AQUACULTURE

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AQUACULTURE or aquiculture, as the term denotes, covers the broad aspect of growing organisms under human control in an aquatic environment including all types of water bodies from fresh to saltwater and even brine-pools. Until recently culture of organisms in the marine environment was considered to be more of an academic exercise than of any practical utility. But of late considerable advancements have been made in this direction and such culture operations have come to be known by a separate term—mariculture.

The Present

Aquaculture is catching the imagination of many and increasing attention is being devoted to its problems. Irrespective of the possible differences in the historical background of the origin and development of fish farming in various parts of the world, the current interest stems from the realisation of its importance as a means of supplementing the wild fish catches from stocks many of which are reaching or have reached the optimum level of exploitation. Although it is appreciated that aquaculture can play a significant role both from the socio-economic viewpoint and environmental conservation, it would be wrong to expect an immediate 'food revolution' from fish farming because of innumerable constraints hindering optimisation of production. Guided by the accumulated experience coupled with the innovative capacity of modern science and technology, the time factor for developing fish farming into its industrial phase can be shortened. This process, nevertheless, presents all the challenges and exciting possibilities of a great industry in its early stages of development.

Data on the yield through aquaculture operations are grossly inadequate. According to the available information the production of fish and prawns through culture operations is estimated to be around 0.48 million tonnes in India accounting for nearly 38 per cent of the total fish production.

The lack of convincing data on the cost-effectiveness of aquaculture has perhaps been a serious constraint in its development. It is, however, quite obvious that aquaculture would not be profitable under all conditions because profitability would depend on a large number of factors like land value, capital and operating costs, productivity, processing, marketing, etc. There is increasing concern about the decreasing land : man ratio and the fact that more land than what is desirable from the ecological viewpoint is under plough. Therefore, the increasing need for food should be met by increasing the productivity per unit area than by extending the area under cultivation which applies to aquaculture also. In the order of priority agriculture necessarily gets precedence and this invariably leads to conflict of interests because in both agriculture and aquaculture the basic productivity is related to the fertility of the land and there is the question of use of water. Fortunately, there are several areas not suitable for agriculture such as swamps, salt water lagoons and backwaters which could profitably be used for fish culture. In regard to the use of water in fish culture it should be mentioned that water is non-consumptive as it is used primarily as a medium for the fish to live. The techniques like cage culture opened up the possibility of utilizing almost any available body of water for fish culture avoiding a conflict in the use of water for other purposes.

While there is a great deal of technical know-how in respect of freshwater fish culture, the state of the art in respect of brackishwater and seawater farming is still in its infancy and so is their economics. The problems involved in the development of both these, especially mariculture, need more critical study and analysis. However, in culture operations, like pearl, mussel and edible oyster the techniques are well advanced and the economic viabilities have been established.

Development Prospects

It is estimated that nearly 70 million hectares of fresh, brackish and saltwater are available as potential area for aquaculture out of which only 0.6 million hectares are under cultivation. Even with the present knowledge it is believed that the output from aquaculture operations could be substantially raised immediately if sufficient assistance in the form of monetary inputs and an assured supply of fish seed were available. Suitable land leasing policies are also necessary so that the fish farmer has a stake in the venture.

Operational projects and national demonstrations in composite fish culture have been organized and in selected states, which have a long tradition in fish farming, rural aquaculture development at village level has been taken up. Pilot projects in pearl, mussel, eel and prawn culture are also being initiated. But the gap between research results achieved and their field application is an index of our inadequate extension efforts. Therefore, a more integrated and purposeful approach is now necessary in order to ensure that our resources,

funds and expertise are fully utilized for the development of national productivity.

In recent times there have been remarkable technological advancements elsewhere which would enable higher yield from aquaculture operations. These include, to mention a few, formulation of fish feed, capsulation process of food, development of mechanical feed dispensing devices, control of diseases, genetic upgrading, hybridization, etc. Experience in agriculture and animal husbandry has demonstrated the advantages of using genetically uniform material produced by selective breeding and hybridization. Similar work on fish has begun only recently but the results so far obtained have shown that modern genetic methods are applicable in the case of fish too to produce hybrids with desirable quality and material of uniformly high performance. In intensive fish culture operations the quality and quantity of fish food are important factors. Therefore, to accelerate the growth of fish, natural food production in the farm system has to be either augmented by fertilization or supplemented by additional feed. Although much work has been done in other countries on feed formulations, this is by and large for raising aquarium or ornamental fish and sport fish. With the high cost of fertilizers and conventional feeds like oilcakes, rice bran, etc. there is need to study the possibility of developing feed formulations using re-cycled wastes and inexpensive ingredients. Utilization of sewage in place of costly fertilizers to increase the fish food in pond systems is yielding encouraging results.

In the matter of feed conversion efficiency no farm animal can match the fishes. This together with the possibility of a three-dimensional culture has certain advantages as well as disadvantages. It is believed that it may be cheaper, weight by weight, to grow aquatic organisms rather than land animals for human food because the former have the same density as the medium which they live and require only containers for this medium as against shelters, stables, etc. needed for land animals. But at the same time there is a serious problem with the unused food and metabolic wastes befouling the medium which surrounds the organisms and thereby affecting the carrying capacity of the farm. To overcome this there is need for frequent change or re-cycling of water which can be costly. In the wide spectrum of aquaculture there are thus complex relationships between a large number of variables. These pose certain problems in working out cost: benefit ratios of different types of aquacultural operations. Therefore, immediate attention has to be devoted to develop suitable models to assess the impact of changes in any of the variables either singly or in combinations on the cost per unit of production.

It is now well acknowledged that aquaculture deserves more support not only to cover development aspects but also to strengthen the research and extension efforts. While some advanced technology developed in other countries could be borrowed, it is important to build up indigenous scientific capability to provide an effective development strategy. The logical sequence to a sound way forward would, therefore, be from research to technological developments, and economic assessment and finally to the establishment of commercially viable systems. Even with the accelerated tempo of development it may take some time for aquaculture to attain the status of an industry. Meanwhile the importance of aquaculture as a small-scale industry cannot be overlooked in the present climate of chronic unemployment and under-employment. Aquaculture as practised today, is labour-intensive. Its development would consequently provide means for a better investment for our large 'human capital'. Thus, aquaculture assumes particular importance as a production system not only from the stand-point of the supply of the regional needs of fish but also of the local economy.