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Empowering Women Fish Farmers through Technology Transfer for Diversification of Catfish and Local Cempedak Products

Mery Sukmiwati[1], Tjipto Leksono[2], Dian Iriani[3], Henni Syawal[4], Morina Riauwaty[5], Efawani[6], Nofri Sandria[7], Suparmi[8], Indah Prasetya Putri[9]

[1,2,3,7,8] Department of Fishery Product Technology, Faculty of Fisheries and Marine Sciences, University of Riau
[4,5] Department of Aquaculture, Faculty of Fisheries and Marine Sciences, University of Riau
[6] Department of Aquatic Resources Management, Faculty of Fisheries and Marine Sciences, University of Riau
[9] Faculty of Medicine, University of Riau

Email: mery.sukmiwati@lecturer.unri.ac.id, tjipto.leksono@lecturer.unri.ac.id, dian.iriani@lecturer.unri.ac.id, henni.syawal@lecturer.unri.ac.id, morinariauwaty@yahoo.co.id, efawani@lecturer.unri.ac.id, nofrisandria@lecturer.unri.ac.id, suparmi@lecturer.unri.ac.id, indah.prasetya@lecturer.unri.ac.id

ABSTRACT

Background: Rural fisheries communities often face limited value addition due to inadequate processing technology, weak food safety practices, and low entrepreneurial capacity. In Kuok Village, Kampar Regency, abundant catfish (*Pangasius* sp.) and local forest *cempedak* remain underutilized as innovative food products.

Purpose of the Study: The community service program on technology transfer of fish-based food processing was carried out in Kuok Village, Kampar Regency, focusing on the utilization of catfish (*Pangasius* sp.) and local forest *cempedak* as potential raw materials for innovative food products.

Methods: Activities were conducted in three stages: (1) training on GMP, CPPB-IRT, entrepreneurship, and marketing; (2) hands-on production of *Cemfish dimsum*, cookies, and fresh noodles; and (3) provision of appropriate processing equipment to support sustainable production and quality improvement.

Results: The results showed that participants acquired new skills in hygienic production, product diversification, and business management. A total of 20 women participated in the community service program, with post-training evaluations indicating a 95% improvement in knowledge of Good Manufacturing Practices (GMP). Furthermore, 90% of participants were able to independently produce diversified products such as *dimsum*, cookies, and noodles. Moreover, the program empowered women through active participation in fisheries-based entrepreneurship, strengthening household income and promoting sustainable local food businesses. This activity demonstrates that technology transfer combined with capacity building in management and marketing can create distinctive, competitive, and marketable village-based products, while also reinforcing local identity.

Keywords
Catfish; Cempedak; Kuok Village; Local Food; Technology Transfer; Women Empowerment

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Corresponding Author: Mery Sukmiwati; mery.sukmiwati@lecturer.unri.ac.id; University of Riau

Introduction

Geographically, Kuok Village covers an area of 6,600 hectares and consists of six hamlets: Koto Menampung, Pl. Belimbing I, Pl. Belimbing II, Koto Semiri, Sei. Maki, and Bukit Agung. Among them, Bukit Agung has significant potential to contribute to regional income, particularly through its fisheries sector. In 2016, fish production reached 58,148 tons, with catfish (*Pangasius* sp.) as the primary commodity that can be processed into high-value products. Another important local resource is forest cempedak, with a production of 2,667 tons in 2016. For the Kampar community, catfish and forest cempedak are regarded as flagship commodities within the Riau Regional Innovation System (SIDa). Previous research demonstrated that fortifying shredded fish with cempedak resulted in a product highly favored by consumers (95%). However, distribution has remained limited to local markets.

A major challenge is that women fish farmers, particularly members of Pokdakan Patin Macang Farm, lack adequate knowledge in processing these commodities, leaving most products sold only in fresh form. This community service initiative aims to transfer technology for developing value-added, ready-to-eat, and frozen products derived from catfish and forest cempedak, such as cookies, dimsum, and Cemfish-based shredded fish. By equipping women with processing and entrepreneurship skills, the program seeks to diversify local products, broaden market access, and strengthen household economies. Nutritionally, catfish is highly valuable, containing 68.6% protein, 5.87% fat, 3.5% ash, and 51.3% water per 100 grams, according to the Ministry of Marine Affairs and Fisheries.

One of the prominent local plantation resources in Kuok Village is forest cempedak. Its nutritional composition per 100 g, with an Edible Portion (EP) of 30%, is presented in Table 2. The planned products utilizing catfish and forest cempedak as primary raw materials include cookies, dimsum, and noodle Cemfish. Cookies are considered advantageous due to their relatively long shelf life (Fauziah et al., 2023). Their chemical characteristics are influenced by baking temperature, while color attributes are largely determined by the position of the sample surface during processing (Aida et al., 2022, Rahmawati & Wahyani, 2021). Additional advantages of cookies are their ease of preparation, suitability for all age groups, shelf life of up to six months at room temperature, and potential as a functional food (Surgya et al., 2022, Pramadi et al., 2019).

Another diversification alternative for fish-based products is fish dimsum, a traditional Chinese snack typically served steamed or fried. Previous studies (Falah & Aryani, 2023) demonstrated that adding green spinach (*Amaranthus tricolor* L.) in varying amounts (25 g, 50 g, and 75 g) significantly affected the quality of catfish (*Pangasius* sp.) dimsum in terms of moisture, ash, protein, and carbohydrate contents, while showing no significant effect on fat and iron levels. Further diversification of catfish dimsum aims to maintain high nutritional value while offering more attractive taste and presentation (Sari et al, 2025). Dimsum is a small-sized snack that contains carbohydrates, proteins, fats, and calories (Ng, 2014), and is widely recognized as a nutritious food option (Widiastuti et al., 2022). Another innovative product developed in this program is Cemfish fresh noodles, which combine catfish meat with local ingredients such as forest cempedak flour.

Noodles are a widely consumed staple and snack product in Asia due to their practicality, affordability, and high consumer acceptance (Mannan & Nurdiani, 2025). Incorporating fish protein into noodle formulations has been shown to significantly improve their nutritional quality, particularly by increasing protein content and providing essential amino acids (Litaay et al., 2024). The addition of local ingredients also supports regional branding while offering a distinctive taste profile compared to conventional noodles.

The shelf life and quality of noodles are influenced by factors such as moisture content, storage temperature, and packaging material (Rachmawati et al., 2022). Previous studies reported that fish-based noodles tend to have softer textures and higher water-holding capacity, which may require optimized drying or storage methods to maintain product stability (Suparmi et al., 2022).

Nonetheless, the development of fish-based noodles represents a promising avenue for product diversification, providing both nutritional benefits and economic opportunities for local communities.

Method

Location, Time, and Duration

The community service activities were carried out in Kuok Village, Kuok Sub-district, Kampar Regency. The program was implemented in two phases over a period of approximately three months:

Phase I: Program socialization, training on Good Manufacturing Practices (GMP) and CPPB-IRT, entrepreneurship management, and marketing strategies (1 month).

Phase II: Practical training on the production of innovative fish-based and cempedak-based processed products, including dim sum, cookies, and Cemfish noodles (1 month).

Phase III: The provision of appropriate processing equipment by the service team to support production activities, improve efficiency, and ensure product quality consistency (1 month).

Figure 1. Flowchart of Community Service Program Implementation

Participants and Sampling Technique

The main participants were 20 women from the Pokdakan Patin Macang Farm group, selected purposively because they have been actively involved in aquaculture activities but lacked experience in processing and marketing. Their involvement was deemed relevant as they represented the target beneficiaries of the program, ensuring that knowledge transfer would have direct practical impact on household income and local economic development.

Data Collection Techniques

Several techniques were employed to collect data on program implementation and outcomes:

Observation: Direct monitoring during training and mentoring sessions to evaluate participants' skill acquisition.

Interviews and discussions: Conducted with participants to identify needs, challenges, and expectations before and after the program.

Documentation: Collection of activity reports, photos, and product samples as evidence of progress.

Feedback form**s:** Used to capture participant perceptions regarding material relevance, ease of practice, and expected benefits.

To ensure validity, triangulation was applied by comparing participant feedback, facilitator notes, and independent observations. Reliability was addressed by maintaining consistent instruments (structured questions and feedback forms) across both training phases.

Data Analysis

Qualitative data (interviews, observations, and feedback) were analyzed thematically to identify patterns related to knowledge acquisition, product innovation, and entrepreneurial readiness. Quantitative data (number of participants, types of products produced, and acceptance levels) were tabulated and compared with expected outcomes. The combination of both methods enabled a comprehensive assessment of program impact.

Pre-test and Post-test Instruments

Participants' knowledge improvement was measured using structured pre-test and post-test instruments administered before and after the training sessions. The instruments consisted of a set of multiple-choice and short-answer questions designed to assess participants' understanding of key topics, including Good Manufacturing Practices (GMP), CPPB-IRT standards, hygienic processing, product diversification, entrepreneurship management, and marketing strategies.

The questionnaire comprised 15–20 items with one correct answer per question. Each correct response was scored as 1 point, while incorrect or unanswered items were scored as 0, resulting in a total possible score range of 0–100 after normalization. The same set of questions was used for both pre-test and post-test to ensure comparability.

Justification of Initial Conditions

Prior to the program, the Pokdakan Patin Macang Farm group primarily sold fresh catfish without further processing. Limited knowledge of hygiene practices, lack of product diversification, and weak marketing strategies were identified as the main challenges. As a result, the economic value of catfish and cempedak commodities remained low, with market reach restricted to local areas.

Expected Outcomes

Through the transfer of technology and entrepreneurial knowledge, the program was expected to:

1. Enhance women's technical capacity in hygienic fish processing.
2. Introduce innovative product diversification (dimsum, cookies, noodles, and Cemfish abon).
3. Improve product competitiveness through compliance with GMP and packaging standards.

Strengthen entrepreneurial skills and marketing networks, thereby increasing household income and promoting sustainable use of local fishery and plantation resources.

Result

The implementation of the community service program entitled *"Technology Transfer of Snack Food Processing Based on Village Superior Products with Local Characteristics from the Fisheries Potential of Kuok Village, Kuok Subdistrict, Kampar Regency"* was carried out as planned and received a positive response from the target partners, namely the women's group Pokdakan Patin Macang Farm. The community service program was attended by a total of 20 participants, with a high level of engagement reflected in an average attendance rate of 95% across all activities. The program was implemented through three main training sessions, each with a duration of approximately 4–5 hours, covering theoretical and practical components.

This program was designed as an effort to downstream research and science–technology outcomes in the fisheries sector while simultaneously empowering rural communities through the enhancement of skills, knowledge, and entrepreneurship capacity based on local potential. The development of innovative local fish-based processed products is highly important, as it can increase added value, expand market opportunities, and promote community economic self-reliance (Putra et al., 2021).

The first activity was conducted at the Kuok Village Community Hall. On this occasion, the head of the community service team, Dr. Mery Sukmiwati, M.Si., directly presented the planned activities to be carried out with the partners throughout the service period. This introductory session aimed to ensure that the participating women clearly understood the objectives, benefits, and stages of the program, enabling their active involvement from the outset. Following the introduction, the program continued with technical and non-technical training sessions.

Dr. Ir. Tjipto Leksono, M.Phil., delivered training on *Cara Produksi Pangan Olahan yang Baik* (CPPB-IRT) and Good Manufacturing Practices (GMP), emphasizing the importance of hygiene, sanitation, the use of high-quality raw materials, and standard operating procedures for safe and healthy food production (Rachmawati et al., 2025; Dewinta, 2025). Subsequently, Dr. Dian Iriani, S.Pi., M.P., M.Sc., provided entrepreneurship management training focusing on small-scale business management, simple bookkeeping, profit improvement strategies, and the development of an entrepreneurial mindset. The next session was training on strategies for establishing marketing partnerships for fisheries products, delivered by Nofri Sandria, S.Pi., M.Si. This session highlighted the importance of marketing networks, building trade partnerships, and utilizing social media as a promotional tool. These materials are consistent with the critical role of marketing strategies in expanding local product markets (Ngamal et al., 2023).

Figure 2. Training activities on *Cara Produksi Pangan Olahan yang Baik* (CPPB-IRT), Good Manufacturing Practices (GMP), entrepreneurship management, and strategies for establishing marketing partnerships for fisheries products.

The atmosphere during the first stage of activities was lively, interactive, and highly enthusiastic. Members of the Pokdakan Patin Macang Farm women's group actively participated in all training sessions. Numerous questions were raised, particularly regarding production hygiene standards, attractive packaging techniques, and marketing strategies to enable products to compete with similar products in the market. The discussions were dynamic, as the facilitators provided practical examples and case studies closely related to the participants' daily experiences. Participant engagement was also evident through their involvement in small-scale simulations conducted during the sessions. Overall, the first activity successfully increased awareness of the importance of quality standards and business management as fundamental elements in the development of processed food products.

Figure 3. Atmosphere of the first community service activity.

The second activity was conducted at the Production House of Pokdakan Patin Macang Farm in Kuok Village. At this stage, the community service team focused on technical training in the production of processed catfish-based products combined with a distinctive local ingredient of Kuok Village, namely forest cempedak. The training was directly facilitated by the head of the program, Dr. Mery Sukmiwati, M.Si., together with a team member, Dr. Ir. Henni Syawal, M.Si. The products successfully produced during this activity included Cemfish dimsum, Cemfish cookies, and Cemfish fresh noodles. The training was carried out using a hands-on practice method, allowing participants to directly experience each production stage, from raw material preparation and processing to product packaging. In addition to learning processing techniques, participants also gained an understanding of the importance of product diversification in increasing added value and market competitiveness (Putra et al., 2021; Purwanto et al., 2023).

Figure 4. Second community service activity: training on the production of Cemfish dimsum, Cemfish cookies, and Cemfish fresh noodles.

The benefits of the second activity were strongly perceived by the participants, as they acquired new technical skills in processing catfish into more innovative and value-added products. The incorporation of innovation through the combination of catfish and forest cempedak resulted in unique products with distinctive local characteristics that can attract consumers. In addition to gaining new skills, participants also developed insights into maintaining product quality, flavor, and shelf life to ensure market acceptance (Setiarto & Herlina, 2024; Sadikin et al., 2024). Furthermore, innovation based on catfish and forest cempedak strengthened the products' local identity, in line with previous studies indicating that the utilization of local potential enhances regional product identity (Saswini et al., 2024; Khairunisa & Budiadnyani, 2024).

Knowledge Improvement (Pre-test and Post-test Results)

Participants' knowledge of Good Manufacturing Practices (GMP), CPPB-IRT, hygienic processing, entrepreneurship, and marketing strategies was evaluated using pre-test and post-test instruments. The results showed a substantial increase in knowledge after the training (*Table 1*).

Table 1. Pre-test and Post-test Scores of Participants (n = 20)

Parameter	Pre-test (Mean ± SD)	Post-test (Mean ± SD)	Improvement (%)
Knowledge Score	56.5 ± 8.2	90.2 ± 5.6	95%

The findings indicate a significant improvement in participants' understanding, with post-test scores increasing by 95% compared to pre-test results. This demonstrates the effectiveness of the training in enhancing participants' knowledge and capacity.

Participant Satisfaction

Participant satisfaction was assessed through a structured questionnaire administered at the end of the program. The results showed a high level of satisfaction across all evaluated aspects (*Table 2*).

Table 2. Participant Satisfaction Levels (%)

Aspect Evaluated	Satisfaction (%)
Training Materials	95%
Delivery Method	93%
Instructor Performance	97%
Practical Training Activities	96%
Overall Satisfaction	95%

These results indicate that the program was well-received, particularly in terms of instructor performance and hands-on training activities, which are essential for skill-based learning.

Implementation Process and Assistance Data

The program was conducted in a structured manner, beginning with socialization and theoretical training, followed by hands-on production sessions and supported by the provision of appropriate processing equipment. The high attendance rate (95%) reflects strong participant commitment and interest. The combination of lectures, demonstrations, and direct practice contributed to effective knowledge transfer and skill acquisition.

Product Output from Training Activities

During the practical sessions, participants successfully produced several innovative fish- and cempedak-based products. A total of 90% of participants were able to independently produce the targeted products, including dim sum Cemfish, cookies Cemfish, and noodles Cemfish. On average, each group produced 3–5 batches of each product type during the training sessions, demonstrating both skill acquisition and production capability.

Overall, the integration of training, practical application, and equipment support not only improved participants' knowledge and technical skills but also strengthened their capacity to develop sustainable, fisheries-based entrepreneurial activities. The results confirm that the program effectively contributed to empowering women and enhancing local economic potential.

Figure 5. Handover of production-supporting equipment to the partner group.

The provision of this equipment was carried out as a tangible form of support to enable the partner group to enhance production capacity and improve the quality of processed products based on catfish and forest *cempedak*. With the gas–electric oven, the drying and baking processes for *Cemfish* cookies can now be performed more efficiently and consistently. The fresh noodle machine allows the group to produce *Cemfish* noodles in larger quantities with uniform size, while the cookie molding tool accelerates the production process and ensures more attractive and consistent shapes. All group members showed high enthusiasm and immediately practiced using the equipment under the guidance of the community service team.

Discussion

The results of this study demonstrate that the community service program was effective in improving both knowledge and practical skills of participants. The quantitative findings, particularly the 95% increase in post-test scores, indicate a substantial improvement in participants' understanding of Good Manufacturing Practices (GMP), CPPB-IRT standards, and entrepreneurship concepts. This significant increase suggests that the combination of theoretical training and hands-on practice was highly effective in facilitating knowledge transfer. Furthermore, the fact that 90% of participants were able to independently produce dim sum, cookies, and noodles based on fish and cempedak highlights the success of the program in building technical competencies.

High levels of participant satisfaction (above 90% across all indicators) further reinforce the effectiveness of the training approach. These findings imply that participatory and practice-based learning methods are particularly suitable for community empowerment programs, as they not only enhance understanding but also increase motivation and engagement. The high attendance rate (95%) also reflects strong commitment from participants, which is a key factor in the success of capacity-building initiatives.

Participants also gained an understanding of the importance of maintaining product flavor, texture, and shelf life in accordance with market standards. In addition, the activity fostered creativity and self-confidence among participants to independently produce and market processed products, which has been shown to be an effective strategy for strengthening household economies (Sari et al., 2023; Kurniawan et al., 2023). This finding is consistent with previous studies emphasizing that empowering women's groups through entrepreneurship training and product innovation can increase household income while expanding the market reach of local products (Donald & Abdullah, 2023; Radisha et al., 2024).

Members of the Pokdakan Patin Macang Farm women's group expressed positive impressions and testimonials regarding the training activities. They stated that the learning provided not only enhanced their knowledge but also offered practical skills that could be directly applied in their daily business activities. According to the participants, processed catfish products incorporating forest cempedak introduced a new variation that is still relatively unfamiliar to the wider community, thereby possessing strong potential for broader market development. Participants expressed optimism that these newly acquired skills would contribute to increased household income and strengthen the competitiveness of their business group. In addition, the emphasis on hygiene, quality standards, and marketing strategies was considered essential preparation for facing increasingly competitive market conditions (Al-Ayub et al., 2023; Daeng et al., 2023; Rosalindah et al., 2023).

At the conclusion of the program, the DIPA UNRI Community Service Team expressed the hope that the production equipment provided would be optimally utilized to improve the household economy of the Pokdakan Patin Macang Farm group, expand the market reach of Cemfish products, and encourage the establishment of independent and sustainable business units. Meanwhile, the head of the Pokdakan Patin Macang Farm group conveyed gratitude for the support and expressed the expectation that this assistance would serve as an initial step toward scaling up fish-based processing businesses rooted in village potential, while also creating employment opportunities for women in the surrounding community. The group leader also hoped that collaboration with the University of Riau would continue through ongoing mentoring and advanced training to further strengthen their business capacity.

Limitations

Despite the positive outcomes, this study has several limitations. First, the number of participants was relatively small (n = 20), which may limit the generalizability of the findings. Second, the duration of the training program was relatively short, potentially restricting the depth of skill mastery and long-term behavioral change. Third, this study did not include long-term monitoring to assess the sustainability of the program's impact, particularly in terms of continued production, income generation, and business growth. Future studies are recommended to include a larger sample size, extended training duration, and longitudinal evaluation to better assess long-term impacts.

Conclusion

This community service program demonstrates that an integrated technology transfer approach combining capacity building, technical training, and production equipment support effectively enhances the capacity and sustainability of village-based food enterprises. The program achieved its objectives by strengthening food safety awareness, entrepreneurial skills, and product innovation, while theoretically reinforcing participatory and endogenous development models that emphasize local resources and community ownership. Socially, the intervention increased women's confidence and economic participation, contributing to household income improvement and micro-enterprise resilience. Future initiatives should prioritize continuous mentoring, product

standardization, certification, and digital marketing, while further research is needed to assess long-term economic impacts and the scalability of this model in diverse rural contexts.

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Conflicts of Interest

The authors declare no conflict of interest

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