

Cutting-Edge Agricultural Technology for Farmer Self-Reliance: Support and Implementation of Efficient Spraying Equipment

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ABSTRACT

Agriculture plays a crucial role in Indonesia's economy but faces various challenges such as climate change and low productivity. To address these issues, technological innovation is essential. Efficient modern agricultural sprayers are one key innovation that helps farmers apply pesticides and fertilizers more effectively. This study focuses on the support and implementation of efficient sprayers in Bana Village, Teriak District, Bengkayang Regency. Through lectures, discussions, demonstrations, and simulations, farmers are encouraged to understand and adopt this technology. The results show an increase in farmers' knowledge and skills in using the sprayers, as well as improved crop productivity and reduced chemical usage. The participatory approach in this study ensures practical and sustainable solutions, enhancing farmer self-reliance. It is hoped that the implementation of this technology will improve farmer welfare and support agricultural sustainability in Indonesia.

Keywords: *Cutting-Edge Agricultural Technology, Farmer Self-Reliance, Efficient Sprayers.*

1. INTRODUCTION

Agriculture is a crucial sector in Indonesia's economy, significantly contributing to national income and providing employment opportunities. However, this sector often faces numerous challenges, including climate change, limited land, and low productivity (Siregar et al., 2024). To overcome these challenges, technological innovation is key to enhancing agricultural efficiency and productivity. One such technology currently being developed and implemented is the efficient agricultural sprayer. This device is essential for crop cultivation, helping farmers manage their crops more effectively, especially in pesticide and fertilizer application. Modern sprayers are designed to save

time and labor while reducing excessive chemical use, making them more environmentally friendly and safer for farmers' health.

This study focuses on contemporary agricultural technology aimed at farmer independence through the support and implementation of efficient sprayers. Support in this context includes training and educating farmers on new technology use and providing continuous technical support (**Kusnanto, Gudiato, 2023**). Implementing appropriate technology is expected to enhance farmer independence, improve agricultural productivity, and reduce dependence on harmful chemicals. The primary goal of this research is to achieve farmer independence, defined as the ability to manage their resources efficiently without excessive external assistance (**Pamungkas et al., 2023**). Consequently, farmers can have greater control over the production and distribution processes of their agricultural products, ultimately improving their overall welfare.

The methodology of this research involves a participatory approach, engaging farmers actively in every research stage (**Haryanto & Anwarudin, 2021**). From problem identification, solution design, to result evaluation, farmers play a key role. This approach ensures that developed solutions meet local needs and conditions, enhancing acceptance and sustainability of the implemented technology (**Pekerti, 2023**). Expected outcomes of this research include increased farmer knowledge and skills in using efficient sprayers, improved crop productivity, and reduced chemical usage. Additionally, the research aims to identify factors influencing technology adoption by farmers and develop effective support models replicable in other regions (**Eka & Lestari, 2020**).

In the context of the Village Law 2014, agriculture remains vital in development planning, contributing to poverty alleviation, economic growth acceleration, gender equality, food security, and environmental balance. The agricultural sector is also one of the largest contributors to the Gross Domestic Product, averaging 13.25% from 2011 to 2019, and it is the most significant employer (**Mesra et al., 2023**).

Implementing cutting-edge agricultural technology benefits individual farmers and positively impacts the environment and society (**Yennita, 2022**). Efficient sprayer use is expected to reduce environmental pollution caused by excessive pesticide and fertilizer use. Additionally, this technology can help address climate change challenges by enhancing crop resilience to pests and diseases. Overall, this service aims to meet the urgent need for technological innovation in the agricultural sector, contributing significantly to achieving farmer independence (**Djuliansah et al., 2020**). Through proper support and efficient technology implementation, farmers can optimize their potential, improve productivity, and achieve better welfare (**Andrianto, 2023**).

Thus, this breakthrough aims not only to enhance the independence and welfare of farmers in Bana Village, Teriak District, Bengkayang Regency, West Kalimantan Province but also to support sustainable agriculture in Indonesia. By integrating modern technology and continuous support, farmers can gain significant long-term benefits (**Cahyono & Putra, 2022**). This initiative is expected to serve as a model for similar projects in various regions, strengthening national food security and supporting sustainable and inclusive agricultural development. With joint commitment from the government, researchers, and farmers, a more independent and competitive future for Indonesian agriculture can be realized

2. METHODOLOGY

2.1 Activity Location

The community service activities were conducted in Bana Village, Teriak District, Bengkayang Regency. The location is approximately ± 10 kilometers from Institut Shanti Bhuana, and it takes about 45 minutes to reach the site by motorcycle. The exact location of the community service is at Jalan Bana, Teriak District Office, Bengkayang, West Kalimantan, 79214 as seen in figure 1.



Figure 1. Community Service Location in Bana Village, Teriak District, Bengkayang Regency Community Service Activities

Lecture Method: The Community Service Team presented and explained the importance of modern agricultural technology for the advancement of current farmers (Purnomo, 2021). The use of modern technology can enhance agricultural yields and the prosperity of farming communities in Bana Village. Various latest agricultural technologies were introduced to farmers, specifically modern spraying equipment, which will be demonstrated directly to the community.

Discussion Method: Investigating questions and dialogues posed by participants regarding modern agricultural technologies that will be introduced and demonstrated directly to the farming community of Bana Village.

Demonstration Method: Through direct practice using modern spraying equipment. The head of the community service team and other members demonstrated the assembly and operation of the modern spraying equipment. This demonstration was conducted comprehensively, from assembling the equipment to its operational readiness, ensuring that the community gains a comprehensive understanding of the technology.

Simulation Method: Presenting an analysis of the application of modern spraying equipment, allowing attendees to observe its operation firsthand and try using it to assess its effectiveness in assisting farmers, especially those in Bana Village.

3. RESULTS AND DISCUSSION

On Monday, May 20, 2024, the Community Service Team from Institut Shanti Bhwana (ISB) conducted activities with the theme "Latest Agricultural Technology for Farmer Empowerment: Assistance and Implementation of Efficient Spraying Equipment in Bana Village, Teriak District, Bengkayang Regency." The event commenced at 09:00 in a multipurpose building and agricultural land area in Bana Village, garnering enthusiastic participation from the local community.



Figure 2. Welcoming Remarks from the Head of Bana Village, Teriak District, Bengkayang Regency, and Presentation of Materials by the Community Service Team

Figure 2 depicts the opening session and remarks from the Head of Bana Village, Irisius, S.Pd. In his address, Irisius expressed that the community had eagerly anticipated this event. He emphasized that the farmers in his village greatly needed new agricultural technologies to enhance the yield and quality of their agricultural production. Irisius also appreciated the presence of the ISB faculty team who were willing to share knowledge and technology with the community. Following the village head's remarks, the event proceeded with a presentation by Kusnanto, S.Pd., M.Pd. As the head of the community service team, Kusnanto explained the importance of modern technology in agriculture for the advancement of today's farmers. According to him, the use of modern technology can improve crop yields and the prosperity of farmers in Bana Village. He presented various cutting-edge agricultural technologies that can be adopted by farmers to enhance their productivity and efficiency.



Figure 3. Hands-on Practice with the Community on Assembling Efficient Modern Spraying Equipment

Figure 3 showed Kusnanto and other team members demonstrated the assembly and operation of the modern spraying equipment. During this demonstration, they explained each step in detail, from assembling the device components to its operation. Attendees were given the opportunity to observe how the equipment works and to try using it themselves under the guidance of the outreach team. This demonstration not only showed how to assemble the equipment but also explained calibration and maintenance procedures to ensure optimal and durable use. The community was encouraged to actively participate, creating an interactive and enjoyable learning environment. Through this approach, participants gained a comprehensive understanding of the technology, from theory to practical application in the field. It is hoped that through these demonstrations, farmers can adopt this technology with greater confidence and effectiveness in their daily agricultural activities.



Figure 4. Simulation of the Efficient Use of Modern Spraying Equipment by Farmers in Bana Village.

Figure 4 shows that participants are given the opportunity to observe firsthand the operation of modern spraying equipment and try using it themselves. This simulation is designed to provide practical experience for participants, allowing them to directly understand how the sprayer operates under real conditions. The outreach team guides participants through each step of using the equipment, from filling the container with liquid, adjusting the pressure, to effective spraying techniques.

Participants are encouraged to actively participate, with each individual given the chance to operate the sprayer themselves. This gives them the opportunity to experience firsthand the ease of use and efficiency of the equipment. Additionally, participants are taught basic maintenance and troubleshooting techniques to ensure the sprayer functions well in the long term (Kusnanto, Gudiato., 2024).

This simulation allows participants to assess how much modern spraying equipment can assist them in their daily farming activities. Through this practical experience, farmers in Bana village can directly see the benefits of modern sprayers, such as time and labor savings, and improved spraying effectiveness. Thus, this simulation method is expected

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to enhance farmers' confidence in adopting new technologies that can enhance their agricultural productivity.



Figure 5. Participants Practice Using Modern Spray Equipment

Figure 5 shows one of the communities directly applying a modern spray tool that has been assembled together with service members. The use of the latest agricultural technology aims to increase efficiency and effectiveness in spraying pesticides or fertilizers. With the help of specially designed spray equipment, farmers can manage their land more optimally and reduce excessive use of resources. It is hoped that the support and application of this equipment can strengthen farmers' independence, advance agricultural products, and improve the economic welfare of the Bana village community. Figure 6 shows group photo with participants or farmers from bana village.



Figure 6. Group Photo with Participants or Farmers from Bana Village

4. CONCLUSION

The community service activity conducted by the Community Service Team from Shanti Bhuana Institute in Bana Village, Teriak Sub-district, Bengkayang Regency, has successfully provided new insights and knowledge to farmers regarding modern agricultural technology. Through lectures, discussions, demonstrations, and simulations, participants gained a comprehensive understanding of the efficient use of modern spraying equipment. The positive response from the community indicates the effectiveness of this activity and its potential for widespread adoption by farmers in Bana Village. Thus, this initiative is expected to bring progress and prosperity to the people of Bana Village through improved agricultural production and quality.

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