



Improving water use for dry-season agriculture by marginal and tenant farmers in the Eastern Gangetic Plains

ACIAR project LWR/2012/079

The issue

The Eastern Gangetic Plains, which include the Nepal Tarai, Bihar and West Bengal regions, is one of the most densely populated and poverty-stricken belts in South Asia. Behind this persisting poverty are deeply entrenched social structures of class and caste, with a high incidence of inequitable landlord-tenant relations. This is combined with poor access to irrigation water in the dry season, limited irrigation capacity and low agricultural innovation.

Earlier research in the Indo-Gangetic basin established the interactions between poverty and access to water. At present technical, social and economic constraints have limited the effective use of groundwater and ponds for irrigation, and large areas of land remain fallow during the dry months. Access to year-round water for irrigation would significantly promote the productivity of agriculture, improving incomes and food security. Marginal and tenant farmers, youth and women are the target set of farmers who could benefit from a new approach to irrigation provision.



A member of the fishers' cooperative in front of an irrigation tank near Madhubani, Bihar State, India. Photo: Michael Scobie

This research is crucial to the long-term sustainability of small-scale agriculture in the Eastern Gangetic Plains. The region must alleviate poverty and achieve food security in part through a program of improved water management and irrigation using efficient systems, which are less reliant on expensive or unreliable electricity and diesel, and are appropriate to the needs of the marginal (owning <0.5ha) and tenant farmer majority.



Research questions

Through comparative research in India, Nepal and Bangladesh this project will address the following research questions:

1. What is the existing distribution of ground and surface water, irrigation demand and extent of irrigation in the study sites? What are the technical constraints of existing irrigation systems utilising different energy sources?
2. What are the existing patterns of vulnerability and the social structures (e.g. land tenure, role of women and young people), institutions and policy context that determine access to ground and surface irrigation and shape livelihood outcomes in the study areas?
3. How have adaptations to ground and surface irrigation in Bangladesh addressed structural, institutional and energy constraints? How can these experiences inform policy changes in Nepal and India (and vice versa)?
4. What is an appropriate model for the sustainable provision of dry-season irrigation using both surface and groundwater, and energy-efficient, affordable pumping technologies?
5. What institutional innovations are necessary to make this model appropriate to marginal and tenant farmers, including women and potential migrants? How can this model most effectively strengthen their livelihoods and build resilience?

Aim and objectives

The overall aim of the project is to improve water use and increase dry-season agricultural productivity among marginal and tenant farmers in the Eastern Gangetic Plains.

Specific objectives are to:

- » determine existing water resources and sustainable utilisation for irrigation from tanks and groundwater
- » determine the socioeconomic, structural and institutional constraints to sustainable water use
- » determine and evaluate approaches for access to water for irrigation, focusing on using renewable technologies and alternate approaches to land tenure and their impact on livelihoods and resilience
- » facilitate long-term up-scaling and out-scaling of approaches and alternative opportunities.



Typical diesel-powered pump for groundwater being used to grow boro (dry-season) rice in the Khoksar region of Nepal. Photo: Fraser Sugden

Methodology

The research approach involves four main steps.

1. An assessment will be made of available ground and surface water resources, potential demand for irrigation water, and water available for irrigation in selected districts.
2. Qualitative and quantitative research will be undertaken to identify livelihoods, land tenure, water management institutions, gender relations and different farmer groupings and their impact on water management in Nepal, India and Bangladesh.
3. Both social and technological interventions for improving agriculture through use of pond and groundwater resources together, will be evaluated in the selected sites of Nepal and India using a participatory action research approach. This constitutes the core of the project.
4. Focus will be on capacity building and scaled-up engagement to broader villages and communities to deliver training and demonstration of successes. The selection of approaches to water management will be informed by the research in north-western Bangladesh which can offer both positive and negative case studies of how to maximise water use efficiency while addressing environmental, energy-related, technical and social constraints. At all stages feedback loops involving technical staff, researchers, extension personnel, and private and government agency representatives will be incorporated into the approach to drive change at a local and broader scale.

Outputs and impacts/benefits

The main expected **outputs** can be summarised as follows:

- » technical guidance and recommendations on improved irrigation methods, water storage and energy management
- » assessment of socioeconomic context, including land tenure, gender, migration, water management, farmer stratification and existing policy
- » case study pilot sites trialling feasible technical, institutional and socioeconomic interventions
- » packages of information, case study reports and factsheets

capacity building and training of local service providers and agency representatives

interactive training and aids to improve water and energy management delivered to stakeholders and communities

knowledge networks with established links between public and private sector and village institutions.

The main **outcomes, impacts/benefits** foreseen are:

- » cooperative approaches for land, water and energy management adopted, leading to improved food security, community health and wellbeing, and reduced poverty
- » empowered communities and increased capacity to manage and operate new technologies for water management
- » improved farmer understanding of the options and opportunities for improving agriculture through irrigation.



ACIAR

aciar.gov.au

Partnerships

The **University of Southern Queensland (USQ)** will lead the project, while **IWMI** will coordinate research on the ground and provide support to in-country partners. **CSIRO Australia** and the **National University of Singapore (NSU)** will provide additional research support. In Nepal the implementation of interventions will be carried out by the **NGO iDE**, and the **Department of Irrigation (DoI)**. In West Bengal it will be carried out by the Government University, **Uttar Banga Krishi Vishwavidyalaya (UBKV)**, and the **NGO CDHI**.

In Bihar implementation will be carried out by the **Indian Council of Agricultural Research (ICAR)** and the **NGO Sakhi Bihar**. Implementing partners will also support the research team by collecting field data. The groundwater analysis in Nepal will be carried out by the **Groundwater Resources Development Board (GWRDB)**. In Bangladesh, **CSIRO** will take the lead, but with research support from local partner **Bangladesh Rice Research Institute (BRRI)**.

This project will work in collaboration with the ACIAR-funded projects CSE/2011/077 - *Sustainable and resilient farming systems intensification in the Eastern Gangetic Plains (SRFSI)* led by CIMMYT, and CSE/2013/099 - *Assessment of water resources and sustainable irrigation potential in nine districts of the Eastern Gangetic Plains* led by IWMI.

Further information

Australian Centre for International Agricultural Research (ACIAR)

38 Thynne Street, Fern Hill Park
Bruce ACT Australia
GPO Box 1571 Canberra
ACT 2601 Australia

P: +61 2 6217 0500 **F:** +61 2 6217 0501
E: aciar@aciar.gov.au

aciar.gov.au

Project leader:

Erik Schmidt

Deputy Director
National Centre for Engineering
in Agriculture
University of Southern Queensland
E: Erik.Schmidt@usq.edu.au