



Methods for Irrigation and Agriculture
لتطوير أساليب الري والزراعة

NEWSLETTER

MARCH 2025 | ISSUE NO. 24



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RESEARCH AND DEVELOPMENT

Farmers' Perspectives on the Role and Effectiveness of Water User Associations in the Jordan Valley: A collaborative work between MIRRA and the Ohio State University



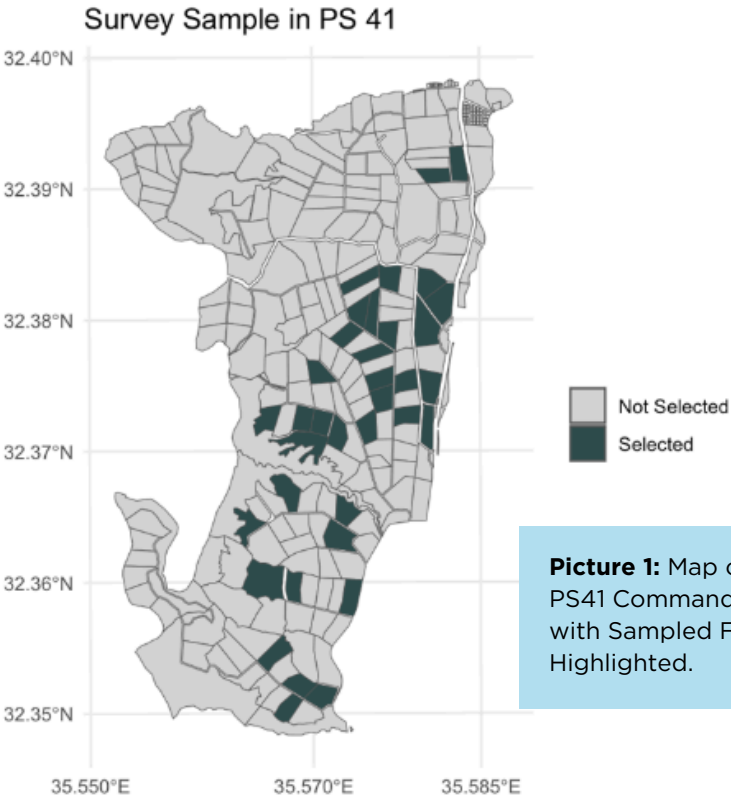
Beneficiaries

Farmers in the Jordan Valley

MIRRA conducted a survey to understand farmers' perspectives on Water User Associations (WUAs) in the Jordan Valley. The survey aimed to assess the impact of water shortages in the area, evaluate the effectiveness of WUAs in maintaining the water distribution system, ensuring timely and adequate water allocation, and monitoring irrigation networks for violations. Additionally, farmers were asked whether they believed the WUA operated fairly and equitably.

The survey included 49 questions divided into eight thematic sections. A total of 36 farmers were randomly sampled—25 from DA 16 and 11 from DA 17. These farms share the same pumping station (PS 41) and fall under the jurisdiction of the WUA located there. Farmers were selected through stratified sampling, ensuring representation from different locations along the irrigation network. Most interviews were conducted in person, with a few conducted over the phone when necessary. Interviews were held in Arabic, lasted 15 to 30 minutes, and farmers were assured confidentiality.

Most surveyed farmers (63%) were WUA members, while 20% had never joined, and 8% had left. Membership was often seen as a way to improve access to water and communication with the Jordan Valley Authority (JVA). Non-members were often new farmers or saw no incentive to join. However, all farmers, regardless of membership, had to engage with the WUA since it managed water distribution across the area. Only members could participate in meetings and vote for the WUA president.



Picture 1: Map of PS41 Command Area with Sampled Farms Highlighted.



Water shortages were a major issue, with 75% of farmers reporting insufficient water for irrigation. Many estimated a deficit of 50-70%. To cope, farmers reduced the number of crops grown, shortened irrigation hours, or sought alternative sources such as private wells, canals, or streams. Regarding the reliability of their water supply, 44% reported consistent weekly quantities but irregular timing, sometimes receiving water in the middle of the night. Another 28% experienced both inconsistent timing and quantity, while only 14% received water regularly in both aspects

Picture 2: A plastic-lined pond commonly used in the Jordan Valley to store water.



Farmers largely preferred contacting the WUA rather than the JVA for maintenance needs, with 66% reporting WUA as their first point of contact. This varied between the two areas; in DA 16, 56% reached out to the WUA, 20% contacted the JVA, and some handled maintenance independently. In DA 17, 90% relied on the WUA, while only 10% contacted the JVA. Overall, 72% of farmers found the WUA effective in addressing maintenance issues. However, many noted that the WUA often acted as an intermediary, forwarding maintenance requests to the JVA rather than addressing them directly. When asked who should be responsible for maintenance, 58% preferred the JVA due to its greater expertise, while 30% supported WUA responsibility. The preference for JVA oversight was stronger in DA 16 (64%) compared to DA 17 (20%).



Picture 3: A Farm Turnout Assembly (FTA), which includes a meter and flow limiter and is contained within a concrete box.

Farmers reported that the WUA consistently fined violators, 20% sometimes enforced penalties, and 16% no action was taken. 82% believed water theft and unauthorized irrigation system modifications were widespread. Many farmers justified illegal actions by inadequate JVA water allocations, claiming they sought alternative sources.

Farmers have mixed perceptions of fairness in Water Utilities (WUA) operations. 70% believe all farmers are treated equally, while 13% disagree and 16% hesitate to respond. However, opinions change when discussing water allocation fairness. 38% feel treatment varies based on the farmer, 44% believe requests are handled equally, and 17% decline to respond. Concerns are more pronounced in DA 17, where 63% perceive unequal treatment and 54% feel disadvantaged.

The survey revealed challenges in water access, allocation, and fairness, with many farmers favoring the JVA for key irrigation system responsibilities, highlighting the need for transparency, equity, and resource management improvements, despite the significant role of WUAs.



FULBRIGHT

RESEARCH AND DEVELOPMENT

Representatives from the Ministry of Agriculture and the Ministry of Water and Irrigation Visit MIRRA's Climate-Smart Farm in the Jordan Valley and Discuss On-going Research and Development Projects

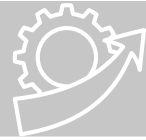
In December 2024, MIRRA hosted its first coordination meeting with focal points from the Ministry of Agriculture and the Ministry of Water and Irrigation to discuss on-going research and development projects at MIRRA's Climate-Smart Farm in the Jordan Valley. In particular, MIRRA and MIT's USAID-funded project titled: "Tuning Water Delivery to Evapotranspiration Using Ultra-Low Energy Drip Irrigation and Commercializing it in the MENA Region," was at center-stage of this visit. The project aims to revolutionize water management in agriculture through cutting-edge technologies developed in partnership with MIT's GEAR Lab.

The visit aimed to establish a collaborative relationship with ministry focal points who will play a crucial role in monitoring the project's progress, goals, and future plans. It also served as an opportunity to brief them on the project's innovative approaches, current achievements, and the next steps in implementation. During the meeting, the focal points were introduced to the project's core objectives: optimizing water use efficiency, reducing energy consumption, and enhancing crop yields through ultra-low energy drip irrigation systems.



MIRRA showcased key outcomes achieved so far, including:

Development of an innovative irrigation controller and scheduling app.



Field trials on grapes, potatoes, and okra demonstrated significant improvements in water usage and crop performance.



Successful clogging resistance tests on locally available and newly developed emitters.



MIRRA and the MIT team highlighted the project's solutions for real-time monitoring of soil moisture, irrigation schedules, and weather conditions such as the Grafana Control Panel.



The MIT team demonstrated low-pressure emitters designed to operate at 50% of conventional energy, addressing water loss and emitter durability issues among Jordan Valley farmers. These innovations have the potential to revolutionize irrigation practices. Ministry representatives and the team visited MIRRA's research farm to observe experimental fields and use the irrigation controller and app, discussing scalability and broader implementation steps.

The ministry representatives engagement marks a pivotal step in ensuring the project's alignment with national priorities such as Jordan's Green Growth Action Plan for the agriculture sector. Cross-sector collaboration is a national goal for maximizing green growth activities, and this event represents an important step forward towards realizing this goal. The involvement of government and private sector stakeholders at MIRRA's research farm will be critical in monitoring progress, identifying challenges, and steering future activities.

The collaboration between MIRRA, MIT, and key Jordanian ministries highlights a shared commitment to sustainable water management and agricultural advancement which will continue to yield long-term impacts on the region's food and water security.

We thank the MIRRA and its partners for their outstanding efforts in adopting this remarkable project to transfer climate-smart irrigation system technology to farmers. These systems are highly effective in agriculture, especially in a country like Jordan, which is considered one of the most water-scarce nations.

Ashraf Naimat ,Ministry of Agriculture



Picture 1: MIRRA Climate Smart Farm, December 10, 2024 – The MIT team, MIRRA, and ministry representatives collaborate on-site to advance innovation and sustainability.

TECHNICAL SERVICES

MIRRA Optimizes the Design of Drip Irrigation Systems for 60 Farms in Jordan: A Technical Service Provided to IWMI



Beneficiaries
61 Farmers

In partnership with the International Water Management Institute (IWMI), MIRRA provided new designs for drip irrigation systems across 61 farms in Mafraq, Ramtha, Azraq, and South Amman. This project addressed the inefficiencies of existing drip irrigation systems design, helping farmers optimize water use in one of the world's most water-scarce countries.

Understanding Existing Systems

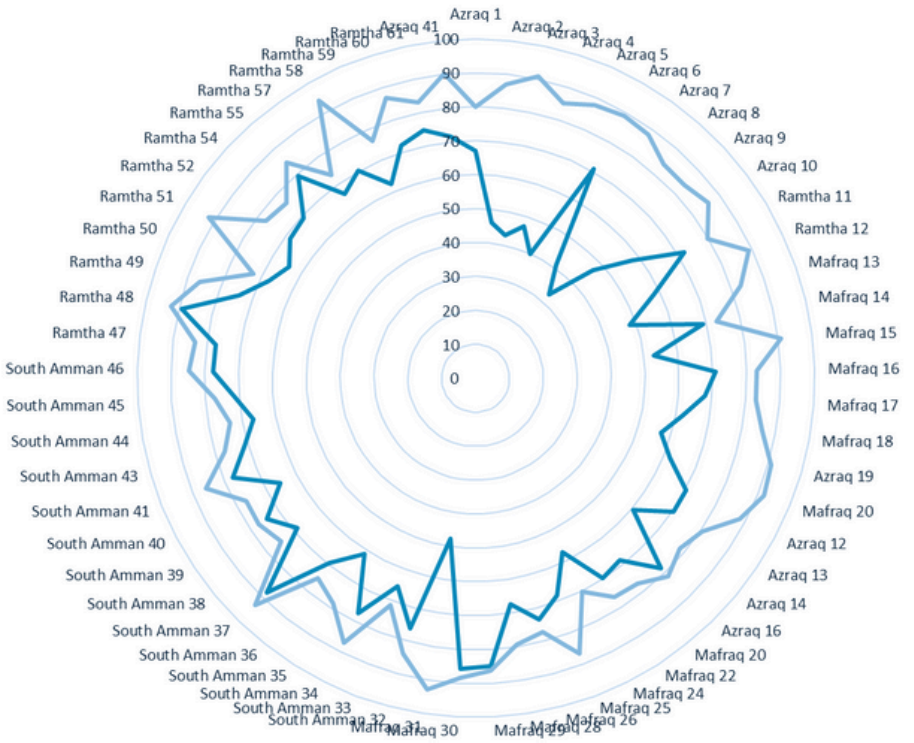
The project began with an in-depth assessment of the existing irrigation systems, revealing a widespread reliance on virojets (high emission rate devices) and inline drip emitters. Virojets, although cost-effective and resistant to clogging, were found to have high emission rates, leading to significant water losses to deep percolation and uneven irrigation distribution uniformity (DU). Inline emitters, while offering better DU, still required optimization to meet the peak irrigation requirements of diverse crops.

MIRRA's Approach

Using advanced IRRICAD software, MIRRA designed tailored solutions for each farm. Key modifications included replacing virojets with pressure-compensating (PC) emitters and optimizing pipe diameters, lateral lengths, and emitter flow rates. For example, at a maize farm in Azraq, MIRRA transitioned the irrigation system from standard inline emitters with a flow rate of 8 L/hr to PC inline drippers with a flow rate of 2 L/hr. This adjustment improved the farm's DU from 72.7% to 88.4%, while reducing water consumption by 75%.

Enhancing Efficiency and Sustainability

By improving distribution uniformity and reducing water losses, MIRRA's redesigns helped farmers achieve higher crop yields with less water. The redesigned systems ensured that each plant received its optimal water requirement, aligning irrigation practices with Jordan's urgent need for water conservation. Additionally, the project introduced best practices in filtration and maintenance to prevent clogging and maintain long-term efficiency.



— Distribution Uniformity (%) - Before - - - Distribution Uniformity (%) - After

Picture 1: Comparison of Distribution Uniformity (DU) across 61 farms, showing the DU results for the current irrigation system versus the recalculated values after adjustments to the new irrigation design



Picture 2: Google Earth imagery of a farm in Azraq, displaying the farm and irrigation pond. The irrigation system was re-designed to conserve water and enhance efficiency.

Addressing Jordan's Water Scarcity

Jordan faces severe water scarcity, with agriculture consuming a significant share of available resources. Projects like this are critical in adapting to these challenges, enabling farmers to sustain agricultural productivity while conserving water. MIRRA's efforts demonstrate the value of innovation and collaboration in promoting sustainable water management.

Through this project, MIRRA has reinforced its commitment to supporting Jordan's agricultural sector by delivering efficient, sustainable irrigation solutions. As water scarcity intensifies, initiatives like this will play an increasingly vital role in ensuring the country's food and water security.



Picture 3: Google Earth imagery of a farm in Ramtha, north Jordan, showing a block of 11 standard greenhouses selected for which the irrigation system was redesigned to conserve water and improve distribution uniformity.



International Water
Management Institute

TECHNICAL SERVICES

MIRRA and Dorsch Join Efforts to Design Sustainable Solutions for the Reuse of Treated Wastewater in the Irrigation and Production of Forage Crops at the Azraq Refugee Camp: A project funded by GIZ



Beneficiaries

Azraq Community & Azraq Refugee Camp

In a significant effort to address water scarcity and promote agricultural sustainability, MIRRA collaborated with Dorsch on a GIZ-funded project: the "Wastewater Treatment and Reuse Azraq Refugee Camp." This initiative focused on providing innovative solutions for wastewater management and agricultural reuse, with a particular emphasis on MIRRA's contributions.

MIRRA

played a pivotal role in:

Designing and implementing essential systems for reusing treated wastewater to benefit the agricultural sector. **MIRRA** developed an efficient irrigation system to support the reuse of treated wastewater. The system aims to irrigate approximately 200 donums, cultivating alfalfa and barley—high-demand crops in the local context. Additionally, **MIRRA** designed a 10,000 cubic meter water pond to collect treated water from the wastewater treatment plant (WWTP) daily. This pond ensures a consistent water supply for irrigation needs. Detailed designs for a pumping station were prepared to facilitate water distribution, ensuring reliable and efficient water transfer to the irrigation system. A standard greenhouse model was also designed, leveraging **MIRRA's** expertise to promote controlled-environment agriculture. This addition enhances crop yield and supports nursery operations.



The project delivers multiple benefits to the Azraq Refugee Camp and surrounding communities. The reuse of treated wastewater reduces dependency on scarce freshwater resources, promoting sustainable water management. Cultivating alfalfa and barley not only supports local food security but also generates income opportunities for refugees and host communities. By introducing advanced irrigation techniques and greenhouse farming, the project enhances local knowledge and skills, empowering community members to adopt sustainable practices. The initiative mitigates environmental risks by ensuring treated wastewater is utilized responsibly, preventing potential contamination of surrounding ecosystems.

MIRRA's contributions exemplify innovative and sustainable approaches to addressing water and agricultural challenges in resource-constrained settings. This partnership with Dorsch and GIZ underscores the potential of collaborative efforts to transform lives and promote resilience in vulnerable communities.



Methods for Irrigation and Agriculture Wishes You a Blessed Eid al-Fitr!

On this joyous occasion, the Methods for Irrigation and Agriculture team extends warmest greetings to you and your families. May Allah bless you with prosperity, happiness, and abundant harvests in the coming year.

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