

Social Feasibility of Coastal Aquaculture

The appropriate role of technology in rural and agricultural development, indeed in economic growth and progress as a whole, has been the subject of intense debate for many years. Technology and the structural change it brings has been the centerpiece of claims of prosperity in the developed countries and is often espoused by planners and policy makers as the solution to underdevelopment and poverty elsewhere. This approach has been criticized for its materialism and failure to appreciate sociocultural differences and the often negative impact technology can have on traditional communities. There is now the willingness to measure development not just solely in terms of total output, worker productivity or monetary value but also in terms of social feasibility.

Concern for the purpose and impact of technology should be at the heart of any discussion regarding development of any sector, be it industry, commerce, agriculture or aquaculture. With fish supplies levelling off in many countries as limits to fisheries production are reached, aquaculture is being viewed as the primary means of achieving the incremental growth in aquatic food supply necessary to keep up with continued increases in population and demand. In response to the favorable economic conditions created for aquaculture producers in many countries, aquaculture production is already rapidly increasing. In some Southeast Asian nations, annual rates of aquaculture production increase since 1980 approach 20%, a potentially gratifying development for consumers in these countries, since up to 60% of the population's animal protein requirements are derived from fish.

While much of this increase worldwide comes from freshwater culture systems, especially those for carps and tilapias, coastal aquaculture systems are also experiencing rapid expansion and increases in production. Important species raised in brackishwater and nearshore aquaculture systems include milkfish, shrimps, mullets, various bivalves, and to a lesser extent, certain marine species such as seabass and grouper. Of these, shrimps are the most important economically. Many govern-

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ments are turning to brackishwater pond culture of shrimps as a means of maintaining or increasing the levels of foreign exchange that are earned by exporting shrimp to Japan, North America and Western Europe. Indeed, it is the attractive export potential of shrimp more than any other factor which explains recent changes in coastal aquaculture production patterns.

There is a critical need to determine the social feasibility of coastal aquaculture in the tropics because of several factors: 1) the rapid pace of technological development in coastal aquaculture systems; 2) the expansion of potential export markets for the products of coastal aquaculture and the economic pressure that this potential creates for increased production; 3) the need to add to the supply of aquatic protein available domestically; 4) the fragile nature of the coastal zone itself and potential competition for its use can bring; and 5) the general lack of institutional preparedness to deal with such extreme competition.

It is the objective of this article to address the issues relevant to assessing the social feasibility of technology for coastal aquaculture in the tropics. The concept of social feasibility as used here is a broad one, essentially encompassing "all aspects except those which are technical and financial." This distinction is crucial because much of the current aquaculture development in the coastal

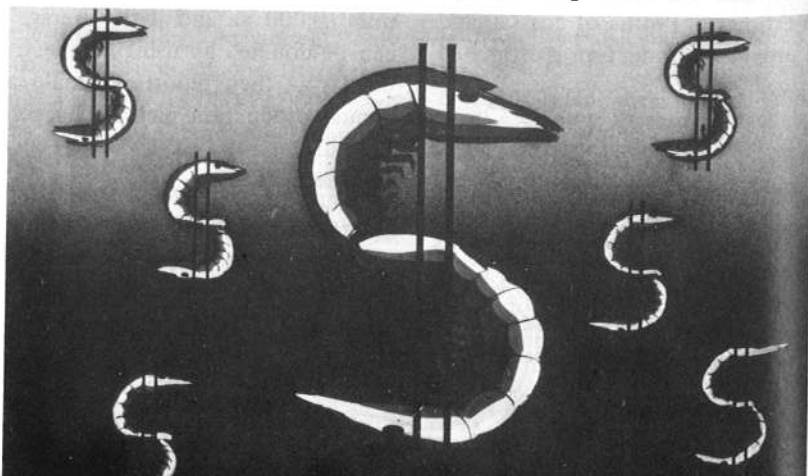
zone in the tropics is undertaken by private entrepreneurs, motivated primarily, if not exclusively by technical and financial considerations. Given the many and complex repercussions such development can bring on coastal resources, the economic (in the social welfare sense), sociocultural, legal, political and institutional dimensions of aquaculture development must be addressed. This means giving more attention to issues of employment, income distribution and local nutrition.

Aquaculture for Whom?

At the heart of deliberations in the social feasibility of aquaculture, are the following issues:

1. Aquaculture projects justified solely on technical and financial grounds usually fail to take into account the sociocultural and institutional setting of coastal communities and there is the danger that the interests of these communities are being overlooked in the drive by many nations for foreign exchange earnings from such coastal cultured species as shrimp which require large-scale industries.

For example, the conversion of mangrove swamps to pond aquaculture can cause grave dislocation to traditional coastal communities. Mangroves are believed to be important breeding and nursery grounds for many aquatic species that are later caught in the nearshore areas by capture fisheries. However, the potential fisheries losses that may occur by clear-cutting mangroves are usually understated, if stated at all, in cost/benefit studies of coastal pond aquaculture. Other traditional users of mangrove areas such as shellfish gatherers, charcoal makers and nipa palm growers are also frequently





ignored in these calculations, though the value of these activities can be substantial.

2. Coastal aquaculture faces an added dimension where workers in coastal communities view the nearshore waters, connecting waterways, mangroves and swamplands as "their" resource by virtue of traditional use rights. Much of these areas are instead viewed as public property by fisheries and aquaculture authorities at state and national levels. Planning for aquaculture development at these central levels thus frequently occurs without any consultation whatsoever with the current users of the resource. While within the coastal communities, one will find many of the same inequities and institutional rigidities characteristic of agricultural communities (i.e., local power elites, patron-client ties, indebtedness to money lenders), the interest of the whole community might be bypassed or over-run by new aquaculture developments that do not respect traditional use rights.

This bypassing of coastal communities is frequently true of large-scale shrimp farms which are often corporate run. In these cases, as happened in many Green Revolution areas, elite groups within the community participate in the new development to the exclusion of most of the other community members, thus reinforcing local power structures. The institutional twist in the case of coastal communities with respect to their traditional resources which are suitable for aquaculture is that most frequently *no* institution exists to protect the community's interests in the face of the "technically sweet" and financially profitable project which may be — and usually is — proposed from outside the community rather than from within.

3. The vast majority of residents in coastal communities are desperately poor. They are poor because of their lack of access to alternative employment opportunities and because existing community and national structures and institutions often allow local elites to capture the bulk of any benefits that come from more productive technologies introduced to or adopted by such communities. Large-scale aquaculture enterprises frequently displace small-scale fishermen and aquaculturists through subsidized financing and institutional arrangements that favor the large-scale or corporate investor. To

prevent aquaculture from becoming an elitist craft, more than laissez-faire approaches and support for large-scale activities are needed. It would seem that direct intervention of concerned government agencies and involvement of non-governmental organizations in community-based aquaculture is required to achieve greater "social feasibility" in the sector.

4. The social structure, economic needs and cultural wishes of a coastal community must be understood before those who desire to work with such communities can contribute constructively to change and the community's possible adoption of aquaculture technology. A coastal community, is not a single entity within which each individual and family has universally shared roles, careers and ambitions. Most common among such communities are local power structures that allow individuals or groups to concentrate control of the community's sources of wealth. In Coastal fishing communities, it may be the boat and gear owners or more likely the money lender, fuel supplier or fish processor. Sometimes these three functions are consolidated in the same individual. Such local power structures require that for assessment of the "social feasibility" of aquaculture, distinctions be made among individual, family, group and community perspectives and interests. In addition, the possible influence of persons living outside the community — absentee landlords, for example — should be determined.

5. Institutional support, especially for credit, extension and markets will be necessary if a "socially feasible" aquaculture activity is to be sustainable. While the community's preference may be to rely as little as possible on formal credit schemes, the lack of sound technical advice on production and market potential will surely result in much waste of community resources. Boom and bust cycles

are not unknown in coastal aquaculture. These are frequently caused by initial overestimation of market potentials or sustainable prices and resulting overproduction relative to the markets that have been identified.

External linkages with credit and extension institutions will be especially important for community-based aquaculture projects. Credit at less than the money lenders' rate, but retaining some of the flexibility in timing of repayment will be necessary. Supervision of large numbers of small loans will be required, a subsidy in other words, but why not? Credit subsidies have been made available to large-scale fishing and aquaculture endeavors; why not to small-scale activities that generate increased incomes and protein for local markets? The argument that development banks cannot bear the cost of added supervision for small loans is spurious; this added cost could easily be recovered by setting the interest rate at a level somewhat above those made available to the large-scale sector. Even at this higher rate, the interest rate would still be far below the rates charged by local money lenders.

6. Finally, equally important to consider is the degree to which coastal zone residents in the tropics can participate when questions of aquaculture development are addressed. Appropriate technology is thought to bring change with widespread benefits because it can remain within the control of the community that adopts it. Any change that reduces the tyranny and inequities that exist in so many local villages should be desirable. But change will require courage by those who would try to get out from under the yokes of indebtedness and poverty, as well as long term commitment and support from the individuals and organizations that wish to contribute to rural development through the use of appropriate technology. Recent experience has

shown that generally it is still groups outside the community that define what is and is not appropriate, and it is now widely agreed that community participation in development of appropriate technology is essential.

Appropriate Community-Based Aquaculture Systems

Three major questions remain to be addressed. First, can appropriate community-based aquaculture systems be developed within the contexts of the socio-cultural and community structure dimensions discussed above? Second, can a balanced approach be found that permits community participation in planning and management while at the same time leaving the community receptive to adapt aquaculture technology developed externally at research stations for example? Third, can community-based systems co-exist with the capital-intensive systems that are currently invading the coastal zone?

Most coastal communities in the tropics and the majority of the residents in these communities are poor. The common characteristics of limited resources for investment in new activities and the jump in technical and managerial skill that would be required of the new aquaculturists, suggest that capital-intensive systems such as brackishwater pond culture of shrimp and shrimp hatcheries will *not* be appropriate for such communities. More appropriate will be small-scale activities such as:

- stake or raft culture of molluscs
- bottom culture of oysters or cockles
- culture of seaweeds
- cage culture of marine species
- integrated systems such as animal-fish culture in small ponds;
- managed ranching systems such as artificial reefs, pens or other enclosures.

All of the above have the advantages of being amenable to small-scale, part-time operation. They can begin at such a level that the other primary occupation of the individual or family, such as fishing, can continue to provide steady cash flow to the household while the aquaculture harvest is awaited. Labor requirements are low and could likely be filled by household labor. The level of other

inputs required from outside coastal communities is also low. All these activities can be operated by domestic groups (individuals or families) or communally and can be expanded as managerial skills and markets (including household and community consumption) permit.

Community Participation

Communities must participate in and contribute to technology adaptation if aquaculture development in a particular community is to succeed. Partnerships between individual fish farmers or communities, researchers and non-governmental rural development organizations (NGOs) will be necessary to assure that technology developed by researchers will be appropriate for community adoption and modification. The role of rural development NGOs is particularly important because they are likely to have the expertise in judging "social feasibility" that technicians in research organizations and government extension services lack. Such groups can also assist in training researchers and extension officers to build up the number of professional rural developers who also have an understanding of the technical, financial and managerial aspects of aquaculture.

Co-existence with Large-Scale Systems

Given the multiple uses to which coastal zone resources could be put, to what extent can the full range of coastal aquaculture systems co-exist?

The lessons of the Green Revolution in agriculture seem to imply that there will be differential adoption rates with any new technology, that at least initially the rich will get richer, and that despite attempts to redistribute productive assets, these holdings may become concentrated. The same process need not occur with aquaculture. A successful co-existence of large-scale and small-scale community activities is possible with careful planning. To being with, there are many more species and system choices in aquaculture than in rice farming. This implies more specialization possibilities with wealthier farmers concentrating on higher value (and higher risk) systems, such as shrimp, while other less well-off producers concentrate initially upon less complex sys-

tems, such as bivalve culture for domestic markets. Market competition between systems is thus reduced.

Competition for space within the mangrove and backwater areas is much more difficult to resolve but it can be done. In most countries, legislation to address resource allocation and use does not exist. Since national systems of legislation have generally failed to date to meet basic conservation guidelines and avoid overexploitation, a more decentralized approach to coastal zone management is clearly called for. Not only will such an approach be essential to resolve issues of competition at the local level, potentially it will generate income for coastal communities.

Conclusion

Ways must be found to balance the technical and financial arguments currently favoring rapid expansion of large-scale capital-intensive expert-oriented coastal aquaculture with a concern for the long-term effects that such development will have on the coastal zone in the tropics, and more importantly, upon the present inhabitants there, most of who are small-scale fishermen and gatherers. Otherwise the likely environmental damage will be great, while social feasibility in terms of more equitable growth, better local nutrition and increased employment opportunities will not be achieved. It is imperative that some compromise be found between national objectives of increased aquaculture production and foreign exchange on the one hand, and coastal community requirements for increased employment and income on the other.

Participatory development on the part of coastal communities requires conscious efforts to involve them in the process of aquaculture development. Participatory development will not come about without efforts to decentralize control and decisionmaking over the coastal zone itself and the technologies that are appropriate there. Nor will it come about without efforts of interested researchers, extension workers, rural bankers and NGOs to make certain that communities are directly involved and supported over the long-term. Involvement of these cooperative and supportive groups is also necessary to help individuals and families adjust to the changes and new roles that aquaculture activities bring.