

**NATURAL RESOURCES SYSTEMS PROGRAMME**  
***FINAL TECHNICAL REPORT***

**DFID Project Number**

R7000

**Project Title**

More from less - Better water management

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**Organisation**

University of Cranfield

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**NRSP Production System**

High Potential

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## FINAL TECHNICAL REPORT

R7000/01

### Executive Summary

The aim was to hold an open and informal meeting at which it was hoped that participants would be able, and willing, to stand back from their own institutional and disciplinary affiliations and help to identify how and where the available research funds could be deployed to greatest effect in each of the NRSP Production Systems represented at the workshop.

The individual contributions summarised what the authors (or their institutions) have learned about better water management, supported by key facts, field measurements and locations, and their assessment of the current gaps in knowledge and the priority attention those gaps would merit in a research programme.

### Background

The Department for International Development of DFID (formerly the ODA) uses the aid programmes to finance technology development and research (TDR) in a number of fields judged to be important for resolving problems currently faced by many developing countries. The emphasis of these TDR programmes is increasingly on applied research, and on the transfer and adaptation of technology to the circumstances of each country.

DFID's Renewable Natural Resources Research Strategy from 1995 to 2005 includes five strategy areas. In each area, the DFID seeks to achieve uptake of research results and impact on livelihoods by supporting systems-based research projects that adopt participatory approaches for identifying farmers' needs and systems constraints. The strategy areas include research programmes on systems, agriculture, forestry, livestock and fisheries.

The first of these research programmes, the Natural Resources Systems Programme, convened a workshop on the theme "*More from less: better water management*", with the purpose of identifying a strategy to improve use of this crucial resource through systems-based research. In this field, the United Kingdom considers it has a comparative advantage and can make a contribution to ongoing international efforts aimed at better irrigation water management in developing countries.

### Project Purpose

The objectives of the workshop were:-

- to summarise ongoing programmes, knowledge gaps and research opportunities
- to define the water management research agenda for the next 7-8 years of NRSP
- to identify and prioritise fundable systems-based projects

It was essential that the focus of the workshop and of the subsequent research projects would be on farmers, and on their problems and perceptions. This means good science must be combined with participatory activity to achieve sustainable impact. The challenge was to combine scientific rigour with developmental uptake on farmers' fields.

### **Research activities**

- Organisation and holding of workshop
- Debate on, and then identification of, priorities for research amongst peer group

### **Outputs**

A special (peer-reviewed) issue of the Journal of Agricultural Water Management

### **Contribution of Outputs**

The exchange of knowledge led to a summary of conclusions which in turn will be used as guidelines for prioritising / optimising research project commissioning.

## DFID WORKSHOP NATURAL RESOURCES SYSTEMS PROGRAMME

**"MORE FOR LESS - BETTER WATER MANAGEMENT"****Background**

The Department for International Development of DFID (formerly the ODA) finances technology development and research (TDR) to resolve problems faced by developing countries. The emphasis is on applied research, and on the transfer and adaptation of technology to the circumstances of each country. DFID's Renewable Natural Resources Research Strategy from 1995 to 2005 includes five strategy areas, where uptake of research results and impact on livelihoods are required in the drive to eliminate poverty.

DFID supports systems-based research programmes on agriculture, forestry, livestock and fisheries, that adopt participatory approaches to identify farmers' needs and constraints. One of these, the Natural Resources Systems Programme, convened a workshop at Cranfield University, Silsoe from 21 to 23 September 1997 on the theme "*More from less: better water management*", with the purpose of identifying a strategy to improve use of this crucial resource through systems-based research. In this field, the United Kingdom considers it has a comparative advantage and can make a contribution to ongoing international efforts aimed at better irrigation water management in developing countries.

**Objectives**

The objectives of the workshop were:-

- to summarise ongoing programmes, knowledge gaps and research opportunities
- to define the water management research agenda for the next 7-8 years of NRSP
- to identify and prioritise fundable systems-based projects.

The focus of the workshop was on farmers, their problems and perceptions, as a first step towards research projects that combine scientific rigour with sustainable developmental uptake on farmers' fields. It was an open and informal meeting, at which participants were encouraged to stand back from their own institutional and disciplinary affiliations and suggest how and where the available research funds could be deployed to greatest effect in NRSP projects.

**Outputs:**

In addition to the keynote papers, short individual contributions were invited, summarising what the authors (or their institutions) have learned about better water management, supported by key facts, field measurements and locations, and their assessment of the current gaps in knowledge and the priority attention those gaps would merit in a research programme.

- 21 technical papers were presented to an audience of 40 people from 24 organisations, and 6 countries were represented (UK, Philippines, India, Bangladesh, Holland, Sri Lanka)
- each contributor identified at least one knowledge gap for debate
- speakers also suggested reasons for lack of impact in the past as a guide to the best opportunities for achieving impact in the future.

There was a consensus that two broad research themes merit early attention; these deal respectively with physical and socio-economic aspects of water management:

- *prediction of productivity and environmental impacts of irrigation and drainage options* at farm, project and basin levels. Within this theme, specific topic areas included a) water accounting, b) salinity, water quality and pollution, and c) sustainable productivity improvements.
- *evaluation of socio-political realities and their effects on farmer motivation* to strengthen stakeholder incentives under various irrigation, drainage and water management options. Sub-themes included a) participatory irrigation management and turnover, and b) farmers' experiences and expectations.

In the immediate future, these prioritised themes will be considered in formulating a call for concept notes for future research funding under the NRSP in target countries. The workshop papers and summaries of the debate on research opportunities and past failures have been peer-reviewed and edited for consideration as a special edition of the Journal - Agricultural Water Management.

## WATER MANAGEMENT WORKSHOP SILSOE 22/23 SEPTEMBER 1997

### MAIN POINTS FROM THE WORKING GROUPS: ISSUES AND FUTURE POLICY

The full texts of the individual group presentations are provided elsewhere in the workshop proceedings, but an attempt is made here to draw some conclusions from the group deliberations that might guide the selection of research topics to be commissioned in the near future under the High Potential Production System of the NRSP.

Each working group began with the same lists of 26 gaps in knowledge and 28 impact opportunities, but in their attempts to prioritise and adapt them to formulate research themes, the four groups came to surprisingly different conclusions, although a deliberate effort was made by the organisers to ensure a range of background disciplines and experience in each group.

The research themes selected by each group for priority attention are summarised as follows:

#### GROUP 1

1. The effects of economic and policy change on the dynamics of local level water resources management.
2. Understanding farm level and system level constraints to productivity (losses, variability, quality of water)
3. Increasing the reliability of water supply and service delivery by institutional change, innovative technology and management.

These themes appear to reflect the traditional 'top-down' approach, and are concerned with the development and transfer of technology, the application of engineer-led solutions, the imposition of hierarchical control and externally developed management solutions. The reference in the presentation text to "developing effective partnerships with users" reflects something of this ambiguity; it might mean the search for ways to secure compliant recipients or a determination to explore genuinely new approaches to farmer involvement in resolving the issues and obstacles to better water management at all levels.

#### GROUP 2

1. Better methods for recovery and re-use of all readily available catchment water to achieve greater equity and productivity.
2. Organisational partnerships to improve joint management of irrigated systems.
3. Methods to deliver and charge for water as a monitored commercial utility.

These themes focus on the search for more productive use of an increasingly scarce resource by the combination of accurate and detailed accounting of catchment water to maximise the deliverable amount of this marketable commodity with partnerships between providers and users for better management. The improved joint management envisages a

strictly commercial relationship between provider and user for the supply of a carefully audited commodity in optimal amounts.

#### GROUP 3

1. What makes a successful enabling framework for optimum and sustainable allocation and use of water?
2. The development of water auditing and the definition of available and achievable levels of real water savings (as opposed to "dry" savings).
3. Understanding the reasons for past successes and failures in implementing good research results.

These themes reflect very clearly the meeting's expressed frustration over past failures and the need to understand why there has been so little positive uptake of the good science that has undoubtedly been done; in contrast, past successes received little or no attention. The recommended themes recognise that the task of auditing is necessary (though difficult and costly), and that not all "losses" can be effectively recaptured for use. They also imply that it is possible to achieve optimum allocation and use of water if only the relevant framework or enabling environment can be put in place, but the ways in which this might be achieved are not prioritised as researchable issues.

#### GROUP 4

The group prefaced its two research themes with a logical framework Goal of "adopting better practices to improve the livelihoods of poor communities".

1. Prediction of productivity and environmental impact of irrigation and drainage options at the farm, project and basin level.
2. Strengthen stakeholder incentives by socio-political means to affect farmer motivation under various irrigation, drainage and water management options.

These research themes focus on modelling of the physical system at different levels, and on the manipulation of farmer response by various socio-political instruments designed to affect all stakeholders including the farmers. Both of these proposals are placed at some distance from the farmers' fields, and imply that the causes of unacceptably low levels of management are to be found in poor understanding of the physical systems, and insufficient incentives for farmers to improve their current management of the available water resources.

These research themes from the working groups can mostly be placed into one of three general categories:

1. Economic / political / social context, including institutions.
2. Technical and technological issues for the agency mandated to understand, manage and deliver water to farmers.
3. Questions of success and failure, in achieving joint management of resources with the various stakeholders.



The groups were quite clear and confident about items in category 2, the need for, and value of, modelling and auditing to quantify the resources, and the adoption of technologies to ensure optimum use and productivity. These are essentially the disciplines and areas of strength represented by the researchers at the workshop.

The majority of participants were less sure about category 1 issues, but there was a recognition that the enabling environment is an important influence that we need to understand, and that institutions are an integral part of that environment. By implication, this means in-country institutions, but perhaps it should also include the external institutions of the researchers. Perceptions are strongly modified by disciplinary and institutional affiliations, but also by the policies and attitudes of both the recipient and donor governments, and of the development community at all levels.

Research themes in category 3 emerged in all four groups, suggesting that this is an area of great concern and possibly the area requiring earliest attention. It underlines the need for approaches that are truly participatory, across the full range of stakeholders and including at all stages the farmers as the ultimate users of the water resource. It may well be the most difficult to address in the context of a strategic research programme, in that it is time-consuming, emphasises social skills rather than technical skills, and must involve all stakeholders.

Successful irrigation projects must address all three of these categories; they are not in fact separate issues, but the several strands of the same complex problem. The difficulties in almost all irrigated systems occur because undue emphasis was placed on a single aspect, usually the technical or technological aspects of resource capture and delivery, without appreciating or correctly evaluating the importance of other considerations. Improvement will therefore require a radical change in culture and mind-set, and a prolonged dialogue - and perhaps conflict - with the many established institutions (in the broadest sense and therefore including the farming communities) which have a vested interest in defending past activities and approaches, and in maintaining the status quo.

The above priority issues suggest that the current change in emphasis from the traditional top-down, technology- or donor-driven approach towards more Participatory Irrigation Management (PIM) might be extended in the case of existing schemes to include detailed consideration with farmers of ways to introduce restructuring and more appropriate technology, as well as better management arrangements. For new schemes, the approach could be an exploration of Participatory Irrigation System Design (PISD) in which farmers, agronomists, social scientists and engineers visit sites together, walk over the irrigable area, agree on what is needed, where and how water will be captured and delivered, and how the whole scheme under consideration should be implemented within locally sustainable limits. If this were adopted on an experimental basis, it is likely that the approaches found to be positive and conducive to success in the case of PIM would also be helpful to PISD.

Stephen Walker  
28 October 1997

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## SILSOE WORKSHOP 22/23 SEPTEMBER 1997

### PRESENTATIONS OF WORKING GROUPS

After the five keynote papers, 19 individual papers were delivered to the workshop, and at the end of each paper the author was asked to identify one gap in our current knowledge and one reason for the lack of impact in the past as a distillation of each person's experience. In the event, some authors listed more than one, and there was some blurring of the distinction between the two categories, but bullet-pointed lists of 26 gaps and 28 impact opportunities were circulated to participants as the basis for discussion in the working groups.

The working groups were asked to debate the knowledge gaps, prioritising the most crucial, and to analyse the main reasons for lack of impact in the past, as a guide to the best opportunities for achieving impact in the future. Finally, the groups were asked to use these two related analyses to define a shortlist of three project proposals. The projects - expressed in the form of research themes for easy translation into the logical framework format - should be poverty-focused, farmer-oriented and systems-based, possibly but not necessarily combining several knowledge gaps and impact opportunities.

The conclusions of the working groups were summarised by the elected rapporteurs in short presentations to the plenary session; these are given below in note form as delivered. To preserve the groups' intentions, there has been minimal editing, comment or addition.

#### **GROUP 1**

##### **Context for the research proposals:**

- user focus
- productivity and livelihood researchability
- UK comparative advantage
- windows of opportunity (needs, demands of users)
- UK contacts and networks
- future directions, and look at changes/dynamics
- focus on dissemination

##### **Theme 1: "Understanding the dynamics of local level water resource management in an environment of economic and policy change"**

Sub-themes:

1. Improved access and use by **poor** water users (eg. by use of groundwater, greater control of water resources, increased productivity)
2. Development of **effective** partnerships with users (eg. through belief networks, incentives to optimise use, conflicts between different water uses and different water users)

##### **Theme 2: "Understanding farm level and system level constraints to productivity"**

Sub-themes:

1. Strategies for more 'efficient' (ie more productive) on-farm use of water
2. Effects of unreliable and poor quality water
3. Understanding of hydrological variability and its implications (seasonality, long-term)
4. Developing risk avoidance and coping strategies

**Theme 3: "Understanding how institutional change (at all levels) and the introduction of modern or innovative technology and management can combine to produce more reliable water supply and service delivery"**

Sub-themes:

1. Canal systems
2. Groundwater
3. Drain water re-use

## **GROUP 2**

**Three cross-cutting themes** from the group: understanding, incentives, communication. These are required between all stakeholders, ie researchers, agencies and institutions, and farmers.

**Theme 1: "Improved methods for recovery and re-use of water in the basin context"**

Sub-themes:

1. Groundwater management, and its relation to surface water and re-use
2. Losses: assessment, occurrence, and achievable productivity (rather than 'efficiency')
3. Water quality, and its relationship with economics
4. Water management and the equity of distribution: top-enders and tail-enders
5. Soil-plant-water relations
6. Multiple use of water
7. Different scales to be considered (farm, scheme, basin, region, nation)
8. Productivity ("more crop per drop", "more for less" etc - formerly termed 'efficiency')

**Theme 2: "Improved joint management of irrigated systems through organisational partnerships"** (NB irrigated systems not irrigation systems, ie generic)

Sub-themes:

1. User perspectives
2. Organisation, services, roles, responsibilities
3. Technologies
4. Communication
5. Incentives and accountability (and hence "uptake").

6. Methodologies to achieve these.

One specific research objective: the supply of services, infrastructure, and technology to give the poorest farmers access to water as "insurance" for increased food security. Sub Saharan Africa has declining production, few people on formal schemes, and more (but still few) people on traditional irrigation schemes.

### **Theme 3: "Developing methods for delivering water as a service"**

Sub-themes:

1. Treat water as a utility, adopt a business approach
2. Standards, regulations required and enforced
3. Users needs and ability to pay
4. Technology to deliver reliable and efficient supply (to meet demand)
5. Accountability (of agencies' designers and operatives)
6. Measurement (at relevant points and by appropriate people)
7. Incentives (for agency staff and farmers)
8. Productivity (follows from the above)

## **GROUP 3**

**Reasons for lack of impact:**

1. No uptake of research technologies (a dissemination problem?)
2. Lack of an enabling "environment" (broad catch-all phrase: policy, incentives etc)
3. Farmers' mixed ability to use and manage water (can they measure soil moisture?)
4. A lack of agency accountability and no real service provision
5. Strategic allocation and assessment of water resources problematic
  - farm versus catchment scale
  - lack of means and/or technology to measure and allocate effectively
6. Inappropriate technology interventions (design/operation of scheme and structures)

The knowledge gaps evolved into a number of researchable themes. The top three themes were:

**Theme 1: "Identification of essential aspects of a successful enabling framework at all levels, leading to appropriate/optimum/sustainable use and allocation of water (and other) resources."**

What makes a successful framework (legislation, incentives, prices, policies etc)? How to set up the enabling conditions? Consider at what level or scale they are needed.

**Theme 2: "Identification of achievable levels of water saving and development of associated methodologies and procedures for water auditing."**

How is auditing used now; how equitable is it? What level of water saving might be available and what is achievable?

**Theme 3: "Understanding the reasons for successes and failures in the past (including research uptake pathways)."**

Need to learn from the past; and have to use existing knowledge/experience. Good research has been done; why has it not been taken up?

Other research themes discussed and supported were:

Theme 4: Productivity and value of water and its inter-relationships with other inputs.

Theme 5: Multiple uses and allocation of water

Theme 6: Forecasting and management of salt and water balances (eg Western India)

Theme 7: Compatibility between individual's and society's needs (ie equity argument)

**GROUP 4**

The group began by ranking the lists of 26 "knowledge gaps" and 28 "lack of impact" causes to compare them; logically, they might be expected to correspond in general terms.

The "knowledge gaps" assessment focused on two groups of issues:

The first group deal with "water as a business"; they are practical, concrete and centred around

1. Inability to forecast salt and water balances
2. Integration of "on-farm" with "whole system" issues
3. The need for an accounting framework

The second group related to farmers' conditions, and are more abstract and socio-economic ie how farmers perceive their problems, and perceive the solutions to their problems, but also how researchers and government agencies perceive the problems, and the lack of correspondence between the main issues identified from these three different perspectives.

The "lack of impact" assessment told a different story. Of the 28 listed reasons for lack of impact, those that were rated as most important were not about policy and pricing, but about regulation and incentives.

In the spirit of the logical framework, the Group proposed the following Goal:

**GOAL:**

"Accelerating the adoption of water allocation and management practices which enhance the livelihoods of poor communities"

Two research themes were recommended:

**Theme 1: "Develop, test and implement appropriate methodologies for predicting productivity and environmental impacts\* of irrigation and drainage options at farm, project and basin levels."**

Sub-themes:

- water accounting
- salinity, water quality and pollution
- sustainable productivity improvements

[\* Comment; ICID guidelines already exist on environmental impact.]

**Theme 2 " Strengthen incentives for stakeholders through identifying the socio-political reality and its effects on farmer motivation under various options for irrigation, drainage and water management."**

Sub-themes:

- participatory irrigation management (PIM), turnover etc
- farmers experiences and expectations