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Socialization and Implementation of Automatic Watering System for Greenhouse in Kelompok Tani Wanita (KWT) Mawar Siyono Tengah

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ABSTRACT

Lumbung Mataraman Kelompok Wanita Tani (KWT) Mawar Siyono Tengah has a greenhouse as part of the implementation of the Lumbung Mataraman program from the Daerah Istimewa Yogyakarta government. This greenhouse is used as a means of cultivating food plant seeds. Watering plant seedlings in the greenhouse is still manual, where in the watering operation it still requires human labor in carrying out daily watering activities. The background of this service is based on automation, where automation is a technology used to carry out work processes or procedures without human assistance. In the current era of the industrial revolution 4.0, manual activities that use human labor are beginning to decrease and be replaced by automated systems and tools in order to streamline and effectively operate a field of work. Automation of the watering system in the greenhouse aims to carry out watering activities on plants in the greenhouse without using human labor. The implementation of the automatic greenhouse watering system at the Mataraman Lumbung KWT Mawar Siyono Tengah is very useful for the management and members, where this system facilitates the operation of watering plant seedlings in the greenhouse. From the results of the water discharge measurement used in this automatic watering system, the water discharge was obtained at 1.73 lt/minute where the watering time on the timer was set at 2 minutes for 2 times a day at 07.00 and 17.00. The addition of valves and replacement of nipples was carried out according to partner feedback.

Keywords: *Automation, Lumbung Mataraman, Watering System, Greenhouse*

1. INTRODUCTION

The Lumbung Mataraman Program is a form of initiation by the Agriculture and Food Security Office of the Yogyakarta Regional Government in order to elaborate integrated farming and corporate farming activities carried out on a regional basis. The main goal of the program is to revive the community's economy through the role of farmers where agriculture is still a basic sector in Yogyakarta. The Mataraman Barn is financed through the 2022 Special Fund, the Mataraman Barn program in 2022 has been applied to two locations, namely Bendung, Semin, Gunungkidul and Pengasih, Kulon Progo. One of the Mataraman Barns is the Mataraman Lumbung of the Central Mawar Siyono Women Farmers Group (KWT).

1.1. Situation Analysis

The Lumbung Mataraman is not a physical building. Rather, it is a live food barn based on households that are integrated into farmer groups. The Lumbung Mataraman activity is under the work unit of the Agriculture and Food Service. The philosophy of the mataraman barn itself is "Nandur sing dipangan, mangan sing ditandur". From that philosophy, it is hoped that people will want to plant edible plants. For example, vegetables and fruits. In addition, the community can also use the vacant yard land for simple farming. With the existence of this lumbung mataraman, it is hoped that it can become a village or village food barn that can support food security, food independence, and food sovereignty in the Special Region of Yogyakarta.

Lumbung Mataraman KWT Mawar Siyono Tengah has a greenhouse as part of the implementation of the Mataraman Lumbung program from the Yogyakarta government. This greenhouse is used as a means of cultivating food plant seeds. Greenhouse is often interpreted as a greenhouse because of its buildings made of glass and translucent. In subsequent developments, other materials such as plastic, fiberglass, and paranets were found so that the name changed to a plant house. According to Widyastuti (1994:2), the term greenhouse comes from the word green which means green and house which means house. Therefore, a greenhouse is commonly translated as a greenhouse. In general, the figure of a greenhouse building consists of a skeleton as a support for strength, a roof and walls as a protector, a greenhouse interior which is usually in the form of shelves or pot hangers, and greenhouse equipment in the form of climate control devices, especially reducing the intensity of sunlight and exposure to rainfall.

1.2. Partner Problems

Watering plant seedlings in the greenhouse is still manual, where in the watering operation it still requires human labor in carrying out daily watering activities. M. Narji et,al. (2022) discusses the issue of watering, several things need to be considered to take care of plants, such as determining the right time to water and how much water content plants need to develop, but if it is still done manually, it increases the possibility of errors, because humans cannot objectively determine the level of soil dryness and air temperature, This can be bad if the plant is too dry or damp. Plants are living things that need water for their life development. There are many factors that can affect plant development, such as temperature, soil moisture, and light intensity. The need for sufficient water is also an important factor for plants in carrying out photosynthesis. If these things are not met, the plant can wither and die (E. Z. Kafiar, 2018). The tendency to water sporadically is often observed by busy urban dwellers. The lack of time available to pay attention to and care for the plant encourages a need for automatic watering). The factors that determine the failure of the growth of a plant are almost 80% influenced by the wrong technique or way of watering the plant. This is due to the watering technique that is done manually so that not all plants get an even water intake to avoid plants from wilting. Another factor that causes crop growth failure is soil moisture.(M. Irsyam, 2019). The background of this community service is based on automation, where automation is a technology used to carry out work processes or procedures without human assistance. In the current era of the industrial revolution 4.0, manual activities that use human labor are beginning to decrease and be replaced by automated systems and tools in order to streamline and effectively operate a field of work. Automation of the watering system in the garden aims to carry out watering activities on plants in the garden without using human labor. This watering automation can maintain the volume of water used in watering and because it does not use human labor, it can reduce the workload of residents in daily activities which ultimately has an impact on improving the peace of residents in their daily activities

2. SOLUTION

Watering plants that are still manual in the Mataraman Lumbung KWT Mawar Siyono Tengah greenhouse can be solved by applying automation to the greenhouse watering system. Automation is a technology used to carry out work processes or procedures without human assistance. This work is carried out using an instruction program combined with a control system to carry out these instructions. To automate a process, a power source is needed both to run the process in question and to operate its control programs and systems. Although automation can be applied to a wide variety of work areas, automation is more closely related to manufacturing industries (Grover, 2005). Clock-based watering automation can adjust the watering frequency, watering time and water discharge used in this watering so that it can use water resources effectively and efficiently. Frequency, time and discharge settings can be adjusted based on the needs of partners or based on the availability of water resources in the greenhouse environment. Comparison of water use measurements before and after automation can be an indicator of watering effectiveness and efficiency assuming plant conditions remain good.

3. IMPLEMENTATION METHOD

3.1. Socialization of Automatic Watering System

Automatic watering socialization activities are given to members and administrators of the Lumbung Mataraman KWT Mawar Siyono Tengah with the aim of providing education and knowledge transfer related to the scope of definitions and tools that can be used as well as designs that will be proposed in the context of implementing automation in existing greenhouses. The socialization activity is show in figure 1.

3.2. Partner Participation

The Lumbung Mataraman KWT Mawar Siyono Tengah will contribute to learning related to the function and form of timer programming and in its implementation, it will supervise the ongoing automation system and troubleshoot if there is an operational error both in the timer program and in the automatic watering system.

Figure 1 Automatic watering system socialization activities.

3.3. Automatic Watering System Implementation

The implementation of the automatic watering system as a follow-up to the previous service activity, namely automatic watering socialization was given to members and administrators of the Mataraman Lumbung KWT Mawar Siyono Tengah. Socialization is carried out in the early stages with the aim of providing education and knowledge transfer related to the scope of definitions and tools that can be used as well as designs that will be proposed in the context of implementing this automation in existing greenhouses. Measurement and collecting data from greenhouse is shown in Figure 2.

Figure 2. Measuring and collecting information in the greenhouse

This implementation began with the addition of pipes and additional water reservoir arrangements as well as automatic faucet settings in the greenhouse. Followed by electrical installation as a power source for timers and pumps in this watering system. Then the making of the poles and the arrangement of the watering nipple follow the existing design proposal. Setting a timer then running this watering system for 2 weeks which is then evaluated based on feedback from partners and making adjustments according to that feedback. After the adjustment is made, the system is re-run for the next 2 month to ensure that the watering is in accordance with the partner's expectations. The timer and pump for automatic watering system are shown in figure 3.

Figure 3 Timer and pump for the automatic watering system

Figure 4 Automatic watering system for greenhouse .

3.4. Evaluation and Sustainability

The implementation of the automatic watering system as a follow-up to the previous service activity, namely automatic watering socialization was given to members and administrators of the Lumbung Mataraman KWT Mawar Siyono Tengah. Socialization is carried out in the early stages with the aim of providing education and knowledge transfer related to the scope of definitions and tools that can be used as well as designs that will be proposed in the context of implementing this automation in existing greenhouses. This community service has been done from the month January 2024 till August 2024. In the first two months, socialization activities and proposals for the design of automatic watering systems for greenhouses will be carried out, and in the rest of the months there will be implementation of the previous proposals. During the

implementation period, this watering system will be checked every 2 weeks. At the end of the August 2024, an evaluation of the system's performance and its benefits to partners will be carried out so that feedback can be obtained on things that can be added in the future. For installation, this system will remain in the partner's greenhouse and will remain in the support of its operation as long as the partner is still needed. The implementation of automatic watering system in the greenhouse is shown in figure 4.

4. RESULT & CONCLUSION

In accordance with the implementation schedule in the previous chapter, for the socialization activity, namely the introduction of automation at the Mataraman Barn KWT Mawar, it was completed on January 31, 2024, which was attended by the management of KWT Mawar members RW Siyono Tengah Gunungkidul. This introduction to automation explains the meaning of automation and its related components as well as proposed watering designs in greenhouses.

The socialization of the greenhouse automatic watering system at the Lumbung Mataraman KWT Mawar Siyono Tengah were useful for administrators and members because it can provide insight related to the science and automation tools that will be used in the automatic watering system. Watering activities in the greenhouse are carried out in rotation every day according to the schedule that has been arranged in the Lumbung Mataraman KWT Mawar, so it is hoped that this automatic watering system can be implemented immediately considering the weather conditions and the start of the fasting month so that members and administrators will be busy with many activities and household activities. The proposed design of the watering system was also approved, regarding the technical details, feedback can be given according to KWT's needs. For non-technical watering needs, in this case, the electricity bill will be used as one of the feedback and comparison points before and after this system is implemented, as a reference for the tradeoff between the ease of watering and the burden of the electricity bill.

The installation of the automatic watering system itself was completed as scheduled in June and automatic watering began from July to August, to measure performance and get feedback from partners. The timer setting for this automatic watering is set every 07.00 and 17.00 for 2 minutes. The arrangement of 2 waterings is based on the picket schedule of the management and members of KWT Mawar. Where in the picket schedule there is a task of watering plants both inside and outside the greenhouse. From the measurement results, it was found that the water discharge used for watering was 1.73 lt/minute. The feedback from partners related to the need to add a valve at the T junction of the plant watering pipe outside the greenhouse, so that the water path for watering plants outside the greenhouse can be opened and closed without disrupting the water supply to the temporary water reservoir in the greenhouse. So that watering plants outside the greenhouse can still run. And the distribution of watering water from the nipple is less evenly distributed, so it is necessary to replace the nipple more so that the water can be more evenly watered.

The implementation of the automatic greenhouse watering system at the Lumbung Mataraman KWT Mawar Siyono Tengah is very useful for the management and members, where this system facilitates the operation of watering plant seedlings in the greenhouse. Watering activities in the mataraman KWT Mawar barn are carried out in rotation every day according to the schedule that has been arranged in the Lumbung Mataraman KWT Mawar, with the implementation of this automatic watering system, the work load of members in the picket schedule can be reduced, in addition to that if there is a rainy weather condition where members cannot carry out their picket duties, watering plant seedlings in the greenhouse can still be carried out. From the results of the water discharge measurement used in this automatic watering system, the water discharge was obtained at 1.73 lt/minute where the watering time on the timer was set at 2 minutes for 2 times a day at 07.00 and 17.00. The addition of valves and replacement of nipples was carried out according to partner feedback.

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