

ROLE OF TECHNOLOGY IN THE DEVELOPMENT OF FISHERIES

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The basic purpose of fishing is to catch/harvest as much fish as possible and reach it to the consumer as a wholesome, acceptable food, though fishery development programmes are based on diverse objectives which include, besides the production of a valuable food, creation of employment opportunities, socio-economic uplift of the fishermen community, and earning foreign exchange through export. Both the production and the utilisation of fish depend intrinsically on the efficient application of technology. Fisheries technology which covers the fields of fishing craft and gear, fish preservation, processing and distribution thus occupies a pivotal role.

Fish production in India has increased from 7.52 lakh tons to 13 lakh tons per annum over the period of three successive five year plans. The 4th Plan (1966-1971) envisages an additional increase of 5 lakh tons raising the annual production to 18 lakh tons in 1971. To ensure a daily supply of 35 g of fish protein per capita to the fish eating section of the population of the country an annual production of 46 lakh tons of fish is necessary. While this figure indicates a threefold in-

crease in the present production it is not beyond achievement considering that our marine resources have been estimated to be about 100 lakh tons; our inland resources are also estimated to be about 13 lakh tons if developed adequately. The fishing techniques as well as the methods of handling, processing and distribution of fish will need considerable improvement and change if the potential resources, both marine and inland, are to be exploited fully.

Though fishing is an occupation followed from ancient times the methods of fishing, fish handling and processing have undergone substantial changes only in the recent years particularly in the technologically advanced countries. The advent of internal combustion engines and navigational aids reduced distances, mechanical handling of gear led to increased use of the more active methods of fishing such as trawling and purse seining, electronic devices helped in locating the fish and use of synthetic materials for gear fabrication improved the quality and efficiency of the fishing operations. In India the changes have been slow and so far not significant though the trends are

promising. Almost all of our marine fish catch is taken from the inshore area extending up to 5 miles from the coast; the bulk of the catch is made by indigenous fishing boats and shoreseine operations, while only 30% of the catch is taken by the mechanised boats. The indigenous craft have several limitations from the view of employing mechanical devices and providing proper facilities for icing and handling of the catch on board. Also, the mechanised vessels now operating employ power for propulsion only and fishing gear is still handled manually. It is evident that a large scale programme of mechanisation of the fishing craft is necessary if the fishing has to progress beyond the present subsistence level. The number of powered vessels which stood at 5,200 at the end of the III Plan period is expected to be augmented by 8,000 mechanised craft during the 4th Plan period, in addition to which 300 vessels of a larger size are also expected to be put into use for offshore fishing.

The development of mechanised fishing on a large scale involves certain developments in other fields such as increase in the number of fishing harbours, boat-building yards and ancillary industries, improvement in handling, storage, processing and distribution of the catch. Fish production is naturally related to the existing demand, a demand which implies the capacity to buy as distinct from the need for fish as protein food. Economics no doubt influence this situation but another factor, i. e., the technological capacity to deliver the fish to the consumer in the most acceptable form is also of great importance. Irrespective of the resources and means of production, the demand element is the primary incentive to greater production, and processing technology plays a very significant role in helping to create the demand.

Technological advance in the preservation and utilisation of fish undoubtedly provides the impetus for large developments in fisheries. It is well known that the salmon fisheries developed only after the introduction of canning, introduction of freezing led to the development of tuna and shrimp fisheries on the global scale; freezing, canning and reduction to fish meal and fish oil on board factory ships have opened up possibilities of extensive exploitation of the world ocean resources. Some of the spectacular increases in fish production in the recent years have been sustained mainly by a highly developed fish meal industry. In North America and Europe the existing capacity to handle and process fish on the principles of food science, and adequate transport facilities has made it possible for fish to be brought over several hundreds of miles and providing the people with an abundant, varied and nutritious diet. In India the development of an export oriented shrimp processing industry at Cochin has led to extensive exploitation of the shrimp resources off the South West coast. Fish being a highly perishable commodity the processing technologist plays the leading role in making fishing activity successful and economically worthwhile, whether the fish is needed as additional protein food for the people or for export, or as raw material for industry.

Traditional methods of preservation such as salting, drying, smoking are currently used on a large scale in the less developed countries but in the technologically advanced countries modern methods such as freezing, and canning are being employed increasingly. The traditional products might still be relished as a variety but it is clear that they are losing flavour with the sophisticated populations who prefer fresh, bland flavour in the fish to the high flavour usually associated

with cured fish. In India most of the catch is landed within a few hours after it is taken from the sea and the bulk of the fish is marketed fresh while the rest is salted and dried. While shrimp (prawns) are frozen and canned on a large scale, freezing and canning of fish are carried out only to a very limited extent in India. This pattern of disposal might suit the present level of fishing but it would have to change with increase in the landings by mechanised fishing and from fishing in more distant waters. The changes should commence with the first handling of fish and the use of ice for preserving fish on board the vessels as a common practice. Quality of the fish at landing has to be very high if the fish is intended for processing subsequently into canned or frozen products.

While the principles of preservation by refrigeration and canning are well known, their application under our local conditions needs the attention of experienced technologists. Quick-freezing of fish on a large scale has been the most significant development in fish handling since World War II. The distribution of frozen fish needs a highly developed 'cold chain' which includes refrigerated storage space, facilities for refrigerated transport over long distances by rail/road, and refrigeration facilities at the retailers level. Problems of suitable packaging for the frozen product in order to ensure retention of high quality have to be overcome. Even though icing is an old practice for preserving wet fish the choice of the type of ice, the quantity and the method of application need technological consideration. Diversification in the processed fish products is a necessity with an increased production of fish. Besides the conventional products such as canned fish, frozen fish and fish fillets, other products such as fish sticks, breaded fish and shrimp,

fish sausages, fish chowder etc. are necessary for increasing the consumption of fish. The processing technologist should be alert to another problem arising from greatly increased fishing activity. Increased landings would include several species so far underexploited and which are unfamiliar. Trawling operations normally yield a good proportion of 'trash fish' which does not have a market though that fish also constitutes a first class protein comparable to that of any of the popular fish varieties. At present 1/4 of the world fish catch goes into the reduction industry; some fisheries such as the anchoveta in Peru and menhaden in the U. S. A. are exploited solely for the reduction industry. Though fish meal is used in animal nutrition and fish oil is an important industrial raw material it is obviously uneconomical to convert fish protein into another animal protein for human nutrition when fish could be used directly for this purpose. Diversion of fish into the reduction industry may be justified in countries having other rich resources of animal protein, as in the U. S. A., but in India which suffers from an acute shortage of animal protein it would be irrational and the aim of processing must be the conversion of even the trash fish into processed products which are generally acceptable as food. A substantial advance in the technology of fish utilisation must accompany or even precede any substantial increase in fish production. The emphasis should be on the use of fish as a low cost food for the lower income groups. A recent development in the utilisation of fish is the conversion of trash or 'industrial' fish into fish protein concentrates (F. P. C.) or Marine Protein Concentrate (M. P. C.) on a commercial scale; the surplus fish in one region could thus be made available to protein deficient regions.

The development of fisheries needs a 'technological chain' extending from mech-

anised fishing vessels to fishing harbours, cold storages, ice-making units, fish processing plants, reduction factories, refrigerated rail/road transport, quality control and inspection services. The availability of sufficient number of competent technologists would limit the progress of development in mechanised fishing and in the fish processing industries. The extent of our shortcomings in this respect are only too obvious in the present phase of our fishery development programmes. The setting up

of the Central Institute of Fisheries Technology, the Central Institute of Fisheries Education, the Central Institute of Fisheries Operatives in quick succession is a manifestation of governmental awareness of the urgency. The emphasis which so far has been mainly on the resources, their identification and assessment, must now shift to the requirements of technology. Much progress has to be made in a short time in order to achieve the planned targets.