Equitable flows

Increasing urban and industrial demand for water in China is placing pressure on agriculture to use water more efficiently

BY WARREN PAGE

China's water use has risen to about 500,000 million litres, a five-fold increase over the past 60 years. Economic and population growth rates of about 7% and 0.5% respectively are the main drivers of increased demand. Underpinning this growth is a focus on exports and increased integration into the global economy.

One of the challenges presented is equitable distribution of water—between sectors, regions, industries engaged in export markets or domestic production, and within individual river basins and irrigation schemes. Water in northern China, where more grain is grown, is scarcer than in southern China.

The Yellow River Basin represents a convergence of many of these issues, with the river winding through a number of regions. More than 130 million people live in the basin and rely on water from the river system, many of them farmers relying on irrigation for their livelihood. Much of the irrigation infrastructure is of poor quality, with pollution also a growing problem.

An ACIAR-funded project examining water policies and institutions identified a range of impediments to effectively managing water resources. A major focus in the Yellow River Basin, and in many irrigation schemes, is on water-use efficiency and water-saving irrigation techniques.

Both approaches are effective in river basins and irrigation schemes that are yet to enter a 'mature phase' where all available water has been allocated, or in the case of the Yellow River Basin, over-allocated.

Government approaches to these water shortages utilise technical and engineering approaches, including emphasising water-

Irrigation is vital to ensuring cropping in parts of northern China.

saving technologies. Despite this investment, including in innovative delivery mechanisms, shortages continue.

In part these have been exacerbated by a lack of coordinated and integrated approaches between regions and sectors. Meeting demand in one sector or region can be achieved; however, too often this creates shortages downstream.

Another barrier is the lack of property rights to water, restricting the ability to price water through market interactions.

Irrigation schemes in China, such as the Zhanghe Irrigation Scheme, operate as centrally managed institutions, responsible for supplying water to end users. In the Zhanghe scheme, the subject of another ACIAR-funded project, improvements were sought for main system water management, where farmers are charged for any water they use.

Orders for water must be placed with the irrigation managers at the nearest canal station three days prior to delivery. The Main Canal office aggregates these demands to calculate the total inflow into the canal from the river system. Water is then priced on a volumetric basis—the more requested, the higher the bill.

The ACIAR project team, led by Professor Hector Malano of the University of Melbourne, found that the scheme operates as a disincentive to farmers to place advance orders. Instead the farmers delay orders in the hope of rain. Where rain does not fall, crops become water-stressed, resulting in a high number of orders, which then cause the system to become congested. The system is unable to meet this demand, resulting in only some orders being delivered.

Two computer-based models, developed through similar ACIAR-funded research into Vietnamese irrigation schemes, were adapted to the peculiarities of the Zhanghe scheme. The Irrigation Main System Operation (IMSOP) model was used to analyse and improve operations, with asset data collected and analysed by the ASSET Manager model.

Utilising the IMSOP model the project team was able to develop prediction and sequencing information, including linkages to climate data collected from a nearby weather station. More accurate management of demand in turn has helped make water-saving irrigation techniques more effective.

Changes to water pricing in the years prior to the project had exacerbated the farmers' habit of delaying orders, resulting in reduced demand and a revenue shortfall. This in turn impacted on the cost of water supply. The ASSET Manager model was used to calculate the actual operational costs and develop a sustainable fee structure.

Valuing water correctly is essential in any future approaches to water trading, including changes in the Yellow River Basin, as demonstrated by the ACIAR project. Property rights for water would allow farmers, villages and communities to buy and sell water, lessening the reliance on state-run irrigation systems to allocate water and set prices.

Similarly the lack of a value on water, other than in purchases from irrigation schemes, makes compensating for water transfers an impediment. This includes mechanisms to transfer revenues from water sales. Resistance to water-trading schemes has in part been based around uncertainties regarding water transfers on rural incomes, particularly where water is not priced and compensation not delivered.

Water trading may accelerate the adoption of local solutions to water scarcity by creating economic incentives for technical solutions based on local needs. Additionally, such approaches could also enhance grain self-sufficiency.

This could include adopting recommendations from the project to consider water use by crops. For example, the economics of transport and location suggest that high-value perishable crops be grown closer to urban centres, and crops that are more dependent on water, such as summer-grown cotton or maize, be grown in the wetter parts of China.

These and other key findings from research into institutional and policy arrangements relating to water in the Yellow River Basin have been used in AusAID project work on water governance in China, which has examined policies and priorities for institutional reform. ■

PARTNER COUNTRY

China

PROJECTS: LWR/2000/120: Institutions and policies for improving water allocation and management in the Yellow River Basin, China; LWR/2001/001: Improving main system water management in China: a demonstration project in the Zhanghe Irrigation Scheme

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Irrigated water in China is often free, undermining efforts to ensure it is seen as a valuable commodity.