

Modernizing Irrigation in Central Asia

Agriculture is an important sector for the economies of Central Asia. Nearly 60 percent of the population of the region resides in rural areas and are dependent on agriculture for their livelihoods. While the contribution of agriculture to national gross domestic product has been declining over the last decade because of other economic development, the agricultural sector remains important in Central Asia for food security, fighting malnutrition, poverty reduction, and rural development. In addition, agriculture irrigation represents a major climate-adaptation measure. It increases the resilience of agricultural production systems and livelihoods to climate-induced meteorological and hydrological variability.

Currently, irrigated agriculture consumes approximately 90 percent of all abstracted water in the Aral Sea Basin, where these countries are located. About 80 percent of the agricultural land in Central Asia is irrigated due to the semi-arid climate and limited surface runoff. With only about 12 percent of all potentially arable land being irrigated, water, rather than land, is the constraining resource in bringing about agricultural development in the region. Irrigation improves agriculture productivity and increases food security and job opportunities.

The key problems facing the irrigation sector in the region relate to (1) overdevelopment of irrigated areas, with some schemes being economically unviable (particularly schemes with extensive water pumping); and (2) lack of adequate funding for management, operation, and maintenance, even for schemes that demonstrate economic viability. The continuous



©Neil Palmer/IWMI

deterioration of irrigation and drainage (I&D) infrastructure in the region, combined with weak irrigation management institutions, results in decreased income for farmers who suffer lower-than-optimum irrigation services, including high water losses in the systems, low water-use efficiency, top-to-tail end disparities in irrigation water supply, and salinization or inundation.

A combination of high levels of water withdrawals and already limited water resources puts considerable stress on the water supply in the region. Additionally, an important hydrological feature of the region is that the downstream countries (Uzbekistan, Turkmenistan, and Kazakhstan) are highly dependent on upstream countries for essential irrigation water originating in the upstream Kyrgyz Republic and Tajikistan.

If no improvements in productivity of water are achieved, the likely increases in water abstractions and additional water storage in the upstream countries are likely to lead to increased seasonal water shortages in irrigation water supply in downstream countries of the basin, thereby negatively affecting agricultural production and rural livelihoods and intensifying out-migration to urban areas. Thus, increasing water use efficiency is critical for economic development in Central Asian countries. Moreover, improving irrigation infrastructure and management also represents a critical factor for building peace and political stability in this region, which is also characterized by high dependency on transboundary water resources and large cross-border irrigation schemes.

The cost of inaction is expected to be high. Central Asian economies are already facing significant losses in agricultural productivity due to water scarcity compounded by inefficient use of irrigation water. Poor irrigation water management, coupled with this increasing water scarcity, also contributes to the existing environmental problems in the region, causing significant economic and social damage.

In addition, this rapidly growing water scarcity in the region makes agricultural activities vulnerable to variations in seasonal river flows. Climate change is expected to aggravate water availability in Central Asia through increased evapotranspiration and rainfall fluctuations, as well as a resultant severity of droughts and floods. Climate-change-related hydrological variability and the increasing water scarcity impose considerable economic risks for the region.



Neil Palmer/IWMI

Thus, the Central Asian countries find themselves at a crossroads when it comes to irrigated agriculture. They have only begun to open up to modernization of on-farm irrigation and to undertake relevant reforms in the sector with hopes of providing improved water services to farmers in support of broader agricultural and water resource transformation in the region.

Modernization of irrigation systems in the region is emerging as a key solution for responding to the challenges in the sector under the changing socioeconomic circumstances. It is estimated that modernization of irrigation infrastructure and methods across Central Asia could increase crop yields by 20 percent by 2030 and 50 percent by 2050. Under changing climate conditions, irrigation helps realize climate-smart agriculture by improving robustness against climate risks and flexibility against increased variability. Irrigation also creates jobs and stimulates the rural economy.

Technological advances and innovations made over the past few decades have resulted in significant improvements in the efficiency of irrigation systems and the quality of their performance. This includes a range of modern technologies that incorporate, among other things: pipe distribution systems combined with pressurized irrigation (drip and sprinkler irrigation), ET-based water management using remote sensing, geographic information systems (GIS), digital and wireless communication of data and information, and SCADA (Supervisory Control and Data Acquisition) systems for canal control. Moreover, new agricultural technologies in seed varieties, fertilizers, no-till

cultivation, as well as in precision agriculture, provide enormous opportunities for increasing agricultural yields and irrigation water productivity. In addition, renewable energy (especially solar) offers reliable options and can be affordable to farmers.

The purpose of the regional Irrigation Modernization Initiative, launched in February 2018 by the World Bank, is to provide guidance on modernization of the I&D sector in Central Asia based on the activities carried out under an Advisory Services and Analytics (ASA) study. The initiative has three components: (1) stocktaking of current irrigation development in Central Asia, (2) sharing information to pave the way to irrigation modernization, and (3) providing technical assistance, piloting, and support of institutional reform.

The [Modernizing Irrigation in Central Asia](#) (P166407) ASA, which was completed in FY2020, supported irrigation sector clients in the region through early exposure and education on the topic of irrigation modernization as well as in the adoption of concepts, such as subsystems and on-farm modernization, through irrigation investment operations. As part of the study, a stocktaking exercise was also undertaken in collaboration with the Food and Agriculture Organization (FAO) which assessed irrigation systems performance at several sites (in Tajikistan and Uzbekistan using FAO rapid appraisal procedures. The exercise resulted in a stocktaking and strategic discussion [report](#), finalized in May of 2019, summarizing key recommendations.

The primary focus of the [Modernizing Irrigation in Central Asia](#) (P166407) ASA was to enable regional dialogue on the topic of irrigation modernization, which culminated in a

Regional Workshop that took place in Almaty, Kazakhstan, in November of 2019. The event drew an audience of 94 delegates composed of policy makers, irrigation practitioners, scientists and researchers, representatives of water user associations, private sector actors, and international partners and donors.

The Stocktaking Report provided proposals for modernization in the region, which were then discussed at the workshop. The regional workshop was convened to (1) learn from the findings of the stocktaking study and to learn from a range of national, regional, and international specialists from organizations, research institutions, and universities; (2) discuss potential private sector involvement in the I&D sector; (3) discuss options for modernization in individual countries; and (4) build networks to assist each country in their moves toward modernization.

The regional workshop succeeded in raising interest in irrigation modernization along with the Bank's support in such processes. For additional information on the workshop, you may refer to a [3-minute film](#), a [blog post](#), and the [proceedings report](#). Furthermore, following the meeting, a delegation from the Bank visited Kazakhstan and Uzbekistan to discuss options for a public-private partnership.

The [final report](#) from the ASA took stock of the World Bank's initiative for irrigation modernization in Central Asia, summarized the engagements that took place, and offered a transformation pathway through: (1) policy development and legislation, (2) institutional reform, (3) modernization of irrigation (and drainage) infrastructure, (4) strengthening of agricultural services and practices, and (5) improved utilization of knowledge



and information systems. This report thus provided high-level messages for the modernization of the I&D sector in Central Asian countries by identifying: (1) key enabling factors required to facilitate sustainable modernization of the I&D sector in Central Asia, (2) component parts to a modernization program,

(3) “smart” technologies that can usefully be deployed in the modernization process, and (4) steps that can be taken to modernize the I&D sector. The succeeding developments became part of a new ASA—[Strengthening Irrigation Management and Reforms in Central Asia](#) (P173250), approved in FY2021.



Neil Palmer/IWMI

Connect with the Water Global Practice

www.worldbank.org/water worldbankwater@worldbank.org [@worldbankwater](https://twitter.com/worldbankwater) blogs.worldbank.org/water

© 2020 International Bank for Reconstruction and Development / The World Bank. Some rights reserved. The findings, interpretations, and conclusions expressed in this work do not necessarily reflect the views of The World Bank, its Board of Executive Directors, or the governments they represent. The World Bank does not guarantee the accuracy of the data included in this work. This work is subject to a CC BY 3.0 IGO license (<https://creativecommons.org/licenses/by/3.0/igo>). The World Bank does not necessarily own each component of the content. It is your responsibility to determine whether permission is needed for reuse and to obtain permission from the copyright owner. If you have questions, email pubrights@worldbank.org.

