Strategy to increase export of fish and fishery products from India

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In India, fisheries provide full-time job for 6 million fishermen and fish farmers, and earn foreign exchange equivalent to 47,000 million rupees. Shrimps, crabs, lobsters, squids and finfishes constitute major items of our export; these were previously sent dried and canned but presently in frozen form; increasingly, live fishes are being now exported. Strategies for increasing fisheries export, processed at a cheaper cost, in a value-added form, for a higher unit price are suggested. Scope for expanding capture (offshore and deep-sea) fisheries, and intensive but eco-friendly culture fisheries including exotic fishes is explained. Importance of maintaining high standards of hygiene at the collection and processing centres is highlighted. For the quantum export earning, budget allocation by the Central Government for fisheries development is woefully low (0.3% of the total outlay), and for research development is also low (6% of the ICAR budget outlay). The urgent need for the formation of a separate Ministry for Fisheries in the Central Government, and strategies for overall developmental fisheries are emphasized.

ASIA is the centre of fishing and aquaculture activities. Four out of 10 top fish-producing countries in the world are from Asia: Japan, China, India and South Korea. They contribute about 80% of total Asian landings. Seven out of 10 top shrimp-producing countries are also from this region: India, Indonesia, China, Thailand, Philippines, Malaysia and Vietnam[1]. Expectedly, fishing and aquaculture industries play a significant role in contributing to fish production to a large number of Indian population. More than 6 million fishermen and fish farmers of India are working full time and perhaps twice as many working part-time rely on nearby waters for their livelihood. Almost all of them are small-scale fishermen and farmers[2]. Hence our strategy to enhance export promotion of fish and fish products, especially in value added form, will pay a rich dividend to the rural poor fishermen, fish farmers and our country on the whole.

Export scenario

The value of marine products export from India substantially increased from 25 million rupees in 1950–51 to 46,975 million rupees in 1997–98 (Table 1)[3,4]. The marine products export, which accounted for just 0.5% of India's total exports in the early 1950s, contributed 3.5% of the total exports in the 1990s. Frozen shrimp, fish, cuttlefish and squids constitute the major items of our fish export (Table 2). The contribution to export by these items is only 14.4% of our marine production but they constitute as much as 74% of the total value of the landings[5].

The quantity of marine products export from India increased by about 20 times, from 19,650 tons (t) in 1950–51 to 385,818 t in 1997–98 (Table 1)[2,3]. Compared to the 5-fold increase in the marine fish production during the same period, the growth in export has been phenomenal, which is due to three reasons. Firstly, there has been a steady increase in the marine fisheries production through capture fisheries from 0.5 million ton (mt) in 1950–51 to 2.7 mt in 1996–97 (ref. 5) due to modernization of fishing fleet and discovery of rich shrimping grounds. In addition to this, export of cultured shrimps commenced in 1990, progressively increased to 70,400 t, valued at 22,000 million rupees in 1996. Secondly, there was a shift in the export markets and products. For instance, India did not export marine products to Japan in 1940s but exported 45% of its products to Japan in the 1990s (Table 3)[4]. Also, the demand from Southeast Asia and the Gulf countries is on the increase since 1990s, in addition to the demand from the developed countries. Thirdly, a part of the production that was earlier used for domestic consumption is diverted for export in the 1990s, as exemplified by the export of ribbonfishes to China and other medium priced fishes such as the threadfin breams, mackerel and carps to the Middle East, where there is a good concentration of Indian population. The marine products export, which accounted for only 3.7% of the country's marine fish production in the early 1950s, contributed 14.4% during 1997–1998. Consequently, a good part of our investments, employment and income is related to this increased export.

Shift and strategy towards high value products

There has been a shift in the export from low value fish and fish products towards the high value products. For instance, the export of finfishes decreased from 99%

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of the value during 1940–46 to 12% during 1990–1994 (Table 4)[4], but that of the high value shrimps and cephalopods increased to 72 and 12%, respectively. Also the export pattern shifted from dried and salted products to canned and later to frozen products/live organisms. The value of dried and salted products, which was 85% of the export, declined to a negligible quantity in the 1995–1997 (Table 5)[3]. In the early 1940s, frozen products were not exported, as there was no freezing plant in the country. Canned products dominated the scene in the 1950s and frozen products from the late 1950s, as a few freezing plants were set up in Kerala. With increasing demand for frozen products, more freezing plants were installed in the 1960s and the total freezing capacity in the country reached 517 t/day and the frozen storage capacity 7,739 t/day, with Kerala contributing 75% of them. The freezing and storage capacities attained 6,600 t/day and 80,000 t/day, respectively in 1996. Consequently, about 99% of the export value is realized from the frozen products since 1990s.

Some of the fishery resources such as shrimps, lobsters, crabs, sea cucumbers, sea snails (abalones), bivalves (oysters, scallops) and finfishes (groupers, eels, snappers, sea breams, sea bass and ornamental fishes) and freshwater turtles command persistent demand in live fish markets of Japan, Korea, China, Taiwan, Europe and USA, fetching very high price, when compared to frozen fish. India's export of live marine products stood at 2,000 t worth 340 million rupees in 1996–97 (Table 2). The major items of live fish export are the mudcrab (*Scylla serrata*), spiny lobsters and reef fishes. For instance, the frozen lobsters fetch only Rs 370/kg, while live ones Rs 1,000/kg. Similarly, fattening of juvenile lobsters from 100 g size (Rs 200/kg) to 300 g size for live export would increase the financial returns five fold. As export of live animals realizes higher unit price than frozen products, research institutions, especially Universities, should play a key role to develop suitable techniques for exporting live fishes.

The strategy to increase the export earnings of spiny lobsters should be to enhance the natural population through a large scale sea-ranching programme with hatchery reared larvae/juveniles. Spiny lobster with a fecundity of 1.0 million eggs and limited migratory behaviour is an excellent item for captive breeding and sea ranching, as it is possible to enrich the lobster fishing grounds at least by 400% (and increase the export to US $ 200 million). The export of berried females and juveniles of < 200 g size should be banned. As a conservation measure, closed fishing season during spawning period should be introduced[5]. Adequate infrastructure facilities should be created to keep the lobsters alive and export them as live lobsters. This will fetch an additional export revenue.

Andaman and Nicobar islands have enormous, untapped export potential for the above live marine products with a close proximity to Singapore, from where very good air service is available to any destination in the world. India should set up a very strong base for sea-farming and export of live marine products with proper infrastructure for production and export from the Andaman and Nicobar islands as well as the main land. Port Blair, Chennai and Mumbai can emerge as the major

Table 1. Export of marine products from India[3,4]

Year	Our export	
	Quantity (thousand ton)	Value (million Rs)
1950–51	19.7	24.6
1960–61	15.7	39.2
1970–71	35.9	350.7
1980–81	75.6	2,348.4
1990–91	139.4	13,758.8
1997–98	385.8	46,974.8

Table 2. Export of marine fish and products from India[4]

Item	1994–95	1995–96	1996–97	1997–98
Frozen shrimp				
Quantity	101.8	95.7	105.5	101.3
Value	25102.7	23568.1	27036.2	31405.6
Frozen fish				
Q	122.5	100.1	174.5	188.0
V	4465.7	3722.6	6526.6	7257.3
Frozen cuttle fish				
Q	28.1	33.8	31.2	37.3
V	2240.1	2608.0	2723.7	3234.1
Frozen squid				
Q	37.2	45.0	40.9	35.1
V	2451.0	3195.8	2904.5	2708.9
Dried fishes and products				
Q	—	—	9.8	5.7
V	—	—	418.6	2708.9
Frozen lobster				
Q	—	—	1.2	1.3
V	—	—	438.7	477.9
Live fishes and shellfishes				
Q	—	—	2.0	1.7
V	—	—	339.7	293.4
Chilled products				
Q	—	—	1.6	3.2
V	—	—	187.4	443.1
Others				
Q	17.7	21.6	13.1	12.2
V	1493.2	1916.0	814.2	805.6
Total				
Q	307.3	296.2	379.8	385.8
V	35752.7	35011.1	41389.6	46974.8

Q, Quantity in thousand tons; V, Value in million rupees.

ports for export of live marine products, which can step up her export at least 10 times from the present level.

Changing phase of consumer preference

Sea-food processing industry is undergoing two major changes to suit the eating habits and lifestyle of consumers in industrialized nations. Cooked products have started replacing the raw products and introduction of microwave oven has brought in a revolutionary change in processing and packing of fishery products in ready-to-eat convenient packs. Imitation products prepared partly with fish and partly with other products are making an inroad in the sea-food to replace expensive gourmet dish and satisfy consumers of all classes. Probably this new innovation in product development may find a solution to the shortage of fishery products in the coming years.

Value addition in frozen products

India is still remaining a supplier of raw material to the developed countries and to a few developing countries (Table 3). The Marine Products Export Development Authority did a lot of promotional programmes for value addition, which must be continued to achieve desired results. When an exporter from a developing country gets into the process of value addition, the resistance builds up in importing countries, especially among the re-processors. They discourage the export of value-added products through tariff and non-tariff barriers. It also requires a lot of image building exercise for India. The consumers in the developed world go by established brand name, which is a very expensive affair for an exporter in the developing country. Attempts were also made to pack in India in the name of established brand of a few supermarkets in Japan, EU and USA. Though the value-added products are moving today, the Indian exporters are not getting the price, brand image and recognition. Supermarkets demand supply and servicing of their sea-food racks at short notice. Unless the products are stored locally in the reefer warehouse, it may not be possible to satisfy/meet the requirements of supermarkets. Warehousing and blocking of capital also add to the cost, making the Indian exporters uncompetitive. The following strategies are recommended: (i) The Central Government should take steps to introduce the latest technology, popular in the developed world, to process value-added products; (ii) Warehousing for frozen sea-food should be set up in EEC to centralize marketing of value-added products and interested

Table 3. Changes in the pattern of marine products export to different countries; the figures are percentage of total value of export[4]

Country	1940–46	1956–65	1966–72	1972–89	1990–94	1995–97
Japan	0	7	48	68	46	45
Europe	2	11	8	13	25	19
USA and Canada	0	57	39	12	12	11
South East Asia	98	24	5	5	12	21
Middle East Asia	0	0	0	0	1	2
West Asia and Africa	0	1	0	2	4	2

Table 4. Changes in the pattern of export of marine fishery groups; the figures are percentage of total value of export[4]

Group	1940–46	1956–65	1966–72	1972–89	1990–94	1995–97
Shrimps	0	81	92	87	72	65
Lobsters	0	2	2	3	2	2
Crabs	0	0	0	0	1	1
Cephalopods	0	0	0	3	12	14
Fishes	99	10	1	6	12	16
Shark fins	1	3	1	0	0	1
Others	0	4	4	1	1	1

Table 5. Changes in the form of export products; the figures are percentage of total value of export [4]

Group	1940–46	1956–65	1966–72	1972–89	1990–94	1995–97
Dried and salted	85	21	3	2	< 1	< 1
Frozen	15	65	93	98	99	99
Live	0	14	4	< 1	< 1	< 1

exporters should avail this facility to overcome the initial hurdles in retail marketing, and (iii) A group of large established exporters should step into this venture. According to the choice of different supermarkets, the value-added products should be pooled from India and made available in the warehouse in appropriate quality and quantity. These strategies will help India to compete as effectively as other Asian countries, for instance Thailand (Table 6), are doing.

Increase in unit price

The average unit price of the exported marine products increased substantially from Rs 1.25/kg in 1950–51 to Rs 122/kg in 1997–1998. The increase in the unit price is due to increased demand, inflation and weakening of Indian currency. Escalation in the cost of boat-building materials, machineries, oil and labour has substantially increased the cost of fish production in capture as well as culture fisheries. The cost of fish produced by a trawler in India, for instance, has increased from Rs 4/kg in 1984 to Rs 14/kg in 1996. With increasing human population, the demand and supply gap for sea-food has increased to 20 mt.

Present problems

The marine products are highly perishable. It is extremely important that maximum care is taken to maintain hygienic conditions in places where they are landed and processed. In India, improper preservation of fish catches, inadequate infrastructure to transport the raw material to processing factory, want of adequate investment and lack of interest in modernization have resulted in lowering the quality of raw materials. Regarding shrimp processing, there are about 900 peeling sheds and 402 processing units in India. Since peeling is a house-hold activity of the fisherfolk, the required hygiene for handling the highly perishable material is not maintained. Consequently, the incidence of pathogenic microbes *Staphylococci*, *Vibrio*, *Salmonella*, *Bacillus*, *Pseudomonas* and others are often reported in the export consignments. There is an immediate need to centralize and upgrade the pre-processing (peeling) activities by putting up very modern hygienic units, preferably close to the landing centres.

Capture fisheries

At present, the fishery resources of the inshore waters of India are being intensively harvested and this has

Table 6. Export trend of crustaceans (shrimps) to European Union (EU) to show the value-addition of Thai export *vis-à-vis* India's export of raw material

Country	1988	1989	1990	1991	1992	1993	1994
India							
V	37.2	51.7	62.8	89.3	74.3	71.6	117.4
Q	8648.0	11543.0	13796.0	19255.0	17917.0	16147.0	23209.0
Thailand							
V	42.9	51.1	74.6	108.8	121.3	121.3	162.5
Q	5897.0	69098.0	11349.0	19255.0	18070.0	18903.0	20874.0

Q, ton; V, Million European Currency Unit (ECU).

Table 7. Annual potential yield and average catch (1995–1997) of exportable fish groups in the inshore (< 50 m depth) and offshore (> 50 m depth) in the EEZ[7]

	Potential (000 t)			Catch (000 t)		
Group	Inshore	Offshore	Total	Inshore	Offshore	Total
Sharks	27	40	67	27	14	41
Perches	114	125	239	114	40	154
Ribbon fishes	94	216	310	94	30	124
Carangids	143	304	47	130	32	162
Pomfrets	42	12	54	34	8	42
Seerfishes	34	8	42	34	8	42
Tunas	37	451	488	37	5	42
Penaeid shrimps	178	3	181	178	0	178
Lobsters	2	3	5	2	0	2
Cephalopods	90	21	111	90	23	113
Total	761	1183	1944	740	160	900

perhaps led to over-exploitation of exportable species of fishes, shrimps, lobsters, crabs and cephalopods. The resources of offshore waters appear to be under-exploited (Table 7). However, a potential yield of over one million ton has been estimated, which at a modest rate of Rs 100 per kg can generate export earnings of about 100 billion rupees.

Culture fishes

There is an urgent need to select different kinds of aquatic environment to augment export production. In 1995, the brackishwater environment accounted for only 5.4% and 16.4% of total world aquatic production by quantity and value, respectively; these have now increased to 7% in quantity and 30% in value. However, the total production from marine waters was high, if aquatic plants are included. Marine aquatic plants and filter feeders (oysters, mussels, clams, scallops), finfish and crustaceans account for 90, 8 and 2% of the total marine production. However, shrimps and finfish (10%) fetch US $ 12 billion.

The availability of vast potential areas and a number of species amenable to culture offer excellent scope for producing exportable species of finfishes, crustaceans, bivalves and sea cucumbers. However, aquaculture activities, at present, are restricted to shrimps. There is an urgent need for increasing the number of biological species and diversifying aquaculture (see ref. 6). Out of the potential area of 1.4 m ha, only about 150,000 ha has been brought under shrimp culture and it is possible to extend it to at least another 150,00 ha and produce about 300,000 t exportable shrimps; there is a similar scope for expanding inland water aquaculture; however, all without harming the environment. Polyculture of carps with freshwater prawns can be taken up in large scale to produce prawn for export and fish for domestic consumption. *Parapenaeopsis stylifera*, a shrimp in great demand for its texture, colour and flavour, and *Metapenaeus dobsoni*, known for its ability to tolerate wide variations in salinity, may be taken up for intensive culture in a big way.

Protection of aquatic ecosystems

Feeding 7 billion people on earth through agriculture in an environmentally sustainable manner has posed a major problem. Hence people all over the world have started looking upon water resources as a major source for food production investing far more time and capital in aquaculture. Therefore a strategy has to be evolved to protect our water bodies from pollution, siltation and to reclaim them to protect the fish habitats and faunal/floral diversity. The deterioration of aquatic ecosystem is a growing concern in the coastal waters including estuaries and lagoons. The major pollutants threatening the water resources are industrial effluents, sewage and farm wastes. Chilka lake is receiving 12 million tonnes of silt every year due to deforestation for agriculture purposes. About 25% of the pesticides (i.e. 25,000 ton) used in agriculture reaches the sea every year, poisoning the coastal ecosystem and causing destruction of fish habitat. The destruction of coral reef in the Gulf of Mannar due to dynamite fishing, removal of coral to manufacture calcium carbide and fly-ash pollution from thermal power plant in Tuticorin have become a potential threat to the entire reef fisheries. Oil slicks are also destroying the fish habitats, especially the coral reef ecosystem.

Need for intensive farming

Extensive farming is promoted today for want of proven technology for intensive farming. The extent of area of land and water resources available today in India to carry out extensive farming will not be available tomorrow, since it will get divided into smaller units, when many people are forced to share this resource. Many small countries have realized this and commenced developing technology for intensive farming, especially to fight against disease and pollution. For instance, the total area under culture in Israel decreased by 30% but production remained unchanged[9]. Therefore, when the Aquaculture Authority of India frames the policy and guidelines, adequate care and flexibility to adopt to the improved technology (as and when developed) with increased stocking density for a higher production should be bestowed. This warrants technology investment in therapeutant development, genetic research, inshore and offshore technologies for sea-farming and pollution control. Of course, the sustainable production with proper care to protect the environment should not be surrendered to any system of farming.

Exotic fish for export

Suitable species selection for aquaculture is a slow process and development of technology for it to the level of commercial production requires several years. Therefore the Exotic Fish Committee of India should be open minded on introduction of exotic fish and keep a close watch on the developments in other countries. The following example may illustrate how our 'stiff policy' has let us down. Tilapia (*Oreochromis mossambica*) was introduced in India in 1950s and became a nuisance for other indigenous fish. Since inbreeding was inevitable, the size reduction took place, resulting in boney tilapia. This has created an allergy to introduce

any exotic fish at the Ministry's level. However, many countries have introduced other tilapia species such as *O. niloticus*. Of the global tilapia production, *O. niloticus* alone contributes 72% and its production has increased from 18,000 t in 1984 to 315,000 t in 1995 in China, where it is cultured in superintensive scale in freshwater, brackishwater and marine environment. However, India has not yet officially permitted the introduction of the Nile or red tilapia, a hybrid of it.

Processing centres

Of 402 sea-food processing units in India, only 10 of them have the approval of the supervisory auditing and interdepartmental panel of Export Inspection Agency (EIA). The Marine Products Export Development Authority (MPEDA) provides financial assistance to the sea-food processors to modernize their units with updated machineries and required international standards of hygiene. Only 50% of processors have availed this facility. Hence the problem is that the processors do not have the aptitude to spend money. They do not even calculate the amount of money they lose by not realizing proper value per unit of their products. For instance, the Indian shrimps fetch at least US $ 1.0 less per kg. On this account alone, the annual loss is about US $ 120 million. The root cause for this problem is the quality of the raw material, collected from hundreds of landing centres without having basic infrastructure facilities. The conscience to maintain the high standard of hygiene for such a perishable commodity like fish does not easily penetrate the minds of fishermen, pre-processors and processors.

To export sea-food the processors have to comply with the standards set by Hazard Analysis Critical Control Point in USA and ISO 9000 in European Economic Community. Japan, China and other Asian countries have not come out with such regulations and therefore even third-grade exporters can survive in the trade. The exports, sometimes through a third country, is also in practice and the Indian products reach USA and EU through them. The developing countries like Thailand (see Table 6), Indonesia and Malaysia, who have set up modern machineries, are exploiting this situation by cashing in on the weakness of the Indian exporters.

This can be solved to a large extent, if the basic infrastructure facilities are improved and fishermen are educated on quality conscience. Consumers resistance in domestic market to buy sub-standard material can bring a quick change. The suggested strategies to be followed are: (i) Quality upgradation should start on-board preservation of the fish catch and on-shore handling from the time of landing. There are about 1,500 marine fish landing centres in India and all of them require proper basic hygiene and infrastructure such as landing platform, ice plant, cold storage, potable water, toilets and other facilities according to the number of fishing vessels and quantum of fish landing. (ii) The processors, who buy the fish directly or through their agents should introduce a quality check, and the price should be fixed accordingly. (iii) The present practice of mixing the good and bad quality material in one basket should not be entertained. (iv) A cheap and simple quality check meter (similar to Tory meter) should be introduced to identify the level of spoilage and sort out the substandard material.

Preservation, transport and marketing

The fish landing centres, pre-processing centres, processing centres and ports for shipment are to be linked with proper 'cold chain'. They are all scattered in the 8100 km coastline. A survey by the MPEDA indicates that about 60% of the fish catch is still transported through bicycle and head load for want of road. Fish catches from far off places are transported in baskets in uninsulated wagon of our railways. According to the need, the processors buy raw material from far off places and transport it in insulated truck or train with ice. This does not allow the required standard of quality to be maintained. However, the available 800 insulated trucks and refrigerated trucks to transport raw material and finished products are not adequate. Some steps to improve the quality of finalized products are: (i) Long distance transport should be discouraged. More processing units are required, especially where there is substantial fish/shrimp landings. A transport standard has to be prescribed for raw material and finished products, as per the HACCP/ISO 9000 and strictly enforced. Delay in check posts/ports of shipments is to be avoided by treating sea-food as priority item under perishable cargo. (ii) Basic infrastructure such as cold storage, reefer transport and ice plant should be created in the private sector with adequate financial incentive in the form of capital/interest subsidy.

Fisheries development

To implement suggested strategies for expansion of fisheries production and promotion of the export will have to be necessarily supported by the Government machineries and policies. Justifiably, a new outlook for fisheries policy, including the desired budget allocations for fisheries development and research by the central government is suggested.

Ministry for fisheries

The responsibility of fisheries development including aquaculture is primarily vested with the Ministry of

Agriculture, which in co-ordination with the State Fisheries Department, carries out all the fishery development activities. Surprisingly, almost all the state governments have an independent Ministry of Fisheries but the central government is yet to do it. The revenue available to many state governments is meagre; consequently, fisheries are given much smaller outlay. Therefore, there is a disparity in the over-all development. Deep-sea fishing and fish-processing sectors are looked after by the Ministry of Food Processing and export by the Ministry of Commerce. Thus, there are many agencies without the desired level of coordination between each other for the common development. Therefore, the formation of independent Ministry of Fisheries by the central government is urgently needed.

Meagre financial investments

The outlay for agriculture and allied sectors has gone up from Rs 2,940 millions during the first five-year plan to Rs 2,24,670 millions during the VIII plan period. The outlay for fisheries increased from Rs 50 to Rs 6060 millions only. Yet, what is important is that the plan outlay for fisheries development has stagnated at the woefully low level of about 0.3% (Table 8). There is an urgent need to invest more funds for improving hygiene in the fish landing centres, modernizing processing centres, refrigerated transport facilities and warehouses in the importing countries.

During the 9th plan period (Table 9), Central Fisheries Research Institutions received an annual grant of Rs 1,250 millions; this represents just 6% of the total funds available for agricultural research. Most of this grant is required to meet the salaries and establishment costs of the institutions, leaving very little for the fisheries research. However, the budget outlay for fisheries research represents just 2.6% of the Rs 47,000 million worth foreign exchange earned from export of fish and fish products. This low percentage is reduced to 1.3%, when the total value of fish landings is also included. Our export earnings from fisheries sector have consistently remained above 3.5% of the total export earnings since 1987–88. Therefore, the fisheries, a multi-billion dollar enterprise, have been neglected from the very beginning (see Tables 8, 9). The failure to project (i) the true image of fisheries potential and (ii) the magnitude of developmental work involved in the harvest of the fishery resources and tapping the aquacultural potential, may be the reason for this kind of gross negligence of fisheries sector. Incidentally, it must also be pointed out that whereas the expected increase from 1997 to 2007 ranges between 22 and 40% for wheat, rice, oilseeds and pulses, that for fisheries is 100% (Table 10). Therefore, it will be totally justified that the grants for fisheries research by the ICAR is raised to 12% of it total outlay or 5% of the fisheries export earnings.

Fresh outlook for fisheries policy

Being one of the leading maritime nations in the world with a number of oceanic islands (2.02 million km^2 within the EEZ) and abundant freshwater and brackish-water resources, Indian fisheries/aquaculture can emerge into an important sector to generate employment to millions of rural people, several million tons of health food and billions of dollar foreign exchange earnings to the nation. To accelerate the desired pace of fisheries development, the following steps need to be taken: (i) The Central Government should urgently form an independent Ministry for Fisheries to bring all developmental work, education, research and marketing under one head. (ii) The Centre should prepare a master plan for fisheries development at micro level covering both capture and culture fisheries, work out a meaningful budget and implement the programme within a time frame. (iii) Fisheries administration should be strengthened with

Table 8. Budget outlay (million Rs) for agriculture and fisheries development during successive five-year plan periods in India

Five-year plan	Period	Total outlay	Allotted amount as % of total outlay: Agriculture and allied area	Allotted amount as % of total outlay: Fisheries
I	1951–56	19,600	15.00	0.26
II	1956–61	46,000	11.50	0.27
III	1961–66	75,000	14.24	0.38
IV	1966–71	159,020	17.16	0.52
V	1969–74	393,220	10.94	0.38
VI	1974–79	975,000	6.78	0.38
VII	1980–85	1,800,000	5.85	0.30
VIII	1985–90	4,341,000	5.18	0.09
IX	1992–97	3,790,000	–	0.16

Source: Fisheries Statistics, Ministry of Agriculture, Government of India; personal communication, Fisheries Divisions, Ministry of Agriculture.

Table 9. Allocation of funds (million Rs) for fisheries research in India

Plan period	Agriculture and allied sector (Rs)	Outlay to ICAR (Rs)	Grants to fisheries research: (Rs)	Grants to fisheries research: (%)
IV	27,280	850	23	2.7
V	43,020	1,536	96	6.2
VI	66,090	3,400	158	4.6
VII	1,05,240	4,480	182	4.0
VIII	2,24,670	13,000	650	5.0
IX	—	21,000	1250	6.0

Source: Personal communication from the Deputy Director General, (Fisheries), Indian Council of Agricultural Research, Krishi Bhavan, New Delhi.

Table 10. Projected increase in production targets for the two plan periods in India[8]

Commodity	1996–97	Production (mt) 9th plan period ending 2001–2002	10th plan period ending 2006–2007	Expected increase from 1997 to 2007 (%)
Wheat	69	76	84	22
Rice	81	94	104	28
Oilseeds	25	28	34	36
Pulses	15	18	21	40
Vegetables	65	94	111	71
Milk	69	93	120	74
Meat and eggs	3	5	6	100
Fish products	5	8	10	100

experts in every field of major developmental work. (iv) Coastal economic development zone should be clearly demarcated for different sectors in order to avoid clash of interests and degradation of environment. (v) Active participation/involvement of private sector is very essential and infrastructure required for development should be set up by both government and private sectors. (vi) The scientists and faculty employed in the ICAR institutions, universities and MPEDA constitute an excellent network. They should provide (a) training for fishermen to enhance their skill and to inculcate in them the desired hygiene in handling fishes and fisheries products and (b) seminars for bankers and insurance companies on various affairs of fisheries. (vii) Several research centres of excellence in fisheries/aquaculture should be supported to develop, acquire, test, demonstrate and disseminate the latest technology to fish farmers and fishing technicians on a self-financing basis. (viii) Tax holidays for 5 years should be extended for (a) investment in areas of aquaculture for diversified species, (b) introduction of latest technology in fisheries, aquaculture, and processing for value addition, (c) investment on creation of 'cold chain' for quality improvement and creation of new facilities for export, (d) investment on modernization of processing units, (e) breeding and sea-ranching of hatchery-raised seeds of over-exploited species, (f) investment in offshore fishing, and (g) technical manpower development for fisheries, aquaculture, fish processing, fisheries management and export trade.

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