

Strengthening Organic Rice–Fish Farming Through Participatory Focus Group Discussions and International Collaboration in North Sumatra, Indonesia

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ABSTRACT

This community service activity aims to strengthen farmers' capacity to develop an environmentally friendly integrated farming system based on organic rice-fish farming through a Focus Group Discussion approach grounded in global collaboration. The activity was conducted in Tanah Merah Village, Serdang Bedagai District, and involved farmer groups, the local government, academics, and international partners from Srinakharinwirot University, Thailand. The method used was a participatory approach through the stages of problem identification, guided group discussions, technology dissemination, and the formulation of recommendations. The activity results showed an increase in community understanding of the integration of rice and fish farming, as well as the importance of downstream product processing and standardization. The Focus Group Discussion also successfully identified key issues, including limited marketing opportunities, weak farmer institutions, and dependence on chemical inputs. Additionally, international collaboration contributed to the transfer of food production technology and the enhancement of product value.

KEYWORDS

Rice-fish farming; sustainable agriculture; Focus Group Discussion; global collaboration; community empowerment.



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INTRODUCTION

Sustainable agricultural development has become a critical agenda for ensuring food security while preserving natural resources and environmental sustainability. Contemporary agricultural challenges extend beyond increasing productivity and encompass the ability of farming systems to maintain environmental quality, improve resource-use efficiency, and enhance farmers' livelihoods in a sustainable manner. Previous studies have demonstrated that intensive agricultural systems characterized by long-term dependence on synthetic fertilizers and pesticides may contribute to soil degradation, biodiversity loss within agroecosystems, and increased risks of environmental pollution (Pinto et al., 2023). These concerns highlight the urgent need for a transition toward environmentally sustainable agricultural systems through the application of agroecological principles and the optimal utilization of local resources.

Serdang Bedagai Regency is one of the major rice-producing regions in North Sumatra Province and plays a strategic role in supporting regional food security. According to data from the Central Statistics Agency of Serdang Bedagai Regency (2024), the harvested rice area reached 45,593 ha, producing 241,273 tons of milled dry grain with an average productivity of 5.29 tons ha⁻¹. These figures indicate that agriculture remains the primary economic sector supporting rural livelihoods in the region. One of the villages with considerable agricultural development potential is Tanah Merah Village, Perbaungan District, where the majority of residents depend on rice farming as their main source of income.

In addition to its favorable agricultural resources, Tanah Merah Village possesses strong social capital through the presence of active farmer groups affiliated with the Serdang Bedagai Farmers Union (Serikat Petani Serdang Bedagai—SPSB). Farmer organizations play an important role in facilitating innovation adoption, strengthening human resource capacity, and improving farmers' bargaining position in farm management and agricultural marketing activities (Herawati, 2025). Despite these advantages, the existing potential has not yet been fully translated into a sustainable agricultural transformation. Farmers continue to face several constraints, including a high dependence on chemical fertilizers and pesticides, limited access to environmentally friendly agricultural technologies, and low adoption of integrated farming innovations.

The reliance on synthetic agricultural inputs remains one of the major challenges facing rice farming systems in many agricultural regions of Indonesia. Excessive use of fertilizers and pesticides not only increases production costs but also contributes to the deterioration of soil physical, chemical, and biological properties. Previous studies have reported that intensive chemical-based farming practices reduce soil organic matter content, suppress beneficial microbial activity, and create nutrient imbalances that negatively affect long-term agricultural productivity (Abbott & Murphy., 2007). From a sustainability perspective, these conditions may reduce the carrying capacity of agricultural land and increase the vulnerability of farming systems to environmental changes.

As an alternative to conventional farming systems, agroecological approaches have increasingly been promoted as a pathway toward sustainable agricultural development. Agroecology emphasizes the integration of ecological, economic, and social dimensions through the management of agroecosystems that optimize biological interactions and ecosystem functions (Somashekar et al., 2024). One agroecological practice considered particularly suitable for paddy-field ecosystems is integrated rice–fish farming (*mina padi*), which combines rice cultivation and fish production within the same farming area. This integrated system creates mutually beneficial interactions between rice plants and fish, thereby improving resource-use efficiency, enhancing ecological functions, and diversifying agricultural outputs.

Numerous studies have reported that integrated rice–fish farming generates both economic and ecological benefits. The introduction of fish into paddy fields contributes to natural pest control, improves nutrient cycling, enriches soil organic matter, and reduces dependence on synthetic pesticides (Sathoria & Roy, 2022). Furthermore, fish production provides an additional source of income, increasing farm profitability and strengthening household economic resilience. Berg et al. (2017) found that rice–fish systems provide broader ecosystem services than conventional rice monoculture systems, particularly in terms of environmental quality, biodiversity conservation, and production sustainability.

Despite the documented benefits of integrated rice–fish farming, its adoption among farmers remains relatively limited. Several factors contribute to this situation, including insufficient knowledge of integrated farming techniques, limited access to information and

technical assistance, and inadequate institutional integration among farmer organizations. Moreover, the successful development of rice–fish farming systems requires not only technical improvements in cultivation practices but also capacity building in farm management, postharvest processing, product marketing, and the establishment of collaborative networks that support long-term program sustainability.

The transition toward sustainable agriculture requires active engagement from multiple stakeholders through collaborative approaches. Partnerships involving universities, farmer groups, local governments, and international institutions can accelerate knowledge transfer, technology adaptation, and the development of locally appropriate agricultural models (Sarangi, 2023). Such collaborations also provide opportunities for farmers to access best practices, technological innovations, and broader market networks. Within the context of community engagement programs, higher education institutions play a crucial role as facilitators of learning, providers of technical assistance, and bridges connecting research outcomes with community needs (Teslenko, 2019).

Preliminary observations and discussions conducted with farmer groups in Tanah Merah Village revealed significant potential for the development of organic integrated rice–fish farming systems. This potential is supported by the availability of paddy land, water resources, and active farmer organizations. However, the utilization of these resources remains suboptimal due to limited technical knowledge, the absence of an integrated management model, and restricted access to information related to organic agriculture and agricultural product downstreaming. These conditions indicate a gap between the available resources and farmers’ capacities to implement sustainable agricultural practices effectively.

Therefore, a community engagement program was designed to facilitate collective learning, knowledge transfer, and farmer capacity strengthening through a participatory approach. The program was implemented through Focus Group Discussions (FGDs), educational outreach activities, and technical assistance involving farmers, academics, local government representatives, and international partners. Through these activities, the program aimed to improve farmers’ understanding of organic integrated rice–fish farming systems, strengthen farmer institutions, and formulate recommendations for integrated agricultural development that are responsive to local conditions. Beyond its direct benefits to the community, the program also contributes to the achievement of the Sustainable Development Goals (SDGs), particularly SDG 2 (Zero Hunger), SDG 12 (Responsible Consumption and Production), and SDG 17 (Partnerships for the Goals).

RESEARCH METHODS

Location and time of activity

The community service program was conducted in Tanah Merah Village, Perbaungan District, Serdang Bedagai Regency, North Sumatra Province, Indonesia, on February 17, 2026. The location was purposively selected because the village has strong agricultural characteristics, active farmer organizations, and substantial potential for developing an integrated organic rice–fish farming system. The activity was implemented through a combination of face-to-face meetings and online international collaboration involving experts from Srinakharinwirot University, Thailand.

Participants and Stakeholders

Participants consisted of approximately 30 individuals representing farmer groups in Tanah Merah Village, including members of Karya Tani, Makmur Bersama, and Tani Maju farmer groups, village government representatives, agricultural extension officers,

lecturers, university students, and regional stakeholders. The activity also involved an international collaborator, Associate Professor Dr. Ulisa Pachekreapol from the Faculty of Agricultural Product Innovation and Technology, Srinakharinwirot University, Thailand, who contributed expertise in food processing technology, food safety, and value-added agricultural products. Participants were selected purposively based on their involvement in agricultural development and community empowerment activities.

Community Service Approach

This program employed a Participatory Action Research (PAR) approach, which emphasizes active stakeholder involvement in identifying problems, formulating solutions, implementing interventions, and evaluating outcomes. The approach was selected to ensure that the proposed solutions reflected local needs and conditions while integrating scientific perspectives from national and international experts. Through this approach, community members were positioned not only as beneficiaries but also as active contributors in the decision-making process.

Focus Group Discussion Procedure

Focus Group Discussion (FGD) was used as the primary method for community engagement and data collection. The FGD was conducted in two stages. The first FGD focused on baseline assessment and needs identification. Participants discussed existing farming practices, challenges in organic rice–fish farming implementation, institutional conditions, and opportunities for sustainable agricultural development. The discussion also explored local resources and community readiness for adopting environmentally friendly agricultural innovations.

The second FGD was conducted as an evaluation and sustainability forum involving farmer groups, local government representatives, the Department of Agriculture of Serdang Bedagai Regency, and international partners through an online platform. This session focused on evaluating the outcomes of knowledge dissemination activities, identifying implementation barriers, and formulating recommendations for future program development and replication.

Program Implementation Stages

The community service program was implemented through four sequential stages:

1. Problem Identification

The initial stage involved field observation, stakeholder consultation, and preliminary discussions to identify major constraints faced by farmers. Particular attention was given to issues related to dependence on chemical inputs, weak institutional coordination, limited market access, and inadequate postharvest management systems.

2. Focus Group Discussion

Participatory discussions were conducted to facilitate knowledge exchange among farmers, government agencies, academics, and international experts. The discussions generated a comprehensive understanding of local challenges and opportunities for developing an integrated organic rice–fish farming model.

3. Technology Dissemination and Knowledge Transfer

Technology dissemination activities included presentations and discussions on organic rice–fish farming systems, food processing technology, postharvest handling, food safety standards, product diversification, and value-added processing strategies. International

partners contributed knowledge regarding food-grade packaging, cold chain management, food quality assurance, and product branding.

4. Recommendation Formulation

The final stage involved synthesizing discussion outcomes into technical and policy recommendations. The recommendations focused on strengthening farmer institutions, improving product standardization, developing digital marketing strategies, enhancing value-added processing, and expanding collaborative networks for sustainable agricultural development.

RESULTS AND DISCUSSION

Identification of Community Problems and Development

The initial Focus Group Discussion (FGD) successfully identified several critical challenges faced by farmer groups in Tanah Merah Village. Participants reported persistent dependence on chemical fertilizers and pesticides, limited market access, weak bargaining power in agricultural supply chains, and inadequate institutional coordination among farmer groups. These challenges have constrained efforts to maximize the economic potential of organic rice–fish farming systems and have limited the development of value-added agricultural products.

Discussions further revealed that the village possesses substantial supporting resources, including productive agricultural land, water availability, active farmer organizations, and community willingness to adopt environmentally friendly farming practices. However, these resources have not been integrated effectively into a coherent agribusiness development strategy. This finding suggests that the primary challenge lies not in resource availability but in the management and coordination of production, processing, and marketing activities. Similar conditions have been reported by Herawati (2025), who emphasized that institutional fragmentation often becomes a major obstacle in developing sustainable rural agribusiness systems.

Furthermore, farmers expressed concerns regarding their dependence on intermediaries for product distribution. Such dependency reduces farmers' bargaining position and limits their ability to capture additional value from agricultural production. According to Kaponda and Chiwaridzo (2024), community-based marketing systems and collective action mechanisms are essential for empowering smallholder farmers and improving market access. Therefore, strengthening institutional arrangements and developing integrated value chains should become strategic priorities for future interventions.

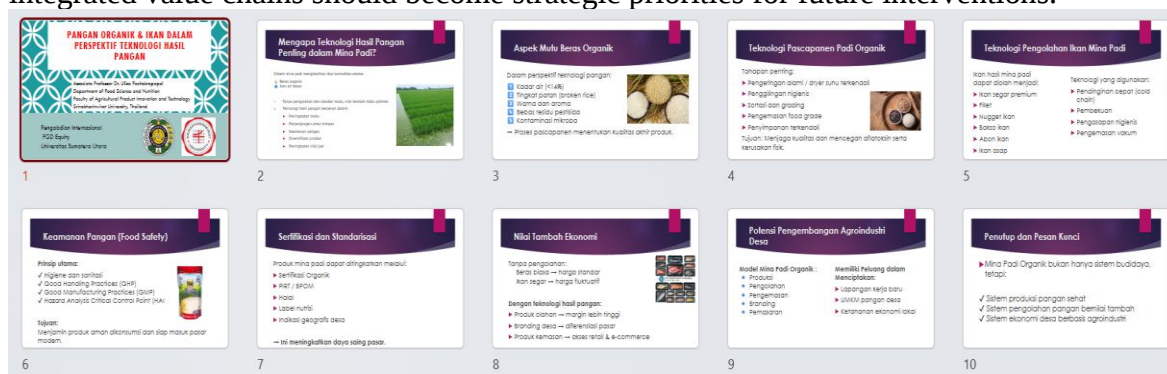


Figure 1. Problem Mapping Results from the Focus Group Discussion

Strengthening Farmers' Knowledge of Organic Rice–Fish Farming

One of the most significant outcomes of the program was the improvement of participants' understanding of integrated organic rice–fish farming systems. The knowledge dissemination session introduced ecological interactions between rice cultivation and fish production within a single farming ecosystem. Participants recognized that rice–fish farming offers multiple benefits, including improved land-use efficiency, enhanced nutrient cycling, biological pest control, and diversified farm income sources. Prior to the activity, many participants viewed rice cultivation and fish farming as separate production activities. Following the discussions, participants demonstrated a more comprehensive understanding of the ecological and economic synergies generated by integrated farming systems. These findings support previous research indicating that integrated rice–fish farming contributes to sustainable food production while reducing dependency on external agricultural inputs (Sathoria& Roy, 2022).



Figure 2. Knowledge Transfer Session on Organic Rice–Fish Farming

Dissemination of Postharvest and Food Processing Technologies

Another important outcome of the program was the dissemination of knowledge related to postharvest handling and food processing technologies. Participants were introduced to quality standards for organic rice and fish products, including moisture management, hygienic milling, sorting procedures, food-grade packaging, and proper storage techniques. Discussions revealed that most participants had limited experience with quality assurance systems and postharvest management practices. This finding is important because postharvest losses and inadequate processing techniques often reduce product quality and market competitiveness. According to Elmunsyah et al. (2023), implementing Good Handling Practices (GHP) and Good Manufacturing Practices (GMP) is essential for ensuring food safety and maintaining product quality throughout the value chain. The international partner from Srinakharinwirot University provided additional insights regarding food safety standards, cold-chain management, and value-added product development. Participants were introduced to diversification opportunities such as fish fillets, fish balls, and fish floss products, which can potentially increase household income and enhance rural agroindustry development. Similar findings were reported by Al-Ghifary et al. (2025), who highlighted the importance of packaging, branding, and halal certification in improving the competitiveness of community-based food enterprises.

Table 1. Key Problems Identified During the Focus Group Discussion and Proposed Development Strategies for Organic Rice–Fish Farming in Tanah Merah Village

Issue	Findings	Proposed Solution
Chemical dependency	High use of synthetic inputs	Organic fertilization
Marketing	Dependence on middlemen	Digital marketing
Institutional capacity	Weak coordination	Capacity building

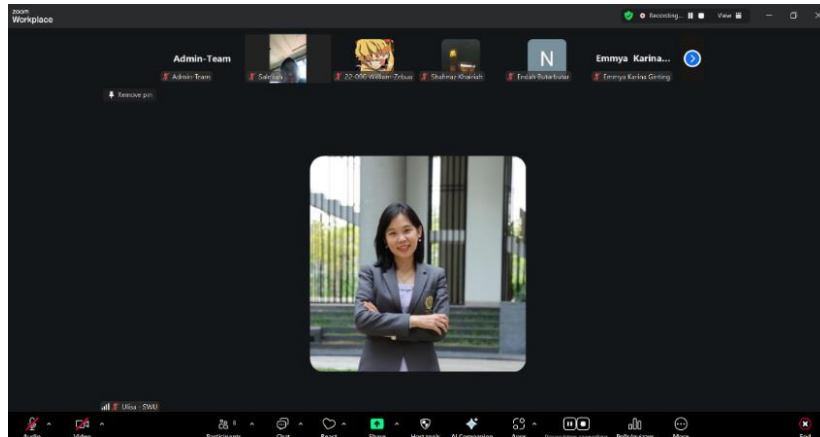


Figure 3. Technology Dissemination on Food Processing and Product Standardization

Institutional Strengthening and Community Empowerment

The program highlighted the importance of strengthening farmer organizations as a foundation for sustainable agriscultural development. Discussions indicated that although several farmer groups were active within the Serdang Bedagai Farmers Union (SPSB), coordination among members and collective business management remained limited. Farmer organizations play a strategic role in facilitating technology adoption, collective marketing, and resource mobilization. Herawati (2025) emphasized that institutional capacity is a key determinant of agribusiness sustainability because it enables farmers to coordinate production activities, negotiate market opportunities, and access external support services more effectively. The participatory nature of the FGD encouraged farmers to share experiences and collectively identify solutions to existing challenges. Such collaborative learning processes contribute not only to knowledge enhancement but also to community empowerment and social capital development. The findings indicate that strengthening farmer institutions should be prioritized alongside technological interventions to ensure long-term sustainability.



Figure 4. Stakeholder Participation During Focus Group Discussion

International Collaboration for Sustainable Agricultural Development

One distinctive feature of this community service program was the involvement of an international partner from Srinakharinwirot University, Thailand. The collaboration facilitated cross-border knowledge exchange concerning sustainable agriculture, food processing technologies, food safety, and product value addition. Participants perceived international collaboration as a valuable opportunity to gain exposure to global best practices and innovative approaches in agricultural development. The interaction between local farmers and international experts broadened participants' perspectives regarding product quality standards, certification requirements, and sustainable agricultural entrepreneurship. These findings align with Sarangi (2023), who argued that international partnerships contribute significantly to community capacity building and sustainable development by enhancing access to knowledge, resources, and innovation networks. Similarly, Teslenko (2019) emphasized that collaboration between universities and external stakeholders strengthens the social impact of higher education institutions while supporting community development objectives.



Figure 5. Equity FGD Community Service Team with the Community in Lubuk Bayas Village – “Organic Agriculture”.

Development Strategy and Sustainability Plan

The final FGD generated several strategic recommendations for strengthening the sustainability of organic rice–fish farming in Tanah Merah Village. Key recommendations included village branding as a center for organic rice–fish production, implementation of digital marketing strategies, product certification, institutional strengthening, and development of an integrated rural agroindustry model. Village branding emerged as a

particularly important strategy because it enables local products to establish a unique market identity based on environmentally friendly production practices. Previous studies have demonstrated that branding and certification can significantly enhance consumer trust and product competitiveness (Rusdi et al., 2024; Asmara et al., 2025).

Participants also emphasized the importance of digital marketing as a means of expanding market access and reducing dependence on intermediaries. Kusumawardhani et al. (2025) reported that digital marketing platforms improve farmers' market connectivity and increase business competitiveness through direct engagement with consumers. The sustainability plan further highlighted the need for continued collaboration among universities, local governments, farmer organizations, and international partners. Such multi-stakeholder engagement is essential for ensuring the long-term implementation of recommendations generated through the program.

Table 2. Strategic Recommendations and Sustainability Plan for the Development of Organic Rice–Fish Farming in Tanah Merah Village

Strategic Area	Proposed Action	Expected Outcome
Branding	Village identity development	Stronger product differentiation
Marketing	Digital marketing adoption	Expanded market access
Certification	PIRT, Halal, Organic	Improved competitiveness
Institutional Capacity	Farmer group strengthening	Sustainable management
Partnerships	Multi-stakeholder collaboration	Long-term sustainability

CONCLUSION

The community service program successfully enhanced farmers' understanding of organic integrated rice–fish farming systems through participatory Focus Group Discussions (FGDs), knowledge dissemination activities, and international collaboration. The program improved participants' awareness of sustainable farming practices, postharvest management, food safety standards, product diversification, and value-added agricultural processing.

The discussions identified several key challenges faced by farmer groups in Tanah Merah Village, including dependence on chemical inputs, limited market access, inadequate postharvest management, and weak institutional coordination. At the same time, the activity revealed substantial opportunities for developing an integrated organic rice–fish farming system supported by active farmer organizations, available natural resources, and stakeholder commitment.

The program also strengthened collaboration among universities, local government institutions, farmer groups, and international partners, creating a foundation for future sustainable agricultural development initiatives. Several strategic recommendations were generated, including strengthening farmer institutions, improving product standardization, developing village branding, adopting digital marketing strategies, and expanding collaborative networks. Therefore, continued technical assistance and multi-stakeholder engagement are essential to ensure the long-term sustainability and scalability of organic rice–fish farming development in Tanah Merah Village.

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