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A social science perspective on stock enhancement outcomes: Lessons learned from inland fisheries in southern Lao PDR

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Abstract

Stock enhancement initiatives have become an increasingly popular intervention in inland rural fisheries development over the past two decades, with stocking being a high priority on inland fisheries development agendas in Southeast Asia. However, stock enhancement initiatives have shown that whilst releases of cultured juveniles have the potential to yield substantial benefits, the actual outcomes, in terms of yields, distribution of benefits and institutional sustainability, are often different from those initially expected. One reason for this is the complexity of the environments into which enhancements are introduced, involving dynamic interactions between the biological characteristics of the resource, the technical intervention of enhancement and, crucially, the people who use and manage it. The introduction of people as a major factor affecting outcomes distinguishes stock enhancement from aquaculture. It also makes the need for interdisciplinary and social science research increasingly evident. This paper highlights lessons learned from long-term interdisciplinary research on stock enhancement of small waterbodies in Lao PDR. Using quantitative and qualitative methods, we sought to understand when enhancement would be taken up by resource users, what factors affected the nature and distribution of enhancement benefits, and what affect resource users had on those biological outcomes that were achievable in the first instance. The responses to enhancement varied. Factors facilitating uptake included strong leadership, direct observation of benefits and an ability to adapt technology to suit requirements. When taken up, stock enhancement catalysed institutional change that affected both the nature and distribution of benefits among resource users. Who this benefited, and to what extent, was highly context specific and dependant on the wider social, political and institutional environment surrounding the enhanced fishery. Finally, interdisciplinary research demonstrated that an increase in production potential did not automatically lead to an increase in yields. Rather, it depended on the characteristics of the user community and the way they chose to manage and use the resource. Resource users were crucial in determining all the outcomes of stock enhancement. They were not only recipients, but also drivers, of enhancement technology. This has fundamental implications for how stock enhancement research and development is conducted. In particular, it requires increased participation of resource users in the research process, serious inter-disciplinary study, and the need to recognise and deal with uncertainty.

Keywords: Inland fisheries; Stock enhancement; Institutions; Participation; Adaptive learning; Lao PDR

1. Introduction

This paper, using enhanced fisheries in the Lao PDR as a case study, provides a review of the lessons we have learned since 1995 about the human aspects of inland fisheries enhancement. Whilst the details of research described here are specific to Lao, the lessons are general and widely applicable to stock enhancement initiatives, whether they be in inland or coastal areas, in Asia or elsewhere.

Stocking initiatives have become a popular intervention in rural fisheries development, and stocking has been a high priority on fisheries development agendas over the past two decades (Warren, 2000; Welcomme and Vidthayanon, 2000;

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De Silva, 2003). However, the opportunities to examine the outcomes of enhancement initiatives, and evaluate their effectiveness, particularly in the context of poverty alleviation, have not always been taken (Cowx, 1998; Welcomme and Bartley, 1998). Another issue is that much of the research has concentrated on the technical aspects of enhancement, such as determining optimal stocking strategies and environmental conditions (e.g., Hasan and Middendorp, 1998; Glasser and Oswald, 2001). Although these technical aspects are obviously important, we argue that such research is not sufficient for several reasons.

Firstly, in the context of poverty alleviation or livelihood enhancement, focusing on the effect stocking has on resources, as opposed to resource users, reflects "an implicit assumption that an increase in fish production will automatically lead to an improvement in human welfare" (Lorenzen and Garaway, 1998). In fact, stocking can influence how and by whom living aquatic resources are used, thereby significantly affecting the distribution of benefits and consequent impact (Somnasung et al., 1991; Samina and Worby, 1993; Thompson and Hossain, 1998; Peters and Feustel, 1998; Garaway et al., 2001; Noraseng et al., 2001; Bene, 2003; Garaway, in press).

Secondly, in cases where stocking initiatives have been evaluated, actual outcomes are frequently different from those initially expected or predicted. This includes, the extent to which the technology is taken up (Pushpalatha, 2001) as well as total yields (Hartmann, 1995; Lorenzen et al., 1998; Garaway, 1999; Garaway et al., 2001), recapture rates (Viet et al., 2001) and, as mentioned above, benefits going to different groups of resource users. Unexpected outcomes can occur for a number of reasons. However, one of the most crucial is that enhancements are introduced into complex human–environment systems, involving dynamic interactions between the biological characteristics of the resource, the technical intervention of enhancement and the people who use or manage it (Garaway et al., 2001).

The introduction of people as a major determinant of outcomes distinguishes stock enhancement from aquaculture, where the determinants of outcomes relate primarily to the inter-relationship between the biological characteristics of the resource and the technical intervention of raising cultured fish. Stock enhancement, by contrast, is typically applied to common pool resources[1] where rights of ownership, control and use are complex and determined by the wider institutional, social, economic and political environment. In such circumstances, as explicitly recognised by Lorenzen et al. (2001), human action is difficult to control and/or predict. Consequently, uncertainties relating to outcomes are greatly increased.

Both these issues point to the need for investigation beyond the technical aspects of stock enhancement, and challenge the traditional view that enhancement outcomes can be predicted and/or controlled, and that technical research on its own can explain outcomes. How the benefits of stock enhancement are distributed is rarely straightforward and an obvious question for social science research. Less obvious, but by no means less important, is understanding how human interaction with the system affects what biological outcomes are achieved or achievable.

[1] A common pool resource can be briefly defined as one, which is exploited jointly by separate users, resource use by one individual substracts from the use of others, and the exclusion of users is not trivial (Ostrom, 1990).

2. Inland fisheries enhancement in southern Lao PDR

2.1. Small waterbodies and the role they play in people's livelihoods

Fish is widely considered to be the major source of animal protein for the majority of people in the Lao PDR. Subsistence fishing is carried out by almost everyone who has convenient access to water (Claridge, 1996). The Provinces of the southern Lao PDR are characterised by semi-independent rural villages engaged in subsistence agriculture, with rice farming being the primary economic activity supplemented by other activities such as fishing and small livestock rearing.

Small waterbodies are ubiquitous and play a very important direct role in the livelihoods of almost all rural households primarily for subsistence needs but increasingly for income generation (Garaway, 2005). The resources under consideration, small waterbodies, include reservoirs and lakes with an area of less than 10 km^2, small ponds, canals, irrigation canals, swamps and small, seasonal, inland floodplains (Marshall and Maes, 1994). Personal fishing in small waterbodies accounts for at least 70% of the fish acquired by rural households (Garaway, 2005). Other research has pointed to the importance of small-scale fisheries to rural households in various parts of the country (Baird et al., 1998; Sjorslev, 2000; Noraseng et al., 2001; Nguyen Khoa et al., 2005).

2.2. Promotion of stocking

Fisheries stock enhancement in the Lao PDR is gaining popularity with government and communities alike (Phonvisay, 2002). In Savannakhet Province, stocking of small waterbodies, particularly with Nile tilapia (*Oreochromis niloticus*), and to a lesser, but growing extent, Indian major carp (*Cirrhinus mrigala* and *Labeo rohita*), has been actively promoted by the government since 1994, and the practice is spreading rapidly. Government policy has stated that "priority in the short, medium and long term is to be given to the reduction of declining harvests and the development of fisheries in the rivers, lakes and reservoirs. . . these actions could allow the fisheries sub-sector to increase gradually its production from the current estimates" (Phonvisay, 1994). The promotion of stocking in small waterbodies is seen as one way of doing this.

Waterbodies subject to enhancement include oxbow-lakes, natural depressions and man-made reservoirs of sizes ranging from 1 to 20 ha. Typically, these waterbodies are under the *de facto* ownership of one, or two closely connected, villages and are adjacent to the villages concerned. The government has been supporting villages through the provision of limited technical advice, through part-payment of fingerlings and through facilitating 'study tours' to villages already involved with stocking. Operational rules (including monitoring and enforcement) regarding management are predominantly devised (and carried out) by the local villages themselves and hence there is considerable variation between villages, with villages also experimenting with their own rules through time. Government staff do give advice, particularly regarding who should be the beneficiaries of these initiatives.

2.3. Common management systems

Prior to enhancement, many of the waterbodies are open to members of the village for any, or all, of a range of activities including fishing (either for subsistence or income generation); collection of other aquatic animals and plants; and water for livestock and household use. Other waterbodies may have always served some form of special function in the village (e.g., temple pond) and be restricted in some, or all, of these uses.

Whilst many small local variations in management exist, the types of management adopted post enhancement typically fall three categories: group fishing; renting; and fishing days. Waterbodies are generally stocked at the start of the rainy season (June/July), access for fishing by village members is prohibited and harvesting begins at least 6 months later. In all cases, one of the principle functions of the enhanced fishery becomes the generation of village income for community development projects (such as the building/repair of a road, temple or school). Generally, this changes the role of the resource compared to when it was a capture fishery.

In 'group fishing' systems, the resource is fished by teams under the supervision of the village administration during the dry season in March/April (a period of low agricultural labour demand). Male members of the village, often selected on a household rotational basis, usually make up such teams. The majority of fish is then sold collectively by the village to produce village income. Some fish is used as payment in kind for fishers and any others involved in community work, and some is used for entertainment of guests.

In 'rental' systems, the waterbody is usually rented out for all, or part, of the year for a fixed sum, with the income generated being used for village development. Those renting the waterbody are typically a group of households within the village, though more recently teams from outside have become involved. They harvest in the dry season and own all fish caught. After such a time, the waterbody becomes village property again and, as the rains return and the waterbody fills, it may be used for fishing once more by village members.

In 'fishing day' systems, the waterbody is essentially harvested on 1 day in the dry season with a restricted selection of gear types. Typically, access for fishing on this day is gained by the purchase of a ticket, the price determined by gear type. Many people from the village and neighbouring villages participate. All fish caught is the property of the person who caught it, and village income is generated from ticket sales. Following the fishing day, the waterbody may be open again for subsistence fishing by members of the community until it is restocked.

3. Key results and lessons learned

3.1. Uptake of enhancement

While enhancement through stocking has been enthusiastically promoted in southern Lao PDR, the response to stocking in rural communities in Savannakhet Province has been varied.

In a study of 31 villages and waterbodies in 1997, 20 (∼65%) supplied new institutions to manage their waterbody once stocked for the first time, and subsequently maintained these new institutions, whereas 11 did not (Garaway, 1999). All waterbodies belonged exclusively to one or two closely-connected villages and, from a technical, resource point of view, were suitable for enhancement.

A range of factors encouraged uptake and active management (Garaway, 1999). In particular, villages were more likely to create new rules when there was a commitment to doing so prior to stocking. Such commitment was evident by the village having come up with the idea themselves, or in partnership with the government fisheries department, and by them at least part-financing the stocking. Such commitment was strengthened by villages having information about the benefits of stocking, in particular, first-hand information gained from visiting other villages. Other factors encouraging supply of new rules included the presence of skilful leaders, entrepreneurs and district government staff in the village.

Thus, villages were more likely to take up and manage enhancement when they could actively see for themselves, prior to implementation, the benefits of doing so. The most effective means of information exchange was through individuals visiting the villages of those already operating an enhanced fishery. Sometimes this occurred as a result of government intervention, whereas in other cases it occurred naturally between neighbouring villages. Also crucial was the villagers' perception that they could adapt management to suit their own purposes. Finally, uptake was not only about how beneficial the initiative might be, but as suggested above, was also dependant on the presence of key individuals within the village. This is a fact that extension agents cannot affect, but have to consider. All these observations have important implications for how such technology should be extended in the future.

3.2. Enhancement, institutional change and its impact on people's command over living aquatic resources

One of the most striking impacts of stock enhancement was the way in which it could catalyse institutional change, with such changes frequently being considerable (Garaway, in press). As described above, after enhancement, fishing for personal consumption or sale was most commonly prohibited or, if not prohibited, then very restricted. Instead, the fishery became increasingly commoditised with access to fish being determined directly, or indirectly, by ability to pay. Given that many of these waterbodies had previously been open to village members for fishing, stocking had radically altered peoples' command, i.e., use, access, control (Leach et al., 1999), over aquatic resources.[2]

A survey of 45 waterbodies in both Savannakhet and Khammouane Provinces in 1999/2000 revealed that in 23 cases (51%), access to fishing of the resource by village members, even when fish were of harvestable size, became more restricted following stocking. In no case was access less restricted. Additionally, in the 22 where no change was recorded, 16 of them (73%), already forbade individual fisher access (Garaway, in press).

Stock enhancement often serves as a catalyst for institutional change and the nature of such changes could have serious implications for the distribution of benefits and costs of enhancement among users. This is an extremely important consideration in a poverty alleviation context, particularly, as in the cases here, where traditional access to resources is denied. Even when change does not affect traditional use of a resource, with enhancement providing a justification for institutional change, there may still be equity issues. For example, poorer groups can lack the power to ensure that they are the beneficiaries of any such change.

3.3. Institutional change and socio-economic outcomes

To determine the impact that the institutional change described above was having on households from different socio-economic groups, a detailed study was conducted on four villages operating an enhanced fishery under the 'group fishing' (Garaway, 1999, in press). Household benefits from the enhanced waterbodies included: a cheap source of good quality fish; decreased personal cash contributions to the community development fund; increased community income for improved community services (in some cases); decreased personal fish contributions for when the village entertained guests; and payment (in fish or sometimes cash) for communal harvesting and marketing.

Regarding the distribution of these benefits, with their higher capacity to buy fish, richer households were able to take more advantage of the new market supply of fish than the poorest socio-economic groups. However, this saving was small. In contrast, the poorest households, with less household economic surplus, benefited more in relative terms, from the decreased personal cash and fish contribution needed to fulfill community obligations. In summary, no socio-economic group benefited substantially more than others.

With regards to costs, Garaway (2005) demonstrated that the traditional role of small-scale fisheries and fishing to these households, although substantial, was not substantially different between the socio-economic groups, with poorer households catching only slightly more than richer households on a 'per household member' basis. The loss of the capture fishery therefore had the potential to affect poorer households more, but only marginally so. In fact, analysis revealed that the majority of villagers from any of the socio-economic groups did not perceive they had been adversely affected by access restrictions. They suggested this was because they either had other convenient places to fish or, when this was not the case, it had been taken into consideration by the rule designers and the access restrictions to the fishery were correspondingly less severe.

Despite significant changes, and the concentration of decision-making power into the hands of a few, in this case outcomes were, and were perceived to be, beneficial to all socio-economic groups. Possible reasons why fears of political disempowerment and outcomes detrimental to poorer groups were not realised included: relative homogeneity amongst village members with respect to wealth, religion, and livelihood options (including dependence on fishing); strong inter-dependence and societal norms that kept conflict low; accountability of decision-makers to village members; and the presence of low cost conflict resolution mechanisms (Garaway, in press). It is believed that these factors led to local rules that were well-adapted to local circumstances.

Although stocking is likely to catalyse institutional change and alter the distribution of benefits from a resource, equitable distribution of benefits depends on who has power in this arena, and under what circumstances. That is, it depends on the characteristics of the community and the social, political and institutional context into which enhancement is placed. In the Lao case, outcomes were beneficial. However, as described above, there were particular, unusual circumstances that facilitated this. Enhancement is frequently carried out where 'communities' are far more heterogeneous, with significant differences in the affected population with respect to livelihood options, wealth and power distribution. Bene (2003) describes such cases in Bangladesh where he suggests that Fisheries Enhancement Projects (FEP) "might have *de facto* led to an increase in inequity through transfer of access and benefits of the common resources from the poor landless to the rich rural elite". Given the potentially

[2] Institutions are defined, in this context, as "the sets of working rules that are used to determine who is eligible to make decisions in some arena, what actions are allowed or constrained, what aggregation rules will be used, what procedures must be followed, what information must or must not be provided, and what payoffs will be assigned to individuals dependant on their actions" (Ostrom, 1986). Such rules can be both formal and informal, recognised in law or through custom.

negative impacts on poorer groups, enhancement carried out in a poverty alleviation context must consider this wider environment.

3.4. Institutional change and technical outcomes

As part of a study investigating the production potential and yields from enhanced fisheries, a comparative study of waterbodies under different management regimes showed that the group fishery management systems described above, with a combination of access restrictions and stocking, had a strong positive effect on both standing stocks and biological production potential (Lorenzen et al., 1998). However, low levels of effort, brought about by the access restrictions and selected harvesting of the larger stocked species only, meant that overall yields were not different between enhanced and non-enhanced fisheries. In other words, the potential for increased production was not realised (Garaway, 1999). Instead, harvesting efficiency and hence the productivity of labour in the fishery increased greatly by up to a factor of three, and this was appreciated and valued highly by stakeholders (Garaway, 1999).

Further analysis suggested that low levels of effort were a combined result of the operational rules that governed access, and low incentives for active involvement in the fishery. Crucially, whilst any of these rules could have been changed to increase effort, all would have involved increased costs or lower economic returns to labour and hence, it is suggested, were not preferred (Garaway, 1999).

These were surprising results that could not have been adequately interpreted or explained without reference to the dynamics of the whole system, including how humans interacted with it, and their reasons for doing so. Without this understanding, any recommendations for increasing yields were likely to have been widely off the mark. The results demonstrate the uncertainties surrounding stock enhancement and the fact that the technical outcomes cannot be understood with reference to technical considerations alone. Rather, interdisciplinary study is required.

4. Discussion

Together, the results demonstrate the crucial role local users can play in determining the outcomes of all aspects of stock enhancement. Far from being mere recipients of enhancement technology, intended beneficiaries may determine whether enhancement is adopted, what technical outcomes are achieved and how any benefits produced are distributed. Local users are not the recipients of enhancement technology and its benefits, but the drivers of it.

The results show the importance of social science research. In a research context, it is necessary both to help predict and/or explain outcomes. In a development and extension context, it is necessary to help determine when and how enhancement technology will be adopted, and when and how it might deliver an appropriate distribution of benefits among affected parties.

The results also have implications for how enhancement research and development is conducted. These are: the need for inter-disciplinary study; the need for increased participation of resource users in the research process; and the need to recognise and deal with the uncertainties inherent in enhancement management. A justification for adherence to these principles and a brief explanation of how they were operationalised in the Lao case is set out below. In our own case, these lessons led to a series of changes in the way we worked in southern Lao PDR from 1999 onwards, we moved towards a process that we termed ‘adaptive learning’ that actively involved villages in managing enhanced fisheries at the same time as collaborating in locally relevant, interdisciplinary, and experimental research. Adaptive learning, an approach sharing the key principles of adaptive management (Walters and Hilborn, 1978; Lee, 1993; Hilborn et al., 1995; Stephenson and Lane, 1995; Berkes et al., 2001), was seen as a structured and collaborative approach emphasising learning processes in management rather than single solutions, or control. Indeed, management is treated as an experimental process, aimed at yielding crucial information for the improvement of management regimes, as well as providing more immediate benefits.

4.1. Interdisciplinarity

Although the importance of social science research was recognised early on in our work, as the fully inter-related nature of the human/resource/technical system became apparent, it was clear that this could not be an ‘add-on’ component. Instead, there was a need for real integration, requiring researchers to cross traditional disciplinary boundaries to communicate adequately, define questions and interpret findings.

Attitudinal change was crucial but, aside from this, as a starting point for mutual engagement between disciplines, the Institutional Analysis and Development (IAD) framework (Oakerson, 1992; Ostrom et al., 1994) proved extremely useful. An example of the framework is presented in Fig. 1, and applications to stock enhancement are given by Hartmann (1995); Middendorp et al. (1996); Lorenzen and Garaway (1998); Garaway (1999) and Lorenzen et al. (2001).

Whilst details can vary, the principles of the framework remain the same. Outcomes (on the right hand side of the diagram) are ultimately determined by the physical/biological nature of the resource and technology on the one hand, and by the combined actions of resource users on the other (solid arrows in Fig. 1). The latter are also known as ‘patterns of interaction’, and are determined by the individual users’ choices, which in turn, are influenced by a set of characteristics (in this case: the physical/biological nature of the resource; the institutional arrangements governing resource use; and the social and economic characteristics of the ‘community’ in which the person lives). At any one point in time,

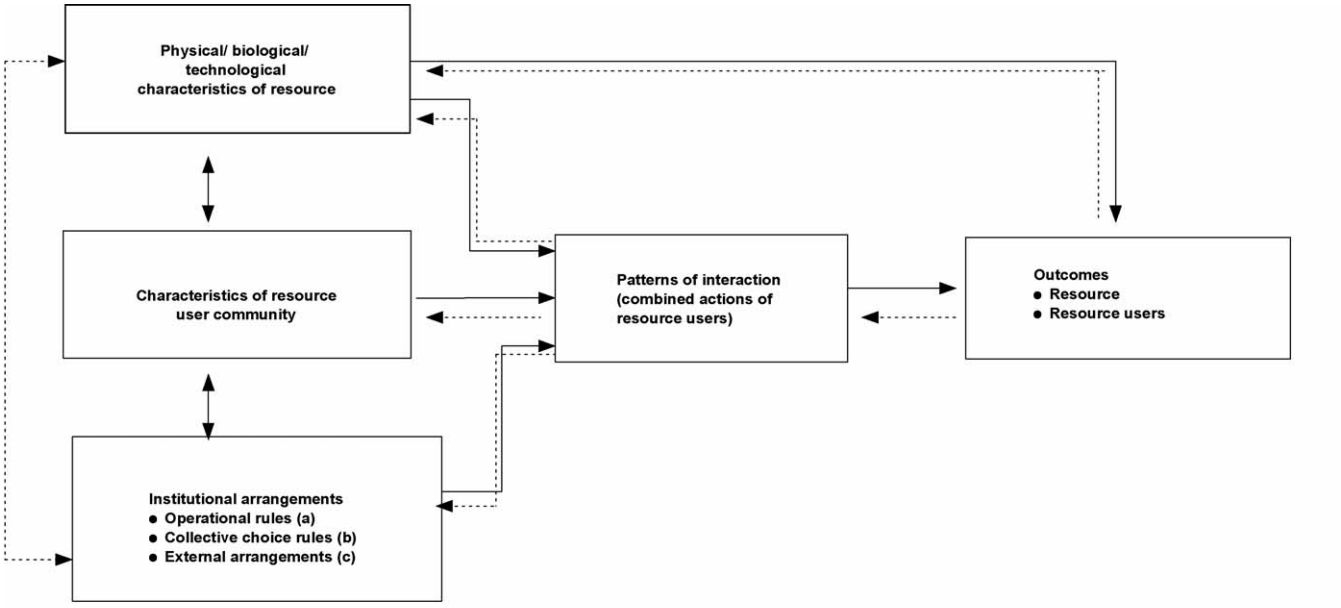

Fig. 1. An institutional analysis and development framework (adapted from Oakerson, 1992).

these influencing characteristics are fixed, but over time they are dynamic, frequently being modified in light of resource outcomes (dotted arrows in Fig. 1).

The framework was a useful heuristic tool used to conceptualise interactions and aid inter-disciplinary communication. It was used as a guide to data collection at the start of a new expanded and exploratory phase in our work where we were identifying the uncertainties, constraints and opportunities faced by 38 villages managing a community fishery in the Southern Provinces. By taking a holistic systems-based approach, and doing so for every community fishery visited, the IAD framework provided the basis for developing a common understanding of these systems based on technical and scientific as well as local knowledge. This understanding was firstly between government staff and researchers, and secondly, through communications workshops with resource users, the resource users in the 38 villages themselves. The IAD framework continued to guide us throughout our research, highlighting relationships and interactions that needed to be considered and analysed.

4.2. Increasing participation and dealing with uncertainty

The interdisciplinary approach calls for a change in research content. Increased participation of resource users and the recognition of uncertainty (the other two principles) requires a fundamental change in how research is done. Although calls for increased participation are ever more common in development research (Hagmann and Chuma, 2002; Wiber et al., 2004), in practice, the extent to which it occurs and what it constitutes is extremely varied (Probst and Hagmann, 2003). Some argue that the involvement of resource users can be limited to an investigation of their needs, their constraints and their expectations prior to the research process. Others argue that this investigation also needs to include study into the wider social, political, institutional and economic environment, which drive their actions (Lee, 1993; Dovers and Mobbs, 1997; Scoones, 1999). Results from Lao PDR suggest that both of these are crucial and are likely to increase the relevance of the research, and hence the likelihood of uptake. Indeed, all of these issues were raised and investigated in the exploratory phase in 1999/2000. However, they may not be sufficient.

In the case of enhancement research and development, dealing with the causes and consequences of uncertainty and increasing the involvement of resource users and/or managers in research are inextricably linked. Uncertainties in enhancement are large, due to the complexity of the fisheries (physically, biologically, technically and institutionally), the dynamic nature of the human/environment/technological interactions involved, and their spatial variability (Lorenzen and Garaway, 1998). Management therefore has to proceed despite uncertainty, and research has to be built in to the management process.

Reasons for why it is important to involve resource users in this instance (over and above understanding their needs) are twofold. Firstly, it can help address the causes of uncertainty

described above. Local users frequently have considerable knowledge of local resources and the people that utilise them and, at the same time, are frequently the best placed, if not the only ones placed, to observe the impact of management change through time. Secondly, if research is being conducted simultaneously with management, and resource users are involved in management, greater collaboration becomes essential.

In the exploratory phase in 1999/2000, local users were involved in the research in as much as they described and explained how their community fishery systems operated, the problems they faced and key uncertainties that they had with regards management. Following this, the resource users then played a key role in defining the experiments that should be conducted, collecting the data, analysing results and reaching conclusions.

The overview of 38 community fishery systems provided a list of key uncertainties and problems relevant to users. Scientific analysis carried out by researchers identified which of those uncertainties could be reduced through active and/or passive experimentation given the degree of variation between the systems involved. Discussion and analysis also identified those uncertainties that could be reduced by simply facilitating better communication between villages (this already having been shown to be a most effective means of information exchange). A list of options was then made available to all stakeholders and through a process of discussion and negotiation between researchers, government staff and village headmen in a series of workshops, a learning strategy was designed to address uncertainties that were potentially reducible, useful, and involved acceptable levels of risk.

In this case the learning strategy included: an active stocking experiment to examine the interactions between water body tropic status and species stocked; a passive experiment to examine the costs and benefits of the existing three forms of management; and the instigation of a communications network and communication methods to enable new and existing information to be exchanged within and between the different stakeholder groups. Roles and responsibilities relating to implementation and monitoring were also assigned and agreed based on the available skills and resources. To make the process transparent and ensure accountability, informal individual contracts in the form of 'village action plans' were drawn up specifying the roles of government, villages and researchers in terms of what each would do and provide.

Implementing the experiments over 2 years generated new information on species and water body tropic status interactions and the costs and benefits of the different forms of management as intended. This was information that was highly relevant to both the villagers who were planning stocking and to the government extension staff who were able to provide better advice to villages managing, or intending to manage community fisheries. The communications network, building on systems of information exchange that already existed, facilitated top down, bottom up and sideways information flow, whilst new methods were developed that enabled all stakeholders, irrespective of educational training, to analyse the data that they had collected, reach their own conclusions and relate the results to their own experiences (Arthur and Garaway, 2004). Sharing the results this way was timely, well received and increased both ownership and understanding of the results, crucial if they were to be utilised effectively.

The approach has shown positive results, both reducing uncertainties and increasing interest in, and uptake of, enhancement technology in the region. For more details see Garaway and Arthur (2004), Arthur and Garaway (2005) and; Arthur and Garaway (in press). As a result of these successes, the approach is being tested in a follow-on project in larger reservoir fisheries and smaller rice-fish systems in Vietnam, Lao PDR and India.

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