

PARTNER COUNTRIES: Vietnam, Sri Lanka
PROJECTS: FIS/2001/013: Culture-based and capture fisheries development and management in reservoirs in Vietnam; FIS/1997/1068: Reservoir fishery development and management; FIS/1994/040: Management strategies for enhanced fisheries production in Sri Lankan & Australian lakes; ADP/2000/018: The economics of developing reservoir aquaculture in Vietnam
DESCRIPTION: By providing relevant information on how to significantly improve the fish yield from reservoirs, the project aims to make fish more available and affordable to the rural poor and to generate livelihood opportunities for communities living near reservoirs
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Farming FOR THE FUTURE

These fingerlings are raised for sale to farmers building their own small aquaculture ponds.

BRAD COLLIS

Encouraged by the self-replicating success of ACIAR-funded farmer fishing trials in Sri Lanka and Vietnam, rice farmers in many other developing countries may soon be able to supplement their incomes through communally managed fishing from village reservoirs and the small lakes that form in flood plain depressions. Adrienne Jones reports

Farmer-managed trials have been a crucial and highly successful component of increasing inland fish production and developing best-practice models to increase fish availability and affordability in Sri Lanka and Vietnam over the past six years. Working with farmers, fishermen and regulatory agencies, aquaculture scientists have developed management strategies for the two forms of inland fisheries most common throughout Asia: capture fisheries based on large permanent reservoirs (usually dependent on species that reproduce naturally); and the less well developed, culture-based fisheries developed around smaller, seasonal reservoirs, which need to be stocked with hatchery-produced seed fish. The projects have been funded by ACIAR.

Australian project leader Professor Sena S. De Silva, from Deakin University's School of Life and Environmental Sciences, says the projects' findings should ensure the long-term sustainability of capture fisheries in large permanent water bodies in developing countries – and, by optimising the use of smaller reservoirs, give poor rural farmers an additional income source.

The concept of culture-based fisheries is to release hatchery-pro-

duced 'seed fish' into small, community-managed water bodies at the onset of the rainy season, and for these to be recaptured when they reach a certain size. This usually coincides with receding water levels during the dry months.

In the Sri Lankan and Vietnamese projects, farming communities downstream from small irrigation reservoirs were encouraged to take collective responsibility for all fishery activities – preparing the water body, stocking and harvesting the fish, keeping records, rearing fish fry to fingerling size in floating net cages (to sell back to cultivated fisheries that will rear them to market size), preparing feed for the fingerlings and marketing and selling the fish.

Professor De Silva says many of the initial attempts to use small water bodies for fish production failed because of an inappropriate choice of reservoirs and an overemphasis on the biology of the reservoirs. The ACIAR projects focused instead on developing holistic management strategies incorporating biological, physical, socio-economic and political factors.

Researchers in Sri Lanka and Vietnam have used computer-generated software with Geographical Information Systems (GIS) technol-

ogy to develop an evaluative process for grading reservoirs according to their suitability.

The process uses a mathematical formula to group complex biological and socioeconomic factors affecting fish production under single or 'common denominator' criteria, enabling otherwise heterogeneous factors to be collectively evaluated.

For example, water quality criteria such as conductivity or chlorophyll *a* levels are assessed under 'water qualities'; catchment land use patterns, and correlated factors such as the number of buffalo per hectare, under 'catchment characteristics'; issues such as distance to the main road under 'marketing aspects'; and factors like family income under 'socioeconomic factors'.

Sub-categories are then weighted to allow reservoirs to be ranked as poor, fair, good or excellent. It is the first model of its kind used to conduct research into culture-based fisheries.

Professor De Silva says earlier culture-based projects were not as effective as they should have been because they concentrated on the biology of reservoirs.

"We took a step further and concentrated on the people, the catchment and the reservoirs, because they're all one entity if you want effective utilisation of resources," he says. "Catchment affects the nutrient quality of the water and people affect what you take out.

"We have a more holistic approach, which for the first time has quantitatively shown that the catchment area has an effect on fish production, and this could be used as a management tool."

While the activities of the fishing community *per se* are important factors in assessing the fisheries potential of perennial water bodies, Professor De Silva says it is the wider village community that primarily determines culture-based fisheries' success. "They are less resource-intensive with no capital input as such. What is basically needed is cooperation. You need the cooperation of the whole village. They are all farmers, they must be willing to be fishermen, to mess about with fish, to look after fish. It's a new ball game for them.

"With rice-growing, each farmer has a demarcated paddy and works on that paddy, but with fishing, all the farmers have to cooperate. They have to guard the fish until they grow, they have to get together and harvest together, then they have to sell the fish and divide the spoils."

Professor De Silva says that because it is a communal activity, other synergies develop: "There's social cooperation and potentially political cooperation as well. That's social capital. These are not quantifiables in dollars or cents, but they're very important. Culture-based fisheries cannot be sustained – they won't even get off the ground – without due consideration of this socioeconomic factor."

The first ACIAR projects evolved in 1997 when the Sri Lankan Government sought Professor De Silva's expertise in scoping sustainable management strategies for the country's existing inland fisheries, based on its perennial reservoirs.

As the first phase of the Sri Lankan project developed, the Government of Vietnam was also looking for strategies to improve fish yield from its once heavily subsidised perennial reservoirs, and also sought help from ACIAR. So Professor De Silva began working with Vietnam's Research Institute for Aquaculture No 1 and the Faculty of Fisheries at the University of Agriculture and Forestry, Ho Chi Minh City, in 2002.

Culture-based projects in Sri Lanka involved farmer-managed fisheries trials around 43 reservoirs selected at random in four administrative districts of the country's dry zones, where most of the reservoirs are located.

Fisheries Committees were appointed from farmer committees selected by the Sri Lankan Department of Agrarian Services. The trials evaluated optimum stocking densities, species combinations and ratios, best harvesting size and cost-benefit analyses over three

growth cycles, each eight to nine months long.

Farmer-managed trials were also conducted in two provinces in Vietnam (12 in Yen Bai Province and eight in Thai Nguyen) over two growth cycles to establish optimum water conditions, stocking and harvesting parameters and the most effective management strategies.

The Sri Lanka projects finished after five years in June 2005, with a GIS model for predicting fish yield in the large reservoirs. The GIS 'common denominator' model for ranking the likely effectiveness of individual reservoirs for culture-based fisheries, and research findings on the economic, biological and socioeconomic inputs, were consolidated as best-practice approaches for culture-based fisheries.

The best-practice approaches – which have already been incorporated into Sri Lankan Government development strategies – include recommendations on reservoir selection, stocking densities, water quality, species combinations and relevant socioeconomic factors.

The Vietnam projects are still in their final stages and many of the research findings have been incorporated with the Sri Lankan findings to create a best-practice manual for regional use.

Professor De Silva says the most direct evidence of the projects' success is the major impact they have had on policy and development strategies in the region, particularly in Sri Lanka, where the Government has recently amended its Agrarian Services Act 47 of 2000 to legalise culture-based fish farming, and in Vietnam, where reservoir fishery development has now also been incorporated into the Vietnamese Government's strategic plans.

In Vietnam this is expected to result in the production of 200,000 tonnes of reservoir fish annually by 2010, mostly from the country's rural areas. Professor De Silva says the work has directly contributed to an increased interest in developing inland fisheries industries in other developing countries.

In recognition of the importance of the projects' findings to the region, ACIAR has also recently supported a further project to disseminate these findings through the intergovernmental agency NACA (Network of Aquaculture Centres in Asia-Pacific), a regional organisation comprising 17 member countries, including Australia.

"We've held workshops in Indonesia, Laos and Cambodia to disseminate our results," Professor De Silva says. "I take pride in these ACIAR projects because they have not only changed the policies and government thinking in both project countries, but we've also been able to produce a number of really good scientific publications which are of use to everybody."

While it is difficult to quantify the extent to which trial farmers have increased their incomes, he says they have benefited. "These people are rice paddy farmers, they're not unemployed, but they now have an additional source of income and additional income means the children get more schoolbooks. It's a snowballing effect. The whole village gains because it's a common resource.

"Of the 32 village communities we started in Sri Lanka, every one is continuing. Word has spread and more are coming in and telling the Government they want to do this. The people want it. I don't think they'd come on board if it wasn't productive for them. It's the same in Vietnam." ◀

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