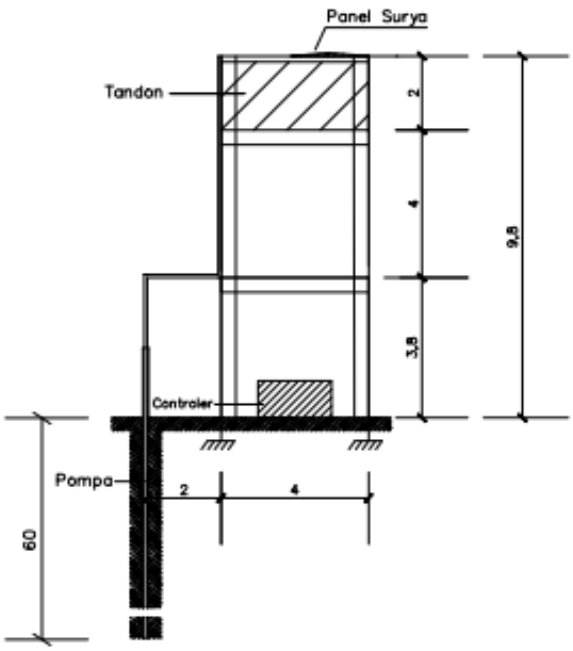

Figure 3. Design of Si Pitem Technology

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Socialization and Use of SI PITEM Technology

The SI PITEM Technology outreach was located at the Sinarancang Village Hall, Mundu District, Cirebon Regency. The SI PITEM Technology socialization activity was attended by village officials and representatives of local farmers. Information dissemination for SI PITEM Technology was carried out using lecture, simulation, and discussion methods. The SI PITEM Technology socialization activities are shown in Figure 4.

Figure 4. SI PITEM Technology Socialization Activities

SI PITEM Technology Assembly

SI PITEM Technology consists of solar panels, controller boxes, and pumps. The location of the solar panels is above the substation, so that the absorption of sunlight is maximized. The substation where the solar panels are placed can be seen in Figure 5.

Figure 5. Substation installation location for solar panels

The controller box is located under the substation, so that it is not exposed to rain or direct sunlight. In addition, the controller box must be located close to the pump because it is the link between the pump and the solar panel. The location of the controller box and pump is shown in Figures 6 and 7.

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Figure 6. Box controller installation location

Figure 7. Pump location

In the time of assembling the SI PITEM Technology, there were several obstacles when installing solar panels because of their relatively high position. So, the assembly took a while. The process of installing solar panels on the substation is shown in Figure 8.

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Figure 8. The process of installing solar panels onto the substation

Program Evaluation and Program Sustainability

In general, the installation of the SI PITEM Technology went smoothly and received a very positive response from partners, including village officials, BUMDes, and farmers. However, in the operational process, the person in charge of SI PITEM Technology from the village side had a few difficulties, so it was necessary to do several simulations. For the maintenance process and program sustainability, an MOU had been made between Sinarancang Village and the UGJ Electrical Engineering Study Program to both maintain and utilize SI PITEM Technology. Sinarancang Village utilizes SI PITEM Technology for irrigation systems, and the Program Study of Electrical Engineering University of Swadaya Gunung Jati utilizes SI PITEM Technology for laboratories.

Conclusion

Based on the results of the SI PITEM Technology application activities in Sinarancang Village, Mundu District, Cirebon Regency, it can be concluded that SI PITEM Technology can be used for irrigation systems in agricultural land during the dry season and has a high level of efficiency because the electricity comes from solar panels that are free of charge. So that, technology application activities of SI PITEM can increase the productivity of agricultural products. The SI PITEM Technology application also provides new insights for Sinarancang Village community, especially regarding solar energy-based electric pump systems.

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