Learning-by-doing in fisheries management

RIU

Validated RNRRS Output.

Collective learning is helping communities make the most of small fisheries. Often, these fisheries are open to all and so, ideally, all stakeholders need to be involved in managing them. But stakeholders often don't understand all the issues that need to be considered and how changes in the way they do things—new technologies or management strategies—will benefit them. The learning-by-doing approach helps those with interests in the fishery share information, plan, manage, adapt and reap the benefits of working together. Co-management and learning-by-doing approaches have already proven successful in rice–fish systems in India and Southeast Asia. They could have a major impact on poor producers' livelihoods—benefiting not only fishers but also those depending on other common-pool resources.

Project Ref: **FMSP07:**
Topic: **3. Improving Fishers Livelihoods: Better Fishing Management & Aquaculture**
Lead Organisation: **MRAG Ltd, UK**
Source: **Fish Management Science Programme**

Document Contents:

Description

Research into Use
NR International
Park House
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Geographical regions included:

India, Lao PDR,

Target Audiences for this content:

Fishers,

FMSP07

A. Description of the research output(s)

1. Working title of output or cluster of outputs.
In addition, you are free to suggest a shorter more imaginative working title/acronym of 20 words or less.

Adaptive co-management: Supporting co-managed fisheries

2. Name of relevant RNRRS Programme(s) commissioning supporting research and also indicate other funding sources, if applicable.

Fisheries Management Science Programme (FMSP)

3. Provide relevant R numbers (and/or programme development/dissemination reference numbers covering supporting research) along with the institutional partners (with individual contact persons (if appropriate)) involved in the project activities. As with the question above, this is primarily to allow for the legacy of the RNRRS to be acknowledged during the RIUP activities.

R7335 – Adaptive learning approaches to fisheries management
MRAG – Dr Caroline Garaway, Dr Kai Lorenzen, Dr Robert Arthur
Regional Development Committee (RDC) in southern Lao PDR – Mr Khamchan Sidavong, Mr Phansy Homekingkeo, Mr Bounthong Saengvilaikham

R8292– Uptake of adaptive learning approaches for enhancement fisheries
MRAG – Dr Robert Arthur
Central Inland Fisheries Research Institute (CIFRI) in India – Dr Utpal Bhaumik
Department of Agriculture West Bengal – Dr S.B. Bardan Roy and Dr N.K. Saha
WorldFish Center – Dr Madan Dey and Dr Mark Prein
Mekong River Commission (MRC) - Mr Wolf Hartmann
Support To REgional Aquatic resource Management (STREAM) – Dr Graham Haylor

R8470– Synthesis of FMSP experiences and lessons learned for fisheries co-management
MRAG – Dr Robert Arthur

*4. Describe the RNRRS output or cluster of outputs being proposed and when was it produced? **(max. 400 words)**. This requires a clear and concise description of the output(s) and the problem the output(s) aimed to address. Please incorporate and highlight (in bold) key words that would/could be used to select your output when held in a database.*

There is increasing recognition in both agriculture and natural resource management sectors of the potential benefits of involving a range of stakeholders with different perspectives, skills and knowledge in management activities. The outputs from this cluster provide tested approaches, innovative methods and practical tools for developing collaborative **learning alliances** for **fisheries management**, increasing management **capacity** and realising this potential. The specific products developed and tested between 1999 and 2006 include **guidelines** for implementing **adaptive co-management**, **technologies** for stocked **inland fisheries** developed through

learning alliances in **India** and **Southeast Asia** and a synthesis of **lessons learned** on **co-management** from a series of **case studies** from **Africa** and Asia. Additional communications materials including websites, **policy briefs**, flyers, journal articles, posters and newsletters were developed to raise awareness and promote uptake of these promising products.

Small-scale fisheries in developing countries are dynamic systems characterized by diversity and complexity in not only the biological aspects of the system but also the economic, social, technological, cultural and political dimensions. Where these fisheries have been managed it has most often been through centralised arrangements, focusing on the inter-relationship between the fish and the technical act of fishing, encouraging the view that the outcomes of fishing are predictable and can be optimised. However, in many small-scale fisheries this certainty is an illusion because it is not possible to exert the control required or to predict peoples' actions. Interest in fisheries as broader **socio-ecological systems** and the potential of co-management to provide more locally relevant management arrangements and strategies is increasing as a result. There is also increasing recognition that in complex, dynamic systems such as these, management must proceed despite large uncertainties and that management itself should become a learning process aimed at providing benefits while maintaining or improving the condition of the resource base and increasing the overall **resilience** of the system.

This cluster has developed and tested tools and methods for developing and supporting **innovation processes** based on the **participation** of relevant stakeholders in the identification, prioritisation and addressing of management and information needs. The guidelines and lessons learned focus on: how successful management and learning alliances can be established between different stakeholder groups; how they can develop management strategies that can, at the same time as providing direct benefits, generate vital new information that assists in developing new strategies and technologies; how **access to information** can be improved by stakeholder groups with different communications requirements; and how the process and its outcomes can be **monitored and evaluated**.

5. What is the type of output(s) being described here?
Please tick one or more of the following options.

Product	***Technology***	***Service***	***Process or Methodology***	***Policy***	***Other Please specify***
X	*X*		*X*		

6. What is the main commodity (ies) upon which the output(s) focussed? Could this output be applied to other commodities, if so, please comment

The main commodity that the outputs focus on, and have been validated for, is fish and fisheries. The outputs on co-management and adaptive learning could be applied to other commodities successfully but the key point is that they have been developed for managing resources such as fisheries that are diverse, complex and dynamic common-pool resource systems (i.e. require collective management) where uncertainties are high and those dependent on the resource may have few rights relating to, or little control over, the resource system. The other outputs, i.e. the locally relevant technologies developed through the process of adaptive learning, are relevant for enhanced inland fisheries and wetlands rice based systems.

7. What production system(s) does/could the output(s) focus upon?
Please tick one or more of the following options.
Leave blank if not applicable

Semi-Arid	***High potential***	***Hillsides***	***Forest-Agriculture***	***Peri-urban***	***Land water***	***Tropical moist forest***	***Cross-cutting***
					X		*X*

8. What farming system(s) does the output(s) focus upon?
Please tick one or more of the following options (see Annex B for definitions).
Leave blank if not applicable

While focussing on fisheries, it should be noted that the approach has been validated in wetland rice based systems where it was used to test technologies for both fish (stocking and feeding strategies) and rice (new rice varieties) components of the systems.

Smallholder rainfed humid	***Irrigated***	***Wetland rice based***	***Smallholder rainfed highland***	***Smallholder rainfed dry/cold***	***Dualistic***	***Inland artisanal fishing***	***Coastal artisanal fishing***
		X				*X*	*X*

*9. How could value be added to the output or additional constraints faced by poor people addressed by clustering this output with research outputs from other sources (RNRRS and non RNRRS)? (**max. 300 words**).*

Please specify what other outputs your output(s) could be clustered. At this point you should make reference to the circulated list of RNRRS outputs for which proformas are currently being prepared.

The outputs provide an overall framework and supporting principles, tools and methods for developing a systematic and participatory learning process, combining both reflective, experiential, “learning by doing” with experimental “learning as an objective of doing”. Other research outputs that this can be clustered with are initiatives rather than products and represent a means through which it could possibly be institutionalised. These include the CGIAR Institutional Learning and Change initiative, The Adaptive Co-mananagement Initiative, The FAO/WorldFish initiative on small-scale fisheries and the Resilience Alliance.

Looking at co-management and adaptive learning as a process, an initial step is to identify stakeholders and the existing management objectives, constraints and uncertainties. This provides a clear opportunity to integrate other research outputs from within the RNRRS and elsewhere depending upon the nature of the resource system. This includes providing access to existing information, local testing of existing technologies or the use of tools and methods in collaborative research to identify or develop locally appropriate strategies and technologies, for example, the use of decision support tools or assessment packages in fisheries. In fact the technologies or support tools could be from any of the crop, forestry or livestock Programmes depending on the nature of the resource system.

Finally ‘process support’ tools such as consensus building and conflict resolution methods can be useful in developing and agreeing learning and management strategies. Within the FMSP this has been done to some

small extent, for example in the development of the ParFish and enhancement Decision Support Tool. The table below provides further suggestions for clusters that represent where value could possibly be added. This is not easy as the output titles are not always informative.

Existing information	**Process support**
Integrated Floodplain Management.	Decision tools for institutional change in public and private sectors.
Policy knowledge for alternative NR livelihoods.	Improving NRM through CBM - PAPD.
Improving NRM strategies and access to CPRs	Community-led improved NRM.
Developing quality seed networks.	Policy process for pro-poor rural services.
Short-crop aquatic production.	Pro-poor rural services for improved livelihoods.
Promoting healthy peri-urban aquatic food supply.	Linking demand with supply of agricultural information.
Integrated aquatic production for rural livelihoods.	Participatory Market Chain Analysis (PMCA).
New strategies for aquatic animal health management.	Institutions for pro-poor livelihoods in ICZM.
Promoting networks for market quality.	Public governance mechanism for NRM.
Developing market information systems within the aquatic foods supply chain.	Linking field activities with Policy.
Sustainable coastal production.	Peri-urban interface.
Databases of information (management tools)	Fisheries stock assessment and management guidelines.
Livelihood appraisals (management tools).	Bayesian stock assessment and management with limited data.
Tools for managing floodplain fisheries.	Generic management guidelines.
Enhancement of inland fisheries.	Post Harvest Livelihoods Assessment Tool (PHLAT).
Enhancement of marine fisheries	A guide to the analysis of fish marketing systems using a combination of sub-sector analysis and the sustainable livelihoods approach.
Trainer's guide to controlling blowfly infestation of traditionally processed fish.	
Log it - Quality and sanitation log.	
Ice it - Ice calculator and trial management system.	

Validation

B. Validation of the research output(s)

*10**. How** were the output(s) validated and **who** validated them?*

*Please provide brief description of method(s) used and consider application, replication, adaptation and/or adoption in the context of any partner organisation and user groups involved. In addressing the "who" component detail which group(s) did the validation e.g. end users, intermediary organisation, government department, aid organisation, private company etc... This section should also be used to detail, if applicable, to which social group, gender, income category the validation was applied and any increases in productivity observed during validation **(max. 500 words)**.*

The outputs were developed and tested between 1999 and 2002 (R7335), further validated between 2002 and 2004, and products subsequently developed (and themselves tested) and promoted based on this validation (R7335, R8292 and R8470). This was done by MRAG (R7335, R8292 and R8470), Imperial College London (R7335) and University College London (R8292), in collaboration with intermediary organisations and government departments who would become 'champions' for the approach. Such intermediary organisations and government departments included the Mekong River Commission (R8292) and WorldFish Center (R8292), the RDC and Department of Livestock and Fisheries in Lao PDR (R7335) and Central Inland Fisheries Research Institute (CIFRI) and Department of Agriculture and Department of Fisheries in West Bengal (R8292). The validation involved 38 villages in Savannakhet and Khammouane Provinces Lao PDR (R7335) and 30 villagers and eight development committees in West Bengal (R8292), who were villagers and village administrations representing the target beneficiaries. The adaptive learning projects were about developing and validating a collaborative, multi-stakeholder approach by implementing, monitoring and evaluating performance, and the validation is fully documented in the project FTRs. The process of validating the approach, because it is an innovations approach, also involved developing and testing (by the administrations or villagers) of locally relevant technologies (stocking and fish culture strategies and rice variety trials) in replicated experiments.

Validation of other tools relating to co-managed fisheries also occurred in capture fisheries, primarily through the development and testing of data collection guidelines and the ParFish method and this was captured in the FMSP co-management synthesis. The validation processes in both capture and enhanced fisheries indicated that the co-management process could result in increased management capacity and a sounder shared knowledge base for decision-making. Furthermore, the adaptive learning approach enabled those dependent on the resources to increase the benefits from the systems and, at the same time, government agencies and others to better understand the systems and needs of users so that they can better provide relevant advice. In enhanced systems, yields of rice and fish and incomes were both increased during validation. Household surveys covering all socio-economic groups indicated that the benefits derived from these productivity increases were perceived to be desirable by all respondents.

*11. **Where and when** have the output(s) been validated?*

Please indicate the places(s) and country(ies), any particular social group targeted and also indicate in which

production system and farming system, using the options provided in questions 7 and 8 respectively, above ***(max 300 words)****.*

The validation process began with the development and testing of the adaptive learning approach in Savannakhet and Khammouane provinces, Lao PDR (R7335, 1999-2002). This targeted small water body fisheries managed collectively by a village to provide income for village development (**Inland artisanal fisheries**). As such these fisheries have an important role in supporting the livelihoods of rural households. The validation benefited the community as a whole in each of the 38 villages involved but attention was given to the distribution of benefits from increased productivity or changes in management strategies and how these might affect the poorest.

The successful testing in Lao PDR led to a further project (R8292, 2002-04) to validate the approach in different resource systems. The systems selected were household brackish water rice-fish and collectively managed freshwater rice-fish systems in West Bengal, India (**Wetland rice-based** and **Inland artisanal fishing**) and collectively managed reservoir systems in northern Lao PDR, Cambodia and Vietnam **(Inland artisanal fishing**). The brackish water rice-fish validation targeted marginal farmer households while the work in freshwater systems and in reservoirs again benefited entire communities.

Current Situation

C. Current situation

12. ***How and by whom*** *are the outputs currently being used? Please give a brief description* ***(max. 250 words****).*

Considering the stakeholders targeted in turn, there has been increased awareness of benefits from fisheries co-management and learning processes to which the project has contributed, particularly within Sida and IDRC, and the outputs continue to be influential in the on-going development of initiatives on adaptive co-management and small-scale fisheries.

There is also evidence that the outputs have influenced the way in which agencies are thinking about working with fisheries-dependent communities, particularly in Southeast Asia. This includes organisations such as the Asian Institute of Technology (AIT), WWF, WorldFish Center, Mekong River Commission (MRC) and the Institute for Fisheries Management (IFM), who are beginning to include aspects of the approach in their work plans.

The RDC and Department of Livestock and Fisheries in Savannakhet Province, Lao PDR have been keen to continue with the co-management process and have continued, as funds allow, holding multi-stakeholder workshops as learning platforms.

Within individual villages and households in West Bengal and Lao PDR in particular, the adoption rates of the technologies and management strategies developed through the adaptive learning process are high and there is evidence of spread of adoption. This is due in part to the increased capacity of local extension workers to identify where the application of the technologies would be beneficial and to support the adoption process.

*13. **Where** are the outputs currently being used? As with Question 11 please indicate place(s) and countries where the outputs are being used **(max. 250 words).***

Outputs in terms of the technologies developed are being used in the small water body fisheries across Savannakhet, Khammouane and Champassak provinces of southern Lao PDR. At the last count in 2005, there were over 40 water bodies in Savannakhet and ten in Khammouane whose management had been affected by the use of the outputs (up from 26 and eight respectively during the project).

In India, the technologies developed during the process in the brackish-water area have shown an adoption rate within the trial area of over 68% and there are indications that adoption is spreading. Within the reservoir fisheries, the information generated on marketing arrangements has led to changes in the structures of these, and the effects of this is subject to on-going monitoring by the MRC.

*14. What is the scale of current use? Indicating how quickly use was established and whether usage is still spreading **(max 250 words).***

In Lao PDR, the project (R7335) had, by 2002, directly benefited 4098 households in 34 villages. By 2005, the number of villages benefiting from the increased knowledge of extension staff and the technologies had increased to 50, potentially benefiting up to a third more households. The extension staff in both provinces and in all 12 districts involved were able to see the benefits of the technologies and learning approach. They are better able to provide advice to villages interested in collective management and have also arranged workshops to share their experiences with provincial and district staff in four further Provinces in southern Lao PDR.

In West Bengal by 2005 in the brackish water area there was an adoption rate of some 68% amongst participating households (26 households). Involving extension staff in the learning process has meant that the technologies developed are being promoted more widely.

Use of the adaptive learning and co-management products is less easy to gauge though they are influencing thinking in a number of organisations, particularly in Southeast Asia, and it is expected their influence will become more widespread. Interest in the adaptive learning approach in particular has come from donors including GTZ, NORAD, CIDA, SIDA and DANIDA, Universities, CGIAR centres and development projects, e.g. the DANIDA funded SUFA project and the WorldFish managed component of the Challenge Program for Water and Food. Because these outputs have only recently been promoted it is likely that uptake and subsequent impact will only be seen over the next few years.

*15. In your experience what programmes, platforms, policy, institutional structures exist that have assisted with the promotion and/or adoption of the output(s) proposed here and in terms of capacity strengthening what do you see as the key facts of success? **(max 350 words).***

For the technologies themselves, the best adoption rates have been amongst management units with effective decision-making structures, particularly important in collectively managed systems. Supporting and developing the capacity (e.g. leadership, transparency and accountability and access to information) of local decision-making structures is crucial for better management of such systems.

Involvement in the development and ownership of the approach, methods and technologies by the RDC and DLF has been instrumental in institutionalising methods and ensuring that the technologies continue to be promoted, adopted and supported. However, funding and capacity to undertake the more scientifically demanding aspects of the approaches (designing and implementing management experiments) remain a limiting factor.

Similarly collaboration with WorldFish Center and the MRC, respectively international and regional centres of excellence for science in fisheries management, helped increase recognition of the potential benefits that could result from application of the outputs and the inclusion of the principles in their ongoing work.

More widely a number of programmes have been recognising the failure of blueprint and “research then manage” approaches to natural resource management, such as the Resilience Alliance and IDRC Rural Poverty and Environment (RPE) Program Initiative. There is currently quite a lot of discussion of this at a more theoretical level – principles for adaptive co-management, innovation systems etc. but much less on the practical tools to support the implementation of such approaches in diverse resource systems such as those developed in these outputs.

Communications and capacity building activities using a wide range of channels and media at the local, national, regional and international levels have raised awareness and interest in the outputs. Generally it was found that active promotion through dialogue, including methods such as meetings, workshops and email worked well and was needed to support passive methods (websites, briefs, publications). At this stage there remains more to do if the outputs are to be adopted as they still need to be presented in the appropriate formats for national policy makers and the scientific community.

Current Promotion

D. Current promotion/uptake pathways

*16. **Where** is promotion currently taking place? Please indicate for each country specified detail what promotion is taking place, by whom and indicate the scale of current promotion **(max 200 words).***

In India, the technologies (rice varieties and stocking strategies) are currently being promoted in suitable areas within West Bengal by staff of the Departments of Fisheries and Agriculture. This is done through regular meetings with the village administration and farmers.

In Lao PDR, information on marketing arrangements is being promoted by the Mekong River Commission in meetings with reservoir management committees. In southern Lao PDR, regular meetings with village administrations arranged by staff of the Department of Livestock and Fisheries provide opportunities to share knowledge of fisheries management, and some of the villages involved in the learning networks developed in the project continue to use other meetings as an opportunity to continue sharing information.

Globally, the promotion of the more enabling products (briefs, synthesis and guidelines) also continues primarily

through the FMSP (www.fmsp.org.uk), adaptive learning (www.adaptivelearning.info – 554 downloads) and STREAM (www.streaminitiative.org – 765 downloads) websites though the products are also available from a range of other sites (e.g. Eldis, STREAM and FAO OneFish). The WorldFish Center is also emerging as a champion for the approach through a number of fora.

17. What are the current barriers preventing or slowing the adoption of the output(s)? Cover here institutional issues, those relating to policy, marketing, infrastructure, social exclusion etc. ***(max 200 words)****.*

The major barriers slowing adoption are awareness of the value of the approaches and the provision of evidence to support this. The key stakeholders need to be aware of the approaches and evidence, and be using it in policy-making and planning processes. Currently two key stakeholder groups have been identified: the scientific community and other policy influencers. While there is some awareness amongst the former group, the efforts have been focussed on awareness-raising and few peer-reviewed papers have been produced, and this is hampering discussion of the approaches amongst researchers. For the latter group, access to policy makers and the difficulty in identifying policy influencers and their information sources remains an issue. A further hindrance is the normalisation of terms, such as co-management, that make it difficult to show what the specific benefits of the outputs are.

A lack of awareness amongst the two groups above who can create an enabling environment for use of the outputs hampers their adoption. Also, at the local level, in Lao PDR in particular, the key constraint to wider use of the technologies is the lack of resources available to the local government.

18. What changes are needed to remove/reduce these barriers to adoption? This section could be used to identify perceived capacity related issues ***(max 200 words).***

Essentially, two changes are required. The first is to develop the capacity of local change agents (to use the outputs, be able to articulate demand and to access relevant information) and the second is to increase the access of researchers, policy makers and planners to the outputs. Developing capacity at the local level requires support and training for local staff as well as increasing the communications linkages between stakeholders.

Increasing access to and uptake by policy makers and planners requires two things, firstly an increased evidence base. Much of the successful testing has been in enhanced floodplain fisheries and further testing in capture fisheries, including both marine and river fisheries, would provide a much wider evidence base. For scientists and other policy influencers, the outputs and evidence then also need to be promoted through peer-reviewed papers and book chapters. It has been a comment of the project reviewers that these products need to be produced.

To get the outputs into use, local experts should be found who can to help identify the formal and informal information pathways for policy-making and planning processes. They can help identify appropriate targets, channels and products as well as highlight opportunities - timeliness is a crucial factor in adoption.

19. What lessons have you learnt about the best ways to get the outputs used by the largest number of poor people? ***(max 300 words).***

The key factor at all levels has been active participation by relevant stakeholders in developing the outputs from

conceptualisation through to evaluation, and an emphasis on 'learning by doing'. This has been very effective in ensuring in the first place the relevance of the outputs, and also that the outputs, and the potential benefits opportunities and constraints associated with them, are well understood. At the local level, this has meant the involvement of local farmers and fisher communities in the identification and development of new strategies and technologies through collaborative action research, and the development of capacity within local change agents (e.g. district fisheries staff) to identify the needs of local communities, to access information and support local decision making.

Within research organisations and those supporting policy and planning processes, participation has helped show the value of co-management and learning approaches, and created "champions" for the approach. The principle of active participation has also been extended to the communications strategies within the projects. Target communications stakeholders have been involved in the development of communications materials – extension staff helping produce extension materials, and guidelines being pre-tested amongst target practitioners. This has helped ensure that key messages are provided in the formats that they prefer. It has also helped in the process of developing dialogue that has been a major part of the communications strategies. Our experience has been that passive methods for communicating (e.g. websites) may have limited impact on their own but that their effectiveness can be enhanced with active communications activities, particularly where target communications stakeholders become established as 'dialogue partners'.

Impacts On Poverty

E. Impacts on poverty to date

20. Where have impact studies on poverty in relation to this output or cluster of outputs taken place? This should include any formal poverty impact studies (and it is appreciated that these will not be commonplace) and any less formal studies including any poverty mapping-type or monitoring work which allow for some analysis on impact on poverty to be made. Details of any cost-benefit analyses may also be detailed at this point. Please list studies here.

Studies on the benefits and expected benefits were conducted as part of the validation process, together with some basic cost-benefit analyses. These can be found in the evaluation appendices of the FTRs for R7335 and R8292. Additionally, assessments of dissemination and uptake are covered in the communications strategies included in the FTRs for R8292 and R8470.

R7335 was included in as a project for consideration by the external impact assessment of the RNRRS:

LTS (2005) Evaluation of DFID Renewable Natural Resources Research Strategy 1995-2005. Evaluation Report EVD659, Department for International Development Central Research Department and Evaluation Department (available from www.dfid.gov.uk).

Additional studies were undertaken by the FMSP to assess impact that included assessments of R7335 and R8292:

Arthur, R.I., Halls, A.S. and Mees, C.C. (2006) Impact of Fisheries Management Science: experiences from DFID's Fisheries Management Science Programme. IIFET 2006 Portsmouth Proceedings

Halls, A. S. & Arthur, R.I. (2006). Assessment of the Impact of the FMSP: A summary of the assessment of impact from the perspectives of key fisheries institutions and researchers. Report to the DFID, London, MRAG Ltd.

Arthur, R.I., E. Fisher, R. Mwaipopo, X. Irz, and C. Thirtle, (2005). Fisheries Management Science Programme: An overview of developmental impact to 2005, Final Technical Report., MRAG Ltd. (see www.fmsp.org.uk and Search Project Database, Project R4778C).

21. Based on the evidence in the studies listed above, for each country detail how the poor have benefited from the application and/or adoption of the output(s) ***(max. 500 words):***

- *What positive impacts on livelihoods have been recorded and over what time period have these impacts been observed? These impacts should be recorded against the capital assets (human, social, natural, physical and, financial) of the livelihoods framework;*
- *For whom i.e. which type of person (gender, poverty group (see glossary for definitions) has there been a positive impact;*
- *Indicate the number of people who have realised a positive impact on their livelihood;*
- *Using whatever appropriate indicator was used detail what was the average percentage increase recorded*

For collectively-managed resources such as fisheries, much of the effort is focused on developing suitable transforming structures and processes, rather less on directly enhancing household capital assets. However it is still possible to see some benefits from these outputs on capital assets.

Human

Interviews with members of the village administrations and individual households at all sites have suggested that knowledge and skills were developed through the collaborative learning process. This has led to the development of successful community fisheries and in several instances also had the spin-off of improved learning on the part of individuals who have created or improved privately-owned fish ponds.

Social

A range of social benefits have been recognised, particularly for the communally managed systems including more flexible and resilient management systems, increased collective management capacity, increased social cohesion and solidarity and collective benefits from village development funds. While quantitative analysis of the village managed fisheries in Lao PDR suggested that overall the incomes in years after the study were similar to those predicted, in a number of cases it was found that the knowledge generated from the learning process did not lead to increased yields and income from community fisheries, as might be expected. Instead, the information allowed those managing the systems to take a more flexible approach to management, changing the management strategy and type of benefits received depending upon the circumstances that the community found itself in. The effect was therefore to increase the resilience and adaptability of the management.

The outputs were considered by participants to have contributed to strengthening social networks and collective administration as well as increasing levels of solidarity (from being involved in a communal activity). Selling fish cheaply to surrounding villages and entertaining guests strengthens links between villages. These are less tangible benefit, but ones that are highly regarded.

In terms of improved services, money from the village development funds in Lao PDR and India was typically spent on electrification, the building of schools and/or temples, road improvement as well as providing support to poorer households and those facing hardships. The capacity to improve income generation for such community activities should not be underestimated given the limited opportunities that exist for rural income generation. As an example, in India incomes from village leased systems increased by around 12% because of the increased production that was possible.

Natural

The technologies and strategies developed through collaborative experiments were able to increase productivity of the resource in each case. For example, results from stocking trials in India indicated that a conservative adjustment to species composition could increase yields by an average of about 80 $kgha^{-1}$. Across the total 273 hectares at the site, this represents a potential increase in yield of some 48 tonnes with a value in the region of USD 35,000 (based on the lowest market price of INR 30 per kg described at the site).

Physical

In the collectively managed systems in both India and Lao PDR, income from fish or leasing the water body and fish for labourers have allowed villages to address their development priorities including providing wells, improving the local school, road, temple or health centre.

Financial

Economic evaluations indicated that in Lao PDR the benefit of adopting the technologies was equal to some US$1,113 per village or $250 per hectare. Indications are that 67% of villages that had been involved in the project had adopted the recommendations and 16 additional villages had started a community fishery and were benefiting from the outputs. For households, the fisheries can provide a cheap source of fish; free or cheap fish at times of household emergency (e.g. funerals); decreased household cash contributions to community development funds; community development; decreased household contributions when the village entertained guests; payment (in fish or cash) for communal harvesting and marketing; and payment for labour related to community development. At the farmer managed brackish water sites in India the evidence suggested income gains of around 11% from yield increases of 15% could be attained by adoption of the (no cost) stocking and feeding strategies developed there.

Transforming structures and processes

All stakeholder groups (villagers, extension staff and researchers) felt that their capacity (both skills and knowledge) had increased as a result of using the outputs. Use of the outputs helped to strengthen local institutions for collective decision making and it was said that this also led to improved decision making in areas other than fisheries.

Within the government agencies, knowledge about participatory techniques, and the principles behind

collaborative learning more broadly, helped to generate a new approach to fisheries promotion amongst government officials and a new perspective on the experiences and skills of those managing the resources. The collaborative learning approach was contrasted positively by government employees with projects funded by other donors, in which objectives were pre-established and villagers were simply involved in implementation.

Environmental Impact

H. Environmental impact

24. What are the direct and indirect environmental benefits related to the output(s) and their outcome(s)? ***(max 300 words)***

This could include direct benefits from the application of the technology or policy action with local governments or multinational agencies to create environmentally sound policies or programmes. Any supporting and appropriate evidence can be provided in the form of an annex.

In its application in South and Southeast Asia the outputs have been used as a means to assess the development implications of stocking. In Lao PDR, the opportunity was taken to study the effect of the already widespread practice of stocking carps and tilapia (*Oreochromis niloticus*) on the resident populations of wild fish. The results of the study indicated that there were no negative effects of the current practices. In India, there was a study on the effect of stocking bhekti (*Lates calcarifer*) on wild fish – particularly important as bhekti are a carnivorous, high value species that feed on the small, cheap wild fish in the water body. Thus the studies were also able to address or raise issues relating to the environmental impacts of management practices. In this way the outputs can be used to generate information that can be useful for local governments and international agencies in developing environmentally sound policies.

25. Are there any adverse environmental impacts related to the output(s) and their outcome(s)? ***(max 100 words)***

None have been identified so far and it was the opinion of one of the reviewers that, on the contrary, “successful widespread adoption of the project outcomes could have large-scale environmental benefits.”

26. Do the outputs increase the capacity of poor people to cope with the effects of climate change, reduce the risks of natural disasters and increase their resilience? ***(max 200 words)***

The outputs are aimed at increasing socio-ecological resilience by generating locally relevant information and increasing the access of decision-makers to this. The outputs also provide a means to support collective action and develop the capacity of government agencies to provide support to local decision makers. Experiences with the outputs have shown how the information generated and shared leads to improved management and, importantly, increased flexibility, with management being adjusted in the light of changing circumstances. For example, in Phin village in Lao PDR they were able to use knowledge about the benefits of different management systems to meet village needs. The village traditionally holds a fishing day each year, a single day on which the

entire village buys tickets and fishes the water body. However, since the project, when other priorities have required it, the village has used knowledge gained from involvement in the project to adjust management of the resource accordingly. For example, when the priority was to maximise income in order to provide electricity, the villagers managed the water body collectively and fished themselves. Another year, when conditions were particularly hard, the restrictions on fishing were removed in order for villagers to obtain enough for household consumption. In this way, the village has been able to manage their own resources flexibly, leading to increased resilience.