Research Issues in Aquaculture Economics

IAN R. SMITH
ICLARM

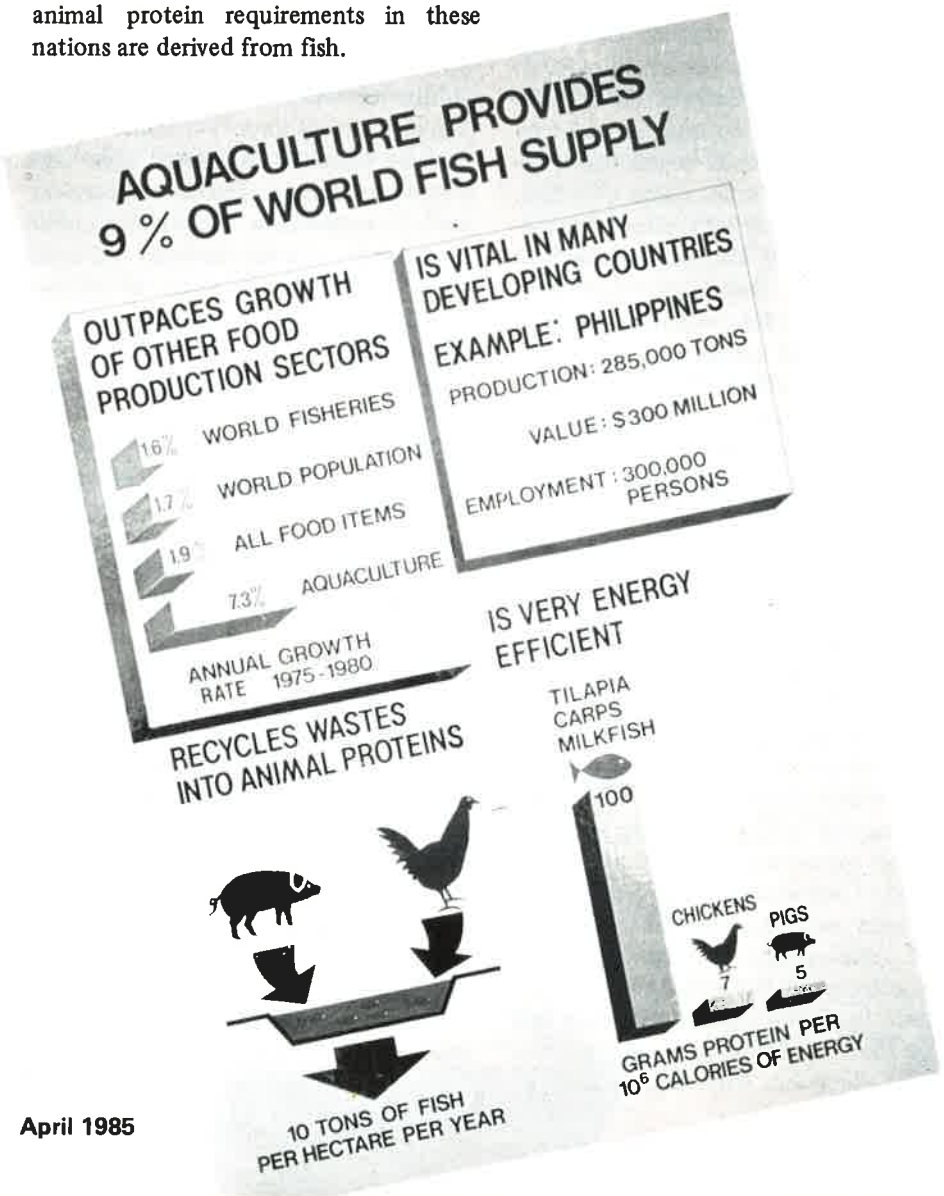
With fish protein supplies levelling off in many countries as limits to capture fisheries production are reached, aquaculture is being viewed as the primary means of achieving the incremental growth in aquatic food supply necessary to keep up with continued increases in population and demand. In response to the favorable economic conditions created for aquaculture producers in many countries by these relative shifts in supply and demand, aquaculture production is already rapidly increasing. Although aquaculture currently provides only 9% of total worldwide fisheries output, production from aquaculture is growing at more than 7% annually, far outstripping rates of increase in most other worldwide food producing sectors. In some Southeast Asian nations, annual rates of growth since 1980 approach 20%, a gratifying development for consumers in these countries since up to 60% of the animal protein requirements in these nations are derived from fish.

With such rapid growth occurring in the sector, largely as a result of private initiatives, one might question the need for research, or at least its urgency. However, there are at least two major research areas that require attention.

Seed Supply and Quality

First, and primarily from the technical point of view, is the uncertain sustainability of this growth. Of particular concern is whether adequate supplies of high quality stocking materials (fry and fingerlings) are likely to be available to producers on a continuous long-term basis. Though there currently appear to be only isolated problems related to quantity of seeds, serious difficulties are beginning to emerge for some species due to the genetic deterioration of parent broodstock and consequent poor performance of fry and fingerlings after stocking. This problem has an economic dimension in that it introduces an element of uncertainty to the production process.

Quality deterioration, much of which is due to inbreeding, is most pronounced for the tilapias, a group of freshwater fish which are rapidly becoming the major cultured species worldwide due to their widespread acceptance among consumers. To overcome this emerging problem, investment in research and facilities to improve the performance of selected species through standardization of techniques for genetic typing, broodstock management, hybridization and even gene banks will be required. In this regard, animal husbandry techniques for cultured aquatic species are just in their infancy, but the payoff from their continued improvement and application can be very high as has been true in the past for poultry. Economics has an important contribution to make here with respect to the evaluation of improved techniques.



Distribution of Benefits

The second major research area requiring immediate attention is primarily economic in nature and relates to the potential benefits and beneficiaries (and losers) from expansion of aquaculture. The Food and Agriculture Organization (FAO) has raised concerns in the past about the danger of aquaculture becoming an elitist craft. Indeed, it appears that in many countries recent growth in production has been primarily achieved either by the more progressive farmers using large-scale intensive production systems or by city-based entrepreneurs investing in new techniques with promise of high return but which often compete for production space with traditional small-scale capture fisheries.

Examples of the former case include expansion of shrimp culture from brackishwater ponds in Ecuador and Indonesia. Examples of the latter include milkfish production in pens from freshwater lakes in the Philippines and cockle and other bivalve production from coastal areas in Thailand. In many instances, expansion of aquaculture production area has resulted in the conversion, even expropriation, of formerly public land, mangrove areas or coastal and inland waters to private use and de facto ownership.

The financial benefits, or private profitability, of many aquaculture production systems are beyond doubt; what is far less obvious is whether the use of land, water and mangrove areas in this manner increases net benefits to society as a whole. Also not well-documented is the impact of aquaculture development upon traditional users of coastal areas and inland waters, since adequate social cost-benefit analyses of alternative resource use have rarely been conducted where aquaculture is concerned.

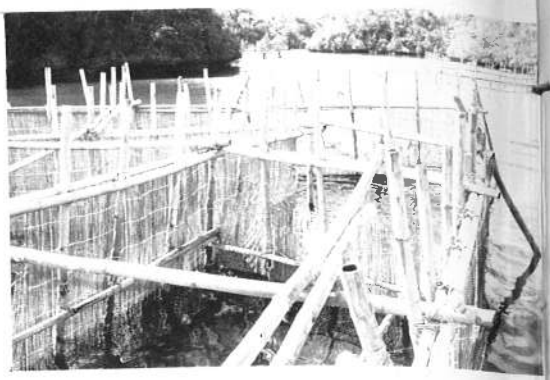
One must also ask to what extent aquaculture growth can contribute to the generation of income for small-scale rural producers. Capital requirements for intensive high-risk systems, such as shrimp or catfish culture, are clearly beyond the means of most small-scale producers, including small-scale fishermen who may represent the logical group to undertake aquaculture activities in many locations. However, other low-cost aquaculture systems do exist and they can be a valuable source of supplementary income. Again, tilapias–integrated with pig or poultry production and using the manure of these animals for fishpond fertilization–are perhaps best-suited for these small-scale, even backyard operations.

Mangrove areas converted to aquaculture production areas are, in many instances, beneficial only to private users.

Nevertheless, unless they produce primarily for household consumption, small-scale operations face constraints not usually incurred by progressive large-scale farmers. Not only are inputs, such as stocking materials and fertilizers, likely to be more expensive on a per-unit basis because average purchases are small, but also extension advice and credit are less readily available to the small producer. Moreover, their low levels of production make marketing more difficult and costly unless they can avail of some cooperative approaches with other small-scale producers.

Some examination of these economies of scale has been conducted for Philippine milkfish and Thai catfish culture systems. In both cases it was demonstrated that small-scale producers need special attention from government credit and extension agencies if they are to be able to compete successfully with larger-scale farms for available markets. Thus, unless an explicit policy decision is taken by governments to assist small farms to overcome the constraints that they face, the likely trend for aquaculture development will be for the industry and its benefits to become increasingly concentrated in the hands of fewer farmers.

The potential market for aquaculture products adds a final dimension to this need to establish the distribution of benefits from aquaculture growth. While most of the recent increases in production of freshwater species, such as tilapia, have resulted in increased supply for domestic markets, many brackishwater and marine species are destined for overseas markets. This is especially true of cultured shrimps which fetch high prices in Japan, Europe and North America and thus earn significant foreign exchange for their exporters. The trade-offs between using scarce domestic resources (especially capital funds) to support development of export-oriented culture systems instead of domestic-oriented systems have not been carefully examined. In particular, employment and domestic nutrition effects are rarely included in aquaculture feasibility studies, though of late there have been some encouraging moves in this direction. This issue is actually



Fishtrap to capture migrating milkfish for broodstock, Philippines.

of importance to the whole fishery sector in tropical developing countries as convincingly shown by Kent (ICLARM Newsletter, April 1983, p. 12) who argues that it is time to stop cash-cropping ocean food resources.

Multidisciplinary Approaches

Technical, economic, sociocultural and institutional factors all have a bearing upon the potential for continued aquaculture growth, the structure of the industry and its impact on other sectors, such as those in the coastal zone with which aquaculture is either complementary or competitive. The above points imply that a broad overview of aquaculture's 'fit' in national or regional economies and trade patterns, coupled with evaluation of alternative resource use options is likely to yield a more realistic appraisal of aquaculture's status, potential and impact than would a view which is narrowly technical or biological.

Research and planning for aquaculture have long been concentrated in the hands of biologists and other technical scientists and administrators. Their work needs to be complemented by social scientists if issues related to the interplay of supply and demand, technology transfer, competition for resource use, income distribution and role of small farmers are to be adequately addressed. As experience with the Green Revolution in agriculture has shown, a primary focus on increased production is insufficient to guarantee that the benefits from improved productivity are widely spread among farmers. Similarly, multidisciplinary approaches to research and planning are needed for aquaculture, especially now that the sector is developing so rapidly. •