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# Guidelines for the development of environmentally acceptable coastal aquaculture

Aquaculture Department, Southeast Asian Fisheries Development Center

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# GUIDELINES FOR THE DEVELOPMENT OF THE ENVIRONMENTALLY ACCEPTABLE COASTAL AQUACULTURE

To ensure that financial gain of any aquaculture activity is not at the expense of the ecosystem or the rest of society, aquaculture development must follow established principle. An outline of this guideline which included general principles and strategies was featured in AFN, Jan-Feb 1994 issue. However, for better understanding, the following plans of action are discussed in detail:

## Recommended Actions:

### **1. Formulate coastal aquaculture development and management plans**

A coastal aquaculture development and management plan at national or local level is an essential first step towards achieving the above objectives. Such a plan must be integrated into the overall coastal zone management plans discussed below.

The allocation of potential sites and the selection of forms of coastal aquaculture practice must be preceded by adequate survey and evaluation. Not all the sites found to be technically suitable will be utilized for aquaculture since they will also need to be economically viable and socially and culturally acceptable and their impacts must be within the assimilative capacity of the particular ecosystem. Such planning procedures provide the framework for an orderly development of aquaculture practices including the use of species and culture systems reflecting the physical, chemical and biological characteristics of the site. The scale and level of operation will often depend on societal and economic objectives and investment opportunities. The plans also provide the framework for institutional and legislative arrangements to administer, regulate and monitor the development of aquaculture farms.

### **2. Formulate integrated coastal zone management plans**

Within the general framework of integrated coastal zone management, policy and management guidelines must be established for the allocation of coastal resource to various economic development needs. The zoning approach is one effective means of assigning priorities and limiting development activities to specific areas or zones.

The priority activity in a particular zone acquires "predominant use" status. Other "permitted uses" can be accommodated, but only as long as they do not jeopardize the predominant use. Integrated coastal zone management requires institutional and legislative provisions if it is to succeed in achieving multiple use. This includes zoning regulations and regulatory measures to control effluents. Continued monitoring and evaluation form an important part of integrated coastal zone management programs. Remote sensing and geographical information systems can be effectively used for this purpose, especially to determine changes in resource use over time.

### **3. Apply the environmental impact assessment (EIA) process to all major aquaculture proposals**

EIA is a process whereby the potential impacts of a proposal on the social, biological, chemical and physical environment are assessed and justified, and the means sought to minimize or eliminate negative effects.

### **4. Select suitable sites for coastal aquaculture**

In selecting an appropriate site for aquaculture it is essential to consider, in addition to the socio-economic consideration, the biophysical requirements of the cultured organism, the characteristics of the site and the culture method to be used. In evaluating the characteristics of the site, essential physical, chemical and biological variables should be considered. These include coastline morphology and bathymetry, water temperature and salinity, flushing time, sediment particle size, water movement (current speed and direction), dissolved oxygen, dissolved inorganic nutrient, sedimentary redox-potential and organic content, natural resources and their use, wildlife, planktonic biomass and species composition, and bacterial population.

### **5. Improve the management of aquaculture operations**

Properly sited and managed aquaculture activities should not result in unacceptable ecological change. Nevertheless, should change occur, a number of measures can be used to minimize it.

For example, ensuring good health of the

stock will reduce wastage of feed and the use of bioactive compounds. Techniques, though costly, are also available to collect or disperse waste to reduce the severity of the impact beneath cages. Longer-term measures to reduce waste output from intensive fish and shrimp farms include improvements in the formulation of diets to increase digestibility and the development of techniques to monitor the biomass and health of stock.

#### **6. Assess the capacity of the ecosystem to sustain aquaculture development with minimal ecological change**

The concept of environmental capacity can be applied to the control of pollution and assumes that coastal ecosystems have differing quantifiable capacities to assimilate the discharge of a contaminant and provide trophic and non-trophic resources. Thus, in the context of the ecological impact of some coastal aquaculture development in which there can be a net loss or reduction in a variable (as well as the discharge of a contaminant) ecological change can be limited by ensuring that the scale of development does not exceed the availability of a trophic or non-trophic resource or the capacity of the ecosystem to assimilate the changes resulting from production.

#### **7. Establish guidelines governing the use of mangrove wetland for coastal aquaculture**

The use of mangroves along the shore front or fringing river banks for aquaculture should be discouraged in view of their significant contribution to coastal stability preventing soil erosion, and their role as valuable habitats. Unlike extensive shrimp farming in mangrove swamps utilizing tidal energy for water exchange and shrimp larvae supply, modern intensive shrimp farming uses mechanical pumps for water supply and seeds from hatcheries. As such there is no justification in the use of mangrove swamps for shrimp culture. Traditional use of mangrove wetland for extensive aquaculture has minimal negative ecological impacts. The use of river basin mangrove should be guided by the recommendations from national mangrove committees which have been established in some nations.

#### **8. Establish guidelines for the use of bioactive compounds in aquaculture**

The use of bioactive compounds, including antibiotics and pesticides should be controlled to prevent misuse.

#### **9. Assess and evaluate the true consequences of transfers and introductions of exotic organisms**

Transplantation of exotic species beyond their natural range to new habitats for aquaculture and stocking purposes should be carefully and rigidly controlled. Adequate inspection services and quarantine facilities should be made available in both the exporting and importing country before any transfer and importation is authorized. *It should be emphasized that every movement of species to and from aquaculture sites, even within the same general area, should be strictly controlled through inspection and certification.*

#### **10. Regulate discharges from land-based aquaculture through the enforcement of effluent standards**

The accumulating effects of discharges on the coastal environment could be greatly reduced by the enforcement of site-and-contaminant-specific effluent standards (e.g. suspended solids, nutrients, and BOD). Levels to be adopted should be within the assimilative capacity of the receiving ecosystems.

#### **11. Establish control measures for aquaculture products**

All aquaculture products should conform with safety standards for seafood before they are allowed for human consumption. A directive from the European Community adopts a provisional value of 300 faecal coliforms/100 ml of bivalve tissue. Therefore, it is essential to ensure an adequate sanitary standard for waters in areas supporting aquaculture. Improved water treatment techniques and effluent standards would help to minimize human health risks. Monitoring by the health authority should be established to ensure that the growers comply with such requirements. Depuration and appropriate storage and preservation facilities need to be established to ensure adequate quality products.

#### **12. Increase public awareness of the safety aspects of consuming seafood**

Better public awareness of the need for good seawater quality in the production of marine aquaculture products will provide pressure for the control of undesirable inputs to the local environment. A knowledge of the specific risks associated with handling, processing and consuming seafood including aquaculture products could help reduce the incidence of food poisoning and

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infections from food-borne organisms. Consumer awareness is an effective way to compel fish farmers to produce hygienic products. The appropriate use of the news media, avoiding the spread of misinformation, can help to increase consumer confidence and to support those seafood industries which are not affected by contamination.

### 13. Apply incentives and deterrents to reduce environmental degradation from aquaculture activities

Incentives such as concessionary lease of wetlands, tariff exemption on feeds and equipment energy subsidies and depreciation allowances on facilities and deterrents such as taxes on land and water uses and effluent discharge can be used to encourage aquaculturists to make more efficient use of resources and take full responsibility for mitigating or minimizing environmental change.

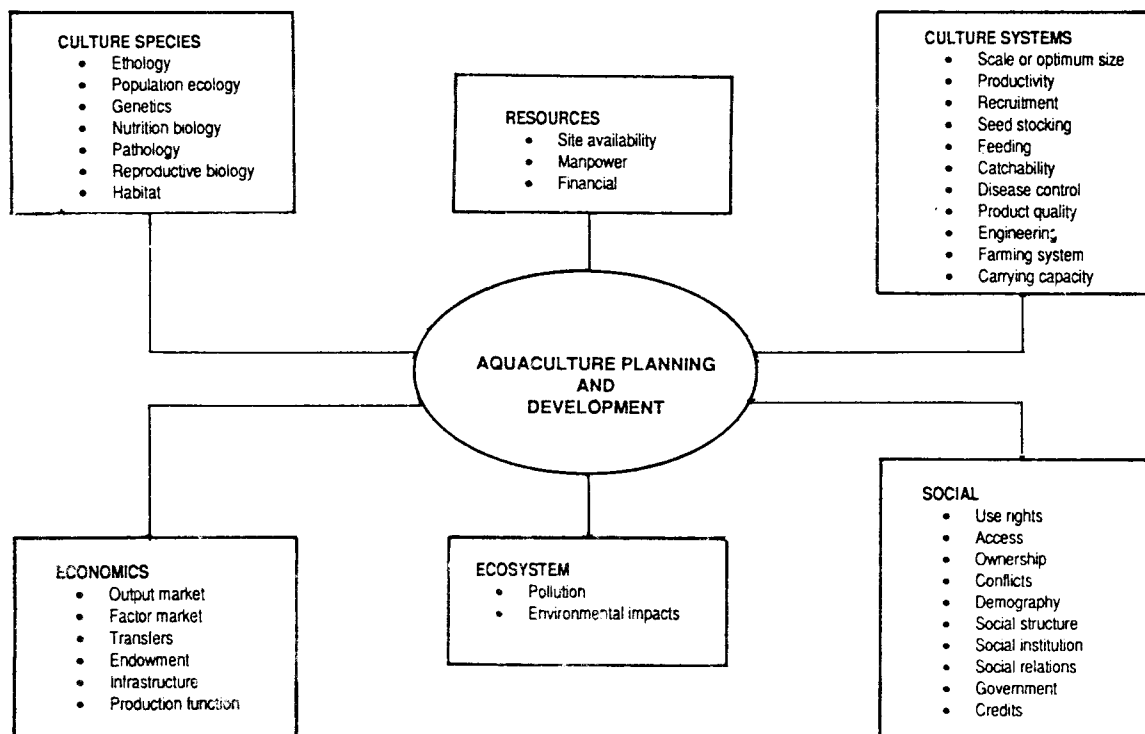
### 14. Monitor for ecological change

There are existing protocols which have been developed to monitor ecological change in coastal water and in the vicinity of effluent discharge points. However, given that the nature and scale of an ecological impact will depend on the type of

aquaculture practice and the location of the operation it is likely that existing protocols will have to be modified according to local requirements.

The purpose of monitoring for regulatory control of aquaculture development is ecological protection. The aim is to identify the level of, or trend in a particular variable and ensure that it does not fall below or exceed a predetermined value related to the natural conditions for the area. Identification of the spatial and temporal trend in a particular variable will be aided by reducing variation due to seasonality and sampling and method error. Validation of a trend will require statistical analysis and this requires that a sufficient number of samples are collected. Since monitoring is only a means to an end, the results obtained must be used to modify the operation if the change in a variable exceeds or falls below the predetermined.

*Source: GESAMP (Joint Group of Experts on the Scientific Aspects of Marine Pollution), Reducing Environmental Impacts of Coastal Aquaculture. Rep. Stud. GESAMP (47):35p. 1991.*



Key research areas needed to provide critical information for aquaculture planning and development that are technically sound, socio-economically feasible and environmentally compatible.

*Source: Aquaculture in Asia: Quo Vadis? Chua Thia-Eng and Elsie Tech. In: M. Mohan (Ed.) 1990. Aquaculture in Asia, Asian Fisheries Society, Indian Branch, Mangalore, pp 396.*