
BACKGROUND

The North China Plain is one of the most densely populated regions in the world, encompassing the capital Beijing, many other important industrial cities, and on the coastal edge, commercial ports. It covers about 400km² and is China’s main agricultural region. The soil of the North China Plain is fertile, but water scarcity is a growing problem. In many areas, increasing agricultural demands can no longer be met by adding hydraulic infrastructure such as storage reservoirs, and groundwater is over-exploited. Water supplies to agriculture are under mounting stress from competing demands for municipal and industrial uses. The problem of water scarcity is compounded by worsening water pollution from heavy industrialization and rapid urban population growth. It is increasingly realized that future growth in agricultural water demand can only partly be covered by the additional development of water resources or possibly by costly water transfer projects that would bring water from the relatively water-rich south to the north. The remaining demand will need to be met through water savings, demand management, and deficit irrigation.

PROJECT DESCRIPTION

The North China Plain Water Conservation Project aimed to enhance beneficial use of water resources, agriculture production capacity, and farmer incomes by: increasing the value of agriculture production per unit of water consumed through increasing yields and reducing non-beneficial water losses; and establishing mechanisms for sustainable use and management of water resources in irrigated areas. The project supported integrated improvements to over 100,000 hectares of irrigated land and 257,000 farm households in the provinces of Hebei and Liaoning and in the municipalities of Beijing and Qingdao.

The project had four components: (a) irrigation and drainage works and on-farm systems, including canal lining, low-pressure pipes, drains, wells, surface irrigation improvements, sprinklers, and micro-irrigation systems; (b) agriculture support and services, including land leveling, non-tillage in the dry season, deep plowing in the rainy season, soil fertility improvements, organic and plastic mulching, cropping pattern adjustments, seed improvements, balanced fertilization, and improvements to planting and cultivation techniques; (c) forestry and environmental monitoring of the project’s impact on soil and water; and (d) institutional development and capacity building for water and soil conservation.

PROJECT OUTCOMES

The sets of integrated water-saving measures under the project’s components, including improvements in irrigation infrastructure, agronomic practices, and on-farm irrigation management, contributed to real water savings while increasing agricultural yields and incomes. In addition, institutions were developed to manage water in rural areas in a more sustainable manner. Among the project’s contributions are:

- Increased water productivity and reduced consumptive use. The value of agricultural production per unit of water consumed increased in the range of 60 to 80 percent throughout the project area; non-beneficial water consumption was reduced by a sixth. Agricultural production tripled and farmer per capita incomes increased between 10 to 554 percent. About 360,000 households were among the project’s beneficia-
ries. Annual water savings averaged 1,200 m³/ hectare.

- More sustainable groundwater use. Across most of the project area, groundwater depletion was reduced to negligible levels or eliminated. Adaptable institutional arrangements supported groundwater recovery, with priority given to providing farmers with incentive packages linked to reductions in water consumption. County-level groundwater management plans were piloted in four counties.

- Strengthened institutional arrangements for irrigation system operation and maintenance. The original project target was 100 water user associations (WUAs), but more than 500 were established, covering about two-thirds of the project area. Women’s participation was estimated at 30 to 40 percent, and they were regularly elected to association committee posts. For the first time on this scale in China, WUAs assumed responsibility for both financing and operating irrigation systems.

- Water charges. Volumetric water charges were initiated for about 62,000 hectares, 110 percent greater than the target area. Progressive increases in water charges typically rose from the relatively low pre-project baseline by a multiple of three to four times above appraisal targets.

- High benefits. The economic analysis suggested that the project achieved an overall rate of return of 24 percent, higher than the appraisal estimates of 21 percent.

**LESSONS LEARNED**

The project successfully focused on new approaches to finding an appropriate mix of technical and institutional changes that reduced agricultural water consumption while at the same time benefiting the agricultural sector. Among the lessons are:

- Development of WUAs. The success of the WUAs stemmed from two organizing principles: (a) democratic self-organized associations based on hydraulic boundaries, and (b) water measuring, with corresponding water charges on a volumetric basis. Other contributing factors were: a flexible approach and adaptation to local conditions; the inclusion of farmers from the beginning in sub-project design; transference of control for water structures to WUAs; and the active support of both the Ministry of Water Resources and local governments.

- Importance of economic incentives. Approaches to water savings in agriculture are more likely to succeed if appropriate incentives are given to farmers to modify their practices.

- Monitoring and evaluation for technical innovations. An appropriate monitoring and evaluation system is necessary to verify the efficacy and efficiency of integrated water saving measures in agriculture, and to share the information with water user associations.

**SCALING UP**

The Government of China is enthusiastic about scaling up project successes, in particular: the use of consumptive use rates as a performance measure; the comprehensive approach integrating engineering, agronomic, and water management measures; and the development of WUAs. Successful practices from the project are already built into central government programs, notably the government-financed National Water Conservation Program. Lessons are also being scaled up through local government programs, particularly in Beijing and Qingdao, where prosperous urban areas are keen to invest both in agricultural water saving with a view towards ensuring urban water supplies, and in the “harmonious society” approach to balancing rural and urban development and incomes. Lessons are also being applied in other World Bank-financed projects, notably the Second and Third Irrigated Agricultural Intensification Projects currently under implementation. In addition, some of the technical and institutional innovations introduced in the project are being adopted in policy, planning and investment for rural water saving nationwide. For example, the preparation of county-level groundwater management plans, piloted in four counties in the project, has been taken up by a further 21 counties across Northern China. This process of scaling up responds to China’s major policy decision to create a “water saving society”.

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**RELEVANT PROJECT**

North China Plain Water Conservation Project

- **Project ID**: P056516
- **Timeline**: 2001–2006
- **Loan Amount**: US$ 74 million

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