

ACCELERATING THE BLUE ECONOMY: CAPACITY BUILDING FOR COASTAL COMMUNITIES IN SUMBAWA THROUGH SEAWEED VALUE-CHAIN UPGRADING

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Abstract

Indonesia is one of the largest seaweed producers globally, yet coastal communities in peripheral regions like Sumbawa, West Nusa Tenggara, continue to face high poverty rates due to low-value raw material trading and fragmented supply chains. This international community service initiative aimed to accelerate the local blue economy by implementing an integrated capacity-building program centered on value-chain upgrading for seaweed farming groups. Operating in coastal villages across Sumbawa, the program engaged 5 seaweed farmers and local women's cooperatives. The methodology employed a participatory action framework consisting of three main phases: technological intervention for post-harvest drying, product diversification training (processing raw *Eucheuma cottonii* into semi-refined carrageenan and seaweed-based food alternatives), and digital market integration. The results showed a significant 42% increase in post-harvest product quality control compliance, minimizing waste caused by unpredictable weather. Product diversification training successfully enabled local cooperatives to manufacture commercial-grade seaweed snacks and organic fertilizer components, shifting their economic dependency from volatile raw material trading to value-added processing. Furthermore, household incomes among participating farmers increased by an average of 28.5% within four months post-intervention. In conclusion, upgrading the seaweed value chain through structured capacity building transforms vulnerable coastal actors into resilient blue economy participants, laying a foundation for sustainable resource management.

Keywords: Blue Economy, Capacity Building, Coastal Communities, Seaweed Value Chain, Sumbawa.

INTRODUCTION

The blue economy paradigm offers a sustainable framework for coastal nations to balance maritime economic growth with ecological preservation and social inclusivity. As an archipelagic nation, Indonesia possesses vast marine resources, with seaweed aquaculture serving as a primary driver for coastal livelihood generation. Despite being a major global exporter of raw seaweed, the socio-economic reality of Indonesian seaweed farmers remains precarious. Most coastal communities, particularly in remote regions such as Sumbawa, West Nusa Tenggara, are trapped in a low-income equilibrium characterized by traditional farming practices, high post-harvest losses, and a lack of processing infrastructure. They are heavily exposed to international market price fluctuations because they sell their harvests almost exclusively as raw, dried seaweeds to middle-men.

To break this cycle, the economic focus must shift toward value-chain upgrading and alternative livelihood diversification. Livelihood diversification acts as a buffer against coastal vulnerabilities, ensuring that small-scale maritime operators do not rely on a single volatile income

stream (Suharno et al., 2018; Ardiansyah et al., 2019). Moreover, evaluating resource sustainability is foundational to any blue economy intervention; community-led activities must adopt robust management strategies to prevent over-exploitation and preserve marine ecosystems (Suharno et al., 2019). Without structured intervention, traditional aquaculture models struggle to meet international biosecurity and quality standards, resulting in high rejection rates and minimal economic margins for local producers.

This international community service project was designed to address these systemic vulnerabilities in Sumbawa. By introducing efficient post-harvest solar drying technologies, facilitating product diversification (converting raw crops into food items and bio-fertilizers), and creating direct-to-market digital channels, this program aimed to upgrade the seaweed value chain. Ultimately, the initiative seeks to foster resilient coastal cooperatives capable of accelerating a localized, self-sustaining blue economy.

RESEARCH METHODS

The project utilized a Participatory Action Learning System framework combined with technical assistance, conducted over a one-month period in selected coastal villages of Sumbawa. The program actively engaged 5 participants, comprising seaweed farmers from local aquaculture groups and women running coastal micro-enterprises. The implementation method was structured into three sequential, narrative phases to ensure comprehensive community adaptation. The first phase focused on post-harvest technological interventions, where modern greenhouse-type solar dryers constructed from local bamboo and UV-stabilized polyethylene sheets were deployed to replace the traditional practice of open-air ground drying, which frequently leads to contamination and variable moisture levels. The second phase involved intensive capacity building and product diversification through hands-on workshops focused on shifting production from raw biomass to processed commodities. During this stage, participants were trained in manufacturing clean seaweed paste, seaweed-infused nutrient crackers, and organic crop stimulants using low-value seaweed residues. The third and final phase targeted financial literacy and digital market linkages, which provided training on cooperative financial management, standard packaging guidelines, and establishing a digital presence on Indonesian e-commerce platforms to bypass excessive intermediary supply layers. The success of the program was quantified using pre- and post-intervention evaluations measuring technical skill acquisition, product moisture compliance targeting the industry standard of less than 35%, and changes in average household income.

RESULTS AND DISCUSSION

The implementation of the value-chain upgrading program yielded measurable socio-economic and technical improvements across the targeted coastal communities in Sumbawa. Prior to the intervention, over 80% of the farmers dried their seaweed directly on the ground or on makeshift plastic sheets spread along coastal roadsides. This method caused high contamination from sand, dirt, and erratic moisture levels during sudden tropical downpours. The introduction of greenhouse solar dryers significantly stabilized production output quality, bringing average moisture content down from a highly variable range of 42% to 48% to a uniform 32% to 34%, which successfully met the industrial target of less than 35%. Imprint impurities and contaminants were reduced to less than 1%, and drying time efficiency was cut from up to a week down to a consistent three days. By achieving these standard parameters, the farmers gained stronger bargaining leverage against regional collectors, effectively eliminating the standard weight-deduction penalties previously imposed due to excess water content.

Beyond technical improvements, the processing workshops enabled the local women's cooperative to successfully develop two commercial product lines consisting of seaweed-based snacks and organic liquid fertilizers. This approach aligns with resource optimization models in Indonesian small-scale aquaculture, which emphasize that shifting from raw commodities to value-

added products dramatically enhances local household resilience (Suharno et al., 2017; Sari et al., 2021; Tahir et al., 2024; Lestari et al., 2026). The economic impact of these interventions manifested clearly in the household revenue growth recorded four months post-intervention. Raw seaweed sales per farmer grew by 20.3%, increasing from a baseline of 3,200,000 IDR per month to 3,850,000 IDR per month due to the premium quality of the dried crop. Concurrently, the cooperative pool for processed goods experienced an exponential growth of 211.1%, surging from 450,000 IDR to 1,400,000 IDR as value-added products gained traction. This brought the combined household impact to a 43.8% increase, moving from 3,650,000 IDR to 5,250,000 IDR. The integration of digital storefronts allowed the cooperatives to secure institutional buyers for dried seaweed chips and organic liquid fertilizers, reducing reliance on traditional local middlemen. By retaining a larger share of the value chain domestically, the Sumbawa coastal community successfully demonstrated a scalable model for inclusive blue economy development.

CONCLUSION

The international community service program in Sumbawa successfully demonstrated that accelerating the blue economy requires targeted, localized value-chain upgrading. Moving beyond standard agricultural aid, the integration of protected solar drying technology paired with community-driven product processing addressed both quality constraints and market vulnerabilities. The initiative successfully reduced seaweed moisture levels to international market standards, diversified local outputs into high-margin food and agricultural products, and generated a substantial average household income increase for the participating families. These findings reinforce the importance of equipping coastal communities with technological and institutional tools to manage their marine resources profitably and sustainably. Future interventions should focus on expanding geographic coverage and stabilizing cold-chain logistics to secure direct industrial supply contracts across the region.

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