Abdimas Umtas: Jurnal Pengabdian Kepada Masyarakat
LPPM-Universitas Muhammadiyah Tasikmalaya
Volume: 6 Nomor: 1
E-ISSN: 2614 - 8544

Pest Control on Shallots Using Solar-Powered Trap Lights in Srimulyo Village, Sragen Regency

Hendri Widiyandari[a)], Yofentina Iriani, Kusumandari, Fahru Nurosyid, Khairuddin, Risa Suryana

Department of Physics,Universitas Sebelas Maret Jl. Ir. Sutami 36 A Surakarta Indonesia
[a)] Author: hendriwidiyandari@staff.uns.ac.id

Abstract

Shallots one of a leading vegetable commodity in Central Java. However, the shallot farming industry is frequently confronted with the issue of decreasing yields due to the presence of plant pests. Onion plant pests include the butterfly (Spodoptera exigua) and the leafminer fly (liriomyza). There are two approaches to dealing with this pest problem: pesticides/insecticides and light traps. In terms of organic farming methods, the use of light traps is more profitable. However, the operational costs are quite high because farmers must have a generator to generate electricity, diesel fuel to turn on the generator, oil to lubricate the engine, operators, or must connect to the PLN electricity network. So, we used a solar-powered pest trap lamp system with Li-ion batteries as the energy storage medium to solve this problem. In Srimulyo village, Gondang district, Sragen regency, community service activities such as installing pest trap lights to control pests on shallots were carried out. The onion farmer group association is the service activity's partner (Gapoktan). This activity was well received by shallot farmers because the presence of this light trap can reduce pest attacks.

Keywords: Community Service, Pest prevention, Shallots, Lamp

INTRODUCTION

Shallot production increases year after year, but it appears that it is still insufficient to meet consumer demand, necessitating imports. Shallot imports typically occur between April and July as a result of a domestic supply shortage caused by low shallot production during the previous rainy season. [2] This is due to an unequal supply of production between in-season and out-of-season harvests, one of which is caused by the high intensity of pest and disease attacks, particularly when planting is done out of season. Furthermore, red onion is a commodity that cannot be stored for an extended period of time, lasting only 3-4 months despite the fact that consumers require it at any time. Apart from the season, the main issue with shallot farming is the high risk of crop failure due to an unfavorable environment, particularly pest and disease attacks. Pests and diseases that affect shallots include the onion caterpillar (Spodoptera exigua) and thrips, as well as anthracnose, fusarium, and trotol.

Farmers overuse pesticides because they believe that the success of controlling pests and diseases is determined by increasing the dose, frequency, and composition of the type of pesticide mixture used. As a result, the cost of shallot farming is rising, and profits are unbalanced and unconcerned about environmentally friendly agriculture. Another effect of excessive pesticide use is an increase in secondary pests. To increase shallot production, it is first necessary to understand the issues that farmers face when growing shallots such as plant care and maintenance includes fertilization, watering, and preventing pest attacks, all of which are done to obtain optimal yields (Diharja et al., 2021) as the solution to land use efficiently and optimally (Masnang et al., 2022). It will be able to determine what actions must be taken to solve the problems of these farmers if it is aware of their problems.

Those certain problems faced by farmers in Srimulyo Village in shallot farming include: differences in production between the dry and rainy seasons, a lack of superior varieties of shallots resistant to important pests and diseases and suitable for the rainy season, shallot farmers'

reliance on imported seeds, and constraints in terms of socialization and substitution of high-yielding shallot varieties.

Shallot farming is still in its infancy in Srimulyo Village, Gondang District, Sragen Regency. Insect pests such as butterflies (Spodoptera exigua) and leafminer fly (Liriomyza) pose problems for shallot farmers (Figure 1). The common control measure carried out by farmers in Srimulyo Village is to use insecticides (Figure 2.a), so that insecticides are the main guarantee for the success of farming. The volume of insecticide solution used in each application ranges from 560 to 1,588 liters per ha. Farmers spray every 3 - 4 days, so they spray 15 - 20 times in one growing season. Even during the August planting season, the spraying interval increases to 1 - 2 days, so they can apply insecticides up to 50 times in one growing season. [3] If the hot weather continues, mechanical caterpillar control (taking and disposing of groups of eggs and caterpillars) and insecticide applications (1 - 2 day intervals) will be ineffective in controlling the population of S. exigua caterpillars, which can cause onion plants to wilt in one week. The impact of excessive use of pesticides includes being a source of contamination for food, water, and the environment, and leaving pesticide residues in agricultural products and in the soil, as well as residue hazards for human health. [4].

Farmers have also used physical countermeasures, such as light traps, as an alternative (Figure 2.b). However, trap lights are quite expensive to use because they require generators and PLN as a source of electricity, as well as equipment operators. As a result, this method is only used by farmers with large plots of land, while smallholder farmers continue to rely on insecticides. So that the purpose of this community service activity is to help shallot farmers in Srimulyo Village, Gondang District, Sragen Regency use solar-powered safe pest trap lights and use electrical energy storage media in the form of lithium-ion batteries.

Figure 1. Pests that take the form of insects, such as butterflies, are known as klaper (Spodoptera exigua) and leafminer flies (Liriomyza) [5].

Figure 2. Farmers today use several pest management techniques.

METHOD

Based on the activity flow depicted in Figure 3, this community service project is carried out. The steps of an activity start with the production of battery modules, continue with the creation of a solar-powered pest trap light system, the testing and installation of equipment, the gathering of data for publications, and the reporting and distribution of results.

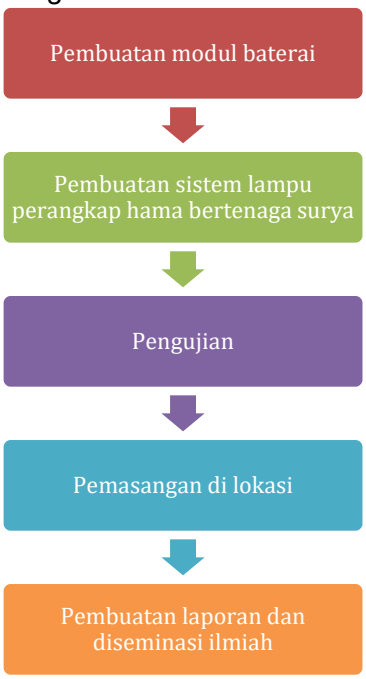

Figure 3. Flowchart of community service activities

Figure 4 shows the design of the pest trap light system. The generator, load, and supporting components of the solar-powered pest trap light system are among its parts. Solar panels, PV panels, solar modules, PV modules, solar charge controllers (BCRs/BCUs), and batteries are examples of the parts used in generators. In order to store energy for use at night, a battery is required as a form of energy storage. Components should be loaded with UV (ultraviolet) bulbs. While poles, battery box wires, and oil drums serving as pest traps make up the supporting elements.

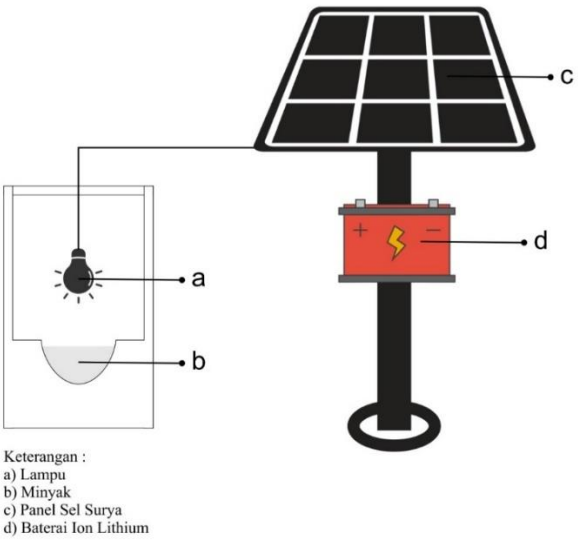

Figure 4. Design of a lamp unit for a shallot plant pest trap

RESULT AND DISCUSSION

Centre of Excellence for Electrical Energy Storage Technology, UNS produced solar-powered pest trap lights. Figure 5 shows the production procedure (a) and the finished pest trap lights (b). On June 21, 2022, shallot growers who were also represented by the Head of Srimulyo Village, Mr. Tri Prasetyo Utomo, S.Si, received the pest trap lights (Figure 6). Figure 7 depicts the lights that have been put in the shallot rice fields. Figure 8 displays the state of the lights at night.

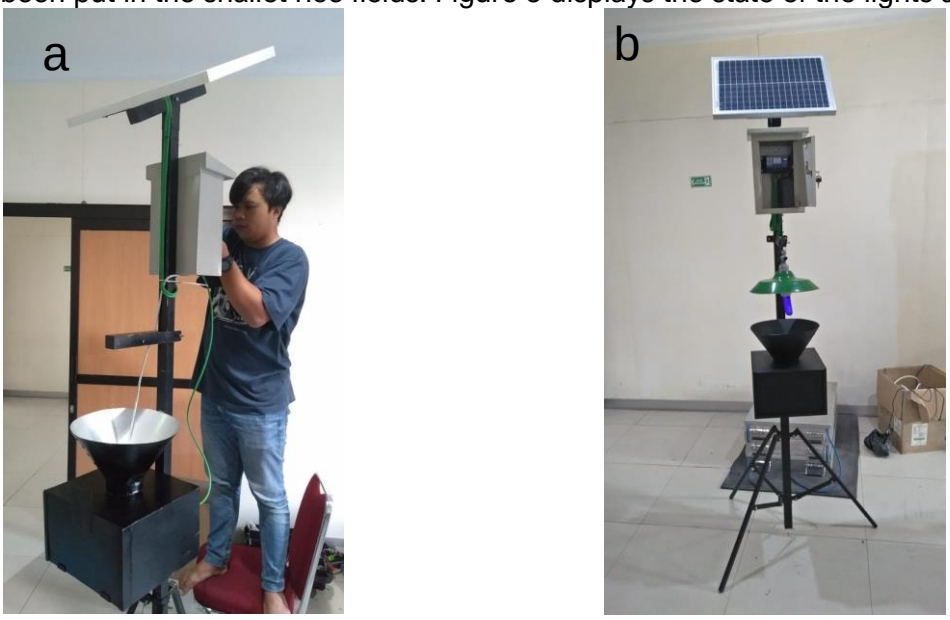

Figure 5. The steps involved in making a pest trap light (a) and a solar-powered pest trap light (b) that uses a lithium-ion battery as an energy source (b).

Figure 6. Pest trap light units are distributed to shallot farmers in Srimulyo Gondang village, Sragen

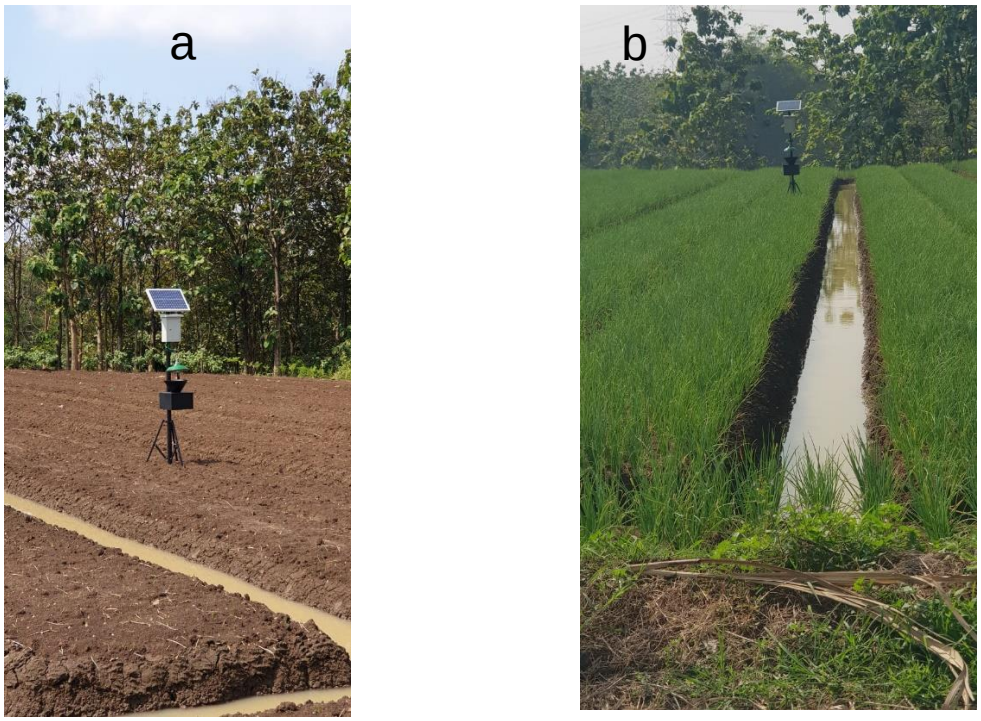

Figure 7. Installation of light units, (a) land preparation, and (b) after the shallots are planted in paddy fields (1 month).

Table 1. The results of farmer satisfaction using the results of appropriate technology for pest trap lights

Name	Address	What are the pests that often attack?	Are farmers happy to get new tools?	Are farmers able to use tools easily	Can the tool repel pests?	Did agricultural yields increase after using the tools?	If the lamp has ever been replaced, what type of lamp is the most effective in repelling onion pests?	Suggestion (optional)
Yudi yulianto	Srimulyo	caterpillars	YES	YES	YES	YES	Ultra violet light (UV)	Hopefully next time the tools can be evenly distributed, because of the vast agricultural area in Srimulyo village
Tri Prasetyo Utomo	Toklaos Rt 09 Srimulyo Gondang	capers	YES	YES	YES	YES	White LED	Hopefully, all rice fields will receive more

								support in the future.
Name	Address	What are the pests that often attack?	Are farmers happy to get new tools?	Are farmers able to use tools easily	Can the tool repel pests?	Did agricultural yields increase after using the tools?	If the lamp has ever been replaced, what type of lamp is the most effective in repelling onion pests?	Suggestion (optional)
Yudi Yulianto	Tegalrejo rt 20 desa srimulyo	caterpillars	YES	YES	YES	YES	Ultra violet light (UV)	Hopefully for the following year there will be another program, so that the area of Srimulyo agriculture can be free of pests.
Sugiman	Pagah Lor Rt 04 srimulyo gondang sragen	Leaf flies	YES	YES	YES	YES	Light bulb	-
Joko waluyo	Karangrejo rt 33	caterpillars	YES	YES	YES	YES	White LED	The suggestion is that the tools can be reproduced more. Thank you
Ari sulistyo	Pagah lor	caterpillars	YES	YES	YES	YES	White LED	Provided a stock of lamps for guarding
Danang wijayanto	Toklaos kidul rt 09 desa srimulyo	caterpillars	YES	YES	YES	YES	White LED	Hopefully given a spare lamp
Sugiarto	Toklaos kidul rt34, Srimulyo, Gondang, Sragen	caterpillars	YES	YES	YES	YES	White LED	The provision of tools if possible is evenly distributed, so that

	farmers from the middle and lower classes can all get it, not only farmers who have an area of land.

Figure 8. The condition of the lights at night in the shallot rice fields.

Table 1 shows the user satisfaction results. These safe and energy-efficient pest trap lights are advantageous to farmers. According to information from direct farmers, leaf flies, capers, and caterpillars are the three insect species that pose the most issues on his farm. The operation and use of the pest trap lights are simple for onion farmers. Farmers that employ the instruments claim that they can fend off pests, and they anticipate higher harvests as a result. Farmers claim that as compared to UV and tungsten lamps, white LED lights are more effective at keeping pests like capers away.

CONCLUSIONS

In conclusion, this community service project has been a success in implementing appropriate technology in the form of safe, useful, environmentally friendly, and energy-efficient pest trap lights that are powered by solar energy and have their electrical energy stored in lithium-ion batteries. In Srimulyo Village, Gondang District, Sragen Regency, this ham trap lamp can be utilized to manage pests in onion plants.

ACKNOWLEDGEMENT

Universitas Sebelas Maret provided funding for this charitable endeavor under the terms of a contract with the grant number: 255/UN27.22/PM.01.01/2022.

REFERENCES

Basuki, R. S. (2014). Identifikasi permasalahan dan analisis usahatani bawang merah di dataran tinggi pada musim hujan di Kabupaten Majalengka. Jurnal Hortikultura, 24(3), 266-275.

Diharja, R., Nur Witdi Yanto, W., Wike Handini, W., & Sri Wiji Lestari, W. (2021). Implementation of Automatic Plant Sprinkler Control System in RT 07 RW 08 Pabuaran Mekar Subdistrict, Cibinong, Bogor. ABDIMAS UMTAS: Jurnal Pengabdian Kepada Masyarakat.

Hama utama bawang merah dan penanggulangannya, https://www.baktikunegeriku.com/, 4 November 2019, diakses pada 29 Januari 2021.

Masnang, A., Jannah, A., Purba, T. Y., & Rosyad, A. (2022). Technical Guidance for Revitalizing Land Yard In the Family Welfare Empowerment Group (PKK) Pasir Mulya Village, Bogor City. ABDIMAS: Jurnal Pengabdian Masyarakat, 5(2), 2857-2863.

Statistik Daerah Kabupaten Sragen Jawa Tengah 2020, nomer 52070.1912, BPS Kabupaten Sragen, 2020.

Surya, E., Armi, A., & Ridhwan, M. (2019). Kerusakan tanaman bawang merah (Allium ascalonicum L.) akibat serangan hama ulat tanah (Agrotis ipsilon) di lahan bawang merah gampong lam rukam kecamatan peukan bada Kabupaten Aceh Besar. Bionatural: Jurnal Ilmiah Pendidikan Biologi, 6(1).

Udiarto, B. K., Setiawati, W., & Suryaningsih, E. (2005). Pengenalan hama dan penyakit pada tanaman bawang merah dan pengendaliannya.

Yudha, C. S., Muzayanha, S. U., Widiyandari, H., Iskandar, F., Sutopo, W., & Purwanto, A. (2019). Synthesis of LiNi0. 85Co0. 14Al0. 01O2 cathode material and its performance in an NCA/graphite full-battery. Energies, 12(10), 1886.