

# 12. Conclusion

Rice-fish farming offers tremendous potential for food security and poverty alleviation in rural areas. It is an efficient way of using the same land resource to produce both carbohydrate and animal protein concurrently or serially. Water is similarly used to simultaneously produce the two basic foodstuffs.

Fish in the rice field has been shown to be capable of eradicating weeds by eating or uprooting them. It also devours some insect pests not the least of which are stemborers. Experience has shown that the need for chemical pesticides is greatly reduced and in many instances even eliminated. Fish also add to the rice field's fertility and can reduce fertilizer requirements. Integrating aquaculture with agriculture results in an efficient nutrient use through product recycling since many of the agricultural by-products can serve as fertilizer and feed inputs to aquaculture (Willmann et al. 1998). This in turn leads to more fish for the household and can put more cash in the pocket. An important side effect is a cleaner and healthier rural environment.

Other economic impacts can be expected. Rice field modifications may need extra labor beyond what is available within the family, leading to rural employment. Increased fingerling demand may spur the growth of the hatchery and fingerling production business and all other ancillary activities, such as making of hapa nets, harvesting seines, fabrication of hand tools, installation and repair of pumps, among others. Fish need to be marketed and perhaps even processed before marketing. Thus there is a potential to generate additional employment.

The reality is, however, that the adoption rate of rice-fish farming is very low. China with 1.2 million ha used for rice-fish farming is clearly the world leader, but this figure represents only 3.92% of its irrigated area. Surprisingly, it is outside Asia where the rice-fish farms are extensive relative to the irrigated rice fields. In Egypt, the rice-fish farm area represents 37.4% of the irrigated area and in Madagascar, 11.75%. Within Southeast Asia, Thailand is reported to have 2.966 million ha devoted to rice-fish farming and another 25 500 ha related to stocking and managing the fisheries. In all the rest of Asia, the adoption rate is only a little over 1% or there are no statistics available

on the extent of rice-fish farming. Should the adoption rate increase to an average 10% of the irrigated rice fields (68.07 million ha), even an annual yield of only 150 kg·ha<sup>-1</sup> would mean more than 1 million t of fish annually. This figure does not include rainfed areas that also have a potential for fish production.

In order to realize this potential, there is a need for a fundamental shift in attitude towards rice-fish farming in all sectors involved in rice production, from policy-makers to extension officers and farmers. At present rice-fish farming at best is considered a novelty and at worst a fringe activity that does not merit serious consideration in the formulation of national rice production strategies, and is often relegated to a limited set of projects. Further, fishery technologists and scientists are not the appropriate people to best reach out to rice farmers, or to whom rice farmers would listen. The message must be carried by the rice people.

To integrate fisheries and agriculture, Willman et al. (1998) recommend multi-sectoral integration between various government agencies involved in river basin and coastal development and various government agencies that may be involved in fisheries and agriculture. However, the authors also acknowledged the difficulty involved in such integration. While ideal, the case of promoting a more widespread adoption need not involve too many agencies; in fact it should involve only those involved in agriculture.

The various sub-sectors in agriculture need to recognize rice-fish farming as a distinct and viable farming system that farmers can choose to adopt wherever the physical conditions are appropriate. If rice-fish farming is seen as a viable agronomic practice, many of the expenses that go into raising fish in rice fields will be part of legitimate expenses where supervised credit is involved. Fisheries agencies have an important role to play, in seeing that good quality fingerlings are available at the time required by farmers.

Proper guidelines should also be in place to safeguard that the fish culture component not be overdone to the detriment of rice production. With good fish production and high prices farmers tended to enlarge the refuge areas in Viet

Nam (Halwart 1998). Purba (1998) concluded in Indonesia that an increase in fish demand and price would decrease rice production, as the ratio of the refuge to the rice planting area becomes excessive. It should be clear that the objective of raising fish with rice is to increase fish production without lowering rice yields.

With such a shift at the top level, agricultural extension agents can be properly trained to promote and demonstrate the “new” technology. In this manner, the popularization of rice-fish integration will not be limited to a few farmers under a special project, although it may be initiated in such a manner. Widespread introduction of rice-fish concepts to communities, coupled with demonstrations in farmers’ own fields, and linking of the rice-fish approach with the IPM Farmer Field Schools (Kenmore and Halwart 1998) is likely to result in sustained

adoption. The farmers themselves are the most effective agents of change. For improved contact with adopters, person-to-person channels are the best mechanisms to obtain information about new technologies. These channels include direct contact with other farmers, extension workers and technical specialists. In India, about 85% of the farmers mentioned other farmers as their sources of information (Librero 1992).

In summary, in order to popularize rice-fish culture, the concept should become part of the agricultural system rather than the fisheries system. The fisheries agencies will need to put further efforts in the establishment of viable national fish seed production and distribution system operated by the private sector so that fingerlings of the desired species are readily available to the farmers. Only then can more fish be found in the rice fields.