Food and Agriculture Organization of the United Nations

المؤسسة العامة للري
Saudi Irrigation Organization
المملكة العربية السعودية

Saudi Water Forum
30th June 2026 | Jeddah, Saudi Arabia

"Strategic Pathways toward Sustainable Water Resources Management: A High-Level Policy Dialogue"

Pillar 2: Regional Experiences in Addressing Water Scarcity, Non-Conventional Water, and Demand Management

Aggregate Impact of Demand Management Practices on Jordan's Irrigated Agriculture

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King Tala Dam of Jordan, the largest water body for mixing treated wastewater with fresh surface water. Photo by Hazim El-Naser

Executive Summary

Jordan's irrigated agriculture provides a policy model for managing water demand under severe scarcity by combining irrigation modernization, treated wastewater reuse, crop planning, institutional coordination, and farmer participation.
The policy outcome is clear: irrigation now represents about 48% of Jordan's water budget, compared with a regional average of 80%, while Jordan Valley irrigated land expanded from about **29,000 hectares** in 1995 to **33,000 hectares** in 2023. Over the same period, total irrigation use fell from about **337 MCM**, including **50 MCM** of treated wastewater, to about **263 MCM** in 2024, including **156 MCM** of treated wastewater—a 22% reduction.
These reforms improved both productivity and economic value. Agriculture's GDP contribution rose from about **3.8%–4%** in 1995, with the Jordan Valley contributing around 60%, to draft 2025 estimates of **8%–8.6%**. Jordan Valley production also increased from about **one million tons** in 1995 to about **2.0 million tons** in 2023.

First, policy should support on-farm modernization—drip systems, automation, shade nets, improved networks, and supplementary irrigation—while linking efficiency gains to allocation control so that savings are not lost through expanded use.
Second, digital monitoring and precision scheduling should become core public management tools. Satellite monitoring and IPADT can guide allocation, identify underperformance, and support evidence-based advisory services.
Third, treated wastewater reuse should be governed as a strategic water source, supported by blending rules, salinity monitoring, crop selection, and quality standards. Policies that encourage higher-value crops such as date palms, olives, and protected vegetables can raise returns per cubic meter.
Finally, implementation requires institutions that share data, align incentives, enforce rules, and work directly with farmers through bodies such as the Jordan Valley Authority, Water User Associations, and relevant ministries.

Aggregate Impact

The Jordan Valley covers approximately **29,000 hectares** of irrigated land in 1995 to **33,000** ha in 2023, depending on the boundary and reference year used. The water mix has shifted substantially over time: in 1995, total irrigation use was about **337 MCM**, including around **50 MCM** of treated wastewater reuse. By 2024, the water budget included approximately **107 MCM** of surface water and **156 MCM** of treated wastewater reuse, for a calculated total of about **263 MCM**, a 22% reduction in water use from the 1995 level.
These changes have helped raise output and value. In 1995, agriculture contributed roughly **3.8%–4%** of Jordan's GDP (JV contribution about 60%). More recent figures cited in the draft suggest a higher contribution, around **8%–8.6%** in the first half of 2025. In parallel, Jordan Valley production is cited as increasing from about **one million tons** of vegetables, fruits and filed crops in 1995 to about **2.0 million tons** in 2023.

Why Has Productivity Improved while allocated water decreasing?

1. Modern Drip Irrigation, Automation, and Supplementary Irrigation

Jordan has practical experience with **pressure-compensating drip systems, automated irrigation, shade nets, and improved irrigation-network design**, especially in groundwater-dependent areas such as Mafraq, Azraq, and the Amman–Zarqa basin. These technologies improve on-farm efficiency, reduce leaks and excess application, and support more accurate delivery of water to crops. In 1995 total irrigated area under surface water irrigation was 47% of the total JV irrigated are, converted all to drip and sprinklers by the early 2010. Since 2005 no more surface water irrigation in the JV.

2. Precision Irrigation Scheduling and Digital Monitoring

A leading demand management practice is to irrigate according to **crop water requirements, soil moisture, and evapotranspiration**, rather than fixed routines. Jordan is increasingly using digital tools and satellite-based monitoring to assess irrigation performance, crop water deficits, and water productivity across farms and irrigation schemes. This allows institutions to identify underperforming areas, target advisory support, and improve allocation decisions.

The Irrigation Performance Assessment and Diagnostic Tool (IPADT), co-developed by IWMI, FAO, the Jordan Valley Authority, and the Ministry of Agriculture, uses WaPOR satellite-derived indicators such as water consumption, crop water deficit, and water productivity. This provides a clearer spatial picture of irrigation performance and helps guide evidence-based demand management.
Demonstration cases show that IPADT can reveal seasonal and spatial variations in water use and crop performance, making it useful for both scheme-level management and farm-level advisory services.

3. Blending Water Sources and Managing Salinity of Treated Wastewater Reuse

Jordan has one of the region's strongest experiences in using treated wastewater for irrigated agriculture. Treated wastewater reuse has grown from about 50 MCM in 1995 to around 156 MCM in recent Jordan Valley figures. This has allowed scarce freshwater to be reserved for higher priority uses while maintaining agricultural production. Jordan reuses around 100% of treated wastewater, with it supplying 34% of irrigation water in Jordan, and 59% of the total irrigational water in the JV. This is a major demand-management success because it allows freshwater to be reallocated to other uses. The key lesson from Jordan's experience is that reuse works best when supported by tertiary treatment, quality standards, monitoring, and farmer trust.
A key lesson from Jordan is that treated wastewater reuse should not be managed as a simple one-to-one substitution for freshwater. Better results come from **blending treated wastewater with surface water**, matching crops to water quality, and closely monitoring salinity and nutrients to protect soils and maintain yields.
Localized irrigation systems—such as drip, trickle, and splitter systems—are generally the most suitable methods under Jordan Valley water-quality conditions. Because sodium and chloride concentrations can be high, crop selection must account for salinity sensitivity.
King Talal Reservoir is a major irrigation source for the Jordan Valley, supplying water through the King Abdullah Canal and flows from the Zarqa River. Because much of this supply includes treated wastewater, safe agricultural use depends on quality monitoring, suitable irrigation methods, and crop choices that match the available water quality.

4. Crop Choice, Water Productivity, and Salinity Tolerance

Jordan's experience with treated wastewater and scarce freshwater shows that demand management must include **crop planning**. Crops should be selected according to water productivity, market **value**, **and** tolerance to salinity or lower**-quality water**. Date palms and olives can be more resilient under saline or blended-water conditions, while crops such as citrus, peppers, and bananas require more careful management because of their sensitivity or high-water demand.

Shift to High-Value Permanent Crops

- **Date palms:** Since the 1990s, date palms—especially Medjool—have expanded significantly because of their high market value and relative tolerance to saline water. They are now a leading crop in the hotter southern parts of the valley.
- **Citrus:** Citrus remains important in the northern valley, including North Shouna. Growers increasingly rely on regulated deficit irrigation and tighter water management to cope with scarcity and climate variability.
- **Bananas:** Bananas remain commercially attractive but are highly water-intensive and depend on better-quality water. This makes them a continuing challenge for demand management despite efforts to reduce production.
- **Plastic greenhouses and tunnels:** Jordan has seen a major shift from open-field vegetables to protected agriculture. This transition helps stabilize yields, protect crops from climate shocks, and improve water-use efficiency for crops such as tomatoes, peppers, and strawberries.

5. Institutional Coordination and Farmer Participation

A recurring lesson in Jordan is that demand management for irrigation depends on how well institutions coordinate. Recent irrigation monitoring efforts bring together the Jordan Valley Authority, Ministry of Agriculture, Ministry of Water and Irrigation, Water Authority of Jordan, and National Agricultural Research Center. Jordan's experience suggests that real gains come when these institutions share data, align incentives, and jointly enforce rules rather than acting separately.

The Jordan Valley Authority works with local farmers through Water User Associations, which help manage water distribution, reduce losses, and support infrastructure maintenance. The draft notes that there are **24 Water User Associations**, covering about **78%** of the Jordan Valley area, equivalent to roughly **27,000 hectares**.

Main Lessons from Jordan's Experience

Jordan's experience shows that effective demand management depends not on one technology, but on the combined use of irrigation efficiency, water reuse, crop planning, and institutional coordination.
Drip irrigation, digital scheduling, and treated wastewater reuse can generate substantial benefits, but they achieve full savings only when paired with, crop discipline, monitoring, and farmer participation.
Jordan therefore offers a practical regional model: improve irrigation efficiency, expand non-conventional water use, adapt cropping patterns, and strengthen governance in parallel.
In irrigated agriculture, Jordan demonstrates that demand management is most effective when technology, reuse, crop planning, and governance are applied together. Precision scheduling, drip irrigation, treated wastewater reuse, and protected agriculture have improved productivity in the Jordan Valley, while groundwater control, salinity management, and Water User Associations remain essential to turning efficiency gains into real water savings.

- Adoption of smart irrigation technologies and stronger on-farm water control
- Shift toward higher-value, more water-productive crops
- Expanded reuse of treated wastewater in the Jordan Valley
- Growth of contract farming and market-oriented production systems
- Stronger coordination through the Jordan Valley Authority and Water User Associations

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