

Circular Economy Model in Utilizing Unsold Catch in Sungai Kupah Village

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Abstract: Unsold catch is susceptible to quality deterioration and economic value loss if it is not handled promptly. This study aims to formulate a circular economy model for utilizing unsold catch through the Pelita Patra Bahari Program in Sungai Kupah Village, Kubu Raya Regency. The study employed a qualitative descriptive approach with a case study design. Data were obtained through direct observations during program implementation and mentoring, supported by village profiles, group profiles, planning documents, activity reports, documentation, and production records. Data were analyzed using descriptive analysis, material flow mapping, value chain analysis, and source triangulation. The results show that, of the approximately 13,632 kg of recorded catch per month, 3,618 kg (26.54%) was not absorbed by the fresh-fish market. The program established a processing pathway for unsold fish that remained fit for consumption through sorting, salting, drying, packaging, and marketing. A drying house supported shorter drying times and reduced dependence on weather conditions. The model connects KUB Bina Bersama as a fishing group and raw material provider with Poklahsar Permai Lestari as a fish processing and marketing group, allowing material value recovery to occur alongside the expansion of coastal women's economic activities. The sustainability of the model requires continuity of raw materials, quality standardization, facility maintenance, production records, institutional strengthening, and market access. The findings indicate that a community-based circular economy can support efforts to reduce value loss in fisheries products while creating new social and economic value chains.

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Introduction

Capture fisheries are an important source of food and livelihoods for coastal communities. However, the economic value of the catch is strongly influenced by the speed and quality of post-landing handling. Fish deteriorate rapidly, so delays in sales, limited storage, and inadequate processing facilities can result in physical and economic losses (Boziaris, 2014; Maulu et al., 2020; Tesfay & Teferi, 2017).

A circular economy offers an approach to maintaining resources within production systems through loss reduction, reuse, processing, and value recovery. This concept shifts the linear "take-use-dispose" pattern toward longer and more productive material flows (Geissdoerfer et al., 2017; Ghisellini et al., 2016; Kirchherr et al., 2017). However, circularity does not automatically result in sustainability because outcomes are also influenced by system boundaries, energy requirements, economic feasibility, and the distribution of social benefits (Korhonen et al., 2018; Murray et al., 2017).

In the fisheries sector, circular economy principles can be applied by utilizing unsold catch and processing by-products as inputs for value-added products. Such application requires the identification of materials, technologies, actors, markets, and the benefits generated (Cooney et al., 2023; Mozumder et al., 2022). Drying is a relatively suitable option for community-scale enterprises because it reduces moisture and extends shelf life. Product quality, however, remains dependent on raw-material freshness, salting, sanitation, temperature, drying time, and storage conditions (Al-Ismaili, 2021; Indrastuti et al., 2019; Putalan et al., 2022; Savitri et al., 2018).

Sungai Kupah Village, Sungai Kakap District, Kubu Raya Regency, is a coastal area with capture-fisheries and other coastal-resource potential. KUB Bina Bersama is one of the fishing groups operating in the village. Established on July 9, 2020, the group consists of 10 fishers and conducts regular group meetings alongside its fishing activities (KUB Bina Bersama, 2025; Sungai Kupah Village Government, 2023).

Pelita Patra Bahari Program documents record an average of 10,014 kg of fish sold per month, while approximately 3,618 kg per month was not absorbed by the market. This indicates that part of the catch had not yet generated optimal economic value. The program therefore linked KUB Bina Bersama with Poklahsar Permai Lestari, a fish processing and marketing group consisting of 10 women, to process eligible unsold fish into dried products using a drying house (PT Pertamina Patra Niaga Aviation Fuel Terminal Supadio, 2026). The involvement of women in post-harvest activities is important because their contributions to fish processing and trade are often less visible within fisheries value chains (Harper et al., 2013).

Studies in Indonesia have shown that processing can increase the utility and economic value of fishery resources through salting, drying, and the development of derivative products (Nurhayati, 2004; Nurilmala et al., 2010; Setyarini et al., 2024). However, studies that connect unsold fish, appropriate technology, fishing groups, and women's groups within a village-level circular economy model remain limited. This study aims to formulate a circular economy model for utilizing unsold catch in Sungai Kupah Village and to identify the roles of technology and institutions, the potential benefits, and the factors supporting sustainability.

Research methods

This study employed a qualitative descriptive approach with a case study design focusing on the Pelita Patra Bahari Program in Sungai Kupah Village. The case study approach was used to understand the utilization of unsold catch within its actual social, technological, and institutional context (Yin, 2018).

Primary data were obtained through direct observations during program implementation and mentoring, including catch sorting, fish processing and drying, use of the drying house, packaging, and the division of roles between groups. Secondary data were obtained from village profiles, the KUB Bina Bersama profile, program reports and minutes, the Scope of Work, Logical Framework Analysis, roadmap, documentation, and production records. Document analysis was conducted systematically to identify baseline conditions, interventions, achievements, and information requiring further verification (Bowen, 2009).

Data were analyzed through reduction, categorization, presentation, and conclusion drawing (Miles et al., 2014). Material flow mapping was used to describe the transformation of unsold fish into raw materials and dried products, while value chain analysis was used to map actors, functions, products,



and benefits (Brunner & Rechberger, 2016). Data validity was strengthened through triangulation among observations, documentation, production records, and program documents. Target and projection data were distinguished from actual data.

Results and Discussion

Catch Conditions and Points of Value Loss

KUB Bina Bersama conducts capture-fisheries activities and sells fresh fish. According to program documents, the average monthly volume of fish sold was 10,014 kg, while 3,618 kg was not absorbed by the market. The total recorded catch was therefore approximately 13,632 kg per month, indicating that 26.54% of the recorded catch was not absorbed by the fresh-fish market. This condition shows that value loss occurs after landing when fish that are still fit for consumption do not immediately find buyers or receive further handling. This is consistent with findings that post-harvest losses in small-scale fisheries are influenced by limitations in preservation, facilities, handling, and market access (Maulu et al., 2020; Tesfay & Teferi, 2017).

Table 1. Initial conditions for utilization of catch results

Indicator	Volume	Proportion
Fish sold	10,014 kg/month	73.46%
Unsold fish	3,618 kg/month	26.54%
Total recorded catch	13,632 kg/month	100%

Source: Authors' calculation based on PT Pertamina Patra Niaga Aviation Fuel Terminal Supadio (2026).

Transformation of Linear Flow into Circular Flow

Before the implementation of the Pelita Patra Bahari Program, catch utilization by KUB Bina Bersama was primarily oriented toward fresh-fish sales. After capture, landing, and sorting, the fish were marketed directly to buyers. Fish that were not absorbed by the market within a limited period were at risk of quality deterioration and economic value loss because no further processing pathway was available.

The Pelita Patra Bahari Program extends this utilization flow by directing unsold fish that remain fit for consumption into a processing pathway. The fish undergo sorting, processing, drying, packaging, and marketing. This extended flow allows the catch to retain economic value even when it is not absorbed by the fresh-fish market.

Figure 1. Catch Utilization Flow in the Circular Economy Model



Gambar. Aliran Pemanfaatan Hasil Tangkapan dalam Model Ekonomi Sirkular

Source: Authors' analysis based on Pelita Patra Bahari Program data (2026).

As shown in Figure 1, sorting is a critical stage in determining the subsequent utilization of the catch. Fish absorbed by the fresh-fish market continue to be sold fresh, while unsold fish that remain fit for consumption are transferred to Poklarsar Permai Lestari, a fish processing and marketing group, for further processing. The model therefore does not rely on spoiled fish, but on edible fish that have not yet achieved optimal economic value.

This transformation demonstrates a shift from a linear pattern toward a more circular flow. In the linear pattern, utilization effectively ends when the fish cannot be sold fresh. In the circular flow, eligible unsold fish re-enter the production chain through product transformation and shelf-life extension. Drying and packaging create a more durable product and open market alternatives beyond fresh-fish sales.

This pattern is consistent with circular economy principles that emphasize maintaining resource value through processing, reuse, and the creation of new value chains (Geissdoerfer et al., 2017; Kirchherr et al., 2017). In fisheries, value recovery also requires appropriate technology, suitable raw-material quality, group capacity, and market availability (Cooney et al., 2023). Circularity in the Pelita Patra Bahari Program is therefore characterized not only by the utilization of unsold fish, but also by the relationships among fishing groups, processing groups, drying-house technology, and processed-product markets.

The Role of the Drying House in Value Recovery

A drying house measuring approximately 3×3 meters is the main technology supporting the processing stage. Program documents indicate a capacity of more than 300 kg over a two-day cycle, or approximately 149 kg per day, with a drying time of 6-24 hours. This is shorter than the conventional sun-drying period, which was reported to require more than one week (PT Pertamina Patra Niaga Aviation Fuel Terminal Supadio, 2026).

Technically, an enclosed drying system has the potential to reduce dependence on weather and exposure to environmental contaminants (Al-Ismaili, 2021; Savitri et al., 2018). However, drying speed alone cannot substantiate claims of improved product quality. Salted-fish quality remains influenced by raw-material condition, sanitation, salt concentration, drying time, packaging, and storage (Indrastuti et al., 2019; Putalan et al., 2022). Quality development therefore also requires process standardization and consistent market orientation (Sumarno et al., 2020).

Table 2. Comparison of drying processes

Aspect	Conventional drying	Drying house
Time	>1 week	6-24 hours
Weather dependence	High	Lower
Environmental exposure	Relatively open	More controlled
Capacity	Depends on weather and space	±149 kg/day
Production scheduling	Less stable	More planned

Source: Processed from PT Pertamina Patra Niaga Aviation Fuel Terminal Supadio (2026).

Figure 2. Drying house and fish arrangement process



Source: Documentation of the Pelita Patra Bahari Program.

Social and Institutional Value Chains

The circular economy model of Pelita Patra Bahari is shaped by the relationship between KUB Bina Bersama as a raw-material provider and Poklahsar Permai Lestari as a fish processing and marketing group. The involvement of 10 women extends the fisheries value chain from capture activities

to post-harvest processing. This indicates that material value recovery can occur alongside the expansion of women's economic participation (Harper et al., 2013).

Added value is generated not only through changes in product form, but also through the organization of raw materials, labor, technology, and marketing. Studies of fish processing in Indonesia show that value creation depends on production inputs, product quality, and the capacity to develop derivative products (Nurhayati, 2004; Nurilmala et al., 2010; Setyarini et al., 2024). Therefore, intergroup arrangements need to clarify raw-material quality and pricing, production schedules, operating costs, facility maintenance, sales records, and benefit sharing.

Figure 3. Fish Processing Activities by Poklahsar Permai Lestari



Source: Documentation of the Pelita Patra Bahari Program.

Model Sustainability and Key Factors

The model comprises five main elements: (1) catch as a resource; (2) unsold fish as a point of value loss; (3) processing and the drying house as value-recovery mechanisms; (4) KUB Bina Bersama and Poklahsar Permai Lestari as the main community actors; and (5) products and markets as key determinants of sustainability. The model can be summarized as follows: KUB Bina Bersama → eligible unsold fish → Poklahsar Permai Lestari → drying house → dried fish products → market → economic, social, and environmental benefits.

A sustainable model requires continuity of raw materials, product quality, appropriate facility use and maintenance, product legality, production records, and market demand. Increasing production without sufficient market absorption would only shift the risk of value loss from raw fish to unsold processed-product stocks. In addition, a circular economy should account for processing residues and energy use so that environmental benefits are supported by measurable evidence rather than assumptions (Ghisellini et al., 2016; Mozumder et al., 2022; Murray et al., 2017).

The program document contains figures of 600 kg and 724 kg of dry product per month, along with some inconsistent revenue data. Therefore, these figures cannot be used to infer actual economic impact. Further measurements should record the weight of raw materials and products for each cycle, yield, costs, sales volume, quality test results, residues, and benefit distribution. Traceability of this data is essential so that the model can be assessed based on actual performance, not just capacity or projections.

Conclusion

The Pelita Patra Bahari Program demonstrates the development of a community-based circular economy pathway for utilizing fish that are not absorbed by the fresh-fish market. Program documents identify approximately 3,618 kg of fish per month as unsold catch with the potential to be redirected into processing, provided that the fish remain fit for consumption. The processing pathway includes sorting, salting, drying, packaging, and marketing. The drying house supports value recovery, while the relationship between KUB Bina Bersama and Poklahsar Permai Lestari creates a value chain involving both fishers and coastal women.

The sustainability of the model depends on raw-material quality and continuity, standardized processing, facility use and maintenance, business records, benefit-sharing arrangements, and market

access. This study formulates the structure and potential of the circular economy model; however, a more precise measurement of its economic and environmental impacts requires verified data on actual production, costs, sales, product quality, processing residues, and the volume of unsold catch utilized.

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