

# Manpower Requirement in Mariculture

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## ABSTRACT

The role of scientific technical and managerial manpower in mariculture and estimated requirements for increased production have been described. A detailed account of existing facilities for education and training of manpower in the Central Marine Fisheries Research Institute is provided. The paper also provides an account of a number of short-term training and programmes to meet immediate needs of trained manpower in capture and culture fisheries in the country.

In the marine fisheries sector, our country's declared objective since the commencement of VI Plan has been to increase production through exploration and exploitation of the vast resources of the Exclusive Economic Zone and through development of a package of technologies for improving production through coastal aquaculture. The research and development organisations have been geared towards achieving these goals.

However, in capture fisheries, the production from presently exploited narrow coastal belt has been stagnating around 1.5 million tonnes during the past few years leaving an unexploited gap of about 2.9 millions tonnes out of an estimated potential of 4.5 millions tonnes in the EEZ. This raises doubts whether substantial increase in production could come from capture fisheries without heavy capital investments. On the other hand, the viable low cost technologies developed at Institutes such as CMFRI, Cochin

in sea farming of cultivable species promises additional production from the low lying coastal water bodies such as estuaries, lagoons and swamps the extent of which is estimated around 2.5 million ha.

Although traditional methods of fish and prawn farming are in vogue in certain parts of our country, the production from these methods have been low. With improved methods of scientific farming of candidate species, production could be enhanced to 1 tonne/ha/annum in a potential area of about 1,400,000 ha. This would mean that fish production could be nearly doubled. But such a development could be possible only if the development agencies and State Governments are able to meet the required scientific, technical and managerial manpower. This requirement is critically evaluated in this account.

### Role of Specialists in Mariculture

Absence of clear policies with regard to the

use of fallow land, scarcity of seed for stocking, suitable artificial feeds and lack of technically trained manpower to handle the multi-disciplinary functions connected with aquaculture have been identified as major constraints in the development of coastal aquaculture as envisaged. Among these, lack of qualified expertise is acute.

*Farm Engineers.* The age old system of seasonal prawn filtration fields of the country depend solely on nature. In this system, sea water is let into the fields during high tide and the fish and prawns that enter are filtered out as the water flows out during low tide. The development of a perennial culture system, however, requires expert knowledge, to survey and select sites, construct and maintain bunds, prepare ponds and provide channels, canals, sluices and shutters to facilities free inflow and planned outflow of water all through the year. These can be done by qualified farm engineers.

Responsibilities of a Farm Engineer do not end with the above. Infrastructure facilities necessary in fish culture, especially, the open sea farming and sea ranching are varied and many. Culture of finfish, prawns, lobsters, crabs, pearl oysters, edible oysters, clams, mussels and seaweeds have their own specific requirements with regard to facilities. Pens, cages, rafts, racks, ropes, mats that can withstand corrosion by salt water and the vagaries of monsoon weather have to be designed, fabricated, experimented and improved upon through research and experience by qualified engineers.

Scarcity of fish seed in nature is already mentioned as one of the constraints in fish culture. Therefore, controlled production of seeds is essential. Construction, management and maintenance of hatcheries for seed

production is no doubt a great challenge before a Farm Engineer, warranting sound knowledge not only in civil but mechanical and electrical aspects. Maintenance of water circulatory system, controlled temperature and lighting, automatic feed dispensers and cleaning systems demand expert knowledge and experience of Engineers in hatchery systems. Unless the farms and hatcheries work throughout the year, the overheads on construction and maintenance will become a burden making the culture system uneconomical. Constant vigil by the Engineers is therefore indispensable.

*Mariculture Specialists.* The need for mariculture specialists need not be over emphasised. Experts with knowledge on various culture systems, species and their combinations, stocking schedules, feeds and their formulation, monitoring of water quality, maintenance of hatcheries and production ponds and management techniques are needed for successful programmes in mariculture.

The life history, biology, food and feeding, growth, maturity, fecundity and spawning of the candidate species should be thoroughly known. The selection of species for culture is a task by itself. The species must be commercially important, with more meat than bones, big in size, fast growing, disease resistant, prolific breeding, not fastidious in feeding, non-carnivorous, vulnerable and economically viable. Spawners must be easily available and or are their larval stages readily procurable.

The major problem in a culture system is that of nutrition. In natural habitat the fish move about and finds its own food. In the controlled culture systems where the fish are confined to limited space, it has to be provided with artificial feed. This can be achieved in

two ways. One method is to fertilize the system and inoculate it with suitable micro organisms. This will accelerate formation of primary and secondary producers that directly form the food. In areas where this is not possible or inadequate, compounded feeds with necessary nutrients like lipids, carbohydrates, proteins, minerals and vitamins have to be provided. The feeds thus provided must be non-leaching in water and should have higher conversion ratio. In a controlled culture system, as the space is limited, it causes crowding resulting in development of diseases. Experts on fish diseases play a vital role in controlling and curing fish diseases in farms and culture systems.

The food that is given and the money spent on it cannot be wasted by stocking fish where energy conservation is not possible. The activities of the fish have to be such that the fish spends less energy and converts the food into more meat. With knowledge on physiology one can control water quality where temperature, salinity, pH, Eh etc. are also controlled. Similarly, knowledge on reproductive physiology is essential for controlled and induced breeding and seed production. Genetic improvement of the species cultured can be tried through cross breeding and genetic engineering. Evolution of disease resistant and high yielding varieties rests in the hands of experts in genetics.

*Technicians.* Most of the routine work expected to be done in culture systems can be looked after round the clock by trained technicians. The water quality, suitability of the soil and substratum, pollution problems, ecological problems, disease problems etc. have to be continuously monitored for identifying any untoward happening that can hamper production in the culture system. Rate of

growth of the species under culture, survival and mortality of the stocked population need to be periodically watched and remedial measures sought from experts during unforeseen circumstances. The number of technical personnel needed is far greater than specialists in various areas.

*Farm Manager.* The Farm Managers will be directly responsible for the daily running of the farm, and interaction and co-ordination of various activities. Procurement and supply of materials, maintenance of accounts and administration rest with them. The Manager in turn has to be a knowledgeable person in all aspects related to fish biology, fish culture, breeding and rearing, harvesting, processing, transportation and marketing.

#### **Education and Training in Mariculture**

Technological progress in any industry including that of fish farming greatly centre round the research and development programmes affiliated to it. The country, since independence, developed organised research in capture fisheries. Fisheries as a subject was being taught in many colleges and Agriculture Universities. Mericulture being a new field of multidisciplinary and inter-disciplinary nature was not offered as a core subject till recently. Scientists and teachers in this area are scanty.

Results of research developed in the laboratories should be taken down to the farmers level for implementation and commercialisation. Farmers and field laborers are to be trained in the new technologies through extension programmers. The country needs a number of extension workers to see to this grass-root level transfer of technology through learning and doing.

### Manpower Requirements

Taking into consideration the potential cultivable species, water area and industrial needs, the estimated manpower requirements in various categories in the decade would be as follows :

1. Research and teaching personnel	250
2. Technical personnel	500
3. Fish farm managers and development personnel	1000
4. Mariculture specialists	100
5. Fish Farm Engineers	100
6. Extension workers	200
7. Farm Economists and Statisticians	50
	2200

Realising the dire need of 2200 persons under various categories, Government of India decided to promote and catalyse research and postgraduate education in mariculture as the first step and established a Centre for Advanced Studies in mariculture with UNDP assistance at the Central Marine Fisheries Research Institute in July 1979, where mariculture experiments were already initiated on the culture of fish, prawns, oysters, mussels and seaweeds. The centre offered M.Sc. and Ph. D. Degree courses in Mariculture from 1980 onwards.

The M.Sc. (Mariculture) is a two year programme comprising of 4semesters conducted in collaboration with Cochin University of Science and Technology which awards the degree. The intake capacity of the course is 10 students per year drawn from different subject matter areas such as zoology, botony, chemistry, bio-chemistry and fishery science. In structure, the coursed is designed to provide

knowledge on basic subjects essential for a programme in mariculture. The candidates are also trained in research methodology, farm management, engineering, economics, statistics and extension. Besides, they are to undertake a short-term research on a selected subject and submit a dissertation in partial fulfilment of the degree.

By the end of 1986, a total of 49 students in 5 batches have completed their studies. The 6th batch of 10 students who have joined the course in 1985 are at present doing their 4th semester. Another 9 students of 7th batch who joined in December 1986 are now in their 2nd semester.

The Ph D. programme, likewise, is of three years duration organised into two semester of course work (1st year) and two years of research. While the 1st semester is devoted to mariculture subjects including, bio-statistics research methodology, farm engineering, management, economics and extension the second semester is related to the subject selected for the research by the scholar. The topics for long term research are chosen from priority areas such as reproductive physiology endocrinology, ecology, nutrition, pathology, genetics of cultivable marine organisms and of different culture systems. Considering the need for more experts, the ICAR has sanctioned the continuation of the M.Sc. and Ph.D. course during the VII Five Year plan period also, under the post-graduate Education and Research Programme in Mariculture of CMFRI with funds from the sanctioned budget of the Institute.

The fellows who come out with the degrees in Mariculture are expected to form the nucleus to build up additional required manpower for

research and teaching in the country. It is gratifying to note here that a good number of these fellows are engaged in research and a few others in teaching. Some are engaged in prawn culture farms with MPEDA, TATA, Hindustan Lever, Vorion Chemicals, Commercial Banks and State Fisheries Departments like MATSYAFED of Kerala.

### Short-term Training

Considering the immediate needs of trained personnel, CMFRI arranges short term training on courses and summer institutes from time to time on subjects such as aquaculture, fish culture, prawn culture, lobster culture, crab culture, pearl culture edible oyster culture, clam culture, seaweed culture, induced breeding and rearing techniques, hatchery production of seeds, and aqualung diving. A total of about 350 persons drawn from the teaching, research and administrative level from India as well as from out side India (Developing countries of Afro-Asian region) were trained so far.

At the fish farmers' level, training is organised by the Institute at its Krishi Vigyan Kendra (Farm Science Centre) at Narakkal. Following the principal of 'learning by doing', the

Kendra offers short duration courses on marine prawn culture, poly culture of prawn and fish, seed collection etc. to small and marginal farmers, landless labourers and farm woman. So far about 3050 fish farmers (which includes about 1550 women) were trained in the Kendra.

With a view to expedite and popularise mariculture State Government officials, already engaged in training of farmers are given refresher courses at CMFRI's Trainers' Training Centre (TIC). A number of officers from all the maritime states have already been trained under this programme.

Under mariculture programmes, CMFRI is now taking up studies on marine ornamental fishes, turn livebaits, sea cucumbers, squids and cuttle fish, corals and sea-grass etc. Experiments on sea-ranching of prawns and pearl oysters, pilot projects on mussel culture, oyster culture and sea weed culture offer prospects of improving the production if suitable expertise and trained manpower is available in the country.