Conservation of Fisheries Resources in India - Economic and Livelihood Issues

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Introduction

Fish is the main animal protein source for over one billion people and it provides livelihood for over 200 million people world wide and 90 percent of these people are from developing countries. The world's marine catch has increased more than four times in the past 40 years, from 18.5 million t in 1950 to 141.6 million t in 2008 (FAO, 2009). There is a massive over capacity in the global fishing fleet. The build up of fishing fleets, deployment of powerful fishing technologies, increasing pollution and habitat loss has depleted fish stocks world wide. Even with advancement in fishing technology and increased fishing effort, the productivity has declined. The excess fishing fleets competing for limited fish resources result in stagnant productivity and economic inefficiency. The fish catching operations are buoyed up by subsidies. At global level each tonne of fish caught uses almost half a tonne of fuel. Marine fishing operations are part of the USD 400 billion global seafood industry. Economic losses in marine fisheries resulting from poor management, inefficiencies, and overfishing add up to a staggering USD 50 billion per year. Well-managed marine fisheries could turn most of these losses into sustainable economic benefits for millions of fishers and coastal communities (Arnasonis *et al.*, 2009).

The increasing demand for fish both in developing and developed countries put much pressure on the stocks of marine fishes around the world. Market expansion creates demand for new products, which greatly expands fish processing facilities. The requirement of raw material for processing in these facilities fuels the expansion of backward linkages into the fishing activity and enhances capacity. The diffusion of bottom trawling

in Asian waters in the 1960s following the expansion of the market for shrimp in the United States, Europe and Japan is one of the classic examples (Kurien, 2006). Marine fisheries in many of the developing countries are exploited unsustainably due to its characteristics of open access situation with ill specified property rights and imperfect market conditions. Those with access to modern technology (trawlers) can put a cost on others by causing over fishing. Without well defined property rights, individuals will increase their effort, and in fisheries without efficient license limitations, new fishers will enter, provided that greater profits can be earned in the fishery than in other industries or activities. More equitable and sustainable management of the oceans as well as stronger protection of marine ecosystems through a well-enforced network of marine reserves is essential in solving these problems. The FAO code of conduct of responsible fisheries also recommended sustainable exploitation of natural resources at national and international levels.

Marine fisheries scenario in India

India has a coastline of 8,118 kilometer, 2.02 million square kilometer of Exclusive Economic Zone and 0.5 million square kilometer of continental shelf. There are about 3,937 fishing villages, 189 fish landing centers, 59 minor fishing harbours and six major fishing harbours. Out of the 2,80,000 fishing crafts, 1,81,000 are in the non-motorised sector, 45,000 in motorised category and 54,000 in mechanized sector. Fish production in the country increased from 0.75 million t in 1950-51 to 6.4 million t in 2007-08 and there was a structural shift in the contribution from marine sector to inland sector during this period. Contribution of fisheries to national GDP is about 1.21% (2007-08), which formed about 5.37% of the agricultural GDP. Fishing, aquaculture and allied activities are a source of livelihood to over 14 million people and a major foreign exchange earner to the nation.

The Maximum Sustainable Yield (MSY) of the fish stocks from the Indian EEZ has been assessed as 3.9 million t, which included the demersal (1.93 million t), pelagic (1.74 million t) and oceanic (0.25 million t) resources (Sudarsan *et al.,* 1990). The coastal zone (up to 50 m depth), which holds an estimated potential production of 2.28 million t, is experiencing fishing pressure by the operation of traditional and mechanized boats. In many cases, the rate of harvesting has exceeded the natural rate of renewal resulting in biological overfishing. Literature on Indian fisheries showed that majority of the fishing population in India earned their livelihood under precarious and vulnerable conditions (Kurien, 1998). Marine fish production

from near shore waters had reached almost a plateau and, only marginal increase is predicted from this zone. Major gap in total fishable potential and present production exist in deep sea and offshore pelagic resources, which is estimated at about 0.92 million t (Dehadrai, 2006).

Domestic marine fish marketing in India

Seafood industry is a potential foreign exchange earner and supports a vast majority of population in the coastal belt of India. Fisheries that had been the traditional avocation of coastal fishing communities in India, has now been transferred to the status of a multi-million industry consistently contributing about 1% to country's GDP. The increasing share of fisheries in the total GDP can be attributed to the increasing fish production (both from marine and inland), consistent demand in external and internal markets and the ever increasing awareness on nutritive value of fish. Increased demand for processed value-added products is a worldwide trend. With a rapid economic growth, the domestic retail sector is expanding in India. This has created a significant market for processed and value-added fishery products within the country and also new opportunities for trade in seafood fish processing and value-addition.

With the growth of national and international business of fisheries, the ability to meet customer expectations has emerged as the key competitive factor with the advent of emerging technologies sensitive to market variations. The infrastructure of marine fish marketing in India is principally oriented towards export market and suffers from drawbacks among others such as disorganised marketing structure, lack of adequate infrastructure, deterioration and wastage of fish during transportation and dominance of middlemen (Sathiadhas, 1998).

In the light of WTO regulations, the export front has become more competitive and exclusive dependence on export market can cause serious repercussions in the event of any setback. Internal marketing systems catering to increasing demand for fish and fish products can serve as a buffer in times of setbacks in export. Supply chains in domestic marketing can be improved by enhancing private investment in value addition and transportation sectors. There is immense scope of market development of value added products for domestic consumption as about 30% of the total landings become unsuitable for fresh consumption.

The gross earnings from marine fisheries at first sales in India increased from Rs.74,090 million in 1995 to Rs.166,494 million in 2008.

The fishing industry in India is still totally depending on the export markets as 50% of the gross earnings at landing centre level is contributed by exportable varieties like crustaceans and cephalopods which hardly constitute 20% of the total landings. In the domestic marketing system, marine fish sales used to be mostly confined to the coastal and adjoining regions in the past. In 2007, about 42% of fish is consumed fresh in and around the production centres, 47% in demand centres located up to a distance of 200 km from the coast and only 11% goes to the centres located beyond 200 km. In marine fish marketing, only 20% of production is exported and the remaining is channelised in the domestic marketing system. However, fish marketing system in India is not well organised unlike the marketing of agriculture, horticulture or livestock products.

Price behaviour in the domestic marine fish marketing system

Fish prices fluctuate widely across the day, season and regions. This fluctuation is very high because of the uncertain nature of fish harvest, its perishable nature and variation in short run supply. Besides, fish supply being highly inelastic, a bumper catch can slash down the fish prices and a small catch will boost the prices to very high level (Sathiadhas and Narayanakumar, 1994). The post-harvest operations of fish provide more employment than the production sector. The increase in price of wholesale and retail price of fish for the last three decades is far higher than any other food items. The average landing centre price of different varieties ranged from Rs. 16 per kg for silverbellies to Rs. 251 per kg for penaeid shrimps in 2008-09 at the national level. Change in unit price was high during the last ten years for varieties like eels (125%), lizardfishes (104%), threadfins (128%), pomfrets (165%), mackerel (188%), seerfishes (170%), lobsters (117%) and crabs (237%). The average consumer price (2008-09) for different varieties ranged from Rs. 25 per kg for flying fishes to Rs. 634 per kg for lobsters. An analysis of prices of selected varieties of fishes showed that price at first sales and last sales increased significantly over the years. There was price rise with effect on increase in consumer demand coupled with inflationary pressures.

The fishermen's share on consumers' rupee has increased over the years (1989-90 and 2008-09) for varieties like seerfishes (63 to 73%), pomfrets (62 to 72%), mackerel (54 to 71%), rays (39 to 55%) and silverbellies (41 to 48%), indicating increase in fish marketing efficiency (Table 1).

Although the share of producers increased over the years for high quality fishes, there is enormous scope to enhance the marketing

Table 1: Percentage share of fishermen in consumers' rupee for different varieties of fish (1989-90 to 2008-09)

Fish groups	1989-90 %	1996-97 %	2000-2005 %	2008-09 %
Seer Fishes	63	68	71	73
Pomfrets	62	60	70	72
Mackerel	54	50	71	71
Ribbonfishes	41	48	55	63
Tunnies	55	45	62	59
Catfishes	49	56	63	65
Barracudas	53	40	62	64
Silverbellies	41	30	51	48
Lizardfishes	42	35	53	66
Goatfishes	37	57	57	67
Rays	39	47	64	55
Threadfins	46	42	65	65

Source: SEETTD, CMFRI, Cochin

efficiency of low quality fishes such as silver bellies and lizard fishes in the internal markets. Fresh fish, once inaccessible to distant locations till a few years ago are now easily available due to the vast improvements in handling technologies coupled with advanced transportation facilities and consequent market penetration. Parallel development of internal marketing system is essential for maintaining sustainable growth of fisheries sector. The consumers are also becoming increasingly quality conscious and are also aware of their rights and claim good quality produce for consumption necessitating balanced approach to development of domestic market infrastructure. Thrust should be given for popularizing value added products and quality consciousness at par with international standards as well as introduction of policy measures (support price for selected species) protecting producer's interest at times of glut in the market. Strengthening cooperative marketing and popularizing responsible fish marketing is a welcome step in this direction to promote quality control, consumer welfare and marketing efficiency.

Infrastructure development to promote domestic marketing

Domestic markets invariably lack infrastructure including basic amenities. Marketing functions like grading and weighing is done as in

its primitive stage coupled with lack of equipped platforms for facilitating these processes, as the first point of sale in fish marketing is landing centre itself. In effect, producers and consumers bare the brunt of monopoly of big traders dominating at the point of first sales. While state interventions in this arena offer little success, there is scope for cooperative marketing channels that undertake the role of marketing intermediaries to the advantage of producer and consumer.

Fish is a highly perishable commodity and domestic supply is often restricted by lack of effective supply chain mechanisms. This is invigorated by insufficient infrastructure in terms of transport, rail, road and storage facilities. It is hence imperative to create the primary infrastructure facilities for transport and establishment of modern markets with basic amenities in the auspicious of the local panchayats which can be operated on nominal fees. Technological advancements have facilitated refrigerated transportation vehicles and storage yards adding to place and time utility. Promotion of supply chain mechanisms in public and private sector that facilitate transportation of fresh fish to interior locations is essential.

Prospects of cooperative fish marketing

Intermediaries have undeniable role in marine fish marketing both in domestic and export markets despite increasing demand and high price of fish varieties and public interventions. Marketing margins are still taking away a lion's share of the producers' income indicating the need for institutional sales channels. The experiments in the cooperative fish marketing have not picked up momentum except in Gujarat, Maharashtra and few pockets of other maritime states. Fish marketing conducted by fishermen societies in the districts of Tuticorin and Kanyakumari of Tamilnadu State during the last decade indicate that the fishermen receive 60-80 % of the consumers' rupee for different varieties of fish (Sathiadhas *et al.*, 2000). Promotion of Self Help Groups and specialised training of a minimum number of members in marketing may enhance the fishermen's share in consumer's rupee and generate additional employment opportunities to coastal fisherfolk.

Shifting focus to middle income consumer segment

The marketing focus has recently shifted from the affluent to the middle order clients, including that of trans-nationals by the permeation of the supply chains. Fish marketing through these types of networks can prove successful due to increase of fish eating consumers in the

population. Consumerism and the growing fast food markets have increased the demand for "ready to cook" and "ready to eat" items instigating demand for value added products among the domestic segment. Rural and semi-urban consumer segment has vast potential which is still a niche market for fish. Consumers in these markets depend on mobile vendors who supply only low value fishes. Mobile cold storages can be utilised to serve such markets.

Quality assurance in domestic marketing

Quality assurance in the domestic marketing channel is the need of the hour for development of the internal marketing system, which is essential to offset any market collapse and price crash in the export market at any point of time (Sathiadhas and Hassan, 2002). The marketing and distribution system in the fishery sector of the country is not well equipped with quality maintenance mechanism comprising essential marketing infrastructure and proper administrative procedures. In the light of HACCP regulations, the government as well as industrialists has been increasingly complying with the quality standards of the export products. However, quality maintenance in the internal distribution system of fresh and processed fish is also essential. With the agreement on free trade and frequent fish imports imposing stringent quality control in the domestic system need immediate attention. Introducing uniform quality certification process both for exports and domestic trade is required.

Responsible fish marketing

The concept of responsible fisheries advocated by FAO through its Code of Conduct for Responsible Fisheries (FAO, 1995) is an epitome among global efforts for realising the coveted goal of sustainable utilization of our marine resources. Article 11 (Post-harvest Practices and Trade) of the Code of Conduct for Responsible Fisheries lays out ideas of responsibility in three main areas namely, the environment; the industry that produces fish and fishery products and responsibility to the consumer of fish. The article manifests that the state should adopt appropriate measures to ensure the right of consumers to safe, wholesome and unadulterated fish and fishery products.

International sea food trade: sustainability issues

World markets are becoming more global or changing rapidly at an increasing rate complying with the supply-demand dimensions.

International trade in fish and fish products has been increasing very rapidly in recent decades. During the last 25 years, the Indian seafood export increased from 75,591 t in 1980-81 to 6,02,835 t in 2008-09 (Table 2). During the same period, the value of seafood trade also increased from Rs. 2348 million to Rs. 86,080 million (Source: MPEDA, Cochin). The growth in the value of seafood trade is nearly twice as that of the volume of trade, which can be attributed to the increase in prices of different varieties coupled with liberalisation and consistent demand in the export market for Indian sea food.

Table 2: Export growth of marine products from India (1995-96 to 2008-09)

Year	Quantity, t	Value, Rs. million	Unit value, Rs. kg^{-1}
1961-62	15732	39.2	2.49
1971-72	35523	445.5	12.54
1980-81	75591	2348.4	31.07
1990-91	139419	8933.7	64.08
1995-96	296277	35011.1	118.17
2000-01	440473	64438.9	146.29
2001-02	424470	59570.5	140.36
2002-03	467297	68813.1	147.26
2003-04	412017	60919.5	147.86
2004-05	461329	66466.9	144.08
2005-06	512164	72453.0	141.46
2006-07	612641	83635.3	136.52
2008-09	602835	86080.0	142.79

Source: MPEDA, Cochin

Exports played a crucial role for development of marine fisheries and socio-economic scenario of coastal rural sector. The infrastructure development in terms of ice plants, pre-processing centres, processing centres, export houses, consequent transport and other facilities along the fishing villages greatly owes to the growth of marine product exports. Seafood business in India is still oriented towards international trade. About 80 percent of the catch is channelised through domestic marketing system and the rest for exports.

The declining fish catches and international legislations regarding seafood exports pose serious consequences on livelihoods of poor

fishermen. Despite improvements in the sector, benefits are not uniformly distributed among different stakeholders of fishing industry. Post-harvest fisheries activities including processing, preservation, product development, transport and marketing provide greater employment to labour than harvesting sector. As demand and price of fish keep continuously increasing in domestic and export markets, opportunities for above activities also keep growing. Liberalization of economies coupled with increasing demand for value added products and other product diversifications has resulted in structural changes in the seafood industry in the last decade. The Uruguay Round Agreement on the Application of Sanitary and Phytosanitary Measures (SPS) and the Agreement on Technical Barriers to Trade (TBT) adopted by WTO members in 1995 had given a new direction to the international food trade to ensure that requirements such as quality, labelling and methods of analysis applied to internationally traded goods.

Quality consciousness has gained importance in the present day scenario, especially after the WTO regulations governing international trade. The consumers in developing countries are also becoming increasingly quality conscious due to spread of globalization and they are also aware of their rights and claim good quality produce for consumption. Responsible fish marketing is a welcome step in this direction that essentially promotes the consumers welfare and quality control systems with international standards in the auspicious of the State. In addition, there should be appropriate safety and quality assurance systems to protect consumer health and prevent fraud. With specific regard to fish processing, distribution and marketing, the code entrusts responsible practices to avoid post harvest losses and waste, efficient use of bycatches, responsible use of water and energy involved in post harvest handling operations. In promoting responsible trade, the code suggests promotion of value added products by developing countries. In addition, it is required that the goods traded accords with sound conservation and management practices. Also it is essential that legal provisions may be made to avoid post harvest sector creating environmental problems leading to market distortions.

The World Wide Fund for Nature (WWF) and Unilever PLC/NV first publicly promoted ecolabelling at their Marine Stewardship Council (MSC) initiative in 1996, which is a voluntary method of environmental performance certification and labelling that is practised around the world. Since 1990s, ecolabelling schemes have been developed in most industrialised countries for a wide range of products and sectors to

promote a responsible and sustainable fishing industry. Ecolabelling is a market based economic instrument that seeks to direct consumer's purchasing behaviour so that they take account of product attributes other than price. It reassures the consumers that products have been produced in an environmentally friendly manner. The large and progressive global fisheries trade especially from developing to industrialized countries indicates the potential of ecolabelling both as an incentive to improved fisheries management and a barrier to trade. However the approach has caused controversy in several international arena, including WTO subcommittee on trade and environment due to its potential to act as a barrier to trade and its coherence with international trade rules.

Impact of subsidies on fish trade and sustainability

Fisheries subsidies are defined as government actions or inactions that are specific to the fisheries industry and that modify by increasing or decreasing the potential profits by the industry in the short, medium or long term. Subsidies to the fisheries sector may be either direct (e.g. vessel buyback schemes) or indirect (e.g. foregone tax revenue on fuel), and may be provided for goods, services, income or price support. According to FAO (2009), 75% of the fish stocks worldwide are fully or overexploited and part of the cause of this overexploitation are the subsidies that have been provided to fishing fleets. Subsidies lead to the build-up of excessive fishing capacity. Global fisheries subsidies are estimated at USD 30–34 billion per year representing 35-40% of the value of total fisheries production. Capacity enhancement and fuel subsidies account for USD 20-24 billion. Developed countries provide about 55% of subsidies and developing countries the remaining 45%.

Subsidies tend to attract more capacity than necessary into the fishery, in the form of vessels, equipment and labour. Over-capacity in a fishery often leads to overexploitation of the fish stocks. This causes reduced productivity and lower catches and consequently lower incomes and profits for the industry. Subsidies can insulate fishers from the economic signals in the fishery, countering the economic incentive to stop fishing when it is unprofitable. Subsidies distort competition by lowering production costs for certain producers, giving them an artificial competitive advantage. Even though subsidies can increase short-term profits for the industry, they result in a reduction in its longer-term viability. By encouraging overcapacity and excess fishing effort, the sustainability of fisheries resources are threatened and catches (and therefore profits) are reduced. The over-capacity created can also inadvertently promote illegal

fishing. If the subsidies affect fish supplies and prices, they can have an impact on trade in fish and fishery products, by increasing the amount of fish available from a particular country, or by reducing the price at which it can be sold. The impacts of subsidies depend on the management system in place, enforcement of its regulations and whether stocks are over-fished or under-fished. If management regulations are limited or absent, subsidies lead to overinvestment and a 'race to fish'. This may result in increased catches in the short term, but reduced fish stocks, lower catches, higher costs and lower revenues in the longer term. If management is well implemented and enforced, subsidies will not necessarily have an impact on the target fish stocks. There is an urgent need to reduce capacity-enhancing subsidies and focus on developing a profitable and sustainable industry that can adapt to changing economic and environmental conditions.

ASEAN FTA - sustainability of Indian sea food industry and livelihood issues

The Indo-ASEAN Free-Trade Agreement would eliminate tariffs on over 4,000 products, agricultural as well as industrial, that account for more than 80% of the trade in goods between the two sides. Tariffs on these products would be reduced to zero by 2016, and on about 10% (500 items) of products that have been placed on the sensitive track, tariffs will not be eliminated but brought down to 5%. Even though majority of the marine products from India are expected to be protected through inclusion in the negative list, there are apprehensions about the impact of ASEAN FTA on India's seafood industry and a comprehensive analysis of the impact of ASEAN FTA on the fishing economy, livelihood of workers and traders linked to the marine sector is necessary.

Conclusion

The extent of marginalization of fisherfolk with less capital investment could be blocked to a certain level due to increase in the domestic and export prices of fish. However greater emphasis on export trade for finfish in recent years has created scarcity for quality products in the internal marketing system. The average capital investment per active fishermen increased over the last four decades and there is a gradual occupational shift from traditional to mechanised units capable to go for multiday operations. High capital intensity coupled with technological advancements have fastened the phase for exploitation of high rent resources creating bioeconomic management problems. The open access nature of Indian

capture fisheries and the absence of economic incentives to conserve fishery resources call national fisheries policy to pay greater focus on resource conservation through regulatory measures.

References

Arnasonis, R., Kelleher, K. and Willmann, R. (2009) Sunken Billions: The Economic Justification for Fisheries Reforms, Joint Publication by the World Bank, Washington, DC, USA and the FAO, Rome

Dehadrai, P.V. (2006) Missing opportunities in marine fisheries, Paper presented at the National Seminar on Sustainability of Seafood Production: Reflections, Alternatives and Environmental Control, 23–24 February 2006, National Institute of Oceanography, Dona-Paula, Goa

FAO (1995) Code of Conduct for Responsible Fisheries, FAO, Rome

FAO (2009) The State of World Fisheries and Aquaculture, FAO, Rome

Kurien, J. (1998) Kerala's marine fishery: evolving towards unsustainability - a personal statement spanning three decades, Discussion Paper 15, Centre for Development Studies, Thiruvananthapuram

Kurien, J. (2006) Untangling subsidies, supporting fisheries: The WTO subsidies debate and developing country priorities, ICSF Occasional Paper, International Collective in Support of Fish Workers, Chennai, India

Sathiadhas, R. (1998) Marine fisheries in Indian economy, In: Advances and Priorities in Fisheries Technology, p. 463-472, Society of Fisheries Technologists, (India), Cochin

Sathiadhas, R. and Hassan, F. (2002) Product diversification and promotion of value added seafood products, Seafood Export J. 33 (8&9): 27-42

Sathiadhas, R. and Narayanakumar, R. (1994) Price policy and fish marketing system in India, J. Biol. Educ.11 (4): 225-241

Sathiadhas, R. and Narayanakumar, R. and Immanuel, S. and Fernando, A.B. (2000) Domestic marketing and infrastructure development of marine fisheries in India, In: Proc. Workshop on Rural Fish Marketing, 2000, Tuticorin

Sudarsan, D., John, M.E. and Somvanshi, V.S. (1990) Marine Fishery Potential in the Indian Exclusive Economic Zone - An Update, Bulletin of Fishery Survey of India 20: 1-27