Unsurprisingly therefore, two linked proposals to the Department of International Development (DFID) from staff at the Institute of Aquaculture and colleagues at the University of Newcastle-on-Tyne caused some raised eyebrows. It is often assumed that an assured supply of water is required for fish culture to be viable. The situation on the ground is rather different, however. In many areas of Asia, aquaculture has been readily adopted by people in rain-fed areas, often in ponds that hold water only seasonally, whilst superficially more suitable sites in areas receiving irrigation water remain undeveloped.

Even the definition of ‘irrigation’ is open to discussion since large irrigation schemes supplied by giant dams are only one part of the story. We have made an arbitrary distinction between farmer-managed systems, that tend to be small-scale and managed at the individual household or community level without the control of outside agencies, and ‘engineer’ managed which include mainly larger systems.

As developing countries with rapidly increasing populations move towards ever more intense conflicts in the use of key resources such as land and water, the pressure to use both more intensively grows. Calls for irrigation authorities to promote multipurpose use of irrigation storage and transfer structures has intensified, but there have been few major successes to date. Institutional barriers between engineers designing and managing canals and dams and agencies responsible for promoting fish production are undoubtedly one cause.

Although regulation of fisheries in reservoirs is fairly common, aquaculture per se often remains unpromoted or has been tried, and failed. Many irrigation systems bring water to arid areas with little tradition of fish consumption. Understanding demand, or even potential interest in fish and other aquatic products has often been overlooked. Knowledge of the needs of people that have access to irrigation systems, or benefit in some way from them, is also typically undervalued. Our research team includes social and economic specialists that are using a livelihoods framework to gain a better understanding of both the current situation and in shaping a research agenda that will prioritize approaches and technologies most likely to benefit poorer people.

The relevance of the research is further suggested by recent experience of field development projects in Latin America and Africa, as well as Asia. The finding that many resource poor farmers value ponds, and the water they hold, more for watering livestock, irrigating vegetables and taking a bath than producing fish is sobering news for many promoters of farming fish. The reality that most farmers view ‘fish’ ponds as a multipurpose resource is still to be comprehended by many.
The project focusing on farmer-managed irrigation systems is working with an NGO, Samuha, in very dry areas of Karnataka State, India. Samuha has been working on watershed development projects mainly with scheduled caste people, using participatory community-based approaches to improve water retention in these semiarid, very poor areas. In the current season they have been trying various approaches to fish culture with farming households and monitoring progress.

In Sri Lanka we have been working with the Agribusiness Centre (ABC) of the University of Peradeniya to assess the potential for increasing benefits from 'tanks' in the dry northern region of the country. Formerly the centre of an ancient hydraulic civilization, these 'tanks', essentially earthen dams dissecting watersheds, have been rehabilitated over the last few decades. Francis Murray has spent time working with staff and students of the ABC building up a better understanding of how these tanks are currently managed and, because they occur in series through a watershed, how development of one tank might impact on others. CARE, Sri Lanka, has found our 'cascade-level' approach of great interest and is now partially funding our fieldwork.

Freshwater fisheries are of great importance in the drier, inland areas of Sri Lanka and understanding how, or if, more intensive approaches to fish production are relevant is critical. Demand for the tilapias that dominate sales both in formal markets and the well-established network of itinerant traders is one focus of our work. Our local partner at the Agribusiness Centre, Sarath Kodithuwakku, a PhD from the University of Stirling's Department of Entrepreneurship, has been essential to the teams understanding of current marketing networks and the development of a clear research framework focusing on benefits to the poor. Benefits arising from fish production for poorer people may arise more from employment opportunities developed, reduction in risk and ensuring fish remain at their low prevailing prices than in their becoming fish producers themselves.

The large-scale project is sharing field site facilities with the ARP project and is based in the Mahawelli H irrigation system in the same part of the island. This project has a focus on the perennial storage tanks that characterize the system. Preliminary analysis conducted by the UK-based team, I.M. Gunawardena and Shirani Nathaniel, has identified field research sites and potential technical foci. The migration of landless minority groups to squatter fishing communities around the tanks has become a major social issue and their reliance on the tank fishery for their livelihoods is believed to be unsustainable as pressure on the fishery has grown.

The engineer-managed irrigation project (KAR) is also working in the Bhavani irrigation system in Tamil Nadu, together with the with Tamil Nadu Agricultural University. The major expected outputs of the project include technical guidance to engineers and managers on how to integrate aquaculture into irrigation systems and policy guidance to planners and donors on circumstances most favourable for integrated aquaculture in irrigation systems. The project also aims to provide research guidance to inform support services on ways to assist smallscale producers to benefit such initiatives. An interdisciplinary team that includes the Institute's Lindsay Pollack and Cecile Brugere (formerly working in the Systems Group) and Quiongfang Li of Newcastle providing social/economic and engineering expertise, respectively, has just conducted a preliminary situation appraisal in the area with TNAU staff, including Ms Dhanalakshmi. Dr K. Palanisami, who has a background in field research assessing efficiency of irrigation water use, is leading the team locally and has been active in the early stages of situation appraisal.

Our third research site is in the very large irrigation system located in the Punjab, Pakistan. An initial visit by John Gowing and myself last year established the potential for research and interest by a large number of stakeholders including the irrigation authorities, Department of Fisheries and IIMI, the CGIAR organisation responsible for irrigation management based in the State. Recent political difficulties have caused us to suspend plans for field work in the current year, but we are hopeful research can begin slightly later in the project.

A common theme that has emerged at the three sites is the role of on-farm reservoirs (OFR's) within large irrigation systems and their potential role for producing fish and other products. John Lingard, an agricultural economist at Newcastle, has begun a comparison of OFRs between the Sri Lanka, India and Pakistan, given the different prevailing market opportunities and agricultural systems.

The large variability in irrigation systems and possible strategies for their use for fish production has become clear in the early stages of both projects. Our collaboration to date makes us question how research into such complex systems could be tackled in any other way- but an interdisciplinary approach to both identify the opportunities and constraints, and work productively with key stakeholders, does seem to be working.