

Evolution of Fisheries and Aquaculture in India



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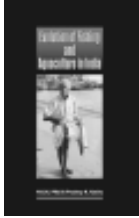
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Recommendations/ suggested action plan

The fisheries sector plays a significant role in the economy, food and livelihood security by its contribution to incomes and wealth through the supply of nutritious food. Hence, the sector is of importance in many developing countries. There are a range of policy issues concerning the ways in which governments might work to increase the supply of fish for human consumption and economic benefits, which are potentially available from this sector. Certain issues, however, and the policy measures to be adopted to deal with them, are of critical importance.

The policy measures likely to be most effective for resources management and protection of critical fish habitats in the aquatic environment are those which embrace the abandoning of free and open access system to resources and introduction of appropriate measures to allocate resources and establish user rights. Where it is possible to introduce such measures, they will, *inter alia*, provide greater incentives to reduce excess fishing capacity/pressure, which has been one of the major factors responsible for overfishing. In addition, in artisanal fisheries, the establishment of user rights is particularly important in protecting the interest of artisanal fishers from unequal competition with industrial vessels. The policy should aim to ensure socio-economic security for the artisanal fishermen whose livelihoods depends solely on this avocation.

Inland

The future strategies for increasing fish production from freshwater aquaculture have to be directed towards horizontal and vertical growth of the enterprise. National Aquacultural Development Plan also envisaged expansion, intensification and diversification of culture systems. The following components hold the key to success of these strategies, subject to suitability of location specific culture practices and productivity levels.

- ◆ The prospects of increasing coverage of freshwater aquaculture are immense; at present only one third of potential water area is under fish culture. The national plan also envisaged to enhance the presently estimated area under freshwater aquaculture from 0.83 million ha to about 1.2 million ha, *i. e.* an increment of about 45%.
- ◆ It is necessary to evolve uniform water leasing policies for fisheries and aquaculture operations. In India, the ownership of water rests with different state departments including revenue, forests, electricity, public works, fisheries and gram panchayats, etc. For the development of these waters, fishing rights must be with the State Fisheries Departments. The leasing policy, including lease period, and amount vary significantly across different states. It should be rationalised with lease duration above 10 years and lease rent according to productivity and level of multiple uses. Specific policies should be framed to lease out different sized ponds to fishermen co-operatives, group of fishers or individual fishermen, in order to have efficient aquacultural management to exploit its full production potential. A policy is also necessary to identify the beneficiaries with active involvement of local administration. It would limit the social conflicts between beneficiaries and other local dominant communities, and may help in creating better social environment, particularly to reduce poaching and other illegal fish harvesting practices.
- ◆ Emphasis must be laid on multipurpose utilization of aquacultural waters, particularly in case of panchayat ponds in rural areas. The extensive fish culture with quality fish stocking and bio-fertilization could be practiced without interfering with the use of water for other purposes. Weed infestations in large water sheets is the main constraint in planned fish culture programmes. It is necessary to launch a massive programme on eradication and management of aquatic macrophytes. A co-ordinated approach is suggested for reclamation of swamps and derelict waters for aquaculture operations.
- ◆ The consumer preferences and prices of fish vary significantly across different regions of India. Carps are the most preferred fish in eastern India as compared to catfishes in northern India. Similarly, highly priced and fast growing cyprinids and catfishes of the western ghats need to be introduced in aquaculture practices in the peninsular India. This pinpoints the need to bring in promising species under the umbrella of aquaculture with due evaluation of growth, breeding potentials and consumer preferences. Every effort must be made to propagate the importance of fish, including commercially important species, in human diet. Furthermore, regulatory measures need to be enforced to prevent

proliferation of undesirable fish species that are often introduced without proper evaluation and certification.

- ◆ The strategy plan proposes enhancement in the mean national pond productivity from 1830 kg ha⁻¹ year⁻¹ to 2762 kg ha⁻¹ year⁻¹ and an increase of 45.18% in the total projected area to achieve targeted freshwater aquaculture production (Gopakumar *et. al.*, 1999). It is necessary to enhance the fish productivity levels by 1.5 to 2 times to achieve this target. The aquacultural waters in several parts of the country have production potential of 6 t to 8 t ha⁻¹ year⁻¹. Intensification of aquaculture practices is required to harness this production potential, without affecting the soil-water ecosystem. Being fully aware of the fallout of unplanned brackishwater shrimp culture (Parthasarthy and Nirmala, 2000), these practices should be implemented in an eco-friendly manner. Running-water fish culture in regions where streams are abound or cage culture in large water sheets like reservoirs and lakes, for producing the stocking material or grow-out production systems are some of the viable options for this purpose.
- ◆ Integrated culture systems of carps, catfishes and prawns are being emphasized with agriculture, animal husbandry, horticulture and forestry. The diversification of aquacultural practices on one side utilizes the waste or byproducts of complimentary enterprise and on the other, reduces the risks of failure by greater variability of the production activities and higher returns to investments. Practices like breeding and culture of ornamental fishes have great potential for meeting the domestic needs as well as earning foreign exchange. Freshwater pearl culture, culture of *Spirulina*, *makhana* and water chestnut are other potential areas for diversification in aquaculture.
- ◆ The availability of two most crucial inputs, quality seed and feed, both in time and space is the necessary pre-requisite for the success of aquaculture development. The production and transport of these inputs should be given top priority. In case of quality seed production, the country has made great strides in different species of carps, but the crucial part of rearing fry to fingerlings of stocking size (10 to 15 g) needs earnest efforts in R & D to meet the demands. These processes require intensive training of the grassroot level workers and decentralization in terms of production of fry and fingerlings at block levels. Further, establishment of hatcheries for carps, catfishes and freshwater prawns, wherever necessary needs to be promoted for ensuring seed supply.

- ◆ The semi-intensive and intensive culture systems are the integral part of enhancing fish productivity of aquacultural waters. It largely depends on supplementary feeding. Commercial feed is not available on a large scale and with a high productivity. Andhra Pradesh farmers are finding fish production uneconomic due to high price and nonavailability of quality feed. Therefore, a policy on the manufacture and distribution of fish feed, similar to animal and livestock feeds, is the need of the hour to bridge the demand-supply gap. Development of fish feed from locally available material, training and education of farmers and entrepreneurs on feed processing and dispensing, would be helpful to increase the production of fish feed. Greater use of low cost plant and animal-based ingredients needs to be encouraged for preparation of fish feeds.
- ◆ The fishermen co-operatives should play an active role in supply of inputs, particularly the fish seed and feed. The efforts should be directed to encourage private hatcheries or fish seed rearing farms to improve fish seed quality and availability. The fish farmers should be trained for various fish breeding techniques and hatchery management. The co-operative personnel must be aware of recommended scientific feeds and their availability or the balanced feed, which can be prepared by locally available ingredients.
- ◆ Indian economy, being mainly an agrarian one, provides abundant organic material in terms of agro-residues, animal excreta, and domestic sewage. There is great scope for intensifying organic farming practices and utilization of waste material through integrated fish farming practices. With a long history in sewage-fed fish culture, the country is well poised for wastewater aquaculture both for enhancing fish production through organic recycling and wastewater treatment.
- ◆ The budgetary support is essential to meet the rising investment demands for research, infrastructure development, training and extension to cater to the requirements of higher growth rate, emerging technologies and new possibilities in different aspects of freshwater aquaculture and fisheries. It is the condition necessary to ensure remunerative returns to fish farmers through organized marketing and adequate storage facilities. It would call for congenial terms and conditions of credit support from various financial institutions including the banks and NABARD. The favourable environment for credit availability would require revision of loan procedures to promote higher growth in the sector.

- ◆ Inadequate database is one of the weakest links in formulation of management policies for fisheries and aquaculture sectors. Adequate and reliable database should be established, as it forms pre-requisite for plan of future course of action. Prior to building such a database, it is imperative to standardize the nomenclature and classification for various parameters, e.g. size of pond, fish seed grades, groups of fish catch, etc. If possible, for all the states, elaborate proformae should be prepared, in order to have uniformity in database. To develop suitable proformae, a committee of experts may be constituted, which would evolve the guidelines, and monitor the survey. The data should be collected over space and time on a continuous basis, to avoid any time lag or data gap. The statistical wing of state fishery departments needs to be strengthened and equipped with necessary skills and software to collect the required data with desired accuracy and periodicity.
- ◆ Strong linkages between research and development agencies are pre-requisites for technology development and implementation as it is basically a multidisciplinary activity. The proven findings or technologies developed through research should be transferred to the state fisheries departments and other development agencies including NGOs for implementation. Therefore, there is a need for strong linkage between research and development agencies and sufficient funds to carry out these activities. The major shortcoming in this process is the weak linkage between the research and developmental agencies, and lack of enthusiasm and shortage of staff in fisheries department to take up these technologies to the ultimate clientele, the fish farmer/fishers.
- ◆ Infrastructure development both at production and post-harvest stage is a key requirement for accelerating the growth in freshwater aquaculture and fisheries. Increased governmental investments with regard to fish and prawn hatcheries, establishment of aquaculture estates, feed mills and ancillary industries for manufacture of aerators, feed dispensers and formulations against fish diseases are suggested. Strengthening the marketing structure including storage facilities, ice plants, cold chains, roads and transportation in identified areas would ensure higher profit margins to the producers enabling faster aquaculture development. Refrigerated rail vans are to be made available at subsidized rates for distant transport. Post-harvest technology measures like processing and value addition would make the sector more attractive to investors.
- ◆ Considering the adoption gap of the aquaculture and fisheries technologies in different parts of the country, it is greatly emphasized that the extension machinery of the State Fisheries Departments are to

be strengthened. Further, the *Krisshi Vigyan Kendras* (Farmers' Training Centre) located in several districts could play a major role, in not only disseminating the technologies, but also providing feedback to the researchers with regard to field problems and indigenous technological knowledge. The other existing agencies like FFDAs, NGOs, etc. could be networked to achieve technology dissemination without loss of time. Organisation of community aquaculture farms and co-operatives would enable higher growth in the sector. A programme for soil and water testing and fish disease diagnosis by using mobile laboratories may be accorded high priority for monitoring and guidance in different aspects of aquaculture.

- ◆ Human resource development programmes at different levels of researchers, development officials, extension officials, entrepreneurs, small and marginal farmers and fishers are vital to bring about the desired qualitative and quantitative improvement in freshwater aquaculture and fisheries sector in the country. Regular refresher courses are proposed for the state fisheries officers by Fisheries Research Institutes under ICAR. Hands-on-training through short-term and certificate courses for imparting skills in different aspects of freshwater aquaculture and fisheries are proposed for entrepreneurs and fish farmers/fishers. Distance education through print and electronic media, vocational courses and publication of literature in local languages may be given greater emphasis for spreading the technologies in the country. The dedicated workers need to be updated about recent developments through periodic trainings.

Brackishwater and Marine

Harvest

- Constraints of small scale fisheries sector (technical, economic and social) need to be looked into critically by research organisations and fishery development agencies. Methods to overcome the same should be formulated and reflected in the National Fisheries Policy.
- Coastal States and UTs should consider formulating a clear definition of access rights to the territorial waters and harmonize their zonation policy for different categories of fishing vessels.
- Production from artisanal sector has been decreasing steadily in recent years (7% in 2003) and conflicts do occur among the artisanal/motorised/mechanised sectors on sharing of resources. Hence, it is desirable to ensure a coastal fringe zone (upto 5 km from the

shore) exclusively for non-motorised traditional crafts as they depend solely on this coastal zone.

- At least 50% of the existing artisanal fishing crafts should be equipped with outboard motor in the plan period, and the existing motorised and mechanised fleet should be equipped to fish in deeper waters and take up diversified targeted fishing.
- The use of high powered (45 h. p. and above) twin engines in motorised crafts should be discouraged so as to keep operation of these units economically viable.
- Proper assessment of optimum number of fishing vessels required for each sector and regulation in construction and deployment of mechanized vessels is recommended.
- New license for mechanised vessels needs be given only to large vessels having capacity for long endurance and capable of fishing in offshore and deep sea.
- Registration of all fishing crafts for adequate monitoring by State Governments is required. The practice of multi-agency registration of fishing vessels, prevalent in some states, may also be relooked.
- Ownership of crafts and gears and adoption of technology (preservation of wood, new building materials) to upgrade their craft for traditional fishers have to be facilitated.
- Adoption of energy efficient harvesting technologies and operational methods which are eco-friendly has to be encouraged.
- Information on the potential fishing zones based on remote sensing of sea surface features need to reach the fishermen well in time to assist them in their fishing operations.
- Fixing of exploitable resource quotas for various resources is required. In order to achieve the twin objectives of maintaining the resources at sustainable levels and reducing the inequality in the distribution of benefits among different sectors, a statutory body may be established.
- Resource enhancement in the coastal waters through sea ranching and installation of village level artificial reefs with community participation should be encouraged. Targets are to be set for sea-ranching by respective State Governments. Programme may be implemented with the involvement of research organisations like CMFRI, CIBA etc.

- A National Artificial Reef plan requires to be formulated.
- Exploitation and discard of low value fish and juveniles of high value fish affect the fish stocks and the nutritional security. This has to be effectively minimized by proper regulations on fishing.
- Development of hygienic landing facilities for small scale fishing units (to ensure higher value for landings and to reduce post-harvest losses) should be taken up on a priority by the State Fisheries Department. Infrastructure facilities for storage and transportation of the catches to the interior markets will also ensure better returns to the fishers.
- Sea safety guidelines including insurance coverage for traditional/ small-scale fishers have to be provided.
- The FAO Code of Conduct for Responsible Fisheries (CCRF) should be widely publicized among all the stakeholders. A simplified and concise version of this Code should be provided to the States/ UTs on a priority basis for translation into vernacular languages.
- The Marine Fishing Regulations Acts in all states need to be thoroughly reviewed, and appropriately modified in conformity with the CCRF, especially with respect to destructive fishing gears/ fishing materials, harvesting and sale of undersized organisms.
- Awareness should be created among the fishing communities to protect/avoid catching of juveniles and the young fish during recruitment phase. Indiscriminate capture of juveniles of shrimps, lobsters, crabs etc. for stocking in culture ponds/fattening would interfere in the natural process of recruitment to the fishery and it should be discontinued.
- Issues related to coastal zone degradation (due to pollution, enhanced fishing pressure in nearshore areas, impact of bottom trawling and its deleterious effect on benthic biota, etc.) need to be addressed. Suitable measures such as protection of nursery and feeding grounds like mangroves, effective implementation of CRZ Act, close monitoring of the domestic, agriculture and industrial discharges into the nearshore area, etc. should be adopted.
- The concept of Responsible Fishing is missing among the stakeholders. Participatory management process could be adopted effectively for sustaining marine fisheries.
- Fisheries management involves management of fishing communities

and stakeholders, and management of fishery resources. Any restriction on fishing (short/long term) will leave the fishers jobless as they are specialised in fishing only. Therefore, women empowerment, alternative employment and training for fisherfolk merit serious consideration.

- There is need for introducing ecosystem-based fisheries management by integrating fisheries management into other coastal zone regulatory plans.

Post -harvest

- Post-harvest losses, which take place due to inadequate landing and berthing facilities, is a serious issue. There is an urgent need to develop more fisheries harbors and fish landing centres with adequate infrastructure and availability of important items like ice. High priority should be given to reduce post-harvest losses and work in this direction should include the use of low cost energy sources in fish processing (for eg., wind-driven ice plants, improved solar dryers etc.).
- Technologies, like insulated ice boxes for transportation should be made available to small scale fishermen/fish vendors through Fisheries Departments.
- Awareness and adherence to standards, guidelines and recommendations adopted by the HACCP should be encouraged in fisheries harbours and landing centres to improve consumer protection and facilitate export of Indian marine products into international markets.
- To minimise exploitation by middlemen and ensure good returns to fishers and fish farmers, marketing of fish should be arranged by identified organisations (Fishermen Co-operative Societies/ Matsyafed/ MPEDA/IFP etc.) through buy-back agreements for farm produces. This will also ensure adequate returns to the farmers, price stability in the domestic market and availability of fish to the consumers.
- Value added products need to be developed by organisations like CIFT, CFTRI and IFP.
- Development of cold chain/ cold storages and a better domestic fish marketing system are required.
- Training in post-harvest activities like fish drying, fish pickle making

and net making should be given to fisherwomen.

- In the fast developing international scenario of fish trade and food security, non-tariff trade barriers (hygiene, quality and food safety standards; environment and labour standards etc.) are being employed to control market access and trade. The government together with fish worker organisations need to develop suitable criteria and mechanisms to ensure that trade barriers do not impair the livelihood of fishers. Compliance with international requirement in post-harvest care of catch is therefore recommended.
- A Food Safety and Quality Assurance System for fishery products has to be set up with active involvement of Seafood Exporters' Association to ensure that banned chemicals and antibiotics are not present in the raw material (sourced from aquaculture) before processing.

Mariculture

- The States/UTs should enact Leasing Acts for public water bodies.
- Artisanal fishermen groups should be encouraged to undertake mariculture and should be given access to coastal water bodies. Intensive mariculture practices that may restrict traditional fishing activities of the coastal fisherfolk should not be allowed. Instead, fishermen groups should be encouraged to take up mariculture activities with research and extension support (CMFRI, CIBA etc) and Funding support (NABARD, NCDC, Brackishwater Fish Farmers' Development Agencies (BFFDA) or State Fisheries Department). This will also pre-empt any possible risks of energy intensive culture techniques (introduction of exotic species, usage of antibiotics and high energy feeds or other inputs) which cause degradation of the environment.
- Environment-friendly low input mariculture activities with the support of traditional knowledge and wisdom, as a supplementary source of income and employment generation, have to be encouraged.
- To meet the increase in demand for seed of culturable marine organisms (mussels, crabs, shrimps), setting up of more backyard hatcheries should be encouraged. Research and extension will have to be strengthened in this area.
- Development of standard technologies for genetic upgradation and conservation of finfish and shellfish has to be strengthened.

- Cost reduction in farming practices, to make the technologies economically viable, has to be encouraged.
- Drawbacks in the technologies developed, which prevent its adoption by farmers have to be identified by the R&D organizations for refinement.
- Under animal health management, risk factors associated with outbreaks of white spot syndrome in cultured shrimps have to be addressed. Also, suitable disease diagnosis/control and prevention strategies have to be evolved.
- Use of antibiotics and other harmful chemicals in aquaculture is to be banned.
- Integrated aquaculture practices which facilitate nutrient recycling should be encouraged. Species of seaweeds and molluscs are suitable for this purpose.
- Consultancy services by unauthorized persons or enterprises should be banned.
- Development of market intelligence (products, prices) information aiming better returns to fishermen, providing protein rich food at reasonable rates in domestic market and augmentation of export need be initiated.
- A trained cadre of manpower to handle the demanding technological advances in fisheries sector and for conducting frequent training and awareness programmes among farmers, has to be developed. National capabilities in policy formulation, development planning, monitoring, surveillance and enforcement in mariculture have to be established.
- Excellent extension service facility should be available to small-scale fishermen with active involvement of Fisheries Development Agencies, Fisheries Departments and Research organisations. The system should encourage regular feedback between the research organisations and fishermen communities.
- An Integrated Coastal Zone Management Plan (ICZM) has to be developed, taking into consideration the interests of all stakeholders.

