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The Utilization of Liquid Organic Fertilizer JAKABA (Eternal Lucky Mushroom) and Refugia Plants in Pest Control and Rice Productivity Improvement on Saline Land in Percut Village

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ABSTRACT
The main problem faced by the Sumber Rejeki Farmers Group in Percut Village, Percut Sei Tuan District, is the low productivity of rice due to saline land and pest infestations. The high soil acidity and low fertility are the main factors hindering rice growth. To address this issue, the community service team from Universitas Sumatera Utara (USU), in collaboration with student activity units, Himadita Nursery, implemented a program utilizing Liquid Organic Fertilizer (LOF) Jakaba (Eternal Lucky Mushroom) and planting refugia plants. LOF Jakaba, derived from mushroom cultivation, helps reduce soil acidity and increases essential nutrients, thereby improving soil structure. Meanwhile, refugia plants serve as habitats for natural pest predators, enabling ecological pest control and reducing reliance on chemical pesticides. The methods used in this program included socialization, training, and assistance for farmers in producing and applying LOF Jakaba, as well as planting refugia plants. The results of this initiative showed improved soil fertility, reduced pest infestations, and increased rice productivity. The conclusion of this activity is that this sustainable agricultural approach has the potential to serve as a model for other areas facing similar challenges and can enhance the well-being of farmers in Percut Village.

Keyword: Jakaba, Refugia Plant, Rice Productivity, Saline Land

1. Introduction

The productivity of rice in Indonesia often faces serious challenges due to suboptimal land conditions and attacks from Plant Pest Organisms (PPO). One of the main issues is the presence of saline land, which hampers rice plant growth. The high soil salinity can lead to a decline in soil fertility and disrupt nutrient absorption by plants, negatively affecting crop yields. Saline land has become an important issue for the Sumber Rejeki Farmer Group in Percut Village, Percut Sei Tuan Subdistrict. Saline land has a high level of acidity due to the presence of sulfide compounds that oxidize when the soil is exposed to air. This condition decreases the availability of essential nutrients such as nitrogen, phosphorus, and potassium, inhibiting rice plant growth. As a result, agricultural productivity in this area tends to be low, which negatively impacts the farmers' economy, which heavily depends on rice production [1,2].

In addition to salinity issues, PPO attacks, such as rice stem borers and planthoppers, also pose serious threats to farmers. The intensive use of chemical pesticides is often chosen as a quick solution to control these pests. However, this approach can have negative consequences, such as pest resistance, environmental damage, and health risks to humans. Therefore, there is a need for alternative pest control methods that are more environmentally friendly and sustainable.

One innovation that has emerged is the use of Liquid Organic Fertilizer (LOF), which can help address the problems of saline land. Research [3] shows that the application of LOF can improve growth and yield in several rice varieties on saline land. LOF plays a role in reducing soil acidity and improving nutrient availability, thereby enhancing soil structure and fertility. Thus, the use of LOF has become an effective strategy in optimizing rice productivity on land with high salinity [4,5].

In addition to improving soil conditions, natural pest control through the planting of refugia plants has also become a promising solution. Refugia plants, such as Kencana ungu (Ruellia simplex), Kembang ratna lekuk (Zinnia angustifolia), Melampodium divaricatum, also known as mini sunflower or thousand star flower, and Kancing flowers, also known as Gomphrena globosa, serve as habitats for natural pest enemies, such as predators and parasitoids. The presence of refugia around agricultural land can increase the population of natural enemies, which in turn helps control pest populations naturally without the need for chemical pesticides. This aligns with efforts to conserve natural enemies and maintain agricultural ecosystem balance [6]. The implementation of this strategy has been supported by various studies and field practices. For example, a study conducted in North Tapanuli showed that the use of refugia plants effectively controlled pests on rice plants. Additionally, community service programs by higher education institutions, such as the University of North Sumatra, have been actively socializing the use of LOF and refugia planting to farmers as part of efforts to improve productivity and agricultural sustainability [7,8].

The combination of using LOF and planting refugia not only contributes to increased crop yields but also supports more environmentally friendly agriculture. By reducing dependence on synthetic chemicals, this strategy helps maintain soil health, water quality, and biodiversity around agricultural land. Furthermore, this approach can improve farmers' well-being through reduced production costs and improved agricultural product quality [9]. Overall, the integration of soil quality improvement through LOF and natural pest control with refugia is a strategic step in addressing the challenges of modern agriculture. This approach not only addresses technical issues in the field but also supports the creation of a sustainable and environmentally conscious agricultural system, in line with the national agricultural development agenda.

2. Methods

The 2025 Independent Theme Community Service program will be carried out at the Sumber Rejeki Farmer Group in Percut Village, Percut Sei Tuan Subdistrict. The steps taken to address the issues will involve an initial socialization of the proposed solutions offered by the service team to the partners, which will be formalized through a partnership agreement between the partners and the USU service team. Once the partners understand and agree to the collaboration, the team will hold discussions about the timing for the extension and socialization activities. This program will also be a primary priority in several aspects, such as economic and socio-cultural aspects within the community.

The approach method that will be implemented in the 2025 Independent Theme Community Service program will involve a survey of the potential/issues within the Sumber Rejeki Farmer Group in Percut Village, Percut Sei Tuan Subdistrict, Deli Serdang Regency. The activity will continue with a Focus Group Discussion (FGD). Guidance training will be provided in the form of extension services on JAKABA cultivation techniques, actions/activities, and mentoring. Additionally, the program will be socialized through extension services and discussions directly with the farming community.

The work procedures to be carried out in the 2025 Independent Theme Community Service program are as follows:

1. Preparation Stage for Tools and Materials
   In this stage, the lecturer as the activity proposer prepares all necessary documents and paperwork, as well as the raw materials to be used in the production of JAKABA. The documents and raw materials that have been prepared are stored by the proposer until the handover of the tools takes place.

Additionally, the service team must prepare supporting tools for this activity. The materials used in this activity include Jabaka and refugia plants, and the tools include buckets, hoes, etc.

2. Extension and Socialization Stage
   After the materials and tools have been gathered, the extension and socialization stage is carried out with the Sumber Rejeki Farmer Group in Percut Village, Percut Sei Tuan Subdistrict, Deli Serdang Regency.
3. Monitoring and Evaluation Stage
   Monitoring needs to be conducted between the USU service team and the partners in Percut Village. This monitoring process will also be observed by the lecturer on the service team and the involved students. Based on the monitoring and evaluation, factors that serve as obstacles and supports will be identified, including both the strengths and weaknesses of the activity.

Figure 1. JAKABA (Eternal Lucky Mushroom)

Figure 2. Refugia Plant (Purple Kencana, Ratna Lekuk, Mini Sunflower and Button Flower)

3. Result and Discussion

The results of the implementation of the 2025 Independent Scheme Community Service program were achieved through several stages carried out by the community service team, namely:

1. Opening of the Activity, Training, and Technical Guidance by the Community Service Team with the Sumber Rejeki Farmer Group

The activity was attended by the implementation team from USU, including Nur Ulina Warnisyah Sebayang, SP., M.Agr (team leader), Julieta Christy, SP., M.Agr (member), Ns. Reisy Tane, MKep (member), and Rouzatul Nafisah, SP., M.Si (member), along with students from the Faculty of Agriculture. The opening of the community service activity was conducted by the MC, who was a student from the Faculty of Agriculture. This was followed by welcome remarks from the Head of the Service Team (Nur Ulina Warnisyah Sebayang, SP., M.Agr), the Agricultural Extension Worker from Sidomulyo Village (Mrs. Juli Tri Adha, S.E., M.Pt), and the Head of the Sumber Rejeki Farmer Group. In her speech, the Head of the Service Team (Nur Ulina Warnisyah Sebayang, SP., M.Agr) explained the importance of utilizing Jakaba (Jamur Keuntungan Abadi) on saline land to increase agricultural productivity, especially in areas with high soil acidity levels.

Jakaba, as a liquid organic fertilizer produced from mushroom cultivation, has the ability to lower soil pH, improve nutrient availability, and restore soil structure that has been damaged by acidic sulfate conditions. With the use of Jakaba, land that was previously unsuitable for plant growth can be optimized for rice cultivation, resulting in a significant increase in crop yields. Additionally, Jakaba is an environmentally friendly and cost-effective solution, making it a more economical and sustainable alternative to chemical fertilizers. This approach not only improves soil quality but also helps farmers become more independent in managing their land efficiently. The Agricultural Extension Worker from agricultural extension work area, Percut also mentioned that the Sumber Rejeki Farmer Group in Percut Village, Percut Sei Tuan Subdistrict, faces serious issues in rice cultivation due to the village's geographic shape, which is half-circular. This shape causes seawater to enter during high tide and makes it difficult for the water to exit, causing salt to accumulate in the soil. This accumulation of salt increases soil salinity, which hinders rice plant growth because the plant roots struggle to absorb the water and nutrients needed.

The construction of the swimming pool successfully created a new attraction at Swembath, drawing a wide range of visitors. Competitive swimming events were organized with participation from schools, local sports clubs, and regional swimming teams. Due to the pool’s design, which meets international standards, Swembath was able to host events that attracted both amateur and professional swimmers. These events not only increased the number of visitors during the competitions but also generated sustained interest in Swembath as a potential training and recreational venue for future sports events. Additionally, these events were heavily promoted online through platforms like Instagram and Facebook, which increased the destination’s visibility and drew visitors from beyond the local area, thus expanding its reach.

Figure 3. The Opening and Introduction Activity at the Sumber Rejeki Farmer Group in Percut Village

2. Socialization and extension on Jakaba Liquid Organic Fertilizer (POC) and Refugia Plants

The socialization and extension regarding Jakaba Liquid Organic Fertilizer (POC) and refugia plants are important activities aimed at enhancing farmers' knowledge and skills related to sustainable farming practices. Jakaba POC is an innovation in environmentally friendly fertilizer management that can naturally improve soil fertility. This socialization aims to introduce Jakaba POC as an alternative fertilizer that is not only effective in improving agricultural yields but also safe for the environment. Providing a good understanding of Jakaba POC usage can help farmers reduce their

dependency on chemical fertilizers, which have the potential to damage ecosystems and degrade soil quality in the long term.

Additionally, this extension activity also covers information about refugia plants, which are planted as buffers or protection for main crops against pests and diseases. Refugia plants serve as habitats for natural pest predators, thereby reducing the use of chemical pesticides. The extension on refugia plants helps farmers understand the importance of biodiversity in agriculture. By planting various types of refugia plants, farmers can create a more balanced ecosystem, support species diversity, and enhance plant resilience against pest attacks.

The socialization and extension on Jakaba POC and refugia plants also focus on practical methods that farmers can easily apply in the field. The use of Jakaba POC, made from locally sourced organic materials, enables farmers to save on agricultural production costs while providing long-term benefits for soil fertility. Similarly, planting refugia plants, which do not require significant costs, can have a positive impact on the sustainability of farming operations. This extension also emphasizes the importance of choosing the right types of refugia plants that are suitable for the environmental conditions and the main crops being cultivated.

This activity is expected to have a positive impact on enhancing the sustainability of agriculture and the well-being of farmers. Through a good understanding of Jakaba POC and refugia plants, farmers can manage their agricultural operations in a more environmentally friendly, efficient, and productive manner. Intensive socialization and extension will help farmers adapt to new technologies that support sustainable and eco-friendly agriculture, which in turn can improve food security and increase farmers' incomes.

Figure 4. The extension and socialization activities were concluded with a discussion session

3. Field practice activity

The community service team from the University of North Sumatra (USU) conducted a practical activity on planting refugia plants with the Sumber Rejeki Farmer Group to enhance farmers' knowledge and skills in creating a healthier and more sustainable agricultural ecosystem. This activity aimed to introduce the concept of refugia plants as a solution to reduce dependence on chemical pesticides, while also increasing biodiversity on agricultural land. With the presence of refugia plants, it is hoped that an environment will be created that supports natural pest predators, thus reducing the damage caused by pests and diseases.

During the practical activity, the USU community service team provided in-depth understanding of the benefits of refugia plants, as well as the types of plants that can be grown as refugia among the main crops. Some of the refugia plants introduced included sunflowers, corn, and leguminous plants, which have dual functions as both pest barriers and soil enrichers. The community service team guided the farmers in selecting suitable planting locations and methods based on the land conditions and the crops cultivated by the farmer group.

Throughout the activity, members of the Sumber Rejeki Farmer Group were taught how to plant refugia plants directly on their agricultural land. The community service team accompanied them through the planting process, from soil preparation and seedling planting to the care of the refugia plants. Additionally, they were given knowledge on crop rotation and how to manage the refugia plants for optimal growth and long-term benefits. This activity is expected to raise farmers' awareness of the importance of biodiversity and environmentally friendly pest management.

Through this practical activity, the Sumber Rejeki Farmer Group is expected to implement new, environmentally friendly farming practices that will enhance the sustainability of their agricultural production. By planting refugia plants, farmers will not only benefit from reducing pest attacks but also improve soil quality and overall agricultural yields. This activity also strengthens the collaboration between the community and academia in applying more environmentally friendly and sustainable agricultural innovations.

Figure 5. The practical activity of planting refugia plants on the edges of paddy fields.

4. Handling Over of Supporting Materials for Community Service to the Sumber Rejeki Farmer Group

The tools and materials for community service were handed over to the Head of Sumber Rejeki Farmer Group. The details of the components of the tools and materials provided are listed in Table 1.

Table 1. List of detailed items handed over to service partners.

No.	Product Name	Quantity of Product
1.	Jakaba Seeds (Perpetual Profit Mushroom)	5 bottle
2.	Bran of corn as a source of food Jakaba	5 kg
3.	Refugia plant *Ruellia simplex*	15 polybag
4.	Refugia plant *Zinnia angustifolia*	15 polybag
5.	Refugia plant *Melampodium divaricatum*	15 polybag
6.	Refugia plant *Gomphrena globosa*	15 polybag

Figure 6. Group photo with the community service team, students, and the Sumber Rejeki Farmer Group

The supporting factors in carrying out this community service activity include the support from the University of North Sumatra (USU), which provides the human resources, knowledge, and skills needed to deliver counselling and training to farmer groups. The presence of a community service team with experience and expertise in sustainable agriculture enables effective knowledge transfer to the farmers. In addition, the active participation of the Sumber Rejeki Farmer Group, which is motivated and open to adopting new farming methods, is a key factor in the success of this activity. The accessibility of refuge plants and an increased understanding of their benefits also strengthen the implementation of the activity.

However, there are several hindering factors in the implementation of this community service activity. One of them is the limited resources and funding available for the activity, which may restrict the quantity and quality of the training and counselling provided. In addition, farmers' adaptation to new technologies and methods, such as planting refuge plants, requires time and patience. Some farmers may still have doubts or old habits in using chemical pesticides, which means they need more time to understand and implement more environmentally friendly methods. Another hindering factor is the climate or weather conditions, which can affect the success of planting refuge plants in certain locations.

4. Conclusion

The implementation of the refuge plant concept in agriculture holds great potential to enhance biodiversity and reduce dependence on chemical pesticides. Through hands-on practice conducted with the Sumber Rejeki Farmer Group, farmers gained knowledge and skills in planting and maintaining refuge plants, which not only help in controlling pests naturally but also improve soil fertility. This activity successfully raised farmers' awareness of the importance of agricultural sustainability and the environmental benefits of using eco-friendly methods such as refuge plants. Although there were challenges, such as limited resources and farmers' adaptation to new technologies, the activity demonstrated great potential to improve sustainable and environmentally friendly farming practices. With continued support from the community service team and the commitment of the farmer group, the use of refuge plants can become a long-term solution for creating more productive and environmentally friendly agriculture. In the future, similar activities could be expanded to include more farmers, providing a broader impact on food security and farmers' well-being.

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