

# MIRRA

Methods for Irrigation and Agriculture

**MIT Gear Lab and MIRRA Pilot and Introduce Farmers in the Jordan Valley to an Innovative Irrigation Scheduling Controller**



**With the Support of the NUFFIC Edu-Syria Program, MIRRA Completes the Training of 40 Jordan and Syrian Refugees Youth on Agri-Tech**



**MIRRA and IdaiNature Pilot a Natural-based Innovative Pesticide that Promises to Cut Chemical Pesticide Use by 30%**



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## MIT Gear Lab and MIRRA Pilot and Introduce Farmers in the Jordan Valley to an Innovative Irrigation Scheduling Controller

*Samer Talози and Ammar Namarneh*

In collaboration with MIRRA, the Massachusetts Institute of Technology's Gear Lab is piloting an innovative, cost-effective irrigation controller that integrates a simple weather station, a minimal solar system and pump,, and crop/soil information which devises an irrigation schedule. Thus, enabling accurate and budget-friendly precision irrigation.

The system relies on solar panels for energy and possibly batteries for energy storage. The pilot of the first generation of the controller is coming to an end with many lessons learned from the first year. Farmers were able to achieve equivalent crop yields while minimizing water consumption.

By extending the irrigation duration and reducing water usage, the controller also facilitates downsizing the power system (comprising photovoltaic panels and batteries), curtailing operating energy requirements. This multi-pronged enhancement significantly contributes to reducing the overall power system expenses. Preliminary estimates suggest that the innovative controller could lead to a substantial 20-40% decrease in the total system expenditure.

The controller processes two sets of data: weather measurements and farm-specific information. During its initial calibration and setup phase, the controller acquires essential details such as crop type, growth stage, field arrangement, and soil composition. Additionally, it leverages comprehensive weather data encompassing metrics like rainfall, solar irradiance, temperature, and humidity.



Ahmad, a 20 years old Syrian refugee in Jordan, is exploring the irrigation application as part of his training program at MIRRA. We aim to contribute to a new generation of farm operators who are aware and capable of utilizing emerging agricultural technologies.

This wealth of information allows the controller to accurately estimate evaporation rates, drawing from typical meteorological year data relevant to the region. By synthesizing these data streams, the controller anticipates forthcoming weather patterns and thoroughly assesses the soil's water equilibrium. This meticulous analysis culminates in the generation of an optimized irrigation schedule. Subsequently, the controller assumes control over pump operations and adeptly manages energy consumption within the power system.

For instance, the controller might prompt, "Open section 1 for 30 mins," awaiting confirmation upon completion before instructing, "Close section 1 and open section 2 for 45 mins,"

once again requiring confirmation. This iterative process persists until the scheduled irrigation is accomplished. The accompanying app also allows the farmer to make real-time adjustments to the schedule, such as extending an irrigation session by 10 minutes if the crop requires additional water.



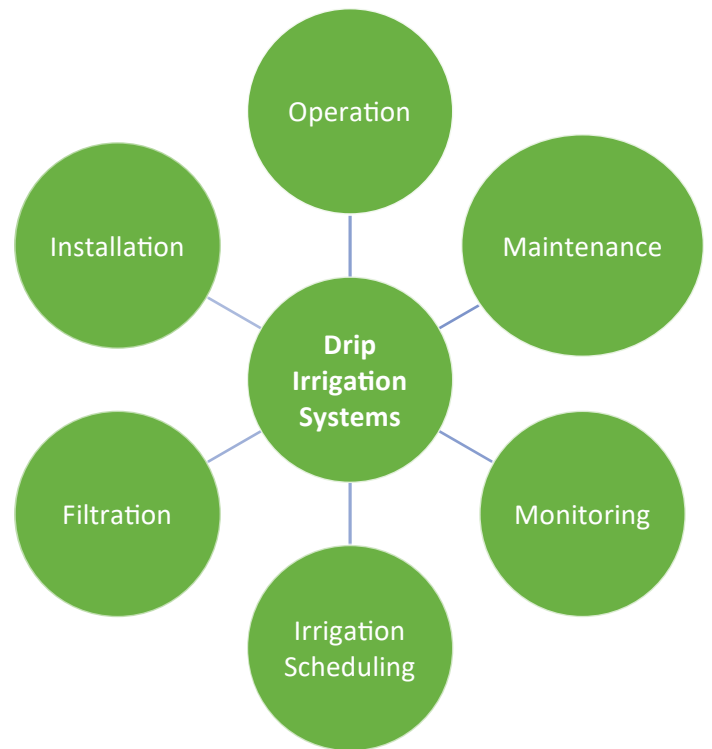
Ayman, who is originally from Egypt, but has been working in the agriculture sector of Jordan for about 8 years, is checking the irrigation schedule for the day. We are lucky that Ayman is able to read Arabic and English; not all Egyptian farm labor are able to do that.

## With the Support of the NUFFIC Edu-Syria Program, MIRRA Completes the Training of 40 Jordan and Syrian Refugees Youth on Agri-Tech

*Samer Talози and Ammar Namarneh*

The EU-funded Edu-Syria NUFFIC Climate - Smart Agriculture program has culminated earlier this month. 40 vulnerable Jordanians and Syrian refugees youth benefited from this program, which spanned over 6 months and provided nearly 130 hours of theoretical and practical training for each participant.

The program, which took place at MIRRA's Climate Smart Farm, covered the principles of drip irrigation systems and major farming practices as seen in the schematic diagrams. In addition, the program included training on a number of soft skills; communication, English, and ICDL.



Discussing the irrigation schedule for the day; during a training session for a group of Syrian Refugees



Reviewing collected data after a long day of assessing the uniformity of the drip irrigation system

This project is part of MIRRA's aspiration towards cultivating a new generation of agriculturists and young professionals driven by a thirst to modernize agriculture, work towards sustainable agriculture, and natural resources conservation.



The last cohort of trainees next to our solar energy irrigation pumping unit on the last day of their training



Discussing the layout and major components of drip irrigation systems

## MIRRA and IdaiNature Pilot a Natural-based Innovative Pesticide that Promises to Cut Chemical Pesticide Use by 30%

*Samer Talози and Ammar Namarneh*

Idai Nature ([idainature.com](http://idainature.com)) is rapidly climbing the ranks to become a global leader in the Biocontrol market, currently holding the fourth position. The company is dedicated to achieving this goal and primarily focuses on developing botanical extracts and microorganisms. Through ongoing research efforts, Idai Nature provides natural solutions for crops, nutrition, organic phytosanitary products, insecticides and organic fungicides, and develops exclusive formulas suitable for all types of agriculture through their natural technology, enabling their clients to increase their profitability and obtain safe food suitable for all markets. MIRRA and Idai Nature are partners within the AZMUD Prima-funded project, which includes several other partners as was reported in previous newsletter articles.

Within AZMUD, Idai Nature created an innovative controlled release system utilizing custom-designed biodegradable polymers. When in a molten state, these polymers will serve to envelop and shield natural pesticides sourced from inventive botanical blends like extracts from Asteraceae, Urticaceae, and Fabaceae plants. These formulations are tailored to enhance the growth of tomatoes, peppers, and lettuce. The resulting capsules will ensure a gradual and sustained release of the natural pesticides, consequently elevating treatment efficacy and safeguarding them against the detrimental effects of light and temperature. This approach aims to minimize their usage while enhancing their prolonged efficacy, achieved through the entrapment of pests within water-soluble and eco-friendly polymers. The manipulation of variables like the thickness of the encapsulation layer and the characteristics of the polymer (such as viscosity and hydrophobicity) will serve as key factors in tailoring the rate at which the pesticides are released. Although research into natural pesticides is ongoing, their successful implementation in the market has been hindered by limited stability and effectiveness issues. Their vulnerability to degradation under environmental conditions such as temperature, water, and light necessitates protective measures.

At MIRRA's Climate-Smart Farm, Idai Nature and MIRRA's team are getting ready to piloting the innovative products on cherry tomatoes within a soilless greenhouse. The planting data is expected to be in early September and the pilot will last throughout the fall and spring.



Encapsulated natural-based pesticides by Idai Nature, Spain. Ready for the pilot on cherry tomatoes at MIRRA's Climate Smart Farm in the Jordan Valley.

## **Timothy Purvis, a Fulbright Researcher at MIRRA, finalizes his project and reflects on his experience and time at MIRRA.**

*Timothy Purvis*

Over the past year, MIRRA has supported my research during my time as a Fulbright Student Fellow. When I was originally looking for an organization to host my research, many at the US Embassy and the Fulbright office noted MIRRA's history in producing successful research projects! I pitched my idea to better understand how farmers perceive water reuse programs in Jordan, which Dr. Talozzi helped to refine into a project that may be more useful for my career, MIRRA's programs, and the scientific community at large.

### ***What did I do with MIRRA?***

My time with MIRRA saw me focus on a few types of projects. The first was my own research, which I spent primarily talking to farmers to understand how irrigation programs and water projects have impacted their livelihoods. Next, I spent time working on MIRRA publications, sometimes editing documents, but often synthe-

sizing the data and policies related to water and agriculture to disseminate to the public. I'm excited to see some of these reports get used by other researchers in the future! My remaining work covered special projects going on at MIRRA: helping to support ongoing programs, interacting with community members, completing literature reviews, and analyzing data sets. These projects were interesting ways to promote the type of research that wouldn't typically fall under a development grant, but which help improve the delivery of agricultural services in the region.

### ***What was my favorite part of working with MIRRA?***

I loved how frequently I would hit a roadblock in my own research that would be easily solved by the staff at MIRRA. When I struggled to find research participants with different experiences, MIRRA staff immediately knew names and farms that I could reach out to. When I didn't know how to present a data set, Dr. Talozzi would have a list of recommendations. With MIRRA having hosted Fulbright Students in the past, I knew that everyone on the team was capable and excited to help! It was an incredible experience to develop and run a research program with the staff at MIRRA, and I believe this time will be important for my long-term professional development. I'm looking forward to come back to Jordan in the future and to work with MIRRA as we wrap up many ongoing projects.



*No caption needed!*



*Timothy meeting with Zaki Al-Rababbah, the head of the Water Users Association #41 in the northern Jordan Valley, to discuss farmers' perceptions and experience using treated wastewater in irrigation.*



Hello!

My name is **Emmeline Failmezger** and I will be working as an intern for MIRRA during this fall semester. I am from a small town in South Carolina but go to school in Georgia. It is a small Liberal Arts school called Covenant College. I am in order to study Arabic and learn more about Middle Eastern culture. I am super excited to be working with MIRRA this semester! I hope to gain not only experience with a sustainably based organization but also learn firsthand how Jordan is dealing with arising agricultural issues.



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