

# **Water for Agriculture in Jordan: Policy Strategies for Reducing Water Consumption in the Agricultural Sector**

## **Agriculture in the Jordan Valley**

Agriculture in the Jordan Valley is extremely important to the local economy, with the sector providing the most jobs in the region. In addition, farming is central to the cultural heritage and way of life of the people who live in the valley. However, agriculture in Jordan is a water-guzzling, inefficient sector, accounting for approximately 70% of all water demand in Jordan. The vast majority of commercial agriculture in the Jordan Valley is irrigated rather than rain-fed<sup>1</sup> and water consumption in the agriculture sector is about 588 MCM per year.<sup>2</sup>

Reducing the agricultural sector's use of Jordan's limited water resources is essential for creating a sustainable relationship to the water economy in the future.<sup>3</sup> A myriad of factors contribute to the poor water-efficiency of the sector. Farmers receive water from the JVA according to crop varieties. Due to water shortages, farmers often do not receive their full quota and in turn steal water or dig illegal wells. The use of modern production and irrigation technologies is dependent on financial realities and farmer knowledge, and 30% of farmers still use the inefficient technique of surface irrigation.<sup>4</sup> Eighty-five percent of water consumption for fruit crops goes towards production of the water-intensive crops of bananas (21 MCM/year) and citrus (71 MCM/year).<sup>5</sup> In 2010, 617,477 tons of vegetables and 9,238 tons of fruits were exported from Jordan.<sup>6</sup> Water is subsidized by the government and farmers therefore do not feel the real cost of water. Exporting therefore equates to selling scarce water outside the country for an artificially low price. Because profits in agriculture are low, most farmers in the Jordan Valley are dependent on loans to survive.

The Jordanian government recognizes that water solvency is an issue in Jordan and has created policies to promote sustainable water solutions.<sup>7</sup> The government's current policies must be better enforced and supported by new strategies to decrease use of non-sustainable water resources.

FoEME envisions solutions that balance the needs of the environment with the needs of the burgeoning population of Jordan for water, agricultural products, and economic opportunities. Water use must be decreased by implementing the following policies:

- Agricultural extensions must be strengthened to systematically promote irrigation-efficient technologies, providing information about the best design and use of irrigation systems.

---

<sup>1</sup> Francois Molle, Jean-Phillipe Venot, and Youssef Hassan. "Irrigation in the Jordan Valley: Are Water Pricing Policies Overly Optimistic?" *Agricultural Water Management* 95 (2008)

<sup>2</sup> Khaleq, Rania A. Abdel. "Water Demand Management in Jordan." *Water Demand Management Unit, Ministry of Water and Irrigation* (June 2008).

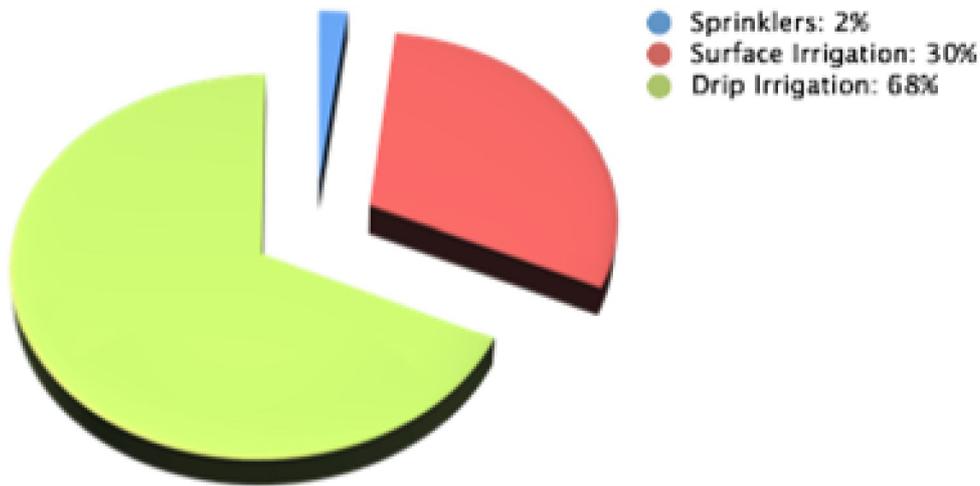
<sup>3</sup> Zeitoun, Mark, Tony Allan, Nasser Al Aulaq, Amer Jabarin, and Hammou Laamrani. "Water Demand Management in Yemen and Jordan: Addressing Power and Interests" *The Geographical Journal* 178, no. 1 (March 2012).

<sup>4</sup> M. Shatanawi, A. Fardous, N. Mazahrih, and M. Duqqah, "Irrigation systems performance in Jordan"

<sup>5</sup> Departure of statistics, food balance sheet 2008

<sup>6</sup> Jordan Department of Statistics, Food Balance Sheet 2010

<sup>7</sup> Zeitoun et al.



- From the funds made available through the selective water tariff increase, the government must increase investment in gray water and treated water infrastructure to increase the supply of water for agriculture.
- Water quotas to farms must continue to be reduced with a particular focus on crops with high water-demand. Additionally, a targeted increase in water tariffs must be implemented. This will not reduce water demand but will work towards covering operation and maintenance costs.

### **The Jordan River Rehabilitation Project**

In 2008, EcoPeace/Friends of the Earth Middle East (FoEME) commenced a study on the rehabilitation of the Lower Jordan River. The study identified the amount of water needed to return the flow of the Lower Jordan River to the sustainable level and the possible water saving alternatives in the national economies of the riparian countries. If implemented, the proposed water saving options will reduce the pressure on the water resources of the Lower Jordan River basin, thus aiding the rehabilitation of the river. The alternatives identified to reduce water consumption in the agriculture sector of Jordan include increasing efficiency of irrigation systems, increasing the use of gray water in agriculture, and lowering water quotas allotted to crops while simultaneously raising water tariffs to more accurately reflect the true cost of water.

### **How to Save Water with Improved Irrigation Techniques**

There are several methods that farmers use to irrigate their land in the Jordan Valley. Farmers' choices of irrigation technique depend on the kind of crops they grow, their financial reality, and the information they have access to. In the Jordan Valley, 68% of the farmers use drip irrigation, 30% use surface irrigation and 2% use sprinklers.<sup>8</sup> It is estimated that water savings through optimization of irrigation could reach almost 40 MCM/year by the year 2020 at a cost of 0.5 US\$/m<sup>3</sup>.

#### **Surface Irrigation**

Surface irrigation uses gravity and grooves in the earth to irrigate crops by allowing water to flow over the land.

Thirty percent of farmers in the Jordan Valley use surface irrigation systems to irrigate their crops. Overhead and maintenance costs are cheap and no training is required to implement this system.

---

<sup>8</sup> M. Shatanawi, A. Fardous, N. Mazahrih, and M. Duqqah, "Irrigation systems performance in Jordan"

However, surface irrigation is inefficient and results in large water losses and irregular watering. Traditionally, farmers use surface irrigation to irrigate 30-50% of their land once every three or four weeks. Water spreads unevenly over the land via grooves in the earth, water-logging some crops while parching others. Much of the water is absorbed by the land, and does not benefit the crop at all. FoEME recommends other methods of irrigation be implemented by farmers to save water and produce healthier crops.

### **Sprinklers**

Water flows through small emitters before it is sprinkled evenly over the irrigated area; each crop area or crop tree has its own emitter.

Sprinklers are superior to surface irrigation in water conveyance and efficiency, with 85% of crops uniformly watered. Less water is used in two or three sprinkler waterings than in one watering of surface irrigation. Maintenance is a barrier that prevents many farmers from using sprinklers, as special filtration systems must be purchased and cleaned and a specific water pressure must be maintained in the sprinkler.

### **Drippers**

Drip irrigation delivers water drop-by-drop through a series of pipes directly to the base of plants. Drip irrigation is steady and does not waste water by irrigating the soil in between lines of crops.

The uniformity of water conveyance with a dripper is even higher than the sprinkler system: 90% of crops are watered evenly. A drip irrigation system is precise and efficient, allowing for frequent watering. The average farm in the Lower Jordan River Valley can be irrigated via drip irrigation three times a week with current water quotas.

The best design for drip irrigation depends on the type of crops being grown—citrus and fruits should have a different configuration than vegetables or water-intensive bananas. However, all variations of drip irrigation systems are placed underground, and therefore do not easily get damaged by elements, human interaction, or animal interference.

Although more profitable than other methods of irrigation, drip irrigation systems require technical knowledge to work properly. Drip irrigation is only efficient when used as designed. Without the right crop configuration and constant maintenance, irrigation efficiency can fall to about 54%. Maintenance, though simple, is intensive. Farmers must clean the filters every two hours of use and replace the drip lines every two to four years. Drip water systems can malfunction under incorrect water pressures. These obstacles are all surmountable with basic training, and the economic and environmental benefits of drip irrigation far outweigh the costs of education.

**FoEME's Policy Suggestions:** If farmers use more water-efficient irrigation systems, production of crops will increase, while saving money and water. The Ministry of Agriculture must strengthen agricultural extensions and launch an awareness campaign to change practices towards the use of efficient irrigation techniques and technologies as well as proper installation and maintenance. The Ministry must also establish a financing mechanism to subsidize purchasing and installation of efficient irrigation equipment.

### **How to Create a Sustainable Water Supply for Agriculture: Gray Water Treatment**

Increasing the use of recycled water, such as treated gray water, would allow farmers to use more water while putting less of a strain on natural water resources. Gray water is water that has been used once but has not come into contact with fecal matter. There are many proven ecological benefits of gray water

recycling, including lower fresh water extraction from rivers and aquifers, topsoil nitrification, groundwater recharge and increased plant growth.<sup>9</sup>

Although not operational, there are three wastewater treatment facilities in the Jordan Valley with a design capacity of about 500,000 MCM/year for treated water. The potential estimated savings of fresh water through use of grey water in agriculture amount to almost 75 MCM/year by the year 2020.

### **Safety Concerns**

Perceived negative health implications are a barrier to gray water use for irrigation in Jordan. However, risks to plants and to human health can be mitigated through proper treatment of gray water. The Ministry of Water and Irrigation suggests that farmers blend treated wastewater with fresh water in order improve quality wherever possible. Heavy metals and salinity in treated water should be monitored, and farmers should select crops “to suit the irrigation water, soil type and chemistry, and the economics of the reuse operations.”<sup>10</sup>

### **Treated Wastewater Use for Agriculture in Jordan**

The idea of treating water and reusing it is not new in Jordan. Wastewater has been used for irrigation in Jordan for several decades. More than 70 MCM of reclaimed water, around 10% of the total national water supply, is used in Jordan each year. The Jordanian government has enacted laws on using treated water in agriculture. The official government position on wastewater is that it must be regarded as a resource rather than waste. Therefore all new wastewater treatment projects are required to include feasibility and design plans for wastewater reuse.<sup>11</sup>

**FoEME’s Policy Suggestions:** FoEME encourages gray water treatment and reuse in Jordan so that the demand for fresh water in the Lower Jordan River Valley can be lowered. The Ministry of Water and Irrigation should launch an awareness and education campaign on reclamation of municipal effluents in irrigation directed at the decision-makers and at water consumers. With the support of international donors, the Ministry of Water and Irrigation and Ministry of Agriculture must commit to support alternative developments through necessary budgetary allocations and to provide the necessary technical and financial support for these developments. They must also establish a system of incentives designed to encourage use of the treated water in irrigation and strengthen agricultural extensions to guide farmer towards the use of treated water.

### **How to Create and Save Water in the Agricultural Sector: Reducing Water Quotas and Raising Water Tariffs**

Saving water through improved irrigation and gray water use will not necessarily result in less water consumption in agriculture. Even if all the aforementioned measures are taken, farmers are likely to expand production and cultivate currently unused land so overall water usage stays the same. Reducing water quotas is therefore essential. Different species of crops are currently allotted different amounts of water from the government. The allotments need to decrease so that water for the agricultural sector can be re-assigned to other sectors, such as the more profitable tourism industry.

The Jordanian government’s official policy is that water costs to farmers should be indicative of the true cost of the water, including conveyance costs. Currently this policy has not been implemented. While an

---

<sup>9</sup> “Greywater Use in other Countries and its applicability to Jordan,” Center for the Study of the Built Environment, 2003.

<sup>10</sup> “Waste Water Policy,” Ministry of Water and Irrigation, Hashemite Kingdom of Jordan.

<sup>11</sup> Center for the Study of the Built Environment

increase in water tariffs won't lower water use by itself, it will help consumers become aware of its true value and incentivize conservation. Thus, while lowering water quotas for agricultural production, the government should also increase the price per CM of water.

### **The precedent for price and quota shifts in water for agriculture**

Historically, there is a precedent for increasing water tariffs. In order to cover maintenance and operation costs for water delivery, the JVA has implemented several price hikes over the years. In 1961, water was charged at an average price of cost of \$0.00141 fils/m<sup>3</sup>; this was raised to 0.018 JOD per CM by 2008.<sup>12</sup> The JVA itself recommends that any water quota and tariff policy be revised and re-scrutinized often, to make sure that it is practical and efficient with the changing times.<sup>13</sup>

### **Wouldn't lowering water quotas hurt farmers?**

Lowering water quotas for crops will not hurt the agricultural sector's productivity if the government also promotes the use of water-efficient irrigation and other technologies and provides training and support to its farmers. With these technologies, crops can thrive and farms can continue to be profitable with less wasted water. Additionally, the decrease in water quotas can and should be done gradually, through a progressive down-scaling over a period of several years. These measures taken in tandem should decrease the water use by the agricultural sector, while maintaining its importance place in the Jordanian economy.

**FoEME's Policy Suggestions:** Water tariffs for agriculture need to be increased, and water quotas decreased. The combination will reduce the demand for water in agriculture in the Jordan Valley, as well as provide additional governmental revenue for development of water treatment infrastructure. These changes will also help align the real cost of irrigation and water conveyance with its perceived cost for farmers, which will slowly change the way those in the agricultural sector view water and their role in its conservation. Updated legislation on water quotas and pricing must be coupled with an awareness campaign on the most cost-effective and water-effective crop varieties.

### **Water-Independent Opportunities for Increasing Farmers' Income in Jordan**

FoEME understands that agriculture's utility and value cannot be measured in economic terms only. Beyond the GDP indicator, agriculture is important for food production, employment, and a sound environmental stewardship of the Jordanian human habitat. Below, we highlight recommendations for providing opportunities for farmers to earn a sustained income that compensates for reduced water availability:

- Support the establishment of local processing facilities. Capturing more of the agricultural product's added value through processing facilities would also enable Jordanian farmers to become less vulnerable to seasonal price fluctuations through selling conserved products in the off-season.
- Encourage emergence of a local market for sustainable products through public procurement policies and health related educational campaigns.

---

<sup>12</sup> Molle, Pricing Policies,

<sup>13</sup> Mandri-Perrott, Cledan. "Jordan: From Water Service Provision To Planning And Management In The Jordan Valley Authority Case #161". Jordan Valley Authority Strategic Planning and Public Sector Institutional Reform: Shifting Roles from Water, n.d, 5

- Support emerging initiatives such as farmers' markets and community-supported agriculture schemes.
- Implement feasibility studies for agro-tourism, taking into account cultural differences and how to approach them.
- Integrate agro-tourism into eco-tourism development. For example, make agro-tourism part of the curriculum of Ajloun Nature Training Center that trains eco-tourism professionals.
- Require procurement from local farmers using environmentally sustainable production techniques as a condition for eco-tourism certification.

Less water for agriculture does not have to limit income for farmers and rural communities. If careful attention is given to the agricultural sector, there are ample opportunities for increased income and sustainable economic development for farmers in Jordan.

**Join our efforts to save water in the Lower Jordan River Valley!**

For more information and to support efforts to rehabilitate the Lower Jordan River please visit:  
[www.foeme.org](http://www.foeme.org).

Friends of the Earth Middle East's Jordan River Rehabilitation Project is supported by the Swedish International Development Cooperation Agency (SIDA), the Richard and Rhoda Goldman Fund, the Global Nature Fund/ Ursula Merz Foundation and the Osprey Foundation.

**Logos from funders**