



IWMI Research Central Asia

Legacy of Soviet irrigation

Water governance

Rehabilitating saline and waterlogged land

The water-energy-food nexus

Managing water scarcity





increasing. Job opportunities are scant. Many Central Asian men migrate to Russia for work. As a result, women are increasingly becoming responsible for agriculture, whilst not yet enjoying a significant say in how resources are managed.

From its office in Tashkent, the International Water Management Institute (IWMI) works to enhance water cooperation within Central Asian countries, guide institutional reforms, and increase water-use efficiency and crop productivity at the regional and farm levels.

Legacy of Soviet irrigation

The Russian Empire first installed vast irrigation schemes in Central Asia and this continued after 1917 with state-run Soviet collective farms. With the collapse of communism, however, these integrated systems had to be shared between independent states. The resulting mismatch between water supply and cropping patterns caused an increasing number of water-related disputes. The system is often poorly maintained, and has to serve thousands of individual farms.

Solutions: For over a decade, the focus of IWMI's work in the region has been the Fergana Valley, where it works to establish an institutional framework to improve water delivery across more than 400,000 hectares (ha) of irrigated land, increasing both agricultural productivity and farmers' incomes.

IWMI seeks to promote transboundary water cooperation. For example, where no institutional framework exists for farmers using water from small transboundary river tributaries, IWMI nurtures 'bottom-up' cooperation, building on existing and past

Introduction

Water is crucial to economic and social development of Kazakhstan, Kyrgyzstan, Tajikistan, Turkmenistan and Uzbekistan. The two major river systems of Amu Darya and Syr Darya, which flow from east to west across the Aral Sea Basin, supply water for irrigation, hydropower and domestic use. However, excessive water use since the 1960s reduced the rivers' outflows, devastating the Aral Sea Basin and the region's fishing industry. Today, water availability varies greatly between countries, and environmental problems of waterlogging and salinization are widespread.

A key water management issue is the legacy of Soviet irrigation infrastructure. Prior to 1991, vast irrigation schemes served 8 million hectares (Mha) of land on large-scale farms that were controlled by the state. Cotton, a highly water-intensive crop, was mandated to be widely grown. After the collapse of the Soviet Union, each newly independent nation undertook its own agricultural, land and water reforms to subdivide state farms into smaller, farmer-owned or managed units. Previously functional water management practices became unsuitable or redundant, resulting in mismanagement, inequity and unreliability in water delivery.

Now, new pressures are building. Climate change will bring its own set of challenges in a region that already endures huge climatic extremes. Populations are slowly but steadily

agreements on property rights, water sharing, basin linkages and compensation mechanisms. In the long-term, the Institute hopes to transfer this knowledge to larger transboundary river basins.

Water governance

Following the breakup of the Soviet Union, many donors instigated projects aimed at improving local water management. A favored way of doing so was to introduce water users' associations (WUAs). However, there was little consistency in the scale of the associations or in how they were structured. Adding to the complexity was a huge variety of man-made water infrastructure that the new WUAs had to maintain.

Solutions: Today, IWMI is working across the Fergana Valley on best practices and models for WUAs. It has helped to create and pilot new structures for WUAs to improve their effectiveness. It advises governments on the rules, capacities, mechanisms and enforcement procedures that enable successful WUAs to operate sustainably and improve water-use efficiency.

Rehabilitating saline and waterlogged land

Despite increasing water shortages in the Syr Darya and Amu Darya river basins, water diversions for irrigation are high, averaging around 10,000 m³ per hectare. By contrast, Australian farms use less than half this amount. Not only are the aging canal irrigation systems inefficient at delivering water,

but farmers employ the conventional furrow system to irrigate their crops. As a result, there are high water losses from canals and extensive return flow from irrigated land.

When the groundwater table rises sufficiently to reach the land surface, waterlogging occurs. Then, as this water evaporates, salts such as sodium chloride and sodium sulphate accumulate in the soil. This negatively affects the growth of crops. The area of waterlogged soils in Central Asia amounts to 2.47 Mha, an area equivalent to the landmass of the entire United Kingdom.

Solutions: Using groundwater instead of water from canals can help lower the water table and reduce waterlogging. IWMI is researching ways to reduce water losses by rehabilitating canal systems, and improving drainage by increasing drainage flows.

The water-energy-food nexus

With growing demand for food and energy in Central Asia, the competition for water has increased. On the Syr Darya River, upstream reservoir operators have switched from balancing water use between agriculture and energy sectors, to favor exclusive use for energy generation. The shift has reduced river flows downstream in the summer and increased flows in the winter. As a result, farmers have to contend with water shortages in the summer and excess, often unutilized, flows in the winter.



Solutions: IWMI is working to try and redress this imbalance by storing the excess winter flow in underground aquifers for use during the dry summer months. This technique is known as Managed Aquifer Recharge (MAR) and IWMI's scientists have so far shown that 500,000 ha (equivalent to 55% of the land area that is currently irrigated in the Fergana Valley) could be shifted from canal irrigation to conjunctive surface water and groundwater irrigation.

Managing water scarcity

Water stress and water scarcity occur where water is extracted from rivers and lakes in an unsustainable manner. The situation is serious in Central Asia, particularly in Uzbekistan, Turkmenistan and Tajikistan, where the water withdrawn each year is more than what is available from natural resources. This

means that a large part of the freshwater withdrawn comprises lower quality wastewater and agricultural drainage water that has reentered the system and been used again.

Solutions: Increasing productivity, by boosting the crop yield per volume of water, is one way in which farmers can overcome issues of water scarcity. IWMI works with farmers in dryland areas to help them identify and overcome barriers to improving productivity. This can involve introducing drought-tolerant crop varieties and altering irrigation practices.

Healthy ecosystems underpin productive agriculture. IWMI is a pioneer of the concept of environmental flows: the amount of water that needs to be retained in a river or wetland for the ecosystem to remain vibrant. It uses this approach in its computer modeling to ensure that agricultural development is not achieved at the expense of natural systems.



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For project details, databases, publications and communication materials.

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