

Aquaculture:

# Motivating production for low-income markets

by George Kent



Much of the early excitement about aquaculture was based on the idea that low-cost cultured fish or shellfish could make a significant contribution to alleviating malnutrition. Now, however, it is clear that commercial aquaculture operations are more responsive to the market demands of middle and upper income classes, whether in domestic or export markets, for the simple reason that supplying people who have money is generally more profitable. To the extent that aquaculturists sell their products aquaculture is a business like any other. The interesting question, then, is how to promote aquaculture that provides fish for consumption by the poor. Under what conditions might commercial operations be responsive to those at risk of malnutrition?

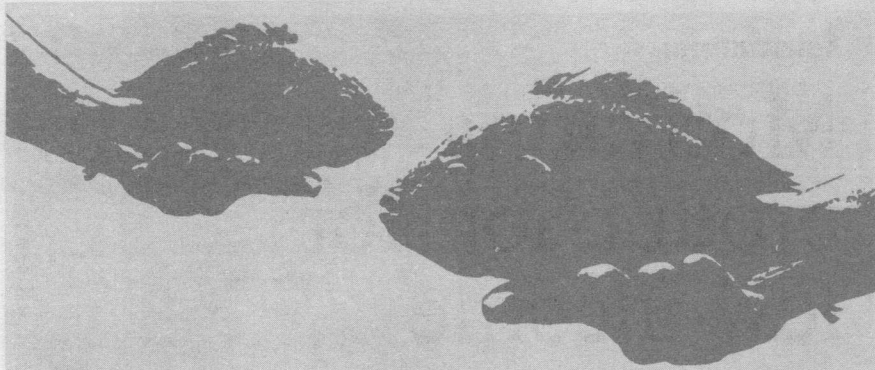
One possibility is for aquaculture to be undertaken by the poor themselves. Small-scale aquaculture can often be integrated with farming operations, with wastes from the farming activities used as input for the aquaculture. However, while in some cases the aquaculture products are used primarily for consumption by the producer and his family, on others they are raised for sale. For example, in a sur-

vey of 159 rice farmers in Thailand who also cultured fish, it was estimated that 42 were raising fish only for their own domestic consumption and not for economic benefit, 49 were raising fish for minor economic benefit, and 68 were raising fish for significant economic benefit.<sup>1</sup>

**Favoured species.** The technological possibilities for culturing low-cost products suitable for consumption by the poor are reasonably clear. Good prospects include tilapia, milkfish, carps, mussels, and other species low on the food chain, with emphasis on fertilization of pond waters or on using nutrients in naturally flowing waters rather than direct feeding, in polyculture or integrated agriculture operations.

Some commercial aquaculture operations are located in poor areas and have no easy access to "upscale"—middle and upper income—commercial markets. They may be limited by their geographical distance from markets, or they may be constrained by their modest capital and technology resources to focus only on products of interest to the poor. As a result, some operations are viable commercially even though they serve only relatively poor local people. Tilapia culture now appears to be commercially viable in

George Kent is a professor in the Department of Political Science, University of Hawaii.



Jamaica.<sup>2</sup> Cultured fish also makes a significant contribution to the diet in Nepal. In the Philippines, culturing of milkfish (*Chanos chanos*, or locally, *bangos*), which is favoured by the poor, is very widespread. Milkfish is preferred even though it is often more expensive than other fish available on the market.

Some commercial operators may choose to be responsive to poor consumers, deliberately forgoing more lucrative upscale markets. That is, some operators might help meet local nutritional needs, even if that means taking less than the maximum profit. Such operations must nevertheless be adequately profitable to be sustained.

Under some circumstances it is possible to respond to nutritional needs with no sacrifice in profitability at all. Some aquaculture operations geared to the upscale commercial market can at the same time produce low-cost products for the poor at little incremental cost, little enough to make the added line profitable. That is, the commercial market may justify and absorb much of the cost of operations and thus in effect subsidize the downscale products. This practice is very widespread in Southeast Asia, where milkfish for local consumption is raised along with shrimp for export. An experiment is being undertaken at the Brackishwater Aquaculture Center in the Philippines on culturing sea bass together with tilapia. The high-value sea bass feed on the small tilapia. The larger tilapia can be sold cheaply for human consumption. Raising the two species together results in improved production of both. Another example is provided by the culturing of the giant clam, *Tridacna gigas*. The clams could be cultured commercially because of the high export value of its

adductor muscle, but its production would also yield substantial quantities of low-cost meat favoured by some Pacific islanders.<sup>3</sup>

**Bulk purchases.** Institutional feeding programmes can provide a basis for operating aquaculture programmes even without special subsidies. That is, if one takes the budget already allotted for meals in a school or hospital (whether public or private), it may be found that better nutritive value can be obtained by purchasing supplies from a local aquaculture operation on a contract basis than by purchasing on the open market. Another approach would be for the aquaculture project to be operated by the institution itself.

Many different kinds of institutions purchase food in bulk, including schools, industrial meal programmes, hospitals, prisons, and the military. If the focus is to be on alleviating malnutrition, the single most suitable institutional feeding programme is likely to be the school feeding programme, since children are particularly vulnerable to malnutrition. The school feeding programme in Brazil provides some 25 million meals a day!

Although commercial operations generally are most responsive to the middle and upper income classes, the production of uniform products in very large numbers for institutional feeding programmes can make it profitable to be responsive to the needs of the poor. Such programmes are commercially attractive because of the consolidation of a large-volume demand in a single decision-making centre, resulting in potentially large economies of scale in terms of marketing. It is far more profitable to make a deal with one food service manager for tons than to sell many different small

amounts to homemakers. The fact that school lunch programmes are often subsidized adds to their attractiveness as markets for commercial operations. But it should be recognized that the advantages of consolidating demands would be obtained even if payments were made out of collections of individuals' lunch money, with no public support.

Aquaculture is a particularly appealing means of providing high quality protein for institutional feeding because it can be operated at or near the consumption site, and production levels can be adjusted to match the demand patterns, thus reducing costs of transportation, storage, and preservation.

**Public support.** Policy-makers in government or in such international agencies as the World Bank or the Asian Development Bank can exert a great deal of influence on the direction of aquaculture operations. Many policy-makers focus on promoting national economic growth and on increasing foreign exchange and give relatively little attention to malnutrition. However, where policy-makers are motivated to help alleviate malnutrition, they have many possibilities for working through aquaculture operations.

Policy-makers can support subsistence operators with many different kinds of programmes in the form of technical assistance, infrastructure development, extension services, research and development, or subsidies. Such support can provide incentives for undertaking projects which otherwise would not be sufficiently beneficial to the operator.

Backyard aquaculture can be an excellent means of self-provisioning by the poor, and thus may deserve public support in some form. In the Philippines, Thailand, and other countries, backyard aquaculture is introduced to local communities through the operation of small ponds at local elementary schools. These ponds provide fish for the school lunch programme and at the same time provide a basis for teaching, both for the children and for the surrounding community. Direct help is likely to be well received. In one region of Thailand, 30 per cent of

farmers surveyed said they would be interested in culturing fish, and this figure went up to 50 per cent if assistance were provided.<sup>4</sup>

Self-provisioning by the poor can be supported through programmes of stocking public waters. According to one estimate, "simply introducing the fish into a suitable environment—without induced feeding or substantial environmental changes—would make possible a modest production of 50 to 100 kilograms of fish per hectare per annum," and "counting only natural lakes, coastal lagoons, and reservoirs of more than 50 hectares, Latin America has 10.5 million hectares in which such fish production can be carried out."<sup>5</sup>

Stocking operations may be undertaken in wholly private waters or in wholly public waters, but there is also an intermediate possibility: stocking community-controlled waters. In Thailand, for example, poor villages can request the Department of Fisheries to prepare and seed ponds for them. The ponds are then managed by village committees. The ponds are open for fishing only a few days each year, with restocking following the fishing days. Most of the fish is consumed locally. The licence fees go into a community fund which serves as a "food bank" to support other food production projects.

**New fish habitats.** In some areas it may be useful to support the construction of artificial reefs, fish aggregating devices, fish pens (for live storage), and other aquaculture operations based on the use of local materials with unpaid labour by local communities. In Ambon, Indonesia, for example, a private development organization, the Appropriate Mariculture Coordination Center (AMCOC) has assisted local people in building three artificial reefs out of used automobile tires, and it has also helped build floating "brush parks" to provide new habitats for fish.

Governments may find it worthwhile to support aquaculture operations to provide fish to the poor through the market or through feeding programmes. From the point of view of government, a small subsidy to an

aquaculture project might be more beneficial than such alternatives as welfare programmes or direct feeding programmes. In other words, an aquaculture project that raises nutritional levels might be understood as a form of nutrition intervention. In that case there would be no presumption that the new project would have to yield a positive cash flow.

From the point of view of public policy, the task is to choose projects that yield the best mix of socially important values, and not just the best revenue producer. Thus, placing an explicit value on the alleviation of malnutrition could affect project choices—as it should.

Little is known about the effects on nutrition of aquaculture projects. Searching the aquaculture literature, one finds many studies about the nutrition of fish but practically none about the nutrition of people.<sup>6</sup> Aquaculture surely makes a significant contribution to alleviating malnutrition, especially in Asia and Africa where the needs are so serious, but this has not been documented.

There are serious measurement difficulties. Nutritionists have developed good indicators for assessing the nutritional status of human populations, such as the Gomez scales based on height and weight measurements of children, but there has been very little experience in measuring the nutritional effects of specific projects or activities. To try to assess the effects of an aquaculture operation in terms of measurable changes over the short term would be to set up a predictable "failure".

**Costs and profits.** Other measures might be used. Perhaps the simplest approach would be to analyze systematically the disposition of the products. If the consumers of the products of an aquaculture operation are very poor (possibly identified in terms of the national poverty line) rather than well off, it would seem reasonable that that operation is helping to alleviate malnutrition.

The disposition of aquaculture products usually is not obvious. Increasing production in a given area does not necessarily mean increasing supplies

available for consumption in that area. Even small-scale production units may supply urban centres or export markets, possibly through middlemen who buy and consolidate the production of many small operations. In Ecuador, for example, shrimp produced for export is gathered from a large number of very small culturing operations. Products may remain in the local area but go to the local middle class or local elite rather than to those most in need. It may go to well-fed men rather than to women and children who have greater needs. A food may be produced cheaply, but this alone does not ensure that it will be consumed by the poor. Low cost can simply mean higher profit margins for producers or marketers, or it can mean that middle-class consumers get a better bargain.

One consultant's proposal for major improvements in aquaculture in a poor Asian country says with regard to nutrition, "While the carp produced under the project are relatively high priced species, the increased supply of animal protein foods on the market as a result of the project will make less expensive fish and meats more available at reasonable prices to lower income groups than would be possible without the project."

The outcome could be just the opposite. Increasing attention to the production of high-priced products can result in a diminished supply of food for the poor. In Southeast Asia, small-scale fishers who once provided inexpensive fish for the local poor now devote themselves to catching high-priced shrimp for export. Their earnings have improved, but there is now less fish available for local people. Experience from many countries throughout the world shows that increasing overall food supplies in itself does not necessarily lead to the alleviation of malnutrition. Whether or not aquaculture projects help in this regard should be treated as an empirical question. Their effectiveness should not be assumed.

Aquaculture operations have been assessed in terms of their economic effects but not in terms of their nutritional effects. This is true even for projects specifically designed for nutritional benefits. For example, in one

*The possibilities  
for culturing  
low cost products*

study of tilapia culture in Cavite in the Philippines, the objective was explicitly stated as being both to increase incomes and to provide improved nutrition for the producer, but the activity was systematically assessed only in terms of its economics.<sup>7</sup>

In another case, a feasibility study of integrated fish and duck farming, the nutritional productivity of the operation was estimated to be highly posi-

tive and the economics as negative. The study did not then raise the question of whether the nutritional advantages might compensate for the economic disadvantages. The economic analysis alone was taken to be decisive in determining the feasibility of the project.<sup>8</sup>

Projects should be judged according to whether they are gainful overall, and not only according to whether

they are profitable in the narrow economic sense. If aquaculture is ever to redeem its early promise, we should begin to measure and acknowledge the contribution it makes to the alleviation of malnutrition. Then we can work to strengthen that contribution.

*1. Peter Edwards et al., Small-Scale Fishery in Pathumthani Province, Central Thailand: A Socio-Economic and Technological Assessment of Status and Potential (Bangkok:*

## Sharing the catch at village level: fish-ponds in Thailand

Although Thailand is a major exporter of rice and fish, both staples of the national diet, there is protein-energy malnutrition among the population. To address this anomaly the Government, through its Fifth National Economic and Social Development Plan (1982-86), established a campaign to reduce poverty in selected target areas. One component of this strategy is a village fish-pond development programme launched by the Department of Fisheries, under the Ministry of Agriculture and Cooperatives. The programme, formally launched in 1982, accounts for almost one-fifth of the department's budget.

Under the programme, poor villages can request the Department of Fisheries to prepare and seed ponds for them. The ponds are then managed by village committees. The Government funds the pond projects completely in the first year, 50 per cent in the second year, and 25 per cent in the third year. Thereafter, the Government provides only advisory services. By the end of 1986 over 500 ponds will have been established, averaging about 100 new ponds per year over the fifth plan period.

Some ponds operate on the basis of selling licences to fish on the designated fishing days; the licence fees are then used to help maintain "food

banks" to support other food production projects. Others operate differently. For example, in the Buan Hua Chang pond near Ban Thad village, in Surin province, started in 1983, the village committee itself does the fishing and sells the catch. Individuals from the six member villages can buy the fish at 15 baht per kilogram, while outsiders can buy it at 20 baht per kilogram. (One US dollar is equivalent to about 26.50 Thai baht.) Comparable fish at the regular market sells for over 20 baht per kilogram. Sales from the pond are limited to about five kilograms per person to assure wide distribution and to reduce the likelihood that the fish will be resold rather than consumed by the family. Committee members who participate in the fishing operations each get a free lunch and about two kilograms of fish. Membership on the committee changes about every two years by an election process. The villages, rather than the committees, decide how the earnings are to be used. About 30 per cent of the revenue is used to expand operations. The fish-pond has a central role in the village food bank. The bank has separate subcommittees producing vegetables, chickens, ducks, and pigs in addition

to the fish.

In contrast with some other village fish-ponds which have had only one or two fishing days each year, the Buan Hua Chang pond is harvested about once a week, with the catch totalling about 100 kilograms. Most of the fish is sold and consumed in the six mem-

*Village chief records weight and prices of fish as they are sold. People from member villages get a discount*



*Uttaradit province, Thailand.  
The Department of Fisheries will prepare  
and seed ponds for poor villages*



*Artificial reefs  
from used  
automobile tires*

- Asian Institute of Technology, 1983), p. 76.
2. T.J. Popma, F.E. Ross, B.L. Nerrie, and J.R. Bowman, The Development of Commercial Farming of Tilapia in Jamaica 1979-1983 (Auburn University, Ala.: Alabama Agricultural Experiment Station, 1984).
3. John L. Monro, "Giant Clams: Food for the Future", ICLARM Newsletter 6.1 (January 1983), pp. 3-4; G.A. Heslinga and F.E. Perron, "The Status of Giant Clam Mariculture Technology in the Indo-Pacific", SPC (South Pacific Commission) Fisheries Newsletter No. 24 (January-March 1983), pp. 15-19.
4. Edwards et al., op. cit.
5. Julio Luna, "Fishery Resources", Natu-

ber villages, but perhaps 10 per cent of it is traded for rice at a favourable exchange rate. The Buan Hua Chang pond, of 70 rai (about 11 hectares) yielded about 170 000 baht from fish sales for the villages in the second year of its operations. In the first half of 1985 it produced over 15 000 kilograms of fish.

In 1984, FAO established an "Action Programme on the Promotion of



*Fish caught  
with  
throw net*

the Role of Fisheries in Alleviating Malnutrition". Encouraged by this initiative, as well as its own successful village fish-pond programme, the Department of Fisheries is now formulating a national version of the programme for the Sixth National Economic and Social Development Plan, to be in effect

- ral Resources in Latin America (Washington, DC: Inter-American Development Bank, 1983), p. 80. See also Elvira A. Bahuyut, Stocking and Introduction of Fish in Lakes and Reservoirs in the ASEAN Countries, FAO Fisheries Technical Paper 236 (Rome: FAO, 1983).
6. The possibilities for aquaculture to respond to human nutritional needs are explored in Leah H. Smith and Susan Peterson (eds.), Aquaculture Development in Less Developed Countries (Boulder, Colo.: Westview Press, 1982).
7. Frank Fermin, "The Introduction of Integrated Backyard Fishponds in Lowland Cavite Province", in I.R. Smith, E.B. Torres,

from 1987 to 1991. The programme focuses on two main elements, fishponds and institutional feeding programmes.

The fish-pond programme will build on experience already accumulated with village ponds and will give increasing attention to school and back-

*Throw-net fishing in  
flooded rice field  
in Thailand's Central Plain*

yard ponds. The nutritional effects of pond operations will be systematically assessed, and where appropriate their design will be modified to increase their contribution to the alleviation of malnutrition. School ponds will be used to supply inexpensive and nutritious food for school lunches.

The ponds will also serve as instruments for teaching. Through collaboration with the Department of Teacher Education, ponds will be established at Teachers' Training Colleges in order to familiarize new and in-service teachers with their technology and management, and particularly to develop the use of fish-ponds in teaching. Loei Teachers' College, in the northeast region of Thailand, for example, is preparing seven different-sized ponds with advice from the provincial fisheries office. The office and the college will work together in supporting the devel-

*The potential  
of institutional  
feeding programmes*

- and E.O. Tan (eds.), Philippine Tilapia Economics, ICLARM Conference Proceedings 12 (Philippine Council for Agriculture and Resources Research and Development, Los Baños, Laguna, and International Center for Living Aquatic Resources Management, Manila, Philippines, 1985), pp. 151-64.
8. Peter Edwards, Kamtorn Kaewpaitoon, Anussorn Meewan, Anant Hamprasitkam, and Chintana Chantachaeng, A Feasibility Study of Fish/Duck Integrated Farming at the Family Level in Central and Northeast Thailand (Bangkok: Asian Institute of Technology, 1983).

opment and operation of fish ponds in the primary schools in the provinces of Khan Kaen and Loei.

School ponds can be useful in rural areas, but in larger schools in municipal areas institutional feeding programmes can be an effective means for reaching children at risk of malnutrition. The Department of Fisheries will not initiate feeding programmes, but rather, through coordination with other concerned agencies in government and in the private sector, it will work with established programmes to find ways in which fisheries products might be incorporated. The effort will begin with schools in Bangkok which already have feeding programmes.

A recent World Bank assessment of the situation in Thailand said that "in the nutrition area, government actions in the past have mostly focused on interventions through the health delivery system. . . a broader approach is required, linking nutritional considerations with agricultural and food policies." Fisheries and nutrition projects will not solve all of the problems, and some projects have only limited nutritional impact. The immediate hallmark accomplishment, however, is the establishment of explicit concern for the alleviation of malnutrition as a matter of formal policy in the fisheries sector. -G. K.

