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Feed Production Training and Floating Net Cage Utilization for Fish Farming at KUPS Fisheries, LPHD Tanjung Sangalang, Pulang Pisau, Central Kalimantan

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ABSTRACT
This article addresses the growing demand for fish products in Indonesia, driven by increased per capita fish consumption, which has risen from 43.88 to 54.49 kg annually. This surge has led to an expansion of fish farming activities, particularly within small-scale enterprises. However, a significant challenge faced by these farmers is the high cost of commercial fish feed, which accounts for 60-80% of total production expenses. These costs are further amplified by the reliance on expensive and environmentally harmful imported ingredients such as fishmeal and soybean meal. In response to these challenges, this study focuses on a community service initiative conducted at KUPS Fisheries in Tanjung Sangalang, Pulang Pisau, Central Kalimantan. The project aimed to provide local fish farmers with essential skills in feed production and the utilization of floating net cages for sustainable fish farming. Through training and hands-on practice, participants were introduced to cost-effective, locally sourced alternatives for fish feed, reducing dependency on expensive imports. The initiative also promoted environmentally friendly practices, contributing to both the economic and ecological sustainability of small-scale fish farming in the region.

Keywords: Training; Fish Farming; Tanjung Sangalang.

INTRODUCTION

The growing demand for fish as a protein source in Indonesia, reflected in an increase in annual fish consumption from 43.88 to 54.49 kg per capita (Khusun et al., 2022), has led to rapid growth in fish farming, from small-scale operations to large commercial enterprises (Fernandes, Miller, and Read 2000). However, this expansion faces a significant hurdle due to the high cost of commercial fish feed, which accounts for 60–80% of total production costs and poses a particular challenge for small-scale farmers striving to remain competitive (Fawzya and Irianto 2020). The problem is further exacerbated by Indonesia's reliance on imported ingredients such as fishmeal and soybean meal, which are not only expensive but also have a significant environmental impact, making feed both a financial and environmental concern (Malcorps et al., 2019).

Recently, the increase in protein consumption from aquaculture products has become popular among the people of Indonesia (Khusun et al., 2022). Data from 2016 to

2019 show that fish consumption in Indonesia has risen annually, reaching approximately 43.88 to 54.49 kg per capita (Sapriani, Wiwoho, and Handayani 2021). This high demand for fish has encouraged many people to engage in fish farming, from small-scale to large-scale operations for commercial purposes (Mzula et al., 2016). However, current fish farming faces challenges, mainly due to the high cost of commercial fish feed, which dominates the market. According to the Ministry of Marine Affairs and Fisheries, the commercial feed costs constituted 60–80% of total fish farming production costs in 2021 (Litundzira et al., 2021). The high cost of commercial feed is largely due to the fact that many feed ingredients are imported, including fish meal, corn meal, soybean meal, yeast meal, and wheat flour (Sunarno et al., 2024). Additionally, locally sourced and nutritionally balanced alternatives could support small-scale farmers, enabling them to meet growing market demand while reducing production expenses.

The Fisheries Social Forestry Business Group (KUPS) of Fisheries Division under the Village Forest Management Institution (LPHD) Tanjung Sangalang was established in 2019 through Decree No. 10876/M3NLHK-PSKL/PKPS/PSL.0/2019, operates within the fisheries sector and has achieved gold status for its contributions. The group produces both fresh fish and value-added products such as fish floss and smoked fish, showcasing its capacity to diversify and add economic value to its operations. nitially, the group experienced considerable success, leveraging community developed skills to process fish into higher-value products (Yuptriani et al., 2020). However, their activities have recently stalled due to repeated flooding, which has severely disrupted the ponds and hampered production. Other obstacles include the absence of halal and P-IRT certifications, which limit market access, and the lack of modern packaging to enhance product appeal and shelf life. The group aspires to develop affordable alternative feed solutions to reduce expenses and increase the sustainability of their operations. Addressing these challenges holistically is essential for the group's long-term viability. While certification and packaging improvements are necessary for expanding market reach, the most pressing priorities are mitigating the flooding problem and reducing feed costs. These steps are crucial to sustaining fish farming at the LPHD Tanjung Sangalang Fisheries KUPS and ensuring the continued development of its value-added product line, thereby benefiting both the community and the broader fisheries sector.

The use of organic waste from restaurants as fish feed provides a cost-effective and sustainable alternative to expensive commercial feed, helping fish farmers reduce production costs (Mo, Man, and Wong 2018). This waste, which is rich in essential nutrients such as proteins, carbohydrates, fats, vitamins, and minerals, can support fish

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growth when processed into appropriate feed types such as floating or sinking pellets (Karimi et al., 2018). Organic restaurant waste, derived from both plant and animal sources, has the potential to provide these essential nutrients and serve as a cost-effective and sustainable raw material for fish feed production (Wong et al., 2016). However, the success depends on community involvement with proper training on handling, processing, and storage to maintain feed quality. In addition to reducing environmental waste, this approach increases economic sustainability and reduces reliance on imported ingredients, making fish farming more resilient to global price fluctuations.

The challenges faced by the KUPS in Tanjung Sangalang village require practical solutions. To address these issues, a community engagement program focused on training in feed production and the use of floating net cages is proposed. This program will provide guidance and training for community groups, especially the KUPS LPHD in Tanjung Sangalang village, on fish feed production and the use of floating net cages in aquaculture. Ultimately, the freshwater fish farming community engagement program aims to increase the productivity and well-being of the broader community in Tanjung Sangalang, Central Kalimantan, strengthen the local fisheries sector, and support government initiatives to implement the Provincial Fisheries and Marine Department's Strategic Food Security Plan for Central Kalimantan.

METHOD

The Community Service Program was carried out using training and mentoring methods, implemented by lecturers and students from Universitas Palangka Raya in collaboration with LPHD Tanjung Sangalang. The activities included training and mentoring on feed production and the utilization of floating net cages at KUPS Fisheries, LPHD Tanjung Sangalang. The program aimed to equip partners with theoretical knowledge and practical skills that could be directly applied to fish farming, enhancing both their productivity and the sustainability of their aquaculture businesses. The flowchart of the community service activities can be seen in Figure 1.

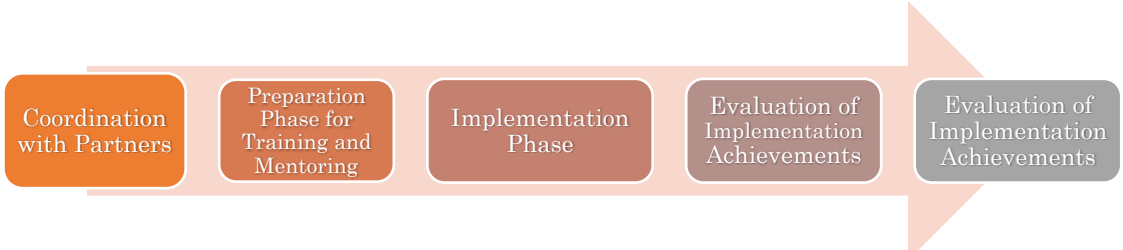

Figure 1. Stages of activity implementation.

Training and Mentoring Activities for Feed Production and Utilization of Floating Net Cages at KUPS Fisheries, LPHD Tanjung Sangalang were conducted systematically through several activity stages (Figure 1) as follows:

1. Coordination with Partners

The coordination with LPHD Tanjung Sangalang aimed to understand the needs, local potential, and challenges faced in fish farming. During this phase, the implementation team held direct meetings with LPHD management and members of the KUPS Fisheries group. The focus of the coordination was to assess the initial conditions of fish farming, identify gaps in knowledge and skills, and determine relevant focus areas to ensure the training and mentoring activities would be effective and well-targeted. This coordination also included drafting long-term program goals, encompassing independent feed production and the sustainable management of floating net cages.

2. Preparation for Training and Mentoring

The preparation phase for the training and mentoring program included developing materials and logistical arrangements. The training team designed a module covering independent feed production based on local ingredients, fish nutrition management, and the maintenance and management of floating net cages. Necessary tools and materials were also prepared, including local feed ingredients (fish meal, rice bran, and palm kernel cake), mixing equipment, and demonstration cages. Additionally, questionnaires were prepared to assess participants' initial knowledge (Saputra dkk. 2022). These were targeted at KUPS members with key roles in fish farming operations, such as feed producers and cage managers, to ensure the program directly benefited those actively involved in fieldwork.

3. Training Implementation

The core stages of the training program began with the opening ceremony led by a representative of the LPHD or the head of KUPS, followed by an explanation of the program's objectives and benefits by the training team. The material was delivered in two sessions: theoretical and practical. The implementation involved expert speakers in the field of fisheries, ensuring that participants gained comprehensive knowledge (Fatiqin dkk. 2024). After the theoretical session, participants engaged in hands-on activities, such as producing fish feed using local ingredients and simulating the installation, maintenance, and management of floating net cages. These practical exercises were conducted in groups with guidance from the training team to ensure all participants thoroughly understood the processes. Additionally, an interactive

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discussion session was held to address participants' questions and discuss technical issues they encountered in their fish farming activities.

4. Evaluation of Achievements and Sustainability

After the training concluded, an evaluation phase was conducted to measure the program's success (Alfanaar et al., 2023). This evaluation was carried out in two forms: process evaluation and outcome evaluation. Feedback from participants was used to assess and address potential challenges encountered during the activities. Additionally, post-training monitoring aimed to evaluate the application of the skills and knowledge provided, serving as both an implementation review and a foundation for recommendations for future programs.

RESULT AND DISCUSSION

The training on feed production and the utilization of floating net cages in fish farming for the KUPS of the LPHD Tanjung Sangalang is a critical initiative to support local economic empowerment and sustainable natural resource management. This program included technical training conducted in two sessions (theoretical and practical) (Figure 2). The training and mentoring activities served as educational efforts aimed at providing essential knowledge and information to the community about the use of high-quality feed in fish farming practices.

(A)

(B)

Figure 2. Documentation of Training and Mentoring Activities for Fish Feed Production: (A) Theoretical Session and (B) Practical Session, at KUPS Fisheries of LPDH Tanjung Sangalang.

The outreach and mentoring program on independent fish feed production and the use of floating net cages at KUPS, LPHD Tanjung Sangalang, significantly enhanced participants' knowledge of feed composition and effective feed formulation techniques. The theoretical sessions provided an in-depth understanding of the nutritional needs of fish, such as protein, carbohydrates, fats, vitamins, and minerals, as well as the availability of local raw materials like rice bran, fish meal, palm kernel cake, and corn. Emphasizing the use of local ingredients aimed to reduce dependency on expensive commercial feed. Participants were also trained to calculate the ideal protein content using the Pearson Square method, enabling them to create feed formulas tailored to the nutritional requirements of the fish species that are the primary commodities of LPHD Tanjung Sangalang.

The theoretical reinforcement (Figure 2A), participants immediately practiced producing feed using formulated local raw materials (Figure 2B). During the practical session, activities included measuring raw materials, mixing ingredients, molding the feed into simple pellet forms, and proper storage techniques to maintain feed quality (Figure 3). Feed distribution simulations were conducted alongside training on the utilization of floating net cages, covering methods for installing cages, monitoring water quality, and efficient feeding practices to minimize waste (Figure 4). The practical outcomes demonstrated that participants successfully produced high-quality feed that met standards while also understanding the importance of feed efficiency in fish farming.

Figure 3. Results of Fish Feed Production at KUPS Fisheries of LPDH Tanjung Sangalang.

Overall, the mentoring program for enhancing independent fish feed production and utilizing floating net cages at KUPS LPHD Tanjung Sangalang has had a positive impact by improving participants' skills in producing their own feed and raising awareness about the importance of managing local potential to boost productivity and ensure the sustainability of fish farming businesses. The success of this activity is

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expected to serve as a foundational step for KUPS LPHD Tanjung Sangalang in establishing a fish farming system that is self-reliant, sustainable, and based on local resources.

Figure 4. Simulation and Utilization of Floating Net Cages at KUPS Fisheries of LPDH Tanjung Sangalang.

The training on fish feed production and the use of floating net cages significantly impacted participants' abilities, particularly in understanding the use of local raw materials as alternative feed. Participants successfully identified various types of local raw materials such as rice bran, fish meal, and palm kernel cake, which had previously been underutilized. This understanding provided a concrete solution for business groups to reduce their dependence on commercial feed. Additionally, the training emphasized the importance of using accessible and cost-effective materials to lower production costs while supporting the optimal management of local resources (Hertika, 2024). The outcomes of the activity demonstrated a notable range of improvement in participants' understanding and skills.

The training on feed production and the use of floating net cages had a significant impact on improving participants' understanding and skills across various measured aspects. Understanding of utilizing local raw materials as alternative feed increased from 45% before the activity to 89% afterward. Participants gained a better grasp of the potential of local raw materials, such as rice bran and fish meal, which had previously been underutilized. Additionally, knowledge of fish feed composition improved from 40% to 85%, reflecting participants' enhanced ability to understand the nutritional requirements of fish, including protein, fat, and carbohydrate content, to support efficient fish growth.

The partners' ability to formulate independent feed showed a significant improvement, increasing from just 38% before the training to 90% afterward. Participants successfully applied formulation techniques learned during the training, which included both theoretical and practical sessions, boosting their confidence in producing feed independently. Moreover, the training positively impacted feed production budget efficiency, with participants' understanding levels rising from 42% to 82%. This improvement demonstrates their ability to reduce production costs by utilizing local materials and minimizing reliance on commercial feed. Additionally, awareness among partners regarding business sustainability increased significantly, from 50% before the training to 98%. This highlights the training's success in instilling the importance of sustainability in fish farming practices based on local resources.

CONCLUSION

The community service initiative successfully addressed critical issues faced by small-scale fish farmers in Central Kalimantan, particularly the high cost of fish feed and the environmental impact of imported feed ingredients. By providing practical training in feed production and the adoption of floating net cages, the project offered sustainable, cost-effective solutions. It also empowered local farmers with the knowledge and tools necessary to improve their farming practices and contribute to the long-term viability of the fish farming industry in the region.

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