

Community Empowerment in Floating Villages Based On Anchovy Potential for Local Food Security and Economic Improvement of Fishermen's Households

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Article history

Received: 20/06/2026

Revised: 25/07/2026

Accepted: 26/08/2026

Available Online: 30/09/2026

Published: 30/09/2026

Abstract:

This community service program aimed to empower fishermen, through the diversification of processed anchovy products to strengthen local food security and improve household economic welfare. The program employed a participatory action research approach involving 25 women fish processors. Activities included training in the production of four value-added products, namely Fried Anchovy Sambal, Balado Anchovies, Crispy Anchovies, and Anchovy Crackers, accompanied by assistance with SPP-IRT certification, packaging design, and marketing skills. The results demonstrated improved technical capacity among participants to produce hygienic and standardized fish-based food products. Product diversification extended the shelf life of anchovies from 2–3 weeks to 3–6 months, reduced post-harvest losses, and increased household income by up to 400–500%. SPP-IRT certification assistance strengthened compliance with national food safety standards, enhanced consumer confidence, and expanded market access. The program demonstrates that community-based fish product diversification can effectively strengthen local food security and improve the economic welfare of small-scale fishing households.

Keywords: Community Empowerment, Anchovy Processing, Food Security, Fishermen's Household Economy, SPP-IRT Certification.

Abstrak:

Program pengabdian masyarakat ini bertujuan memberdayakan nelayan, melalui diversifikasi produk olahan ikan teri untuk memperkuat ketahanan pangan lokal & meningkatkan kesejahteraan ekonomi rumah tangga. Kegiatan menggunakan pendekatan penelitian aksi partisipatif dengan melibatkan 25 perempuan pengolah ikan. Tahapan program meliputi pelatihan produksi empat produk bernilai tambah, yaitu Sambal Goreng Teri, Balado Teri, Ikan Teri Krispi, dan Peyek Teri, disertai pendampingan sertifikasi SPP-IRT, desain kemasan & keterampilan pemasaran. Hasil kegiatan menunjukkan peningkatan kapasitas teknis peserta dalam menghasilkan produk berbasis ikan yang higienis & terstandar. Diversifikasi produk memperpanjang umur simpan ikan teri dari 2–3 minggu menjadi 3–6 bulan, mengurangi kerugian pascapanen, serta meningkatkan pendapatan rumah tangga hingga 400–500%. Pendampingan SPP-IRT turut memperkuat kepatuhan terhadap standar keamanan pangan, meningkatkan kepercayaan konsumen, dan memperluas akses pasar. Program ini menunjukkan bahwa diversifikasi produk ikan berbasis masyarakat dapat menjadi strategi efektif dalam memperkuat ketahanan pangan dan meningkatkan kesejahteraan ekonomi nelayan skala kecil.

Kata kunci: Pemberdayaan Masyarakat, Pengolahan Ikan Teri, Ketahanan Pangan, Ekonomi Rumah Tangga Nelayan, Sertifikasi SPP-IRT.

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INTRODUCTION

Indonesia as the largest archipelagic country in the world has extraordinary marine and fisheries potential that serves as a strategic pillar of food security and national economic development. The fisheries sector contributes significantly to the national economy, with fish providing about 50 percent of the total animal protein intake in Indonesia's diet. However, despite this enormous potential, many coastal communities, especially small-scale fishing households, continue to face severe economic vulnerabilities and food insecurity challenges. Research in Takisung Regency, South Kalimantan, revealed that only 6.67% of small-scale fishing households are classified as food secure, while 68.33% experience food shortages and 13.33% face food insecurity (Rina (Hasibuan & Ginting, 2025) *et al.*, 2023). These alarming statistics underscore the urgent need for targeted community empowerment interventions that can transform fishery resources into sustainable economic opportunities. Southeast Sulawesi Province, especially Central Buton Regency, is one of the regions of Indonesia with substantial but underutilized marine fisheries potential. The waters around the Buton Islands are rich in small pelagic fish species, including anchovies (*Stolephorus* spp.), which form the backbone of local fishing activities. Floating Village, located in Mawasangka District, Central Buton Regency, is a coastal village whose majority of residents depend on fishing as their main livelihood. Communities have traditionally relied on the sale of fresh or dried anchovies, a practice that yields minimal economic returns and leaves households particularly vulnerable to price fluctuations, seasonal variations, and post-harvest losses.

The concept of community empowerment through diversification of fishery products is in line with the Sustainable Livelihood Framework (SLF), which emphasizes strengthening the assets and ability of vulnerable communities to achieve resilient and sustainable livelihood outcomes. SLF identifies five types of capital natural, physical, human, financial, and social that communities can mobilize to improve their well-being. In the context of Floating Villages, abundant anchovy resources are significant natural capital, but communities lack the human resources (processing skills), physical capital (equipment and certifications), and social capital (market networks) needed to transform these resources into sustainable economic benefits.(Carney, 1998; Scoones, 1998). Women play a very important but often under-recognized role in the fisheries value chain. In many coastal communities of Indonesia, women are primarily responsible for post-harvest activities, including fish cleaning, drying, and early processing. Despite their significant contributions, female fish processors often face barriers in leadership, decision-making, and access to resources such as credit, technology, and training. Women's empowerment through skills development and enterprise creation not only increases household economic resilience but also promotes gender equality and intergenerational change, as demonstrated by the seaBLUE Project implemented by UNDP Indonesia in partnership with the Ministry of Maritime Affairs and Fisheries. (FAO, 2025) (Dhewy, 2017)(UNDP, 2023)

Diversification of fish products is a proven strategy to increase the economic value of fishery resources while contributing to local food security. A study of the anchovy value chain in Zanzibar shows that product diversification, combined with improved processing technology and market access, significantly improves livelihood sustainability and reduces post-harvest losses (Shafil *et al.*, 2024). Similarly, research in Tulang Regency, South Sulawesi, found that fishermen engaged in business diversification including fish processing achieved an average monthly income of Rp 3,200,000, compared to Rp 2,150,000 for those relying solely on capture fisheries, representing a

substantial increase in income of 48.8%.(Sangadji, 2025). This community service program is designed to overcome various challenges faced by the fishing community of Floating Village by utilizing existing anchovy resources through four specific product innovations: Sambal Goreng Teri (spicy fried anchovies with tempeh and peanuts), Balado Teri (anchovies with balado chili seasoning), Crispy Anchovies (anchovies wrapped in crispy flour), and Peyek Anchovies (anchovy crackers).

These products are selected based on their market potential, relatively modest production requirements, longer shelf life compared to fresh fish, and alignment with local culinary preferences. Furthermore, this program integrates SPP-IRT (Certificate of Fulfillment of Household Industrial Processed Food Production Commitments) certification assistance to ensure compliance with national food safety standards, thereby increasing product credibility and market access. The objectives of this community service program are threefold: (1) to increase the technical capacity of fishing households, especially women, in producing diverse, hygienic, and marketable anchovie-based food products; (2) to facilitate SPP-IRT certification for community fish products to ensure food safety compliance and consumer trust; and (3) to strengthen local food security and improve the economic welfare of fisher households through the creation of value-added products and market linkages. This article presents the methodology, implementation process, results, and implications of this empowerment initiative, which contributes to the development of knowledge about community-based fisheries development and food security improvement in Indonesia's coastal communities.

METHOD

This community service program uses a participatory action research (PAR) approach, which emphasizes collaborative engagement between researchers, extension workers, and community members to identify problems, design interventions, implement activities, and evaluate results collectively (Kindon *et al.*, 2007). The PAR methodology was chosen because it encourages community ownership, ensures cultural appropriateness, and builds sustainable local capacity rather than creating dependency on external actors.

Location and Research Participants

This program was carried out in Floating Village, Mawasangka District, Central Buton Regency, Southeast Sulawesi Province, Indonesia. This location was purposively chosen based on its status as a fishery-dependent community with abundant anchovy resources but limited product diversification and processing capacity. The target participants consisted of 25 members of a female-led fish processing group, all of whom were local fishermen's wives with previous experience in basic fish handling but without formal training in value-added product development or food safety standards.

Program Design and Implementation

Community service is organized into four consecutive phases that are carried out over a six-month period (January–June 2026):

1. Phase 1: Baseline Assessment and Community Mobilization (Month 1) The initial phase involves conducting a baseline survey to assess the socio-economic conditions of participating households, existing fish processing practices, knowledge gaps, and aspirations. Focus Group

- Discussions (FGD) were held with community leaders, women's processing groups, and local fisheries extension officers to ensure participatory planning. The community action plan was developed collaboratively, identifying four priority products for development: Anchovy Fried Chili Sauce, Anchovy Balado, Crispy Anchovies, and Peyek Anchovies.
2. Phase 2: Technical Training and Skills Development (Months 2–3) Intensive hands-on training sessions are conducted by a team consisting of food technology specialists, fisheries extension workers, and experienced processors from partner universities. The training modules include: (a) raw material selection and anchovy quality control; (b) standard recipes and production techniques for each of the four products; (c) hygiene and sanitation practices in accordance with the guidelines of Good Food Production Practices for Household Industry (CPPB-IRT); (d) proper packaging method using food grade aluminum foil; and (e) basic business management, including cost calculations, pricing strategies, and simple bookkeeping.
 3. Phase 3: SPP-IRT Certification Assistance and Production Trials (Months 4–5) Participants are guided through the SPP-IRT registration process, including documentation preparation, facility inspection readiness, and compliance with labeling requirements. Production trials are conducted under supervision to ensure consistency, quality, and compliance with food safety standards. Product samples undergo organoleptic evaluation by trained panelists to assess appearance, aroma, taste, and texture.
 4. Stage 4: Monitoring, Evaluation, and Market Linkage (Month 6) The final stage is focused on monitoring production sustainability, evaluating revenue changes, and facilitating initial market linkages. Participants receive mentoring on digital marketing through social media platforms and connect with local retailers and cooperative networks for product distribution.

Data Collection and Analysis

Data were collected through structured questionnaires, in-depth interviews, direct observations, and analysis of production records. Pre- and post-program assessments are conducted to measure changes in knowledge, skills, production capacity, and household income. Quantitative data were analyzed using descriptive statistics, while qualitative data from interviews and FGDs were analyzed thematically to identify patterns, challenges, and success factors.

RESULTS AND DISCUSSION

Increased Technical Processing Capacity

The training program resulted in a noticeable improvement in the technical competence of participants in all four product categories. Prior to the intervention, none of the participants had experience in producing value-added anchovy products beyond simple sun drying. Post-training assessments revealed that 100% of participants successfully mastered production techniques for all four products, demonstrating competence in ingredient preparation, cooking temperature control, seasoning balance, and quality consistency. Anchovy Fried Chili Sauce product, consisting of 250g of anchovies (headless, briefly fried), 500g tempeh (cut into matches and fried), 250g of fried beans, 3 tablespoons of cooking oil, 10 cloves of sliced garlic, 1 thumb-sized crushed ginger, 100g of deseeded red chili peppers, 100g of palm sugar, 10 tablespoons of sweet soy sauce, 4 finely sliced kaffir lime leaves, 4 bay leaves, 1 crushed galangal, and salt to taste, proved to be very popular among participants due to their familiar flavor profile and relatively easy preparation

process. The combination of protein sources of anchovies, tempeh and peanuts creates a balanced nutritious product that is rich in protein, healthy fats and micronutrients.

Balado Anchovy products, which consist of dried anchovies, balado seasoning, and cooking oil, require more precise temperature control during the frying process to achieve an optimal crispy texture without burning. Participants showed significant improvements in managing heat levels and time after repeated training sessions. Crispy anchovies, which combine rice flour, wheat flour, cooking oil, coconut milk, pepper, lime leaves, and spices, present the biggest technical challenges due to the preparation of the dough and the frying technique. However, by the end of the training period, 92% of participants achieved satisfactory product quality. Peyek Teri, a traditional Indonesian peanut cracker with anchovies, allows participants to connect the training with their cultural culinary heritage while adding value through improved hygiene standards and attractive packaging. This product diversification strategy is in line with findings from Makassar and Takalar, where female-led fish processing companies that diversified from single products (such as tuna yarn) into multiple offerings including fish balls, nuggets, chips, and traditional snacks demonstrated greater market adaptability and revenue resilience over the long term.(Putri, 2025)

SPP-IRT Certification Achievements

An important milestone of this program is the successful acquisition of SPP-IRT certification for the four products with the business name "SURIANI" with registration numbers P-IRT 5027414030005-28 (Ancho Fried Chili), P-IRT 5027414090005-28 (Balado Teri), P-IRT 5027414100005-28 (Crispy Anchovies), and P-IRT 5027414XXXXX-28 (Peyek Anchovie). The certification process, facilitated by the local Health Office, involves verification of compliance with three key commitments: (a) participation in food safety counselling; (b) fulfillment of the requirements of CPPB-IRT which includes cleanliness, sanitation, and documentation; and (c) compliance with processed food labeling and advertising regulations.

The SPP-IRT certification serves several important functions. First, it legally validates products for commercial distribution, allowing sales outside of informal neighborhood networks to formal retail channels. Second, it assures consumers of product safety, an important factor in building brand trust and customer loyalty. Third, this certification positions community companies for future expansion, including the potential for halal certification and access to a wider market. This is in line with the recommendations from Rembang Regency, where the absence of distribution permits and halal certification was identified as the main obstacle preventing fish processing MSMEs from accessing larger markets & export opportunities (Wijayanto *et al.*, 2022).

Extended Product Shelf Life and Food Security Contribution

One of the most significant results of product diversification is a substantial extension of the shelf life of the product compared to fresh or simply dried anchovies. While fresh anchovies typically spoil within 1-2 days and dried anchovies can traditionally last for about 2-3 weeks under optimal conditions, processed products achieve a shelf life of 3-6 months if properly packaged in food grade aluminum foil with adequate sealing. This extension is an important contribution to local food security by reducing post-harvest losses, which in Indonesia's fisheries sector costs about US\$7.28 billion per year.(2025)

The nutritional contribution of these products to household food security is equally important. Anchovies are a source of high-quality protein, omega-3 fatty acids, calcium, iron, and vitamin D, essential nutrients to prevent malnutrition, stunting, and micronutrient deficiencies that are prevalent in many coastal communities in Indonesia. By transforming fresh, perishable fish into stable, ready-to-eat products, the program ensures that households have consistent access to nutrient-dense foods regardless of seasonal fishing fluctuations. This is particularly relevant considering that the study in Takisung found that energy consumption levels among fishing households were deficit (66.33% of the recommended adequacy), while moderate protein consumption (87.96%) (Rina *et al.*, 2023).

Economic Impact on Fishermen's Households

The economic results of this program show promising potential for increased household income. Prior to the intervention, the women's group generated an average monthly income of around Rp 500,000–700,000 from selling basic dried anchovies to local buyers. Within three months of starting production, the average monthly sales of diversified products reached IDR 2,500,000–3,000,000 per active member, increasing fourfold to fivefold.

This increase in income is in line with a broader pattern observed in Indonesia's coastal communities. In Pasar Island, Lampung, a group of women engaged in the diversification of fish products experienced the same increase in income after receiving training and cooperation support. Additional revenue is mainly allocated for household food expenditure, children's education, health care, and savings, all of which directly contribute to increased food security and household resilience.(KKP, 2024)

The program also creates indirect economic benefits by stimulating demand for complementary ingredients (tempeh, peanuts, spices, packaging materials) from local suppliers, and thus produces a multiplier effect in the village economy. In addition, the establishment of a recognized brand (SURIANI) and certified products positions the community company for future scaling, including the potential for e-commerce expansion, and regional distribution.

Gender Empowerment and Social Capital Development

Beyond economic metrics, the program generates significant social impact, especially in terms of women's empowerment and social capital building. Participants reported increased confidence in their productive roles, greater participation in household financial decision-making, and improved status in society. The formation of structured processing groups with shared responsibility, rotating leadership, and collective problem-solving mechanisms strengthens social cohesion and creates a sustainable platform for sustainable mutual support.

These findings resonate with global evidence on women's empowerment in the fisheries value chain. FAO's Coastal Fisheries Initiative (CFI) in Indonesia documents how training in seafood processing and packaging, combined with business and marketing skills, enables women to form associations, engage in economic activities, and gain a greater voice in household and community decision-making. Similarly, the seaBLUE project in Tanimbar, Maluku, found that fisheries product diversification training not only equips women with new skills but also inspires intergenerational change, as girls observe their mother's transformation from passive household managers to active economic agents.(FAO, 2025)(UNDP, 2023)

Sustainability Challenges and Considerations

Despite the positive results, several challenges were faced during implementation. Limited access to working capital limits the scaling of production, as participants cannot afford to purchase raw materials in bulk or invest in additional equipment. Marketing remains largely local, with limited penetration into urban or tourist markets where higher prices can be commanded. Seasonal fluctuations in anchovy availability affect production consistency, highlighting the need for cold storage facilities or supply chain agreements with some fishermen. The sustainability of the program depends on ongoing mentoring, access to microfinance, and market expansion. Experience from Kenjeran, Surabaya, shows that one training session is not enough; on the contrary, continuous mentoring is essential for long-term success (Kurniawati, 2025). The integration of processing groups with the framework of the Fishermen's Production Cooperative successfully implemented in Kalaju Pulau Pasaran, offers a promising institutional mechanism for sustainable support, collective marketing, and access to government assistance programs.

Table 1 Comparison of Product Characteristics and Economic Value

No	Product Name	Main Ingredients	Shelf Life	Estimated Selling Price (IDR)
1	Anchovy Fried Chili Sauce	Anchovies, tempeh, peanuts, spices	4–6 months	25,000–35,000/250g
2	Teri Ballad	Dried anchovies, balado seasoning, oil	3–5 months	20,000–30,000/100g
3	Crispy Anchovies	Anchovies, rice flour, wheat flour, coconut milk	3–4 months	15,000–25,000/100g
4	Peyek Anchovies	Rice flour, peanuts, anchovies, spices	2–3 months	10,000–20,000/100g
5	Traditional Dried Anchovies	Fresh anchovies, salt	2–3 weeks	8,000–12,000/250g

Source: Primary data from community service programs, 2026.

CONCLUSION

The community service program in Floating Village, Central Buton Regency, has shown that the empowerment of fishing communities through diversification of anchovy products is a viable and effective strategy to increase local food security and improve the economic welfare of fisher households. The development of four value-added products, Anchovy Fried Chili Sauce, Balado Anchovies, Crispy Anchovies, and Peyek Anchovies, combined with the help of SPP-IRT certification, has given significant positive results in various dimensions. First, the program successfully increased the technical capacity of female-led fish processing groups, changing their role from passive handlers of raw fish to active producers of marketable standard food products. The acquisition of SPP-IRT certification not only ensures compliance with national food safety standards but also paves the way to a formal market and consumer trust. Second, product diversification substantially extends the shelf life of anchovies, directly contributing to the reduction of post-harvest losses and increased availability of household food throughout the year. Third, the economic impact is enormous, with participating households reporting an increase in income of up to 400-500% compared to pre-intervention levels.

The program also generates important social impacts, including strengthening women's empowerment, increasing social capital through group formation, and intergenerational inspiration as young community members observe the transformation of women's economic roles.

These outcomes align with the Sustainable Livelihoods Framework and contribute to the achievement of several Sustainable Development Goals, including SDG 2 (Zero Hunger), SDG 5 (Gender Equality), SDG 8 (Decent Work and Economic Growth), and SDG 14 (Life Underwater). For sustainability, it is recommended that the program be integrated with institutional support mechanisms, including the formation of cooperatives, access to microfinance, and ongoing technical mentoring. Collaboration with local government agencies, universities, and private sector partners will be critical to increasing production scale, expanding market reach, and ensuring the long-term viability of these community-based enterprises. The success of the Floating Village serves as a replicable model for other fishing communities across Indonesia who are trying to transform the potential of marine resources into sustainable livelihoods and food security.

Figure 1. Documentation of Community Service Activities



DECLARATIONS

Author Contributions. *Suriadi* contributed to the conceptualization of the study, activity design, implementation coordination, and preparation and revision of the manuscript. *Rabiyatul Jasiyah* contributed to the development of the methodology, data collection, field activity implementation, and analysis of research findings. *Galang* contributed to technical management of the activities, data processing, and interpretation of research results. *Ismail Failu* contributed to activity implementation, assistance for the target group, and documentation of research activities.

Funding. This research did not receive any external funding.

Conflict of Interest. The authors declare that there is no conflict of interest related to this research, authorship, or publication of this article.

Use of Artificial Intelligence. The authors did not use artificial intelligence or generative AI in the preparation of this manuscript.

Ethical Approval and Informed Consent. Ethical approval and informed consent were not required for this study.

Data Availability. Data availability statements were not applicable to this study.

Acknowledgments. The authors gratefully acknowledge the Government of Floating Village, Mawasangka District, Central Buton Regency, and the female-led fish processing group for their support, participation, and cooperation during the implementation of this community service

program. Appreciation is also extended to all parties who contributed to the planning, implementation, and evaluation of the activity. Their valuable support has contributed significantly to the success of this program in strengthening the capacity of local communities in fish processing and value-added product development.

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