

# NEW HOPE FOR SALT WATER FISH CULTURE

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**W**ITH the recent success in induced fish-breeding techniques a major impediment in fresh water fish culture has been removed and henceforth we may expect greater progress in inland fish culture. However, our low-lying, coastal, saline areas remain neglected except for brief spells of fishing activity.

The concept of fish farming on an extensive scale in these coastal areas has not yet begun to attract people as an economic proposition. This failure in the development of what could have been a flourishing industry of the country is not due to the lack of any potential or the know-how. In fact, many small-scale experiments at various coastal centres have demonstrated the possibilities of successful salt water fish farming. Owing to the restricted nature of these experiments and their publicity they have remained more or less only as scientific possibilities and have not had sufficient impact on the public as to induce people to undertake any commercial fish culture. At this stage it seems worthwhile to draw our attention once again to the question of proper utilisation of our coastal lagoons for salt water fish culture.

## Our Major Problems

Although we have extensive salt-water inundated areas along the coast in different regions, it is well known that all these may not be readily amenable to our control or for immediate utilisation. Many of these coastal areas are under periodic influence from the sea or are subjected to the ravages of the weather conditions, thus presenting many kinds of difficulties in management. All the efforts expended can go unrewarded after a cyclonic storm or a tidal wave, as had been experienced in the case of the experimental marine farms at Tuticorin and Mandapam in the earlier years. Or, during the summer the entire region can go dry, leaving only dense deposits of salt. If naturally fertile areas are available the tendency is

to think in terms of conversion of the area for agricultural purposes for which modern techniques are applicable. It may thus imply that many of the uncultivated coastal saline regions are comparatively inferior in their productive potential. Another major problem is the large and apparently idle investment that may be necessary in the initial stages of commercial fish culture. The general scepticism and the inevitable delay in obtaining satisfactory returns, combined with some of the uncertainties, throttle the incentives for any major investments. For fish farming to be of any commercial success, extensive areas and proportionately large initial outlay in expenditure are required. On account of these primary economic factors, very little attention has been devoted in the reclamation or improvement of coastal saline areas for fish production. It should, therefore, be our endeavour to discover the favourable combination of techniques, consistent with our immediate needs and economy, to bring about a revolutionary improvement of these neglected areas so as to help in growing more and more fish.

## Scientific Hiatus

The fish farms at Narakkal (Kerala State) which was started on a modest scale in 1940 have shown the practical ways of utilising the extensive backwater regions of the state and today these farms extend well over one hundred acres. The farms are stocked with locally available species like the mullets and milk-fish. These, together with the prawns that enter along with the tidal flow, are reported to give an average annual yield of a thousand pounds per acre. This high yield is largely due to the very fertile and contiguous backwaters in this region which receive a perennial supply of nutrients throughout the year. Fish farming in such brackish water or estuaries of high productivity is comparatively a simple procedure and the farmers are assured of a satisfactory yield.

Conditions along the east coast are, however, somewhat different. There are vast coastal mud flats where the water gets cut off during the summer. The water becomes highly saline or the places even get dry. These regions are subjected to wide fluctuations in environmental conditions, particularly in salinity and temperature, which have a vital bearing on the growth of fish.

Besides this drawback, the availability of nutrients is often limited in such regions. Many of these places have no immediate access to freshwater and the soil is invariably loose and porous. Thus, these regions constitute a peculiar kind of ecological environment, presenting an almost unfavourable climate for biological production as a whole. Some kind of unorganised and seasonal fishery takes place in these lagoons and swamps, which have been estimated to give only an average of about 50 pounds of fish per acre per year. Experiments conducted in such waters had to be differently oriented and a more basic approach was necessary. In order to find out to what extent these areas could be used for fish culture, some studies were conducted by the concerned state fisheries departments and also by the Central Marine Fisheries Research Institute. The results, it should be said, were quite encouraging. Depending on the particular area where these experiments were conducted, it has been found that under scientific methods of farm construction, stocking and management at least a ten times increase in production could be achieved in many of these waters. While these assessments have been based on preliminary experiments, the results are clearly indicative of the fact that profitable farming in these regions is possible on commercial lines.

Experiments in assessing basic biological productivity and improving it by the use of manures have also been carried out in these regions. Increased production of microflora

which form the basic food of many of the culturable species of fish, has been distinctly proved by the use of both organic and inorganic fertilisers although the economic feasibility is yet to be worked out.

Similar experiments, involving some aspect or the other of fish culture, are even to-day being carried out in different parts of the country. While some basic facts are being gathered, it must be admitted that there are major gaps in our knowledge which remains mostly empirical. Thus, at present we badly lack adequate information on (i) the extent of saline coastal areas that can be economically brought under fish culture and the ecological and other characteristics of the different types, as it may not be possible to utilise all the available areas, (ii) precise knowledge of the basic productivity and other relevant information on the various types of soils, the salt marsh vegetation, etc., (iii) techniques of construction of fish farms suitable for these different areas, (iv) the role of organic and inorganic fertilisers in enhancing the biological production, (v) fish fry resources, possibilities of collection and transport and thus the scope for establishment of successful fry trade, (vi) harvesting and marketing methods and (vii) the scope for organising co-ops and fish culture on cottage industry level. These and related aspects need urgent examination in order that the industry should be put on a sound basis and flourish successfully.

#### **No Neat Recipe**

As coastal lagoons and mud flats vary widely with regard to their physiography and productive potential, no neat recipe for fish farming in these areas can be readily offered because success does not seem to depend on any set pattern of management. Some amount of trial and error in the beginning seem to be inevitable at this state of our knowledge. Suitable techniques in both construction of the farms and

management principles will have to be evolved depending on the area where culture is being practised. Old techniques have scarcely changed and no new techniques have been tried out. A bold and dynamic approach to the problem is called for at this stage.

#### **Research Needs**

It is in this context that the various research agencies under the control of the government have an important role to play. That aquaculture has a close parallel in agriculture, as regards the technical approach, is well established. The aim in both is to increase the primary productivity of the land or the water enclosed by it. While the nutrients are being directly used by the crops in the case of agriculture, in fish culture the nutrients are being directly used by the crops in the case of agriculture, in fish culture the nutrients are made use of by the microflora which form the first link in the primary food chain and which in turn are made use of by the fish at various levels. Maintenance of the physical and chemical characteristics of the water in ponds requires careful testing and constant checks. Techniques in these are fairly well standardised for the various types of soil conditions but these will have to be rigidly exercised. In the initial stages of fish farm development, it will be unwise to start any such venture on regions which indicate the need for costly and uneconomic managerial practices. Despite certain advantages like the close proximity to fry resources or such lone factor, it will not be advisable to start fish culture in an area that is otherwise poor in soil conditions. By more intensive surveys of our resources of fish fry required for stocking farms a better estimate should be obtained so as to make full use of the available fish fry. Nursery management is another field in which we have done very little work and in this direction a lot more information

has to be gathered as a steady supply of adequate number of healthy fry and fingerlings alone can sustain a good fish farm. In many countries where fish culture is practiced, nursery management has been developed into a highly specialised technique. Proper transport of the live fry over long distance often becomes inevitable. Although some research has gone into this problem, better dependable standards, more or less in the form of a nomogram giving the number of fish fry of any particular size that can be transported in a given volume of water or the number that could be stocked in a specified body of water, are still lacking. In practice, only empirical standards are being followed but the loss and wastage of valuable fish fry can be avoided by more precise information. This is specially important in our country because of the fact that most of the salt water fish fry become available in the summer months when their transport becomes a real practical problem. The question of obtaining quality fish fry is also significant in this connection.

Increasing use of scientific knowledge and inputs of fertilisers is bound to produce spectacular result, especially in areas of low productivity, as has been demonstrated in agriculture. Our present knowledge on the use of fertilisers in salt water is extremely poor. While chemical fertilisers may not be available immediately and may also seem costly, even the common organic manures that are abundantly available in our country have not been used with any advantage. Extensive experimental studies in using organic as well as inorganic fertilisers for enriching the ponds is a line of work we have to pursue.

While scientific work on the lines suggested are being carried out, a simultaneous increase in extension agencies to take the results of these experiments to all possible levels is also essential. With the improvement in road transport, satisfactory

means of transporting fry and fingerlings from the collection grounds to the farm site as well as transport of fresh harvest from the farms to the consumer centres also will have to be developed.

#### **Governmental Aids**

In the present economic set up of the fisherfolk, a proper relationship between effort and reward is lacking. Often, an unduly large share of the benefits tends to be appropriated by those to whom the fishermen are indebted for financial assistance. This is a factor applicable to the fishing industry. As long as the fishermen depend on borrowed capital, they try to harvest the stock that is readily available rather than invest such a capital on time-consuming process of fish culture. As in agriculture, motivations and incentives offered by society to the farmers' best efforts are needed. It is here that the governments will have to successfully intervene and support the fish farmer.

The goal 'land to the tiller' remains a distant idea even today. But, as a first step of encouragement, the government must make the so-called barren salt marshes and coastal lagoons available to enterprising societies of fish farmers on nominal long-lease terms. Co-operative effort should be encouraged. Also, side by side, credit and marketing schemes will have to be developed. It appears that some of the inducements given by certain governments to fishermen to promote their activities get diluted by the time they filter down to the fisherman under the present system and this danger should be prevented by screening and adoption of more efficient procedures.

Substantial progress can be achieved with the creation of cooperative organisations to supply the fish farmer with fish fry, fertilisers and other needs on suitably evolved credit systems, with repayment in kind. The price relationship established by the co-ops which stand ready to

buy the farm produce sets the pace for local merchants.

The quest for higher productivity and higher yield has to be more diligently pursued and new methods in this direction are bound to emerge as our knowledge and experience progress. While the use of fertilisers for increasing the productivity of natural waters may not be immediately possible in the existing economic set up, in due course its advantage is bound to be realised. However, the use of these high inputs in fish farming is inconceivable without adequate financial assistance and credit facilities and the assurance of satisfactory returns at the end. Effort and reward are always closely interlinked.

#### **A Package Approach**

While deciding the economic aspects of fish farming, besides the fish that are actually harvested from the farms, many other aspects come to play an important part. For example fish fry collection and fry trade can develop into a very profitable supporting industry. With well organised nurseries fry trade can develop into an almost independent business. Other supporting industries or agricultural products also offer attractive possibilities for developing a few special crops surrounding the farm site. In a properly laid out farm, the area occupied by the bunds may take up nearly one-third the surface where selected crops can be grown, which will not only give yields but also help in stabilising the soil on these bunds. The well-known experiments of Boyko since 1949 in the Negev desert of Israel, converting barren waste lands into a flourishing garden solely irrigated with saline water to produce such crops as melon and tomatoes, and perhaps similar experiments in our country itself will have immense practical applications in these areas of salt water fish farming. Record yields will help to dispel any distrust in the success of such an enterprise.