Export of fishery products from India: status, challenges and the way forward

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Marine products have remained a consistent and leading foreign exchange earner to India for a long time. This study analyses the status and trend in marine products export from India and sketches the way ahead. Augmenting exports without hampering domestic nutritional security calls for enhancing domestic fish production through science-based culture practices, promoting value addition, improving quality assurance systems and effecting enabling policy changes.

Keywords: Aquaculture, food safety, shrimp export, SPS measures, value addition.

MARINE products constitute a major group of primary agricultural commodities exported from India. In 2019–20, the country exported marine products worth USD 6.68 billion (Rs 46,663 crores), accounting for about 4.1% of the global seafood export and 19% of India's total agricultural exports[1]. During 2010–20, marine products have shown the highest growth rate among export of several agricultural commodities. The Government of India (GoI) has declared its intention to increase the fish export earnings to Rs one lakh crore by 2024–25 (ref. 2) and has earmarked an amount of Rs 200 billion to be expended on the fisheries sector over five years from FY 2020–21.

Achieving the export targets calls for focused attention on the entire value chain, including production and processing. In this context, this study examines the performance of marine products from India and discusses the prospects of improving them.

Trends in the export of fishery products from India

The trends and pattern of export of agricultural commodities have shifted with the liberalization of the economy and India's accession to the World Trade Organization (WTO) with effect from 1995, and several other bilateral and multilateral agreements that the country has entered into thereafter[3–5]. During 1995–96 to 2019–20, marine products export from India grew from 0.3 to 1.29 million tonnes (mt), with a corresponding improvement in earnings from USD 1.1 million to 6.68 billion[6] (Figure 1). The share of exported fish products was around 10–13% of the total production during the entire period[7].

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Projected exports

The global export of marine products for human consumption is projected to be 47 mt by 2030, compared to 43 mt in 2018 (ref. 8). Thus, of the incremental production of 26 mt during 2018–30, only 4 mt would enter the export market, and the rest would be consumed domestically along with diversion for non-consumption purposes. The domestic demand for fish in developing countries is bound to increase due to growth in real per capita income, urbanization, and changes in the taste and preference of consumers[9]. China has already emerged as a leading global consumer of marine products and also the leading importer, driven mainly by rising national income[10]. During 1961–2011, China's GDP grew double that of the developing countries, with a fourfold increase in daily fish intake[11]. Domestic fish consumption in India is also bound to increase, leaving a lesser quantity for export, thus impacting export prospects.

Growth performance in the export of marine products

Table 1 shows the growth of marine products export during 2000–20, classified into two equal sub-periods of 2000–01 to 2009–10 and 2010–11 to 2019–20. The trend growth rate was estimated by the least square regression method using data collected from the Marine Products Export Development Authority (MPEDA), GoI. In order to avoid wide fluctuations and provide stable growth rates, a triennial ending average was used. Data for 2020–21 were not used, as the export during this period was impacted by the COVID-19 pandemic. During the entire period, export growth was at a rate of 10.7% yr^{-1} – 12.5% yr^{-1} during the latter period compared to 5.6% yr^{-1} in the former. However, the second period had lower growth at a disaggregated level, except for frozen shrimp and live items. The growth of frozen shrimp export propelled the total exports during the latter period.

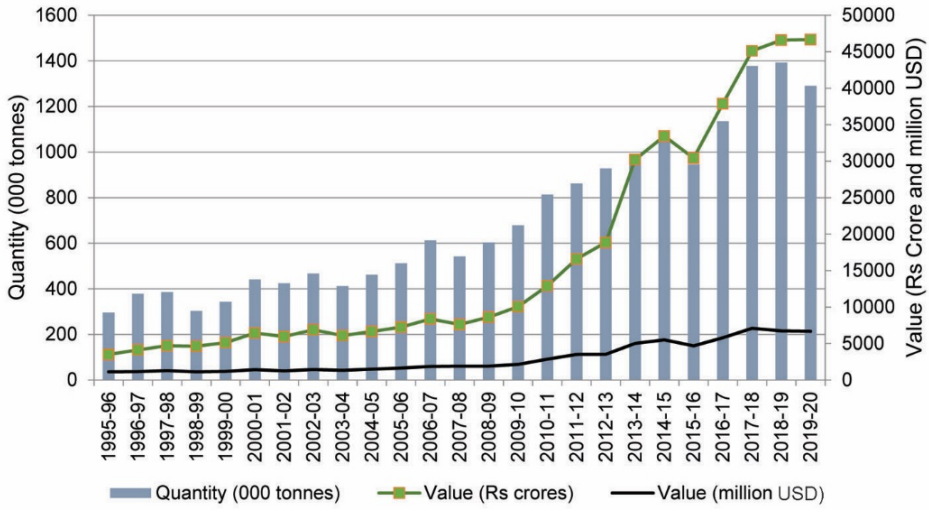

Figure 1. Trends in the export of marine products from India, 1995–96 to 2019–20.

Table 1. Export of marine products during 1990–2020 and its trend growth rate, disaggregated into two time periods, by fish products (based on triennial ending average)

	Export (000 USD)			Growth rate (% yr^{-1})		
Items	1999–2000	2009–10	2019–20	2000–01 to 2009–10	2010–11 to 2019–20	Overall
Frozen shrimp	837 (70.0)	901 (45.5)	4783 (70.0)	0.6	18.9	10.4
Frozen fin fish	148 (12.3)	377 (19.1)	649 (9.5)	11.6	2.7	10.4
Frozen cuttle fish	74 (6.2)	183 (9.3)	313 (4.6)	14.6	4.3	9.6
Frozen squid	69 (5.8)	125 (6.3)	353 (5.2)	8.5	8.0	10.3
Dried items	10 (0.8)	122 (6.2)	165 (2.4)	26.6	–0.1	17.1
Live items	9 (0.8)	23 (1.2)	49 (0.7)	10.2	7.7	11.9
Chilled items	10 (0.8)	45 (2.3)	94 (1.4)	15.5	7.1	15.5
Others	39 (3.3)	204 (10.3)	425 (6.2)	17.1	6.5	11.6
Total	1196 (100)	1980 (100)	6830 (100)	5.6	12.5	10.7

Source: Calculated by the authors' data from MPEDA[6]. Figures in parentheses indicate percentage of the total.

Frozen shrimp accounted for more than 70% of the export (in 2019–20). In terms of absolute quantity, the export of fish is on the increase. Given the slow growth of marine capture fish production, mainly fin fish, increasing its exports could impact nutritional security, particularly in the coastal regions where fish is a major dietary component and protein source.

Diversification of export destinations

Diversification of export destinations is critical to reduce market risks and realize higher unit prices. Indian marine products export is concentrated in certain countries, mainly in the United States, focusing on frozen shrimp (Table 2). Over the years, the export destinations have changed, characterized by a decline in export to certain traditional markets like the European Union (EU) and Japan, along with an increase to China. Diversification of Indian exports by consolidating the existing markets and penetrating newer markets is the need of the hour.

Trend in the unit value of Indian export

The unit value of Indian export is low. From 2000–01 to 2019–20, unit prices have grown at a rate of 3.46% yr^{-1}. The growth rate of unit price for overall export for China, Japan, EU, Southeast Asia, the Middle East and the USA was 9.9%, –0.23%, 3.75%, 2.61%, 4.76% and 2.5% yr^{-1} respectively. A similar analysis for exported items indicated a growth rate of 1.13% yr^{-1} for frozen shrimp, 5.82% yr^{-1} for frozen fin fish and –0.04% yr^{-1} for dried items. The growth rates were 4.83% yr^{-1}, 3.96% yr^{-1} and 2.55% yr^{-1} for frozen cuttlefish, frozen squid and live items. Poor adoption of high-end processing is one of the reasons for the slow growth[12]. Indian export firms must venture into advanced value addition, including ready-to-eat/ready-to-cook/ready-to-serve serve products[13]. Export of sashimi-grade tuna to Japan realizes better prices but needs customized on-board handling, pre-processing and processing facilities[14,15]. Another example is the export of live fish, including lobsters and crabs, which are considered delicacies in certain countries[16,17]. Live transportation for long distances requires

Table 2. Export of marine products during 1990–2020 and its trend growth rate, disaggregated into two time periods, by export destination (based on triennial ending average)

	Export (000 USD)			Growth rate (% yr^{-1})		
Country-wise	1999–2000	2009–10	2019–20	2000–01 to 2009–10	2010–11 to 2019–20	Overall
Japan	572 (47.8)	288 (14.5)	430 (6.3)	–6.9	2.6	0.9
USA	163 (13.6)	231 (11.7)	2409 (35.3)	0.8	25.4	13.2
European Union	162 (13.6)	645 (32.6)	965 (14.1)	15.6	4.6	9.4
China	156 (13.0)	305 (15.4)	804 (11.8)	9.0	3.2	5.8
Southeast Asia	78 (6.5)	216 (10.9)	1492 (21.8)	8.2	18.2	20.5
Middle East	33 (2.8)	107 (5.4)	291 (4.3)	14.7	9.7	14.4
Others	32 (2.7)	188 (9.5)	439 (6.4)	21.6	8.6	14.3
Total	1196 (100)	1980 (100)	6830 (100)	5.6	12.5	10.7

Source: Calculated by the authors' data from MPEDA[6]. Figures in parentheses indicate percentage of the total.

Table 3. Change in the level of aquaculture production and its growth rate, between 2000 and 2018, by major producer countries

Country/region	2000 (mt)	2018 (mt)	Increment (mt)	Per cent increase	Annual growth rate (% yr^{-1})
Asia	28.42	72.81	44.39	156	5.4
China	21.52	47.56	26.04	121	4.5
Indonesia	0.79	5.43	4.64	587	11.3
Vietnam	0.50	4.13	3.63	726	12.4
Bangladesh	0.66	2.41	1.75	265	7.5
India	1.96	7.07	5.11	261	7.4
World	32.42	82.10	49.68	153	5.3

Source: Calculated from FAO[8].

associated infrastructure[18]. Also, the export of ornamental fish is quite insignificant compared to its potential.

Prospects for boosting India's marine products export

India faces stiff competition from some Asian countries for global markets, so a concerted effort is needed to boost export earnings. This study provides a broad sketch of the approaches needed, focusing on four aspects: domestic fish production for exportable surplus, fish processing and value addition, quality assurance system and policy changes.

Technology-led augmentation of fish production to generate an exportable surplus

GoI has proposed a target of 22 mt of marine products by 2024–25 from 13.7 mt in the year 2020–21, warranting a growth rate of 9–10% yr^{-1}. As of 2021, marine fisheries account for only 35% of total fish production. Further, its growth has been stagnating (2.1% yr^{-1} during 2000–20). Therefore, the increased export is to be from aquaculture. Despite a high growth rate of about 7.8% yr^{-1}, India's aquaculture sector performs poorly compared to the competing countries, warranting focused attention (Table 3).

The total production of crustaceans in India (mainly constituted by shrimp production) increased from 0.13 mt in 1970 to 1.19 mt in 2017 (ref. 7). As of 2020–21, the total aquaculture shrimp production was about 0.84 mt, of which 92% was contributed by white leg shrimp (*Leptopanaeus vannamei*). A total area of 0.17 million hectares is under shrimp cultivation in India (Figure 2).

The estimated potential of fisheries resources in India is 7.16 mt, comprising 5.3 mt of conventional resources (demersal and pelagics of inland, and oceanic and non-oceanic resources of exclusive economic zone (EEZ), Andamans and Nicobar Islands and Lakshadweep) and 1.85 mt of non-conventional resources, including deep sea myctophids, oceanic squids, jellyfish and marine macroalgae[19]. The deep-sea harvestable potential, including oceanic tuna, is about 3.3 mt from the EEZ and areas beyond the national jurisdiction. Indian marine products export was traditionally dominated by wild-caught shrimp from the ocean and tiger shrimp from aquaculture. The tiger shrimp was less productive and more susceptible to white spot disease. Introduction of the specific pathogen-free spawn of *L. vannamei* led to an exponential increase in both production and export of shrimp[20,21]. Given the diminished scope for furthering fish production from marine capture fisheries, culture fisheries need to be focused on both inland and marine waters. India has rich water resources comprising of rivers and canals (0.25 m km), small reservoirs (1.78 m ha), medium and large reservoirs (2.2 m ha), tanks and ponds (9.2 m ha), backwaters (1.07 m ha), and of beels/lakes/derelict water (0.45 m ha); and an area of 2.02 million in seas under EEZ[19]. Technologies in the domain of breeding, feed management, and disease management and surveillance are well developed

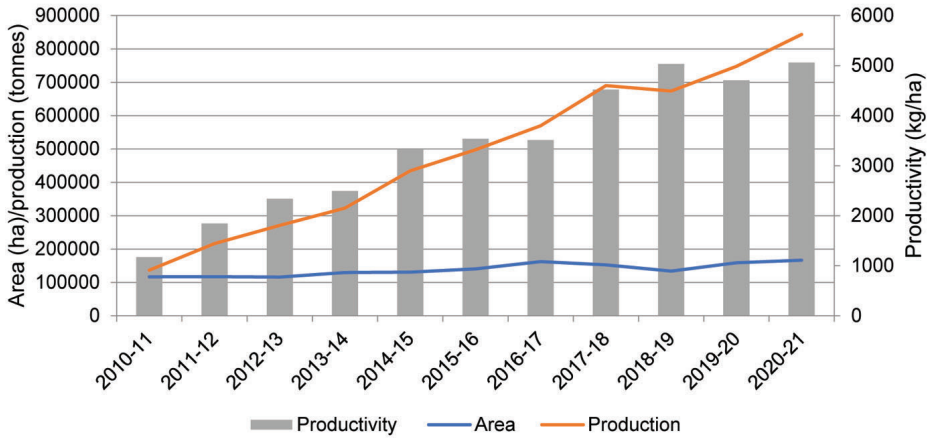

Figure 2. Area, production and productivity of aquaculture shrimp in India from 2010–11 to 2020–21. Source: Calculated using data from MPEDA[6].

in India[20], which would serve as the engine of future growth of aquaculture.

In India, the technological backstopping for fisheries and aquaculture is provided majorly by institutions under the Indian Council of Agricultural Research (ICAR), colleges and universities. Besides contributing to fish production through culture and capture technologies, these institutions have developed technologies in processing and value addition, packaging, quality assurance and testing for chemical and microbial contaminations. Further, they are involved in developmental activities, regulations, and capacity development by being part of the panel of experts of the Export Inspection Council, providing training on regulatory norms like Hazard Analysis and Critical Control Points (HACCPs), inspection and approval of seafood exporting firms, developing and implementing biosecurity norms, developing quarantines guidelines and facilities[20].

In order to augment production and link it to export markets, the potential of the small-scale aquaculturists and fishers is to be leveraged fully. The small-scale fishers must be supported with affordable technologies which are less capital-intensive. One important measure is to organize them into groups to leverage economies of scale, particularly in procuring inputs and output marketing. Self-help groups, producer organizations (of fishers and fish farmers) and contract farming are some options. Further, encouraging smallholders to utilize water bodies for fish culture would increase fish production. However, it would require augmented institutional support in inputs and technologies (fish seed, fish feed and agrochemicals) and extension support (information and training).

Processing and value addition of fish

About 75% of the fish produced is marketed fresh, and only about 15% is processed[19]. Shrimps, squids, cuttlefish and some finfish, are mainly processed for export. The major processed products include canned fish, battered and breaded items like fish fingers, retort pouch products, stuffed products and steamed products. The number of fish processing units has increased from 340 in 2007–08 to 593 in 2018–19 (ref. 21) and further to 625 as on October 2022, with a total processing capacity of 36,300 t. The fish processing sector generates attractive profits – while the gross fixed capital formation (GFCF) in the fish processing sector increased from Rs 591 crores in 2011–12 to Rs 953 crores in 2016–17, the profits have increased from Rs 263 crores to Rs 1011 crores[22].

Capacity utilisation is relatively low (15-25%), owing primarily to a scarcity of fish for processing and value addition[22,23]. The exportable surplus can be improved by importing fish to India to process it domestically and re-export, as is successfully practised by several countries in Asia, notably Vietnam. This could warrant a strict quarantine facility that can be established at designated ports. Innovative technologies like thermal processing, high-pressure processing, pulse light technology, e-beam radiation and radiofrequency heating have been developed for export-oriented processing[20].

Adherence to food safety measures

Marine exports from India have to adhere to food safety and quality standards. The Codex Alimentarius Commission, an organization jointly established by World Health Organization (WHO) and Food and Agricultural Organization (FAO), has proposed a slew of measures known HACCPs as a global standard to be followed. Though WTO encourages members to use standards recommended by CAC, countries generally follow different standards. While USA, the largest importer of fish from India, follows HACCPs to govern food safety and quality, the EU follows the Rapid Alert System for Food and Feed, which is stricter than HACCAPs. The food safety regulations set by the EU are

harmonized, get periodically updated and are based on the principles of risk assessment[24]. Japan has its measures of food safety regulations on imports and advocates a positive list system for maximum residue limits (MRL) for the presence of chemicals. The global trend is to establish stricter quality standards that call for the enhanced cost of compliance by the exporters.

Institutional mechanisms for ensuring quality and safety of marine products export

Having a strong domestic food safety regulatory regime is a prerequisite for compliance with international sanitary and phytosanitary (SPS) measures. The Export Inspection Council (EIC), presently functioning under the Ministry of Commerce and Industries, GoI, serves as a competent authority for trade compliance. MPEDA, a statutory body under the Ministry of Commerce and Industry, GoI, promotes trade.

The food safety scenario in India got further regularized with the passage of the Food Safety Act in 2006 and the enactment of the Food Safety and Standards Regulation in 2011. All categories of food produced, marketed or distributed within the country of domestic and foreign origin must comply with this regulation. The Food Safety and Standards Authority of India (FSSAI) is responsible for laying down science-based standards for articles of food and regulating their manufacture, storage, distribution, sale and import. FSSAI has instituted a Scientific Panel on Fish and Fish Products that is primarily concerned with carrying out a risk assessment of various commodity–hazard combinations of fish. Apart from the above-mentioned agencies, the Department of Fisheries, functioning under the Ministry of Fisheries, Animal Husbandry and Dairying, GoI issues sanitary import permits for the import of seafood to India according to the Livestock Importation Act (1898; as amended in 2001).

Notwithstanding these regulations, Indian seafood has faced several rejections and import refusals from major trading blocs, but this is decreasing over time. The major food safety issues fall under the domain of high levels of human pathogenic bacteria in primary production, parasitic infections, residues of agrochemicals, veterinary drugs and heavy-metal contamination[24]. Some of the management measures in this regard are given below.

Evolving a diversified food safety risk management system

Due to information asymmetry and constraints in enforcement, Government agencies often fail to manage food safety risks. Hence, there is a need to evolve a diversified food risk management system that addresses complementarity among all stakeholders, including the Government, market forces and citizens[25]. Newer technologies like machine learning can be effectively used for this[26].

Strengthening the framework of enforcement and surveillance

The scope and capacity of existing compulsory food policy instruments are to be widened to include unregulated commodities, particularly the fresh and chilled seafood sold in bulk in the domestic sector. The scope of the National Residue Control Programme conducted by the EIC as a requisite for EU requirements could be extended to include all aquaculture operations and the capture fisheries sector. A comprehensive national monitoring system for contaminants and residues can be instituted to evaluate food safety risks and deter inappropriate practices that harm food safety.

Enabling policy changes

The overall policy atmosphere of the exporting countries has a significant role in promoting and facilitating export, mainly by reducing transaction costs. The major dimensions of policy support are discussed here.

Revisiting financial support and subsidies

In recent years, the financial requirements of export firms have changed towards quality improvement rather than bulk processing. In the context of SPS measures and the need to align the existing processing facilities with the requirements of newer export destinations, the financial support accorded to the processing firms is to be revisited to realize better unit value. First, the quantum of credit to the fisheries sector is to be increased. The share of the fisheries sector in ground-level credit to the agricultural sector as a whole has declined from 1.31% in 2003–04 to 0.30% in 2013–14 (ref. 27). During 2020–21, the total long-term refinance credit disbursed for the fisheries sector was only about 0.2% of the farm sector credit of about Rs 459 billion, and only 0.1% of the total long-term refinance credit flow[28]. The Government has extended the Kisan Credit Card (KCC) facility to fishermen and aquaculturists as well, as a measure to increase short-term credit flow to the sector[29], but the uptake has been quite low. This warrants an initiative to promote credit delivery to the fisheries sector.

Skill development in the fisheries value chain

Imparting skills for the development of products suitable for export destinations while following international quality standards is a challenge and warrants professional training. The domain for skill development includes meeting the SPS requirements, packaging technologies, advanced fish processing technologies of international demand in niche markets, quality assurance and traceability, export and insurance management, and financial services. The intake of

students into various branches of fisheries science is to be increased to meet the renewed requirements[30]. The demand for fisheries professionals, para-professionals and skilled workers engaged in a fish processing factory has increased and is likely to increase further[31]. Skill development is integral to diversifying India's export markets, as it warrants developing and promoting country-specific products.

Infrastructure development

A critical issue is an inadequate infrastructure supporting fish export. India has a cold storage facility of 0.43 mt and a chilled storage facility of 24 thousand tonnes, which is inadequate to support fish production and processing[6]. On-board cold storage facilities can be improved by the advanced technological modification of fishing vessels. Reefer vehicles with adequate cold storage facilities can help in making quality fish available for processing and export. The number of ice plants is only 52 with a capacity of 1580 tonnes daily[6]. Another major area of infrastructure requirement is the development of hygienic fish landing centres, which calls for structural modification in the existing landing centres. The formation of food processing clusters would help appropriate economies of scale and reduce unit costs.

Coordination among different agencies in production, processing, quality assurance and trade

The fish export process involves multiple agencies dealing with production, processing, certification, customs, marketing, trade and financial services. Proper communication and coordination among different departments are required to improve decision-making and implementation. The ministries mainly involved are Fisheries, Commerce, Agriculture, Food Processing and Finance.

Convergence in food regulation

In India, multiple agencies regulate the seafood sector, resulting in persistent problems of crossover and ambiguity in enforcement. EIC is endowed with the task of regulating seafood export, whereas the food safety of imported and domestically marketed seafood is managed by FSSAI. Biosecurity measures and some of the food safety issues of imported seafood are regulated by the Department of Fisheries, GoI. The coastal aquaculture activities are regulated by the Coastal Aquaculture Authority of India, which also assures the safety of aquaculture commodities as it certifies antibiotic-free farm inputs (feed additives, probiotics, feed, grow-out chemicals and immune-stimulants). The Bureau of Indian Standards has formulated commodity-specific product standards that address both the quality and safety of fish products. Convergence of these agencies is imperative to eliminate jurisdictional overlap and duplication of efforts by different agencies to ensure better compliance by producers and traders. It needs consultation of the agencies concerned to develop a comprehensive approach.

Sustainable fishery and fisheries subsidy

Niche markets are emerging for products with smaller environmental footprints. The Code of Conduct of Responsible Fishery of FAO recommends adopting sustainable fishing practices in marine waters[32]. One key aspect of green fishing is streamlining resource-depleting and market-distorting subsidies into green subsidies. India accounts for only a minuscule fraction of the global subsidies to the fisheries sector – USD 0.28 billion of global fisheries subsidy amounting to USD 35.4 billion[33] – which can be converted to green subsidies. This will prevent resource depletion and promote value addition.

Diversifying export destinations

Diversifying export destinations is critical to reducing the volatility of export earnings and addressing the disruptions that may occur due to global economic turbulence. Several steps need to be considered in this context. They include technologies for development of value-added products, including ethnic fish products specific to prospective export destinations, developing technologies and skills in quality assurance and traceability systems, liberalizing regulation of import of inputs and machinery for specific product development, inclusion of marine products in free trade agreements and trade promotion, to mention a few.

Conclusion and policy implications

The marine products export has a high growth performance, but it is mainly driven by an increase in the volume exported of frozen shrimp rather than by a significant increase in the unit value arising out of advanced processing and value addition. Further, the exports are not geographically diversified. These issues need to be addressed by bringing in technologies and imparting skills to produce high-value processed products. This warrants enhanced institutional support, particularly in terms of credit and technology handholding. The increased exports are to be realized without compromising domestic nutritional security. The major focus areas for improving exports include generating an exportable surplus, increasing unit value through improved processing and value addition, strengthening the quality assurance system, augmenting credit flow, streamlining subsidies and convergence of developmental agencies. The future production is to be technology-led. The Government interventions are to be directed towards incentivizing

value addition and adoption of modern technologies, including isochoric freezing, on-line automation in monitoring physical hazards, non-thermal technologies such as electron beam irradiation, and pulsed light and plasma light processing. Compliance with SPS measures and ensuring traceability are key elements in this direction. The fiscal policies – taxes and subsidies – are to be relooked for the adoption of responsible and sustainable fishing practices, advanced technologies of processing and value addition, adherence to SPS measures, exploration of newer prospective markets and advanced quality packaging practices. Greater coordination among various departments is anticipated to effect convergence of the efforts and help in conflict resolution. Favourable institutional mechanisms, and legal and administrative backup are necessary for such a reform.

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ACKNOWLEDGEMENT. This article is drawn from the project, 'Assessing input and service delivery system for marine fisheries development in Kerala' at ICAR-Central Institute of Fisheries Technology, Kochi using internal funding.

Received 22 October 2022; revised accepted 30 January 2023

doi: 10.18520/cs/v124/i6/664-670