

AQUACULTURE IN DEVELOPMENT PLANNING

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1. INTRODUCTION

Although aquaculture practices have prevailed at various levels of technology in different countries, and the technical aspects have received much attention, planning at the national level has received very little attention. The potential aquaculture offers for contributing to rural and national economies is being increasingly realized, but a well-planned national strategy and coordinated action is necessary if aquaculture is to develop at a reasonable pace.

The nature and extent of government involvement in aquaculture development depends on its existing status and the availability of financial and technical resources, and would normally conform to the government's overall socio-economic and political policies. For economic reasons, financial provisions and services for aquaculture are generally made in conjunction with those of the fishery and agriculture sectors.

Government involvement normally includes surveys of the national resources, collection and analysis of data required for developing a well-planned strategy for aquaculture, as well as providing much of the infrastructure requirements, and various support services such as research, training, extension, information, financing and credit incentives, and statutory rights.

2. THE ROLE OF AQUACULTURE

The role that aquaculture will play in the rural and national economies need to be ascertained for planning purposes. Aquaculture can be practised for a variety of purposes, including food production,

improvement of stocks in natural waters or sport fishing, but the main purpose is generally the production of human food. Government policies may determine the amount of emphasis on production of cheap fish for the populace, in relation to production of highly priced fish, shellfish and other aquaculture products for the luxury market or export. Aquaculture may be seen as a means of creating yet another avenue for employment. It also may be a means of utilising land that has little or no other use.

Aquaculture has certainly been proved to contribute significantly to the rural economy in many countries. 'For the individual farmers, productivity is the foundation that can provide him with a reasonable standard of living, and for the nation, productivity is the basis for ensuring consumer food products at reasonable prices. By improving the physical well-being and quality of life of the poor, their productivity and ability to contribute to the national economy may be enhanced' (Gerhardson, 1979).

Aquaculture, agriculture, horticulture and animal husbandry can be practised together to yield increased income to the rural farmer. For example, farming of rice with fish, ducks with fish or pigs with fish is being profitably practised in several countries. While the ponds serve as water reservoirs the areas adjoining the ponds can be used for cultivation of crops such as sweet potatoes, cassava, yams and various fruit trees. Aquaculture therefore fits well into integrated rural development programmes.

A factor to be considered is that initial investment and operating costs of the subsistence level or small production units of the rural farmer is likely to be minimal, with family members contributing the labour required.

Depending on the status of aquaculture development in the country, the development plan also needs to take into consideration the existing or potential large-scale aquaculture enterprises in the private or public sector, and the nature and extent of support that need to be given to them.

Owing to the existence of many intermediate types of operations, it is difficult to categorise aquaculture systems into small-scale and large-scale industrial operations. 'However, broad categorisation of the planning requirements are possible, and although the details of the strategy may vary there are some general guidelines to be followed in each type of operation' (Pillay 1974).

3. BASIC DATA REQUIRED FOR PLANNING

Essential pre-requisites for planning aquaculture development are basic data which will help to determine the existing level, extent, and potential for aquaculture development, projections of national re-

quirements through aquaculture and species and culture systems that are most suited to the prevailing climatic conditions and local preferences.

Pillay (1974) lists them as follows: estimates of total requirements for domestic consumption or export; existing and possible sources of production; estimates of possible yields from natural stocks; estimates of yields through viable aquaculture, taking into account possible socio-economic benefits to rural areas, including new avenues of rural employment; and improvement of the diet and nutrition of the people.

The choice of the species and culture systems will depend on whether it is for local consumption or export, local climatic conditions, particularly temperature range. The culture of indigenous fish is generally preferred, for local consumption, but for this data on the general biology and life cycle of the locally available culturable species is required. The need for introducing species, if any, with adequate precautions, has to be determined.

Data is needed on the extent and locations of areas suitable for aquaculture, as well as on the quality and productivity of the waters that will be utilised. It is known that many aquaculture ventures have failed due to their being wrongly sited. Data on the biology and pathology of the species projected for culture will help to determine the suitability of culturing them in the selected environments.

Among the other data required will be the availability of inputs such as fertilisers and feeds and locally available agro byproducts that could serve as feed ingredients, including estimations of quantities and costs.

The categories and respective numbers of existing trained manpower including extension personnel, will be necessary. So also would data on the available support services to the fishery and agriculture sector which may be utilised in an aquaculture development programme.

Finally, there should be a socio-economic study in order to determine the benefits that will accrue to the target communities through aquaculture development.

4. LEVEL OF GOVERNMENT ASSISTANCE

The nature and extent of government assistance to aquaculture will depend on the current status of aquaculture in the country, projected plans for further development, the size of the communities involved, the already existing or projected services in related sectors and the available financial resources. Government involvement will normally conform to the overall political, social and economic development programmes of the country.

5. LEVELS OF AQUACULTURE DEVELOPMENT

Farm sizes range from subsistence level units to commercial scale enterprises, from a fraction of a hectare to more than a thousand hectares and operated by private individuals, private or government cooperatives or private companies.

Farming systems are often referred to as being 'extensive', 'semi-intensive' or 'intensive'. In 'extensive' systems low stocking rates and yields per unit area are involved, and capital, recurrent technological and management requirements are not relatively high. Commercial scale ventures normally involve large areas in order to ensure profitability. On the other hand very high or intensive stocking rates and yields per unit area are involved in 'intensive' culture systems. Here the aim is to achieve profitability using relatively small areas of advanced technology and high management skills. While extensive farming may be considered to be labour intensive, intensive systems involve mechanisation of certain operations in order to minimize dependency on labour. Intermediate between the two are various 'semi-intensive' culture systems.

In planning aquaculture development the role aquaculture can play in generating opportunities for employment, improvement of the rural economy and potential for foreign exchange savings on imports or earnings on exports may be given due consideration, besides the overall objective of increased food production.

6. FEASIBILITY STUDIES AND PILOT SCALE OPERATIONS

Aquaculture development plans, whether for integration into rural development programmes or for large-scale commercial ventures need to be based on feasibility studies and pilot scale operations, particularly if new technologies are to be introduced. The latter will help also to test the assumptions on which the introduction of a particular technology is based.

7. MANPOWER REQUIREMENTS

A pre-requisite for the successful implementation of aquaculture programmes is the availability of adequate expertise and trained personnel.

Aquaculture development plans therefore include an estimate of the national requirements of trained personnel at the various levels. This entails training of personnel and whether training arrangements should be made on a permanent or temporary basis. Three main categories of technical persons are generally needed. One is the

‘aquaculturist’ who has university level or equivalent education and who will be responsible for the execution of all technical aspects of the programme. The other is the ‘technician’ whose specialized training in selected areas will enable him to assist in activities such as hatchery operations or certain routine analysis in the laboratory relevant to the programme. Third category is the ‘extension worker’, whose training will enable him to transfer technical knowledge to the farmer, and also to win his confidence, respect and friendship.

This last category may not be specially recruited for aquaculture, but may be drawn from other sectors such as fisheries or agriculture, and given the necessary training in aquaculture. Besides these three categories, specialists in other areas such as aquaculture engineering, fish nutrition and marketing may be required, but these could also be drawn from related sectors.

With regard to training, it may be more economical to have the aquaculturists trained at regional level, or other existing institutions, than to establish training facilities for them. Training of technicians and extension workers could be carried out within the country, and the aquaculturists need to play an important role in this.

8. SUPPORT SERVICES

Success in implementation of a plan for aquaculture development will depend to a considerable extent on availability of the necessary support services, which have to be provided mainly by government. Among them are research, training, extension, information arrangements and finance and credit.

National research programmes are necessary for solving problems related to aquaculture under local conditions. These would also include pilot scale trials to test the technical and economic feasibility of new technologies. Besides biological and technical problems, research should also be carried out into socio-economic problems associated with aquaculture.

Research related services to the farmer, whether at the subsistence or commercial level, includes assistance in determining the suitability of sites for aquaculture, improved pond management techniques, fish feed formulations using inexpensive locally available by-products, simple processing techniques for aquaculture products, prevention and cure of diseases and monitoring of the aquatic environment for pollution control.

The success of an aquaculture development programme will depend very much on a well organised extension service. Extension services should be the link between the research centres and pilot farms on the one hand, and fish farmers on the other. The technical competence of extension personnel coupled with gaining the respect and confidence

of the farmer is very important, especially in rural development programmes. The plans for extension services should also include facilities such as transport, audio-visual aids and necessary funds to enable the extension worker to carry out his task effectively.

Related to research as well as extension is dissemination of information, which need to be included in the plans. These include extension pamphlets, field manuals, and film strips for the benefit of the farmer. Provision should be made for collection and review of aquaculture information and statistics from aquaculture ventures within the country. A more comprehensive arrangement for collection, storage and retrieval of aquaculture information will be computer based. It may be economical to have it at the regional rather than the national level.

Financing and credit for aquaculture enterprises may have to be arranged from agricultural development or cooperative banks or other existing credit organisations. In this context, the difficulties of the rural farmer in providing collaterals need to be given consideration. Hitherto in Africa and other regions very little agricultural credit has been made available to the smallholder farmers. In order to ensure its proper utilisation, credit to fish farmers should best be linked to the extension services.

Besides credit, government assistance will be required to ensure timely supplies of fish seed, for which hatcheries are needed together with fertilisers, chemicals and drugs for sanitation, weed and disease control.

Support services for marketing, storage and processing are not normally required for subsistence level farming, but may have to be planned for. Fish farmers normally market their products directly to the consumer or through existing distribution channels. As production increases, existing sales organisation in the fishery or agriculture sector may have to be utilised, or even separate organisations may have to be created for aquaculture products. Plans for aquaculture production may also cover the areas of product quality, eg, special cleaning procedures for oysters, and regular inspections and certification of products by pathologists.

9. LEGAL MEASURES

While subsistence level farming does not appear to face serious legal problems, provisions need to be made to accord legal rights to aquaculture entrepreneurs, including the right to acquire or use various sites in the sea and other common water bodies for aquaculture, since conflicting uses may be involved. Regulations need also to be provided concerning the discharge of pollutants into aquaculture areas, fish diseases, inspection of and certification of aquaculture

products, minimum saleable sizes of fish and shell fish used for or produced through aquaculture vis a vis regulations pertaining to minimum sizes in captive fisheries, and the introduction of exotic species.

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