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## **SOUVENIR**



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### **3. DOMESTIC FISH CONSUMPTION IN INDIA: CHALLENGES AND OPPORTUNITIES**

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#### **Introduction**

India features regularly among the ten leading fish producing nations in the world. India has maintained the position of being the second largest fish producer in the world with a total production of 13.7 million tonnes in 2018-19 and 14.16 million tonnes in 2019-20. (Economic Survey 2021-22 and Handbook of Fisheries Statistics 2020) Further the sector has shown consistent growth in the total gross value added with one per cent GDP contribution, provides meaningful employment to 14 million people across the value chain in harvesting, processing, packaging, and distribution (Handbook of Fisheries Statistics 2020 and Shyam Salim 2020). Therefore, fisheries sector portrays a growth sector with potential for welfare distribution and inclusive development. Fish and fish products have emerged as the largest group in agricultural exports from India, with 1.39 million tonnes in terms of quantity and Rs. 57586.48 crore in value in 2021-22 against heavy odds of pandemic covid and economic slowdown (MPEDA 2021-22). This has constituted for around 10% of the total exports and 5.23% to the Agriculture GVA of the country, thus rightfully earning the title of being a “sunrise” sector (Rajeev and Bhandarkar 2022).

The significance of the sector is beyond the production and export spheres. The seminal role in ensuring food and nutritional security of the country, constituting the chief and cheap source of protein for more than 60 per cent of the Indian population cannot be underestimated (Shyam Salim 2016 and NSSO 38<sup>th</sup>, 66<sup>th</sup> and 68<sup>th</sup> round). Based on fish consumption surveys among Indian states, it has been found that there is increased fish consumption among the existing consumer base (Bhutia, Qureshi and Yadav 2019, Sabater 2008, Sharma and Khajuria 2022, Shyam Salim et al 2021a and Shyam Salim et al 2021b). However, the studies also indicate that there are constraints faced by existing fish consumers and perhaps, these are also contributing factors responsible for not being able to widen the existing fish consumer base. This is important for two reasons. Firstly, while India’s average annual per capital consumption is estimated to be 5-8 kg per capita, this remains below the global average per capita of 16 kg and below the WHO recommended level of 12 kg per capita (FAO 2022, Shyam Salim 2015, Lok Sabha Question). Further, if we are to examine the nutritional intake within Indian food basket, there is a need to supplement the protein intake to offset the increase

fat intake. Therefore, from a health perspective, it is important to examine the food consumption basket in the Indian household

In this context, it is important to examine the consumption habits in particular the drivers and impediments as well as the fish supply chain operating in the country particularly the marine fish supply chain. The fish supply chain does not remain bound within national geographical boundaries. International trade has been an important influencing factor with seafood. Further, seafood has a share of around 37% of production value entering international trade- the highest among food commodities including meat and milk and dairy products (Natale and Motova 2015). FAO estimates that 77% of world seafood production is exposed to trade competition showcasing how important it is to examine the global fish supply chain. In the national context, with increasing purchasing power, health consciousness and taste preferences, domestic markets now have massive potential to engage in high-value fish trade (Shyam Salim, 2020). However, the India's average fishers' share in the consumer rupee - an indicator of market efficiency is 65.9% (CMFRI, 2019). This points towards issues within the fish value chain that is not transferring the high value or price of fish being transferred to the fisher community. The efficiency of the marine fish supply chain has notable discrepancies across maritime states, fish species, seasons, landing source and proximity to the markets (Shyam & Antony, 2015). In addition, the lacunae in existing marine fish marketing channels exacerbate the inefficiencies in cost, post-harvest loss, and access. In this context, the present essay attempts to look at the challenges and opportunities that exist in the fisheries sector focusing on the interventions through changing consumption behaviour so that we can maximise the potential for not just revenue but also reap the demographic dividend by building human capabilities with a healthy working force. Further, we also emphasise on how there is the need from a social justice point of view to ensure that the higher value of fish that the consumers are ready to pay (given assurance of quality) benefit the fishers.

### **Fish Demand and Supply in India**

In analysing the fish value chain, it is important to understand the current demand and supply of fish in the country. This helps to know both the production -consumption and we can also infer the distribution chain efficiency through the demand – supply gap. A snapshot of this is presented in Table 1 with projected fish supply if we are in tune with our policy targets as per Prime Minister Matsya Sampada Yojana (PMMSY) and if there are no major disrupting factors along both demand and supply.

**Table 1: Fish demand and anticipated supply - India**

Year	2020	2025	2030	2035
Population in Billion	1.36	1.45	1.53	1.62
Fish eaters ( Percent )	60	65	70	70
Per capita annual fish consumption (kg)	8	9 (12)	10	11
<b>Total fish demand (M.ton)</b>	<b>6.53</b>	<b>8.48</b>	<b>10.71</b>	<b>12.47</b>
Sector				
Marine fish (M.ton)	3.5	4	4.25	4.5
Inland(M.ton)	10.66	12.25	13.5	15
<b>Total supply</b>	<b>14.16</b>	<b>16.25</b>	<b>17.75</b>	<b>19.5</b>
Export (M.ton) 15-20%	1.45	3.25	3.55	3.9
Wastage(M.ton) 5%	0.71	0.81	0.89	0.98
Bait industry(M.ton) (15-20) %	2.12	2.44	2.67	2.93
<b>Total supply (M.ton)</b>	<b>9.88</b>	<b>9.75</b>	<b>10.64</b>	<b>11.69</b>
<b>Supply -Demand Gap</b>	<b>3.35</b>	<b>1.27(-1.56)</b>	<b>-0.07</b>	<b>-0.78</b>

**Source:** Shyam, S Salim (2013) *Demand and Supply Paradigms for Fish Food Security in India*. Seafood Export Journal, 43 (5). pp. 34-40 (with modification)

From Table 1, it can be seen that there seems to be supply – demand mismatch with currently the country experiencing an excess supply (of 3.35 million tonnes) and possible excess supply (to the tune of 1.27 million tonnes) in 2030. However, if we are to keep the vision in the PMMSY which is to increase the annual consumption to 12 kg per capita, then we can anticipate an excess demand (The figures are presented for the year 2025 within parenthesis in Table 1). In determining the demand of fish, we now examine the domestic fish consumption in the country.

### **Domestic fish consumption in India**

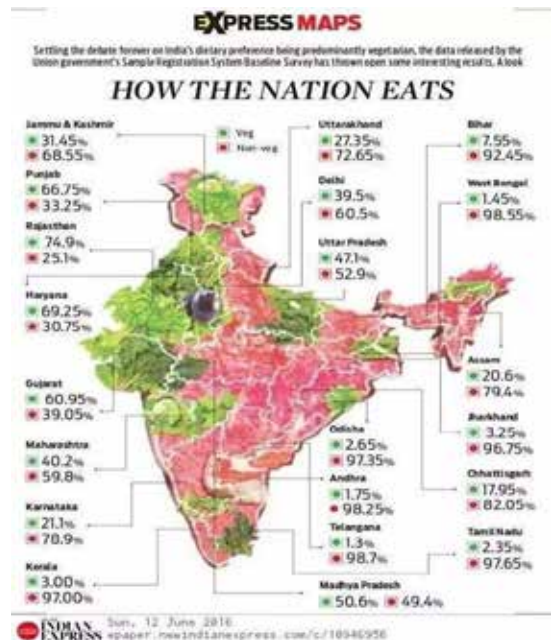
In India, the consumption behaviour has been found skewed towards protein food with increased fish consumption on account of fish being healthier and cheaper amongst animal protein substitutes. With over 60 per cent of the population being fish consumers, fish is therefore can be said to be an integral part of the Indian household. Shyam Salim (2016) and Sajeev (2020) have found that the annual per capital consumption of India population is 5-8 kg per capita with significant regional and state variations. Consumption studies have also indicated that there exists a growing demand for high-value fish even at a higher price. Therefore, one could argue that poor supply of fish to the domestic fish market will lead to a situation wherein the domestic consumers will be devoid of fish in the market at affordable prices.

Given that there is a significant deleterious effect of fish demand - supply mismatch in the domestic market (as can be inferred from the section above), government

interventions in regulating fish exports to ensure domestic fish food security and substituting exports with domestic marketing gain significance. In order to work on strengthening the supply chain, the different stakeholders (fishers, traders, consumers, exporters and policymakers) need to be made aware about the market segmentation and price of fishes for evolving efficient marketing systems and supporting infrastructure (ice, cold storage, etc.) that would eventually lead to better quality and prices. The development of a real time fish market grid to act as a decision support system would ensure fish market and price information dissemination about availability, accessibility and affordability of fish. However, with the current innumerable hassles in export of fish coupled with inefficient domestic marketing system, it is important to integrate domestic and international markets to ensure sustainability of fisheries trade. In view of huge forex reserves, competitive advantage over few exporting fish species, increasing purchasing power of the domestic consumers, changing consumer preferences and willingness to pay for the preferred ones, a concerted effort to regulate the export is highly recommended so that the fish will be available in the domestic market at affordable prices round the year, thereby ensuring fish food security for the domestic consumers. Regarding domestic fish consumers, we now examine the major drivers and impediments.

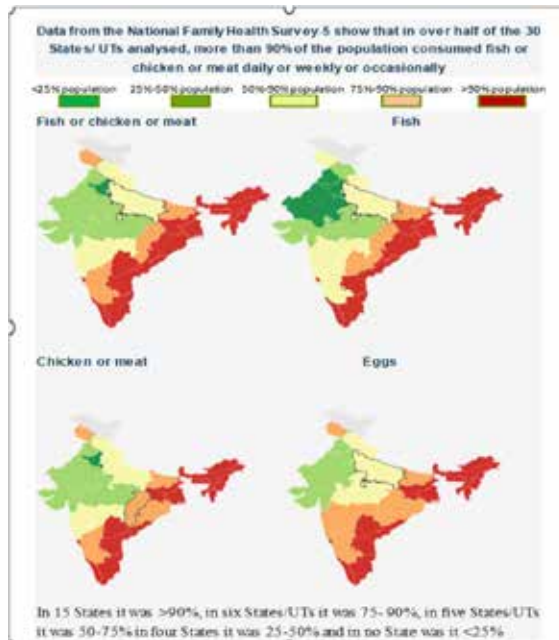
### Fish consumption – Trends, Determinants and Limits

The dietary preference of the Indian population has been of interest among social scientists in India for more than five decades and this has been reflected in the statistical surveys that national bodies such as Census, NFHS and NSSO have conducted over the years. (See Figures Ia and Ib). Dispelling the notion that India is a predominantly vegetarian country, the data from NFHS -5 has shown that 71.8 per cent women and 83.2 per cent men confirmed consume meat, compared to NFHS-4 data (2015-16) which showed around 70 per cent of women and 81.9 per cent of men consumed non-vegetarian. The consumption of fish particular, in India is increasing significantly due to lifestyle changes and the higher relative cost of meat.



**Figure Ia: Food Consumption Habits of the Indian population**

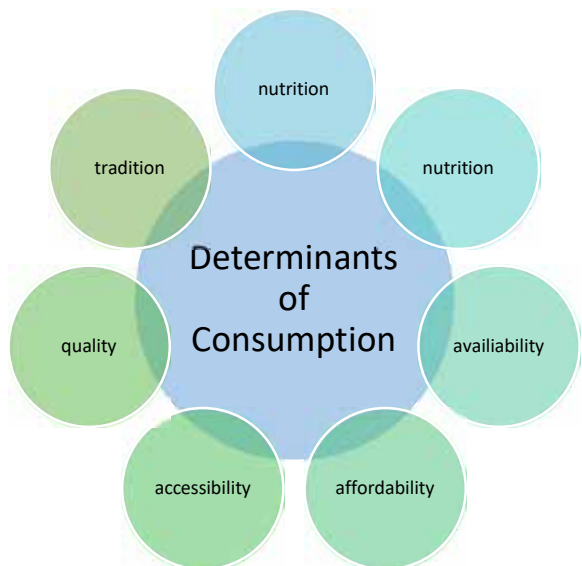
(Source: Sample Registration Baseline Survey 2014, Census of India)



**Figure 1b: Food Consumption in India (Source: NFHS-5)**

In addition, the perception of fish as a healthy food with high levels of digestible protein, PUFA and lowering cholesterol capability constitutes a major factor for its increased consumption (Anneboina and Kumar 2016, Burger and Gochfield 2009, Deslypere 1990, Shyam Salim 2020, Shyam, Rahman and Antony 2013 & Turan, Kaya and Gonmez 2006).

Specific to the Indian context, there are cultural factors that drive the consumption of fish in the country. While there are state and regional specific reasons that would drive consumption of any commodity, from the literature on fish consumption these have been summarised under six heads and this has been depicted in Figure II. In addition, to the nutrition, the consumer needs to be assured of the quality of the fish available, steady and affordable prices, the accessibility (location of markets near to households, easy transport to markets, etc), the taste and preferences for certain kinds of fish



**Figure 2: Factors impacting fish consumption**

species and the easy availability of the same, the tradition and cultural practices that determines the preferences.

### Limits to fish consumption

Similar to drivers towards fish consumption there are also national and in particular state specific studies on fish consumption have identified the possible reasons for limits to fish consumption. In order to analyse this, we need to understand the overarching complexities within the consumption as well as distribution networks. Schematically, this is presented in Figure III.



**Figure III: Intricate fish consumption and distribution network**

The reduced/ irregular availability, seasonal consumption and high prices are the major constraints in increasing the fish consumption (Paramsivam and Malairasan 2021, Shyam Salim 2021a, Shyam Salim 2021b, NCAER 1980). The geographical separation between production and consumption centers, fluctuating prices of species, higher price spreads with consumers paying the higher price with high marketing margins, lower levels of value addition and a concern on quality and health all act as limits towards fish consumption, Awareness among the domestic consumers were regarding low export prices was yet another major constraint. The supply–demand mismatch in domestic market advocates for government intervention to ensure fish food security.

In addition to these factors, there is also a clear lack of both aggregated data since 2013-14 (when the 68<sup>th</sup> round of NSSO was released) and disaggregated data specifying the taste and preferences of the consumer pertaining to species, seasonality (which in turn affects availability and price). While there is rich source such as the Marine Fisheries Census undertaken by ICAR-CMFRI, there is need for further consolidating the statistical institutions so that information may be available to both the producer and consumer. This requires for close attention to the possible policy interventions. When

analysing the policy interventions, the important role of international trade that has exerted considerable influence in fisheries needs to be taken into account. We now take into account the situation of the export of the Indian fisheries sector.

### **International trade and performance of Indian fisheries export sector**

The fish supply chain does not remain bound within national geographical boundaries. International trade has been an important influencing factor with seafood. Further, seafood has a share of around 37% of production value entering international trade- the highest among food commodities including meat and milk and dairy products (Natale and Motova 2015). FAO estimates that 77% of world seafood production is exposed to trade competition showcasing how important it is to examine the global fish supply chain. In the national context, with increasing purchasing power, health consciousness and taste preferences, domestic markets now have massive potential to engage in high-value fish trade (Shyam Salim, 2020).

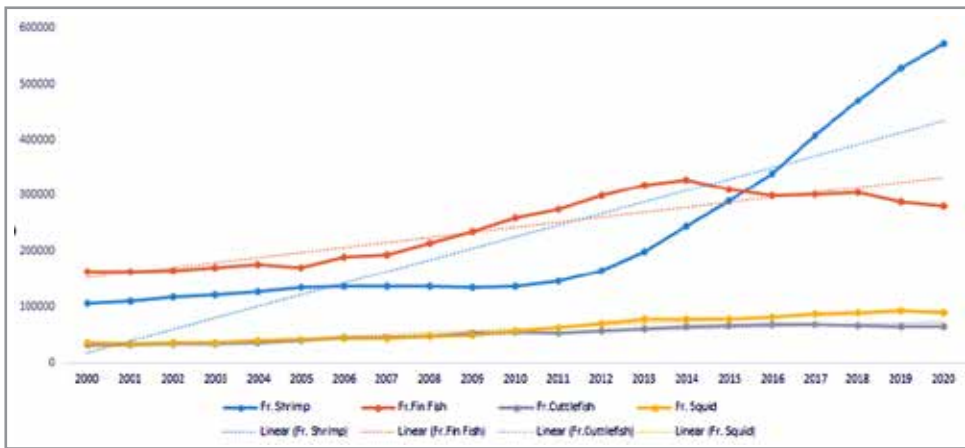
A feature that deserves special attention when one speaks about *the India seafood exports is the resilience of the sector*. This has been witnessed in the global recession in 2007-8 as well as in the context of the global pandemic. Even though the world economy was hit with the economic recession in 2008, the seafood exports grew consistently in terms of quantity and value. The impact of recession did not affect India's seafood trade mainly due to the economic stimulus, strength of the banking system and the demand for retail products increasing coupled with lower demand for ready to serve and ready to cook due to the poor purchasing power in developed countries. The demand for food stamps increased in the developed countries including US and EU with massive economic stimulus provided to the working population. In the South East Asian countries, the recession was countered with more productivities and stronger governmental regulation. The Indian seafood export in particular remained resilient due to the increased demand for raw fish rather than value added products from the retail outlets – former constituting the bulk of the Indian export basket. The commodity-wise export of marine products indicated that considering the total export the post-recession period (2008-2017) performed better than the pre-recession period (1995-2007). Overall, the growth rate of quantity in pre-recession period increased from 4.98 to 7.84 per cent during the post-recession period. Further, it was found that the unit value realization in dollars which had registered a negative growth rate of -0.66 per cent during the pre-recession period, showed a positive growth rate of 6.58 per cent during the post-recession period.

### **Composition of the Seafood Export Basket**

Among the different commodities, frozen shrimp registered the highest growth rate in quantity from 3.15 per cent in pre-recession to 18.95 per cent in the post-recession period. The important reasons for significant growth in frozen shrimp can



be attributed to increased landings, culture of about 70 per cent frozen shrimp, higher price realization and widened markets. The export performance over the last five years was assessed using a five-year moving average method and it revealed that amidst recession the export performance increased (Figure IV).



**Fig. IV. Marine Products Export Performance (Value in US \$)**

### Paradox of export: The missing fish on the Indian plate

However, this does not mean that Indian seafood export does not face any challenges. For example, the reduction in landings coupled with geographical separation of landings often result in irregular supply of raw materials, resulting in non-realization of economies of scale for exporters. In addition, the seasonal variations in marine catches constrain the operations of the firms. During lean seasons, the majority of firms face shortage of raw materials resulting in low-capacity utilization. More than 60 per cent of the landings occur during the post-monsoon period which coincides with the highest export demand period. Thus, to restore parity between demand and supply, raw materials are often purchased at higher prices with even forward marketing with the boat owners. The increasing demand for fish in the domestic market may push up the prices of many exportable fish varieties. The high purchase price and other operating expenses like labour cost, water and electricity charges increase the cost of production to exorbitant levels. There exists uncertainty in prices in the international market with the economic recession spreading to most of the target markets. The price uncertainties lead to delay in payments, loss in revenue, delay in realizing new markets, additional cost on storage, delay in shipment and increased demurrages. In addition, ecolabelling and other private standards by international retailers for environmental and social purposes also result in high costs and low margins in fish export.

Equally important is the fact that from the point of view of the domestic food security – chief concern of any democratic country, there has been the challenge of

domestic fish food security is an important issue considering the fact that export prices of fish are lower than the domestic prices, coupled with unmet trade restrictions and measures. In the context of covid pandemic, and changing the international trade relations, the World Bank estimated a shrinkage of world trade by more than 5 per cent (World Bank 2020). Consequently, global fish markets in fish too can be expected to shrink or at best, alter. Therefore, reliance on domestic market presents the potential adaptation and coping strategy for exporters. Given this context, it is important to ensure the availability and affordability of high-value fishes whose consumption could be augmented by creating awareness in the country. The awareness level on high value fish consumption has indicated that only 15.3 per cent of the consumers were aware about export prices of high-value fishes being low compared to its domestic prices. The exports of fish have been done at a price lower than domestic retail price (less than a dollar) across 42 countries. The price comparison of the high-value species like cephalopods, pomfrets, seer and ribbon fishes has indicated that the domestic prices were on an average 20-25 per cent more than the export prices. This has been due to the fact that high-value fishes do not cater to the domestic market on account of low and inconsistent demand. The exporters in order to reap in the export economies of scale tend to export more quantity at a lower price margin. The revenue gains are contributed mostly by quantity effect rather than the price effect. The exporters make their revenue mostly out of selling more quantities rather than at competitive prices. The paradox export thus refers to the sale of a higher quantity of fish at a lower export price compared to the prices prevailing in the domestic market.

### **International seafood trade and Covid Pandemic**

However, given the fact that there has been buyer alerts and rejections, this necessitates the need for harnessing the domestic market so that the fish food is available across the Indian masses and also provides a steady source of revenue for exporters (Gopal et al 2020, Mukherjee et al 2020 and Ragumaran 2021). In the context of the global pandemic, it has been seen that there has been changing export destinations (with preliminary studies pointing at shift of India export destinations from the US to Asian countries) and given that there is an emerging movement across the world that focus on the food justice, calling for greater consciousness and responsibilities among consumers and producers to ensure that local communities and local economies flourish even as firms and companies engage in international trade. Therefore, one could argue that there is better scope now more than ever for encouraging domestic consumption. In this endeavour, it is also important that we make use of existing policy frameworks to achieve this goal. An ideal existing policy would be the Pradhan Mantri Matsya Sampada Yojana (PMMSY).

## **Scope of augmenting fish consumption: Measures for Future**

Following the examination of the factors driving consumption, we now turn towards the structural issues that can help augment the fish consumption in the country. We begin with what can be possible within the supply side management—with possibility along vertical and horizontal integration. By this we point towards possibilities in increasing production – both quantity as well as species wise (depending upon the demand preferences of the consumer – both domestic and international). This endeavour calls for the re-imagination of fishing using technology and aquaculture presents the best possible scenario.

### **(1) Aquaculture:**

The Indian aquaculture industry has grown six-fold in the past two decades. This becomes significant with the Food and Agriculture Organisation (FAO) reports that given that more than 90% of the global fish reserves have been fully exploited to the extent that recovery may not be biologically possible. Therefore, given the fact that India uses only 40% of the available ponds, tanks and other water bodies for freshwater aquaculture and 15% of the total potential of brackish water resources, there is potential for Indian aquaculture to grow without sacrificing environment. Within the existing framework, the PMMSY provides special focus for training and capacity building of those involved in aquaculture-fishermen, entrepreneurs, fish vendors and fishery officials. For the same, an amount of Rs. 100 crore (US\$ 13.65 million) has been earmarked to train nearly 1.5 lakh beneficiaries and the government is aiming to turn India into a hotspot for fish production through appropriate policies, marketing and infrastructure support.

### **(2) Value addition:**

From the perspective of the producer, the advantages of value addition include higher profit, improved processing utilization, keeping pace with consumers' and to provide variety of product ensuring a constant and consistent market share. There are numerous varieties of fish and they differ widely from one another depending on the shapes, size, flavours, texture etc. Though flesh of all types of fish are nutritionally more or less similar, there is variation in the market prices of these species. The low-cost fish in whole have poor or no preference among the consumers as food due to factors like small/unconventional size, ugly shape, too much spiny body and unfriendly flavour/taste etc. Therefore, these low-cost fish are often used for animal feed or by-product production. It has been found that in some instances, these fish are thrown back into the sea. Due to some species being used industrially for fish meal manufacture, there has been a rising call for their conservation and utilization for human consumption has been recognized as a requirement in order to prevent post-harvest fishery losses. In such a scenario, there is potential, with the application of available technologies, so that

these fish can be directly used for human consumption through value addition. The advantage of this value addition is that it calls for better utilization of low-value fish species and providing protein-rich convenience foods. Environmentally, this would also lead to reduction in discard and wastages in fishing. Further, there is better scope to augment employment (that too employment for women through such activities). However, the key to the success of this approach depends largely on the market strategies utilized as well as in developing synergies for optimum use of technology, indigenous knowledge and market economics.

The demand of the high value-added product is expected to increase in future not only because of the increasing population but due to increasing consciousness of fish and fishery products as a health food items. To achieve our vision and increase value addition, we should assist the supporting industries in the country, like additive manufacturers, batter and bread manufacturers, flavour and marinade manufacturers and machinery manufacturers and packing material manufacturers as our exporters are facing tight competition from foreign countries as these additives and machineries not available in the country at a competitive rate. However, policy structure within the PMMSY calls for such an approach envisioning “an economic revolution through blue revolution” Through this, the country is equipping the manufacturing sector to engage with the primary sector so that it can ultimately benefit the community that is engaged in fishing. This vision is also reflected in the allocation within the scheme with 42% of the total estimated investment of the 20,050 crores being earmarked for creation and upgradation of fisheries infrastructure facilities including the construction and modernisation of Fishing Harbours and Landing Centers, development of Post-harvest and Cold Chain Infrastructure capacities as well as Fish Markets and Marketing Infrastructure, Integrated Modern Coastal Fishing Villages and Development of Deep-sea Fishing. Therefore, the important externalities that will be generated with conscious consumers in all spheres of production and harvesting is set to be reaped with the PMMSY

### **(3) Emerging Online and Digital forms of marketing**

In addition, urbanisation can play an important role in driving the fisheries sector growth. The expansion of supermarkets and hypermarkets from major cities into smaller cities will help to have more growth potential and benefits consumer trends toward convenience and evolving modern and urban lifestyles. Further, within specific geographic locales, there is also scope for expanding markets using online and digital forms of marketing. Keeping in mind that there is also greater environmental consciousness among consumers especially in the post pandemic scenario which saw a shift towards more healthy, more local and more environment friendly consumption, new initiatives such as ecolabelling of the value added products to new cut, ready-

to-eat product, gourmet quality product and seafood products in multiple formats, shapes, dimensions and flavor profiles such as seafood medallions, there is tremendous scope to shift from “fast food to slow food (Pietyrikowski 2004). Apart from the present product forms marketed finfish species, tuna species such as skipjack and yellowfin have good potential for value addition. The skipjack products could be further expanded to include improved smoked/dried products such as katsuobushi and arabushi for the Japanese market, dried and smoked fish flakes and fish extractives. Some of these products are already produced in countries like Maldives and Sri Lanka. Yellowfin tuna also holds good potential for product and market diversification. Tuna loins, fresh and frozen steaks can be produced for export purpose. Other finfish varieties such as seabass, grouper can be exported as slices, steaks and fillets in fresh/chilled and frozen form. Tilapia is produced by both capture and culture fisheries in inland areas can be marketed fresh/chilled with improved packaging like tray packs. Significantly large quantities of carps can also marketed as value added carp products such as carp cooked in traditional curry sauces.

There is a large potential for value added crab products both for domestic and export markets. The products identified for value added production are cut crab (half-cut and quarter-cut-crab), stuffed crab, crab balls, stuffed claws, picked meat and crab mince meat products. These products have good potential when marketed in retail packs. Marinated shrimp (great tasting shrimp marinated in a variety of sauces), Breaded sole fingers(sole fillets cut long ways into strips and breaded) Fish sticks(minced fish meat with spices in a batter)are yet another value added products that can be introduced in our country. Large quantity of molluscs such as squid, cuttlefish and octopus and bivalves such as cockles, mussels and clams can be exported with improved packaging such as fillets (pine-cut, shell-cut and double-skinned), squid rings and cuttlefish strips, which have a potential when marketed in retail packs. The most popular snack foods -Fish and shrimp crackers can be produced from low value fish species or small shrimp. Japanese threadfin bream, bigeye tuna can be used. The main ingredients are fish mince, tapioca flour, salt and spices. There are good opportunities to produce fish and shrimp crackers with improved technologies.

With simple processing methods and attractive packaging, these products could gain popularity in the domestic market. These products should be market at a lower cost to compete with or replace similar higher cost conventional products. Traditional brick-and-mortar stores are increasingly adapting to e-commerce, sales of value added seafood online through e-malls and online retailers will also have high market potential. Therefore, one should aim to co-exist with innovations in new marketing such as online trade with perhaps more indigenous modes of productions that are environment friendly. This has been a rising trend across consumers over the

pandemic. With government intervention, India stands poised to make the step in the right direction. Promising examples from Kerala include the involvement of women in fisheries engaging more directly in the market through initiatives such as *Theeramythri* and *Kudumbashree*.

### **Derived Demand and Externalities**

Undoubtedly, in creating the demand for the value-added products, there would emerge be forward linkage with stricter standards being sought for food safety and quality through packaging as well as greater emphasis on the backward linkage on the right and environmentally sound methods of fishing. Currently, it is estimated that the fishery industries generate huge amount of fish processing wastes and by products that contain highly valuable bioactive compounds (Bostock et al 1990, MOFPI 2017). Therefore, there is an expected future demand for raw material from the fish processing plants and scope for greater utilization of discarded fish species for the optimum utilization of value-added products for human consumption. These initiatives can further the concept of 'green fishing'. In a world where climate change has been rapid and an everyday reality for developing countries including India, this would provide an additional incentive to the traditional fishers who venture on green fishing. Hearteningly, this has been observed in the post covid scenario along the coasts of Kerala – a phenomenon John Kurien terms as “return to artisanal values in fishing” (Kurien 2022: 42). The carbon emission studies by life cycle assessment indicated that the traditional sector comparable lessor carbon to the tune of 0.09 per ton of catch (Shyam et al 2016 and Das et al 2021). On comparisons with the global standards, the carbon emission in Indian fish catch is lower. However, the increase in global fuel prices, exerts enormous pressure on vessels who will then have to travel farther or to deeper waters and spend more to catch the same number of fish as they have in the past. In order to better the situation in terms of social upliftment of the traditional fishers as well as bringing environmental tranquillity, the concept of green fishing needs to be popularised, and supported with incentive-based policies. Pricing the marine fish caught based on the method of fishing, and selling them with a green tag, which suggests the emission they have contributed, can be a precursor for a large movement in the fisheries sector. Once this idea gains popularity, it can be scaled up at a global level and can work on the basis of Kyoto Protocol, where Annex I parties can pay in terms of CER (Certified Emission Reduction) to Annex II parties. This will lead to traditional fishers benefitting, as well as will reduce emissions in the fisheries sector at large and achieving a fishery induced blue carbon economy.

### **Conclusion**

Seafood products are among the most important internationally traded food commodities. Sea food consumers usually demand for the products that are not only

of high quality and safe to eat but also that it derives from fisheries that are sustainable showing a growing eco-conscious consumerism. For retailers to provide such guarantees, they need to receive, together with the seafood, certificates guaranteeing the wholesomeness of the product and the correct product labelling for identifying the species. Further, on their part, retailers need to assure the consumers of how green their products are and what their sources of procurement are. Government can step in to implement the zero-waste concept, optimum utilization of fish by products from the fishery industry and promoting value added of healthy food. Capacity building is crucial in this aspect as measures should be undertaken to enhance the value addition to take place in our own country rather than in importing country ensuring domestic job creation and higher economic activity. We must also exercise caution in not being a exporter of primary goods or an exporter with a limited basket of goods. Diversification is therefore essential. In keeping this is mind, we would also be able to economies of scale and generate externalities that would ultimately strengthen our economic base by making the best use of our aquatic resources.

While there has been a general consensus among development experts and institutions towards advocating the transfer of value addition technologies, know-how and investment capital to these developing countries, these initiatives require greater international co-operation and movement towards decolonisation and is understandably time consuming. However, if we can make use of domestic markets through value addition processes generate further domestic employment and foreign exchange earnings, a greater bargaining power in the international trade negotiations can be expected to follow. An example of this could be the recent WTO 12<sup>th</sup> Ministerial Committee where India's position on differential treatment for reducing the fisheries subsidies was lauded.

To conclude, as far as the fish-processing industry is concerned, value addition is one of the possible approaches to raise profitability as the industry becomes highly competitive. Marketing of value-added products is highly dynamic, sensitive, complex and very expensive. The success of marketing of the value-added products relies highly on the appearance, packaging and display and hence appropriate measures are to be adopted to enhance the marketing strategy of the value addition of sea food products. Introduction of diversified seafood products in the export front has seen improved product acceptance and better unit value realization for our sea food products. Domestically, with growing purchasing power, faster life-styles, increasing number of nuclear families, and urbanisation, there is a shift in increase in consumption in both quantity and quality. On the one hand, there is greater demand for products that are ready and easy to use while on the other there is greater consciousness for green consumption. Therefore, environment friendly economic growth with guarantees of equity would be the need of the hour. The fisheries sector in this regard, can show us the way forward.

## References

1. Anneboina, L. R., & Kumar, K. K. (2016). Caught in the 'Net': Fish Consumption Patterns of Coastal Regions in India. *Economic and Political Weekly*, 49-57.
2. Burger, J., & Gochfeld, M. (2009). Perceptions of the risks and benefits of fish consumption: Individual choices to reduce risk and increase health benefits. *Environmental research*, 109(3), 343-349.
3. Dash, S. S., Shyam, S. S., Dash, G., & Narayanakumar, R. (2021). Economic efficiency indicators of multi-day trawl fleet in Digha, northeast coast of India. *Journal of the Marine Biological Association of India*, 63(1), 73-78.
4. Deslypere, J. P. (1990). Effect of fish consumption compared to intake of fish oil. *Marine Foods*, 46, 53-69.
5. Economic Survey 2021-22, Department of Economic Affairs Economic Division, Ministry of Finance, Government of India North, Block New Delhi
6. Gopal, N., Mohan, C. O., Murthy, L. N., Rao, B. M., & Ravishankar, C. N. (2020). Immediate impact of COVID-19 pandemic on seafood processing and exports.
7. Handbook of Fisheries Statistics 2020, Fisheries Statistics Division Department of Fisheries Ministry of Fisheries, Animal Husbandry & Dairying Government of India, New Delhi.
8. Kurien, John. Bringing back the artisanal in small scale fisheries. Samudra. ICSF March 2022 [https://www.icsf.net/wp-content/uploads/2022/04/Sam\\_87\\_art11\\_IYAFA-2022\\_John-Kurien.pdf](https://www.icsf.net/wp-content/uploads/2022/04/Sam_87_art11_IYAFA-2022_John-Kurien.pdf)
9. Ministry of Food Processing Industries (MOFPI) (2017). Annual Report 2016-17. Available Online at: [https://www.mofpi.gov.in/sites/default/files/english\\_annual\\_report\\_final-ilovepdf-compressed\\_1.pdf](https://www.mofpi.gov.in/sites/default/files/english_annual_report_final-ilovepdf-compressed_1.pdf)
10. Mukherjee, S., Iqbal, A., Ngasotter, S., Bharti, D., Jana, S., Mondal, A., & Pahari, T. (2020). Impact of COVID-19 on Indian seafood industry and potential measures for recovery: a mini-review. *Curr. J. Appl. Sci. Technol*, 39(48), 519-527.
11. Natale, F., Borrello, A., & Motova, A. (2015). Analysis of the determinants of international seafood trade using a gravity model. *Marine policy*, 60, 98-106.
12. Nikodemaska-Wołowik, A. M., Wach, D., Andruszkiewicz, K., & Otukoya, A. (2021). Conscious shopping of middle-class consumers during the pandemic: Exploratory study in Mexico, Nigeria, Poland, and Sri Lanka. *International journal of Management and Economics*, 57(3), 209-219.
13. Pietrykowski, B. (2004). You are what you eat: The social economy of the slow food movement. *Review of social economy*, 62(3), 307-321.



14. Ragumaran, M., Mohan Raj, V., Susan George, S. R., & Mathu Mitha, C. (2021). Impact of Covid 19 pandemic on seafood exports from India. *Intern. J. Zool. Invest*, 7(2), 808-813.
15. Rajeev, M., & Bhandarkar, S. (2022). Fisheries Sector in India—An Overview. *Unravelling Supply Chain Networks of Fisheries in India*, 47-59.
16. Sabater, S., Sharma, A., & Salim, S. S. (2008). Consumption pattern and consumer preference for value-added fish and fish products in north zone of India.
17. Shyam, S. S., & Antony, B. (2015). Marine fisheries trade in India: Perspectives and paradigms.
18. Shyam, S. S. (2020). Demand pattern and willingness to pay for high value fish consumption: Case study from selected coastal cities in Kerala, south India. *Indian Journal of Fisheries*, 67(3), 135-143.
19. Shyam, S. S., Rahman, M. R., & Antony, B. (2015). Sardine economy of Kerala: paradigms and perspectives. *International Journal of Fisheries and Aquatic Studies*, 2(6), 351-356.
20. Shyam, S. S., Narayanakumar, R., & Shridhar, N. (2016). Incentives for Low Carbon Emission Fishing in India: a Life Cycle Assessment Approach.
21. Shyam, S. S., Stanley, L., Shinu, A. M., & Dash, S. S. (2021a). Fish consumption pattern in Purba Medinipur district of West Bengal. *Journal of Inland Fisheries Society of India*, 53(3&4), 201-209.
22. Shyam, S. S., Raju, S. S., Athira, N. R., & Pattnaik, P. (2021b). Assessing fish consumption and its determinants across Andhra Pradesh, India. *Journal of the Marine Biological Association of India*, 63(2), 21-30.
23. Shyam S. S. (2020) Strategies for Augmenting Seafood Revenue: Beyond 2020. 22<sup>nd</sup> International Seafood Show, Kochi, Kerala.
24. Shyam, S Salim (2013) *Demand and Supply Paradigms for Fish Food Security in India*. Seafood Export Journal, 43 (5). pp. 34-40
25. Sharma, O. P., & Khajuria, V. (2009). Fish Consumers and their consumption behaviour In Udaipur (Rajasthan). *Journal of the Inland Fisheries Society of India*, 41(2), 11-17.
26. Turan, H., Kaya, Y., & Sönmez, G. (2006). Position in human health and food value of fish meat. *Ege Journal of Fisheries and Aquatic Sciences*, 23(3).