



Received: 28-09-2025
Accepted: 08-11-2025

International Journal of Advanced Multidisciplinary Research and Studies

ISSN: 2583-049X

Analysis of Canned Fish Product Development in Indonesia

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Abstract

This study aims to analyze the development of canned fish products in Indonesia by reviewing four main aspects, namely raw materials, production processes, packaging, and flavor variations. The analysis was conducted using a comparative method through direct observation in the market, indirect observation through brand social media, and literature studies from various credible and relevant scientific sources. The research subjects included two canned fish brands widely available in the domestic market, namely X and Y. The results of the analysis show differences in the application of innovation in both brands in

each aspect of product development. The X brand stands out with its fancy raw material innovations, the development of local flavors such as balado and serundeng, which are typical Indonesian flavors, and the use of hermetic cans designed to make the product more practical, hygienic, and ready to cook. Meanwhile, Y focuses on diversifying fish types and lighter flavor variants to reach the export market, with high-quality packaging that has long-term durability. In terms of production, the two brands do not show significant differences. This study confirms that innovation in raw materials, production processes, packaging,

Keywords: Canned Fish, Product Development, Raw Materials, Packaging, Flavor Innovation

1. Introduction

Product development is a systematic process that involves transforming an idea into a marketable product through stages such as opportunity identification, concept generation, design, formulation, testing, and commercialization. According to Falahat *et al.*, (2024) ^[10], product development represents an essential function that bridges research, technology, and marketing to create products that meet dynamic consumer demands. It requires a multidisciplinary approach that combines engineering, sensory science, market research, and sustainability principles to ensure both product success and longevity in the marketplace (Iheanachor *et al.*, 2021) ^[14].

Canning is a modern form of fish processing and preservation in which the fish is hermetically sealed and then sterilized at a temperature of $\pm 115^{\circ}\text{C}$ to kill all pathogenic and spoilage microbes. Canning minimizes product spoilage, damage due to oxidation, changes in taste, and extends shelf life (Ratih *et al.*, 2016) ^[23].

Product development is not merely a technical innovation but also a strategic response to evolving market needs. Consumers increasingly seek convenience, nutrition, safety, and environmental sustainability, driving companies to reformulate or redesign existing products to align with these expectations (Pais-Costa *et al.*, 2025) ^[22]. In particular, the seafood industry—where freshness and safety are crucial—requires continuous improvement in processing technologies, packaging systems, and value-added innovation to maintain competitiveness and meet international food safety standards.

The importance of product development extends beyond maintaining competitiveness. It plays a critical role in strengthening national food security, expanding export potential, and promoting local industry growth. In developing countries such as Indonesia, product development in the fish processing sector contributes to economic diversification and employment creation, especially in coastal communities that depend on fisheries as their primary livelihood (Handayani *et al.*, 2021) ^[13]. By developing high-value processed products like canned fish, Indonesia can capture more of the value chain rather than relying solely on raw fish exports.

Product development offers multiple benefits for companies. These include diversification of the product portfolio to minimize market risk, improvement of profit margins through innovation, access to new market segments, and enhancement of brand image and consumer loyalty (Oliveira *et al.*, 2025) ^[21]. Moreover, integrating sustainability into product design—such as

adopting recyclable packaging or optimizing processing efficiency—can reduce environmental impact and appeal to eco-conscious consumers (Almeida *et al.*, 2023) ^[1]. In the case of food canning industries, innovation in formulation, packaging material, and sterilization processes enables the creation of safer, more nutritious, and organoleptically stable products (Appiani *et al.*, 2025) ^[2].

Fish canning is one of the most significant sub-industries in Indonesia's seafood sector. The country ranks among the top global producers of tuna and other pelagic fish, supplying both domestic and export markets. Canned fish products such as tuna, sardines, mackerel, and skipjack have become essential components of Indonesia's processed food industry due to their convenience, nutritional value, and long shelf life. The canning process involves several critical stages, including selection of raw materials, pre-cooking or steaming, filling, adding oil or sauce, sealing, and thermal sterilization. Each stage directly affects the product's safety, sensory quality, and consumer acceptance (Tunç *et al.*, 2025) ^[27].

The quality of raw materials plays a fundamental role in ensuring product excellence. Factors such as fish species, freshness, biochemical composition, and histamine levels determine the safety and taste of canned fish (Jumilla-Lorenz *et al.*, 2024) ^[15]. Poor-quality raw materials can lead to spoilage or the formation of harmful compounds, particularly histamine, which poses a risk to consumer health. The packaging is equally important—not only to preserve product integrity and prevent contamination but also to enhance visual appeal and sustainability. Recent innovations in packaging materials, such as BPA-free cans and glass jars, have addressed both safety and environmental concerns (Almeida *et al.*, 2023) ^[1].

The processing stage is another determinant of success in canned fish production. Thermal sterilization is essential to inactivate microorganisms and enzymes that cause spoilage, but excessive heat can damage texture and flavor. Thus, process optimization is required to balance safety, quality, and energy efficiency (Pais-Costa *et al.*, 2025) ^[22]. Finally, taste remains the key factor influencing consumer satisfaction. Sensory evaluation—including assessments of aroma, texture, and flavor—provides valuable insight into consumer preferences, guiding product formulation and innovation (Taracakti & Aminata, 2024).

This article, therefore, aims to analyze the development product fish canning currently available in Indonesia using four main aspects: raw materials, packaging, process, and taste. Through these parameters, this study seeks to assess how different aspects of product design and manufacturing influence consumer perception and product competitiveness in the domestic market. The analysis integrates literature review, industrial data, and sensory evaluation studies to provide a comprehensive understanding of Indonesia's canned fish products. The findings are expected to support innovation strategies in the seafood processing sector and contribute to the sustainable development of Indonesia's food industry.

2. Research Methods

This study uses a comparative approach involving observation and literature review to analyze two or more research objects based on variables relevant to the research objectives. According to Hudson (2007) in Zayu *et al.*, (2023) ^[30], the comparative method is used to examine the

similarities and differences between two or more facts and characteristics of the research object analyzed based on a specific framework of thinking. This approach is applied to examine the strategies and practices of canned fish product development from several brands in Indonesia, covering aspects of innovation, production processes, and marketing strategies.

Data collection was carried out through two forms of observation. First, direct observation in the market or marketing location to review the research object factually in actual conditions, paying attention to packaging appearance, product variety, and product placement strategies. Second, indirect observation through each brand's official social media platforms, such as Instagram, Facebook, and Twitter, as well as company websites, to obtain an overview of promotional activities, interactions with consumers, and brand image in the digital realm.

In addition to observation, this study also used a literature review method sourced from credible scientific publications. The data obtained from the literature served to strengthen the theoretical basis of the study, particularly regarding the use of raw materials, production processes, product innovation, and market development for canned products in Indonesia.

The research activities were carried out in stages, from the initial stage to the final writing. During this process, data obtained from field observations, social media, and literature reviews were collected, compared, and analyzed using descriptive comparative methods. This analysis aimed to identify differences and similarities between the research objects and explain the factors that influence these differences in terms of raw materials, production processes, and marketing strategies.

3. Result and Discussion

3.1 Raw Materials Innovation

Raw materials are important in production activities. Raw materials are one of the parameters that determine the outcome of the production process so that it runs smoothly and results in a quality product. Raw materials are processed into finished products. The use of raw materials in food and non-food companies is usually obtained from local purchases, imports, and in-house processing (Kurniawan & Ali 2020) ^[18]. Innovation in raw materials in the canning process is essential because raw materials can affect the quality of the final product (Sartini *et al.*, 2024) ^[25]. Innovation in fish canning raw materials is usually necessary to meet consumer demand for a variety of practical seafood products (Pais-Costa *et al.*, 2025) ^[22]. Innovations in raw materials used in canned fish production have been widely implemented, particularly in terms of the fish species used, including tuna (*Thunnus* sp.), mackerel (*Scomber scombus*), and skipjack tuna (*Katsuwonus pelamis*).

Canned fish manufacturer in Indonesia that have developed their raw materials include X and Y. X focuses on sardine raw materials with 51% sardine content and 41% chili sauce added. X's canned filling is developed in a fancy type, which involves filling the can with whole pieces. Similarly, Y's sardine variant also features a fancy-type filling. Y manufacturer also develops raw materials by introducing a canned tuna variant with a flakes-type filling, consisting of flakes or small pieces.

This innovation in raw materials is in line with the statement by (Junianto *et al.*, 2024), which states that canned fish fillings have been developed into three types: fancy, standard, and flakes. The innovation in fish raw materials used is also a positive product development because the variety of fish used can better meet consumer demand for instant canned fish products.



(a)

(b)

Source: Junianto *et al.*, 2024.

Fig 1: Example of fancy piece of sardines (a), example of flakes piece of tuna canned (b)

3.2 Production Process

In general, the canning production process includes handling raw materials or providing a place to receive raw materials, cutting off unnecessary parts, filling cans with fish, steaming, sealing cans, sterilizing, and incubating. The principle of the canning production process itself is to preserve food by creating a vacuum inside the can so that there is no contamination from outside, thereby maintaining the quality of the food (Arini & Subekti, 2019) [4]. Innovation in the canning process is needed to develop various methods of long-term preservation so that the quality of the fish is maintained until it reaches the consumer (Cruz *et al.*, 2022) [7].

The development of the canning production process can take the form of developing product filling media that come in many flavor variants. For example, X products sardines come in several flavors, such as chili, tomato, extra spicy, and serundeng seasoning. Similarly, Y products comes in soy sauce, green chili sauce, bangkok chili sauce, chili sauce, tomato sauce, and fried balado sardines variants. Innovations in the flavoring process can develop products because they can be tailored to consumer tastes (Junianto *et al.*, 2024).

In addition to developing the process of adding flavor to canned fish production, another innovation that has been developed in Indonesia relates to the process of preserving fish in cans, namely canned sardines that use olive oil as a medium for storing fish in cans. This development provides many benefits in terms of the preservation process because olive oil is rich in polyphenols, which play a role in preventing lipid degradation during various stages of seafood processing. The shelf life of products using olive oil has been proven to be longer than those using other oils (Aubourg, 2023) [6].

According to Arini & Subekti (2019) [4], the canning process includes:

1. Receiving Area

Fish are received frozen and packaged in plastic and cardboard. After quality checks, the fish are thawed using normal temperature water in a holding pond so that their body temperature returns to normal without damaging the texture of the meat.

2. Cutting Area

The fish are cut off at the head and tail and their insides are

cleaned using a stainless steel table. This process can be done manually or semi-manually, then the fish are washed thoroughly so they are ready to be filled into cans.

3. Filling into Cans

The cleaned fish are put into cans, 3-4 fish per can, depending on the size of the fish. Before use, the cans are washed to ensure they are free of contamination, then arranged on a trolley for the steaming process.

4. Exhausting Area

The cans containing the fish are steamed with hot steam at around 65°C for ±15 minutes to soften the meat and bones and remove air so that the inside of the cans becomes vacuum sealed. After that, the cans are drained.

5. Medium Making Area

The oil is cooked to a temperature of 100°C to reduce the fatty acid content and kill microorganisms. Once cooked, the oil is drained into a storage tank for the filling process.

6. Medium Filling Area

Hot oil at a temperature of 70–80°C is poured into each can, approximately 36 ml, leaving a space of about 0.5 cm from the can lid (headspace) to prevent excessive pressure during sterilization.

7. Seaming Area

The cans are sealed tightly using a seaming machine to create hermetic packaging. After that, the cans are washed with hot water to remove any oil residue before the sterilization process.

8. Retorting Area

Sterilization is carried out in a retort tube at a temperature of 118-119°C for 90 minutes to kill microbes and extend shelf life. After that, it is cooled to a temperature of around 40°C.

9. Incubation and Labeling

Sterilized cans are stored in an incubation room for quality control. Products that pass the test are labeled with the production and expiration dates using an ink jet printer and then packaged for distribution.

10. Boiler Area

Hot steam for the canning process is produced by a boiler that uses wood, coal, and coconut fiber as fuel at a temperature of up to 250°C. This steam is used in the steaming and sterilization stages.

3.3 Packaging Development

Packaging is a protective wrapping for a product that results from packaging activities, which not only serves as protection but also as a means of communication and marketing the product to consumers. In the commercial world, packaging plays an important role in meeting product safety and utility requirements, differentiating products in marketing programs, and increasing company profits (Ermawati *et al.*, 2019) [8]. In the fishing industry, especially for canned fish products, packaging innovation plays an important role in maintaining quality, extending shelf life, and increasing product appeal in the market. The development of modern packaging now focuses not only on protective functions but also on active packaging and smart packaging (Yolanda *et al.*, 2020) [28]. Packaging development products for canned fish in Indonesia include X and Y products. For example, X and Y products demonstrate two different approaches to packaging development. X products Sardines is known for its innovation through the launch of the “Ready-to-Fry Sardines with Serundeng Seasoning” variant, which uses hermetic cans in 155 g and 400 g sizes. This innovation is designed to

make the product more practical, hygienic, and ready to cook without requiring additional processing. Meanwhile, Y products feature high-quality packaging and long-term product durability. Y products have also developed a variety of packaging sizes (155 g – 425 g) to meet the needs of various market segments.

3.4 Variety of Flavor

A comparison of flavor options between X products Sardines and Y products highlights different approaches in taste-focused product development. X products provides three main variants—original tomato sauce, spicy tomato

sauce, and balado (spicy chili)—each featuring bold and savory-spicy flavors inspired by traditional Indonesian seasonings. This demonstrates a localization strategy aimed at Indonesian consumers who prefer strong and aromatic tastes (Gómez-Limia *et al.*, 2022) ^[12]. In contrast, Y products offers variants like tomato sauce, chili sauce, and sweet spicy sauce, which tend to have gentler and more balanced flavor profiles. This indicates a strategy designed to appeal to a broader audience, including export markets, where milder spiciness is generally preferred.

Table 1: Comparison of Flavor Variants in X products and Y products Canned Sardines

Brand	Flavor Variants	Dominant Taste Profile	Sauce Characteristics	Market Orientation / Target Consumers
X	1. Tomato Sauce Original 2. Spicy Tomato Sauce 3. Balado (Chili Sauce)	Savory-acidic with a strong spicy note; highlights local Indonesian flavor	Thick tomato sauce with intense red color and addition of chili and local spices	Domestic consumers with preference for bold and spicy flavors typical of Indonesian cuisine
Y	1. Tomato Sauce 2. Chili Sauce 3. Sweet Spicy Sauce	Mild spiciness with a balanced sweet-sour flavor; softer on the palate	Lighter sauce texture, brighter color, more neutral taste	Domestic and export markets preferring milder and balanced flavors

Official product descriptions of X products and Y products (Gómez-Limia *et al.*, 2022; Reblová *et al.*, 2022; Cruz *et al.*, 2022) ^[12, 24, 7].

Beyond the number of flavor variants, the composition of the sauce is a key factor in shaping both sensory experience and visual appeal. X products sardines feature a thick tomato sauce with a deep red hue and a robust, spicy aroma characteristic of Indonesian cuisine. This supports the findings of Reblová *et al.*, (2022) ^[24], who highlighted that the type of filling medium—whether tomato-based or oil-based—strongly influences color, aroma, and other sensory qualities in canned fish. On the other hand, Y products employs a lighter, thinner sauce with a sweeter and milder taste, reflecting trends in East Asian and European canned fish products, where more moderate flavors are generally preferred (Cruz *et al.*, 2022) ^[7]. These differences exemplify two distinct product innovation strategies: X products prioritizes a localized sensory identity, whereas Y products focuses on broad, universally acceptable flavor profiles.



Source: Personal documentation

Fig 2: Y products Balado Sauce sardines (a), Y products Chili Sauce sardines (b), X products Chili Sauce sardines (c), X products Tomato Sauce sardines

In general, the differences in flavor offerings between X products and Y products demonstrate a strategy of sensory diversification in seafood product development. X products spicier, locally inspired variants, such as Balado, strengthen the brand's identity and appeal among domestic consumers. In contrast, Y products milder and sweeter options are designed to attract a wider audience, including international markets. This aligns with (Junior *et al.*, 2023) ^[17], who argue that using regionally influenced sauces in canned fish enhances sensory quality while maintaining consumer preference within particular cultural contexts. Therefore, this comparison illustrates that flavor variation goes beyond a simple marketing tactic, representing a technological adaptation aimed at boosting both competitiveness and

consumer satisfaction in the canned seafood sector.

The variation of flavors in canned seafood products is a fundamental product differentiation strategy, implemented by producers to enhance competitiveness in a highly fragmented market (Mustamu & Ngatno, 2021) ^[19]. The development of flavor variants, such as the addition of authentic sauces or distinct regional spices, is primarily aimed at meeting heterogeneous consumer preferences and expanding brand appeal (Mustamu & Ngatno, 2021; Fachrizul Zidan & Dhakirah, 2023) ^[19, 9]. This diversity allows producers to capture a wider market segment, providing consumers with an optimal choice that aligns with their taste or culinary needs, which ultimately significantly influences interest and purchase decisions (Novelina *et al.*, 2024 ^[20]; Zamani *et al.*, 2024).

Another driver behind flavor innovation is the need to adapt to lifestyle trends and consumers' functional demands. Canned products are often associated with speed and practicality. By presenting canned seafood in various ready-to-eat sauces and seasonings, producers offer a food solution that is not only durable but also delicious without requiring complicated additional preparation (Asmoro & Indrarini, 2021). Flavor variant innovation is proven to increase product appeal, which directly translates into a competitive advantage for Micro, Small, and Medium Enterprises (MSMEs) as well as large corporations in the food industry (Arafah *et al.*, 2025) ^[3]. Therefore, flavor variation serves as a strategic tool to attract customer attention and encourage more positive purchasing behavior.

The most tangible impact of flavor variation is on purchasing behavior and consumer loyalty. Flavor innovation, as part of broader product innovation, is found to have a significant and positive influence on customer loyalty, mediated by consumer satisfaction (Mustamu & Ngatno, 2021) ^[19]. Consumers tend to seek out novelty and uniqueness; when new or unique flavor variants successfully satisfy their expectations, this triggers which then leads to long-term loyalty (Mustamu & Ngatno, 2021) ^[19].

Furthermore, product variation in general, including flavor diversity, has a strong positive influence on consumer purchasing decisions (Fatimah *et al.*, 2024; Novelina *et al.*, 2024) ^[11, 20]. When producers offer adequate variety,

consumers feel more accommodated, which encourages them to choose that brand over competitors. Research indicates that product innovation can explain up to 45.2% of customer loyalty, proving that updated and attractive flavor offerings are a key factor in building long-term relationships with the market (Arafah *et al.*, 2025) [3]. Thus, the success of flavor variation is measured not only by initial sales volume but also by its contribution to re-purchase intention and the strengthening of brand image.

4. Conclusion

The development of canned fish products covers four main aspects, namely innovation in raw materials, production processes, packaging development, and flavor variations. In terms of raw materials, innovation is carried out through the selection of fish types such as mackerel and tuna, as well as the development of more diverse cuts to increase the product's appeal. In the production process, development is focused on adjusting the sauce medium and flavor to suit consumer tastes. In packaging development, there are different weight variants, namely 155 g and 400 g. Meanwhile, flavor variations are developed based on lifestyle trends and consumer functional demands.

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