

Value Addition in Fishery Sector

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Seafood is a highly valued and versatile food source, appreciated worldwide for its nutritional benefits, quality, and safety. These valuable commodities are simultaneously convenient due to its potentiality for high product diversification. It is rich in essential nutrients, including high-quality protein, omega-3 fatty acids, vitamins, and minerals (such as iodine, selenium, and zinc). These nutrients are vital for overall health, making seafood an important component of a balanced diet. Though an excellent source of nutrients, it is highly perishable too, which demands its effective processing and preservation. Effective approaches in this regard is crucial to maintain its inherent quality characteristics and extended stability for better returns, to abate post-harvest losses as well as for consumer safety and satisfaction. Food preservation methods are designed to maintain the quality and safety of food products by controlling factors that lead to spoilage. This can be achieved by controlling the storage temperature, maintaining proper water activity, proper pH, use of preservatives, alone or in combination. By carefully selecting and combining preservation techniques, the shelf life of various foods can be extended, reducing waste and ensuring a safe and stable food supply. Among the various preservation methods available, low temperature preservation viz., chilling as well as freezing has attracted interest of many researchers on account of its minimal changes in the texture and other characteristics of fish if properly processed and stored. Traditional preservation techniques, collectively known as curing techniques viz., drying, salting, smoking, pickling etc. are commonly adopted methods for seafood preservation. The demand for minimally processed fishery products has led to the exploration of innovative processing and preservation technologies like retort processing, high pressure processing, irradiation, pulse light technology, cold plasma processing, ohmic heating etc. to preserve and extend the quality and stability of these valuable commodities. These innovative technologies are helping meet the growing demand for minimally processed seafood products that offer convenience, safety, and quality without compromising the nutritional and sensory characteristics. As consumers seek healthier and more convenient food options, these advancements play a critical role in the seafood industry's efforts to meet their needs.

Options for Value Addition

India's status as one of the fastest-growing economies and the second-largest consumer market globally provides a strong foundation for the processed seafood industry. The fish processing sector is poised for significant growth, and value addition represents a key strategy to enhance profitability in this competitive and cost-intensive industry. In foods, value is a combination of functional attributes as well as emotional benefits arising on account of nutritional as well as sensory facets at superior quality as well as affordable price. In addition, it promises utilization of the under-exploited nutrient rich resources in the most effective manner.

Value addition in fish and fishery products is a flexible strategy that responds to the diverse needs of different markets and consumer segments. It allows the industry to create convenient, flavorful, and nutritious products while meeting various dietary, cultural, and sustainability preferences. This approach enhances the appeal and competitiveness of fish products in the global marketplace. Some approaches for value addition include:

1. **Variations in Form:** Value-added fish products can be presented in different forms, including dressed or trimmed, minced, filleted, or deboned. These forms make it more convenient for consumers to use the products in their cooking, reducing the preparation time and effort.
2. **Added Ingredients and flavours:** Value-added products can include additional ingredients to enhance flavor, nutrition, or convenience. Adapting products to cater to diverse global tastes and culinary traditions allows the industry to tap into a wider consumer base. For example, adding a coating to fish can provide a crispy texture, while incorporating bioactive or functional constituents can boost the nutritional value of the product. Marinating fish products with flavor-enhancing ingredients or pre-packaging them with sauces can improve taste and convenience, making them more appealing to consumers seeking easy and flavorful meal options.
3. **Convenience Products:** Ready-to-cook or ready-to-eat fish products, such as fish fillets with seasoned coatings or microwaveable seafood meals, cater to consumers looking for quick and easy meal solutions.

4. **Health and Dietary Preferences:** Value addition can cater to specific dietary preferences or health needs.
5. **Innovations in Packaging:** Innovative packaging techniques such as vacuum packaging, modified atmospheric packaging etc. can extend the shelf life of fish products and preserve their quality and safety.
6. **Sustainable and Eco-Friendly Packaging:** Responding to the growing interest in sustainability, the use of eco-friendly packaging materials can be a value addition, aligning with the environmental concerns of consumers.
7. **Traceability and Labeling:** Providing clear information about the source and quality of fish products through traceability and transparent labeling can enhance consumer trust and perception of value.
8. **Customization:** Some manufacturers offer customizable fish products, allowing consumers to choose ingredients, flavors, or preparation methods to suit their preferences.

A number of such diverse products have already invaded the industry, globally ranging from live fish and shellfish to ready to serve convenience products. Value added fishery products primarily fall under the categories viz., mince/mince-based products, surimi/surimi-based products, enrobed or coated products, ready to serve retorted products, cold/hot extruded products, speciality products, ethnic products like marinated, dried products etc.

Fish mince is a valuable and cost-effective seafood product, which can be defined as deboned and unwashed fish flesh from fillets or frames. It is obtained from the initial steps of surimi manufacturing or through direct processing of raw material. It offers a versatile ingredient for culinary applications and provides economic and nutritional benefits to the seafood industry and consumers alike. When compared to surimi, fish mince can be obtained at a significantly higher yield with much less capital investment. Fish mince also offers nutritional advantages, economic benefits as well as functional advantages compared to the other intermediate materials. Fish mince can also be successfully used directly in various food systems and in a physically or chemically altered form to produce an array of nutritional and functional products. It finds application in processing several convenience foods like fish finger, cutlet, burger, fish momos and also in some

low cost salted and dried products. For preparation of fish finger, stick, etc., the mince stripped from the bone frame is incorporated to increase the yield.

Surimi, a Japanese term refers to mechanically deboned fish flesh that has been water washed and mixed with cryoprotectants for good frozen shelf life. Washing removes fat and undesirable matters such as blood, pigments and odoriferous substances. Further it intensifies the concentration of myofibrillar protein, the content which improves the gel strength and elasticity of the product. This property facilitates in developing a variety of products like fish sausage, balls, burgers as well as fabricated products like shellfish analogues which draws good demand in both domestic and export markets. Low value fishes can also be conveniently used for the preparation of surimi. Surimi and derived products are popular and of high demand, especially in South east Asian countries.

Enrobed/Coated/battered and breaded commodities are highly appreciated form of value-added products on account of their convenience, sensory appealness and nutritional attributes. In view of the increasing consumer demand, the technology has made several advancements. The most important advantage of coating is value addition as it increases the bulk of the product. This technology also paves way for better utilization of underutilized seafood resources. A wide array of seafood products can be categorized in it, with the first commercially launched coated product being fish finger/fish stick followed by commodities in similar line viz., coated fish fillet, fish portions, fish cakes, fish medallions, fish nuggets, breaded oysters and scallops, crab balls, fish balls, coated shrimp products, coated squid rings etc. The most popular battered and breaded products in India include fish nuggets, cutlet, balls, finger, patties etc. In value-added markets, where consumers are willing to pay a premium for high-quality, convenient, and flavorful products, ready-to-eat battered and breaded snacks can find a strong foothold. Their ability to cater to diverse tastes and preferences makes them an attractive option for manufacturers and consumers alike.

Ready-to-serve retorted fish products cater to the demands of modern consumers for convenience, quality, and variety. Their extended shelf life and versatility make them a convenient option for domestic and international markets, and they contribute to the growing popularity of seafood-based convenience foods. A wide array of products is categorized under this including retorted fish curries, rice-fish combos, seafood biriyani etc. These products have a shelf life of more than

one year at room temperature. The most common retortable pouch consists of a 3-ply laminated material consisting of polyester/aluminium/cast polypropylene. As there is increasing demand in domestic and International market for ready to serve products, proper exploration of this technology can provide a lively market for these commodities. The technology for retort pouch processing of several varieties of ready to serve fish and fish products including curries from mackerel, rohu, sardine, tuna, pomfret, prawn, seer fish molly, pearl spot molly, fried mussel, fish sausage, prawn kurma, prawn manchurian, fried mussel masala etc. has been standardized at ICAR-CIFT and this technology has been transferred successfully to entrepreneurs.

Food extrusion is a versatile food processing technology that offers numerous benefits in the development of a wide range of food products, including cereal-based snacks and convenience foods. Extruded products are gaining importance nowadays on account of their unique flavour, texture and convenience. Extruded products, including various snack foods, breakfast cereals, and convenience foods, are often made from starchy ingredients like grains, cereals, or legumes. These ingredients can indeed be lower in protein content compared to other food sources. Hence it is beneficial to fortify extruded products with protein-rich ingredients to enhance their nutritional value. One of the possible ways for alleviating this problem is to utilize fish and fish proteins to enrich cereal-based extruded products. Formulation of appropriate types of products using fish meat and fish portions will add value to the low-cost and underutilized fish and shellfish, thus promoting their utilization. Attractive packaging for the products and market studies are needed for the popularization of such products. These products can command very high market potential particularly among the urban elites.

Product diversification is indeed a key strategy for effective marketing, and the trend toward specialty and convenient products is gaining significant consumer acceptance. The most popular products under the speciality product category include those like stretched shrimp (Nobashi), sushi (Cooked butterfly shrimp), skewered shrimp, shrimp head-on cooked (centre peeled), fish wafers, fish crackers, fish soup powder etc.

Ethnic seafood products are food items that are deeply rooted in the culinary traditions of specific regions or cultures and have been prepared and consumed by people in those areas for generations. These products are often associated with the unique flavors, ingredients, cooking techniques, and cultural significance of a particular ethnic group or geographical area. Some of these EFP are

preserved or processed using centuries-old indigenous knowledge of fermentation/drying/smoking etc. Globalization has resulted in high demand for these ethnic food products and hence approaches towards its popularization by adopting various processing techniques can bring a huge market potential for these commodities.

Fermentation is a traditional preservation technique adopted mainly in the north eastern part of the India. During the fermentation process, beneficial microorganisms in the food produce enzymes that break down proteins and improve the digestibility of nutrients. It leads to improved taste and texture of fish products. The development of characteristic flavors, such as umami, can make fermented fish a delicacy in many cultures. Fermentation is particularly useful in tropical climates, where the hot and humid conditions can lead to rapid spoilage of fresh fish. The process helps extend the shelf life of fish products.

Smoking fish imparts a unique and desirable smoky flavor and aroma to the product, making it a popular choice among consumers who appreciate this distinct taste. The use of typical flavor extracts is an innovative approach in smoking. By incorporating flavored extracts, it's possible to achieve desired taste and aroma profiles more quickly, reducing the smoking time required. Further by experimenting with different flavor profiles and ingredients, it's possible to create a variety of flavored fish products that cater to different tastes and preferences. Minimal processing protocols can involve the use of modern technologies, such as smoking equipment, to expedite the production process and maintain quality and safety standards. These innovations can make these preserved fish products more accessible and appealing to a broader range of consumers.

Curing and drying, even though an age-old practice, opens up new dimensions and possibilities towards value addition in domestic as well as overseas markets. According to estimates in India, a substantial portion of the total catch, around 17-20%, is processed into dried products and dry fish export contributes to about 7.86% of total fish exports. This practice not only reduces post-harvest losses but also creates value-added products. The major importing countries are Sri Lanka, Malaysia, Indonesia, Singapore and United Arab Emirates. However, there are several factors hindering the addition of dried fishery products to the product profile. The major one being, drying is still considered a traditional method of processing, and hence standard operating procedures are seldom followed. Moreover, there is a general conception that drying is a secondary method for preserving low value varieties and quality compromised materials. Attempts towards improving

the handling practices right from the point of raw material harvesting till marketing, popularisation of improved packaging practices, use of hygienic energy efficient mechanical driers, and adequate extension services can facilitate better adoption of drying practice in seafood sector.

Live seafood is often perceived as a premium product, attracting customers who value the highest level of freshness. Live seafood often commands premium prices, making it a financially attractive option for farmers and suppliers. Several internal and external factors must be carefully considered to ensure the success of this approach. Internal factors include the species-specific requirements and their tolerance limits. External factors encompass the logistics of transportation, packaging, and handling. Gentle handling of live seafood is crucial to minimize stress and injury, which can affect the quality and survival of the animals. Different seafood species have varying requirements and tolerances and it's essential for farmers, suppliers, and retailers to have a thorough understanding of the specific needs of the species they are dealing with. This knowledge helps in setting up the right conditions for transportation and storage. Regulations and standards related to the transportation and sale of live seafood must be adhered to. Compliance with food safety and animal welfare regulations is crucial to ensure that live seafood meets the required quality and safety standards. With the right approach, live seafood can be a highly attractive product for both producers and consumers.

Market Scenario

Seafood processing and marketing has become highly competitive that the exporters are shifting towards value addition for increased margins. Understanding what drives consumers to make purchasing decisions is critical for businesses to tailor their offerings and marketing strategies effectively. By understanding the factors that drive individuals to consider purchasing a product or service, helps the sellers to design marketing campaigns and product features that align with these intentions. Preferences can vary by demographic, location, and other factors. Further, product quality also plays a significant role in meeting consumer expectations and creating value.

Summary

Value addition involves transforming the raw seafood materials into more valuable and marketable products. This includes processes like filleting, marinating, freezing, preparing ready-to-eat seafood dishes etc. On account of value addition, seafood products can cater to a wider

range of consumer preferences and demands. Value-added seafood products are often better positioned in the food and nutraceutical markets. These products can be marketed as healthier alternatives, rich in essential nutrients. This appeals to consumers seeking nutritious and convenient food options.

Further, one of the significant advantages of value addition is the reduction of post-harvest losses. Proper processing, preservation, and packaging can extend the shelf life of seafood products, reducing waste and economic losses within the seafood supply chain. By adding value to seafood products, the seafood industry can generate more revenue from the same quantity of raw materials contributing to economic growth by increasing the value of the seafood sector and creating employment opportunities in processing, packaging, and distribution. This approach also plays a vital role in addressing nutritional security by providing readily available, nutritious food options. These products can help meet the dietary requirements of populations and combat malnutrition, particularly in regions where seafood is a dietary staple. Technology plays a crucial role in the value addition process. Advanced processing, packaging, and monitoring technologies can enhance the quality, safety, and efficiency of seafood production. Innovations in seafood processing methods, such as minimal processing, can help maintain the nutritional quality of the products. Further smart packaging concepts and intelligent quality monitoring systems can ensure that seafood products remain fresh, safe, and of high quality throughout the supply chain. This builds consumer confidence and reduces the risk of spoilage or contamination.

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