

Irrigation Water Allocation and Use Policy

Background

Water in the Hashemite Kingdom of Jordan is extremely scarce. The current annual endowment of renewable fresh water is only about 145 cubic meters per person, a value which will decline to worrisome levels in 10 years time as the population continues to grow. This is less than one-fifth of the internationally recognized threshold of water scarcity of 1,000 cubic meters per person per year.

Irrigated agriculture consumes about two-thirds of the country's fresh water supply, but its contribution to the Gross Domestic Product is far smaller than this. Moreover, there are growing competitive demands for water from urban areas, industry, and tourism; and irrigated agriculture must become more efficient in using water to allow these demands to be met. In the future, agriculture will have to rely increasingly on reclaimed wastewater as a primary water resource, which creates a special set of management problems because of the altered chemical and biological characteristics of such water.

The Jordan Valley is the fruit and vegetable garden of the country and its largest contiguous irrigated area. The Jordan Valley Authority (JVA) conveys water effectively and efficiently along the length of the valley from the Yarmouk River to the Dead Sea through the recently renovated 110 km King Abdullah Canal (KAC) and the Southern Ghors south of the Dead Sea. Water is delivered to farms in closed conduits, under pressure in all cases. The challenge remaining is to allocate the limited supply of water available to approximately 10,000 Jordan Valley farms in a transparent and equitable way and to apply it to crops so as to (a) maximize output per unit water, (b) prevent the accumulation of salts and other contaminants in soils, and (c) avoid deep percolation losses of water below crop root zones.

The northern portion of the KAC delivers water from the Yarmouk River and other freshwater sources in the irrigated areas above Deir Alla. At that point most of the remaining water in the canal is withdrawn and pumped up the plateau to serve domestic water needs in Amman. Simultaneously, reclaimed wastewater from Amman, mixed with whatever fresh water is available in the upper Zarqa River, is returned to the KAC to irrigate the remaining area served by the KAC. This "blended" water is significantly altered in quality from its original state. In the Southern Ghors, fresh water is diverted from side wadis to pressurized irrigation system serving mostly vegetable farms.

To make most efficient use of irrigation water, both improved technology and improved management must play a role. Partners in this effort include public agencies, private firms, external assistance agencies, and, most importantly, the farmers who use the water.

Current Water Allocation and Use Policy

Water allocation in the Jordan Valley is currently managed through twelve stage offices distributed along the JVA command area. Farmers visit these offices at least

once a season to learn the days of the week that water is available on their lateral and to request deliveries on one or more of those days. They generally request the maximum number of deliveries available to them. During the irrigating season, JVA ditch riders open the farm turnout assemblies (FTAs) serving individual farms according to the rotational schedule of the laterals and the requests for water farmers have made. In principle, each FTA has a meter which measures the amount of water delivered to the farm, and meter readings are used to allocate water and to prepare bills for water use according to the schedule of tariffs established in 1995. In practice, meters are often missing (Southern Ghors) or non-functional, especially in the central and southern parts of the valley served by blended water, and ditch riders estimate volumes.

Upon receiving water, farmers either irrigate directly from the lateral, usually by connecting their drip lines to a line leading from the FTA, or they direct their delivery to a private plastic-lined farm pond where they store the water for later use. In the latter case, they must operate their own pumps to withdraw water from the pond and pressurize their drip lines. Farmers often irrigate their crops with little knowledge of how much of the water they apply is stored in the crop root zone for beneficial use, and how much percolates below the root zone and is lost. Because water is relatively inexpensive, there is little incentive for them to concern themselves with this question.

Farmers in about 40 percent of the Jordan Valley are in various stages of establishing Water User Associations (WUAs). These WUAs interface with the JVA at the level of the head units along the KAC and in the irrigation systems in the Southern Ghors.

To guide allocation, the JVA uses target values of crop water requirements for three categories of crops: (a) bananas, (b) citrus, and (c) other tree crops and vegetables. Target values are slightly higher south of Deir Alla to account for the poorer quality of the blended water delivered there. No distinction is made for type of water application technology used by farmers or between greenhouse and open-field cultivation. Actual deliveries are not firm and depend on the amount of water available in a given year and other factors.

The Policy

Objective

This policy statement follows from longer-term objectives outlined in the *Water Strategy* and elaborates on priorities specified in the *Irrigation Water Policy*. As such, it comprises an updating and extension of selected elements of the *Irrigation Water Policy*. In particular it consolidates and elaborates elements of that policy relating to on farm water management, management and administration, water tariffing, and irrigation efficiency. It is consistent with the *Water Strategy* and is in conformity with its long-term objectives.

Although national in scope, the policy has particular relevance to situations in which a public agency provides irrigation service to a large number of private irrigators. As such, it is particularly relevant to the Jordan Valley.

On Defining and Updating Crop Water Requirements

1. Computed crop water requirements (CWRs) shall be used as a reference to estimate the amount of water required by particular crops, farms, and regions. JVA irrigation system managers shall adopt and

use best available CWR values to derive target water allocations to the farmers they serve.

2. Revised CWRs recommendations for use in Jordan shall be prepared for the range of crops grown. Consideration will be given to environmental variables, production methodologies, and irrigation technology when developing the CWRs recommendations.
3. Consideration shall be given to preparation of a user-friendly computer model to calculate CWRs based on user-provided local parameters.
4. The revised CWRs recommendations shall be used to prepare crop irrigation water requirements information in forms useable by all stakeholders.

On Water Allocation and Billing Practices

5. Irrigation water delivered to FTAs shall consider the crop water requirements (CWR) and the MWI / JVA operation and Water Master planning needs.
6. Irrigation service in public irrigation systems shall be provided on a limited rate on-demand volumetric basis. Limits shall be based on the revised set of CWR values to be developed under this policy, and according to water availability.
7. Farmers shall be billed for the volume of water used, according to the officially approved schedule of tariffs.
8. A written irrigation water allocation plan for the Jordan Valley (JV) shall be developed, and the use of the FORWARD model for tariff determination shall be assessed for internal use by JVA to analyze revenue receipts and full water delivery costs. The results of an annual analysis of receipts versus costs for irrigation water delivery will be provided to the Cabinet of Ministers for information during discussions on tariff rates.
9. The JV water allocation plan shall specify procedures for requesting water; billing, water delivery and water measurement procedures; procedures for adjusting water allocations in light of water availability; and upper limits on deliveries to particular crops. It shall also provide for joint implementation of these procedures with WUAs.
10. The JV tariff model shall account for inflation, reflect the value of water used in crop agriculture, consider farmer's ability to pay, recognize both quantity and quality differences in delivered water, and reflect the difference in costs to JVA between bulk and retail water sales.
11. JVA stage office boundaries shall be revised to correspond to head unit command areas and JVA shall report all water use data on a head unit basis.

On Building Farmers' Water Management Skills

12. Farmer's skills, attitudes, and incentives are key to increasing on-farm water use efficiency. Concerted programs shall be undertaken to boost

farmers' skills and align their interests with the public interest in efficient water use.

13. The ability of farmers to measure the actual moisture status in the crop root zone of the soil profile is essential for efficient on-farm water use. There is a variety of techniques and equipment available for this purpose. This should be a central component of the extension message delivered to irrigating farmers.
14. Opportunities for cooperation between the National Center for Agricultural Research and Technology Transfer (NCARTT), JVA and other organizations, e.g., WUAs, to organize field-based hands-on short training courses in soil moisture measurement and irrigation water applications management for farmers and farm laborers shall be pursued.
15. Serious consideration and advocacy support shall be given to closing the agricultural research-extension loop by restructuring the provision of extension services to farmers.

On Using Reclaimed Water

16. Reclaimed water shall increasingly become the primary source of water for irrigation in Jordan.
17. The quality of irrigation supplies containing reclaimed water shall be provided to irrigation system managers and farmers in advance of the start of the crop season and weekly during the cropping season.
18. The monitoring program shall also regularly sample agricultural soils and tissues from plants/crops irrigated with blended water to measure the accumulation and mobility of potentially harmful contaminants imported with it.
19. The monitoring program shall also include the effect of reclaimed water use in irrigation on groundwater quality.
20. Procedures for implementing the regular monitoring program and mechanism for disseminating results of the monitoring shall be developed.

On Measuring Deliveries

21. Accurate and widely-accepted measurements of irrigation deliveries are necessary for efficient system operation. Reliable meters shall be installed and read routinely at all FTAs. The possibility of farmer or WUA ownership of installed meters shall be considered.
22. Meter reliability is strongly influenced by water quality. Alternative technologies shall be investigated for measuring irrigation water containing a high proportion of reclaimed water and high particulate loads.
23. FTA meters shall be serviced regularly as a part of the water delivery responsibility.

24. WUAs should be involved in making and measuring water deliveries to farms wherever possible.
25. Trash and suspended solids originating from surface water supplies (KAC and Zarqa Carriers) shall be effectively excluded and minimized, respectively, from head unit structures.

On Delivering Water to Groups

26. The JVA shall support and facilitate the establishment of WUAs across the entire system command area.
27. Officials with decision-making authority shall meet regularly with WUA representatives to discuss water allocation and delivery issues.
28. Decision-making authority for system management shall be devolved downward to the maximum extent possible to interface effectively with WUAs organized at the head unit.
29. Where they demonstrate capability, WUAs shall be delegated the authority to manage water allocation and distribution below the head unit.
30. Where permitted by the main delivery system and when 29, is satisfied, WUAs shall have access to a continuous and measured water supply at the head unit.
31. According to existing JVA law and all modifications (items 18 b and 24 j) the Board of Directors of the Jordan Valley Authority requests the Cabinet of Ministers to grant permission for the sale of water in bulk to WUAs at the head unit entering the WUA managed area. JVA shall remain responsible for the maintenance of all irrigation networks down to the FTA, in agreement with JVA law.