

DEPARTMENT FOR INTERNATIONAL DEVELOPMENT
STRATEGY FOR RESEARCH ON RENEWABLE NATURAL RESOURCES

NATURAL RESOURCES SYSTEMS PROGRAMME
FINAL TECHNICAL REPORT

DFID Project Number

R7600

Project title

An assessment of strategies for integrated crop management

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NRSP Production System

High Potential

Date

March 2001

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1. Executive Summary

This project assessed the feasibility of promoting integrated crop and farmland management strategies in rice-based farming systems in Bangladesh.

It has contributed to the DFIDs goal to develop and promote a suite of integrated management strategies that offer improved and sustainable benefits to the poor. As a short-term project, it informed research calls by both DFID NRSP and the DFID in-country bilateral project Poverty Elimination Through Rice Research Assistance (PETRRA).

To achieve uptake by organizations in Bangladesh that will be involved over the longer term in implementing integrated crop management (ICM) approaches this project streamlined its specific activities with relevant in-country projects/programmes and organisations. Working links were developed with the DFID funded project, 'Poverty Reduction Through Rice Research Assistance' (PETRRA) and one major local NGO, PROSHIKA. The project also consulted widely with organisations and individuals involved in ICM, from both technical and institutional viewpoints.

It was recognised that ICM research is relevant to the PETRRA research themes – 'farmer understanding and decision making in fertiliser management'. Both NRSP and PETRRA have drawn upon the findings of this study in planning future research calls and have established a basis for further collaborative research.

We used scored causal diagrams constructed with small focus groups of farmers to obtain insights into farmer's approach to crop management. These activities were undertaken at some of PETRRAs target sites. Additional consultations were undertaken with both the scientific community and intermediaries involved in ICM or related activities. A database was assembled of technologies relevant to ICM, drawn principally from Bangladesh and the surrounding region (the Indo-Gangetic Plains).

Our main findings were that:

- (i) Farmers are already practising elements of ICM, but that further development of ICM will require changes in the way in which scientists and extension workers interact with farmers.
- (ii) Better use of information tied up in existing technologies (by the various agents communicating with farmers) would aid implementation of ICM strategy.
- (iii) That considerable opportunity exists for improving the communication of information, concerning farmers needs, between farmers and those responsible for responding to their needs.

On the basis of feedback, we propose that development and targeted promotion of the database as a decision support tool for local professionals to access and uptake ICM knowledge.

2. Background

The need to improve the livelihoods of individual poor farmers whilst providing sustainable increases in agricultural production is widely articulated. A continuing shift from subsistence farming to production for markets is expected in Bangladesh, together with diversification in the range of agricultural products and increased levels of production. Given the nature of agricultural enterprises in Bangladesh, this shift will require integrated approaches to crop management.

Integrated crop management (ICM) commonly is defined in terms of a farm management approach. For example the British government defines ICM as “a whole farm approach aiming to provide the basis for efficient and profitable production which is economically viable and environmentally responsible” (MAFF, 1998¹). The MAFF definition suggests that ICM can be achieved by combining of crop rotation with the targeted use of crop protection chemicals and fertilisers, cultivation choice, variety selection and improved energy efficiency, together with a positive management plan for landscape and wildlife features.

Other terms, including ‘eco-farming’ (e.g. Gerber and Hoffman, 1998²) and ‘agro-ecology’ (The Economist, 2000³) have been used to describe a similar vision. Some have associated ICM (inaccurately) being associated by some with integrated pest management (IPM) - which focuses on improved plant health through improved soil fertility management and other cultural practices (UNL, 2000⁴) and even with organic or ‘biodynamic’ agriculture (De Lisle, 1999⁵).

Substantial effort has been made to develop technologies that are relevant to the cropping systems of Bangladesh and to compile information on these technologies. However, less attention seems to have been given to the means by which this knowledge is shared with farmers. The widely held assumption has been that with competent planning, transfer of technology and sound economic management alone would lead to improved livelihoods. This assumption led to a top-down approach in research and extension. However there is concern that farmers do not adopt technologies generated by scientists. By involving farmers in the technology development process it seems constraints to adoption can be overcome. In the light of the anticipated changes in the nature agriculture production, we proposed to assess these constraints in the context of ICM.

Initial meetings between NRSP and PETRRA (see NRSP trip reports Dec 1999, Jan 2000) confirmed the potential benefits of linkages between NRSP and PETRRA. The interest of NRSP in ICM complimented the PETRRA theme “*Soil fertility and crop management*”. The key areas identified by PETRRA within this theme were i) sustainability of intensive cropping systems and ii) farmer level knowledge.

In order to achieve these linkages, this project identified specific outputs and OVIs that would deliver a strategy for collaboration between DFID NRSP and PETRRA. PETRRA offered resources to support this project.

¹ MAFF (1998) News release: Farming in Harmony with the environment.

<http://www.maff.gov.uk/inf/newsrel/1998/981001b.htm>

² Gerber A and Hoffman V (1998) The diffusion of eco-farming in Germany. In: Röling NG and Wagemakers MAE (Eds.) Facilitating Sustainable Agriculture. Participatory Learning and Adaptive Management in Times of Environmental Uncertainty, pp 134-152. Cambridge University, Cambridge.

³ Economist (2000) A survey of agriculture and technology: Growing pains. The Economist March 25th 2000

⁴ UNL 2000 URL (2000) Integrated Crop Management. <http://ianrwww.unl.edu/ianr/triad/icm.htm>

⁵ De Lisle, L (1999) Green Fantasies. The Guardian (London), 18 June.

3. Project Purpose

This project assessed the feasibility of promoting integrated crop and farmland management strategies in rice-based farming systems in Bangladesh.

As a short term project, it informed a subsequent research calls by DFID NRSP and the Bilateral project Poverty Elimination Through Rice Research Assistance (PETRRA).

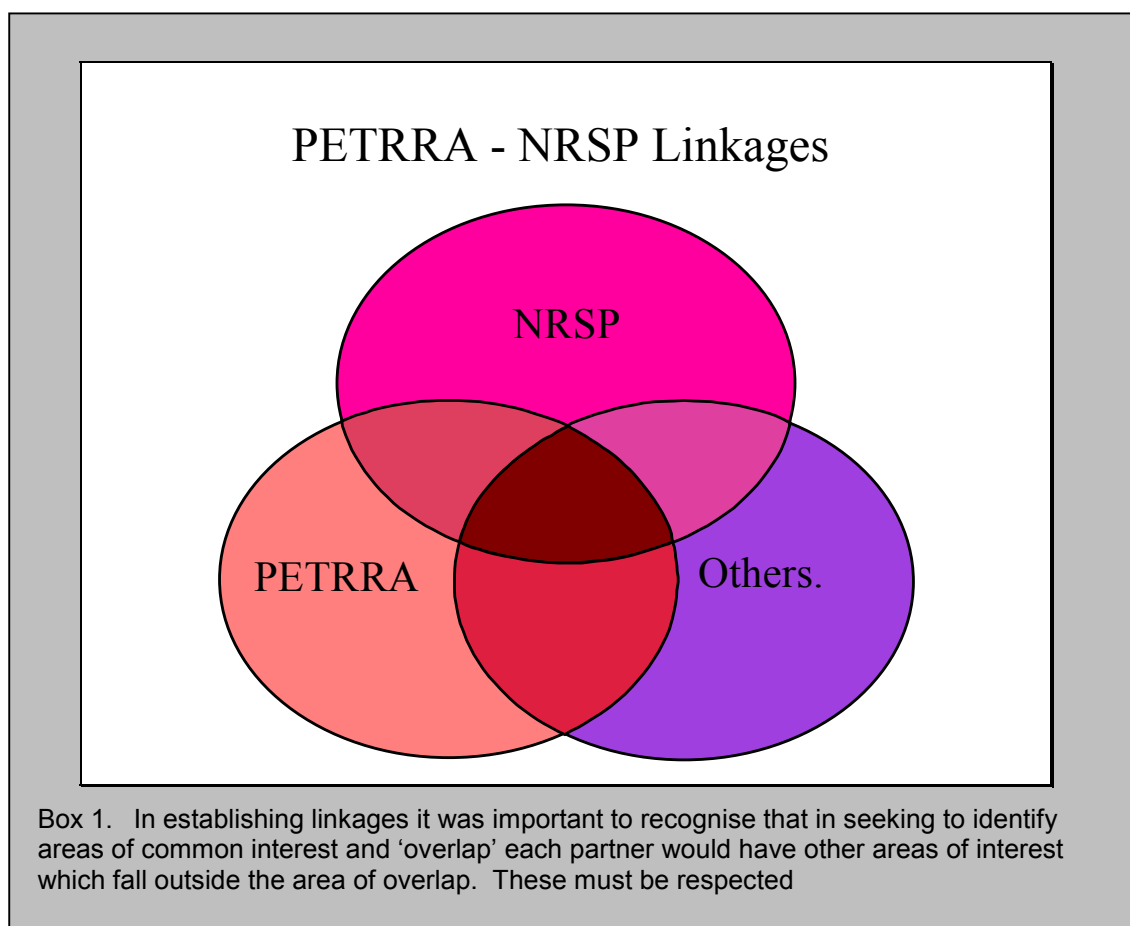
4. Research Activities

It was critical for this project to work closely with organizations in Bangladesh who will be involved the longer term in implementing ICM approaches in the longer term. The specific activities were streamlined to be compatible with relevant in-country projects/programmes and organisations. The activities contributing to each output are summarised briefly below and in detail in the relevant appendices.

1. Strategy for ICM research including modalities for involving stakeholders agreed by PETRRA and NRSP

Initial interactions between R7600 and the PETRRA manager recognised that partnership did not require complete overlap of objectives and priorities. Thus we identified areas of common interest between PETRRA and NRSP (Box 1) agreed that our involvement in ICM represented sufficient basis to move forward.

PETRRA organised a roundtable meeting of about 25-30 people to define a potential research strategy for PETRRA (Appendix 2). The meeting targeted participants who will probably be actively engaged in future research and included John Gaunt and Liz Robinson.



The two topics taken for discussion by PETRRA were i) sustainable nutrient management under intensive cropping and ii) farmer understanding and decision making in fertilizer management

To PETRRA, this meeting was important to bring the key research players in the soil fertility area together to achieve their buy in to a competitive funding arrangement. Also, it would define from the perspective of the scientists involved, a focus on researchable issues (Appendix 2).

To identify constraints at the site level PETRRA had initiated a series of stakeholder consultations at the village, thana and district level. NRSP scientists were invited as observers. We undertook a further validation of *farmer level knowledge* (Appendix 3) at 3 villages where PETRRA stakeholder consultations had been undertaken previously.

A draft copy of the R7600 synthesis review of findings (Appendix 5) was made available to both NRSP and PETRRA, and was used by NRSP and PETRRA in defining subsequent calls for research.

2. Modalities for implementation of ICM by PROSHIKA resolved

Activities 2.1-2.2 involved working with a local organisation to address in practice the feasibility of implementing an ICM approach. PROSHIKA a local NGO expressed interest in introducing an ICM approach in its work, and so together with the ICM project team, determined a strategy to undertake such an endeavour.

To resolve the modalities for implementation of ICM by PROSHIKA resolved we identifies three intermediary objectives:

- To determine a strategy for implementation of ICM at PROSHIKA;
- To establish PROSHIKA's requirements for ICM;
- To agree how to involve PROSHIKA staff in elaborating the modalities for implementation of ICM.

The extent to which these objectives could be met depended not only on achieving commitment from PROSHIKA management and staff, but also fitting the required activities into the relatively short timeframe of this project. Despite these difficulties considerable progress was made (Appendix 4).

The activities revolved, mainly, around meetings and discussions with key PROSHIKA staff. These meetings and discussions were held to ensure buy-in and ownership within PROSHIKA; and to understand how PROSHIKA's current activities fitted within an ICM remit, and the extent to which changes needed to be made to incorporate ICM into their organisation.

A preliminary meeting held with PROSHIKA initiated discussion on determining modalities for implementation of ICM. In this meeting the key implications of ICM on the structure and organisation of PROSHIKA were identified and a timetable for further activities agreed. It was important to move towards documentation by PROSHIKA of what ICM means to the organisation. It was agreed that a brief strategy document should be prepared as a discussion document to underpin further planned activities.

Insights into the potential implications of ICM for an intermediary organisation were gained from a roundtable discussion held by PROSHIKA to consider the opportunities offered to them by ICM.

3. Feasibility of technical and process related options for implementation of ICM assessed and validated

Initial in-country activities involved making contact with representatives of key institutions involved in ICM in Bangladesh. The following list of questions were used:

- What does ICM mean to the institution
- What written information is available
- What technologies are being used and what technologies do they feel are needed
- What approaches are being taken to promote these technologies to the farmers or to encourage adoption by farmers
- Where are projects located
- What are their links with other institutions practising ICM
- What are the origins of the technologies that are being promoted
- Who are upstream (eg. funders)
- Who are the downstream users (e.g. different farmer groups, NGOs etc.)

- Who would they recommend we talk with

Records of interviews with the Department of Agricultural Extension, ICLARM and CARE are available from IACR as project reports. Other interactions yielded material that was included in the synthesis review. By working with local collaborators we were able to identify local literature sources (grey literature and unofficial documentation).

Stakeholder consultation at village level

As part of PETRRA's research prioritisation process stakeholder consultations were undertaken at the village, thana and district level to identify priority problems. The aim of this PFM-based consultation was to complement the PETRRA stakeholder consultations and to explore farmer perceptions of ICM-related issues. It was implemented in three of the 12 Districts covered by the stakeholder consultations (Kustia, Rangpur and Comilla) and within those Districts in the same villages.

We used two techniques: the scored causal diagrams (SCD) and the participatory budgets (PB). The SCD is based on flow-charts, with the important modification of a scoring procedure. It helps to examine in detail the causes, and effects, of problems and to identify root causes that need to be addressed. The scoring enables the *relative* importance of particular problems and their causes to be analysed. The participatory budget is based on a grid in which the columns represent time-periods and the rows seasonal activities, inputs and outputs. Entries in each cell of the matrix thus amount to a report on particular features of the farming cycle in relation to a given time period (in this case the months of the Bangla calendar).

The PB is used for identifying resource-use patterns (including e.g. labour peaks) and critical seasonal points (for e.g. water availability, pests, diseases). In constructing a PB with a group of farmers, it is possible to use a single farm (say that of one of the participants) as a 'case-study', or to construct an 'average' budget for a given size of enterprise. Participants in all the locations chose the second of these options. This highlighted the importance that members of a group constructing a participatory budget should be homogeneous. For the scored causal diagram also, the more homogenous the group, the closer can the experience of members be expected to be and the more coherent the SCD generated by the group. It was also discovered that a group of 5-7 participants worked well in applying the two PFM techniques used. In the first location 12 farmers formed the group, and this was felt to be rather large to be facilitated effectively.

These village workshops were used as case studies related to ICM that are carried forward to a workshop with intermediary stakeholders.

Intermediary workshop

Representatives of intermediary organisations were invited to a half-day roundtable meeting co-hosted by PETRRA at the IRRI office. The reason for targeting intermediaries was to build upon the dialogue undertaken by PETRRA, which had involved mainly representatives of the research community. Key institutions invited included:

- National/international NGOs; such as CARE International, PROSHIKA
- Local/regional NGOs
- Extension; such as DAE, FMS (DFID), FAO farmer field school
- Research institutions; such as BRRI, IRRI, BARC, BARI
- "Other;" such as FORAM (network)

A full list of participants and summary of the output of the meeting are available as a project report from IACR. The meeting started with an introduction to the project followed by clarification questions. Tawheed Reza Noor, who had facilitated the village level activities, presented a summary of the findings from the village level consultation.

The group then identified important issues in the context of ICM. Each participant was invited to put forward an issue (using cards). These were grouped and discussed round the table before a final discussion address how intermediaries:

- Identify options?
- Deliver them to farmers?
- Ensure sustainability?

The synthesis review produced by this project was circulated to all individuals who contributed to the project

ICM database design

Information was initially compiled as an MS Excel and Endnote database. These were interrogated as required during the preparation of the synthesis review etc. We subsequently developed the database for publication in MS Access.

A meeting was held at IAC in Wageningen to discuss the database development. From IAC-KIM Frans Neuman, Ruud Crul and Jetty Bruggeman participated in the discussions John Gaunt and Stephanie White.

Discussions opened with introductions of database activities within each organization and then focused on the design and use of ICM databases (scope, type of data, content, and search criteria). Discussions with respect to database use also dealt with possible future links with existing web-based information systems WISARD and INTERDEV.

An early version of the ICM database, which was demonstrated to the NRSP Programme manager in early December. Based on feedback we further developed the database structure prior to transferring data from the MS Excel database.

Feedback on ICM synthesis review and ICM database

A final visit to Bangladesh was made by Stephanie White and John Best in March 2001, with the following two aims:

- to obtain feedback on the ICM synthesis review (which was sent to participants in the intermediary workshp at PETRRA/IRRI
- to demonstrate the demo version of the ICM database to potential users and obtain feedback

Meetings were held with staff of PROSHIKA of ASIRP/DAE, and with a group of BARI and BRRI scientists. A separate workshop was held for intermediary organisations to which participants in the intermediary roundtable workshop were invited, (in the event a smaller number attended). Detailed notes of all meetings and a summary of the feedback on the database are available at IACR as a project report.

Feedback on the synthesis review and information gathered during this visit on some institutional developments since mid-2000 have informed the review of Outputs (section 5 below).

5. Outputs

The research results and products achieved by this project are summarised below against the outputs as specified in the project logframe.

1. Strategy for ICM research including modalities for involving stakeholders agreed by PETRRA and NRSP

PETRRA and NRSP agreed to commission linked research. It was recognised that ICM research is relevant to one of PETRRA's research themes – *'farmer understanding and decision making in fertiliser management'*. Both NRSP and PETRRA have drawn upon the findings of this study in planning future research calls and have established a basis for further collaborative research (Appendix 6).

As the project cycle of PETRRA and NRSP were in coincidence, it was agreed that NRSP could support the UK component of research projects where in country activities are supported by PETRRA. Box 2 below summarises the elements of the strategy.

Box 2. Elements of synchronised call process for paired proposals:

1. PETRRA and NRSP agreed to synchronise calls (PETRRA call at appendix 6)
2. PETRRA and NRSP issue separate calls – specifying objectives for UK technical expertise and an in-country component. This allows independent screening procedures but with involvement of NRSP / PETRRA respectively.
3. NRSP reviews PETRRA concept notes and project memorandum documents
4. NRSP / PETRRA agree to support inception period to build site level partnerships

2. Modalities for implementation of ICM by PROSHIKA resolved

PROSHIKA recognised that ICM provided a mechanism to integrate their programme-based activities (Appendix 4). However, concerns were raised during discussions with staff at PROSHIKA that ICM implies a more complex system for delivery of technologies to farmers. Indeed, PROSHIKA assumed that ICM would require re-organisation to develop a management structure with appropriate disciplinary integration. PROSHIKA recognised that if they were to take forward ICM further consideration of the implications to the organisation would be required.

Recent feedback from PROSHIKA (March 2001) suggest that PROSHIKA is increasingly confident that ATTP (the Agricultural Technology Transfer Project) represents an integrated approach within the (existing) Natural Resources Programme of PROSHIKA. Thus those consulted suggest that it may not be necessary to change structures to achieve integration. Apart from the ATTP, there is already a good degree of integration between PROSHIKA's Natural Resources programs, with any section able to call upon expertise from others. Hence a multi-disciplinary team with the capacity to implement ICM exists already.

3. Feasibility of technical and process related options for implementation of ICM assessed and validated

The main findings were:

- Farmers are undertaking elements of ICM, but further development of ICM will require changes in the way scientists and extension workers interact with farmers.
- Better use (by the various agents who are involved in communicating with farmers) of information tied up in existing technologies would aid implementation of an ICM strategy.
- That considerable opportunity exists for improving the communication of information, concerning farmers needs, between farmers and those responsible for responding to their needs.

ICM Database

The database produced contains information on ICM in rice based cropping systems. Technologies are drawn principally from Bangladesh and the surrounding region (the Indo Gangetic Plains).

The database categorises information using 4 broad technology groups:

- Commodity
- Production or cropping system
- Practice/ Technique
- Equipment

Each technology entered in the database is assigned one of the following validation levels:

- Validated in country (by farmers), pre-requisites for large-scale implementation are understood and in place.
- Validated in country (by farmers), but where specific logistical factors currently limit uptake.
- Validated (by farmers) in region under similar environmental conditions.
- Non validated i.e. developed/tested under research conditions but not yet validated.

The database is non linear in structure. Users may search using the technology group and / or validation level combined with a number of pre-defined keywords / categories. At each stage free keyword searches are also available. The database and manual are attached (Appendix 7)

During March 2001 the database was demonstrated (separately) to the following organisations and the Demo-Version was left with ASIRP (Gul Hossain), PROSHIKA (Dr Zahid Hossain), Soil Science Department, Dhaka University (Dr Elahi) and BIRRI (Dr Panullah). A copy was also left with PETRRA (Noel Magor), although no demonstration was made.

We found that none of those examining the database were very familiar with using a searchable database and thus were not able to give critical feedback on the structure on the initial presentation. Despite this it was suggested that the simple structure of the database meant that those who were interested would be able to interrogate it, but that putting more records into the database would require some training.

Both Dr Zahid Hossain and Dr Gul Hossain subsequently tried the database out and provided feedback to the group at the meeting of intermediaries. Zahid had problems with opening up the database. He noted that the database is similar to a one set up on credit programs by another organisation and he felt such a database could be quite useful. He did not however elaborate on how it could be used within or by PROSHIKA.

It was suggested that the database currently lacks information on indigenous technologies and that using the validation level it should be possible to capture this⁶. Gul Hossain, felt that there should be sub-categories under the Commodity category⁷. He also felt additional sub-categories under Practice/ Techniques would be required.

Frank Joosten (ASIRP) felt the database required an interface for farmers, extension workers and scientists to use it. The group also felt that it was important to enable feedback on technology validation to be entered. The intermediary group felt that the database could be used in a bi-directional or dynamic way at the field level as well contributing to a dynamic

⁶ Further discussion centred on where this information might be found. BARC were only able to give PROSHIKA a list of 60 indigenous technologies when they were setting up ATTP, but PROSHIKA were aware of far more indigenous technologies being available.

⁷ WISARD and INTERDEV have similar sub-categories to those suggested, e.g. oil crop, cereals, medicinal, etc. This could be incorporated but would require some re-structuring of the criteria form and both the SEARCH and ADD/EDIT form to account for the extra sub-categories.

interaction between different Institutes, agencies, etc.

Further, it was discussed that the database could provide an efficient means to overcome problems that currently exist at the field level. Block supervisors (DAE staff) have few or no materials to explain, teach farmers and are rarely kept informed of new innovations and when pest, disease, mis-management problems arise they do not have the information or resources to help farmers overcome them. It was felt that the database could provide a means to improve access to information.

6. Contribution of Outputs

The assessment of the feasibility of ICM, for one target country, formed the basis of a subsequent research call by NRSP-HP and the in-country bi-lateral project PETRRA. Further, the project has raised awareness in target institutions of ICM.

Dr. Zahid Hossain presented the work of PROSHIKA and ICM at a regional conference in Hisar, India, the Crop Protection Programme (CPP) supported two further participants. The presentation drew on the findings of projects R7600 and R6751 as well as the CPP project A0804. In addition to the presentation, a paper will be published in the Journal of Applied Sciences and Environment which is being launched by the International Society for Nature Farming.

The project leader has been invited to make a presentation at the American Society of Agronomy meeting based on the ICM Synthesis review.

We have also been invited to submit a chapter to a book to be published by the American Society of Agronomy (deadline for submission 20th October 2001).

The ICM Synthesis review, ICM database and manual will be made available via the IACR Rothamsted web site (site under revision).

Plan for dissemination of ICM database

Based on existing feedback on the ICM database, we propose promotion and development of the database as a decision support tool with which local professionals can access knowledge on ICM. However, based on our assessment of the current capacity in Bangladesh it will be important to promote the ICM database in a targeted way, identifying organisations that already use databases or more importantly, where personnel are receptive to the use and development of computer databases.

We believe that this strategy enable us to build awareness amongst other potential users of such tools. Based on the findings of this study we have identified the following potential users in Bangladesh:

- Incorporation into the (new/updated) extension curriculum of BAU, Mymensingh
- Establish link or collaboration with key leading international agencies (e.g. CARE) or national agency such as PROSHIKA
- DAE - 12 thana integrated extension initiative

To be used in the way we propose the database will require further development. In particular it will be necessary to develop an appropriate interface that supports the interactive use of the tool. In order to achieve efficient development and ownership of the database we propose involving local professionals in the further development and evaluation of a decision support interface. We suggest that the necessary programming and manufacture could be undertaken in either Bangladesh or India.

The underlying structure of the ICM database is compatible with the structure of the WISARD and the EU INTERDEV databases being developed by IAC-KIM. The WISARD database underpins the management databases being developed by the Rice Wheat Consortium for the Indo-Gangetic Plains (RWC). Thus our key target institutions to achieve regional promotion was through the RWC and IAC-KIM. We have provided copies of the ICM database to both the RWC and IAC-KIM for evaluation.

We anticipate that further development of the database as a decision support tool may be undertaken with international development funds – possibly in partnership with the DFID NRSP programme.

7. Publications

Gaunt, J., Best, J., Hossain, Z., Norrish P., Robinson, E., Sutherland A. and White, S. 2000. *The feasibility of Integrated Crop Management in Bangladesh.* Harpenden, UK. IACR Rothamsted [unpublished report]

White S. 2000. *Integrated Crop Management Database.* Harpenden, UK. IACR Rothamsted [unpublished executable database and manual]

8. Internal reports

- Report 1 Notes of interviews with staff from Department Agricultural Extension, ICLARM and CARE – available IACR Rothamsted
- Report 2 Notes of ICM intermediaries roundtable meeting, including list of invitees – available IACR Rothamsted
- Report 3 Report of feedback on ICM synthesis review and ICM database – available IACR Rothamsted
- Report 4 Trip report of Hisar conference – awaited

9. Appendices

- Appendix 1 Equipment inventory
- Appendix 2 Invitation to and proceedings of PETRRA mid-level planning day on crop management issues
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