

SECTOR ASSESSMENT (SUMMARY): AGRICULTURE AND NATURAL RESOURCES¹

Sector Road Map

1. Sector Performance, Problems, and Opportunities

1. Uzbekistan's national irrigation service area grew by 200% during 1913–1990 from 1.4 million hectares (ha) to 4.2 million ha, but it has stopped expanding and may be in decline.² The country's irrigation water resources have been allocated to too large an area, which has resulted in water scarcity and salinity, poor service delivery, and low agricultural productivity of water. These problems occur at the river basin level. They are interrelated, require new solutions, and will demand a challenging transition from infrastructure development to integrated river basin management. At the irrigation system level, infrastructure continues to deteriorate, organizational management capacity remains limited, and agriculture faces several constraints.

2. Agriculture in Uzbekistan depends on irrigation. Mean annual rainfall is only 206 millimeters (mm). Agriculture consumes 93% of all water withdrawals, and 96% of the total cropped land is irrigated. This creates a large overlap between water management and agriculture. Uzbekistan's agriculture sector grew at 6.8% per annum during 2000–2007, faster than the economy as a whole. From 2008 to 2010, agricultural growth averaged 5.7%. Agriculture employs 32% of the workforce, produces 24% of gross domestic product, and accounts for almost 70% of domestic trade.

3. **Increasing water scarcity.** Uzbekistan shares the Aral Sea Basin (ASB) with six other countries. The ASB is fed by (i) the Syr Darya River, with a mean annual flow (MAF) of 37.2 cubic kilometers (km³), which is 32% of the ASB MAF; and (ii) the Amu Darya River with an MAF of 79.3 km³, which is 68% of the ASB MAF. Most of the water originates in the upstream countries. The Kyrgyz Republic generates 72% of the Syr Darya MAF. Tajikistan generates 70% of the Amu Darya MAF, and Afghanistan accounts for 18%. Uzbekistan's present annual per capita water endowment of 1,850 cubic meters (m³) is adequate as it is above the 1,700 m³ threshold of water stress. However, overdevelopment on country's irrigated land and overallocation of water to this land has led to acute water scarcity. In 1999, for example, the country's total ASB water supply was 118.6 km³, withdrawal was 156.2 km³, and consumption was 118.6 km³, of which 109.6 km³ (92%) was productive. This meant that the ASB water resources were overallocated—132% of supply was withdrawn and all of it was consumed, and the ASB is “closed” (no outflow), which is why the Aral Sea has desiccated.³

4. The present water scarcity is likely to increase because of increased intersector demand in Uzbekistan, development of upstream storage dams, and climate change. Upstream irrigation expansion will consume more water while hydropower development will continue to change the flow regime from summer, when water is needed for downstream irrigation, to winter.

¹ This summary is based on the Sector Assessment: Agriculture and Natural Resources in the Country Partnership Strategy: Uzbekistan 2012-2016 and the consultant's final report of ADB's technical assistance: Amu Bukhara Irrigation System Rehabilitation (TA 7917).

² Government of Uzbekistan, Ministry of Agriculture and Water Resources. 2011. *Water Resources Management in Uzbekistan*. Tashkent.

³ United Nations Development Program. 2007. *Central Asia—Regional and National Water Sector Review*. http://waterwiki.net/index.php/Central_Asia_%E2%80%93_Regional_and_National_Water_Sector_Review
Withdrawal greater than 100% of MAF is possible because drainage recharges groundwater and water returns to rivers, where it is reused.

5. Simulations using global climate change models suggest that it is likely that by 2050: (i) the annual mean temperatures in the ASB are going to rise by about 3 degrees; (ii) the overall size of glaciers in the Pamir and Tien Shan mountain ranges (the main source of river flow) will decrease by 45% to 60%; (iii) peak runoff will shift from summer to spring and decrease in magnitude; and (iv) total annual runoff into the ASB downstream areas will decrease by 22%–28% in the Syr Darya Basin and 26%–35% in the Amu Darya Basin, with inflow decreases of up to 45% expected in the late summer months. Annual total water demand is likely to increase during the same period by 3.0%–3.9% in the Syr Darya Basin and by 3.8%–5.0% in the Amu Darya Basin. This would in turn raise the levels of annual unmet demand from the current 8.8% in the Syr Darya Basin to 31.6%–39.7%, and from the 24.8% currently in the Amu Darya Basin to 45.8%–54.5%. With overuse of ASB water resources, the size of Aral Sea is projected to shrink from about 17,000 square kilometers now to 13,800 square kilometers in 2050. Climate change projections for Uzbekistan for 2005–2050 also indicate that (i) water demand will increase from 59 km³ to 62 km³–63 km³, (ii) supply will decrease from 57 km³ to 52 km³–54 km³, and (iii) the present water deficit will increase more than 500% from about 2 km³ to 11–13 km³.⁴

6. **Salt accumulation.** Waterlogging and salinity affect 47% of irrigated land in Uzbekistan. Cotton yields decline 20%–30% on slightly saline land and up to 80% on highly saline land, and 20,000 ha of irrigated lands go out of production each year due to waterlogging and salinity. The main source of primary salt in river basins is mineral salt present in some soils. The main sources of secondary (irrigation system level) salt are (i) withdrawal of saline irrigation water, and (ii) waterlogging (high water table) and capillary rise that transports salt into the crop root zone.

7. **Low agricultural productivity of water.** Water productivity, in tons per cubic meter (T m⁻³) is equal to yield, in tons per hectare, (T ha⁻¹) divided by water consumption in cubic meters per hectare (m³ ha⁻¹). Initial analysis indicates that the productivity of water in Uzbekistan is low because the available water is used to irrigate too much cultivated land, which means that optimum water needs of the crops on these lands are not being met. Reducing the land area irrigated and thereby increasing the average amount of water provided for crops can raise productivity. This is because the resulting yield increase will be proportionally greater than the increase in water consumed. For example, initial analysis indicates that 20% more wheat could be produced on 25% less land using the same current overall amount of irrigation water.⁵ Overextended irrigation areas in Uzbekistan will go out of production as water scarcity worsens in any case. The potential for improving the agricultural productivity of water and making better use of suitable land offers the government an opportunity to plan and manage the economic efficiency and social equity trade-offs involved. The improvement and consolidation of existing irrigated areas should receive priority over new development.

8. **Poorly maintained infrastructure.** During the 1990s, the state share of agricultural investment declined from 27% to 8%, with a decline in state financing for agriculture from 2.9% to 1.8% of gross domestic product. Spending on operation and maintenance also declined sharply and remains low. The desilting and structural repair of canals decreased, and reconstruction stopped. Estimates of infrastructure investment needs in 2005 found that (i) 60% of reservoirs needed desilting, (ii) 18 of 42 intakes with capabilities of 10 to 300 cubic meters per second (m³ s⁻¹) needed replacement or reconstruction, (iii) 32% of 22,300 kilometers (km) of main and

⁴ World Bank. 2010. *Climate Change and Agriculture Country Note*. Washington, DC. www.worldbank.org/eca/climateandagriculture.

⁵ International Water Management Institute. 2007. *Water for Food, Water for Life—A Comprehensive Assessment of Water Management in Agriculture*. London and Colombo. Figures 7.2 and 7.3. Present winter wheat yield is 4.2 tonnes per hectare (T ha⁻¹) potential consumption is 500 mm; and potential winter wheat yield, with full consumption, is 9.2 T ha⁻¹. Crop water stress is assumed to account for half the yield gap.

secondary canals and collector drains required reconstruction and 24% needed repair, (iv) 42% of 149,500 km of tertiary and on-farm canals and drains required reconstruction and 17% needed repair, (v) 11,500 km of subsurface drains required reconstruction or repair, and (vi) 19,000 km of open drains needed desilting.

9. Pumped irrigation and drainage (I&D) pose additional challenges. Three massive pumped cascade systems irrigate over 800,000 ha of land from the Amu Darya River. The Asian Development Bank (ADB) is financing the rehabilitation of the Amu Zang system.⁶ The other two systems also urgently need rehabilitation. Almost all pumps are operating beyond their design life and are starting to fail. About 80% of the country's 76 large pumping stations, 50% of its 496 medium pumping stations, and 30% of the 561 small pumping stations—supplying 50% of the national irrigation area—require reconstruction or repair. Substantial investment is needed to convert pumping systems into efficient and cost-effective operations.⁷

10. **Water management.** The Ministry of Agriculture and Water Resources is responsible under the country's 1993 Water Law for agriculture and water resources, including administering water rights and water allocation and resolving disputes. The ministry's directorate for water management is in charge of developing and managing I&D systems. Since 2003, the directorate has managed 10 basin irrigation system administrations in the country, each of which has lower-level administrative bodies for main canals and irrigation systems. However, responsibilities within this organizational structure remain unclear, and new capital and cost-recovery and financing modalities are needed for operations and maintenance to prevent further infrastructure deterioration, including further degradation of pumping stations, and to sustain improvements.

11. Water consumers' associations (WCAs) have been established since 2002 and are responsible for tertiary I&D systems that were managed by the state prior to 1993.⁸ The size and responsibilities of the WCAs vary considerably, however, and fewer than 10% of their members are women. No program exists to develop WCA capacity. The membership fees, collection efficiencies, and financial sustainability of these associations remain low.

12. **Agriculture and food security.** In 2007, cotton accounted for 40% of Uzbekistan's exports, and cotton crops (grown on 41% of the irrigated area) and wheat crops (grown on 42% of the irrigated area) accounted for 60% of agricultural production. Wheat self-sufficiency became a strategic government priority after independence in 1991. Cotton yields increased only marginally during 1992–2008, from 2.5 tons per ha to 2.6 tons per ha. Wheat yields increased from 2.4 tons per ha to 4.2 tons per ha during this period.

13. The government manages the production and marketing of cotton and wheat. Farmers are subject to quotas and provided with subsidized credits and inputs to plant large areas to these crops. They are also required to sell 50% of their wheat and cotton harvest to the government. Land use contracts are often not registered or recognized in Uzbekistan, and land titles are not transferable. This limits the incentive for private productivity investments and the availability of credit, since farms are not viable as collateral. The country's cooperative farms consist of poorly performing state cooperatives that were privatized. About 4 million–5 million farms of 0.15 ha–0.35 ha inheritable household plots are categorized as peasant (*dekhan*) farms.

⁶ ADB. 2003. *Report and Recommendation of the President to the Board of Directors: Proposed Loan to the Republic of Uzbekistan for the Amu Zang Irrigation Rehabilitation Project*. Manila.

⁷ United Nations Development Programme. 2007. *Water: Critical Resource for Uzbekistan's Future*. Tashkent.

⁸ These groups were originally known as water users' associations. They were renamed water consumers' associations in 2010.

They have secure long-term tenure and produce one-fifth of the country's grain and most of its horticultural crops.

2. Government's Sector Strategy

14. The objectives of Uzbekistan's Welfare Improvement Strategy for 2012–2015 include sustainable inclusive economic growth (including agriculture growth) and food security. The government's 2009 integrated rural development program aims to further reform the legislative and regulatory framework of the agricultural sector, improve I&D systems, and develop the WCAs. The national investment program separates I&D projects, often for the same system, and the government lacks an official strategy for the integrated management of land and water resources at the irrigation system level or the river basin level.

3. ADB Sector Experience and Assistance Program

15. ADB's water and irrigated agriculture program in Uzbekistan since 1996 has comprised (i) five projects, involving seven loans totaling \$295.2 million; and (ii) 12 technical assistance (TA) projects amounting to \$8.8 million. Their project completion reports rated the Grain Productivity Project *successful* and the Ak Altin Agricultural Development Project *partly successful*.⁹ There is a positive association between the success of ADB projects, particularly in the water sector, and their quality at entry (improved identification and preparation).¹⁰ The ADB Water Operational Plan for 2011–2020 envisages a new generation of projects to address water scarcity by improving service delivery and water productivity.¹¹

16. A 2011 country assistance program evaluation recommended that ADB maintain its focus on infrastructure—including infrastructure for agriculture and natural resources—and provide advisory TA to help the government develop an agriculture and natural resources sector strategy.¹² A strategy and investment plan, to select core subprojects, was developed as part of the Water Resources Management Sector Project, approved in November 2008.¹³ The strategy identified the low agricultural productivity of water as the core development problem.

17. ADB's country operations business plan for 2012–2014 for Uzbekistan includes assistance for the Amu Bukhara Irrigation Project. This project is part of the government's 2009 integrated rural development program and will improve the agricultural productivity of water. The Amu Bukhara project preparatory TA¹⁴ and regional TA¹⁵ covering Uzbekistan were both approved in late 2011. The regional TA will prepare (i) strategic country water assessments, as envisaged by the Water Operational Plan, to identify and prioritize challenges at the river basin and irrigation system levels; and (ii) water sector strategies with solutions to address the challenges.

⁹ ADB. 2010. *Completion Report: Grain Productivity Improvement Project in Uzbekistan*. Manila; ADB. 2010. *Completion Report: Ak Altin Agricultural Development Project in Uzbekistan*. Manila. The Project only partly achieved its infrastructure outputs, and expected cotton and wheat yield outcomes.

¹⁰ ADB. 2008. *Project Performance and the Project Cycle*. Manila; ADB. 2009. *Country Partnership Strategy: Responding to the New Aid Architecture*. Manila; and ADB. 2010. *Good Project Implementation Practice*. Manila.

¹¹ ADB. 2011. *Water Operational Plan, 2011–2020*. Manila.

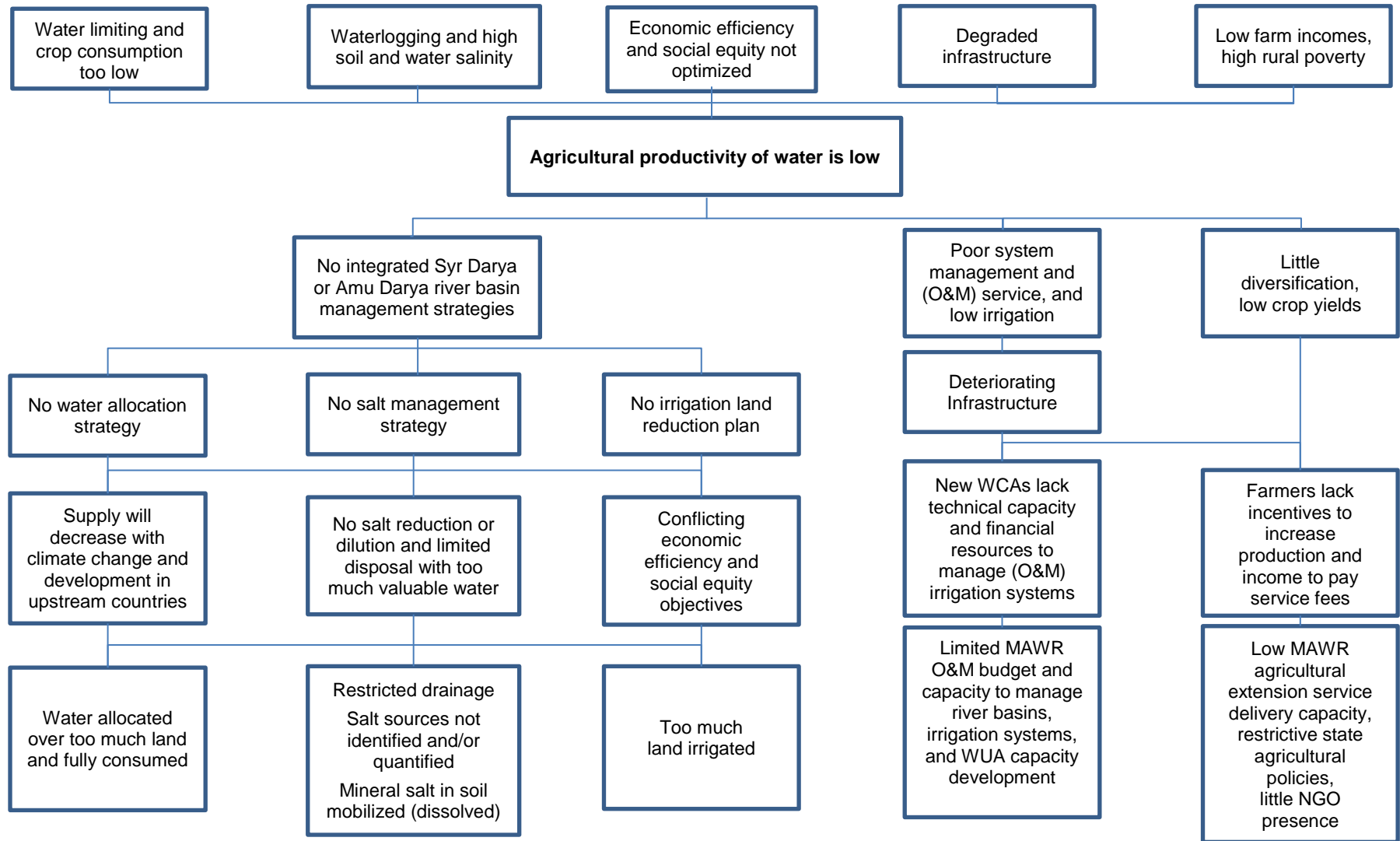
¹² ADB. 2011. *Country Assistance Program Evaluation for Uzbekistan*. Manila.

¹³ ADB. 2008. *Report and Recommendation of the President to the Board of Directors: Proposed Loans to the Republic of Uzbekistan for the Water Resources Management Sector Project*. Manila.

¹⁴ ADB. 2011. *Technical Assistance to Republic of Uzbekistan for the Amu Bukhara Irrigation System Rehabilitation*. Manila.

¹⁵ ADB. 2011. *Technical Assistance for Knowledge and Innovation Support for ADB's Water Financing Program (Supplementary)*. Manila.

Problem Tree for Agriculture and Natural Resources (Irrigated Agriculture)



MAWR = Ministry of Agriculture and Water Resources, O&M = operation and maintenance, WCA = water consumers' association.
Source: Asian Development Bank.

Sector Results Framework—Agriculture and Natural Resources (Irrigated Agriculture), 2013–2016

Country Sector Outcomes		Country Sector Outputs		ADB Sector Operations	
Outcomes with ADB Contribution	Indicators with Targets and Baselines	Outputs with ADB Contribution	Indicators with Incremental Targets	Planned and Ongoing ADB Interventions	Main Outputs Expected from ADB Interventions
Agricultural productivity of water (the limiting resource) improved and sustained at the river basin level	<p>Productivity of water increased from 1.40 kg of wheat per m³ of water in 2011 to 1.68 kg per m³ in 2016</p> <p>Crop yields increased by 5% by 2016 (2008 baseline: 2.6 tons per hectare for cotton and 4.2 tons for wheat)</p>	Water resources infrastructure and systems expanded and improved	<p>800,000 hectares of irrigated land receive secure water supply by 2016</p> <p>60 water pump stations upgraded by 2016</p>	<p>Planned key activity areas</p> <p>Irrigation infrastructure rehabilitation (80%)</p> <p>Irrigation systems management (20%)</p> <p>Pipeline projects with estimated amounts</p> <p>Amu Bukhara Irrigation Project (\$220 million)</p> <p>Ongoing projects with approved amounts</p> <p>Amu Zang Irrigation Rehabilitation Project (\$72.2 million)</p> <p>Land Improvement Project (\$60.2 million)</p> <p>Water Resources Management Sector Project (\$100.0 million)</p> <p>Amu Bukhara Irrigation System Rehabilitation PPTA (\$1.5 million)</p> <p>Water Resources Management PPTA (\$1 million)</p>	<p>Planned key activity areas</p> <p>Rehabilitation of the Amu Bukhara irrigation system improving water resource management</p> <p>Pipeline projects</p> <p>Rehabilitating 315,000 hectares of irrigated land</p> <p>major pump stations upgraded by 2016</p> <p>Upgrading of main conveyance canals and hydraulic structures (targets to be determined)</p> <p>Strengthening irrigation systems management</p> <p>Ongoing projects</p> <p>Improving 183,000 hectares of land under irrigation</p> <p>Rehabilitating 150 km of inter-farm canals</p> <p>Capacity development for improved water resources management.</p>

ADB = Asian Development Bank, kg = kilogram, m³ = cubic meter, PPTA = project preparatory technical assistance.

Source: Asian Development Bank.