

## Node: Suite Summary<sup>1,2</sup>

### **Bangladesh Suite 2: Improved pro-poor information services for NR-based livelihoods**

#### **Context**

In Bangladesh millions of people, the majority of whom are poor, rely for their livelihoods on access to and use of the land and water resources of the floodplain that covers most of their country. For those with access to land, farm size per household is characteristically very small (less than one hectare). Moreover, the land to which the poor have access has a high risk of flooding which affects timeliness of cropping activities, particularly the production of rice that is linked with the summer monsoon wet season.

Over recent decades, Bangladesh has achieved national sufficiency in the main food staple, rice, with the majority of the increased national production coming from the small-scale farming sector. Expansion of irrigation was an important factor in achieving this increase as it enabled much greater rice production in the (non-monsoon) spring season (locally termed *boro*). In the *boro* season, levels of solar radiation are high such that higher rice grain yields can be achieved than in the monsoon season. Changes in annual cropping patterns accompanied the expansion of *boro* rice, characterised mainly by the loss of crop diversity in the winter season. In particular, legume food crops became less common.

This marked change to irrigated *boro* rice production and reduced diversity in annual cropping patterns prompted national policy-level concerns regarding the sustainability of the floodplain rice-based farming systems. Through national level interaction with the donor community, this concern was channelled to the research priority setting undertaken for DFID's central research programme in the mid 1990's. NRSP was assigned to take the lead in such research within the research agenda of the high potential production system. The initial research priority was integrated crop management (ICM) because this was considered to be the best option for sustaining crop and farmland productivity. However, research on rural services was also seen as important, with the aim that services should be better able to support small-scale farmers' endeavours for greater rice production including better management of the lands on which this production relies.

The emphasis on pro-poor livelihoods that was absorbed into research planning in the late 1990's following the UK government's 1997 White Paper 'Eliminating World Poverty' added weight to the importance of research on rural services. How such services could meet the information needs of the poor to help them to build their livelihoods as well providing a conduit for productivity-enhancing technical information became the central focus and rationale of Bangladesh Suite 2. In addition, both research thrusts (ICM and pro-poor rural services) were considered to be relevant to the vast irrigated lowland production systems of South Asia. For this reason, links were developed with the Rice-Wheat Consortium (RWC) for the Indo-Gangetic Plains whose membership covers the national agricultural research systems of South Asia.

---

<sup>1</sup> This document summarises NRSP's work in one of its uptake promotion node: suites. For further details and links to project and project documents see <http://www.nrsp.org.uk/6.aspx>

<sup>2</sup> This document presents research funded by the UK Department for International Development (DFID) for the benefit of developing countries. The views expressed are not necessarily those of DFID.

## Research Topics

- What are the major components of nutrient fluxes in cropping cycles that include *boro* rice, where floodplain soils are managed by application of either chemical fertilisers with some organic residues (farmers' practice, CONV) or only organic residues (eco-farming method, ECO)?
- Are there measures of soil characteristics or processes that are low-cost and easy to use that could be routinely used as indicators for detecting trends of change in soil nutrients and more generally in soil quality (functionality)?
- Based on the findings for nutrient budgets and soil indicators, what soil and crop management practices, and soil monitoring methods can be recommended for use by resource-poor small-scale farmers to assist them to both increase soil nutrient reserves and ensure sustainable production of their rice-based cropping systems?
- What is the technical and institutional feasibility of promoting integrated crop and farmland management strategies for rice-based farming in Bangladesh?
- Is there potential to use electronic information databases on integrated crop management initially at a near-grassroots level, as a means to improve downstream information provision and access for poor farmers?
- What are the information needs of poor small-scale farmers living in the Bangladesh floodplain including the topics which they prioritise as most relevant to their livelihood improvement?
- In the context of information needs which the poor identify, what mode of rural service provision is the most efficacious for enabling them to have access to this information?
- What are the key elements of a viable improved method for provision of pro-poor rural services?

## Projects

Three projects comprise this node: suite: R6751 (Soil fertility and organic matter dynamics in floodplain rice ecosystems, 1996-2000); R7600 (An assessment of strategies for integrated crop management, 2000); R8083 (Strengthened rural services for improved livelihoods in Bangladesh, 2001-2005).

R6751 was undertaken by soil scientists based in the UK and Bangladesh and a major Bangladeshi NGO. This NGO was actively promoting the use of organic residues rather than chemical fertilisers for rice production because of concerns that: (i) resource-poor farmers should not be over dependent on the purchase of chemical fertilisers; (ii) these inputs could jeopardise the quality (functionality) of the soil for rice production in the conditions of the Bangladesh floodplain ecosystem. As a basis for developing improved soil and crop management methods, the project conducted detailed studies of nutrient pools and flows and used the data collected to compile nutrient budgets for the annual cropping cycle in farmers' fields, with detailed attention to the *boro* rice crop. Fields where the main source of nitrogen (N) and other nutrients was either chemical fertilisers with some organic residues (CONV) or organic residues only (ECO) were compared. An additional aspect of the study was to develop measures of soil characteristics or processes, requiring relatively simple analytical procedures, which could be used as indicators of soil quality. The aim was that these indicators could be used as practical tools to assist farmers' decisions on soil and crop management. The research was conducted in farmers' fields at four sites in the Bangladesh floodplain over two years. The sites were chosen to cover a range of soils and agro-

ecosystems. The farmers' fields selected as representative of the ECO regime had only organic residues applied for at least three years prior to the R6751 studies

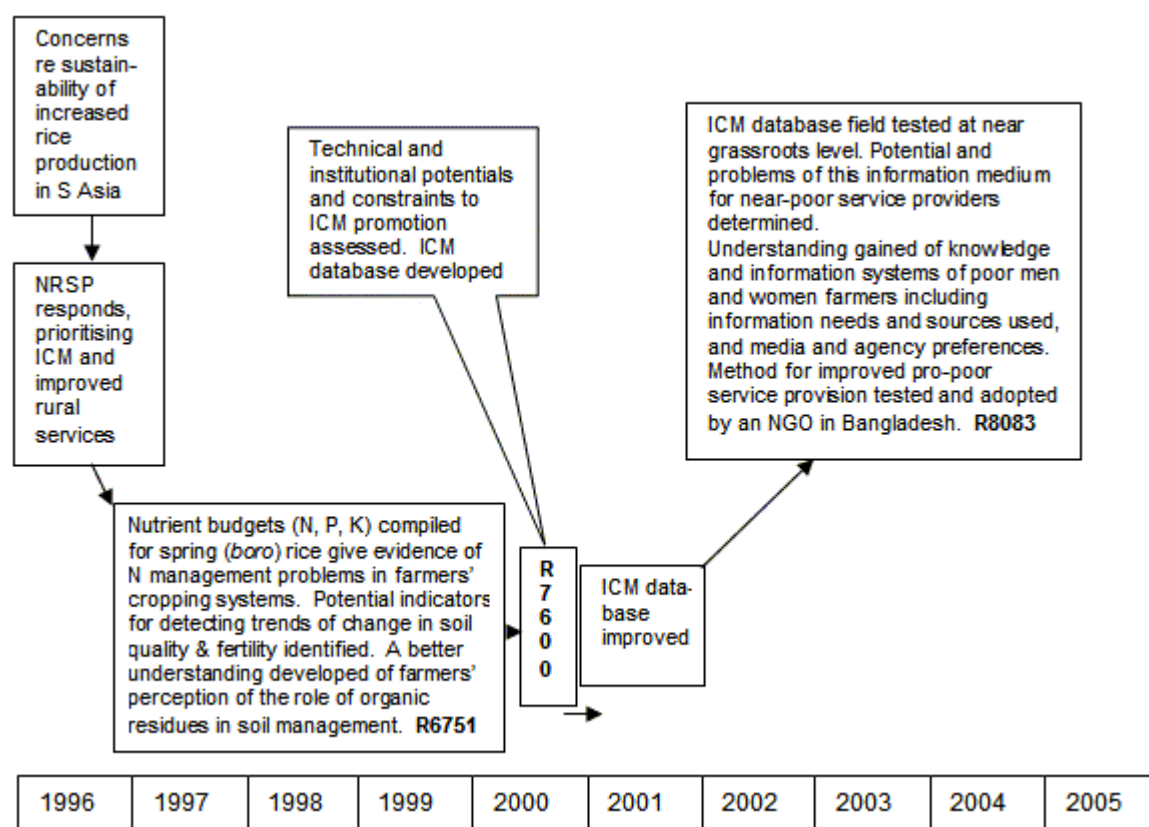
R7600 was a short-term project that assessed the feasibility of promoting ICM in Bangladesh. In deciding to commission such a study, the NRSP research managers argued that a substantial bank of knowledge (in a wide range of published literature) on principles and recommended practices for good soil management in rice-based production systems already existed in the South Asia region. Therefore, emphasis should shift to developing strategies that could best support the wider application of this knowledge, with an emphasis on those strategies that were most relevant to the circumstances of poor farmers. The project established links with a DFID-funded research project in Bangladesh (Poverty Elimination through Rice Research Assistance, PETRRA and continued to work with the NGO who had been a partner in R6751. In the context of the national research and extension system of Bangladesh, the research on the feasibility for ICM was conducted through three main areas of work:

- a) Assessment of the status of technical information relevant to ICM and its progress in terms of delivery at research, extension and farmer levels. An electronic (ICM) database was developed to collate these various findings and was further developed to a client-friendly version after R7600 was completed.
- b) Study of the institutional knowledge, attitudes and practices of organisations that should be involved in the promotion of ICM such as relevant Bangladesh research institutes, universities and government and NGO extension services.
- c) Interaction, through participatory methods, with a sample of farmers to gain some understanding of their management concepts and practices that had a bearing on the feasibility of ICM adoption. The work made use of participatory methods developed in an earlier project in the DFID Socio-economic Methodologies programme.

R8083 built upon the findings and organisational links of R7600. It had two main research areas:

- a) To assess the potential of the ICM database (see R7600a above) as a tool for use by field extension agents and others working at a near-grassroots level. R7600 had established that there was demand for such a tool both from NGOs and the government extension service. R8083 aimed to promote use of the database nationally and regionally as well as stakeholders' involvement in its further development.
- b) To study the knowledge and information systems (KIS) of poor men and women significantly dependent on farming, including their information needs, their experiences of obtaining information to meet these needs, and their preferences for accessing information in respect of suitable media and communication agencies. The understanding gained was then to be used to design and pilot test a method for improving service delivery by grassroots service providers. Through links with PETRRA, two NGOs working in the northwest and northeast regions of Bangladesh were partners in this work.

## Project links within Bangladesh Suite 2: 1996-2005



## Outputs

### Findings

R6751. Although rice grain yields overall were higher in the second year than in the first, yields were similar for the ECO (eco-farming) and CONV (farmers' practice) regimes. Irrespective of the soil management regime, N budgets were negative, with crop uptake and other causes of N output exceeding the N supplied by either the CONV or ECO practices. Relatively low N use efficiency (10-20% recovery in rice grain and only 20-30% recovery in rice grain and straw) was identified for both regimes. Under both regimes a large amount of mineral N, available after winter (*rabi*) production of non-rice crops, was lost when soils were flooded prior to their preparation (puddling) for *boro* rice. In the CONV regimes, additional large N losses occurred at an early stage of rice crop growth from volatilisation of N applied as urea. In contrast to N, the phosphorus (P) and potassium (K) budgets for *boro* production were more favourable, with outputs generally matching inputs. In several instances there was a positive balance. Both soil analysis results and crop performance indicated that the soil organic matter reserves of both the ECO and CONV management regimes were significant nutrient pools but sustained attention to incorporation of residues is necessary to mitigate nutrient losses, especially N.

With regard to indicators of soil quality, it was found that bulk density (that is a low-cost and simple measurement) was the most consistent indicator for differentiating soils that farmers managed under either the ECO or CONV regimes. This measure was able to discriminate between ECO (lower bulk densities) and CONV regime soils in three out of the four experimental sites, even in cases where the conversion to ECO was relatively recent (3-5

years). Other soil attributes (soil organic matter content determined as total carbon (C) content; soil buffering capacity and reaction, determined respectively as cation exchange capacity (CEC) and pH) were higher in some ECO soils but, compared with soil bulk density, they were not as consistent for differentiating the ECO and CONV soil management regimes and their measurement was more costly and complex. An additional finding was that farmers associated lower bulk density soils, arising from their application of organic residues, with better soil texture resulting in a more workable soil. In discussions, they did not prioritise residue application as a means to improve soil fertility. Rather, they recognised and valued its benefits to their ploughing and rice planting practices. Soil microbial biomass and activity (basal respiration) were compared in ECO versus CONV soils, using samples taken from farmers' fields. While each attribute was found to be highly variable irrespective of the farmers' soil management regime, a derived measure – the respiratory quotient calculated as basal respiration per unit microbial biomass – was less variable and was consistently higher in ECO compared with CONV soils. It was suggested that this could indicate greater abundance of respiratory substrates in ECO soils. Although more complex to determine than bulk density, only simple equipment is needed to measure soil microbial biomass and basal respiration suggesting that these measures and the derived quotient had potential as indicators of soil organic matter status.

R7600. Through assessing the current (2000) perceptions of ICM on the part of bio-physical research scientists, extension agents in various GO and NGO organisations and farmers in Bangladesh, R7600 identified institutional and technical linkages and blockages in the information pathway between farmers, extension agents and research scientists. Major factors that undermined communication on ICM were:

- The institutional separation of research disciplines and the professional distance this created between their various research activities.
- The delivery of subject specific technical information with limited consideration of any trade-offs that might be made when adopting the recommendations it contained. In contrast, evidence was found of farmer decision-making based on evaluation of trade-offs between the options available to them.
- The difficulties for extension agents of adapting this information to suit different farmers' circumstances.

R8083. Based on interaction with a sample of stakeholders from various relevant organisations over eight months, R8083 established that targeted stakeholders realised the potential of the electronic ICM database as a tool for improving near-grassroots information services. However, there was no sustained use of the tool by the end of the project period. Inexperience in database use was a major limiting factor.

The KIS study of R8083 established that poor people were largely dependent for information on a narrow range of sources and faced serious gaps in access to information on topics that they identified as important to their livelihoods. These topics included rice – the staple of national importance – but ranged more widely than agriculture even though this was the basis of most people's livelihoods. The responses of those surveyed showed that poor people inter-relate their information needs for crop and livestock production with other aspects of their livelihoods. This included information on markets and credit, and in a wider livelihood context, health matters such as access to vaccination services for children. These findings applied to sample villages where the partner-NGOs were working as well as to those without such services. Common criticisms were that information was not always clear, was often incomplete or not useful, and channels of information were not always accessible. Other

important findings were that: (a) face-to-face means of accessing information were valued well above media-based communication methods; (b) time constraints limited many poor people efforts to seek out information; and (c) many were concerned about rejection or being ignored if they went to government offices to request information on such things as available credit services.

The participatory learning and appraisal (PLA)-based method used for the KIS study was strengthened by ensuring that its structure would provide statistically significant results. Attention to this dimension generated new knowledge on how to add this design feature to PLA-methods. The modified PLA-method delivered defensible findings that could be promoted with confidence with both service providers and relevant policy-makers.

The findings of the KIS study were used to design a better method for information service provision to poor people which each partner NGO then pilot tested in their respective region. There were three key guidelines for design of the method:

(1) The NGOs accepted that they should not be prescriptive. They should not try to second guess what poor people wanted and promote their own field development programmes, as was the case before their exposure to the KIS study findings. Rather, they must help people to identify and prioritise their own information needs. Group meetings were used for this stage, with careful attention to obtaining the views of poor men and women and not allowing less poor people to speak for them.

(2) The NGOs recognised that they needed to devise ways to help poor people to make contact with providers who could meet their information and service needs. This was especially important for areas that the NGOs themselves could not readily cover. The NGOs achieved this by arranging for relevant service providers to attend farmers' meetings as a precursor to farmers' representatives visiting a relevant service provider. In this way, the NGOs enabled links to come into place with a range of service providers.

(3) The need to monitor experiences in using the new method was recognised as important in order to assess progress and use findings to refine the method. A short report form was designed for this that was then used for evaluation of the pilot testing phase by the NGO staff engaged in the pilot testing and their line managers.

As the pilot testing of the pro-poor non-prescriptive service method progressed, it was found that the information and services that poor men and women accessed led to some favourable livelihood outcomes, even within the timeframe of the project. Farmers' feedback indicated that they had gained confidence to visit offices and contact the necessary officers to collect information and/or obtain other services. Specific examples are: in the NW region, poor women obtained training in poultry vaccination and were then able to earn income by offering a poultry vaccination service in their villages; in the NE region young people generated income from sewing and tailoring after receiving relevant training from the Youth Department. An additional outcome was that the NGO staff who implemented the pilot testing became more knowledgeable about services from other providers. This made them better resource persons for improving poor people's access to existing rural service providers. It also was found that the new method of service provision still provided service providers with opportunities to make farmers aware of technologies that might be relevant to them. The key was that promotion of these technologies was not the driver of service provision, rather exposure to new technologies was integrated into poor people's access to information.

Within the life of the project, one partner NGO proceeded with the integration of the main features of the method into its field programmes which included adoption of the method (staff report form) for monitoring and evaluation of field work. This action indicated that the method was both adoptable and recognised as relevant to organisations with pro-poor missions for rural development.

### *Research messages*

- Use of organic residues can achieve *boro* rice grain yields that are comparable to those from applied chemical fertilisers under farmers' production conditions in the Bangladesh floodplain.
- The problems in rice production of low N use efficiency and N losses that arise other than through crop offtake are already reported for rice-based cropping systems in published literature. The knowledge-contribution of R6751 is that it generated data that provided evidence that these problems occur in *boro* rice under farmers' crop production conditions in Bangladesh.
- Based on these two main messages, technical recommendations for *boro* rice production can promote the use of organic residues and should also include recommendations for improving N use efficiency and reducing N losses. However, interaction with farmers during the fieldwork of R6751 indicated that blanket recommendations do not help farmers to understand their cropping system and evaluate options in their production practices. In this regard, nutrient budgets, and resource flow diagrams based on these budgets, have potential as tools to help extension agents and farmers explore options for change to their soil and crop management regimes.
- Although the research on soil management did not identify any simple direct indicators of soil nutrient status, soil bulk density was shown to be a useful comparative measure for differentiating soils under the CONV and ECO regimes with corresponding lower and higher organic matter contents. Bulk density can be determined by a low-cost, simple method and has potential for comparative use in soil assessments in farmers' fields.
- Farmers' perceptions of the benefits of applying organic residues to soils are not primarily linked with fertility management. They see that improvements in soil texture are advantageous for land preparation which eases their workload. Service providers (GO and NGO) need to be more aware of such facets of the role of organic matter when promoting technical messages on soil fertility management.
- Research and extension information needs to be better aligned with the integrated nature of farmers thinking and actions. There is a need for service providers to be more responsive to the circumstances of poor people's lives and the integrated way in which they handle their decision-making on farming as a key component of their broader livelihood portfolios.
- Electronic information sources could assist the work of near-grassroots service providers. However, for successful adoption, time must be allocated for skills development including hands-on training and technical backstopping over a longer rather than shorter period.
- The dimension of statistical rigour can be incorporated into PLA-methods without making onerous demands on skill requirements, time inputs and budgets and have the benefit of providing findings that can be promoted with confidence.

- Gender sensitive pro-poor multi-sectoral services that can include promotion of ICM are feasible in terms of staff resources and budgets for grassroots service provision institutions and other government, non-government and private service providers that link with grassroots organisations. Key features of such services are that time must be given to enabling poor people to express their views on their needs, and service provision must then be responsive to these expressed needs (rather than to supply-side driven assessments of need). Such pro-poor services can engender favourable livelihood changes in a near-term timeframe.

### *Key research products*

#### Final Technical Reports

- Rother, J.A. 2000. *Soil fertility and organic matter dynamics in floodplain rice ecosystems in Bangladesh*. Final Technical Report for project R6751. Chatham: Natural Resources Institute. 305 pp.
- Gaunt, J. L. 2001. *An assessment of strategies for integrated crop management*. Final Technical Report for project R7600. Harpenden, UK: IACR Rothamsted. 16 pp. plus Appendices.
- White, S., Best, J., Abeyasekera, S., Huda, E., and Norrish, P. 2005. *Strengthened Rural Services for Improved Livelihoods in Bangladesh*. Final Technical Report for project R8083. Harpenden, UK: Rothamsted Research. 185 pp plus CDs, posters, leaflets.

#### Other key products

- White, S.K., Hossain, M.F., Sultana, N., Elahi, S.F., Choudhury, M., Sarker, S., Alam, Q.K., Fortune, S., Rother, J. and Gaunt, J.L. 1999. Nutrient budgets - Can farmers use them? Paper presented at tenth nitrogen workshop. The Royal Veterinary and Agricultural University, Copenhagen, Denmark, August 1999.
- 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 41 pp. (R7600).
- White, S.K., Hossain, M.F., Sultana, N., Elahi, S.F., Choudhury, M.H., Sarker, S., Alam, Q.K., Rother, J.A. and Gaunt, J.L. 2001. *Low-input ecological rice farming in Bangladesh*. In Rees, R.M., Ball, B.C., Campbell, C.D. and Watson, C.A. (eds). *Sustainable Management of Soil Organic Matter*. Wallingford: CABI Publishing. Pp. 201-206. (R6751).
- White, S.K. 2001. *Integrated Crop Management Database*. Harpenden, UK: Rothamsted Experimental Station. MS Access, CD. (R8083).
- White, S. 2001. *Integrated Crop Management Database: Users Manual*. Harpenden, UK: Rothamsted Experimental Station. 66 pp. (R8083).
- Huda, E. 2004. *Communication and Information Flow at Grassroot Level: Training Manual and Users' Guide*. (Bangla) Dhaka, Bangladesh: PRA Promoters' Society. 18 pp. (R8083).

### **Impacts**

- All the participating organisations in R6751 became much more aware of the biophysical variability of farmers' fields and farmers' capabilities to assess the efficacy of soil management practices in the context of their farming system. Linked

with this, these organisations also recognised that promotion of improved practices for ICM needs an interactive participatory approach.

- Service-related stakeholders expressed a demand for use of an electronic ICM database, mainly because they recognised the potential for this tool to improve their capacity to provide inter-relational information on the topic of ICM.
- The need for development of the skills of serviced-related stakeholders to utilise electronic-based tools militated against its adoption and further development within the timeframe of the project.
- Through careful attention to communication between project partners on the findings of the KIS study, two NGOs agreed to pilot test an improved method of service provision for the poor and one took a lead in designing the main features of this improved method.
- At least one NGO that was a partner in the project recognised the significance of the KIS findings and took steps to internalise these findings in the organisation's mode of working.
- After the pilot testing of the pro-poor service method, mini-case study findings indicated that poor people had achieved human capital gains through training (related to their demand) and confidence building which enabled them to be pro-active in articulating their demands to relevant service providers. Moreover, some poor people reported beneficial enterprise development linked with this human capacity building.
- At least one NGO (with strong links to the national NGO community and the tertiary agricultural education system in Bangladesh) adopted the method that the project pilot tested for improved provision of pro-poor rural services.

### **Further work**

Further uptake promotion of the pro-poor rural service method was planned to take place in Bangladesh post-project R8083. Monitoring and evaluation of the livelihood outcomes and impacts arising from the institutional adoption of the pro-poor service method and possible wider institutional uptake might provide a body of evidence that could be used at a national policy level for strengthened service provision to the poor in Bangladesh and elsewhere in South Asia.