Powerful planning tool for river basins and lakes

RIU

Validated RNRRS Output.

A new planning tool for river basins and lakes helps track trends and measure the likely results of changes to policies or regulations. Previous methods involved collecting large amounts of data and were expensive and time-consuming. Now, planners can quickly call up scenarios showing the impact of various options on rural development. The modelling tool is based on an extensive database of lake and river basin information from across the tropics. Proven in river and lake fisheries in Nepal, India, Bangladesh and Bolivia, FAO has now incorporated elements into the African Water Resources Database and the World Fisheries and Aquaculture Atlas. This tool also has great potential to be applied more widely, to water resources, human impact and climate change.

Project Ref: **FMSP01:**
Topic: **7. Spreading the Word: Knowledge Management & Dissemination**
Lead Organisation: **MRAG Ltd, UK**
Source: **Fish Management Science Programme**

Document Contents:

Description

FMSP01

Research into Use
NR International
Park House
Bradbourne Lane
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Geographical regions included:

Bangladesh, Bolivia, India, Nepal,

Target Audiences for this content:

Fishers,

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.

Simple empirical models for lake and river fishery assessments.

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

Fisheries Management Science Programme with additional funding from FAO, Rome.

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

R5030 Empirical Models for predicting Fish Yields from River Basin Physico-chemical factors
R6178 Empirical Models for predicting Fish Yields from Lake Basin Physico-chemical Factors

Project leader – Dr Ian Payne with Collaboration from Dr E. Allison of Overseas Development Group of UEA. Additional funding and technical input provided by FAO in extended development.

*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.*

When attempting to determine the significance of and scope for development of **inland fisheries** in **river and lake basins**, a rapid estimate of most probable catches is required, often in places where direct assessment would be expensive and time consuming. A review of all available data on a wide selection of river (R5030; 1994) and lake (R6178; 1996) basins across Africa, Asia and South America was conducted and comparable data on fish production, demographic, physical and chemical parameters entered into respective databases. The **Developing Country River and Lake Basin Databases** are valuable planning tools in their own right and analysis showed simple predictive relationships between various physical parameters and fish yields which would give those first **estimates of scope for fisheries in rural development**. Relationships between physical and chemical factors also provided other relationships which are of value in wider basin-wide planning. FAO took up the product and worked with MRAG, with additional funding, to incorporate the basis into the **African Water Resources Database)** (1999)**.** It also appeared as a recommended method in Chapter 4 of the FAO Fish Stock Assessment Guidelines (Fisheries Technical Paper 487), and was incorporated into the FAO World Fisheries and Aquaculture Atlas (2001).

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	Regional planning

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

Whilst initially aimed at fisheries, the extensive comparative database of numerous parameters of lake and river basins across the tropics proved very useful as a wider planning tool relating to water resources (eg. Rainfall and water discharges) and river basin planning, including providing baselines against which anthropogenic impacts and climate change could be judged.

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

Smallholder rainfed humid	Irrigated	Wetland rice based	Smallholder rainfed highland	Smallholder rainfed dry/cold	Dualistic	Coastal artisanal fishing	Inland fishing	Deep sea fishing
X	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 very nature of the supporting databases, together with the derived predictive relationships can add to the development of a number of other outputs. This is particularly the case in the evaluation of rural livelihoods which, in most river basins, although centred around seasonal agriculture, will normally profit from fish and fishing at some point. This cluster provides a quick method for establishing the most likely contribution of fish, which can be significant in cash or nutritional terms. Most clearly it can add something to the FMSP Tools for managing floodplain fisheries cluster by defining the larger picture of the probable total yields within which small-scale fisheries development, either on its own or mixed with farming activities, can take place. In a similar fashion, however, it can add value to some of the NRSP Land-Water Interface clusters, particularly Bangladesh – Integrated Floodplain Management, India 2 – Pro-poor

Rural Services for Improved Livelihoods and possibly also Bangladesh 1 – Improving NRM through CBM/PAPD. The water resources aspect of the cluster outputs may also be of value for RiU amongst engineering outputs concerned with water regulation.

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 validated by testing them through their application to river and lake fisheries. Government departments, international agencies and MRAG (private company) were involved in the validation. The initial outputs and Final Technical Reports were independently peer-reviewed by appropriate senior professionals in the field before acceptance by the Programme Manager. Finalisation took into account comments from the reviewers. In addition, the reports and database outputs were sent to information specialists in FAO for appraisal. They were taken up by Dr Jim Kapetsky who had just published a GIS-based approach for aquaculture development with the intention of doing the same for fisheries. Ultimately, FAO provided funds to extend their database before incorporating them into a number of their own widely disseminated products. This was done in conjunction with Dr Pepe Aguilar-Manjarrez, also of FAO. The adoption of the outputs by peers in FAO indicates international validation.

*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 outputs were validated for river and lake fisheries (land-water interface; inland fishing) in Nepal, India, Bangladesh and Bolivia during the period 1995-2004. The outputs from this cluster represent a high-end development and planning tool. As such, it is international validation, as outlined above, which is important. By being incorporated into a number of products by FAO, Rome (see question 4), they have achieved a wide dissemination. Whilst they are still being used by FAO it is difficult to say precisely which countries they are being used in. Most FAO products, however, do have a high uptake. As indicated above, the products are most likely to be used by national and regional planners as well as by the donor agencies in project identification. They would be directed towards basin development, fisheries, integrated farming and water regulation actions.

Validation of the outputs is confirmed through their uptake and adoption by a number of influential international organisations. The tools were used in the early stages of the DFID/World Bank funded ($20 million), Third Fisheries

Project in Bangladesh (1990 – 1996) where the objective was to increase fish production and welfare of poor fishing communities by enhanced stocking of the floodplains with young carps. The tools were used to provide baseline production levels and numbers of poor beneficiaries against which increments and improvements due to enhancements could be judged. They were also used to screen a large number of proposed sites for intervention to select those with the greatest potential. Initial estimates were backed up by more specific baseline surveys and eventually the proven incremental benefit was 220,000 tonnes of fish all harvested by the poor fishing or farmer-fisher communities.

A subsequent use was in a DFID funded appraisal for the Government of Bolivia of projected dam and reservoir, The Caipipendi Dam, on the Pilcomayo River (1995, 1999). From the projected dam area and volume it was possible to predict the most likely gain in fish yield from the reservoir but also, from the discharge pattern, the potential losses downstream. These changes could be put into the context of the needs of the indigenous ethnic groups living along the river for whom fishing was the major aspect of their livelihood and where access to services is particularly difficult. The dam has yet to be implemented.

Again in Bolivia the models were used to provide estimate of fishery potential in various major river catchments, as well as in Lake Titicaca, as part of the feasibility and planning phase of the major EU ADEPESCA project in the Andean region for the support of small-scale fishing.

Current Situation

C. Current situation

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

The outputs are still being used by FAO in their project identification and presentational work. The wide dissemination of the products, however, makes it difficult to know in which particular countries the tools are being currently employed, either for planning or for training.

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).***

As indicated above, the precise countries in which the outputs are being used is now difficult to establish. The outputs are known to have been used in Bangladesh and Bolivia. They are also still actively being used within the international domain represented by the FAO and its dissemination network.

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

Upon the completion of the outputs by 1995, the databases and their predictive relationships were passed on to FAO through Dr Jim Kapetsky then responsible for GIS and information applications within the Fisheries Section. On seeing the possibilities he obtained internal funding for MRAG staff to work in Rome with one of his own staff members, Dr.

Pepe Aguilar-Manjarrez to expand the databases to include other factors, eg. anthropogenic. This was then integrated with a GIS mapping function and linked to all African lakes and sizeable reservoirs as a predictor of yields and confidence limits of the estimates by 1996. In a wider sense this was developed into the African Water Resources Database (1999). The geographical aspect of the fisheries data from the databases was further incorporated into World Fisheries and Aquaculture Atlas (FAO 2001). The use of these predictive models was defined as a proven method in Chapter 4 of the FAO Fish Stock Assessment Guidelines (FAO Fisheries Technical Paper 487 - in press, see FMSP Website) as well as on the TECA list.

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).***

The key programme needs these tools and outputs have served is firstly the need for baseline information on river and lake basins across the developing world which underlines the importance of management of these in the development process and secondly to allow a rapid assessment of the most probable significance of fish in rural development. The FAO provided the key institutional and policy platforms to take the outputs to more finished products that greatly benefited from the FAO/UN dissemination mechanism.

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).***

Promotion is still continuing globally via the FAO dissemination and uptake systems. The products remain in circulation and are included in a new FAO publication on 'Stock assessment for fishery management: A framework guide to the use of the FMSP fish stock assessment tools' (Fisheries Technical Paper No 487), that is about to be published. MRAG is also continuing dissemination via the FMSP website, www.fmsp.org.uk.

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)****.*

There are a number of well constituted products which have been widely disseminated within these outputs. The main barriers/opportunities to further uptake would be the need to get them into training programmes and to establish them as standard practice and also to introduce them more widely into water engineering, physical planning and environmental impact assessment.

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).***

To introduce them in the wider context as suggested above, some repackaging or reformulation would be needed. This would include more formally including them into training packages, perhaps alongside outputs from other clusters within the FMSP. Familiarity with using these extensive databases and information sources could further improve them as a basic tool of fisheries development and planning within tropical countries. The extension of their use into other sectors, specifically engineering, e.g. dam construction or empolderment, and environmental assessment, would probably profit from more specifically tailored outputs but the underlying databases would remain very much the same. For engineering they can provide one-stop planning data and for environmental assessment, benchmarks and baseline conditions.

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 nature of the product is not of the type required to reach poor people directly. It is a management tool best used by managers for the wider benefit. As such, adoption and dissemination through a major international agency is probably the best option. With more time and opportunity, it may be possible to guide the outputs down towards more specific national or regional institutions although the FAO brand normally invites attention both regionally and amongst other international agencies. One of the real objectives of this output is to facilitate the donor institutions reaching out to larger number of poor, particularly in the small-scale fisheries sector where many of the poorest are to be found.

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.

By the very nature of the outputs, this is a difficult question to answer directly. Poverty studies in Bangladesh have shown that specific fishing communities are amongst the poorest of the poor. However, poverty has its own range of classifications. Whilst upward of 13 million people fish annually on the floodplains, only about 25% is totally dependant on fishing, usually because they are landless whilst the remainder are farmers who, with their families, do more or less fishing during the year and are more or less poor. Against this background the pattern of water and land use becomes critical and it is towards these people that the output was directed – to put them in the planning framework and to ensure a more inclusive and targeted delivery of services.

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*

These products are of a type which increases the efficiency and outreach of service delivery to the poor. The products have been in the public domain for some time and have entered the mainstream of tools available to fisheries mangers to produce better results from their fisheries, which typically are conducted by the poorest people and for donor agencies and planning institutions to assist in the targeting of services to the poor. With such broad-based tools, it is difficult to give specific numbers of poor people directly benefiting from them, but the prospect is enormous. More than 90% of people in sub-Saharan Africa live in major river and lake basins, and for the majority of these living within a rural economy even slight differences can have a big cumulative impact. Of the 120 million people in Bangladesh, at a density of 970/km^2 which extends throughout the middle and lower Ganges Basin (ie. India and Bangladesh), over 60% live on and derive benefits from the fish products of the floodplains across the country. The pattern is repeated in the Mekong Basin although densities are, as yet, lower here. Again, cumulative impacts can be enormous. However, the main strength of the products is to emphasise the inter-reliance of poor people on both fishing and farming or some other form of land-use. It is probably within this area that the value of the products could be extended into a proper integrated evaluation of all aspects of the needs of a poor families' livelihood particularly since, in river basins, the use of resources is a family rather than just a male-based activity.

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.

The environmental benefits of using these products are the ability to conduct a direct assessment of potential environmental impacts, both positive and negative. At the instigation of any process which affects the area or flow of water, a baseline of existing conditions and rate of production can be created from the databases and the most probable consequences of those changes can be predicted from the established relationships. Whilst in a detailed project implementation this preliminary assessment would be followed by detailed survey, where a number of potential sites for action have to be considered, use of the tools enables a rapid screening for gains and losses and losers and winners to facilitate targeting of actions. This can help the avoidance of unacceptable negative environmental impacts, and maximisation of the positive impacts.

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

None in itself. However, where a development is proposed, such as a dam, that is expected to have negative environmental impacts, these tools can help identify the expected impacts from different development options. This enables the best option to be identified, that minimises adverse environmental effects and their impacts on the poorest groups.

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)***

By enabling the creation of environmental, demographic and production baselines in river and lake basins, together with the predictive ability to estimate the order of magnitude of responses in relation to environmental, climatic or anthropogenic changes, the outputs can provide early warning of adverse effects on the dependent communities. This can reduce the vulnerability of poor people by factoring this into the planning cycle at the earliest stage and also help to suggest early means of mitigation. This would be particularly the case through support for food security.
