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Implementation of Caterpillar Pest Control (CPC) on Solar Cell Based Onion Plants to Increase Productivity

Wahyu Tri Handoko[1*], Moh. Zainul Falah[2], Dhiyaurrahman Fakhruddin[3], Muhammad Sadidul Itqon [4], Langlang Gumilar [5], Farah Wardatul Afifah[6]
[1,2,3,4,5,6] *Universitas Negeri Malang, Indonesia*

wahyutrihandoko.ee@gmail.com*

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Abstract

One of the agricultural products that is very necessary as a cooking spice is onions. Onions are a mandatory spice in every dish to add flavor and enjoyment to the dish. Onion plants are not limited to the season at which they are planted so farmers can plant onions at any time, especially shallots. Based on this, one of the Farmer Groups in Krejengan District, Probolinggo Regency, is a forum for deliberation regarding agriculture, especially shallots. In shallot farming in Krejengan District, in dealing with caterpillar and planthopper pests, chemical pesticides are often used excessively. This certainly hurts the health of those who consume shallots and the environmental impact. On the other hand, spraying chemical pesticides has large costs in purchasing pesticides and farmer labor. If this is not done, it will have an impact on reducing shallot crop production and even result in crop failure. This community service activity program aims to reduce the use of chemical pesticides for pest control, which of course can reduce the costs of purchasing pesticides and farmer labor. Apart from that, by reducing the use of chemical pesticides, those who consume shallots are healthier. By doing this, the Agro Makmur Farmers Group can maintain the shallot production yields by creating a pest control device or Caterpillar Pest Control (CPC) for solar cell-based shallot plants so that it is environmentally friendly.

Keywords: Caterpillar Pest Control, Increase Productivity, Solar Cell

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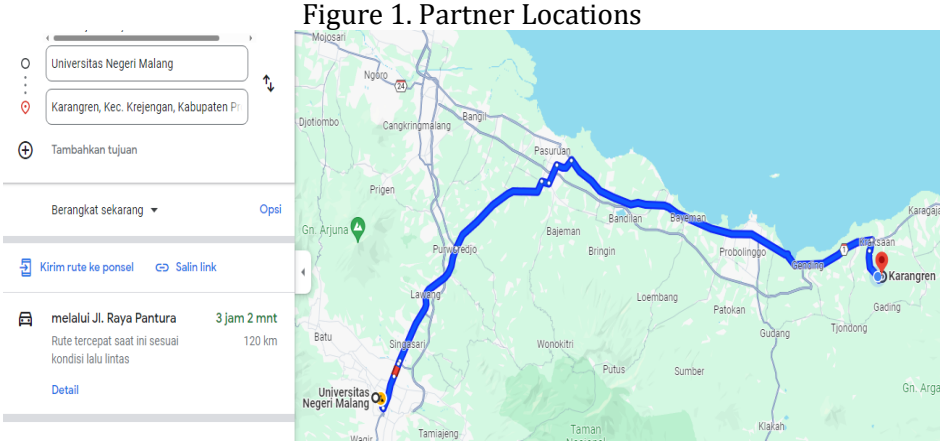
INTRODUCTION

Agro Makmur is a Krejengan District Farmers Group located in Karangren Village, Krejengan District, Probolinggo Regency, East Java Province as in Figure 1. Agro Makmur is a forum for farmer deliberation in resolving agricultural problems, especially in shallot farming, the majority of which grows this crop. Based on its profile, the agricultural production of Krejengan District is rice in the rainy season, tobacco in the dry season, and shallots which are not limited by the season. Of course, this is the main potential for shallot farming because it is not limited by the season and can be planted at any time (Azhari dkk., 2023; Baskoro dkk., 2021; Fitrianata & Rozci, 2023; Novita dkk., 2019). However, the process of caring for shallot farming needs to be paid attention to, especially controlling caterpillar pests and planthoppers (Aldo, 2020; Falah, Handoko, Syah, dkk., 2023; Handoko & Handayani, 2023). Shallot farmers in controlling caterpillar and leafhopper pests use chemical pesticides which are sometimes excessive (Falah, Syah, dkk., 2023; Marisa & Arrasyid, 2018).

Figure 1. Partner Locations



The problems raised by Mr. Khairul Umam as Chair of the Agro Makmur Farmers Group in Krejengan District, which are often encountered, are the excessive use of chemical pesticides and looking for pests on the bodies of shallot plants using traditional methods of controlling caterpillar (Tahyudin dkk., 2020; Triwidodo & Tanjung, 2020) and leafhopper pests which result in increased costs in farming shallots (Muhsin & Linggarweni, 2023; Suyatno, 2022). If chemical pesticide spraying is not carried out (Andani & Nasirudin, 2021), it will fail in crop production. Apart from that, farmers also lack knowledge about the technology that is currently developing in pest control. The lack of knowledge and skills of shallot farmers in applying appropriate technology is one of the reasons shallot farmers have difficulty in designing and developing tools that can deal with pests in their farming (M. F. Abdillah, 2024; Dany'el Irawan dkk., 2022; PUTRI, 2023; Yuniarti dkk., 2021; Yuwono dkk., 2024). Routine spraying of chemical pesticides (Mulyati, 2020; Rosadi dkk., 2019; Sekaringgalih dkk., 2023; Thamrin dkk., 2003) and the process of searching for pests (Adibah dkk., 2023; Istiqomah dkk., 2022; Sahuri & Sahna, 2021) using traditional methods to control caterpillar and leafhopper pests in shallot farming to maintain crop yields as in Figure 2.

Figure 2. Spraying Chemical Pesticides and Searching for Pests on Shallots by Looking at the Condition of the Plants

Therefore, in overcoming the problem of pest control in onion farming, a solution using technology is needed. Simple technology that can control caterpillar and leafhopper pests in shallot farming efficiently and optimally to reduce the use of chemical pesticides and increase costs so that agricultural production results are more optimal. Apart from that, farmers are also able to apply knowledge in using facilities to maintain crop yields.

Based on this background description, the service team would like to propose a tool for controlling caterpillar and leafhopper pests based on Solar Cell (H. Abdillah dkk.,

2020, 2022, 2024; Falah, Handoko, & Kurniawan, 2023), better known as Caterpillar Pest Control (CPC), so that it can reduce costs for controlling pests in onion plants and reduce the use of chemical pesticides. This CPC tool additionally employs a Solar Cell, which serves as an electrical energy producer, allowing the tool to be independent of PLN-generated electricity.

METHOD

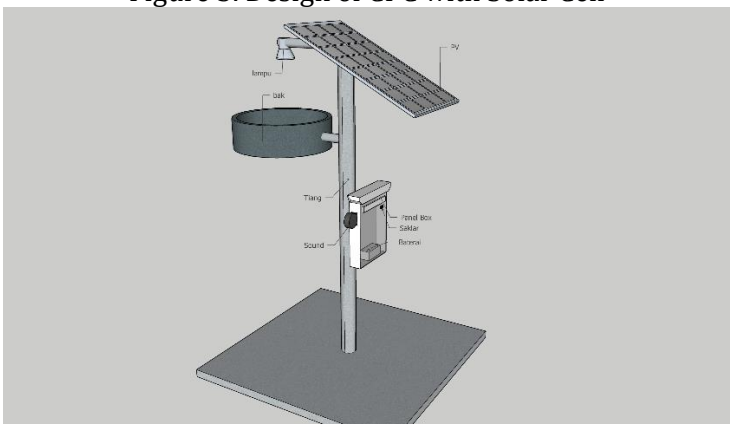
The problem-solving and solutions offered to the Agro Makmur Farmer Group are structured using the following problem-solving framework:

1. Create a Solar Cell-based Caterpillar Pest Control (CPC) tool as a pest control tool to increase work efficiency, costs, and productivity in growing shallot plants.
2. Design and installation of Caterpillar Pest Control (CPC) equipment in the Agro Makmur Farmer Group.
3. Assess the performance of the Solar Cell-based Caterpillar Pest Control (CPC) equipment that has been sent to partners. This test is performed to ensure that the Caterpillar Pest Control (CPC) tool performs as intended.
4. Training on the use of Solar Cell-based Caterpillar Pest Control (CPC) equipment for the Agro Makmur Farmer Group.
5. Evaluation.

The community service team implemented the Solar Cell-based Caterpillar Pest Control (CPC) instrument in the Agro Makmur Farmer Group through the following activity methods:

1. Observation. The observation stage tries to examine demands and identify problems with partners through direct interviews.
2. Planning and Designing Solar Cell-based Caterpillar Pest Control (CPC). At this stage, the service team will arrange the activities needed to purchase equipment and materials to make Solar Cell-based Caterpillar Pest Control (CPC) and determine training activities with the Agro Makmur Farmer Group.

Figure 3. Design of CPC with Solar Cell



The processes for creating a Solar Cell-based Caterpillar Pest Control (CPC) are as follows:

a. Making tool frames
b. Making a charging electrical system from Solar Cell to the battery using SCC.
c. Making butterfly and planthopper pest traps (On/Off).
d. Assembly.

3. Training. The community service team, in collaboration with the Agro Makmur Farmers Group, provided training on how to operate, use, and care for Solar Cell-based Caterpillar Pest Control (CPC).

4. Performance Testing, The performance testing stage is carried out to determine that the Solar Cell-based Caterpillar Pest Control (CPC) tool works well according to its function.
5. Product Handover, At the product handover stage, the Solar Cell-based Caterpillar Pest Control (CPC) tool that has been made will be given by the team leader and members to representatives from the Agro Makmur Farmers Group.
6. Documentation and Reporting, At this stage, all activity processes by the community service team from start to finish will be documented using a camera.
7. Publication. The maximum effort will be made at the publication stage in national and international seminars/journals.

RESULT AND DISCUSSION

The community service program entitled "Implementation of Caterpillar Pest Control (CPC) on Solar Cell-Based Onion Plants to Increase Productivity" produced significant results and a large positive impact in the shallot farming sector. The main objective of this program is to reduce the use of chemical pesticides in controlling caterpillar and planthopper pests that occur in shallot plants to increase harvest yields the technology applied can make it easier and save costs in controlling pests by utilizing new, renewable energy, namely solar cells.

This community service project will be carried out from May to June 2024, yielding four Caterpillar Pest Control (CPC). The CPC poles are assembled and installed by members of the Agro Makmur Farmers Group and other onion farmers and will then be distributed to onion farming locations that need pest control equipment to increase crop yields. Figure 4 depicts the procedure of delivering CPC equipment to the Chairman of the Makumur Krejengan Agro Farmers Group.

Figure 4. Tools are handed over to the Chairman of the Krejengan Agro Makmur Farmers Group.

Figure 5. Training for the Use and Maintenance of CPC Equipment

Figure 6. Results of CPC Installation and Testing on Shallot Agricultural Land

Figure 5 is documentation in the field during training on the use and maintenance of CPC equipment for the Chair of the Agro Makmur Krejengan Farmers Group and other shallot farmers so they know how to operate the equipment. The placement of the CPC installation has been determined by members of the community's Agro Makmur Farmers Group through an agreement.

Figure 6 demonstrates that the CPC equipment is working effectively, and the installation construction is strong. All CPC devices installed can entice insects, which are indicators of pest spread on onions, to enter the traps provided. Every week, regular monitoring and evaluation are required to assess the CPC's efficacy and to update the traps if a large number of insects are captured. It was demonstrated that throughout one month of monitoring the tool, there were no difficulties. Shallot farmers can reduce their electricity consumption by using innovative renewable technology such as solar cells. However, there are still many shallot farming areas that still do not have friendly pest control such as CPC. To boost crop output and pest management efficiency, numerous additional CPC units will be required in the future.

CONCLUSION

Community service activities carried out in the Red Onion Farming Area, Krejengan District, Probolinggo Regency have been completed very well. Caterpillar Pest Control (CPC) equipment that employs solar cells has been deployed and performed well. All installed CPC points are capable of attracting insects that spread pests into the trap. The positive results are that the CPC tool can control pests on shallots, thereby reducing the use of chemical pesticides and saving costs in searching for pests in onion plants. The participation of shallot farmers in this activity generates a sense of collaboration and mutual learning, which enhances the influence of technology. As agriculture evolves, this effort is an intriguing example of how the harmonic blending of technology, farmer involvement, and sustainable farming techniques may result in long-term good change.

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