

Conjunctive water management for sustainable irrigated agriculture in South Asia (LWR1/1997/016)

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Related projects	LWR1/1996/190
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Duration of project	1 July 1998 to 30 June 2001, extension 1 July 2001 to 31 March 2003
Total ACIAR funding	\$625,818

Project objectives

Identify combinations of institutions and technical strategies to manage surface and groundwater at the regional scale to promote environmental sustainability and maximise agricultural productivity of water ('crop per drop'), initially in the Rechna Doab in Pakistan and the Murrumbidgee region in Australia.

Key outputs and outcomes were:

- a methodology to determine appropriate combinations of institutional mechanisms and technical tools to improve conjunctive water management
- guidelines to irrigation department officials and Area Water Board members for effective conjunctive water management at the regional scale in the Rechna Doab and the Colleambally Irrigation Area (CIA).

Location of project activities

South Asia

Overview

The Indus Basin Irrigation System is the largest contiguous irrigation system in the world. Water from the Indus River and its tributaries is diverted into 16 million ha of lands via 45 main canals. This ACIAR project was formulated at a time when major reforms in the Indus Basin Irrigation System were initiated. The reforms were a major part of the National Drainage Program (NDP), which was sponsored by the World Bank, the Asian Development Bank and the Government of Japan. Reforms at provincial level were to take place from 'top to bottom' and 'bottom to top'. As a top-down measure, Provincial Irrigation and Development Authorities (PIDAs) were legislated in all provinces in 1997. The next level of organisation was the formation of Area Water Boards (AWBs) at the primary canal level, followed by Farmer Organisations (FOs) at the secondary canal level. This ACIAR project was designed to complement ongoing research projects addressing irrigation sector reforms at IWMI Pakistan, funded by the NDP.

During the first phase of the NDP, only 4 out of 45 canal commands were to be managed by AWBs. One of the four is within the Rechna Doab, the ACIAR project site.

Expected outputs were:

- a methodology to determine appropriate combinations of institutional mechanisms (rules, regulations and by-laws for AWBs and FOs) and technical tools to improve conjunctive water management (a computer model)
- guidelines to irrigation department officials and AWB members for effective conjunctive water management at the regional scale in the Rechna Doab.

Project achievements

The project delivered all planned outputs, which are listed below:

- Provide consultation to the Punjab Irrigation & Drainage Authority to develop rules, regulations and by-laws which would govern the AWB, its members and the FOs (output 1). Drafted rules, regulations and by-laws for the AWB have been adopted by Irrigation and Drainage Authorities in Punjab and Sind provinces, following revisions made by respective provincial governments. However, not all credit can be ascribed to this project. There were other projects funded by the NDP of Pakistan and the Dutch Government which had similar objectives. But the fact that the ACIAR project scientists actively contributed to the first draft of rules, regulations and by-laws is significant, and duly recognised by the PIDA.
- Compile hydrologic and hydrogeologic data for the Rechna Doab (output 2). This ACIAR project improved existing hydrologic and hydrogeologic databases at IWMI Pakistan. In particular, it was for the first time historic piezometric datasets available at the Water and Power Development Authority (WAPDA) were entered electronically into GIS and relational databases. The end user of this output was this project itself; therefore, its adoption rate was 100%.

- Unfortunately, the following outputs, although delivered by the project, were not adopted by the intended end user, namely the PIDA:
 - the conjunctive water management model and recommendations to the PIDA (output 3)
 - the subsurface evaporation basin, constructed to minimise regional drainage requirements in waterlogged areas (output 4)
 - identification of sites where recharge basins could be constructed to recharge the aquifer when surplus canal water is available, especially during monsoon months (output 5).

The difference the project has made

- Since four AWBs in Pakistan (one in Punjab and three in Sind province) have adopted revised forms of the original rules, regulations and by-laws to which this project contributed, and all 45 AWBs in future will also be governed by the same, the adoption rate for output 1 is very high. This is an important development. It is noted, for example, that the LCC East AWB in Punjab province consists of 87 FOs and the three AWBs in Sind province consist of 369 FOs. The three AWBs in Sind cover 1.82 million ha (32% of all irrigated areas in Sind), and the total number of FOs planned for Sind is 1,300.
- Output 2 has served the initial purpose, which was the development of the groundwater model for the ACIAR project. This database is being continuously improved and used by researchers in IWMI and elsewhere. Therefore, the adoption rate for this output is very high and current users are:
 - IWMI's Integrated Data Information System (IDIS), which has 450 thematic layers of geo-referenced data
 - the Rice Wheat Consortium (RWC) of the Indo-Gangetic Plains (CGIAR Initiative) has several ongoing projects in the Rechna Doab. The database provided valuable information to RWC projects in this region
 - project scientists of CGIAR's Challenge Programs on Groundwater Governance, who have consulted this database to assess the extent of groundwater use along the boundaries of surface irrigated catchments
 - university students at the Center for Excellence, University of Engineering, Lahore
 - IWMI's Basin Kit for the Indus Basin
 - IWMI's project on upscaling productivity at the basin scale.
- Output 3 probably used most of the project funds and involved training for several IWMI staff in Australia. However, the model and the recommendations from the modelling study have not been adopted by provincial agencies.
- Output 4 has served its purpose at the site where it was installed. In combination with other factors, the subsurface evaporation basin has alleviated waterlogging at the project site. Another research agency in Pakistan, the Nuclear Institute of Agricultural Biology, is planning to implement the technology at their project sites.

- Output 5 has the potential to be developed into a development project but requires consultation with PIDA and funds for installation. In an era when surface storage of sufficient water is not feasible, and surplus water for recharge is available only occasionally, it is imperative that artificial recharge structures are in place to collect, store and recharge aquifers. AusAID may consider developing this output further in consultation with Punjab Irrigation Department.

Project impacts

This ACIAR project contributed to the establishment of the first AWB, which can be considered as the pilot AWB. Currently, one AWB in Punjab province and three in Sind province are functional, and another in Punjab is expected to function soon. At the end of the reforms all 45 canal commands will be managed by AWBs. Therefore, the flow-on effect of the contribution made by the project will be very high and potentially affect 2 million farmers living in the Indus Basin Irrigation System.

The subsurface evaporation basin (output 4) is the only on-ground activity of the project, and has helped in alleviating waterlogging in the area. Therefore, the project had a positive environmental impact.

The project has had no quantifiable economic impacts so far.

The project facilitated a PhD dissertation and a Master's thesis during its life. Unfortunately, none of the Pakistani project scientists at IWMI Pakistan and PCRWR are with respective agencies at present. However, all have progressed in their professional careers. Many of them contributed to this report and are grateful to ACIAR for providing an opportunity to advance their professional skills.