



E - BOOK

STRUCTURAL STATUS AND PERFORMANCE OF DOMESTIC FISH MARKETING AND TRADE

2023 EDITION



**National Institute of Agriculture Extension Management (MANAGE), Hyderabad
&
TNJFU – Fisheries College and Research Institute (FC&RI), Thoothukudi**

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Structural Status and Performance of Domestic Fish Marketing and Trade

Programme Co-ordination

**TNJFU – Fisheries College and Research Institute,
Thoothukudi**

Jointly Published By

**TNJFU – Fisheries College and Research Institute,
Thoothukudi**

&

MANAGE, Hyderabad

Structural Status and Performance of Domestic Fish Marketing and Trade

Editors: T. Umamaheswari, N.V. Sujathkumar, B. Ahilan, Shahaji Phand and Sushrirekha Das

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ISBN: 978-93-91668-90-7

Citation: Umamaheswari, T., Sujathkumar, N, V., Ahilan, B., Shahaji Phand and Sushrirekha Das (2023). Structural Status and Performance of Domestic Fish Marketing and Trade [E-book]. Hyderabad: TNJFU - Fisheries College and Research Institute, Thoothukudi & National Institute of Agricultural Extension Management, Hyderabad, India.

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This e-book is a compilation of resource text obtained from various subject experts in Fisheries sector on “Structural Status and Performance of Domestic Fish Marketing and Trade”. This e-book is designed to educate extension workers, students, research scholars, academicians related to Fisheries Science about the Performance of Indian fish marketing and trade. Neither the publisher nor the contributors, authors and editors assume any liability for any damage or injury to persons or property from any use of methods, instructions, or ideas contained in the e-book. No part of this publication may be reproduced or transmitted without prior permission of the publisher/editors/authors. Publisher and editors do not give warranty for any error or omissions regarding the materials in this e-book.

Published for Dr.P.Chandra Shekara, Director General, National Institute of Agricultural Extension Management (MANAGE), Hyderabad, India by Dr. Srinivasacharyulu Attaluri, Program Officer, MANAGE and printed at MANAGE, Hyderabad as e-publication.



MESSAGE

National Institute of Agricultural Extension Management (MANAGE), Hyderabad is an autonomous organization under the Ministry of Agriculture & Farmers Welfare, Government of India. The policies of liberalization and globalization of the economy and the level of agricultural technology becoming more sophisticated and complex, calls for major initiatives towards reorientation and modernization of the agricultural extension system. Effective ways of managing the extension system needed to be evolved and extension organizations enabled to transform the existing set up through professional guidance and training of critical manpower. MANAGE is the response to this imperative need. Agricultural extension to be effective, demands sound technological knowledge to the extension functionaries and therefore MANAGE has focused on training program on technological aspect in collaboration with ICAR institutions and state agriculture/veterinary universities, having expertise and facilities to organize technical training program for extension functionaries of state department.

It is a pleasure to note that, TNJFU- Fisheries College and Research Institute, Thoothukudi, Tamil Nadu and MANAGE, Hyderabad, Telangana is organizing a collaborative training program on “Structural Status and Performance of Domestic Fish Marketing and Trade” from 5-7 June, 2023 and coming up with a joint publication as e-book on “Structural Status and Performance of Domestic Fish Marketing and Trade” as immediate outcome of the training program.

I wish the program be very purposeful and meaningful to the participants and also the e-book will be useful for stakeholders across the country. I extend my best wishes for success of the program and also I wish TNJFU- Fisheries College and Research Institute, Thoothukudi, Tamil Nadu many more glorious years in service of Indian agriculture and allied sector ultimately benefitting the farmers. I would like to compliment the efforts of Dr. Shahaji Phand, Center Head-EAAS, MANAGE and Dr. B. Ahilan, Dean, Fisheries College and Research Institute, Thoothukudi for this valuable publication.

Dr. P. Chandra Shekara
Director General, MANAGE

PREFACE

This e-book is an outcome of the Collaborative Online Training Program on “**Structural Status and Performance of Domestic Fish Marketing and Trade**” conducted from 5-7 June, 2023. This e-book is intended to provide insights to all extension workers, faculties, researchers and students about the status and performance of domestic fish marketing and trade in India.

An effective marketing system is required to make fish available to consumers at the right time and in the right place. Domestic markets and distribution of fish are dominated by a large number of intermediaries that pass through various channels at different levels. The establishment of domestic markets plays a very crucial role in the development of fisheries sector in the country. Apart from ensuring nutritional security and food security, it also helps in minimizing post-harvest losses, increase revenue; enhance employment opportunities and offers high standards of hygiene and sanitation leading to food safety. As more and more trade restrictions are being imposed on the fishery product export, a well-developed domestic marketing system only can ensure the viability of the fisheries sector.

This training shall provide the knowledge to the fishers and stakeholders in finding out the challenges and recent advancements in marketing of fish and fishery products. Additionally, information on integrated fish market and price information systems for Indian fisheries sector, seafood auditing, distribution pattern, role of women in fish marketing would definitely help in understanding the present scenario in Indian fish marketing.

The editors’ heart fully record their sincere gratitude and appreciation to the resource persons for sparing their valuable time to develop this resource material. Additional thanks to MANAGE, Hyderabad for providing the financial assistance to conduct the training program. The editors are very much thankful to Dr. G. Sugumar, Honorable Vice-Chancellor, TNJFU, Nagapattinam and Dr. M. Rajakumar, Director of Extension Education, TNJFU, Nagapattinam for the consistent support and encouragement extended for the successful conduct of this training program and e-book creation for the participants. The editors hope that this e-book will help the participants as well as other extension people across the country to gain valuable information on domestic and overseas marketing of fish and fishery products.

The valuable suggestions for future improvements are always welcome.

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Chapter 1

THE TRENDS, PERFORMANCE, AND COMPETITIVENESS OF THE INTERNATIONAL SEAFOOD MARKET

Dr. M. Krishnan

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Mumbai*

Overview and Status of Seafood Exports of India

The COVID pandemic and sluggish overseas markets cast their shadow over India's resurgent seafood sector as the country exported 11,49,341 MT of marine products worth ₹ 43,717.26 crore (US\$ 5.96 billion) during FY 2020-21, registering a contraction of 10.88 per cent in volume as compared to a year earlier. USA, China and the European Union (EU) were the leading importers, while frozen shrimp retained its position as the major export item followed by frozen fish. In 2019-20, India exported 12,89,651 MT of seafood worth ₹ 46,662.85 crore (US\$ 6.68 billion), marking a decline of 6.31 per cent in rupee terms and 10.81 per cent in dollar value in 2020-21. The pandemic drastically affected seafood exports during the first half of the year, but it revived well in the last quarter of 2020-21. Also, the aquaculture sector performed better during this fiscal by contributing 67.99 per cent of exported items in dollar terms and 46.45 per cent in quantity, which is 4.41 per cent and 2.48 per cent higher, respectively when compared to 2019-20. Frozen shrimp contributed 51.36 per cent in quantity and 74.31 per cent of the total dollar earnings. USA remained its largest importer (2,72,041 MT), followed by China (1,01,846 MT), EU (70,133 MT), Japan (40,502 MT), South East Asia (38,389 MT), and the Middle East (29,108 MT). However, shrimp exports declined by 9.47 per cent in dollar value and 9.50 per cent in quantity. The overall shrimp export was 5,90,275 MT worth 4,426.19 million dollars. The export of *Vannamei* (white leg) shrimp decreased from 5,12,204 MT to 4,92,271 MT in 2020-21. Of the total *Vannamei* shrimp exports in dollar value, 56.37 per cent was exported to USA, followed by China (15.13 per cent), EU (7.83 per cent), South East Asia (5.76 per cent), Japan (4.96 per

cent) and the Middle East (3.59 per cent). Japan, the major market for Black Tiger (*Penaeus monodon*) shrimp, had a share of 39.68 per cent in dollar terms, followed by USA (26.03 per cent), South East Asia (9.32 per cent), EU (8.95%), the Middle East (6.04 per cent) and China (3.76 per cent). Frozen fish, with a share of 16.37 per cent in quantity and 6.75 per cent in dollar earnings, retained the second position in exports basket though its shipments plummeted by 15.76 per cent in quantity and 21.67 per cent in dollar terms. 'Other Items', the third largest category that largely comprised Surimi (fish paste) and Surimi analogue (imitation) products, showed a marginal growth of 0.12 per cent and 0.26 per cent by quantity and rupee value, respectively, but declined in dollar terms by 5.02 per cent.

Frozen squid and frozen cuttlefish exports declined in volume by 30.19 per cent and 16.38 per cent, respectively. However, dried items showed an increase of 1.47 per cent and 17 per cent in quantity and rupee value, respectively. Shipments of chilled items and live items, which were negatively affected due to the reduced air cargo connectivity in the pandemic situation, fell by 16.89 per cent and 39.91 per cent in volume, respectively. Capture fisheries contribution reduced from 56.03 per cent to 53.55 per cent in quantity and from 36.42 per cent to 32.01 per cent in dollar value. However, tilapia and ornamental fish performed well with 55.83 per cent and 66.55 per cent increase in quantity and an uptick of 38.07 per cent and 14.63 per cent in dollar earnings, respectively. Tuna showed 14.6 per cent increase in quantity, but its dollar earnings downed by 7.39 per cent. Crab and scampi exports reduced both in quantity and value. USA, with imports of 2, 91,948 MT, continued to be the major importer of Indian seafood with a share of 41.15 per cent in dollar terms. Exports to that country grew by 0.48 % in rupee value but declined by 4.34 per cent and 4.35 per cent in quantity and dollar terms, respectively. Frozen shrimp remained the principal item exported to USA while exports of *Vannamei* shrimp showed an uptick of 6.75 per cent in quantity. However, its import of Black Tiger shrimps decreased by 70.96 per cent and 65.24 per cent in quantity and dollar terms, respectively. China, with an import of 2,18,343 MT of seafood

worth 939.17 million dollars, remained the second largest market with a share of 15.77 per cent in dollar earnings and 19 per cent in quantity terms. However, exports to this country declined by 33.73 per cent and 31.68 per cent in quantity and dollar terms, respectively. Frozen shrimp was the major item of exports to China, accounting for a share of 46.64 per cent in quantity and 61.87 per cent in dollar earnings. EU, the third largest destination with a share of 13.80 per cent in dollar value, imported frozen shrimp as the major item. However, export of frozen shrimp to EU countries decreased by 5.27 per cent and 6.48 per cent in quantity and dollar value, respectively. Exports to South East Asia had a share of 11.17 per cent in dollar value. However, it declined by 2.56 per cent in quantity and 5.73 per cent in dollar earnings. Shipments to Japan, the fifth largest importer with a share of 6.92 per cent in dollar terms, grew by 10.52 per cent in quantity but declined by 2.42 per cent in dollar value. The Middle East, the sixth largest destination with a share of 4.22 per cent in dollar value, declined by 15.30 per cent and 15.51 per cent in quantity and dollar terms, respectively. Frozen shrimp was the major item of exports, having a share of 72.23 per cent in dollar terms. Mr. Srinivas said besides the pandemic impact, several other factors negatively impacted seafood exports during 2020-21. On the production side, there were reduced fish landings due to less number of fishing days, slow logistic movements and market uncertainties. Scarcity of workers in fishing and processing plants, paucity of containers at seaports, increased air freight charges and limited flight availability affected exports, especially of high-value chilled and live products. The situation in overseas market was another dampener. In China, container shortage, increased freight charges, and COVID testing on seafood consignments caused market uncertainties. In USA, scarcity of containers made it difficult for exporters to execute orders in time. Closure of HoReCa (hotel, restaurant and café) segment also affected the demand. In Japan and EU, COVID induced lockdowns made the retail, restaurant, supermarkets and hotel consumption sluggish (MPEDA).

Growing competition from Ecuador

India is blessed with a long coastline, making it possible to develop a rich seafood economy. This geographical blessing made the country the largest exporter, and the second-largest producer, of shrimps in the world. But that advantage has been declining since 2019-20. India lost its shrimp export leadership to Ecuador. What makes it worse is that the South American country has since been increasing its lead over India every year. Ecuador has traditionally been the largest producer of shrimps in the world, and was in fierce competition with India in the export market. In 2021, India's shrimp exports contracted due to supply chain issues caused by the pandemic. Ecuador, meanwhile, started to push more value-added products such as headless shrimps and took advantage of its proximity to the US, one of India's biggest shrimp export destinations. Ecuador is such a small country. Its coastline on a map does not even look one-third of India's, yet it is producing and exporting more than India. The South American country is about 12 times smaller than India. It has a coastline of 2,237 km, against India's 7,000 km.

There is a problem of accounting in respect of India's Marine Products Export Development Authority (MPEDA) which has data for financial years (in million tonnes) while Ecuador's National Chamber of Aquaculture (CNA) shares data for calendar years (in pounds). But CNA shares a monthly break-up of shrimp exports. Using these numbers to calculate the exports in million tonnes for a financial year shows the South American country has been steadily increasing its gain over India.

The widening chasm

In 2018-19, India exported 6,14,145 MT and Ecuador exported 5,37,512 MT of shrimps. For 2019-20, the numbers were 6,52,253 MT and 6,57,001 MT for India and Ecuador, respectively. In 2020-21, it was 5, 90, 275 MT and 6,79,965 MT. For 2021-22, India exported 7,28,123 MT and Ecuador expanded the lead to 9,14,319 MT. India's exports were worth \$4.8 billion in 2019-20; in 2020-21, \$5.8 billion in 2021-22, according to

MPEDA. Ecuador's exports were worth \$3.65 billion in 2019; \$5.08 billion in 2021 and \$6.6 billion in 2022 according to CNA.

A study by 97 Crisil-rated exporters also showed that in calendar year 2020, India's shrimp exports declined to \$3.6 billion from \$4.7 billion in 2019. At the same time, Ecuador surpassed India with \$3.7 billion exports, rising slightly from \$3.6 billion in 2019. According to The Food and Agriculture Organisation (FAO), Ecuador overtook India as the top shrimp exporter in 2020. Ecuador had a 6.8% rise in annual exports. Moreover, its farmed production increased by a hefty 1,00,000 tonnes, resulting in the cheapest export prices to the world market.

The South American country stole a lead over India because Covid-19 disruptions made it difficult for many Indian exporters to send products overseas. The freight to the US (India's biggest shrimp buyer) was almost five times higher. This gave Ecuador's exporters some leeway to market their own product into the US on a very large scale as their freight cost was much lower.

The loss of market share for the Indian shrimp exporters is largely in the lower value add segment (mainly headless shrimp) where Ecuador is a major player. Increase in Ecuador's exports to the USA market last year was largely driven by China's zero COVID policy which resulted in lower off take from China (Ecuador is the major exporter of frozen shrimp to China).

The Chinese Conundrum

The pandemic spoiled India's shrimp party in other ways, too. Shipments that took 35-45 days to reach the US were reaching 3-4 months because of pandemic disruptions. The journey time from Ecuador to the US was 15 days at the most. So, US customers found Ecuador a better bet. The US' efforts to near shore its sourcing also seem to have played a role here. The Biden administration has been pushing to shift the sources of various supply chains closer to home. The move aims to reduce dependence on China and get raw materials

and goods faster. Ecuador was supplying more to China than the US, but the equation has also changed. According to 2022 figures from CNA, the US is the second-biggest destination for Ecuadorian shrimps, at 19%. The first being China at 59%. Ecuador increased the share of its shrimp exports to the US from 17% in 2020 to 22% in 2021. For China, which had accounted for 53% of its exports in 2020, the number declined to 46% in 2021. According to the FAO Ecuador's 2020 sales to China was lower by 1% but to the US rose 52%.

According to a report by Rabobank Ecuador's shrimp production increased by almost 41% in 2021, and would top 1.35 MT in 2022. In the meantime, India suffered a setback from China. In 2021, about 12,000 containers with 16 tonnes of shrimps in each (roughly worth ₹ 1,200 crore) from India were stranded at Chinese ports.

The reason was that China suspected traces of coronavirus on the packages of frozen shrimps. These exports were coming from 50 Indian companies. In December 2020, China had suspended shrimp imports from 110 processing units; 99 were in India. The suspension was lifted in February this year. During 2021-22, India had 475 establishments that exported seafood. In 2021-22, 47% of Indian shrimps were exported to the US and 17% to China. Indian exporters were overstocked like never before. China was to import 70% of its stock from India but it has turned to Ecuador now, which has tripled its production. The demand from China is coming back; a sizeable quantity of supply from Ecuador is expected to be diverted to China. Also, supply side issues on account of loss of summer crop impacted the shrimp production in India adversely last year.

Shrimp farming needs a relook

The Indian government had helped shrimp cultivators during the pandemic. Shrimp brooders (mature individuals fit for breeding) used to be flown in from Hawaii on charter flights. The government had pitched in to make this possible despite thousands of logistics regulations then. These shrimps, called *Penaeus vannamei*, are an exotic breed native to the Pacific Islands and are lucrative for farmers. The government still encourages breeding this

variety. However, experts say, India is likely to continue losing out to Ecuador because of the unfavorable conditions here.

A 1,000-hectare patch in Ecuador is typically controlled by two farmers; in India, a same-sized patch will have the involvement of some 1,000 farmers. Each will make his own decision on which hatchery to buy the eggs from, which feed to use. No one is coordinating. There is a fundamental structural problem. Even the value chain is highly fragmented in India. There is no own reading programme and so standardization becomes difficult. Here are close to about 100,000 shrimp farmers in India and the typical land-holding pattern is about five acres. In Ecuador, it is a highly consolidated market and they have one general manager to take care of huge swathes of farms.

More value from value-added shrimps

Ecuadorian cultivators embrace automation easily. They follow a western style of farming where they manage farms with tablets in hand. They market traceability — which shrimp is coming from which pond, which ones are being managed by which company, and which ones are going to the international market. They have got good farm management practices. To combat this, India should focus on export value-added shrimps such as headless shrimps, marinated shrimps, and cooked shrimps. Vietnam is a big market for value-added shrimps. Minced shrimp meat is exported for momos and other such foods. So, it becomes a ready-to-cook product. All you have to do is just heat it and eat it.

Shrimp that is sold for ₹600 a kg in the international market can be sold for ₹ 3,000 with the right value additions. The Minister of Commerce and Industry had talked about doubling food exports to \$14 billion by 2025. A lot of policy intervention is needed for this to happen. Trade bodies should come together and identify new market opportunities, and add infrastructure for newer value-added products. Otherwise, it will be very difficult to reach that target.

Tech to Rescue

Technology adoption is one of the biggest impediments in India. There isn't enough investment in infrastructure and technology, and efforts to implement farm-level automation. Use of IoT devices, satellite remote sensing and artificial intelligence can help assess the input requirement in a region. These technologies can also help in predicting demand and growth and can help farmers connect with markets and other stakeholders efficiently. Value-chain stakeholders in aquaculture improve productivity, market linkage and access to formal financing through the use of technology and remote sensing capabilities.

Viral diseases are very common in the country and cost fish and shrimp cultivators almost ₹ 5,000 crore per year. This lowers productivity. The government should do disease management projects among shrimp farmers. The private sector alone cannot manage these viral diseases. The FAO report also referred to the occurrence of diseases in shrimps in India. The government's National Surveillance Programme for Aquatic Animal Diseases has helped scientists create a disease monitoring app.

Budget boosters

In the meantime, the MPEDA has set a target of \$8.8 billion for seafood export in 2022-23, from \$7.76 billion the previous financial year. Shrimp farming is being promoted in Uttar Pradesh, Punjab, Haryana and Rajasthan. It is most common in Andhra Pradesh, Gujarat, West Bengal and Tamil Nadu. The budget has set aside ₹ 6,000 crore as part of the Pradhan Mantri Matsya Sampada Yojana to enhance aquaculture productivity and exports. The basic customs duty has been reduced on fish meal from 15% to 5%, on krill meal from 15% to 5%, on algal prime (our) from 30% to 15%, and on fish lipid oil from 30% to 15%. This will make the imported seeds slightly cheaper. Right now, the prices of shrimp are at rock-bottom. So, even this minor support from the government will go a long way. Farmers can become more competitive in the market.

Conclusion

The issue of recapturing the USA market and emerging as the market leader for shrimp, frozen shrimp and value added shrimp lies in exporting more of value added shrimp products to USA whose appetite for value added shrimp is practically insatiable. The distance and the cost factor in transportation will remain a permanent issue. So the exporters need to outsmart the Ecuadorian exporters by making available irresistible value added shrimp to the Americans.

As far as adoption of corporate culture in shrimp and fish farming as in Ecuador is concerned, it is a definitely “No”. India will always have to support its small and marginal farmers. In order to cut cost of production and achieve economies of scale, it is necessary to network the small and marginal farmers and help them achieve lower costs of production and higher returns of investment. The FFPOs and FFPCs are an answer to this. The FFPOs and FFPCs are being vigorously promoted under PMMSY and we are aiming at establishing as many as 500 FFPOs by end of 2025.

In order to remain at the top of the value chain as well as re-emerge as the global leader in seafood exports, India must concentrate on developing markets near home. The MPEDA is taking these steps in the right direction and India can soon hope to lead the global seafood market again from the front.

Chapter 2

ROLE OF AUDITING, FOOD SAFETY AND QUALITY STANDARDS IN THE FOOD INDUSTRY

M. Jairaj

Lead Auditor, Food Safety Management System, SGS, India

Need for Certification and Audits

Bottom line: ASSURANCE + ENHANCE BUSINESS OPPURTUNITIES

Audits and Certification have become and indispensable tool for carrying out business

Key Terms

Certification The provision by an independent body* of written assurance (a certificate) that the product, service or system in question meets specific requirements.

*Called a Certification Body (CB) or a Conformity Assessment Body (CAB)

Examples

SGS, INTERTEK, DNV, BUREAU VERITAS, TUV SUD SOUTH ASIA
COTECNA etc.

Accreditation A formal, third party recognition of competence to perform specific tasks, task to demonstrate to its customer that it has been successful at meeting the requirements of international accreditation standards.

Means certification bodies have been assessed against internationally recognized standards to demonstrate their competence, impartiality and performance capability. Accreditation is provided by Accreditation Bodies.

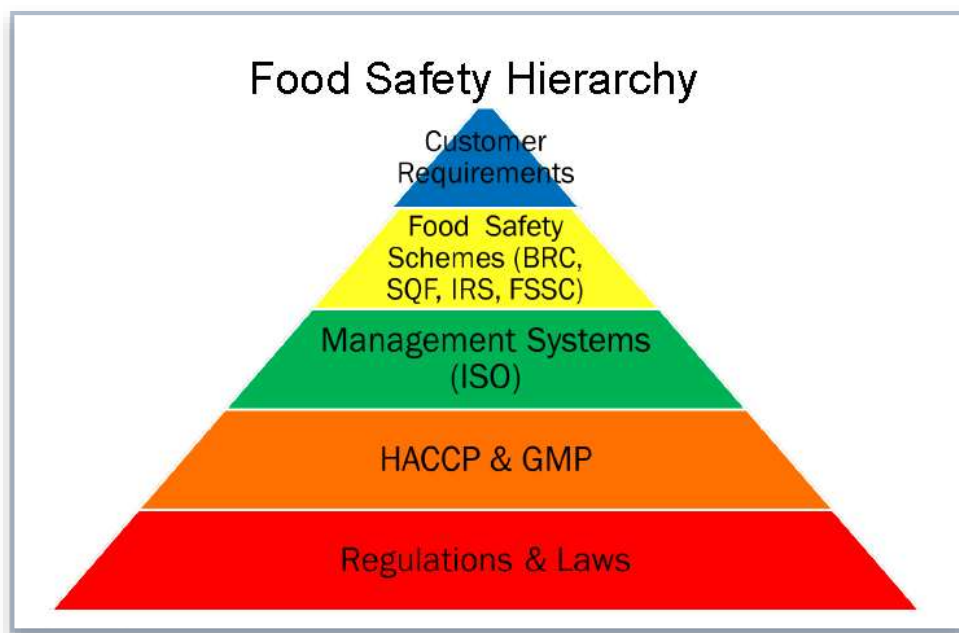
Examples

NABCB – National Accreditation Board for Certification Bodies (India)

UKAS: United Kingdom Accreditation Service

Audit	<p>Systematic, independent and documented process for obtaining objective evidence and evaluating it objectively to determine the extent to which the audit criteria are fulfilled.</p> <p>Examples of Food Safety Management Systems Certification Criteria</p> <p>ISO22000</p> <p>BRCGS Global Standard For Food Safety</p> <p>IFS</p> <p>SQF</p>
Types of Audit	<p>First Party - e.g. internal audits</p> <p>Second Party - e.g. customer audits, supplier audits</p> <p>Third Party- Certification audits</p>
Benefits of Certification	<p>Organization credibility and reputation; Capability and competitiveness;</p> <p>Compliance with legal and regulatory requirements; Process improvement and reduction of customer complaints; Access to external expertise; Keep system updated etc.</p>
Benefits of Accredited Certification	<p>To give customers and stakeholders greater assurance; AB's IAF (international Accreditation Forum) Multilateral Recognition Arrangement (MLA) proves that it complies with best practice; Proves CB - reliable and impartial service; Gain access to overseas markets /Also Domestic Markets; Reduces uncertainty; Reduces need of employing own audit personnel; Facilitate trade and economic growth; Demonstrate due diligence in event of legal action and 'Certified once accepted everywhere'</p>

Inspection	Audit
To verify a process or a system-	To evaluate a process or a system
Especially with respect to licensing, regulatory compliance	
Generally use a checklist with yes/no answers	May have grey areas, go in deep to check if complying if so to what extent
Generally shorter duration than audits	More detailed, takes several hours/ days
	Looks at entire process from start to finish
	Review of procedures, observation of tasks, inspection of equipments, interview of staff –
	open ended questions and discussions- value addition
Inspection findings are fairly easy to prioritize and fix	Sometimes difficult to prioritize so need to categorize :- Major, Minor, OFI,



Certification standards related to food

ISO 22000:2018

Global Food Safety Initiative (GFSI) Benchmarked Standards

- FSSC 22000
- BRCGS Global Standard for Food Safety -
Also available for Packaging, Brokers and Agents etc.
- International Featured Standards (IFS)
- Safe Quality Institute Standard (SQF)
- Best Aquaculture Practices (BAP) – includes sustainability
- ASC - Farms and Chain of Custody

GMP+ for Feed etc.

GFSI Standards have Increased Focus on

GMP or Pre-requisite Programs - Infrastructure, Cleaning and sanitation, equipment design, Food fraud, Intentional contamination etc.

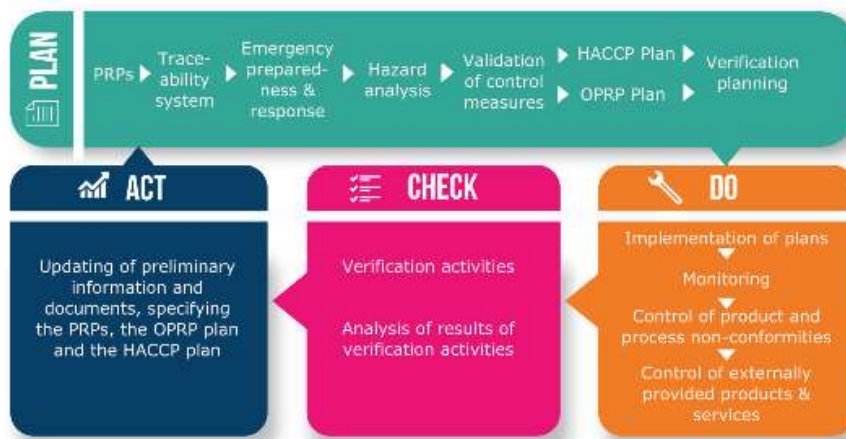
Traceability, Quality, Food Safety, Culture etc.

These Standard /Schemes are built on Codex, ISO 22000, ISO/TS 22002-x Series etc.





OPERATIONAL PLANNING AND CONTROL



Certification standards with criteria other than food safety

SA 8000

BSCI AMFORI

SEDEX

SMETA

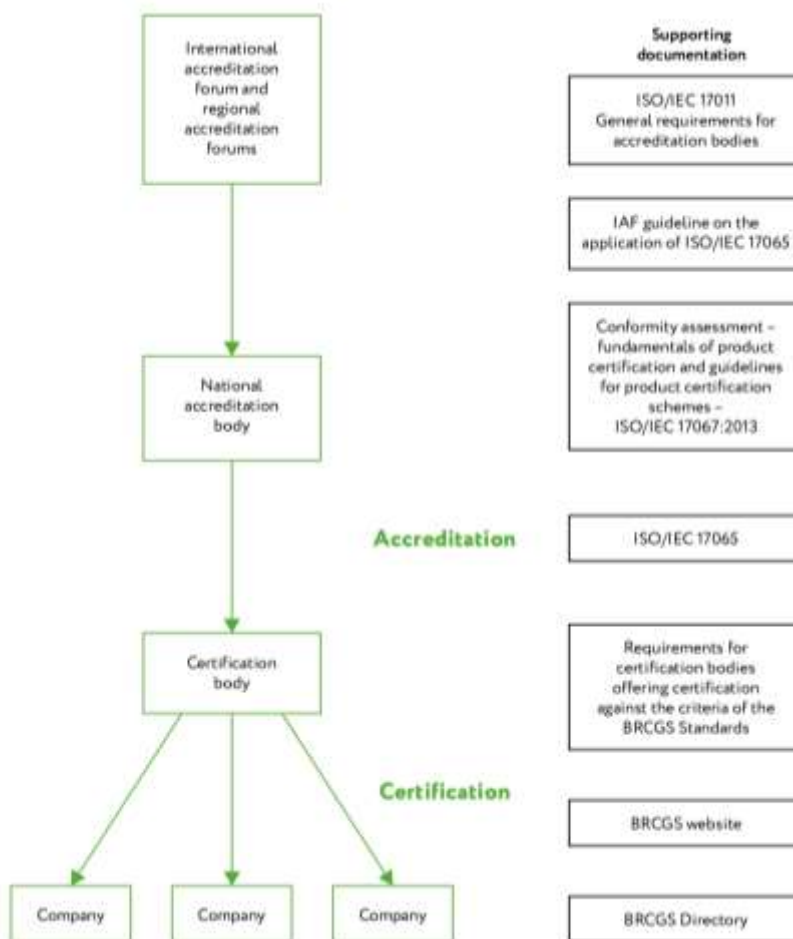
Best Aquaculture Practices etc.

Certification requirements may include

- Social Accountability
- Wages and Benefits
- Working Hours
- Forced, Bonded, Indentured, Trafficked and Prison Labor
- Child Labor and Young Workers
- Hiring and Terms of Employment

- Discrimination, Discipline, Abuse and Harassment
- Freedom of Association and Collective Bargaining
- Employee Health and Safety
- Employee Facilities and Housing
- Worker Health and Safety
- Personal Protective Equipment (PPE) and Clothing.
- Medical Care
- Environmental and Waste Management etc.

Example of framework for certification and accreditation



Process for the accreditation of certification bodies

Chapter 3

CHALLENGES AND RECENT ADVANCEMENTS IN FISH MARKETING AND TRADE

Dr. M. Krishnan

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Mumbai*

India is the third largest fish producing country, contributing 8 percent to the global fish production and ranks second in aquaculture production. The fish production in 2021-22 is 16.24 million tonnes comprising of marine fish production of 4.12 million tonnes and 12.12 million tonnes from Aquaculture. Challenges faced, to a certain extent, include increasing availability of quality seed, cold chain, meeting requirements of infrastructure and post-harvest infrastructure. Since the launch of the Pradhan Mantri Matsya Sampada Yojana (PMMSY) in the year 2020-21, the overall fish production in the country has shown an increasing trend, registering a fish production of 162.48 lakh tonnes in 2021-22 from 141.64 lakh tonnes in 2019-20.

Fish is an affordable and rich source of healthy animal protein and omega-3 fatty acids, offering immense potential to mitigate hunger and malnutrition. India is blessed with rich and diverse fisheries resources, and the fisheries sector has become an important pillar of socio-economic growth, providing livelihood, employment, and entrepreneurship to millions of fishers and fish farmers. Over the past 75 years, the fisheries sector in India has experienced a remarkable transformation, evolving from a traditional activity to a commercial enterprise. India's fish production has grown 22-fold since independence, from 7.5 lakh tonne in 1950-51 to a record-breaking 162.48 lakh tonne in 2021-22, reflecting a growth rate of 10.34% compared to the previous year. With approximately 8% share in global fish production, India is now the world's third-largest fish-producing country.

Inland fish production, predominantly driven by aquaculture, has witnessed an extraordinary surge. In 2000-01, inland fish production stood at 28.23 lakh tonne, which rose to 121.21 lakh tonne in 2021-22, marking a remarkable 400% increase. This growth can be attributed to the combined efforts of fisheries scientists, the central and state governments, and the dedication of fishers, fish farmers, and entrepreneurs. Through various fisheries schemes and programs like Pradhan Mantri Matsya Sampada Yojana (PMMSY) and Kisan Credit Card (KCC), the government is committed to resolving the issues faced by the fishing community and facilitating their economic upliftment.

How to develop the domestic market?

The Indian market for fish and seafood is on a bull run growing at more than 10 per cent recording a production of 162.48 lakh tones, all-time high exports of 13.69 lakh tonnes valued at Rs 57,587 crore dominated by exports of shrimps in 2021-22. Studies show the domestic market for shrimp is restricted to size, 50 counts and more catering to a unorganized market size of 1 lakh ton per annum. Lower counts less than 50 are exported. Therefore there is a clear distinction in the sizes which service the domestic and the export markets. Though the absorptive capacity of the domestic market for lower count shrimp was exploited during Covid -19 times, it is felt that shrimp aquaculture specifically institutionalized for the export market as a consistent foreign exchange earner should not change tacks and cater to domestic market at the expense of the export market.

Fish and shrimp in the domestic market was lapped up during the Covid times thanks to the promotion received from the government as a rich source of iron, copper, protein, selenium, antioxidants, phosphorus, magnesium and vitamin B12. Shrimp also aids in weight loss, fights aging, improves bone health, eases menstrual pain and stems cardiovascular diseases. Consumption of a minimal amount of 85 grams of shrimp per meal is encouraged.

What makes a new food product take off in the Indian market? Cut back to the 1990s, with the advent of the New Economic Policy 1991 and WTO free trade policies Information

Technology (IT) sector also opened up in the mid 90s leading to a slow and steady transformation of the socio-economic, cultural, and migration pattern of young qualified upwardly mobile IT professionals, investment bankers and their ilk. Time was at a premium and the young professionals with income to spare hardly had the time to cook and eat. Fast food restaurants and western cuisine came in through the pizza wave, built entirely on dynamic marketing. The popularity of Pizza Hut, Domino Pizzas followed by Subway and others beat regular restaurants hollow. While poultry and mutton found favor among the restaurateurs, fish and shrimp lagged in restaurateur preference owing to their lower shelf life, handling issues besides odor and additional investment required on exclusive cold storage facilities and special culinary skills. Fish and shrimp as a nutritious food had local urban consumer acceptance but did not yield market space, as the clientele were more interested in being seen in the flashy restaurants than cared for what they ate. Since then and even now, shrimp remains an export item while fresh fish was a home-made item of food or, at best, found favor among clientele in restaurants in states of West Bengal and Kerala. Now, shrimp produced in saline soils of Punjab and Haryana are picked up by processors in Kerala for exports and only a small portion of the produce finds its way to elite Delhi hotels.

The domestic market for shrimp was always held back by absence of any forward linkages and the lackluster investment interest. Moreover the sector was then plagued by complete collapse of the production system owing to the rampage of the WSS virus, which short circuited entire corporate investments and innovations that had stormed into this sun rise sector in the 90's. But the scenario has changed with the start-up scenario in this sector now being very innovative and is networking the domestic market to ensure faster delivery of products by streamlining practices that improves logistics, storage and on site processing that will ensure cost efficiency, reduce spoilage and enable fair margins. Lately, disruptive IT technologies are playing a pivotal role in the transparency and control in supply chain.

Harvesting, temperature monitored transportation systems and storage infrastructure are areas that are fast getting digitally controlled.

Though it does appear a great idea to exploit the latent domestic market for shrimp in India, it does not seem wise to increase output via horizontal expansion of area under culture as it could imply serious implications on the carbon footprint generated by fresh investments in shrimp farming. The carbon footprints of individual species from capture fisheries and aquaculture have been reported to range 1-3 kg carbon dioxide/kg meat and 2-7 kg carbon dioxide/kg meat, respectively (GSA).

In the latest scenario, India, with a Climate Performance Index (CPI) score of 0.76, is the leader among the G20 nations striving to mitigate climate change, India's sincere efforts towards mitigating the climate crisis are being highlighted at a time when the country is helming the G20 nations as its president. In this context, we need to evolve out of the box strategies that would ensure development and diversification of domestic market for shrimp.

India would do well earning few more CPI brownie points in the development of the domestic market for shrimp by eliminating the carbon footprint that accompany fresh shrimp farm development and biodiversity displacements in horizontal shrimp production expansion. Taking into consideration the nature of the Indian markets for fish and fish products including shrimp, it is important to promote a product in this segment that caters to fish palette of the Indian consumer, is stable, has good shelf life, amenable to spicy home cooking, restaurant presentation and is reasonably priced. The India plant-based meat market is projected to register a growth rate (CAGR) of 26.3% during 2023-2028. Similar to "Imagine Meats", the celebrity plant based meat brand, already making serious inroads in urban markets, the Indian alternative seafood firm, Seaspire, is offering bio-printed plant based snapper fillets. Other companies are on the anvil to bring plant based shrimp to the Indian menu. A kink in the presentation of shrimp to the consumer in both the urban and rural markets could not only by pass the requirements of marketing linkages essential for delivery of fresh shrimp to the

consumer but also serve the national objective of taking a wholesome food product to the market that should appeal to the booming food industry. Singapore and Israel are the leaders in this segment and have found consumer acceptance riding the tag of environmental protection.

The official institutional architecture that is currently marshalling Indian fish industry and conducting number of investor conclaves would do well to invite plant based and cell culture based fish and meat industry to the table, enabling the sector to fast track India's contribution to achieving climate change goals and deliver technology driven shrimp / fish products that would make a sea change in the domestic market.

Can PMMSY Pip the post?

The product profile of fish in urban hyper markets is fast getting revolutionized. Companies are storming the market with plant based fish alternatives. They are rightly positioning themselves as leaders striving to comply with SDG 14 of the UN satiating the consciousness of the urban Indian who yearns for the revival of the ecology of the oceans. We also have companies that manage 60,000 plus fish and shrimp farmers digitally, helping their clients to use their resources efficiently, enabling them to improve their bottom line.

PMMSY, the biggest flagship program ever for boosting the fisheries sector in India, aims to increase fish production to 220 lakh tons, average annual growth rate of fish production to 9 percent, fisheries exports to ₹100,000 crores, reduce post-harvest losses to 10 percent and increase employment in the sector to 55 lakh by 2024-25. It is a massive drive to increase fish production and productivity with specific plans to expand the horizons of specific sub sectors, like seaweed culture and product development, ornamental fish culture and exports, exponentially increasing seafood exports and the like. Infrastructure development in fisheries is also getting a big fillip. Massive budget outlays are enabling structural growth at the ground level. The extension of Kisan Credit Card to fisheries sector is a master stroke that has enabled the stakeholders to breathe easy.

There is not much of a technology push that has been built into PMMSY. Private investment in information technology driven fisheries is happening independent of the official big push to fisheries. In a recent meeting of the SICCI on fisheries, there was not a mention of PMMSY and the National Fisheries Policy that is nearing finalization. The fisheries sector has already opened up fully to Foreign Direct Investments (FDI). Aquaculture, cage culture technology and re-circulatory and bio-floc systems are most ideal investment avenues for FDI. Core areas of fisheries flagged for PPP mode of development, like harbor, cold storages, landing centres development, could take the FDI route. Involvement of chambers of commerce is very important to push private investments in the sector. The poultry and meat giants are very much interested in opportunities to invest in aquaculture. Ground level market constraints, logistics and technology issues such as volumes, timeliness and regularity of delivery to drive the market seem to restrain them from taking the investment plunge in the sector. Rural electrification is a big concern. The transition from some power for some time at some voltage to assured, quality and steady power supply needs to be stepped up to make it attractive for FDI to actually happen.

The fulcrum of development is credit. Enabling institutional finance cater to end stakeholders in the primary sector, is a challenge in India. With rapid strides in non-banking financial (NBFC) intermediation in agriculture and growth of micro finance companies, we may expect the fisheries sector will be assured of sufficient, timely and easy credit. But it does appear that NBFCs are yet to realize the opportunities in marine fisheries and inland aquaculture constrained by their poor knowledge of fisheries. India is still a word of mouth country. Farmers adopt practices that are recommended by their brethren. Digital extension has been successful in agriculture. But in for small scale (potential) fish farmers, especially those in the hinterlands, the PMMSY still remains unknown.

The institutional banking framework supports a network of banking correspondents who meet the householders regularly to help them bank their daily savings. If these

correspondents are trained to disseminate information about PMMSY, the reach of the scheme would certainly experience a dramatic horizontal expansion. Only 1, 13,076 KCCs have been sanctioned for the fisheries sector (October 2022) out of 20 million marginal fishers identified for direct income support. The post office banking system offers a completely institutionalized network of banking system across the country that should be used for the rapid spread of the KCC. If banks can sell insurance products, post office banking system can definitely support KCC in the hinterlands.

Aquaculture of high value species is a high technology, management intensive and investment heavy enterprise. Expecting the small holders to push production to the targets set is shortsightedness. India definitely needs to take care of its marginalized sections of the population. Private investments in such areas of hi-tech aquaculture should lead the way, including the local population in their HR profile. Technology in fisheries production, product development and marketing needs to be closely followed. Plant based fish and cellular based seafood could have a cataclysmic impact on structure of employment in the sector as the level of education across the country improves. An inclusive approach of the official line with the tech line of the private sector could help PMMSY pip the post.

Chapter 4

INDIAN SEAFOOD TRADE - EXPORT MARKET PERSPECTIVES WITH EXPLORATION AND GLIMPSE OF ALTERNATIVE SEAFOOD

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India is the fifth largest exporter of seafood in the world in 2022. Breaking all previous records, India for the first time did the seafood export worth more than 08 billion USD in the financial year 2022-23 (April 2022-March 2023). Shrimp is the major commodity on which export of India is heavily dependent. India is the topmost shrimp producer however the industry is facing various challenges and it should be tackled at earliest otherwise serious threats seems viewable considering global market. Domestic market in India has seen the emergence of few startups in the organized sector which has shown some new hopes for the business in different directions. Tilapia is one of the species which is globally accepted as one of the important fish food species and India has started giving importance for the trade development aspects of this commodity. Alternative seafood is relatively new concept and India is at very niche stage for this category. This category is novel and many experiments are happening round the globe to know more about the potential scope about this category for the business and to provide one more option as a food for feeding the global population.

Global Seafood Market

Global seafood export trade value was estimated at 193.5 billion USD in 2022. Per caput consumption for seafood was recorded as 20.5 kg/year where as if we understand the contribution from capture fisheries then it was 09 kg/year & at the same time, it was 11.5 kg/year from aquaculture which clearly signifies the increasing importance of aquaculture segment.

WORLD FISH MARKET AT A GLANCE				
	2020	2021 estim.	2022 f'cast	Change: 2022 over 2021
	<i>million tonnes (live weight)</i>			%
WORLD BALANCE¹				
Production	177.8	182.0	184.1	1.2
Capture fisheries	90.3	92.3	92.1	-0.2
Aquaculture	87.5	89.7	92.0	2.6
Trade value (exports USD billion)	150.9	174.8	193.5	10.7
Trade volume (live weight)	64.3	68.3	68.9	0.8
Total utilization	177.8	182.0	184.1	1.2
Food	157.4	161.1	163.7	1.6
Feed	16.4	16.9	16.4	-2.8
Other uses	4.0	4.0	4.0	1.1
SUPPLY AND DEMAND INDICATORS				
Per caput food consumption:				
Food fish (kg/yr)	20.1	20.4	20.5	0.8
From capture fisheries (kg/year)	8.9	9.0	9.0	-0.5
From aquaculture (kg/year)	11.2	11.3	11.5	1.8
FAO FISH PRICE INDEX² (2014–2016=100)	2020	2021	2022 Jan–Sep.	% Change Sep 2022 over Sep 2021
	94.9	101.7	124.0	22.8

Source: FAO Food Outlook 2022

India is playing the key role in global seafood trade and it contributes 4.32% in the global seafood export market. India is the leader in the aquaculture production and contributes around 10% to the world aquaculture production. The Asian countries dominates largely in the world seafood export market. Below are the major seafood exporter-importer countries in the world.

Top Seafood Exporters of the World (2022)

1. China: 23.5 USD Billion
2. Norway: 14.00 USD Billion
3. Vietnam: 10.00 USD Billion
4. Ecuador: 8.1 USD Billion
5. India: 7.7 USD Billion
6. Chile: 7.2 USD Billion
7. Canada: 6.6 USD Billion
8. USA: 5.6 USD Billion
9. Indonesia / Thailand: 5.5 USD Billion
10. Russian Federation: 5.3 USD Billion

European Union: 36 USD Billion

Top Seafood Importers of the World (2022)

1. USA: 29.6 USD Billion
2. China: 24.4 USD Billion
3. Japan: 14.6 USD Billion
4. Republic of Korea: 6.3 USD Billion

European Union: 56.9 USD Billion

Note: European Union has been mentioned separately as it is a bunch of few countries. The figures are based for the period of January-December 2022.

HS Codes for Fish and Fish Products

HS Codes is nothing but the Harmonized System nomenclature developed by World Customs Organization (WCO). HS Codes are being used for the international trade of all products including seafood. Majority of the seafood products belong to Chapter 03 (Fish and crustaceans, molluscs and other aquatic invertebrates) however there are few more categories which include some form of fish in the products (e.g. Chapter 05 – Products of animal origin, not elsewhere specified or included).

HS classification of fish and fish products								
		Live	Whole; fresh, chilled	Whole; frozen	Fillets; fresh, chilled, frozen	Dried, salted, in brine, smoked	Flours, meals, pellets	Prepared, preserved
Fish		0301	0302	0303	0304	0305	0305 or 2301	1604
Crustaceans		0306	0306	0306		0306	0306 or 2301	1604
Molluscs		0307	0307	0307		0307	0307 or 2301	1605
Other aquatic invertebrates		0308	0308	0308		0308	0308 or 2301	
Seaweed, algae	1212 or 1302							
Oils	1504, 1516.10, 1517.90							

Source: “HS Codes for fish and fish products” by
FAO and World Customs Organization (WCO), 2021

HS code varies as per the type of the product get traded though it belongs to same species. Below is the representation of the species Shrimps at HS code level for better understanding.

Shrimps (see also prawns, and cold-water shrimps and prawns)		
TREATMENT		HS CODE
Live		0306.36
Fresh or chilled	in shell, not cooked	0306.36
	in shell, cooked by steaming or by boiling in water	0306.36
	not in shell, not cooked	0306.36
	not in shell, cooked, not in airtight container	1605.21
Frozen	not in shell, cooked, in airtight container	1605.29
	in shell, not cooked	0306.17
	in shell, cooked by steaming or by boiling in water	0306.17
	not in shell, not cooked	0306.17
Smoked	not in shell, cooked, in airtight container	1605.29
	in shell, not cooked before or during the smoking process	0306.95
	in shell, cooked before or during the smoking process	0306.95
	not in shell, not cooked before or during the smoking process	0306.95
Dried	not in shell, cooked before or during the smoking process, not in airtight container	1605.21
	not in shell, cooked before or during the smoking process	1605.29
	cooked after the smoking process, whether in shell or not	1605.29
	in shell, not cooked	0306.95
Salted	in shell, cooked by steaming or by boiling in water	0306.95
	not in shell, not cooked	0306.95
	not in shell, cooked, not in airtight container	1605.21
	not in shell, cooked, in airtight container	1605.29

TREATMENT		HS CODE
In brine	in shell, not cooked	0306.95
	in shell, cooked by steaming or by boiling in water	0306.95
	not in shell, not cooked	0306.95
	not in shell, cooked, not in airtight container	1605.21
Prepared or preserved	not in shell, cooked, in airtight container	1605.29
	not in airtight container	1605.21
Flours	in airtight container	1605.29
	fresh or chilled, fit for human consumption	0306.36 +
	frozen, fit for human consumption	0306.16 +
	smoked, fit for human consumption	0306.95 +
Meals	dried, fit for human consumption	0306.95 +
	salted, fit for human consumption	0306.95 +
	unfit for human consumption	2301.20 +
	fresh or chilled, fit for human consumption	0306.36 +
Pellets	frozen, fit for human consumption	0306.16 +
	smoked, fit for human consumption	0306.95 +
	dried, fit for human consumption	0306.95 +
	salted, fit for human consumption	0306.95 +
Dust	unfit for human consumption	2501.20 +
	unfit for human consumption	0511.91 +
Products not elsewhere specified	unfit for human consumption	0511.91 +

In such way, the detail for all the major commercial species available at HS codes through which the international trade of seafood happens.

Incoterms

Incoterms are a set of internationally recognized rules which defines the responsibilities of sellers and buyers in the export transaction. Few Important Incoterms which are being used while doing seafood trade are:

CFR = Cost and Freight

CIF = Cost, Insurance & Freight

CIP = Carriage and Insurance Paid to

CPT = Carriage Paid To

DAT = Delivered at Terminal

DAP = Delivered at Place

DDP = Delivered Duty Paid

EXW = Ex Works

FCA = Free Carrier

FAS = Free Alongside Ship

FOB = Free on Board

India's Seafood Export to the World

India shipped 17,35,286 MT of seafood worth ₹ 63,969.14 crore (US\$ 8.09 billion) during FY 2022-23 despite the several challenges in its major export markets like USA.

Export		* Values in USD Million				
Month/Year	Current Year: Value	Previous Year: Value	Monthly YoY Growth	Current Year: Cumulative Value	Previous Year: Cumulative Value	Cumulative YoY Growth
April, 2022	634	550	15.23%	634	550	15.23%
May, 2022	666	574	15.91%	1,300	1,124	15.58%
June, 2022	724	646	12.20%	2,024	1,770	14.35%
July, 2022	712	702	1.46%	2,736	2,472	10.69%
August, 2022	663	687	-3.38%	3,399	3,158	7.63%
September, 2022	720	678	6.18%	4,120	3,837	7.37%
October, 2022	720	808	-10.83%	4,840	4,645	4.21%
November, 2022	747	754	-0.97%	5,586	5,398	3.48%
December, 2022	699	720	-2.87%	6,285	6,118	2.74%
January, 2023	586	550	6.61%	6,872	6,668	3.06%
February, 2023	531	506	4.96%	7,403	7,174	3.19%
March, 2023	675	598	12.82%	8,078	7,772	3.93%
Total	8,078	7,772	3.93%			

Source: Department of Commerce, Govt. of India

Frozen shrimp remained the major export item in terms of both quantity and value while USA and China turned out to be the major importers of India's seafood. Frozen shrimp, which earned Rs 43,135.58 crore (US\$ 5481.63 million), retained its position as the most significant item in the basket of seafood exports, accounting for a share of 40.98% in quantity and 67.72% of the total US\$ earnings. The overall export of frozen shrimps during 2022-23 was pegged at 7,11,099 MT. USA, the largest market, imported (2,75,662 MT) of frozen shrimp, followed by China (1,45,743 MT), European Union (95,377 MT), South East Asia (65,466 MT), Japan (40,975 MT) and the Middle East (31,647 MT). The export of black tiger (BT) shrimp increased by 74.06%, 68.64% and 55.41% in quantity, rupee value and US\$ terms respectively in 2022-23. BT shrimp exported to the tune of 31,213 MT worth Rs 2,564.71 Cr (US\$ 321.23 million). Japan turned out to be the major market for Black Tiger shrimp with a share of 25.38% in terms of US\$ value, followed by the European Union (25.12%) and USA (14.90%). The Vannamei shrimp exports declined in 2022-23 compared to 2021-22 by 8.11% from US\$ 5234.36 million to US\$ 4809.99 million.

Frozen Fish, the second largest exported item, fetched Rs. 5,503.18 Cr. (US\$ 687.05 million) accounting for 21.24% in quantity and 8.49% in US\$ earnings. This year the export of Frozen fish has increased by 62.65%, 58.51% and 45.73% in Quantity, Rupee and US\$ value terms respectively.



Source: Department of Commerce, Govt of India

Under Other items, the third largest export basket worth US\$ 658.84 million, Surimi fetched ₹ 2,013.66 crore (US\$ 253.89 million), frozen Octopus fetched ₹ 725.71 crore (US\$ 91.74 million), Surimi Analogue products fetched ₹ 558.51 crore (US\$ 70.35 million), canned products fetched ₹ 326.48 crore (US\$ 41.56 million), frozen lobster fetched ₹ 215.15 crore (US\$ 27 million), along with other products.

Frozen Squid, the fourth largest export item, fetched ₹ 3593.75 crore (US\$ 454.61 million), accounting for 4.83 per cent share in quantity and 5.62 per cent in US\$ earnings. The export of frozen fish increased by 28.07% in Rupee value and 18.58 % in US\$ value. Export of Dried Items, pegged at 2,52,918 MT, showed a tremendous growth of 243.27% in quantity and 167.70 % in US\$ terms, and earned ₹ 3,080.92 crore (384.05 US\$ millions). Under this basket, Dried fish and shrimp meal together contributed US\$ 307.96 million and dried fish maws fetched US\$ 24.88 million.

Export of frozen Cuttlefish, pegged at 54,919 MT, showed a growth of 14.09 % in rupee value and 5.50 % in US\$ value, and earned ₹ 2353.34 crore (295.49 US\$ millions). Export of chilled items, which is considered as a promising sector, also increased by 20.73 % in US\$ terms and 12.63

% in Quantity terms. Export of live Items, pegged at 7,824 MT, showed a growth of 24.53% in Rupee, 15.61% in US\$ value. Growth is observed in the unit values of frozen squid (7.13%), frozen cuttlefish (13.33%), chilled items (7.19%) and live items (3.90%).

As for overseas markets, USA continued to be the major importer of Indian seafood in value terms with an import worth US\$ 2,632.08 million, accounting for a share of 32.52 % in terms of US\$ value. Exports to the US declined by 21.94% in US\$ terms due to sluggish demand. Frozen shrimp continued to be the principal item exported to the US with a share of 92.70% in US\$ terms. Exports of black tiger shrimp to the US increased by 4.06% in quantity terms and 0.26% in Rupee terms. China emerged as the second largest seafood export destination from India in terms of Quantity and US\$ both with an import of 4,05,547 MT worth US\$ 1,508.43 million, accounting for 23.37% share in quantity and 18.64% in US\$ terms. Exports to China market grew by 51.90% in quantity, 32.02% in Rupee value and 28.37% US\$ value. Frozen shrimp, the major item of exports to China, had a share of 35.94% in quantity and 60.92% in US\$ value while the frozen fish had a second most share of 34.88% in quantity and 18.56% in terms of US\$ value out of the total exports to China. Frozen shrimp and frozen fish to China have shown positive growth by quantity and value both. The European Union continued to be the third largest destination with an import of 2,07,976 MT worth US\$ 1,263.71 million. In this market, frozen shrimp is the major item of exports, registering an increase of 15.12% and 7.20% in Rupee and US\$ value, respectively. Unit value in this market shown a growth of 3.77%.

South East Asia is the fourth largest market with an import of 4,31,774 MT worth US\$ 1191.25 million. Frozen shrimp is the major item of exports, with 15.16% share by quantity and 35.17% by US\$ value with growth of 46.08%. Frozen fish, the second major item of exports, with 36.02% share by quantity and 20.57% by US\$ value with growth of 46.84%. Japan continued to be the fifth largest importer with a share of 6.29% in quantity and 5.99% in US\$ value terms with a growth of 9.99 %. Frozen shrimp continued to be the major item of exports to Japan with percentage share of 71.35% and growth of 5.26% in US\$ value. Exports to the Middle East by Quantity were 77,677 MT worth US\$ 330.68 million. This market showed a growth of 32.95% in quantity, 17.33% in Rupee and 9.09% in US\$ terms.

Present Status of Shrimp Commodity in US Market (Jan-March 2023)

Increasing debt ratio, ongoing recession, layoffs in jobs and many such factors in US lead to the reduction in import of seafood commodities in US particularly shrimp during first 03 months of 2023 (i.e. Jan to March).

Import of Shrimp Commodity in USA: Jan-March 2023					
Sr No	Name of the Country	Volume (MT)	Value (Million USD)	% Contribution	
				Volume	Value
1	INDIA	62767	516	34.67%	34.34%
2	ECUADOR	51559	345	28.48%	22.94%
3	INDONESIA	38179	313	21.09%	20.82%
4	VIETNAM	9169	98	5.06%	6.51%
5	THAILAND	5831	71	3.22%	4.76%
6	MEXICO	5195	71	2.87%	4.71%
7	ARGENTINA	3106	43	1.72%	2.85%
8	BANGLADESH	637	9	0.35%	0.59%
9	CHINA	1027	6	0.57%	0.40%
10	CANADA	418	5	0.23%	0.31%
Top 10 Total		177889	1475	98.25%	98.21%
All Countries Total		181056	1502	100.00%	100.00%

Source & Credit: US Customs, A2S2 Enterprises India

Considering the period of Jan-December for calculation, the average import of Indian shrimps in US per month was 25298 MT in 2022 which was dropped to 20922 MT in 2023 (Jan-March duration). Average value of Indian Shrimp product in US Import was 09.13 USD/Kg for the year 2022 which was dropped to 08.22 USD/Kg in 2023 (Jan-March duration). The more worrying thing is the average price of Indian shrimp in US market is consistently falling from 08.55 USD/Kg (Jan 2023) to 08.02 USD/Kg (Feb 2023) to 07.99 USD/Kg (March 2023). As per present industry interactions, the situation is not much positive for this commodity from India in US market for April and May 2023. Industry experts are also finding it difficult to predict the situations as global situations at other lead shrimp producing countries is also changing fast.

**Shrimp Commodity
Import: USA Market
(Export from India –
Imp Items): 2023**

SHRIMP WARM-WATER PEELED FROZEN FARMED		
Month	Volume (MT)	Value (Million USD)
January	16458	130
February	13999	104
March	13533	100
Grand Total	43990	335
SHRIMP FROZEN OTHER PREPARATIONS		
Month	Volume (MT)	Value (Million USD)
January	4112	42
February	2961	29
March	2702	26
Grand Total	9774	96
SHRIMP BREADED FROZEN		
Month	Volume (MT)	Value (Million USD)
January	64	0.46
March	31	0.19
Grand Total	95	0.65
SHRIMP WARM-WATER SHELL-ON FROZEN FARMED 21/25		
Month	Volume (MT)	Value (Million USD)
January	1451	12
February	817	6
March	967	8
Grand Total	3236	26

Source: US Customs, A2S2 Enterprises - India

**Shrimp Commodity
Import: USA Market:
Major Countries Month
wise Scenario: 2023**

2023	Volume (MT)	Value (USD)
INDIA	62767	516
January	24497	209
February	19568	157
March	18703	149
ECUADOR	51559	345
January	18718	124
February	15382	101
March	17459	120
INDONESIA	38179	313
January	14158	121
February	10419	84
March	13602	108
VIETNAM	9169	98
January	3899	41
February	2423	25
March	2846	32
THAILAND	5831	71
January	2678	33
February	1233	15
March	1920	23

Note: Value is in Million USD

Source: US Customs, A2S2 Enterprises - India

Tilapia: Highly Export Potential Candidate Fish Food Species

Global wild and farmed tilapia production increased nearly 100 times from 69,710 tonnes in 1950 to 68,82,202 tonnes in 2018. As of 2018, around 125 countries are producing tilapia through some form (that means either wild or farmed). The top 03 largest tilapia producing countries are China, Indonesia and Egypt. Top 20 largest tilapia aquaculture countries accounted for 97% of the world production in 2018.

In 2022, global trade of tilapia reached to 1.63 billion USD through import with volumes of about 4,53,514 tonnes. Internationally tilapia is traded mainly through four types:

1. Fresh or chilled tilapia
2. Frozen tilapia
3. Fresh or chilled fillets of tilapia
4. Frozen fillets of tilapia

World Import of Tilapia Products

The World Import of Tilapia brought the trade value of about **USD 1.63 Billion** & saw volumes of **453514 Tonnes**

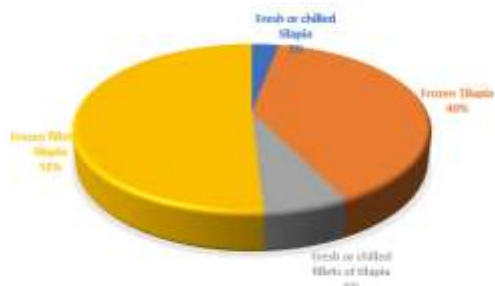
Value	2020		2021		2022	
	USD 1000	Share %	USD 1000	Share %	USD 1000	Share %
Fresh or chilled tilapia	57,974	5%	61,884	4%	72,438	4%
Frozen Tilapia	2,61,620	20%	3,45,702	23%	3,53,494	22%
Fresh or chilled fillets of tilapia	1,91,959	15%	1,96,684	13%	2,23,694	14%
Frozen fillets of tilapia	7,75,359	60%	8,87,115	59%	9,83,539	60%
Total Tilapia Products	12,86,912	100%	14,91,385	100%	16,33,165	100%

Quantity	2020		2021		2022	
	Tonnes	Share %	Tonnes	Share %	Tonnes	Share %
Fresh or chilled tilapia	20,836	5%	19,344	4%	13,288	3%
Frozen Tilapia	1,94,079	45%	2,22,540	43%	1,80,154	40%
Fresh or chilled fillets of tilapia	29,188	7%	28,087	5%	29,270	6%
Frozen fillets of tilapia	1,82,544	43%	2,49,800	48%	2,30,802	51%
Total Tilapia Products	4,26,647	100%	5,19,771	100%	4,53,514	100%

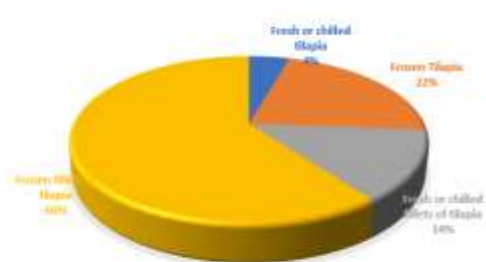
Source & Analysis: UN Comtrade / ITC Trade Statistics & A2S2 Enterprises

Product Composition of World Tilapia International Market 2022

World Tilapia International Market, Quantity 2022



World Tilapia International Market, Value 2022



Source & Analysis: UN Comtrade / ITC Trade Statistics & A2S2 Enterprises

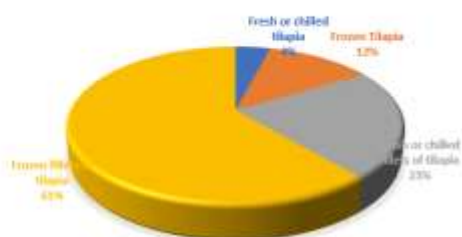
The top 10 countries are contributing to more than 82% in the global import trade of tilapia with USA being on the top with more than 50% contribution.

Major Import Markets of Tilapia 2022

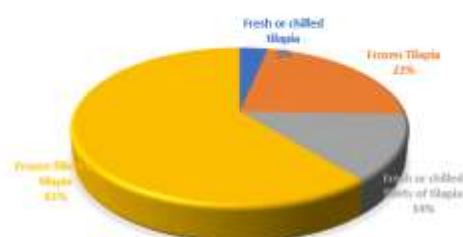
Top 10 Tilapia Markets		Tilapia Import in Each Market 2022				
Sr No	Country Name	Value (1000 USD)	% Share	Quantity (Tonnes)	% Share	Price/Kg (USD)
1	United States of America	849148	51.99%	177459	39.13%	4.79
2	Mexico	151718	9.29%	55658	12.27%	2.73
3	Israel	103908	6.36%	20644	4.55%	5.03
4	Côte d'Ivoire	72861	4.46%	51575	11.37%	1.41
5	Canada	60403	3.70%	11239	2.48%	5.37
6	Costa Rica	29129	1.78%	9289	2.05%	3.14
7	Netherlands	24783	1.52%	6884	1.52%	3.60
8	Germany	19915	1.22%	3686	0.81%	5.40
9	Colombia	17981	1.10%	5993	1.32%	3.00
10	Mali	17404	1.07%	7777	1.71%	2.24
Sub-Total		1347250	82.49%	350204	77.22%	3.85
Rest of the World		285915	17.51%	103310	22.78%	2.77
World		1633165	100.00%	453514	100.00%	3.60

Source & Analysis: UN Comtrade / ITC Trade Statistics & A2S2 Enterprises

United States of America: Import of Tilapia 2022



Value	2022	
	USD 1000	Share %
Fresh or chilled tilapia	34,242	4.03%
Frozen Tilapia	1,04,007	12.25%
Fresh or chilled fillets of tilapia	1,91,335	22.53%
Frozen fillets of tilapia	5,19,564	61.19%
Total Tilapia Products	8,49,148	100%



Quantity	2022	
	Tonnes	Share %
Fresh or chilled tilapia	5,832	3.29%
Frozen Tilapia	39,509	22.26%
Fresh or chilled fillets of tilapia	24,015	13.53%
Frozen fillets of tilapia	1,08,103	60.92%
Total Tilapia Products	1,77,459	100%

Source & Analysis: UN Comtrade / ITC Trade Statistics & A2S2 Enterprises

United States of America: Import of Tilapia 2022

Top 10 Tilapia Products Exporters to USA, 2022						
Sr No	Exporter Name	USD 1000	% Share	Q (Tonnes)	% Share	Price (USD/Kg)
1	China	461716	54.37%	116292	65.53%	3.97
2	Colombia	121655	14.33%	16713	9.42%	7.28
3	Honduras	76763	9.04%	9856	5.55%	7.79
4	Indonesia	61682	7.26%	7217	4.07%	8.55
5	Taipei, Chinese	44949	5.29%	12113	6.83%	3.71
6	Costa Rica	32096	3.78%	3855	2.17%	8.33
7	Brazil	23016	2.71%	5422	3.06%	4.24
8	Mexico	5900	0.69%	916	0.52%	6.44
9	Malaysia	5246	0.62%	758	0.43%	6.92
10	Thailand	5089	0.60%	1964	1.11%	2.59
Sub Total		838112	98.70%	175106	98.67%	4.79
Rest of the World		11036	1.30%	2356	1.33%	4.68
Total		849148	100.00%	177462	100.00%	4.78

Source & Analysis: UN Comtrade / ITC Trade Statistics & A2S2 Enterprises

Overall, globally the most favored form of tilapia is frozen fillets and value wise it is a right proposition to consider for the expansion of the tilapia business.

Tilapia carries a significant proportion of protein; its taste is delicious and acceptable in various channels of the business and most important it is economical. Considering the global food crisis situation, the tilapia can become one of the ideal foods for global population. As per IMF report, 345 million people impacted & exposed to acute food insecurity in 2023 where as more than 828 million people go to bed hungry every night which is an alarming situation.

Government of India has started giving huge focus for the development of tilapia in the country since last few years and putting serious efforts to support this commodity to grow on sustainable levels. Estimated tilapia production in the country was about 70000 tonnes in 2020 out of which contribution of aquaculture were 30000 tonnes & wild caught production was 40000 tonnes. India exported around 4682 tonnes of tilapia products to the global market in 2021 with value of 4.72 million USD which was negligible.

India's Export of Tilapia Products (2019-2021)

India exported the Tilapia worth of 4.72 Million USD with 4682 MT volumes

Value	2019		2020		2021	
	USD 1000	Share %	USD 1000	Share %	USD 1000	Share %
Fresh or chilled tilapia	20.00	0.92%	3.00	0.20%	2.00	0.04%
Frozen Tilapia	2,159.00	99.08%	1,488.00	99.80%	4,714.00	99.87%
Fresh or chilled fillets of tilapia					2.00	0.04%
Frozen fillets of tilapia					2.00	0.04%
Total Tilapia Products	2,179	100%	1,491	100%	4,720	100%
Quantity	2019		2020		2021	
	Tonnes	Share %	Tonnes	Share %	Tonnes	Share %
Fresh or chilled tilapia	7.43	0.40%	0.98	0.07%	1.40	0.03%
Frozen Tilapia	1,863	99.63%	1,375	99.93%	4,679	99.94%
Fresh or chilled fillets of tilapia					1.00	0.02%
Frozen fillets of tilapia					1.00	0.02%
Total Tilapia Products	1,870	100%	1,376	100%	4,682	100%

Source & Analysis: UN Comtrade / ITC Trade Statistics & A2S2 Enterprises

India's Overall Tilapia Export to National Markets (2021)

India exported Tilapia to around 30 Export Markets in 2021

Top 10 National Export Markets for Indian Tilapia (2021)				
Sr No	Name of the Export Market	USD 1000	Q (Tons)	Price (USD/Kg)
1	United Arab Emirates	1475	1446	1.02
2	Mozambique	546	788	0.69
3	Kenya	344	355	0.97
4	Kuwait	298	215	1.39
5	Cameroon	286	278	1.03
6	France	239	125	1.91
7	United Kingdom	235	129	1.82
8	Côte d'Ivoire	201	245	0.82
9	Qatar	166	180.38	0.92
10	Nigeria	121	94	1.29
Sub-total		3911	3855.38	1.01
Rest of the World		811	829	0.98
World		4722	4684.38	1.01

Source & Analysis: UN Comtrade / ITC Trade Statistics & A2S2 Enterprises

As per official records, almost all the export from India for tilapia has been happened for the frozen whole tilapia whereas globally the major trade is happening in frozen fillets. The price in an international market for fillet is better and gives good returns to the producers. India should start focusing making market ready for selling fillets domestically and also in the export market to fetch good pricing with volumes. Also, it is possible that few countries may give good price for whole tilapia however we should identify such markets with care and start experimenting. In 2022, India sold frozen whole tilapia to US and fetch better price in comparison with price the country has received by selling same product to other countries.

India's Export of Frozen Whole Tilapia to US (2022)

INDIA TILAPIA EXPORT to US MARKET: JAN-DEC 2022				
Month	Product Name	Quantity (MT)	Value (USD)	Value (USD/Kg)
September 2022'	TILAPIA WHOLE FROZEN	24.30	108378	4.46
October 2022'	TILAPIA WHOLE FROZEN	20.91	64400	3.08
		45.21	172778	3.82

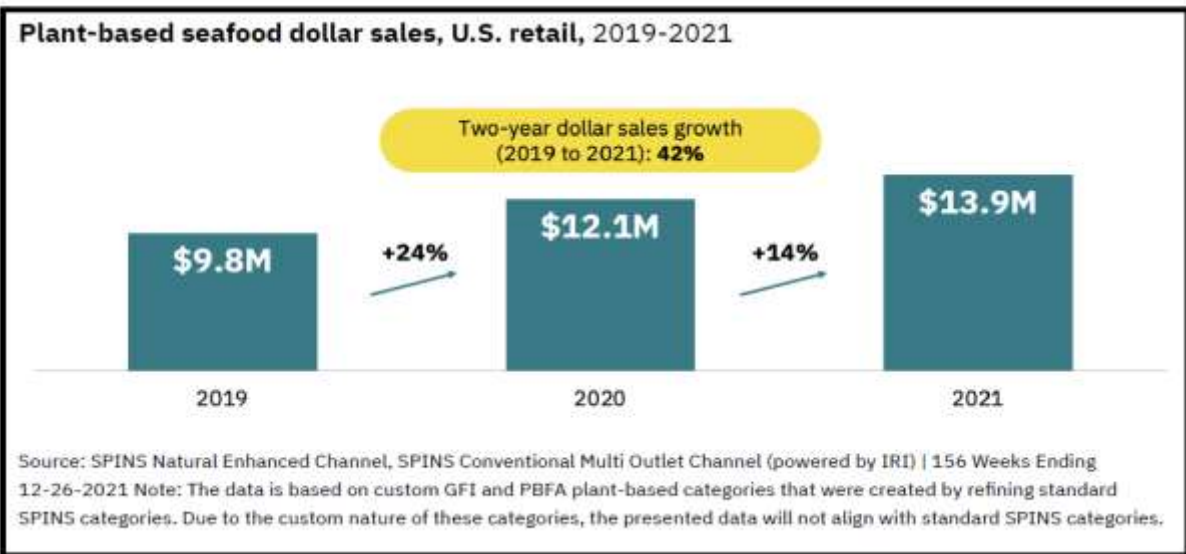
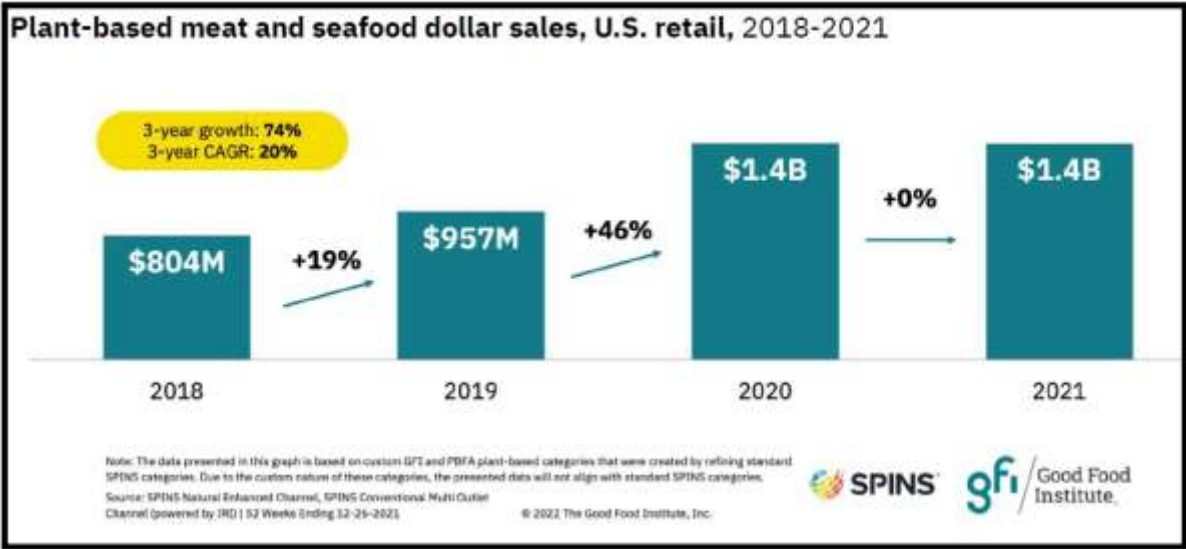
Source: US Customs, Analysis: A2S2 Enterprises India

Tilapia is among the top 05 fish species in terms of sale in United States of America. This species is robust to environment conditions, grows faster, have high protein and can be sold in an economical pricing when volume meets so it has high potential to become a major food in the world at a time when food crisis is rising. Present is the right time to push the sales of this species from India in domestic and export market with right strategies.

Alternative Seafood

Collectively termed Alternative Seafood, is plant-based, fermentation derived and cell-based seafood which are emerging as a new source of food with potential to augment future food supplies. Alternative seafood is comprised of all plant-based, fermentation-derived & cell-based seafood alternatives that mimic the taste, texture, appearance and/or nutritional properties of conventional seafood. This concept is spreading faster and various companies and organizations are involved in this segment on global scale.

Plant based meat & seafood retail sales in US grown significantly from US \$ 804 million in 2019 to US \$ 1.4 billion in 2020 however the growth remains stagnant from 2020 to 2021. From 2019 to 2021, plant-based seafood grew 42 percent. 2021 saw dollar sales growth in both plant-based shellfish and plant-based fish. Plant-based shellfish, which includes plant-based analogs for shrimp, scallops, and crab, grew 30 percent, and plant-based fish grew 9 percent. By composition in Alternative seafood, plant-based fish category & plant-based shellfish category did 10.4 US \$ million & 3.5 million US \$ retail sales respectively in US market in 2021. Eight new plant-based seafood products saw their first sales in U.S. retail in 2021.



The plant-based seafood sales are growing in United States of America and it has been initiated in rest of the countries in the world but uptake is very slow yet. One of the main challenges is the taste in comparison with traditional seafood and price. It must be worked upon and yet none of the company has achieved 100% result or acceptance on taste level. The efforts for fermentation-derived seafood are progressing fast and few companies are at a stage to launch the products soon. The launch of cell-based seafood in market on commercial level is yet challenging though few companies have received the approval for sales and product tastings with customers has also been done on experimental basis.

The “Alternative Seafood” may grow well in next few years and will support the existing traditional seafood industry. In India, the development of alternative seafood is very much slow but good thing is professionals, academia and government is aware about it and closely watching the

sectoral development in other regions of the world.

Some suggestive reading for the alternative seafood is as below:

1. “Global Overview of Alternative Seafood and Status in India”, MPEDA Newsletter, Volume X, No 04, July 2022 (<https://mpeda.gov.in/wp-content/uploads/2022/11/8-MNL-JULY-2022-FOR-WEB.pdf>).
2. “Dominant Trends in the Emerging Alternative Seafood Market: Focus on Asia”, INFOFISH International, Issue 5/2022/September-October (http://infofish.org/v4/images/2022/ii/ii_5%EF%80%A22022_FA.pdf).
3. “Innovative Doubletake of Seafood”, NUFFOODS Spectrum India, June 2022 edition (<https://www.linkedin.com/feed/update/urn:li:activity:6937762367560634368/>).
4. Alternative pioneers have raised \$178m this year (2022), Fish Farming Expert (<https://www.fishfarmingexpert.com/alternative-seafood/alternative-seafood-pioneers-have-raised-178m-this-year/1146830>).

Conclusion

India is one of the major seafood producer and contributor in this category on global level. The status of aquaculture in India is at significant level though largely dependent on shrimp commodity. The other commodities of seafood are playing good role and through export, various players have started understanding the potential however much more focus must be given by all stakeholders to promote the sustainable seafood through targeting more varieties by critically studying the global market. Tilapia is one of such highly potential species which fits perfect by considering various factors at the global level. India has a capacity to play the major role in sufficing the global food demand by feeding rising global population and all right strategies with clear focus and approach require achieving that goal.

Chapter 5

EMPLOYMENT AND ROLE OF FISHERWOMEN IN FISH MARKETING

Dr. Nikita Gopal

Principal Scientist, ICAR-Central Institute of Fisheries Technology, Cochin, Kerala

Introduction

The perspective on roles that men and women play in fisheries and aquaculture is highly gendered and is dependent on socio-cultural factors. Men are perceived to be involved in fishing and women in post-harvest activities.

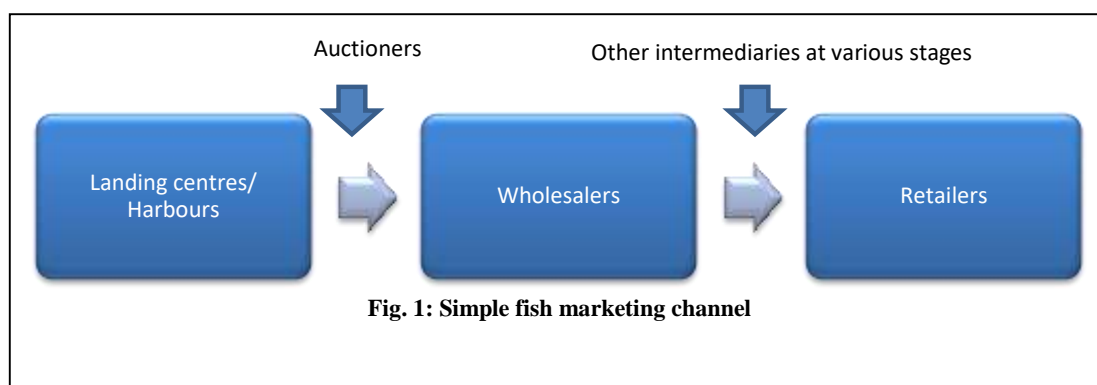
Though women are predominantly engaged in postharvest fisheries like pre-processing, processing, marketing, value addition and other allied activities, in fish value chains, women are found in all nodes. While they are rare in industrial fishing, their contribution to fish production is significant in small scale fisheries (Harper et. al., 2022). This is also true in inland fish production and in aquaculture where women are involved in several key production activities. Women in several coastal states are engaged, along with the menfolk, in harvesting fish (Gopal and Ananthan, 2021) and later also marketing the harvested fish like the gill net fishery in Ratnagiri in Maharashtra. Women in other inland states also fish in water resources like reservoirs, lakes, ponds, kole lands, backwaters and bheels, either singly or in groups; as husband-wife teams or in small groups (that can be women-only) or larger groups of men, women and children engaging in community fishing which are carried out during certain times of the year and have cultural connotations (Inaotombi, 2016).

Women dominate fisheries post-harvest. Women are key links in fish reaching the consumer as they engage in fish retailing. Traditionally when fishing was still small scale women were key players in landing places with their work starting right from sorting catches to marketing fish and processing excess fish through traditional methods like drying,

smoking, fermenting and pickling. Much of this work however was seen as extension of reproductive roles and was not considered economic activity (except for marketing which brought in cash incomes). The dried fish they help produce also had economic value, however marketing of this is generally taken over by men, and women deal with sale of smaller quantities. The traditional fermenting process that is carried out in several North-Eastern states in India is still a woman centric and the products have been an important ingredient in household diets ensuring protein availability, but marketing at commercial scale is now being carried out by men (Uchoi et. al., 2022).

Women in fish marketing

In marketing fish, about 75% of labour is by women. Marketing of fish is a complex activity with many intermediaries along the marketing channel. A simplified marketing channel would involve fish being landed in landing centres or harbours and reaches the consumer after passing through several markets like wholesale and retail markets. The employment of women along this marketing channel is dependent on the channel itself, the changes that are taking place in the channel as well as factors outside the marketing channels that has an impact on the channels.



There are several modes of fish vending in our country. One is vending in shops or establishments that sell fish and probably other meat products. Many men vendors use two and three wheelers to vend fish using plastic crates to store and carry the fish. There are small sellers in fish markets and on roadsides who sell fish in very small volumes. And then there are headloaders who carry the fish in bamboo or



Pic. 1: Woman headloader (Tamil Nadu)

aluminium baskets and sell it door-to-door. Women are mostly headloaders or small petty traders in markets or roadsides. Their work is thus largely informal and they come under unorganised labour who find access to benefits and schemes difficult.

Lessons from earlier evidence

Some earlier studies reinforce what is already known about women's marketing work. Women who earlier had access to fish near their fishing villages have now been deprived of this due to changes taking place in fishing (Gopal et. al., 2014). With fishing vessels becoming mechanised landings have shifted to harbours far away from fishing villages. Women, who have to also look after their household responsibilities, find it difficult to travel to the harbours. They have been eliminated from the marketing system. Women now pool resources and travel to harbours and source fish. They are also not able to participate in the auctions directly as the volumes of fish traded has gone up and they do not have the capacities to absorb these volumes of fish for marketing. So they wait for larger traders or wholesalers to first buy the fish and then source fish from them after one or more intermediaries have traded it. It was also easier for women to get cheated on weights and quality in wholesale markets.

In a study in Patna, Bihar, researchers found that women were slowly being pushed out of fish retailing (https://www.genderaquafish.org/wp-content/uploads/2019/01/STAT_O5_Meghna-Sinha.pdf). They studied 8 different retail markets and found that women were proficient at handling fish such as sorting cutting and marketing skills (weighing and price negotiation) even though they were poorly educated. The fisherwomen were basically confined to smaller retail markets and several issues like poor sanitation and water supply and improper drainage. There are limited organised state run markets and women find it difficult to access these areas and most fisherwomen opt for door to door fish vending.

Women also are facing increasing competition from male vendors. This has been exasperated during the pandemic with a lot of unemployed men taking up fish vending as a viable livelihood activity. A recent ICAR-CIFT study also reinforced these trends with women buying more from secondary rather than primary markets and in smaller volumes. They were more into door-to-door vending and continued to face issues of lack of credit, poor infrastructure (not gender related but impacting women more than men), poor access to fish etc. The issues were related to market structure and conduct as well as systemic in nature with poor facilities to store fish lack of basic facilities like toilets and potable water, lack of night shelters etc. Still traditional occupation

Some emerging trends

It is now well documented that disasters and shocks have differential impacts on men and women (Defiesta and Badayos-Jover, 2014). During the recent COVID-19 pandemic it was reported that women's work had increased, especially that related to reproductive roles like domestic, unpaid, care giving work. The lockdown restrictions had made harbours and markets inaccessible. There were also reports of increased violence against women. Though things have returned to normal, with the pandemic all but forgotten, the lessons learnt need to be nurtured.

One of the major changes that occurred was the influx of new players in fish retailing. Men on two and three wheelers were already a competition to women vendors but the numbers increased as this was an easy livelihood option that people out of jobs could take up. Women were ill equipped to face this competition as women had not though that this could be an option.

Lesson 1 : Adapt; Meet and beat competition



Pic. 2: Ramani Mani who sells fish on a two wheeler, Ernakulam, Kerala (Snap shot from WSI website where a film on her won a prize: Makers: Jiswin Joseph & Sijitha

However there are examples of women who have adopted the same strategy (see picture 2). Other women’s groups have also taken to skilling their members in driving two wheelers to do door-to-door delivery.



Pic. 3: News report on bus service for fisherwomen, Kerala

Several novel initiatives were taken by state agencies as well as NGOs during the pandemic. These included training given by Institutions like ICAR-CIFT on use of fish vending kiosks and special bus services for fisherwomen to reach places of operation. Under the

Society for Assistance of Fisherwomen (SAF), Department of Fisheries, Government of Kerala, using the CSR funds of the Cochin Shipyard Limited, fish vending kiosks have been distributed to women groups. The bus service was an initiative of the state government which solved issues of travel for women

The lesson from these initiatives are:

- **Diversify**
- **Ensure legal and other rights enforced**
- **Effectively utilise policy support mechanisms**



Pic. 4: Women being trained in using the kiosk at ICAR-CIFT under the SAF collaborative program

The fish vending kiosks which were given to women SHGs were assessed to find out operational issues and impacts. Of the 20 that were distributed, 11 were in use and the rest in various stages of disuse. The reasons included socio-personal as well as

technical issues. The technical issues can be addressed by resolving the technical problems. Issues like poor market potential in areas where the kiosks were supported are systemic in nature and needs institutional support mechanisms. Identification of stakeholders is an important step in successful implementation of any scheme or programme. Some of the challenges included poor maintenance leading to need for repairs, poor sale of fresh fish due to competition from door-to-door vendors, need additional inputs like freezer and ice boxes. These initiatives can be expanded in a phased manner through appropriate government schemes.

The lesson from this programme are:

- **Effective convergence needed to address felt needs**
- **Technologies can be utilised for employment and income generation – supported by capacity building**
- **Successful models exist to learn from**
- **Can be extended spatially**

An initiative by an NGO, SEWA, is a case in point on how with proper planning and implementation an emerging opportunity can be exploited. SEWA started the SEWA Livelihood initiative in Kerala through opening of food counters and food cart that are managed and run by fisherwomen. They have begun using social media like Facebook and WhatsApp to promote their products and have diversified their product base as well to include tea time snacks, spices etc. This has been able to provide and widen their customer base.

LESSONS:

- **New models need to be tried (social media, swanky outlets, more products..)**
- **Consumer demand to be met**
- **Modernisation and diversification**
 - **Products, process**
- **Schemes can be tapped into**

Fisherwomen in several states are today using WhatsApp to keep a record of their customers and send them information on the day's fish and prices for them to place their orders. These new systems of marketing can be better utilized by women with greater awareness and support by Institutions on how to use these media.

Conclusion

Marketing is still a major livelihood option for fisherwomen. However, traditional ways of marketing are seeing a change and there is need to equip women to meet these changes and take advantage of the opportunity it offers. New modes and models need to be adopted through development of new skills, technologies and inputs. This requires specific schemes and greater convergence of institutions.

Marketing is a domain where women work in large numbers. Streamlining marketing activities and infrastructure, and ensuring women safe and secure access to these spaces is very important. Sufficient access to credit to enable participation at all levels of marketing including primary markets is also to be ensured. To enable women to compete with male

counterparts, skill development in using 2 and 3 wheelers that can extend their operation and can also be time saving is essential and specific State schemes are required for this. Access to modern marketing technologies and strategies is also essential that requires capacity building. Women are already on their own using mobile phones to reach consumers, but they can be equipped to enter into the e-marketing space. Women vendors need to ply their trade in safe and secure environment and this requires strong legal protection. Licensing for fish vending work is to be introduced. Just like in marketing, in other activities along fish value chains, safe work spaces must be ensured so that women can carry out activities with dignity and confidence. New collectives or increased participation in existing collectives need to be built through State or non-State supported actions, so that the voices of women are reflected in decision-making in fisheries and aquaculture on all aspects as all activities affect the participation of women, either directly or indirectly.

References

1. Defiesta, G.D and Badayos-Jover, M. B, 2014, Do Catastrophes Exacerbate Gender Bias? An Analysis of Coastal Women's Experiences of Economic Marginalisation in a Disaster Context, *Gender in Aquaculture and Fisheries: Navigating Change Asian Fisheries Science Special Issue 27S (2014): 97-109* ©Asian Fisheries Society.
2. Gopal, N. and Ananthan, P.S., 2021, workers in small scale fisheries in India, paper presented at the webinar 'Women Work in Fisheries, Too!', November 29, 2021, organised by GAF Section and SUFIA Project of the USAID Regional Development Mission Asia, ICAR-CIFT and SOFTI.
3. Gopal, N., Leela Edwin And B. Meenakumari (2014) Transformation in Gender Roles with Changes in Traditional Fisheries in Kerala, India, *Gender in Aquaculture and Fisheries: Navigating Change Asian Fisheries Science Special Issue 27S (2014): 67-78.*

4. Harper, S., Kleiber, D. and Gopal, N., 2022, A first look at findings on gender and small-scale fisheries by the Illuminating Hidden Harvests project, SPC Women in Fisheries Information Bulletin #35, March 2022, p.4-5.
5. https://www.genderaquafish.org/wp-content/uploads/2019/01/STAT_O5_Meghna-Sinha.pdf.
6. Inaotombi, S and Mahanta, C, 2016, Fisheries Related Traditional Knowledge of Meitei Community of Manipur, India, 2016, Gender in Aquaculture and Fisheries: The Long Journey to Equality Asian Fisheries Science Special Issue 29S (2016): 181-191.
7. Uchoi, D, Kishore, P., Kumar, A., Nadella, R. K., Oanda, S. K., and Zynudheen , A. A., 2022, Prevailing challenges in Processing of Fermented Fishery product ‘Shidal’ in Tripura, India and Solutions Fishery Technology 59 (2022) : 26 – 32.

Chapter 6

DEVELOPMENT OF INTEGRATED FISH MARKET AND PRICE INFORMATION SYSTEMS (FMPIS) FOR INDIAN FISHERIES SECTOR

Dr. Shyam S Salim

ICAR - Central Marine Fisheries Research Institute, Kochi

Fisheries economy of India – Some key facts

- Global position – 3rd in Total
- Contribution of Fisheries to GDP (%) –1.02
- Contribution to Agricultural GDP (%) –5.23
- Annual Export earnings (Billion \$) – 7.78
- Employment sector (million)– (14.00)
- Production –14.16 MT
- Unit value realisation (₹/kg) – 102

Fish demand and anticipated supply - India

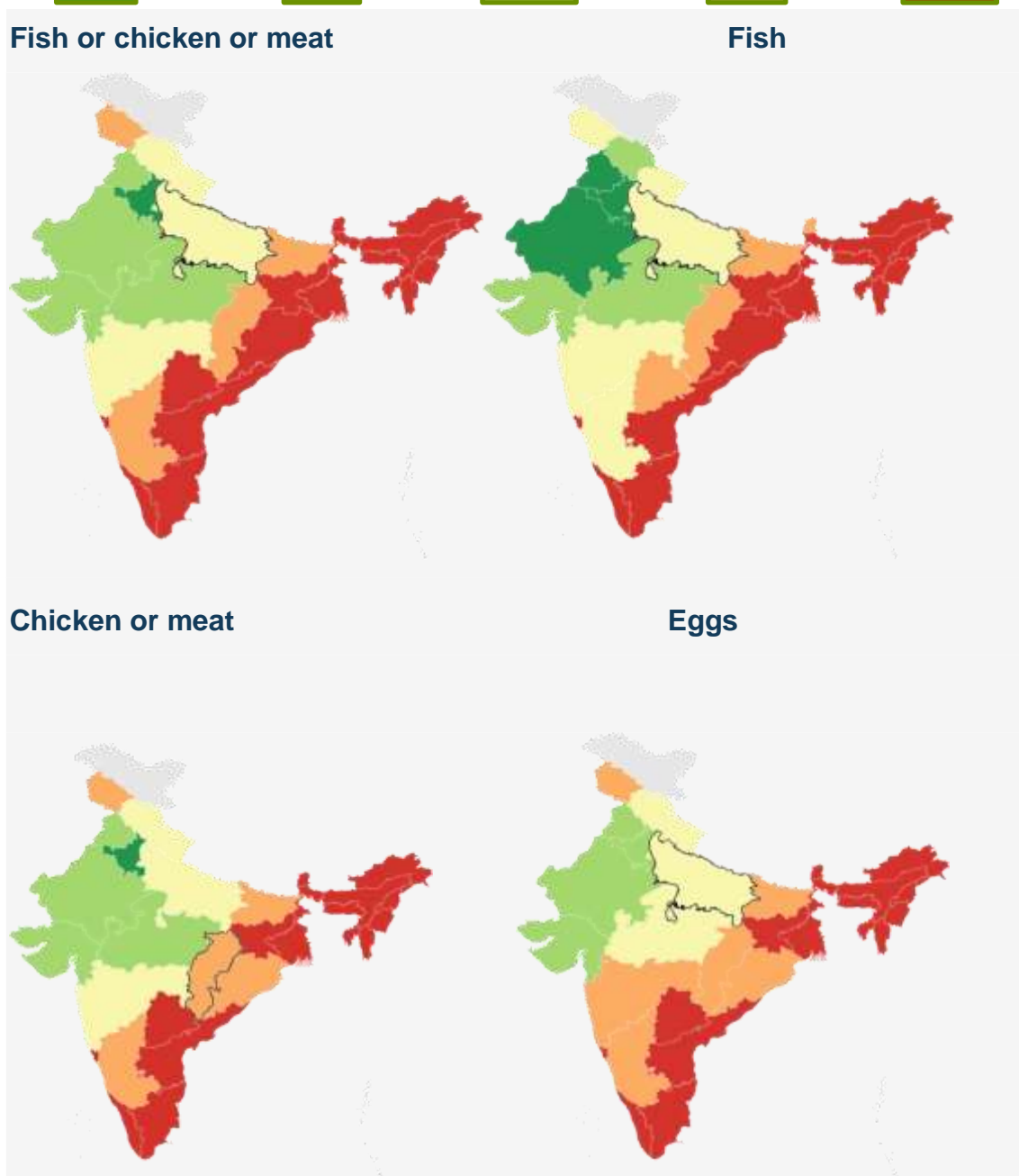
Year	2020	2025	2030	2035
Population in Billion	1.36	1.45	1.53	1.62
Fish eaters (%)	60	65	70	70
Per capita annual fish consumption (kg)	8	9 (12)	10	11
Total fish demand (M. ton)	6.53	8.48	10.71	12.47
Sector				
Marine fish (M.ton)	3.5	4	4.25	4.5
Inland (M.ton)	10.66	12.25	13.5	15
Total supply	14.16	16.25	17.75	19.5
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
Total supply (M.ton)	9.88	9.75	10.64	11.69
Supply - Demand Gap	3.35	1.27(-1.56)	-0.07	-0.78

Source: Shyam S Salim (2013)

Consumption

Data from the National Family Health Survey-5 show that in over half of the 30 States/ UTs analysed, more than 90% of the population consumed fish or chicken or meat daily or weekly or occasionally

<25% population 25%-50% population 50%-90% population 75%-90% population >90% population



In 15 States it was >90%, in six States/UTs it was 75- 90%, in five States/UTs it was 50-75% in four States it was 25-50% and in no State was it <25%

Need for Fish Market Price Information Systems (FMPIS)

- Marketing efficiency are quite low
- Fish production / consumption is on the rise
- Geographical separation between production and consumption centres
- Market News/ Intelligence is minimal
- Price spreads huge with fishers getting minimal share
- Fish distribution needs interventions
- There are accessibility / affordability/ availability
- No economics of scale in landings/ distribution/ trade

FMPIS - Prototype Developed by ICAR- CMFRI-2016

The Institute funded project developed an integrated fish market grid system facilitating decision support on markets and prices from 400 fish markets with weekly prices. The markets included landing centre/ wholesale / retail markets and production centres, terminal markets.

Features of FMPIS

- Decision support system with spatio-temporal parameters
- Fish markets will be mounted on a GIS platform (Latitude – Longitude)
- MS Access will offer historical price data
- Market structure and dimensions
- Price information –trends in prices

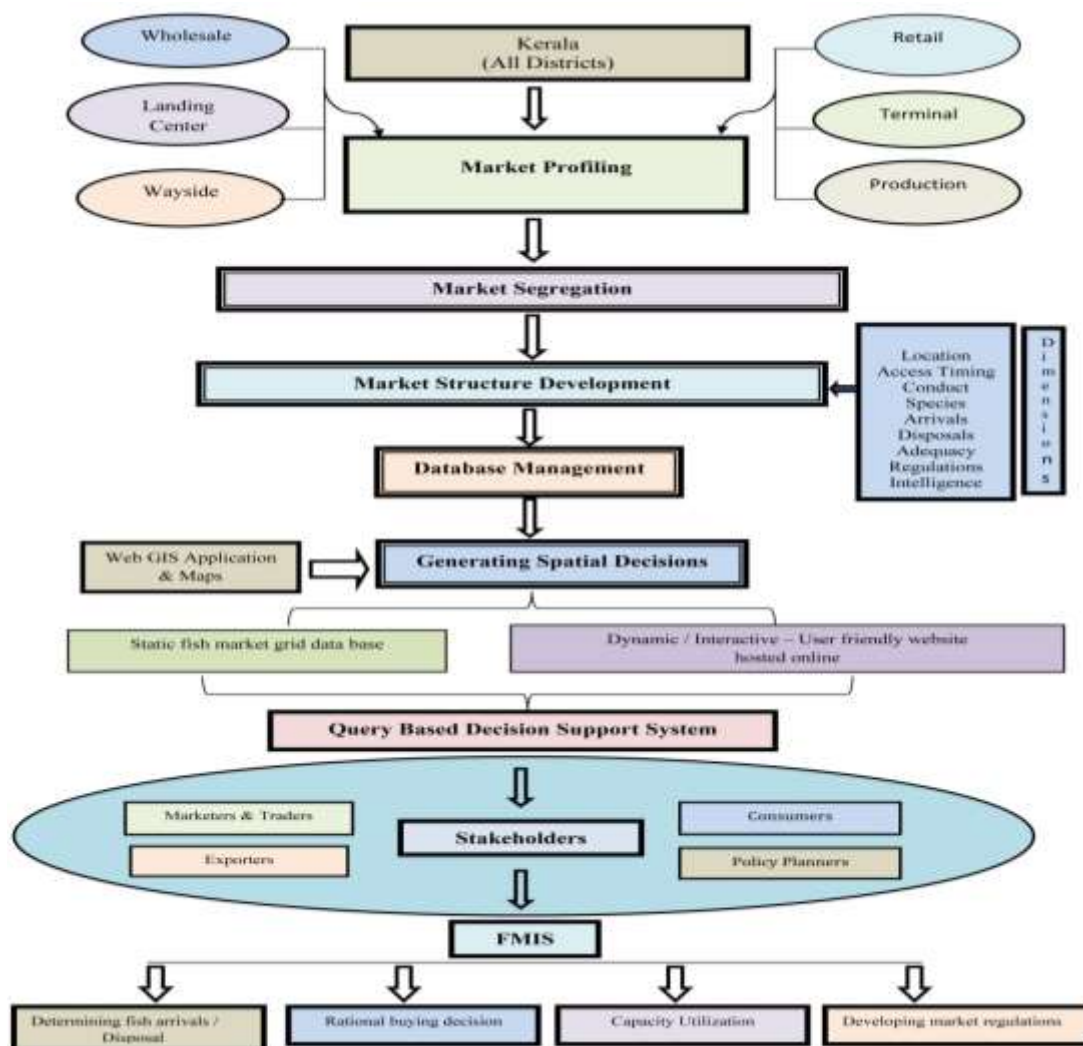
Fish market grid and its components



Dimensions of the market are as follows:

Location, access, timing, conduct, species, arrivals, disposals, adequacy, regulations and intelligence are the components of fish market grid.

Fish Market Information System (FMIS) for Kerala



Possible queries of interest to stakeholders

- Market access (Transport)
- Timings (Day / Night)
- Market profile (Sellers and Buyers)
- Fish arrival and disposal (Intra / inter state)
- Quantity of species available
- Adequacy (Facilities – parking / cold storage)
- Price range
- Market information (News and intelligence)

Working model

ICAR-CMFRI, Cochin has bagged the Outstanding ICAR Institution Award Winner for the year 2007 owing to the proposed market grid initiative for the dimension of fish markets and its prices on a spatio-temporal dimension.



Indian Fish Market Grid- An overview



Decision support system

State:
 District:
 Market:
 Species:
 Type:
 Check:
 Price:

Query

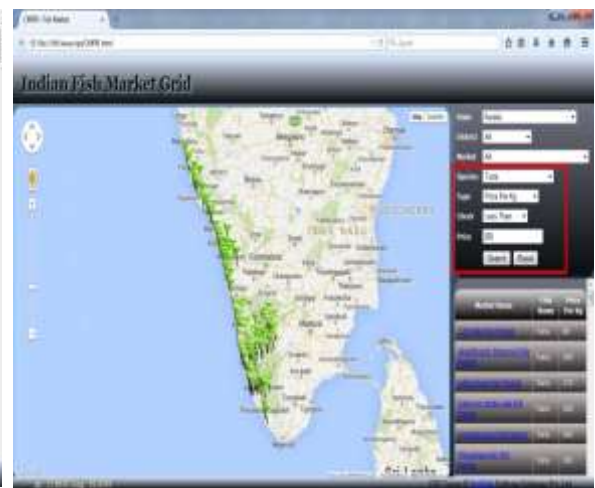


Map layer

Market Name	Fish Name	Price Per Kg
11th Mile Fish Market	Tuna	80
Abdulkhadar Memorial Fish Market	Tuna	100
Kakkazham Fish Market	Tuna	170
Kalavoor whole sale fish Market	Tuna	160
Komalapuram Fish Market	Tuna	160
Mangalapuram Fish Market	Tuna	100

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Output



Query based output for Tuna



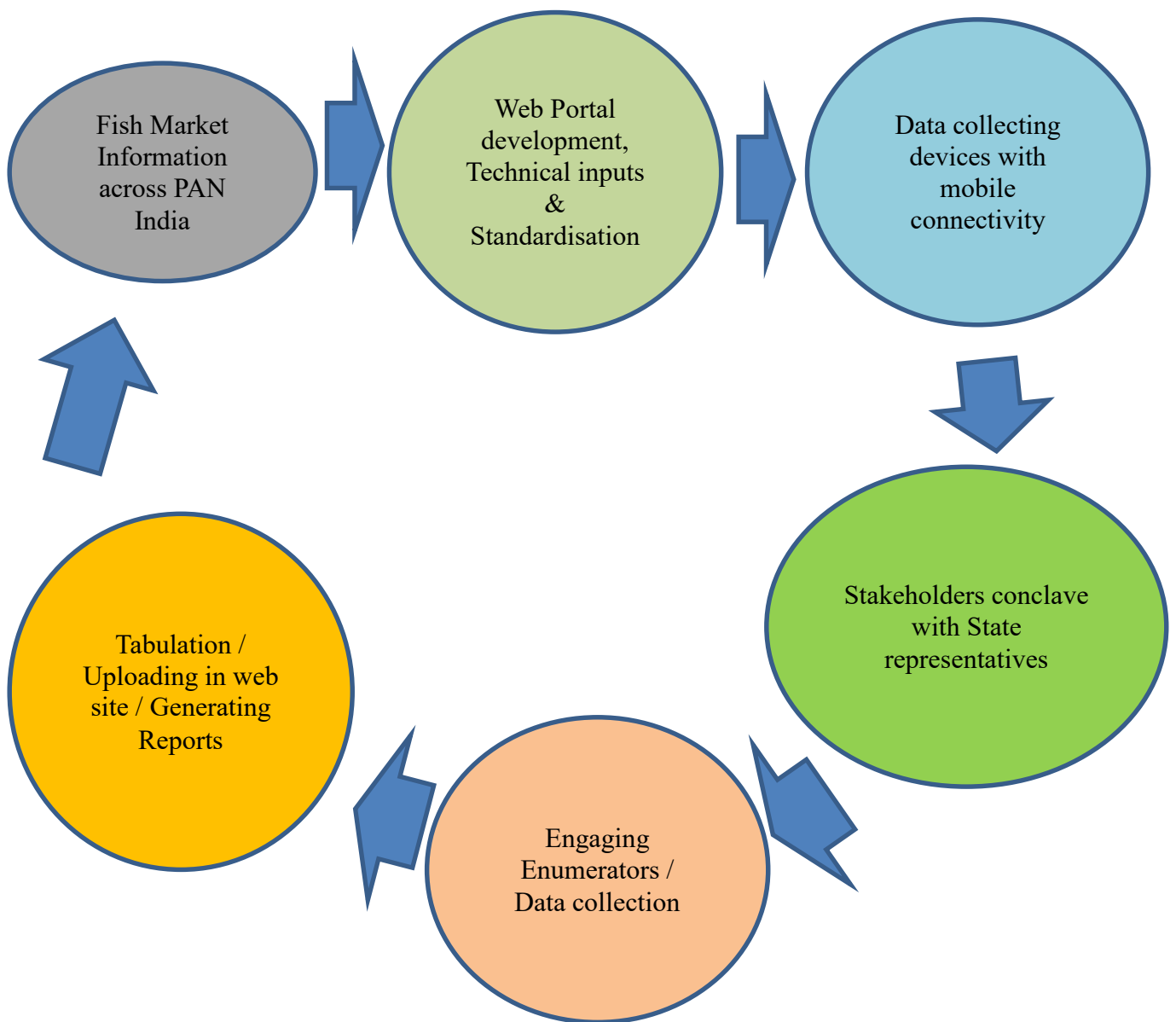
Query based output for Shrimps

e-marketing intervention in Indian fisheries sector

National Fisheries Development Board, Hyderabad, ICAR – CMFRI, Cochin and Department of Fisheries, Kerala jointly developed the Integrated Fish Market and Price Information Systems (FMPIS) for Indian fisheries sector with the budget outlay of ₹128.78 lakhs for a period of three years from 2018 to 2021 with the following objectives:

- Development a fish market information system (FMIS) across the country
Activities include market profiling of Indian fish markets, personnel, market data base development (data pooling, loading in created schema, quality checks and analysis), data storage and registering queries, information retrieval in fish market structure database
- Developing a temporal price data base (FISHPRICES) for the traded commercially important fish species
Activities include identification of the commercially important species, developing data collecting protocol, developing a time series data base on fish prices collected on weekly basis of different size range, creation of hub and kiosks for price data transmission, development of price news / intelligence
- Developing a trade facilitating platform leading to added fish distribution and consumption utilities
Activities include registering fish sellers and buyers across fish disposal points, standardising product lines ensuring quality, facilitating auctions for spot / forward trade

Schematic of FMPIS



Fish Market Information across PAN India



Landing centre



Production centre



Terminal market



Wholesale market



Retail centre

Fish market Grid of India (N - 1500)

State	No. of markets	State	No. of markets
Kerala	125	Haryana	25
Tamil Nadu	125	Punjab	25
Karnataka	100	Rajasthan	30
Andhra Pradesh	100	Himachal Pradesh	25
Telangana	50	Uttarkhand	25
Goa	60	Jammu and Kashmir	20
Puducherry	45	Sikkim	15
Maharashtra	100	Arunchal Pradesh	20
Gujarat	100	Assam	25
Orissa	60	Nagaland	20
West Bengal	75	Meghalaya	20
Madhya Pradesh	35	Mizoram	20
Chattisgrah	30	Manipur	20
Jharkhand	30	Tripura	20
Uttar Pradesh	35	Andaman	20
Bihar	35	Dam and Diu	20
Delhi	25	Lakshadweep	20

Schedules developed

- **State Fish Market (SFM) schedule:** Collates the entire list of fish markets with chosen parameters. The same will be used as the universe in arriving at representative markets to be included in the scheme where price and market information could be collected.

- **Market price (MAP) schedule:** Attempts to collect the weekly realized prices of more than 120 major species of marine and inland fishes according to its size ranges which are commercially traded in the country (Small / Medium / Large).
- **Market structure (MAS) schedule:** Aims at collecting the profile of the market attribute under twelve dimensions. All the markets in the state could be documented using this schedule which could be developed as a retrievable data base.

Web portal development, Technical inputs and Standardisation



A. Elasmobranchs		
Sharks		
A-1		
Common Name : Milk shark		
Scientific Name : <i>Rhizoprionodon acutus</i>		
Vernacular Name :		
Hindi : Pal sura	Kannada : Thatte	Oriya : Magar / Eid
Bengali : Mera	Malayalam : Palsravu	Tamil : Palsorrah
Gujarati : Sandho / Magra / Pisori / Mooshi	Marathi : Balda / Pisori / Mushi / Mori	Telugu : Kukkasorr
Range :		
Size	Length (cm)	Weight (kg)
Small	Less than 25	Less than 0.50
Medium	25-50	0.50 - 4
Large	More than 50	More than 4

Data collecting devices with mobile connectivity



Stakeholders conclave with State representatives



Engaging Enumerators / Data collection



**Telangana
Kerala
Tamil Nadu
Puducherry
Andhra Pradesh
Maharashtra**



Tabulation/ Uploading in web site / Generating Reports

Data Sorting Methodology

Data strength Identification	Price Entries
	< 50 % - Poor
	50 % - 75 % - Average
	> 75 % - Good
Price Arrangement	Weekly prices - (I,II,III,IV)
Species Arrangement	Small (Marine, Inland)
	Medium(Marine, Inland)
	Large (Marine, Inland)
Market Arrangement	Whole Sale Markets
	Retail Markets
	Landing Centers

Tools of Analysis

- Species - Market price analytics (SMPS)
- Marketing efficiency
- Price Covariance analysis
- Price Instability Analysis
- Markov analysis

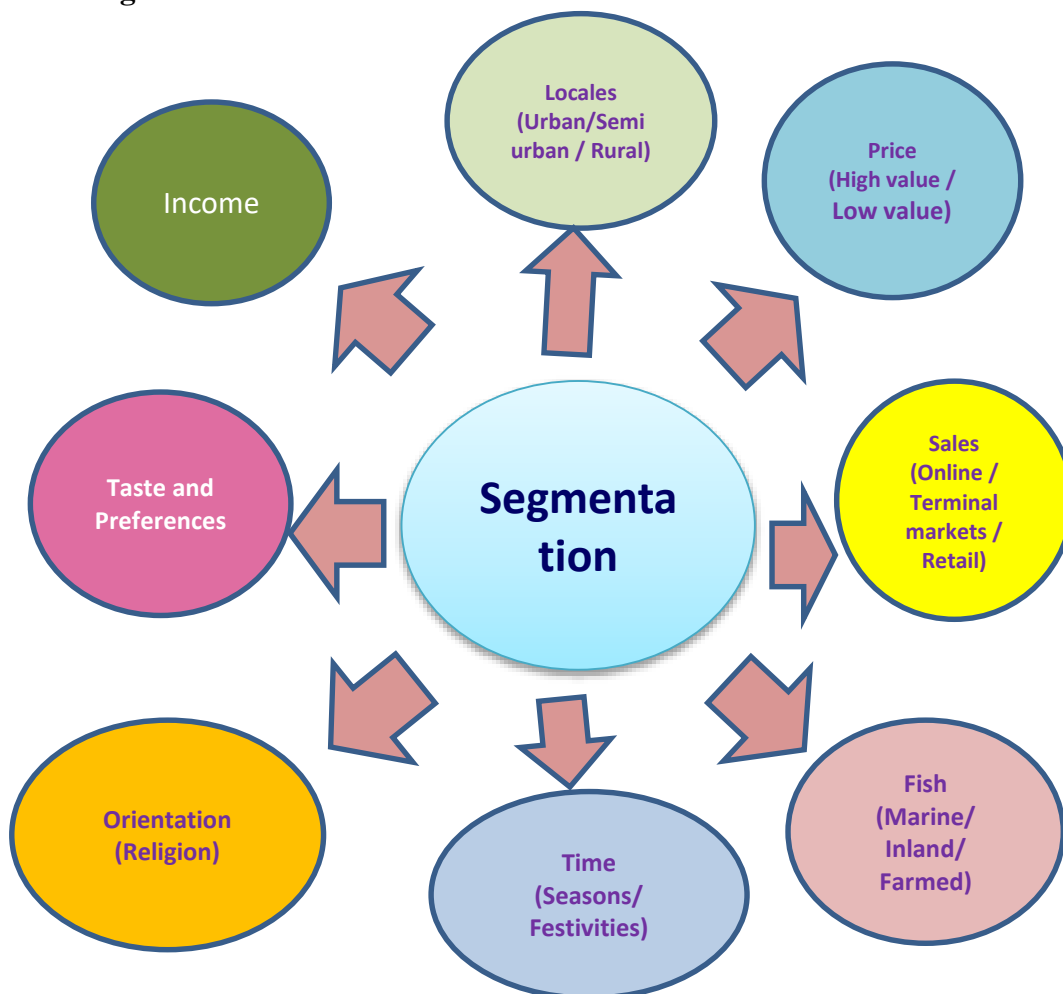
Challenges forward

- Supply and Demand Interplay - Prices are dynamic
- Marketing functionaries often play CARTELS
- Continuous data requirement
- Involvement of State and Market Functionaries
- Real time Access to the Stakeholders
- Societal gains more than the individual losses

What is that the consumer faced with?

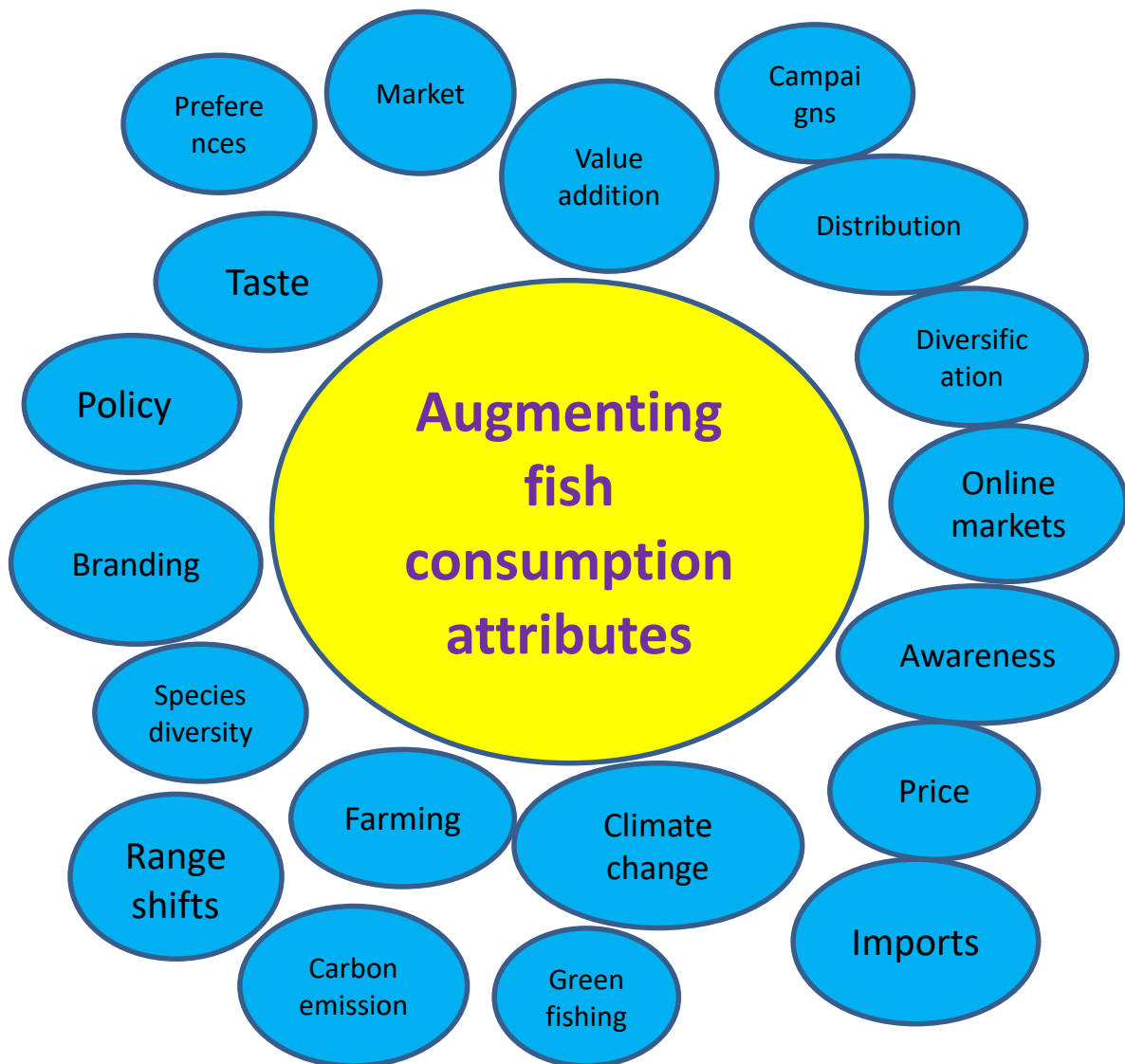
- Geographical separation between production and consumption centres
- Price spreads high with consumers paying high price
- Market Information/ Intelligence is minimal
- Low level of value addition/ Infrastructure creation
- Quality concerns and health concerns
- Climate change and spatial distribution of fish
- Fish distribution needs interventions
- No economics of scale in landings/ distribution/ trade
- There are accessibility / affordability/ availability issues

Market Segmentation



Scope of augmenting fish consumption

- Supply side – Integrations -Horizontal and vertical integration
- Aquaculture sector is on the boom
- Enabling policy environment
- Improved fish production and distribution
- Newer candidate species identified
- Emerging Online and Digital forms of marketing
- Import policy leading to more preferred species



Chapter 7

DISTRIBUTION PATTERN OF FISH AND MARKETING STRUCTURE IN INDIA

Dr. T. Umamaheswari¹ and Dr. Sushrirekha Das²

¹TNJFU-Fisheries College and Research Institute, Thoothukudi

²National Institute of Agricultural Extension Management, MANAGE, Hyderabad

Fisheries sector is recognized as a powerful income generator, stimulates growth of a number of subsidiary industries, provides cheap and nutritious food and plays an important role in the socio-economic life of thousands of people directly or indirectly involved. The sector provides source of employment and income to millions of fishers and farmers, particularly women. Growth of fish production as well as development of fishery sector in terms of economy and infrastructure is highly dependent on an efficient fish marketing system (Chourey et al., 2014)

Food chains - Need of the hour?!

Food basket has become more diversified in both rural and urban areas with a significantly higher share of milk, fruits, vegetables, meat and fish. Indians have positive attitude towards Seafood because of healthy and balanced diet and the demand for processed food items is increasing in India over the years. Globalization of Agriculture and allied sectors food markets also provides an opportunity for the Indian producers (farmers/fishers/processors) to participate in the global food supply chains by increasing exports. To tap the market potential, innovative institutional models are emerging in Agriculture and allied business for developing more efficient and value-added supply chains

Fish consumption

Domestic value chains are well developed in India, in case of milk, coffee, and few food grain crops (Ranganth 2011; Srinivasan 2012). When it comes to livestock value chains, often it is well organised. Lack of coordination, elongated supply chains, lower profit margins

and lack of incentives for harnessing ‘upgrading potential’ are the major roadblocks. In case of fisheries, international fish/shrimp value chain created new market opportunities but, benefit of this largely went to traders not the fishers (Kumar, Shinoj, 2008). Profit oriented value chains ignore the welfare of fishers, biodiversity and environmental sustainability. Problems in certification, low literacy of fisherman and perishability offers greater challenge for inclusion of fisherman in the chain (Lindhal, 2006).

Fish marketing

To make fish available to consumers at the right time and in the right place, an effective marketing system is required. Traditional fish market is the only source of domestic marketing of fish in India. Domestic fish marketing holds a huge potential and is highly unorganized and unregulated. Neglected for various **reasons** and serious efforts have not been made on marketing of fishes as compared to its production. Marketing channels for fish and fish products involve several intermediaries undertaking multiple functions. Number of intermediaries and channels of distribution vary from region to region, state to state and district to district within a state. Depending on the distance of the markets and type of consumers, i.e. individual or institutional, the number of intermediaries varies. Bulk of the fresh fish (70%) passes through one to three hands. In the case of institutional customers such as restaurants and hotels, not more than three intermediaries are involved. While the bulk of sales are carried out through auctioneers, about 40 % of fresh fish is sold through commission agents or wholesalers.

Distribution channel

Channel of distribution take different forms and levels as follows.

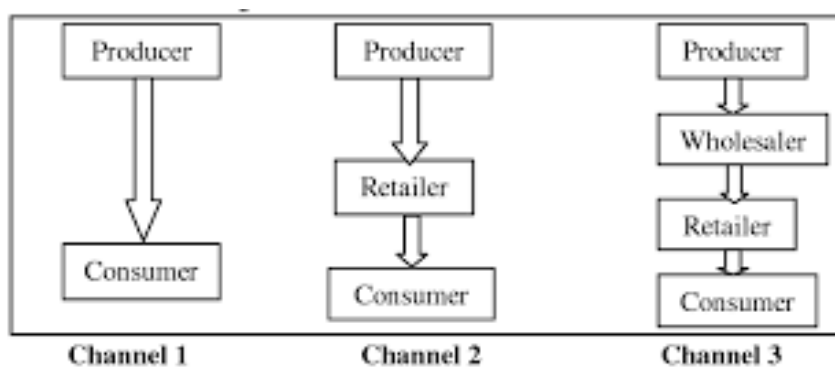
Levels

Primary market: Usually located near to fish catchment area (Villages, District Headquarters, and Crossroads) where variety of cultured and captured fishes will be available.

Secondary market (To Wholesalers): Distribution of fish routes to urban markets/higher secondary markets through Commission Agents.

Higher Secondary market (To Consumer/Terminal markets): Existence of one or more wholesale markets/centers will be well connected by road, river and rail. Have trading connections with several secondary markets.

City or Terminal or Consumer market (To Consumer directly): From Wholesaler centers of Higher Secondary and Secondary markets/centers, sales is routed through fixed stalls/vendors. Have trading connections with several secondary markets.



Regional distribution of fish

Fish Production has remained uneven across the States depending on the available coastline, infrastructure and entrepreneurship. Southern region accounted for almost half of the fish production, followed by Eastern Region with one fourth of the total national fish production. Among the States, Andhra Pradesh (27.4%) and West Bengal (13.8%) together produce about 41% of the country's total fish production. Almost every State in India produces inland fish to a certain extent whereas top six States account for about three fourth of the country's total inland fish production. Andhra Pradesh, West Bengal and Uttar Pradesh together account for half of the fresh water production in the country. Marine fish production has remained limited to nine States and four UTs with coastlines. The West Coast produces 59% and the East Coast produces 41% of total marine fish Gujarat, with 19% of the total marine fish production, is the leading marine fish producing State followed by Andhra Pradesh (16.4%) and Tamil Nadu (13.5%).

Domestic marketing system in India

Domestic fish marketing system is neither efficient nor modern. There exist a number of private traders with a number of Intermediaries b/w Producer and Consumer. The physical facilities and infrastructure in all types of fish markets are far from satisfactory (FAO, 2001). Some of the problems in fish marketing include high perishability and bulkiness of material, high heterogeneity in size and weight among species, high cost of storage and transportation, no guarantee of quality and quantity of commodity, low demand elasticity and high price spread (Ravindranath, 2008).

Market Intermediaries

Fish passes through several intermediaries from the landing center or fish pond to the consumer. The intermediaries are involved in providing services like head loading, processing, preservation, packing and transporting and these activities result in cost addition at every stage of marketing (Bishnoi, 2005). The key intermediaries in fish marketing include auctioneer, wholesaler, retailer and the vendor. Several other intermediaries like local fish collectors and fishermen cooperatives also exist in several markets. The biggest challenge in documenting intermediaries in fish marketing is their multifunctional performances. There is no strict boundary between intermediaries and they perform several functions while marketing fish (Kumar et al., 2008).

Institutions in fish marketing

A. National Federation of Fishers Cooperatives Ltd.

The National Federation of Fishers Cooperatives Ltd. (FISHCOPFED) IS A National Federation of fisheries cooperatives and the apex institution of Indian Fisheries Cooperative movement. Under the marketing activities FISHCOPFED undertakes the following though it's eight RO/Unit offices and Head Office.

- Promotion of Aquaculture
- Cold Chain

- Inter-state Fish Marketing
- Retail Marketing of Fish
- Supply of Fish to Group of ITDC Hotels
- Promotion of Export of Fish and Fish Products

B. NFDB

PMMSY Scheme

Foreseeing the immense potential for development of fisheries and for providing focused attention to the sector, the Government in its Union Budget, 2019-20 has announced a new scheme, the Pradhan Mantri Matsya Sampada Yojana (PMMSY). PMMSY has been approved at a total estimated investment of ₹20,050 crores to be implemented over a period of 5 years from FY 2020-21 to FY 2024-25. The PMMSY is an umbrella scheme under the following three broad heads: (i) Enhancement of Production and Productivity (ii) Infrastructure and Post-harvest Management (iii) Fisheries Management and Regulatory Framework. Under markets and marketing infrastructure sub-head, the following schemes are present:

- Construction of fish retail markets including ornamental fish/aquarium markets
- Construction of fish kiosks including kiosks of aquarium/ornamental fish
- Fish Value Add Enterprises Units
- E-platform for e-trading and e-marketing of fish and fisheries products

Mega investments are proposed in construction and strengthening of Fishing Harbours and Landing centres for hygienic handling of fish, reduce post-harvest losses, higher value realization etc. Reforms in their management and operations would be a focus area under PMMSY.

MPEDA

The Marine Products Export Development Authority (MPEDA) is a statutory body under the Ministry of Commerce and Industry for the promotion of marine products export

from India. Has been guiding and supporting the seafood industry of the country to produce and process quality seafood and market it.

Challenges facing the fisheries sector in India

Technical Challenges

- Fishing business - Reliant on a few fish species (Carps, Pacu & Pangasius) – increasing this base will boost FP
- Overproduction - Focusing on fewer species results in an overstock of specific fish species, lowering prices and increasing volatility
- No additional aqua feed-consuming species or high-value fish – Introduction of new species (e.g. Tilapia farming)
- Inadequate hatchery technology for new species introduction that include freshwater, brackish, and marine species
- Diversification of species - costs stability; Also driving up demand for formulated aquafeeds
- Classical freshwater fish farming methods – large ponds, no water exchange, no draining, and no bottom sediment removal– are still in use, which can lead to disease-promoting conditions

Marketing challenges

- Higher number of middlemen, high marketing cost, fluctuations in prices, poor storage facilities, lack of market information on price, delay in settlement of sale proceeds, lack of drinking water facilities in market yard, very high degree of dependency on middlemen for financial support, poor infrastructural facilities and absence of cooperative marketing
- Existence of non-competitive market (presence of few commission agents), other factors like fish price, non-availability of fresh fish and preferred species, poor marketing facility and unhygienic condition of market premises

- Middlemen - disadvantages to both fishermen and consumers, marine fish marketing systems suffer from problems concerning the distribution/supply chains including the lack of funds for production, transportation, cold storage facilities, marketing activities and procurement

Economic & Future challenges

- Poor quality fish delivered in poorly managed production systems - Impact on customer acceptability and preferences
- Lack of proper cold chain and distribution systems - Impact on availability and marketing as a perishable item
- DEEP-GREEN POND WATER – Blooming problems during summer months
- RED LAYER ON POND WATER - Excess iron or EU glenoid algae results in food and oxygen scarcity in the water
- Oxygen depletion in pond and fish gasping for air – Challenge frequently faced experience
- To meet the growing demands for seed, feed and fertilizers, in terms of quantity and quality
- Increasingly severe competition with other resource (land/water/feed) users
- Deteriorating quality of water supplies resulting from aquatic pollution
- Climate change; Weak marketing and extension network; Overfishing; By-catch; Damage to the ocean floor and Illegal fishing

Conclusion

- Unregulated and unorganised fish marketing system
- Neglected for different reasons; serious efforts not taken for improvisation as compared to its production
- Traditional fish markets; structural defects and infrastructural inadequacies

- Fisherman and marketing intermediaries suffering from several problems and constraints – discouraging factors to expand at its optimal level in the country
- Marketing facilities and services – Poor order showing serious shortcomings on the part of the authorities
- Need to be addressed with special care and utmost priority
- Need of supervision and enforcement of regulations by public authorities for a competitive and efficient fish marketing system

Way ahead

- Fishing Sector - Instrumental in sustaining the livelihoods of over 28 million people (M & V communities); towards socio-economic development
- FS must develop the capacity to build and run effective quality assurance systems to comply with increasing stringent international standards of international & domestic markets
- Should promote efforts to improve selective fishing gears to minimize by-catches of juveniles and non-target species and to develop technologies to make economical utilization of unavoidable by-catches
- Implementation of the Code of Conduct for Responsible Fisheries - Facilitate sustainable utilization of fishery resources
- Long run - Need to develop national and regional fishery governance to ensure rational and effective fisheries management in the region

Chapter 8

STATUS AND PROSPECTS OF ORNAMENTAL FISH MARKETING AND TRADE

V. Rajaraman

Proprietor, M/s Raj Aqua Clinic, Kolathur, Chennai

Status of Ornamental Fisheries

India is the marginal player in world export (1%) and the major contribution is from the indigenous freshwater fishes (90%). Kerala, North eastern states and Tamilnadu are the major contributing states and the species are Barbs, Eels, Gobies, Catfish and Loaches.

Indigenous fish



Indian glass fish



Denisoni



Barb



Loach

Import of ornamental fishes

The import of the exotic ornamental fishes *viz.*, Betta, Flower horn, Arowana, Gold fishes, Koi carp, Red parrots, Oscars etc. has been increased. Importing countries include Thailand, Singapore, Malaysia, Vietnam, Indonesia etc. and the demand for exotic ornamental fishes is more than the indigenous fishes owing to less awareness among hobbyists and less attractive.



Imported species

Why Indian breeders are not focused for exports?

Indian breeders are not focused for exports based on the following reasons:

- Domestic price is greater than export price
- Delayed payment and more DoA
- Lack of good connecting Aqua cargo flights to EU
- Meeting up international standards and procedure seems very tough

Problems in Indian ornamental fish breeding sector

- Non maintenance of quality & quantity
(Inbreeding, non-selective breeding)
- No consistent production and supply
- Most of the farms are backyard farms
- Very few farms are built to meet international standards like quarantine, sorting, packing, and brood stock maintenance

To improve exports

- Special training for selective breeding practices
- Assurance of minimum purchase price irrespective of seasons
- Popularizing the quality of Indian varieties through various Aqua exhibitions abroad
- Engaging farmers and breeders to get hands on experience in abroad fish farms

To make domestic market strong and for revenue generation

- Conduct of Aqua shows in various cities across India at regular intervals to promote aquaculture as hobby
- Enlightening hobbyists through seminars and field visits to various farms
- Fish competitions to encourage hobbyists on regular basis

Live feed

- Commercial mass live feed production (Blood worms, Daphnia, Moina, Tubifex worms, Artemia, Rotifers etc.) should be established and its effectiveness should be evaluated
- Mass mortality due to disease
- Many breeders get skin and other systemic infections due to live feed collection

Chapter 9

MODELS AND TOOLS FOR QUANTIFICATION OF TRADABLE RESOURCES

Dr. T. Ravisankar

ICAR-CIBA, Chennai

Fish supply & Fishery resources

India is the 3rd largest fish producing and 2nd largest aquaculture nation in the world after China. The Blue Revolution in India demonstrated importance of Fisheries and Aquaculture sector. The sector is considered as a sunrise sector and is poised to play a significant role in the Indian economy in near future. In the recent past, Indian fisheries has witnessed a paradigm shift from marine dominated fisheries to inland fisheries, with the latter emerging as a major contributor of fish production from 36% in the mid-1980 to 70% in the recent past. Within inland fisheries, a shift from capture to culture-based fisheries has paved the way for sustained blue economy.

Although inland fisheries and aquaculture have grown in absolute terms, the development in terms of its potential is yet to be realized. The unutilized and underutilized vast and varied resources, in the form of 191,024 km of rivers and canals, 1.2 million Ha of floodplain lakes, 2.36 million Ha of ponds and tanks, 3.54 million ha of reservoirs and 1.24 million Ha of brackish water resources offer great opportunities for enhanced production along with livelihood development and ushering economic prosperity.

Domestic fish Consumption –Structure and performance

Fish is a staple dietary source in most Indian states. Almost 60% of Indians consume fish in their diet. The increase in consumption of fish is resulting in an increase in India fishing industry. There are 10 states that outwit the rest of the states, viz., Andhra Pradesh, West Bengal, Gujarat, Kerala, Tamil Nadu, Goa, Daman & Diu, Puducherry, Odisha, Karnataka and Maharashtra where there is high demand for fish or marine resources and the

opportunity to cultivate these resources is optimum.

According to the Handbook on Fisheries Statistics (2023) the state Kerala is the second highest fish consumption state, just after Lakshadweep. However the average fish consumption of Kerala was just half of the average consumption of the Lakshadweep. The 5 major states of India in which the total protein intake was 10% or above are West Bengal, Assam, Andhra Pradesh, Tamil Nadu, and Karnataka (NSSO surveys). Since the India is considered to be the second largest producer of fish, there is a scope to increase the fish consumption in rural as well as urban areas. The fish is considered as a cheap source of protein and has medicinal values so the consumption of the same can be increased by creating awareness about its health benefits. In India, as far as species wise demand analysis of fish is concern, the Indian Major Carps (IMC) is the most consumed fishes among fresh water fish species. Among the marine fish species, the Pelagic Low Value (PLV) fishes are consumed maximum (Kumar, 2005).

Reasons of low fish consumption in India

Fish consumption is governed by income along with many other factors. For low income group, fish is luxurious commodity and income elasticity of demand is found to be more than one for most of the fish species. They cannot afford fish even once in month. So for low income group, low consumption of fish is related with their purchasing power rather than their preferences. Hence, for low income group, income is considered as major constraint for the low consumption of fish.

For medium income group, income elasticity of demand for fish is found to be about 1 which implies that the fish is a normal commodity. But problem with these income groups is awareness. Since they did not know the importance of fish for healthy life, awareness must be created to increase the fish consumption among the middle income group.

For high income group, the income elasticity of demand is found to be slightly less than 1, which means fish is not an inferior commodity for high income group. But the problem is

that, the high income group is more health conscious and freshness is big problem associated with fish. So, the most of the fish consumer like to shift towards its substitute commodity (mutton, chicken etc.) available in the market. One more problem related to this group is the maintenance of fish market. The condition of fish market in India is not good. So, most of the people of high income group avoid to go to fish market for buying the fish.

Beyond this, a large number of vegetarian population also a main cause of low consumption of fish. In northern part of India (Uttar Pradesh, Bihar, Madhya Pradesh, Jharkhand) have large no. of population vegetarians. So, Per capita consumption is very low in these states. Processed food from fish is less available in India, which also has a negative effect on consumption.

India is a developing country and the economy is performing well. So in future the income of low income group will rise and the consumption of fish will increase. We can also increase the fish consumption for low income group to some extent by ensuring the availability of low price fish in domestic market. For medium income group awareness is required to increase the fish consumption. So, by making medium income group aware regarding importance of eating fish, consumption of fish can be increased for medium income group. Especially in rural areas, awareness is needed more. For high income group, freshness of fish is the main problem. So, consumption of fish among high income group can be increased by improving the quality of fish and condition of fish markets. Mobile fish marketing is a very good concept and it has capability to overcome this problem because in mobile fish marketing fish is well maintained and available at consumer's door. So, promoting the mobile fish marketing is a way to insure freshness and availability of fish, which is related with the increase in fish consumption among high income group.

Markets: Physical & New age e-markets

Currently traditional fish markets operate in a substandard manner in consumer perception:

- Un hygienic environment

- No proper icing
- No raised platforms & water disposal system
- Improper waste disposal
- Rustic handling equipment

The conventional fish markets are mostly narrow, crowded, with no parking facilities and in total an unhappy place from buy.

Fish markets are evolving in India and many e portals and app based marketing by corporates like Fresh to home, Licious and Tender cuts. The new age suppliers provide hygienic fish supply to the consumers in the end of the value chain better quality fish at slightly higher price

Other issues

Food safety standards, consumer awareness education including proper popularizing tasty fish recipes/culinary dishes among young population is to be taken forward by government and other Institutions.

Methods

Several econometric tools are available for supporting policy makers to have estimates on following parameters:

- Demand estimation
- Supply projections
- Willingness to pay
- Price analysis
- Estimating infrastructure requirements-regions/seasons

At present the commonly used methods to draw the above estimates are the following:

- Expert estimates
- Statistical/Econometric models
- FAO/NACA/MoA estimates/databases

- Expert estimates/projections (Ministry/ICAR/SAU/Dept. projections)
- Household/Consumer Surveys (CSO- NSSO rounds of consumer surveys)

Resources for data acquisition

1. State of world fisheries
2. FAOSTAT
3. Hand book of Fisheries Statistics
4. MPEDA website
5. Aquastat- ICAR-CIBA
6. CMFRI marine fish catch statistics and fishermen census
7. CSO- NSSO rounds of consumer expenditure
8. Agmarknet.nic.in

Major works reported

A brief list of major references is listed hereunder may be consulted for further information.

1. International Model for Policy Analysis of Agricultural Commodities and Trade (IMPACT): Model Description.
2. International Food Policy Research Institute (IFPRI), Washington, DC (2012).
3. Impacts of fisheries management and policy scenarios in Sarangani and Sulu-Sulawesi seas to Philippine tuna industry: simulations from the Asia Fish model.
4. Projecting supply, demand and trade for specific fish types in Asia: baseline model and estimation strategy Dey 2005.
5. Quadratic Engel curves and consumer demand
6. Willingness to Pay Models

Chapter 10

FISH CONSUMPTION BEHAVIOUR AND PERCEPTION TOWARDS FOOD SECURITY

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Introduction

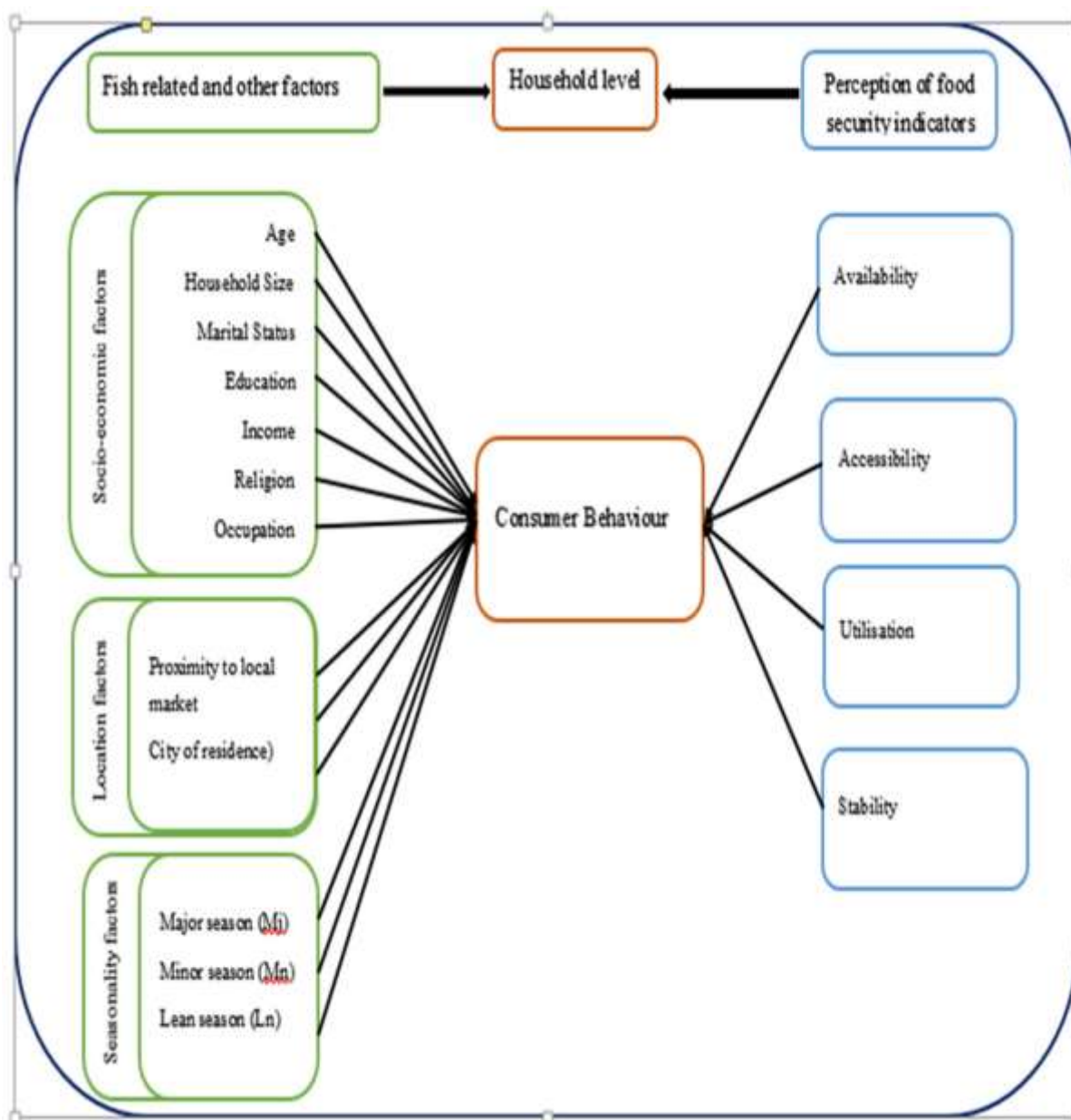
World aquaculture which is the fastest growing food sector in the world with almost 70 million tons of annual production accounting for about 50% of the fish consumed globally, according to FAO (2014), the fish industry is currently an international business with a global production estimated at US\$ 232 billion in 2012. Fisheries and aquaculture, together with supplementary activities such as processing, packaging and distribution of fish, provide livelihoods and income to hundreds of millions of people accounting for about 10–12% of the world's population. In addition, fish world trade has grown significantly from US\$ 8 billion in 1976 to US\$ 129 billion in 2012, accounting for about 10% of global agricultural trade. In particular, the fish processing industry is becoming more intensive, geographically concentrated, vertically integrated and strongly linked with international distribution channels dominated by large food processors and retailers.

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geographically concentrated, vertically integrated and strongly linked with international distribution channels dominated by large food processors and retailers.

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 ₹ 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). World per capita fish consumption has increased from an average of 9.9 kg (live weight equivalent) in the 1960s to 19.2 kg in 2012 (FAO, 2014).

Consumer behaviour towards fresh fish attributes



Drivers and barriers of fish consumption

The drivers and barriers of fish consumption often introduce this topic highlighting three questions:

- i) Eating fish provides very important health and nutritional benefits;
- ii) The recommended fish intake is not widely achieved;
- iii) Interventions aimed to increase fish consumption are needed in order to improve public health.

Sensory perception

Sensory characteristics of fish such as taste, smell and texture are expected to be key determinants of fish consumption and they are also extremely important to especially evaluate the freshness of the product.

Sl.No.	Fish attributes	Behaviour Category
1.	Fish Freshness	Positive
2.	Fish Texture	Positive
3.	Fish Hygiene	Positive
4.	Fish Aroma	Positive
5.	The Price	Positive

Health beliefs

Number of specific health and nutritional benefits mainly associated with the high content in proteins and Omega-3 fatty acids together with a low fat content, leads to the positive consumers' perception of fish in terms of healthiness and nutritional value seem to be so strong that it could not be further increased by exposing consumers to messages stressing health benefits of fish consumption. Overall motivational aspects of consumers such as "general health involvement", "interest in healthy eating", "healthy eating habits" or the belief that "diet is important for health" seem to be more effective factors in explaining fish consumption variations. A significant and positive relationship exists between "health involvement" of consumers and their fish consumption.

Fish eating habits

Old habits are hard to break and new habits are hard to form. Consumer fish choice is strongly affected by habits which emerge and are reinforced from the accumulated satisfactory/unsatisfactory past experiences associated with the same behaviour.

Convenience perception

Like to other food products, fish consumption is expected to be influenced by consumers' needs for convenience, i.e. the desire to save time and effort in food preparation. With respect to this factor, consumer behaviour should change in relation to the consumption of fresh and processed fish products. The former is expected to be perceived as difficult to prepare, while the latter could be perceived as a quick and easy meal option. The convenience of fresh and processed fish products confirmed the lack of convenience for the former and convenience for the latter.

Self-efficacy in the fish preparation process

The preparation of fish, particularly fresh fish, often requires a high degree of “self-efficacy” which refers to how competent a person feels in doing what is necessary to manage a specific situation, and thus reduce uncertainty. In the case of fish preparation, self-efficacy depends on the levels of knowledge, experience, expertise and self-confidence, firstly, in evaluating the quality of products at the place of purchase and, successively, in cooking them at home. It is expected that low levels of self-efficacy in managing the entire fish preparation process may affect fish consumption negatively.

Self-efficacy in the fish preparation process

41% of respondents did not know how to recognize the freshness of fish, 29% did not know how to select fish and 25% stated they were not familiar with preparing fish at home.

Price perception

Fish include a variety of products sold at very different market prices and perceived fish as being too expensive and thus making price as one of the most relevant fish consumption barrier

Fish availability

Fish consumption may be also strongly affected by the availability of fish

assortment. This happens because when preferred fish products are not available, the available alternative fish products may appear to be weak substitutes and thus consumers may decide not to buy any fish products.

Consumers’ preferences about fish quality attribute

Consumers’ preferences about the most important quality attributes of fish and fish products. Intrinsic and extrinsic characteristics and assumes that consumers choose, amongst the available products, those with a specific combination of attributes that maximizes their utility. On the other hand, the utility level of consumers varies individually being strongly influenced by psychological, moral and cultural factors such as beliefs and traditions as well as several kinds of social, political, moral and ethical values and relevant attributes considered by consumers in choosing fish products. In particular, the characteristics of fish that emerged as the most relevant for consumers are the origin, production method, preserving method, product development, packaging, and eco-labelling.

Consumer behaviour towards market attributes

S.No.	Fish attributes	Behaviour Category
1.	Location Proximity	Positive
2.	Trader’s Hospitality	Positive
3.	Product Diversity	Positive
4.	Place Comfort	Positive
5.	Market Layout	Positive
6.	Place Cleanliness	Positive
7.	Means of Parking	Positive

