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# **HARNESSING MARKET SYSTEMS FOR WATER CONSERVATION IN JORDAN**

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# Executive Summary

The Water Innovation Technologies (WIT) program is one of the first large-scale applications of the Market Systems Development (MSD) approach to water conservation, and the first one of its kind in Jordan. It was funded by the United States Agency for International Development and implemented between 2017 and 2022 by Mercy Corps, in collaboration with the International Center for Biosaline Agriculture, the International Water Management Institute, the Jordan River Foundation and the Royal Scientific Society.

WIT's main objective was to save water through the sustainable adoption of water-saving technologies (WSTs) and practices by farmers and households. The program led to total savings of 28 million cubic meters (MCM) of water in the agricultural sector and at community and household levels. These savings exceeded the original target of 18.5 MCM by 51% and are equivalent to 11,000 Olympic pools.

Agriculture water savings amounted to 24 MCM, which represent almost 10% of all the underground water consumed by the agriculture sector in 2017. The program achieved these results at extremely low costs per MCM, compared to other initiatives. Furthermore, the rate of return for farmers who invested in WSTs and approaches was approximately 450%.

The WIT program worked on two market systems: agricultural irrigation and domestic consumption. This report focuses exclusively on the former, mainly because agriculture is the biggest user of water globally. In addition to the impacts mentioned above, the report also discusses WIT's evolution and the main areas of intervention from an MSD perspective.

**Regarding WIT's evolution**, the program design was based on a combination of institutional knowledge of the local context, experience from previous programs and market analyses commissioned by the program. During the initial stages of implementation, the team invested heavily in stakeholder engagement and partnership building. This was followed by an effort to better align interventions with MSD principles, and a shift towards co-creation, piloting and improvement of the partners' business models. As the program matured, it continued deepening its partnerships, and promoting business innovation, adoption of WSTs and crowding-in through a combination of financial incentives, technical support and awareness-raising.

WIT's evolution shows the importance of a team that can adapt quickly to market requirements and unforeseeable challenges and opportunities (including the Covid pandemic). For example, dropping interventions that have little traction (e.g., training of farmers on financial literacy), using market actors' feedback to promote innovation, and monitoring structural changes in the market. This enabled the team to adjust their strategies based on evidence, identify and engage strategic partners, find leverage points, and deliver impressive impacts at very low costs compared to other water-saving initiatives.

WIT's experience confirms that highly adaptable teams who can put MSD principles into practice require specialized MSD expertise, a senior leadership committed to building the right staff competencies and promoting a learning culture, discipline to avoid resorting to direct delivery and handouts, and the support of donors who understand and value the MSD approach.

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**Regarding WIT's intervention areas**, the report identifies four main areas that significantly contributed to structural improvements in the WST market and water saving:

- › **Access to information on benefits and availability of WSTs:** This section covers interventions to increase farmers' access to information through WST providers and mass media. A key element was to avoid producing and disseminating the information itself; instead WIT emphasized working with and through partner market actors, such as irrigation equipment suppliers and the media. To support suppliers

with their marketing strategies, WIT worked with a research firm to survey hundreds of 400 farmers on what would encourage or hold them back from adopting WSTs. After learning that some farmers who adopted WSTs were frustrated by the maintenance of the irrigation systems, WIT worked with suppliers to improve their after-sales services and set up demonstration sites to promote good maintenance techniques among farmers. While the MSD approach was new to farmers, used to receiving subsidized support from NGOs, WIT trained field staff as “influencers” to explain WIT’s approach and brokered relationships between the farmers and WST providers.

In tandem, WIT trained journalists, government officials, utilities media staff and social media activists on key water conservation issues and solutions and promoted a network of water journalists in Jordan. This resulted in the trainees proactively reporting on water conservation issues and raising awareness about the water situation in Jordan.

**Facilitation principle at play:** *Help private sector actors improve or find sustainable business models to provide inputs and services to the target groups.*

- › **Building capacity for engagement between market actors:** This section shows how WIT built the capacity of financial institutions and WST providers to engage with their core customers more effectively. The program organized a workshop for banks on the business potential of financial products to promote farmers’ investments in WST, and trained loan officers on the latest WSTs and strengthened their skills to evaluate loan applications related to irrigation investments. It also helped WST providers transition from a mindset of short-term sales to one of long-term value addition and customer satisfaction and loyalty.

In an effort to promote more efficient irrigation practices, WIT worked with suppliers’ staff on WSTs and technical areas related to pre- and post-sale services, such as water accounting, irrigation management, marketing, water auditing and safe pesticide use. WIT also designed and implemented the Results-Based Service Package (RBSP) to motivate suppliers to improve their services to farmers by reimbursing them for each cubic meter of water saved by farmers as a result of supplier’s support. The RBSP included support to suppliers to adopt irrigation systems design software, produce awareness-raising materials, improve their marketing strategies, establish client feedback mechanisms, and conduct field sales and servicing activities. By the end of the program, after only one year of implementation, it is estimated that the RBSP contributed to improved irrigation services that helped farmers save 2.7 MCM of water.

**Facilitation principle at play:** *Build the capacity of strategic market actors to increase the frequency and quality of their interactions with their core customers.*

- › **Access to finance to enable investments in WSTs:** This section shows how WIT worked with financial institutions to help them tailor their products to make them more relevant for farmers interested in WSTs. It also describes how the program introduced financial incentives to encourage irrigation suppliers to improve sales and after-sales services. Due to challenges in collaborating with private sector banks, WIT pivoted to work with a government-owned bank, Agricultural Credit Corporation (ACC), to earmark almost USD 3 million for loans to help farmers invest in WSTs. To train loan officers on WSTs, WIT partnered with NARC (National Agriculture Research Center), an agency under the Ministry of Agriculture, to design and deliver a training course. WIT also influenced the Central Bank of Jordan (CBJ) to enable ACC to expand their credit line for WST loans. This led ACC to earmark USD 14 million in the second year (2021) of the program. This resulted in a win-win for all: the ACC expands its activity in the agriculture sector, NARC’s research and knowledge benefits farmers, the bank’s agents improve the relationships with their clients, and farmers get the advice needed to invest in WSTs.

WIT developed an Investment Fund (IF) to encourage WST suppliers to innovate by providing co-financing and technical assistance to carry out innovative solutions designed to overcome market constraints and promote farmers' adoption of WSTs. Eight companies received support from the IF to install and automate irrigation systems, test weather and soil-humidity sensors, and assess the effects of promotional and educational campaigns, to name a few innovations. The IF led to savings of approximately 13 MCM by the end of 2021 and made participating farmers more aware of the benefits of efficient irrigation systems and practices, such as higher yields and quality, and reductions in operational costs.

**Facilitation principle at play:** Provide support and create incentives for strategic market actors to improve the relevance and affordability of their services.

- › **Creation of spaces for interaction and learning:** This section shows how WIT created spaces, such as sectoral meetings and multi-stakeholder dialogues, to enable market actors to connect, share their views on opportunities and risks, identify common interests and come up with ideas to overcome sectoral challenges. For instance, WIT hosted the first Jordan Irrigation Industry Meeting to bring irrigation equipment suppliers together to learn from each other and find common ground for collaboration. The meeting led to the implementation of demonstration sites and partnership agreements with irrigation companies to promote the demand of WSTs. This was followed by dialogues that convened financial institutions, community based organizations, irrigation suppliers and farmers on financial services for agriculture with the ACC, which resulted in the Jordan Loan Guarantee Corporation (JLGC) agreement to guarantee loans for financial institutions.

Supplier-led field days and demonstration sites were additional interventions that led to improved relationships between WST suppliers and farmers with benefits for both parties through increased sales and farm productivity. Demonstration sites, in particular, helped farmers to resolve their doubts about WSTs and convinced them to invest their own money to install additional WSTs on their farms.

- › **Facilitation principle at play:** Create opportunities for diverse types of market actors to meet, share information and explore opportunities for collaboration and win-win outcomes.

The analysis of the main areas of intervention shows how MSD principles - such as systems thinking, facilitation and stakeholder-driven change, informed WIT's interventions. For example, the engagement of non-sectoral but strategic market actors (e.g., journalists); the facilitation of relationships between farmers and WST providers, and between banks and research institutions; and the emphasis on information flows, post-sales services and farmers' awareness of WSTs' economic benefits. These interventions led, not only to impressive water savings during the program, but also to structural transformations in the irrigation market system that are likely to continue delivering impacts well beyond its end. External evaluators calculate that ex-post water savings will amount to 65 MCM by 2029 (3.5 times the original target).

WIT generated important lessons on how to use MSD to save water at a large scale, and its outcomes are crucial to achieving the goal of sustainable water management. However, higher irrigation efficiency can contribute to intensification of water scarcity through increased water consumption. In order to continue moving closer to this vital goal, future initiatives of this kind will have to deepen their collaboration with the government and community leaders to create and enforce policies that strike a balance between water use and conservation. In the context of climate change and increasing food insecurity, similar MSD programs that incorporate WIT's lessons are urgently needed around the world.

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## Acronyms

<b>ACC</b>	Agricultural Credit Corporation
<b>CBJ</b>	Central Bank of Jordan
<b>ICBA</b>	International Center for Biosaline Agriculture
<b>IF</b>	Investment Fund
<b>IWMI</b>	International Water Management Institute
<b>JLGC</b>	Jordan Loan Guarantee Corporation
<b>JLGF</b>	Jordan Loan Guarantee Facility
<b>MCM</b>	Million Cubic Meters
<b>NARC</b>	National Agriculture Research Center
<b>NDICO</b>	National Drip Irrigation Company
<b>PC</b>	Pressure compensated (technologies)
<b>RBSP</b>	Results-Based Service Package
<b>USAID</b>	United States Agency for International Development
<b>WIT</b>	Water Innovation Technologies

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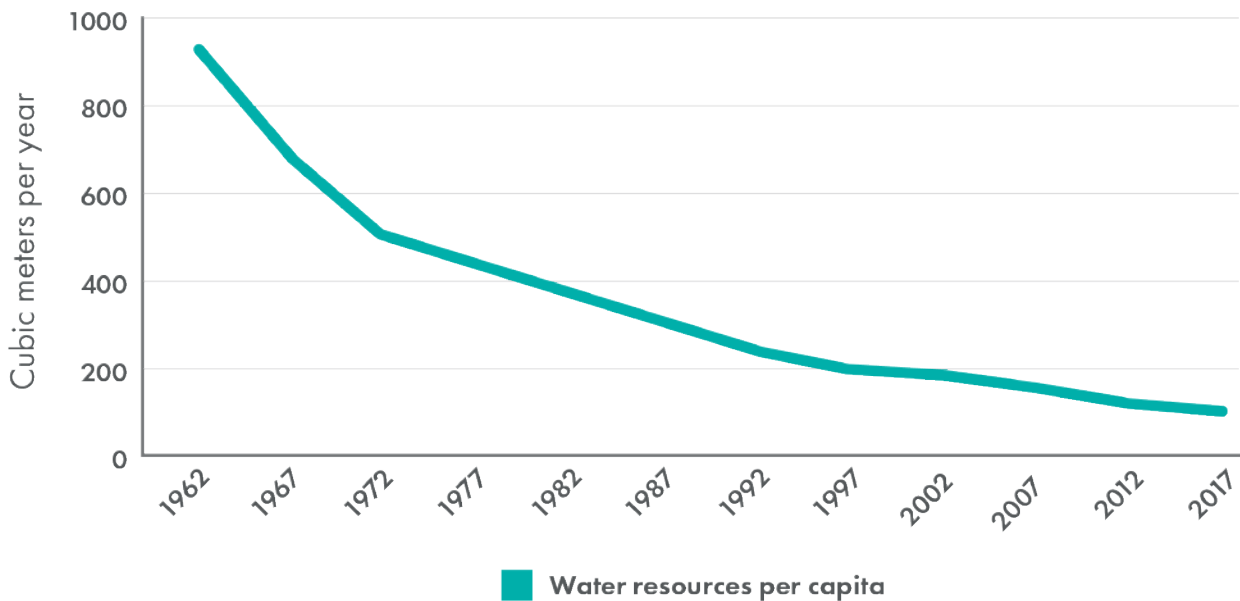
# 1. Introduction

## 1.1. Context

With population growth, urbanization, and climate change, competition for water resources is expected to increase. Agriculture is a key driver of water use, consuming approximately 70% of all freshwater globally, and it is estimated that agricultural production will need to expand by approximately 70% by 2050<sup>1</sup> to keep up with food needs. This trend will also put significant pressure on groundwater, which accounts for 97% of global freshwater supply<sup>2</sup>.

The Kingdom of Jordan is one of the countries where this global crisis manifests with extreme severity. Only nine countries in the world receive less annual precipitation than Jordan, and it is the fifth most water stressed country globally<sup>3</sup>. The majority of the rainfall the country receives evaporates, with less than 6% remaining to flow into surface water or infiltrate into groundwater aquifers<sup>4</sup>. Limited surface water and reliance on groundwater in this rapidly growing society have placed extreme pressure on Jordan's groundwater basins, with an average water-level decline of approximately one meter per year since 1995<sup>5</sup>.

Demand for freshwater in Jordan is expected to continue outstripping supply, prompting unsustainable rates of extraction from rapidly depleting aquifers and a consistent reduction in the availability of renewable water resources per capita (Fig. 1). Immediate and sustained action to reduce consumption and bolster water security for all its citizens is required to ensure that this beacon of political stability in the Middle East remains peaceful and prosperous.



**Fig. 1:** Renewable water resources per capita in Jordan (m<sup>3</sup>/inhabitant-year).

Source: [Worldometer https://www.worldometers.info/water/jordan-water/](https://www.worldometers.info/water/jordan-water/)

<sup>1</sup> World Bank (updated 08 May 2020) [Water in Agriculture webpage](#). Accessed on 06 May 2022.

<sup>2</sup> [Groundwater Quality: A Strategic Approach](#), Washington, D.C., World Bank Group.

<sup>3</sup> According to an analysis by the World Resources Institute. Cited by E. Whitman (2019) [A land without water: the scramble to stop Jordan from running dry](#). Nature Journal. Accessed 6 May 2022.

<sup>4</sup> Al-Shibli, Fayha M, William A Maher, and Ross M Thompson (2017) The Need for a Quantitative Analysis of Risk and Reliability for Formulation of Water Budget in Jordan 8 (2): 13.

<sup>5</sup> Various sources cited by Kruse and Gardner (2022: 2) Economics Of Water Savings Under the WIT Project report. Independent endline evaluation commissioned by WIT.



Despite the daunting challenges, relatively small changes on how Jordanian households and farmers use water, including the adoption of Water-Saving Technologies<sup>6</sup> (WSTs), can help them save significant amounts of water and water-related costs.

Last but not least, Jordan is an exceptional context for policy-makers and development agents to innovate and learn about water management policies and strategies. According to experts, with so few new options for fresh water, the country “will be center stage in showing how a semi-arid region deals with the devastating impacts of a warmer and drier regional climate.”<sup>7</sup>

## 1.2. The Market System Development Approach

The goal of the Market System Development (MSD) approach is to contribute to sustainable poverty reduction at scale. This is done through interventions that facilitate sustained changes in the behavior of market actors, and the functions and structures that shape the performance of market systems that matter to people living in poverty<sup>8</sup>.

MSD programs don't react to observed problems with direct interventions and quick fixes, such as grants and subsidies. Instead, they gain a good understanding of market opportunities and underlying causes of market dysfunction and collaborate with market actors (both public and private) to improve business models, policies and practices. These improvements increase access of marginalised groups to basic inputs and services, making the market system more inclusive, productive and efficient, which in turn contributes to pro-poor growth.

While the MSD approach has most frequently been applied to agricultural markets to increase incomes and improve food security of marginalized communities, there are a growing set of development programs that use it to achieve pro-poor outcomes in other sectors, like improving access to energy, financial services and better jobs.

The WIT program used the MSD approach to sustainably reduce water consumption at a relevant scale for Jordan's water deficit<sup>9</sup>. It merits a deep analysis for its systemic approach to addressing the current global water crisis and its ambition for impact in the challenging Jordanian context.

## 1.3. The Water Innovation Technologies (WIT) Program

The WIT program is a five-year initiative implemented between March 2017 and July 2022 in Jordan. It was funded by the United States Agency for International Development (USAID) to the tune of almost USD 35 million.

WIT was led and implemented by Mercy Corps, in collaboration with the International Center for Biosaline Agriculture (ICBA) who provided technical advisory services to farmers and irrigation suppliers, the International Water Management Institute (IWMI) who implemented the learning agenda and monitored water-savings, the Jordan River Foundation who promoted the adoption of water-saving technologies by households and communities, and the Royal Scientific Society who provided first-hand information about how communities in Jordan were adopting and adapting WSTs.

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<sup>6</sup> WSTs cover all methods of conserving water through increasing water use efficiency, enhancing capacity to retain runoff water, and eliminating water pollution (UNEP/IETC, 1998).

<sup>7</sup> Cited by E. Whitman (2019) [A land without water: the scramble to stop Jordan from running dry](#). Nature Journal. Accessed 6 May 2022.

<sup>8</sup> Examples of market functions are production, storage, processing, flows of goods and information, processing, and advocacy. Examples of market structures are farmers groups, business associations, distribution networks, savings groups and local government agencies.

<sup>9</sup> WIT's goal contributes directly to Sustainable Development Goal #6, which is to ensure availability and sustainable management of water and sanitation for all.

WIT is one of the first large-scale applications of the MSD approach to water conservation, and the first one of its kind in Jordan. One of the key differences between WIT and other MSD programs is that its main objective was to save water through the sustainable adoption of WSTs and practices by farmers and households, and its goal was to contribute to the sustainable management of Jordan’s water resources.

WIT’s strategies and interventions led to total **savings of 28 MCM of water** in the agricultural sector and at household level.

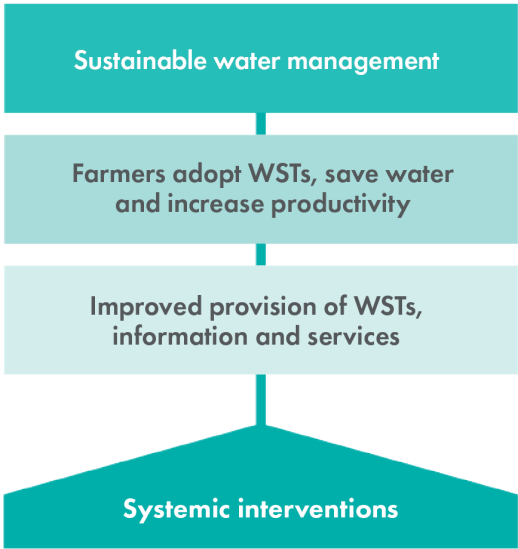


**These savings exceeded the original target of 18.5 MCM by 51% and are equivalent to 11,000 Olympic pools.**

In agriculture, which is the focus of this paper, the combined efforts of WIT’s partners and farmers led to the optimization of more than two thousand hectares of farmland and savings of 24 MCM<sup>10</sup>, which represents almost 10% of all the underground water consumed by the agriculture sector in 2017<sup>11</sup>. WIT also contributed to farmers’ incomes as a result of cost savings in key inputs like water and electricity (for water pumping), and higher crop quality and yields.

This innovative program not only outperformed itself in terms of water-saving targets but, as it will be shown in more detail later, it also did much better in terms of cost-effectiveness (measured in USD/m<sup>3</sup> of water saved) than other water-saving initiatives that used a direct delivery approach and/or focused on a single issue, such as network rehabilitation, awareness raising or technology transfer. To a large extent, its success was due to its capacity to understand the broader water market, partner with strategic market actors and work on several fronts in a coordinated way.

WIT’s theory of change for its agriculture component<sup>12</sup> (Fig. 2) proposes that a set of systemic interventions will improve market functions related to the provision of WSTs, water-saving information, irrigation services and financial services to farmers. As these market functions improve, there will be (i) more farmers learning about WSTs and practices and their economic benefits, (ii) increased availability of appropriate WSTs and technical advice from irrigation providers, (iii) and increased access to affordable financial services. This will in turn lead to more farmers adopting WSTs, saving more water and increasing farm productivity, which contributes to sustainable water resource management.



From its inception, WIT used the MSD approach to design its strategies and guide its interventions. The evidence analyzed in this paper shows that MSD principles and practices were instrumental in enabling WIT to improve the water market system and exceed its original targets.

**Fig. 2:** WIT’s overall theory of change

<sup>10</sup> Approximately 83% of total water saved in the agriculture component was achieved in the last three years of the program.

<sup>11</sup> Source: Fanack Water <https://water.fanack.com/jordan/water-use-in-jordan/> (Accessed July 2022)

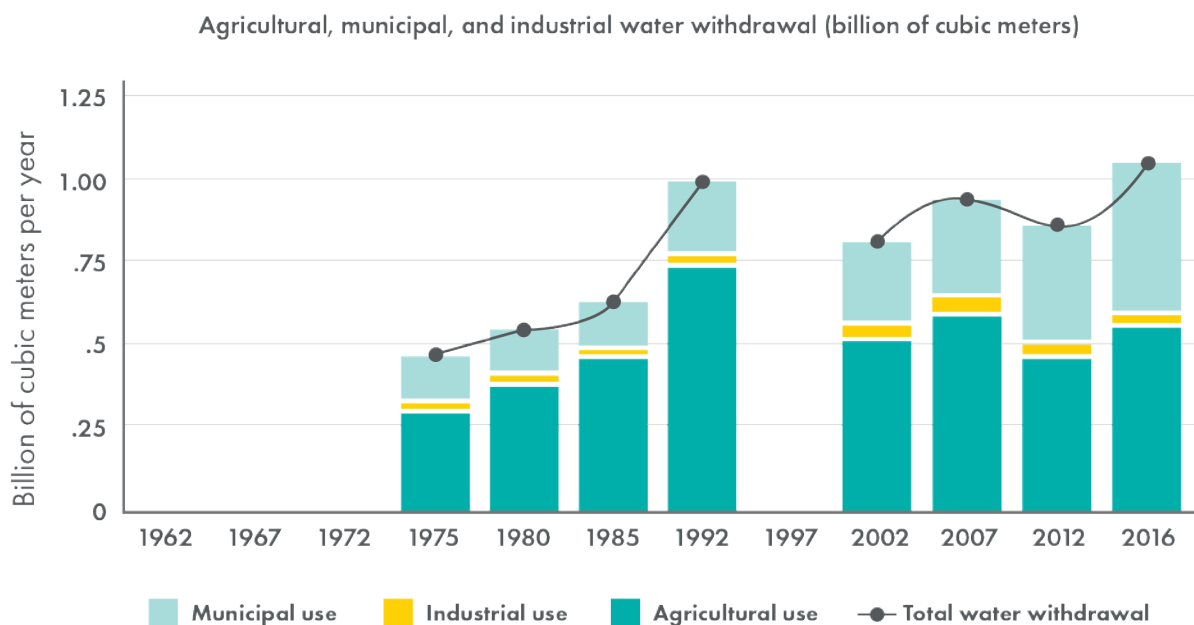
<sup>12</sup> As explained in the following section, this paper focuses only on the agriculture irrigation component.

## 1.4. Audience, focus and structure

This paper is the result of an in-depth analysis of quarterly and annual reports, assessments, evaluations and other documents about the program’s implementation and impacts. It also benefited greatly from the inputs of senior WIT staff and Mercy Corps’ MSD and WASH experts.

The paper covers the most important elements of WIT’s design, strategies, interventions and impacts that are closely linked to the application of the MSD approach. It is aimed at anyone interested in natural resource management, agriculture and food security, including MSD donors and practitioners, and businesses in the irrigation industry.

The WIT program as a whole worked on two broad market systems defined by two different groups of water consumers: farmers using water to irrigate their crops and households consuming water for domestic use. However, this paper focuses exclusively on the market system that revolves around the supply and demand of WSTs for agricultural irrigation. The main reason is that agriculture is the greatest driver of water consumption in Jordan and globally (Fig. 3). Therefore, the lessons learned from WIT can contribute greatly to water security worldwide through similar MSD programs.



**Fig. 3:** Water use in Jordan. Totals by sector and year. Years with missing data are left empty. Water use can include water used and then returned to its source. Source: Worldometers <https://www.worldometers.info/water/jordan-water/#water-use> (Accessed May 2022)

The paper uses two criteria to select the most interesting aspects of the program from an MSD perspective, namely: (i) that they were strongly influenced by MSD principles (e.g. systems thinking, partnership-building and facilitation) and (ii) that there is a reasonable connection between interventions and structural changes in the market system, such as adoption of new business models, increased investments by program partners, and responses from non-partner actors to new market opportunities facilitated by WIT.

The paper covers aspects of the program that provide valuable lessons from an MSD perspective and is structured as follows: A brief description of WIT’s evolution, an analysis of MSD-informed interventions that led to important changes in the market system, details on WIT’s overall impacts and cost-effectiveness, and conclusions.

## 2. WIT's Evolution

WIT was a complex program, implementing different strategies simultaneously and adapting frequently to new obstacles and opportunities. In broad terms, WIT started with a combination of institutional knowledge of the local context, experience from previous programs, and market analyses. This was followed by a process of deeper interaction, engagement and partnership building with key stakeholders. With these partnerships in place, the program shifted toward co-creation, piloting and adjustment of business models. As the program matured, it continued deepening its partnerships, promoting business innovation, adoption of WSTs and crowding-in through a combination of financial incentives, technical support and awareness-raising.

This is a simplified description of the evolution of a very complex program, in which different interventions ran in parallel, interacting and influencing each other. The WIT team also showed a significant capacity to adapt to unexpected challenges and opportunities; innovating, experimenting, and adjusting or dropping interventions according to the realities on the ground.

### BOX 1: IMPLEMENTATION LESSONS

- › MSD buy-in, of both internal and external stakeholders, required significant time and effort, particularly in the first years of the program. It was difficult to create consensus around what an MSD approach should look like and its contributions to program goals.
- › Most market actors were not familiar with the idea of system change facilitation due to a long history of direct, subsidized interventions. This led to confusion among them and expectations of direct interventions.
- › Clear communication of benefits to market actors was critical for stakeholder engagement. Initially, suppliers and users saw little incentive to save water as it is heavily subsidized by the government. Once WIT communicated the business case for WSTs, suppliers and users started to engage with the program.
- › Adaptive management enabled the team to test approaches, support implementation of what appeared to work, and drop what did not work. During Covid, this mindset enabled the team to quickly revisit their assumptions about supply chains, financing and risk, shift from in-person to remote training, increase the use of SMS information and promote digital payments.

The following sections provide a summary of the most important phases and pivotal moments in the program's evolution. Each section is titled according to the most predominant elements in each phase. However, there were many more elements at play at any given moment in time, and some of them took place in parallel, iteratively or straddled across more than one phase (e.g., market analysis and partnership building). The purpose of this section is to help the reader get a broad sense of the main areas of activity throughout the program's cycle.

## 2.1. Market analysis and initial stakeholder engagement (2017)

During this phase, WIT concentrated mainly on getting to know the market system better, building up the team, training them on the basics of the MSD approach, and reaching out to market actors. For example, the program carried out a market system analysis (Box 2); an assessment of WST suppliers, water consumption, wells and irrigation systems; organized the first irrigation industry meeting in Jordan; led the formation of water-saving business networks; and evaluated opportunities for introducing WST loans for the agricultural sector.

This phase enabled WIT to gain a better understanding of the business models used by irrigation suppliers, explore the interests and capabilities of research and training partners to support irrigation extension services, and identify potential partnerships to promote water conservation. Crucially, the knowledge gained by the WIT team during this phase contributed to their credibility and capacity to engage key market actors, such as the ministries of Water and Irrigation and Agriculture, the National Agriculture Research Center (NARC), the Jordan Exporters and Producers Association for Fruit and Vegetables, the Highland Water Forum and the Jordan Loan Guarantee Facility (JLGF)<sup>13</sup>.



*Farm worker in Mafraq reviewing the grape harvest after utilizing WST for irrigation.*

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<sup>13</sup> JLGF is a USAID program aimed at improving access to finance for SMEs in Jordan. JLGF provides partial loan guarantees and technical assistance to mobilize bank financing for creditworthy but previously underserved SMEs. JLGF also promotes partnerships with the private and financial sectors in Jordan to promote good practices in SME financial management and credit.

## **BOX 2: MARKET ANALYSIS SHAPING WIT'S STRATEGIES**

In 2017, WIT worked with the Springfield Centre to conduct a market assessment on water savings for agriculture. The assessment identified the main actors, functions and rules of the WSTs market as well as gaps, opportunities and potential interventions to improve water saving in agriculture. For example, it found that farmers and farm managers were employing sub-optimal water management techniques due to inadequate information and skills, and that very few irrigation equipment suppliers were providing pre- and post-sales advice.

The study revealed three main market constraints to the adoption of WSTs by farmers:

1. Lack of access to affordable WSTs to improve irrigation systems and practices
2. Limited access to information and advice on how to use WSTs
3. Lack of access to information on the benefits of improved irrigation practices

The analysis highlighted the importance of farm managers, not only farm owners, regarding the adoption and perpetuation of irrigation practices. It showed that the adoption of WSTs and practices is more likely to happen if pre- and post-sales advice and training are provided by input and technology suppliers, supported by credible technical and economic information. Also that better informed farm-level decision-making requires appropriate finance and credit solutions that support water-conscious investments. In response to these findings, WIT designed a set of opening strategies and interventions targeting both demand and supply to promote the adoption of WSTs and practices.

A strategic decision based on this study was to target medium-size farms (20-100 hectares) with high levels of water use, mainly those producing stone fruits and olives in the northern governorates of Mafraq and Azraq. These farms became important leverage points that enabled WIT to achieve significant water-saving impacts through a relatively small number of farmers, specifically those with the highest rates of underground water overuse.

## **2.2. Improving alignment with MSD (2017-2018)**

WIT continued deepening its understanding of the market and formalizing its internal procedures. For example, the program carried out surveys on 90 medium-sized olive and horticulture farms<sup>14</sup>; studied farmers' knowledge, attitudes and practices, including demand for WSTs and technical advice, and developed manuals to manage MSD-related investments.

The program also started investing in the expansion of irrigation advisory services and continued raising farmer awareness through demonstration sites and field days, communication campaigns, training and study tours.

<sup>14</sup> Water audits continued throughout the course of the program. As part of regular monitoring activities, farms directly involved with WIT had water meters installed that were monitored monthly from the start of their involvement until the end of 2021.

Despite the progress made up to this point, by 2018 the program was struggling to put MSD into practice mainly due to lack of MSD experience at senior level. WIT had highly competent professionals for the roles of Chief of Party (CoP) and Deputy CoP but it had not been possible to find candidates who also had the required level of MSD experience for a program of this size and complexity. To address this, WIT hired a senior level MSD technical advisor.

The MSD advisor emphasized the importance of systems thinking, partnership-building and facilitation as key aspects of daily field operations. He worked with the team to update and operationalise the results chains and key indicators (Box 3), strengthen the capacity of irrigation suppliers and banks, accelerate partnership-building with irrigation companies, engage journalists as awareness-raising agents, and target early WST adopters as influencers, to name a few examples. He was also instrumental in the design and implementation of the Investment Fund (IF) and the Results-Based Service Package (RBSP) to promote innovation among irrigation suppliers (Sections 3.3.2 and 3.2.2, respectively).

### **BOX 3: THE IMPORTANCE AND CHALLENGES OF ALIGNING M&E WITH MSD**

A key aspect of this alignment was the development of an enhanced monitoring system that could increase the team's capacity to detect systemic changes in the market while still responding to USAID's indicators<sup>15</sup>. In 2018, the team started working on additional indicators, improving the results chains and creating intervention monitoring sheets. However, this produced an additional workload that they could not absorb because they were already busy carrying out field activities and tracking the indicators required by the donor. Over the course of the program

it continued to be challenging to avoid two parallel monitoring systems that could provide the team with useful information while maintaining donor accountability. In the program's final year, the team came up with a light-touch alternative solution: They decided to focus on research questions about key activities and learning issues to track impact at different levels of the market system. These questions shed light on some of the program's structural impacts without requiring the use of a unified, enhanced monitoring system.

## **2.3. Strengthening financial services (2018-2019)**

WIT continued working with financial institutions to help them develop financial products for farmers to adopt WSTs. As part of this effort, in 2019 the program conducted a market assessment to better understand the agricultural financial services subsector, including market gaps and opportunities, farmers' needs and financial institutions' perceptions of WSTs. The findings of the assessment influenced WIT's strategies to collaborate with the Jordanian financial sector and promote linkages between financial institutions and other market actors.

It was also during this phase that the program launched the IF to incentivise market actors to propose new solutions and innovative business models to overcome market constraints and promote the adoption of WSTs. The IF operated until 2021 (See section 3.3.2).

<sup>15</sup> Some of these indicators are necessary, such as cubic meters saved, number of businesses selling WSTs, and number of people using financial services to adopt WSTs. However, there are other indicators that show changes in the routines and behaviors of key market actors that are essential to know if the program is helping the market system shift towards more economic vibrancy and inclusion. For instance, repeated sales, business-mindset shift from "just sales" to value addition and customer service, new partnerships among market actors, and changes in perceptions about WSTs, water saving and sustainable water management.

## 2.4. Adapting to Covid (2020)

The pandemic disrupted supply chains, and farmers' ability to visit irrigation providers and travel to their farms. It also made WIT lose a full installation season, which is the right moment to introduce WSTs. Despite this, the program continued providing support via phone and Internet to keep farmers informed and connected with suppliers. For example, half a million SMS messages were sent to 200,000 farmers with advice on irrigation maintenance and WSTs and practices<sup>16</sup>.

The program also worked with the Jordan University of Science and Technology and the Jordan Olive Products Exporters Association to inform farmers about WSTs and increase their interest in optimizing their irrigation systems.

During this challenging phase, WIT continued working with financial institutions, training them on technical and financial issues related to irrigation systems, and providing them with technical support to pilot loans tailored to the needs of farmers, including Sharia-compliant loans.

## 2.5. Promoting innovation and crowding-in (2020-2022)

Despite farmers' willingness to improve their irrigation systems, many didn't understand how to properly set them up and maintain them. This prompted the WIT team to pilot the RBSP (Section 3.2.2), which is a business model focused on customer engagement and advisory services, with win-win outcomes for both farmers and suppliers. In parallel with the RBSP, WIT continued supporting the partners' initiatives through the IF (Section 3.3.2).

Until the end of its field operations in March 2022, WIT continued working to improve market performance, with emphasis on the expansion of viable business models, awareness raising of farmers and irrigation service providers on water conservation and the benefits of WSTs. The program also continued strengthening the capacity of financial institutions to provide relevant financial services to help farmers invest in WSTs.

### BOX 4: SELECTING RELEVANT MARKET ACTORS TO PROMOTE CROWDING-IN

By the end of 2019, WIT was working primarily with only two irrigation suppliers. The program needed to encourage more companies to sell WSTs to increase impacts and promote widespread changes in the irrigation market. Supporting crowding-in was challenging because it required the team to engage with a large set of businesses in order to find a few with the right incentives to expand into WSTs.

Using information from a farm survey done in 2018 by the ICBA and the team's own knowledge of the sector, WIT identified sixteen potential partner companies. They all showed willingness to collaborate with the program but many lacked experience in WSTs and did not proactively offer advisory services. At this

point, the WIT team decided to interview key individuals and carry out surveys within these companies to gain a deeper understanding of their strengths and weaknesses, as well as their perceptions of opportunities and threats.

Based on the above information, the program identified eight suppliers that satisfied a set of partnership criteria which included market share, collaboration with local suppliers, willingness and capacity to provide after-sales services, and flexibility of payment terms. Five of these companies were finally selected to become WIT's partners and played an important role in the program's efforts to improve after-sales services to farmers.

<sup>16</sup> In most cases, the SMS included links to videos and factsheets.



## 3. Main areas of intervention

This section analyses the main areas of intervention that were influenced by MSD principles and practices. It focuses on the links between WIT's interventions and their effects on the behavior of market actors and the structures and dynamics of the irrigation market system.

This section is organized around the following areas of intervention:

- › Access to information on benefits and availability of WSTs
- › Building capacity for engagement between key market actors
- › Access to finance to enable investments in WSTs
- › Creation of spaces for interaction and learning

### 3.1. Access to information on benefits and availability of WSTs

This section shows examples of interventions designed to expose farmers to relevant information about the benefits of WSTs and the availability of WST providers, technical assistance and financial services. The program avoided producing and disseminating the information itself; instead it emphasized working with and through partner market actors, such as irrigation suppliers and the media.

#### Facilitation principle at play:

Help private sector actors improve or find sustainable business models to provide inputs and services to the target groups.



#### Tips, lessons and insights:

- › Get to know your audience well before you produce information materials for them.
- › Before sharing information with any market actors, ask yourself if there are any market actors for whom sharing this information is part of their core business (e.g., irrigation suppliers and government stakeholders). If so, design the materials with them.
- › Never assume that the target audience will understand the information. Test the materials with them (e.g., focus groups) and monitor their effects on behavior.
- › Check the calendar for any special days or events related to the issues you want to promote or raise awareness on. Plan your information campaigns accordingly to leverage those moments.
- › Mass media actors and media markets may have an interest in the sector (e.g, water and sanitation) and, therefore, on sharing information that can contribute to the program's objectives. Engage early with them and leverage their interests.

### 3.1.1. Information to farmers via WST providers

With the technical support of the IWMI and a market research firm, WIT visited more than 400 farms in both Mafraq and Azraq to gain a deeper understanding of farmers' barriers and incentives to adopt WSTs. Based on this survey, WIT helped suppliers improve their marketing strategies and materials, including discounts, brochures, and field training in demonstration farms. Despite the progress made regarding the adoption of WSTs, some farmers mentioned problems with the operation of improved irrigation systems. In some cases, they were so frustrated that they were disconnecting them completely, leading to increased water overuse. To address this, WIT worked on two fronts: (i) collaboration with irrigation suppliers to improve their after-sales and advisory services, and (ii) dissemination of experiences from 13 demonstration sites and early adopters to raise awareness among farmers and farm managers about the benefits of installing and maintaining WSTs.

But the challenges were not just about getting farmers to access technical information. Farmers were used to NGOs handing out highly subsidized inputs and services and could not understand WIT's market-based approach. The program addressed this confusion by training field staff "influencers" to communicate WIT's approach well during their visits to farmers and brokered relationships between the farmers and WSTs providers. For example, calls from farmers interested in WSTs and practices were redirected to relevant providers.

### 3.1.2. Information to farmers via mass media

As part of the market analysis done in 2017, WIT assessed Jordanian farmers' awareness on water conservation issues and how they were accessing information on WSTs. The findings informed the team to produce a 20-part "Water Is Life" photo series and a communication strategy.



*A supplier of WSTs provides advisory services on the use of an irrigation toolkit in Mafraq*

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In 2020, acknowledging the role of the media in shaping public opinion and people's behavior regarding water conservation, WIT started working with the Center for Defending the Freedom of Journalists. Together, they conducted a media market assessment to identify the constraints media outlets faced when attempting to deliver quality messaging on household and farm-level solutions to water shortages.

The results of the assessment informed the program's strategy to train journalists, government officials, utilities media staff and social media activists on key water conservation issues and solutions. The training was designed to build the capacities of these groups on solutions-oriented reporting and promote a network of water journalists in Jordan. After the training, participants proactively produced in-depth reports on water conservation and raised awareness about the water situation in Jordan.

## 3.2. Building capacity for engagement between market actors

This section shows how the WIT program built the capacity of financial institutions and WST providers to engage with their core customers more productively. The aim of these efforts was mainly to help these market actors transition from a logic of short-term sales to a mindset of long-term value addition and customer satisfaction and loyalty. In all cases, the program worked closely with these market actors to determine the scope, content and format of the capacity building process.

### Facilitation principle at play:

Build the capacity of strategic market actors to increase the frequency and quality of their interactions with their core customers. The aim is to improve the chances of success of new business models and promote their adoption and expansion.



#### Tips, lessons and insights:

- › Understand how seasonality, opportunity costs and relevance can affect the participation of market actors in training activities. Will they be too busy? Do they think the training is worth their time? Will it be interesting enough? Can they access similar information through other channels easier or faster (e.g., Internet, peers, sector conferences)? WIT piloted training sessions for farmers on financial literacy which did not work due to these reasons. The team recognized the need to pivot away from ineffective interventions, and the pilot was canceled after the first cycle.
- › Find out for which actors training is an important part of their core business and try to get them to produce and deliver it. Avoid delivering training directly.
- › Training staff does not necessarily lead to improved customer service. Understand the organizational procedures and incentives they respond to, these could be hampering their capacity to put training into practice.

### 3.2.1. Capacity of financial institutions to promote WSTs

In 2018, WIT and the JLGf organized a workshop for seven banks to introduce them to agricultural WSTs, help them understand their business potential and discuss the possibility of offering financial products to promote farmers' adoption of WSTs. As a result, five of the participating banks agreed to develop such products, including outreach and promotional activities, with WIT's technical and financial assistance.

WIT worked with NARC to develop a training program for Agricultural Credit Corporation's (ACC's) loan officers to engage more productively and provide better financial services and advice to farmers interested in investing in irrigation and WSTs. This training exposed the officers to the latest WSTs and strengthened their skills to evaluate loan applications related to irrigation investments. (See section 3.3.1)

WIT also helped the ACC improve their communication channels to increase the exposure of their clients to relevant information about WSTs and their benefits. For example, changes to the design and content of the ACC's website and the introduction of videos on WSTs playing on TV screens in selected ACC branches. These channels were useful to complement and reinforce the information provided by the loan officers to the farmers.

### 3.2.2. Capacity of WSTs suppliers to improve service quality

Traditionally, irrigation system suppliers offered limited after-sale services and took practically no initiative to follow up with their clients. The dominant business model was to provide equipment as requested by farmers with no knowledge transfer. This encouraged farmers to choose irrigation equipment based mainly on the cost of the pipes and less on the quality or efficiency of the irrigation system. When questioned about these practices, the suppliers were not clear about the services they should offer farmers, when and how to follow them up (e.g., phone consultations and/or field visits) and who should bear the cost of these services.

This lack of clarity also affected the relationship between WIT and the suppliers. They assumed that WIT would offer these services for them. The program continuously encouraged suppliers to follow up directly with farmers after installation but there was no formal verification mechanism in place to ensure that suppliers were actually doing this properly. This led to issues at the installation sites that could have been avoided with a good follow-up service. For example, farmers assumed that plugged pipes meant their new irrigation system was damaged or low quality when the real cause was lack of maintenance, or associated good irrigation with over-watering and water puddles at the base of trees.

To address these issues, WIT trained irrigation equipment suppliers. Based on a training needs assessment the program identified the most critical knowledge gaps and confirmed that suppliers were interested in selling more WSTs if they knew more about them. The following year, WIT worked with IWMI and ICBA to train 22 suppliers' staff on WSTs and technical areas related to pre- and post-sale services, such as water accounting, irrigation management, marketing, water auditing and safe pesticide use.

The training, however, did not have the immediate results that the team expected. Suppliers' staff increased their knowledge but they were still slow at deploying after-sales services. This caused some farmers to go back to their original irrigation equipment and practices. To address this, WIT helped

suppliers strengthen their capacity to produce evidence-based information materials and carry out more effective marketing activities.

WIT also designed and implemented the RBSP to help WST suppliers improve the services offered to farmers while reimbursing them for each cubic meter of water saved by farmers as a result of their services. WIT worked with five suppliers to put the RBSP into practice, which included support to help them adopt irrigation systems design software, produce awareness-raising materials, improve their marketing strategies, establish client feedback mechanisms, and conduct field sales and servicing activities. By the end of the program, after only one year of implementation, it is estimated that the RBSP contributed to improved irrigation services that helped farmers save 2.7 MCM of water.

### 3.3. Access to finance to enable investments in WSTs

This section shows how WIT worked with financial institutions to help them make their products more relevant for farmers interested in WSTs. It also describes how the program introduced financial incentives to encourage irrigation suppliers to improve their sales and after-sales services.

#### Facilitation principle at play:

Provide support and create incentives for strategic market actors to improve the relevance and affordability of their services.



#### Tips, lessons and insights:

- › Understand the target groups' financial resources and dynamics (e.g., from where and how they get financial services, their capacity and appetite to use loans). Do not assume that the availability of financial services will automatically lead to their use.
- › Designing and rolling out financial products for specific sectors can be very costly for financial institutions. Target financial partners who are already serving the sector to minimize marginal costs.

### 3.3.1 Development of tailored financial products for farmers

Most financial institutions in Jordan showed a lack of understanding about agriculture, irrigation and farmers' needs. To address this, WIT launched a collaboration with two private banks to design loans to help farmers adopt WSTs. Around 20 loans were disbursed for approximately USD 1.6 million. However, the banks decided not to go ahead with it because their incentives to invest in agriculture were not strong enough.

WIT knew that getting private banks to lend to farmers wasn't going to be easy, but they decided to give it a try to promote competition and diversity within the sector. However, the reaction of the banks made the team reconsider and they quickly turned their attention to the ACC, which is a government-owned bank with a long tradition and strong interests in agricultural development.

During the first year of collaboration with ACC (2020), the WIT team managed to get the bank to earmark almost USD 3 million specifically for investments in WSTs, which was a type of loan they did not offer before. WIT monitored the use and impacts of these loans on farmers and shared this information regularly with the ACC to improve the loans. Feedback provided by farmers led WIT and ACC to conclude that it was necessary to train the bank's agents on WSTs and practices. But WIT did not do this directly, instead they worked with NARC (an agency under the Ministry of Agriculture) to design and deliver a training course composed of three days of theory and two days of field practice with the participation of lead farmers and WSTs providers as trainers.

WIT also influenced the Central Bank of Jordan (CBJ) to enable ACC to expand their credit line for WST loans. This led ACC to earmark USD 14 million in the second year (2021). WIT also brokered a formal agreement between the ACC and NARC where the latter commits to training new agents using the training scheme designed with WIT's support. WIT knew that

this was a win-win for all: the ACC reinforces and expands its activity in the agriculture sector, NARC fulfills its mission of putting research and knowledge at the service of farmers, the bank's agents improve the relationships with their clients, and the farmers get the advice needed to invest in WSTs.

### 3.3.2. Investment Fund to encourage WSTs suppliers to innovate

WIT's IF is a co-financing and technical assistance mechanism<sup>17</sup> to incentivise irrigation equipment suppliers to carry out innovative solutions designed to overcome market constraints and promote farmers' adoption of WSTs.

The WIT team managed the IF according to a set of selection criteria and procedures specified on the fund's manual. But this was not a hands-off mechanism; WIT worked with successful applicants from the very beginning to maximize the alignment between the business and the development agendas and create win-win outcomes.

During its operation between 2018 and 2021, eight companies received support from the IF to automate irrigation systems, install Pressure Compensated (PC) systems<sup>18</sup>, test weather and soil-humidity sensors, and assess the effects of promotional and educational campaigns, to name a few innovations. The IF led to savings of approximately 13 MCM by the end of 2021.

The innovations implemented by WST suppliers made participating farmers more aware of the benefits of efficient irrigation systems and practices, such as higher yields and quality, and reductions in operational costs. Furthermore, farmers beyond WIT's direct influence started to enquire about these systems and at least two companies that were not WIT partners began selling WSTs in response to increased farmer demand. This is a strong indicator that the program was successfully supporting models that would sustain and potentially spread beyond the life of the program.

<sup>17</sup> The IF could co-finance acquisition of fixed assets, one-off costs and key staff salaries associated with the piloting of the innovation. The IF could not co-finance working capital or raw materials or inputs.

<sup>18</sup> Irrigation hardware and installations that make extensive use of drip emitters and are designed to maintain a constant flow rate under variations in pressure, to ensure uniform water distribution on a field.

### 3.4 Creation of spaces for interaction and learning

This section shows how WIT created different types of spaces to promote interactions and learning amongst different key stakeholders. These spaces enabled market actors to connect, share their views on opportunities and risks, identify common interests and come up with ideas to overcome sectoral challenges. The conversations held in these spaces informed WIT's strategies and interventions.

#### Facilitation principle at play:

Create opportunities for diverse types of market actors to meet, share information and explore opportunities for collaboration and win-win outcomes. Facilitate the interactions; be a relationship broker and allow the market actors to figure out what they want to say, who they want to meet and what they want to do together. Support what is relevant for the program.



#### Tips, lessons and insights:

- › Competitors may have strong incentives to collaborate around shared issues (e.g., policies, logistical obstacles and quality standards). Show them how those issues affect them and how they could benefit if they collaborate.
- › Be careful when asking participants to discuss sensitive issues such as profit margins, production processes or business strategies. Check with them the topics and scope of what they would be prepared to share before meeting other market actors.
- › Engage "big players" strategically: These are perceived as influential, respected or important and can include business leaders, government officials and donor representatives. Invite them to meetings if you want to attract large numbers of participants. However, be careful if the objective is to create safe spaces for candid dialogue as their presence can be intimidating for some participants.
- › Be mindful of how participants perceive you. Some market actors have negative perceptions of NGOs and may not attend if you invite them, or do it because they expect handouts. In those cases, try to get respected peers or "big players" to send the invitations.

#### 3.4.1. Irrigation sector meetings

Irrigation equipment suppliers in Jordan rarely gathered, but in 2018 WIT hosted the first Jordan Irrigation Industry Meeting to bring them together to learn from each other and find common ground for collaboration. In this meeting, they agreed on the importance of helping farmers adopt good practices and technologies. They also agreed to do this through improved farmer extension services and real-life demonstrations. The meeting led to the implementation of demonstration sites and partnership agreements with three irrigation companies to promote more demand for irrigation systems and WSTs.

To build on this private sector momentum, the following year, WIT supported the participation of irrigation companies and banks to showcase WSTs, services and financial solutions at the 10th International Sawsana Agricultural Exhibition, an event organized by the Technical Consultancy Center in cooperation with the Ministry of Agriculture.

### 3.4.2. Multi-stakeholder dialogues

In 2019, WIT and the ACC facilitated a dialogue session that brought together the CBJ, the Ministry of Water and Irrigation, the Association of Banks in Jordan, community based organizations, suppliers, financial institutions, the Jordan Farmers Union and lead farmers to broaden their understanding of the challenges and opportunities in the agricultural financial service market.



*Multi-stakeholder dialogue session, Amman 2019*

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The topics covered included regulation of agricultural lending mechanisms by the CBJ, development of loan products for investments in WSTs, and provision of information to customers on costs and benefits of WSTs. To stimulate reflection and debate, the WIT team shared the findings of an assessment it conducted on financial services for agriculture, and highlighted opportunities and challenges related to farmers' access to finance.

These dialogues led to the approval from the Jordan Loan Guarantee Corporation (JLGC) to guarantee loans of four financial institutions to promote farmers' investments in irrigation systems and WSTs. This is significant because, previously the JLGC were not

open to it due to the high sectoral risks and lack of knowledge about water management methods. Furthermore, the CBJ agreed to help commercial banks and microfinance institutions to start offering agricultural loans to farmers using funds that were already available to them.

### 3.4.3. Supplier-led field days

In 2019, WIT and two partner irrigation providers conducted three field days in Mafrq and Azraq to demonstrate the benefits of WSTs. These events brought together more than 100 farmers and other stakeholders from the agriculture sector. All advisory sessions were facilitated by an agricultural expert from the ICBA. Additionally, representatives from one financial institution were present to provide information about financial services available to farmers.

These interventions taught the program that farmers are interested in attending field days and that these events increase suppliers' sales. Some companies benefited from these events; others didn't because they were comfortable with their current number of customers or not able to maintain the relationship with them after the field days.

### 3.4.4. Demonstration sites

Between 2018 and 2020, the program co-invested in 27 farms to help their owners turn them into demonstration sites. WIT also helped irrigation suppliers carry out follow-up visits to these sites to assess the impacts of WSTs on the ground, gain a deeper understanding of the sites' management successes and challenges, and learn lessons to improve the strategies of suppliers.

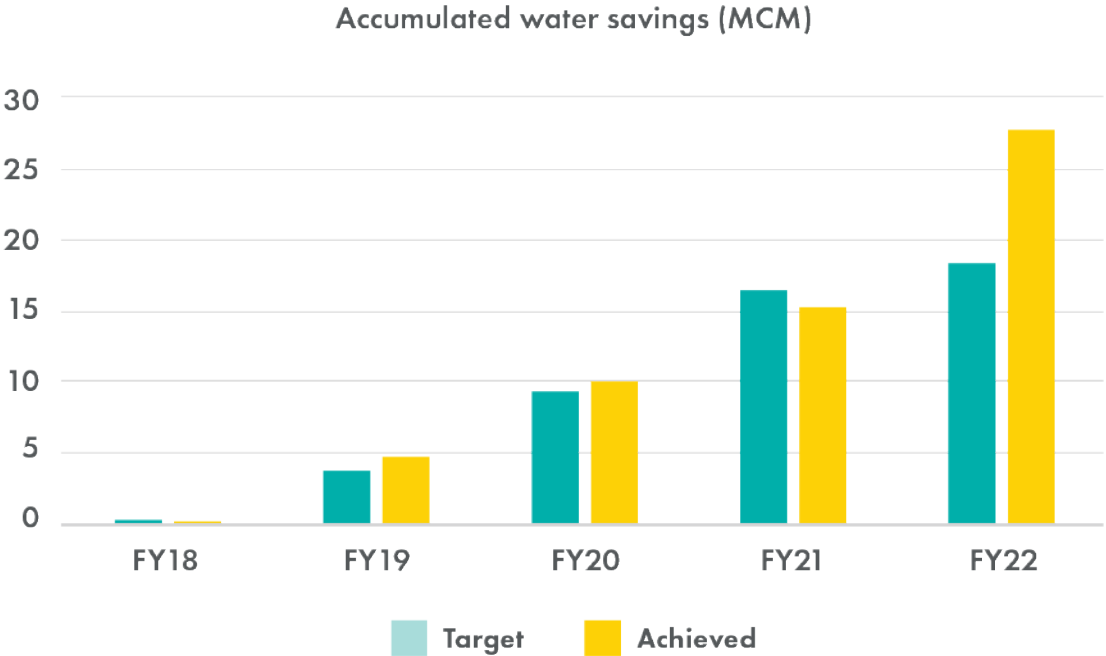
These sites helped to convince farmers to adopt WSTs and practices because they could see how their peers benefited in terms of water and energy savings. But this was not an automatic process of "see-then-adopt"; the people in charge of the demonstration sites played key advisory and coaching roles that helped farmers to resolve their doubts. Furthermore, many owners of the demonstration sites decided to invest their own money to install WSTs in other sections of their farms.

# 4. Main impacts

This section discusses WIT’s main impacts on farmers’ and farm managers’ capacity to save water and increase productivity as a result of the adoption of WSTs. Except when otherwise specified, all the results on the following sections are taken from an endline evaluation commissioned by the WIT program in 2022 to independent evaluators Sarah Kruse, PhD and Tess Gardner, MESM from AMP Insights.

## 4.1. Water saved

Perhaps, WIT’s most impressive impact is precisely the one that the program was designed to achieve as a direct result of its interventions: water savings in agriculture and households. As already mentioned at the beginning of this paper, during the life of the program, the combined efforts of WIT partners, early adopters and farmers led to savings of approximately 24 MCM (in agriculture alone), exceeding the program’s target for agriculture by more than 5 MCM. These savings were generated by approximately 200 farmers who optimized around 1,300 hectares of farmland.



**Fig. 4:** Accumulated water savings in MCM per fiscal year, including both the agriculture and household components (24 and 4 MCM respectively)

There is an additional aspect regarding total water savings: future water savings as a result of WIT’s interventions. It is safe to assume that water savings from adoption of WSTs and practices do not stop immediately after the project is over. If maintained properly, WSTs should continue to function for several more years with minimal additional costs, and most farmers who have experienced the benefits of using WSTs practices are expected to continue using them. The program’s endline evaluation calculated these savings at approximately 65 MCM by 2029<sup>19</sup>. Of course, only an ex-post evaluation will be able to confirm the accuracy of these predictions.

<sup>19</sup> This includes new farmers adopting WSTs for two years after the end of WIT but as an indirect result of WIT’s interventions and at the average rate of new adoption, estimated to be 26 hectares/month, with average water savings of 640 m3/hectares-month.



## 4.2. Adoption of WSTs by farmers

By the end of the program, affordability and financing options continued to be important obstacles to farmers' adoption of WSTs. However, a study carried out by WIT in 2020 to analyze market trends and the endline evaluation revealed that most farmers who invested in WSTs noted significant savings in the costs of electricity<sup>20</sup>, water, weeding, labor, maintenance and fertilizers, as well as increased crop quality and yields. This is important because positive experiences by early adopters contribute to larger scale adoption of WSTs.

The average monthly rates of adoption (in terms of irrigated area) produced by the IF and the RBSP were 26 and 7 hectares, respectively. The majority of total water savings came from the IF (70%), although this result was not unexpected given that savings from the RBSP did not start until August 2020, almost two years later than the IF.

The endline evaluation showed that the most common motivations for farmers and farm managers to invest in WSTs and practices are, in decreasing order of importance: Saving water for future use, saving money on energy bills (mainly for water pumping), saving money on water bills, improving crop quality and yield, and using water somewhere else in the farm.



*Farm workers adding fertilizer to irrigation water in Mafraq*

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## 4.3. Expansion and response by WSTs providers

By 2020, according to WIT's market trends study, the program's partners had already perceived a higher demand for more advanced irrigation technologies and, as a result, responded by increasing their investments in improved information and marketing materials, technical staff and farmer advisory services. They also declared they will continue to provide the services they tested thanks to WIT's support. Furthermore, there is evidence that non-partner irrigation equipment providers started to crowd-in the WSTs market, resulting in water-savings of approximately 1.7 MCM (approximately 700 Olympic pools).

## 4.4. WSTs return on investment

The endline evaluation calculated a return on investment of approximately 450% for farmers who adopted WSTs. This assumed an average installation cost of PC systems of \$1200 per hectare, and average lifespan of the installations of eight years. With a lifespan of three years, the ROI was approximately 135%.

Such high ROIs contribute not only to farmers' decisions to invest in WSTs, but also to the calculations that financial institutions make to design and provide financial services to both farmers and irrigation technology providers.

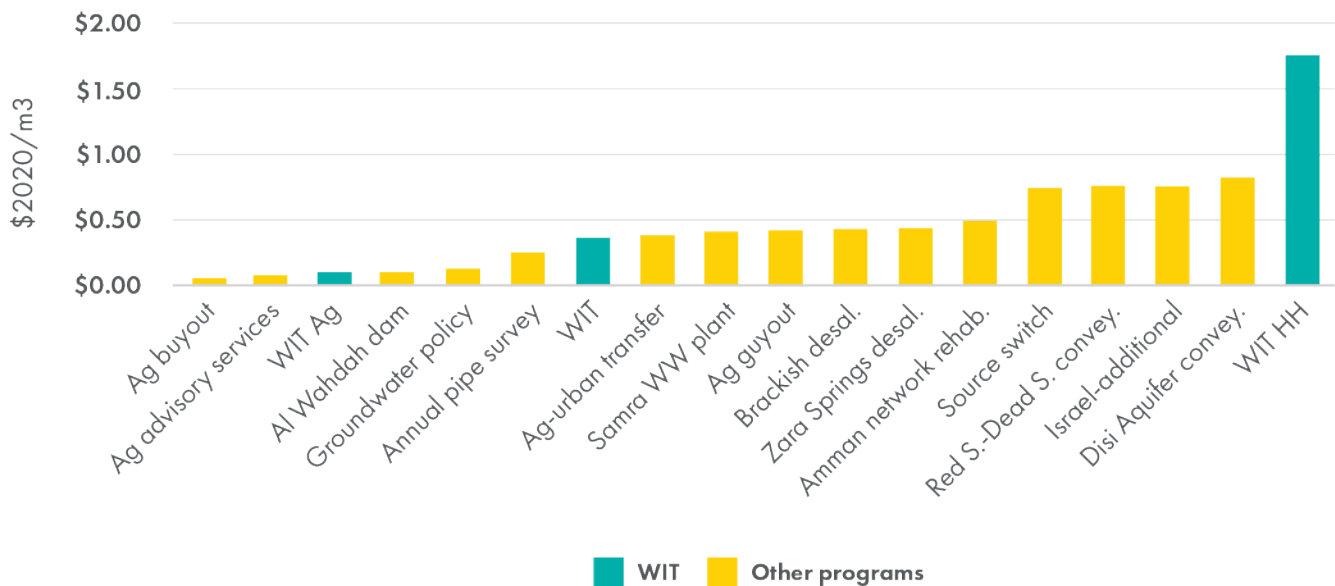
<sup>20</sup> Average monthly energy-related savings have been estimated at around USD 66 per hectare.

## 5. Cost-effectiveness

Assessing the cost-effectiveness of WIT interventions is useful for informing the economic viability of future efforts to promote water saving in Jordan and elsewhere. Cost-effectiveness analysis compares activities within a project or a project to the status quo or another project by estimating the cost per unit gain (in this case, units of water saved).

According to WIT’s endline evaluation, in general, the agriculture component was more cost-effective than the household component. Within the former, the IF was by far the most cost-effective intervention<sup>21</sup>, followed by the RBSP and the demonstration farms.

Figure 5 below presents a comparison of cost per cubic meter from both the literature and WIT activities (highlighted in teal). Given that agriculture accounts for over 50% of total water use in Jordan<sup>22</sup>, WIT in general and WIT’s agriculture component in particular, appear to be highly cost-effective compared to many other alternatives.



**Fig. 5:** Comparison of water saving programs. (The shorter the bar, the higher the cost-effectiveness)

It’s also important to note that cost-effectiveness can be a useful measure of success but it must be considered in terms of the broader goals and outcomes of the project. Certain activities, even though less cost-effective than other alternatives in terms of dollars per cubic meter, may have been implemented with the intent of supporting additional, non-monetary or water saving outcomes such as increased community awareness or a shift in public perception.

<sup>21</sup> The total cost of saving 1 m<sup>3</sup> of water was USD 0.08. (Compare this to USD 13/m<sup>3</sup> in the household loan fund, which was the least cost-effective intervention).

<sup>22</sup> Ministry of Water and Irrigation (2015) Jordan Water Sector Facts and Figures. Amman, Jordan.

## 6. Conclusions

WIT is an impressive MSD program that improved the irrigation water market system in a very challenging context like Jordan and produced significant impacts in a sector where only a handful of MSD programs have operated.

The program's evolution shows how important it is for a successful MSD team to be able to adapt swiftly to market requirements and unforeseeable challenges and opportunities, stop doing what is not working, adjust strategies based on a combination of market analyses and field-based learning, build collaborative partnerships with stakeholders, and use stakeholder feedback to innovate.

There were difficult moments, particularly during the start-up phase, and not all interventions worked but, with the support of a senior MSD technical advisor, the WIT team managed to put MSD principles into practice. For example, avoiding direct provision of inputs and services, working with a few strategic partners, and creating conditions to buy-down innovation risks. This led to impressive results in terms of scale of impact, farmer's ROI, and cost-effectiveness.

WIT's impacts and outcomes are very important to achieving the goal of sustainable water management. However, higher irrigation efficiency can contribute to intensification of water scarcity through increased water consumption<sup>23</sup>. In order to continue moving closer to this vital goal, future initiatives of this kind will have to deepen their collaboration with the government and community leaders to create and enforce policies that strike a balance between water use and conservation.

The WIT program generated important lessons on how to use the MSD approach to save water at a large scale. In a context of climate change and increasing food insecurity, similar MSD programs that incorporate WIT's lessons are urgently needed around the world.

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<sup>23</sup> This is one of the conclusions from a study by Pérez Blanco et al. (2019) who reviewed over 240 water productivity intervention studies. Cited by Yu et. al. (2021: 3) Can water productivity improvements save us from global water scarcity? WASAG White paper 1. FAO. Rome.

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