PROSIM project Final Conference (WP2, Output 2.3, A2.3.1) held in Jordan on the 12th of June 2023.

From June 12 to 13,2023, PROSIM project final conference and cross-border thematic field visit (WP3, Output 3.1, A 3.1. 3) took place in Jordan hosted by the National Agricultural Research Center (NARC, PP1) with the participation of the General Directorate for Rural Engineering and Water Exploitation (DGGREE, PP3), El Centro de Edafología y Biología Aplicada del Segura (CEBAS, PP4) as well as PROSIM Associated Partner 1, the Agricultural Engineering Research Institute (AEnRI) - Agricultural Research Center (ARC) of the Egyptian Ministry of Agriculture and Land Reclamation, and PROSIM's lead beneficiary, the Institute for University Cooperation (ICU).

The two events allowed the partners and associated partner to share the project results and outputs as well as knowledge and actions to capitalise on project activities where multiple discussions were held and a Memorandum of Understanding (MoU) was signed to reaffirm the joint commitment in introducing and developing investment and support for farmers to **(WP3, Output 3.4, A 3.4.1)**

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PROSIM project Final Conference (WP2, Output 2.3, A2.3.1)
12TH of June 2023

The Final Conference of PROSIM project took place on the 12th of June 2023, at the National Agricultural Research Center (NARC, PP1), with the participation of PROSIM project partners, the General Directorate of Rural Engineering and Water Exploitation of the Ministry of Agriculture in Tunisia (DGGREE, PP3) and the Centro de Edafología y Biología Aplicada del Segura in Spain (CEBAS-CSIS, PP4) as well as Egyptian associated partner, The Agricultural Engineering Research Institute (AEnR-ARC, AP1).

I. Welcoming Ceremony

The first session began with a welcoming speech from NARC's Director General, Dr. Nizar Al Haddad, who expressed his appreciation for the event and for the ENI CBC MED Program, for uniting partners and stakeholders from across the Mediterranean region, and for strengthening the cross-border cooperation between private and public institutions.

***Figure 1**. Welcoming Word and presenting the National Anthem of Jordan*

Dr Nizar Al Haddad also underlined the importance of reflecting the results of the PROSIM project to highlight the benefits of reusing non-conventional water in agriculture, particularly at this time of critical economic crisis facing Mediterranean countries due to climate change and water scarcity, and therefore affecting the development of some countries.

The next intervention was presented by Dr. Daniele Bonetti, the Director of the Institute for University Cooperation (ICU), representing PROSIM project Lead Beneficiary, who congratulated NARC for organizing and hosting the event. Dr. Daniele Bonetti also appreciated the hard work of all the partners, which has led to significant results and achieved a huge impact on both irrigated areas and farmers, despite the many obstacles that the partners have faced and which have delayed the implementation of activities, such as the Covid 19 pandemic, which have led to a considerable change in the price of equipment and its availability on the local market.

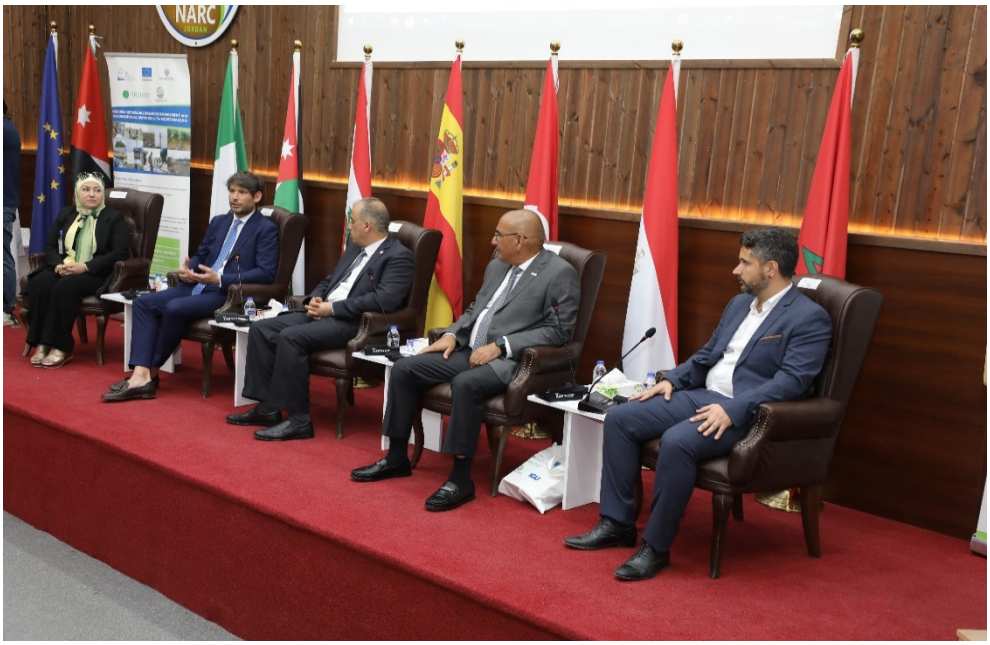

***Figure 2**. Intervention of Dr Daniele Bonetti Director the ICU*

Dr Daniele Bonetti also took the opportunity to highlight the good partnership with NARC, which has lasted for many years, and welcomed future cooperation and the possibility of

creating new ideas with the partners, as they provide the tools and knowledge to create new ideas to ensure the sustainable development in agriculture.

The first session of the event was then closed by Dr. Esmat Karadsheh, coordinator of the Eastern Mediterranean Office of the ENI CBC MED program, who thanked NARC and all the partners for their hard work and congratulated them on the results and positive impact of the activities.

Figure 3. *Intervention of Dr Esmat Karadsheh*

Dr Esmat also took the opportunity to present the next call of the next MED Program, which aims to support cooperation between regions and countries and to further develop joint services and strengthen solidarity. Dr Esmat announced that the call will be launched soon, and invited partners involved in projects in the same cluster to work together on the new proposals in order to exchange their experience and knowledge.

II. Presentation of PROSIM project results

The second session was dedicated to presenting the solutions and results of the PROSIM project implemented in the partner countries. The session was opened by a welcoming word from Mr. Rodrigo Alvarez Nunez, Regional Coordinator of PROSIM, in which he thanked NARC's team

for their hard work and commitment to successfully organize the final conference, as well as the partners for their perseverance and involvement in ensuring the successful implementation of the project's activities, and expressed his recognition to the ENI CBC MED Program for providing the opportunity to implement and contribute to building resilience to climate change.

***Figure 4**. Intervention of PROSIM Project Regional Coordinator Mr Rodrigo Alvarez Nunez*

Mr. Rodrigo Alvarez Nunez also explained that one of the main objectives of PROSIM was to strengthen cross-border cooperation and work together to tackle common challenges. The project addressed the issue of water scarcity as a priority and focused on implementing water saving solutions and the reuse of unconventional water to face these challenges; the project also focused on raising awareness among farmers and public institutions and on building local capacity through training and field visits to improve water management.

Mr. Alvarez also added that the success of PROSIM was further underlined by the Energy Globe award received from the Austrian ambassador in Tunisia in the category of non-conventional water use, reflecting the excellent achievements of the project partners around the Mediterranean in tackling water scarcity through innovative solutions and developing more efficient water resource management systems.

II.1. Presentation of PROSIM project results in Jordan

Next, to present the results in Jordan, Dr Luna Al Hadid, national coordinator of PROSIM project in Jordan, began by outlining the difficult situation of the country in terms of water resources, as it is one of the poorest countries in the world in terms of renewable freshwater, with an average amount of freshwater available per capita of 61 m3/year, which means that Jordan is living under water stress and is confronting the serious problem of climate change.

According to the National Water Master Plan of the Ministry of Water and Irrigation in 2021, Jordan will be facing a water decline of 15٪ in freshwater resources by 2040.

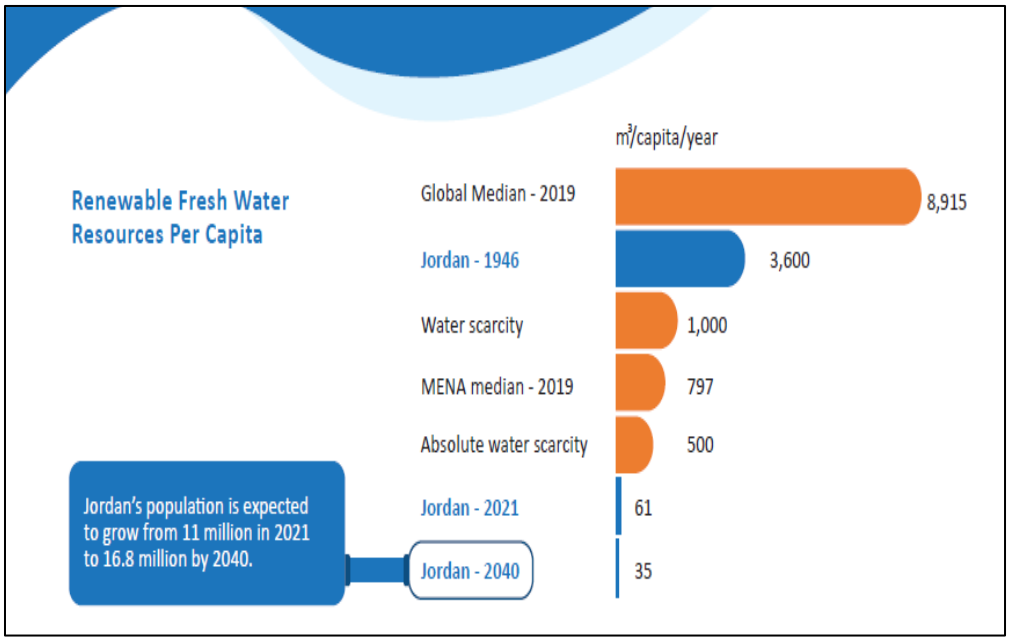

Figure 5. *National Water master Plan (Ministry of Water and Irrigation, 2021)*
Source . Dr. Luna Al Hadidi presentation

Dr. Luna Al Haddidi added that in order to tackle the problem of water shortage and availability, Jordan water supply is currently based on desalination and recycled water, with agriculture being one of the largest consumers of water at 48.6٪ and with the expansion of irrigated areas in Jordan, it has become necessary to replace fresh water with recycled water for irrigation.

Thanks to the use of recycled water, the Jordan Valley has achieved better results in terms of yield growth than irrigation with fresh water. The results of the PROSIM project are therefore a strong confirmation of the importance of using non-conventional water (NCW) in agriculture.

After highlighting the difficult situation of water resources in Jordan, Dr. Luna Al Haddidi presented the main intervention plots in the governorate of Balqa and outlined the main objectives of the project, in demonstrating new/improved and sustainable irrigation solutions that guarantee a more efficient use of water and involve a wider use of non-conventional water resources as well as adopting a technical approach tailored to the local conditions and capacities of the targeted areas, while ensuring that stakeholders throughout the region have access to the solutions.

In Al Balqa governorate, 9 innovative solutions were proposed under WP4 and WP5 for the demonstration of project innovative solutions (IS) related to water use efficiency (WUE) systems and technologies and the demonstration of project IS for increasing NCWs reuse allowing farmers to face limited freshwater availability, decreasing CWs use and improving NCWs quality.

A. Innovative Solutions implemented under the WP4 for PP1 in Jordan

Regarding the IS proposed under WP4, Dr. Luna Al Haddidi presented the systems installed and demonstrated at the field in Balqa, Jordan, improving water use efficiency and reducing water loss. Some photos were then shared with the audience to highlight and illustrate the results on the field:

II.1.1 Demonstration of Sub-surface irrigation systems (WP4, Output 4.1, A 4.1.1, IS1) with TWW in Jordan

Two farmers received the equipment, and 1 ha of agricultural plots was covered.

Figure 6. *Machine for Sub-surface irrigation system (IS1) developed within PROSIM project.*

II.1.2 Demonstration of Drip irrigation systems with NCWs (WP4, Output 4.1, A 4.1.2, IS2) in Jordan.

According to Dr. Luna Al Hadidi, 32 farmers in Balqa governorate received the irrigation systems and at least 12 hectares of open field plots and greenhouses were covered.

Figure 7. *Drip Irrigation Systems (IS2) in Open field installed within PROSIM Project*

II.1.3 Demonstration of Evaporation pan (WP4, Output 4.2, A 4.2.1, IS3) in Jordan,

The equipment was delivered to a total number of 35 farmers covering at least 11.5 hectares of irrigated plots in Al Balqa governorate and enabling to improve water resource management in the area.

Figure 8. *Evaporation Pan (IS3) purchased and installed within PROSIM project in Al Balqa, Jordan*

II.1.4 Demonstration of sensors and weather stations for irrigation scheduling with CWs and NCWs (WP4, Output 4.2, A 4.2.2, IS4) in Jordan.

30 farmers benefited from the equipment through the access to climatic data and soil moisture at different depths of soil profile allowing them to monitor and manage irrigation more effectively at plot level.

Figure 9. *Water mark sensors (IS4) implemented in Balqa under PROSIM project.*

The weather station collects data on wind speed and direction, air humidity, solar radiation, etc. The data is then processed by software within the station to calculate evaporation. The use of sensors and the meteorological station has produced positive results in terms of the rational use of water for irrigation.

Figure 10. *Weather station (IS4) installed in Al Balqa governorate within PROSIM Project*

B. Innovative Solutions proposed under WP5 for PP1 in Jordan

Dr. Luna Al Haddidi presented the different outputs and IS implemented with non-conventional water in irrigation to support farmers in facing limited freshwater availability, decrease CWs use and improve NCWs quality using:

II.1.5 Demonstration of Filtration systems for treated wastewater (TWW) reuse (WP5, Output 5.1, A 5.1.1, IS5),

The systems were delivered to 19 farmers in Balqa, Jordan and covered at least 7 pilot hectares, improving the use of treated wastewater in agriculture, and increasing crop yield.

Figure 11. *Water Filtration System (IS5) installed in Balqa as part of PROSIM Project*

II.1.6 Demonstration of PV solar powered RO desalination systems (WP5, Output 5.2, A 5.2.3, IS6) for NCWs irrigation,

As part of PROSIM project, NARC, procured and installed two systems, each with a capacity of 10 m3/h, for 4 farmers covering at least 4 hectares of agricultural plots in Balqa. The two systems use membrane technology to remove salts and impurities from water and improve water quality so that it can be adapted to different crops.

Figure 12. *Reverse Osmosis desalination unit powered with PV (IS6) implemented in Balqa under PROSIM project.*

II.1.7 Demonstration of PV solar powered nano-filtration desalination systems (WP5, Output 5.2, A 5.2.1, IS7) for NCWs

Two nanofiltration desalination systems were purchased and installed for four farmers to improve water quality and demonstrate its importance in improving crop yields. Significant results were achieved in terms of improved yields and enhanced soil texture.

***Figure 13**. NF desalination unit powered with PV (IS7) implemented in Balqa under PROSIM project.*

II.1.8 Demonstration of capacitive deionisation system (WP5, Output 5.2, A 5.2.2, IS8)

Dr Luna explained that the Capacitive Deionization (CDI) is an emerging desalination technology that utilizes electrochemical principles to remove salts and other dissolved ions from water. The Tender is launched and will be installed soon in Balqa, Jordan for one farmer.

II.1.9 Demonstration of advanced DSS (WP5, Output 5.3, A 5.3.1, IS9) for water mixing

Dr. Luna Al Haddidi highlighted the importance of this innovative remote-control system in optimising the sustainable mixing of different water resources for irrigation ("non-conventional" water and groundwater), depending on the type of crop, soil, and climatic data for the plot. The DSS will be connected to reverse osmosis desalination units to improve water quality and blending as part of the sustainable reuse of non-conventional water.

II.2. Presentation of PROSIM project results in Tunisia

PROSIM project results in Tunisia were presented by the national coordinator, Mr. Nabil Rehaiem. The presentation begun with a highlight of the difficult situation of water resources in the country regarding water resources where Tunisia represent one of the countries that suffer from a shortage of water resources and ranks 17th in the world in terms of water pressure, as the per capita share of water resources is less than 500 m3/year.

Mr. Nabil Rehaiem added that in recent years, Tunisia has also witnessed a decrease in rainfall, especially in the areas that have dams, and thus witnessed: a Revenue shortfall of 43% of average revenue) and a 49% decrease in the stock of dams (about 1.100 million m3),

This situation could deteriorate further in the coming years, with significant differences between the regions and climate change representing one of the most important challenges that the country is facing, in addition to other factors such as the lack of modern irrigation techniques among farmers, the deterioration of irrigation networks and collective water installations in certain irrigation zones and waterlogging and salinization of farmland due to water losses and high-water salinity.

In order to face these, since independence, the Tunisian state has developed important strategies for the mobilization of water resources and the rational management of their use, especially in the irrigation sector that accounts for about 80% of the available surface and ground water resources and treated water and attracts an average of 37% of the total investments allocated to the agricultural sector during the previous development plans.

Mr. Nabil Rehaiem then continued his intervention with a presentation of PROSIM project, as one of the key projects aimed at helping farmers to have access to better water quality and more efficient irrigation systems.

PROSIM project activities in Tunisia are being implemented in 2 governorates (Mahdia and Nabeul).

C. Activities implemented under WP3 in Tunisia

As part of the Output 3.2, Capacity-building training programme on WUE and NCWs use for EAs and WUAs, training sessions were organised by PP3 for extension agents in Tunisia.

II.2.1 Implementation of training and on-field field sessions of EAs and WUAs (Output 3.2, Activity 3.2.2)

As part of the Output 3.2, Capacity-building training programme on WUE and NCWs use for EAs and WUAs, PP3, organised on march 2023 with the support of the Agricultural Extension and Training Agency (AVFA), the training sessions for Extension agents working in water

economy units from 24 agricultural development commission in Tunisia. The Trainings targeted some important topics related to water desalination techniques for agriculture, irrigation scheduling using innovative sensors and weather stations and the use of solar energy to reduce energy consumption. The trainees will then support farmers in managing the demo plots of the project through technical assistance and on-field work.

Figure 14. *Training sessions for Extension Agents in Tunisia with PP3*

D. Innovative Solutions (IS) proposed under WP4 in Tunisia

In Tunisia and more specifically in the 2 governorates of Nabeul and Mahdia, the project is currently implementing WUE systems to reduce water loss and rationalize water use in irrigation through:

II.2.2 Demonstration of Drip irrigation systems with NCWs (WP4, Output 4.1, A 4.1.2, IS2).

54 farmers in the Bir Ben Kemla irrigated area benefited from the equipment and at least 80 hectares of greenhouses were covered.

Drip irrigation systems have achieved very significant results in terms of water savings in the concerned areas.

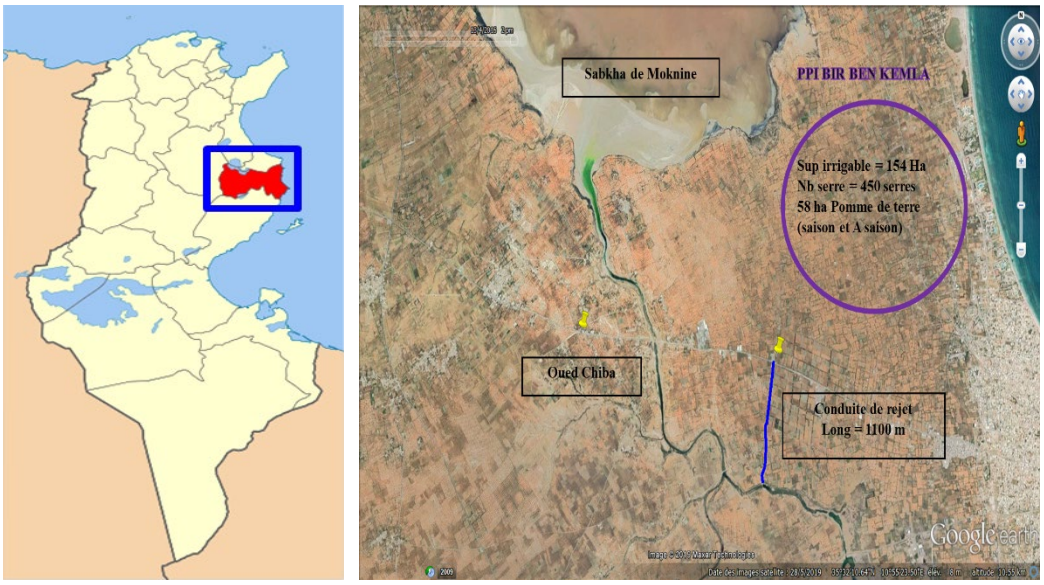

Figure 15. Localisation of the irrigated area of Bir Ben Kemla in Mahdia for IS2

II.2.3 Demonstration of Sensors and weather stations for irrigation scheduling with CWs and NCWs (WP4, Output 4.2, A 4.2.2, IS4) in Tunisia

60 farmers in Mahdia and Nabeul will benefit from the equipment through the access to data and information in terms of real-time climate data, soil moisture and irrigation water requirements of their plots. The data can be accessed via an online platform or by SMS sent to beneficiary farmers on a daily basis.

The station's integrated software automatically calculates evapotranspiration and water requirements, using the Penman Monteith formula, modified by FAO.

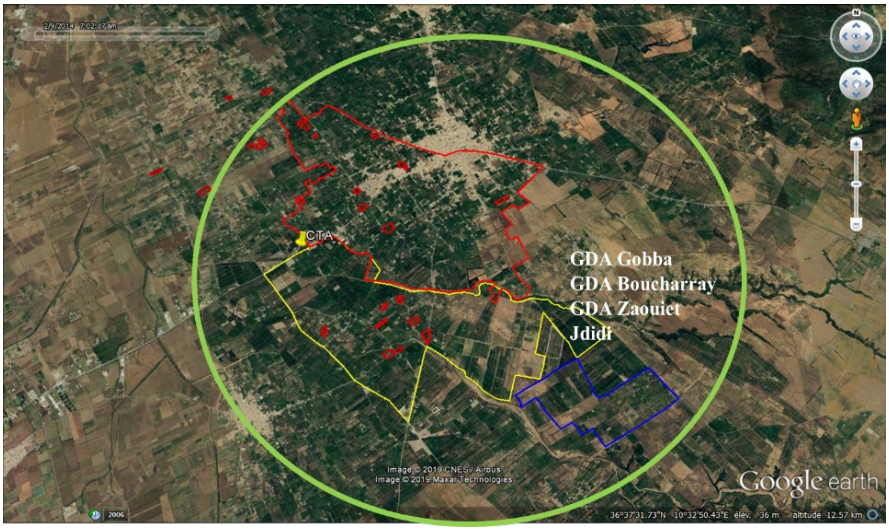

Figure 16. *Intervention area of PROSIM project in Nabeul Governorate for IS4*

E. IS proposed under WP5 in Tunisia

Regarding activities under WP5, Mr. Nabil Rehaeim presented the innovative solutions that have been proposed and implemented in Tunisia to improve the reuse of non-conventional water in the governorate of Mahdia, one of the governorates most affected by water salinity and marine intrusion, thus affecting yield improvement and crop diversification.

Among the activities implemented or being implemented in Mahdia, Tunisia:

II.2.4 Demonstration of PV solar powered RO desalination system (WP5, Output 5.2, A 5.2.3, IS6) for NCWs irrigation in Tunisia

Two RO desalination units with a total capacity of 800 m3/d have been installed in the Bir Ben Kemla irrigated area, reducing water salinity from 6.4 g/L to 1.5 g/L. A total of 95 farmers have benefited from the desalinated water, and more than 154 ha of greenhouses and field crops have been covered.

The desalination units represent a prototype for irrigation in Tunisia, thanks to the hard work of various public and private stakeholders in the country. The Ministry of Agriculture's DGGREE was supported in this activity by the Regional Agricultural Development Commission (CRDA) of Mahdia, the National Water Exploitation and Distribution Company (SONEDE) and the

Agricultural Extension and Training Agency (AVFA), with the aim of boosting the know-how of stakeholders in Tunisia in terms of non-conventional water reuse and desalination.

Figure 17. *RO desalination unit (IS6) installed in Bir Ben Kemla irrigated area in Tunisa as part of PROSIM project.*

The remote techniques and technologies developed within the desalination unit are innovative and tested for the first time in Tunisia in the field of agriculture to support farmers and stakeholders in improving desalination techniques and adopting digitalisation in agriculture.

Figure 18. *Water tanks connected to the desalination units (IS6) installed as part of PROSIM project in Tunisia.*

II.2.5 Demonstration of nano-filtration desalination systems (WP5, Output 5.2, A 5.2.1, IS7) for NCWs irrigation in Tunisia

The nanofiltration desalination unit, with a capacity of 20 m3/d, is currently being installed at the Souassi professional agricultural training centre plots and will benefit at least 4 farmers and 4 ha of greenhouses with improved water quality.

II.3. Presentation of PROSIM project results in Spain

The final presentation of PROSIM project results was delivered by Dr. Francisco Pedrero Salcedo, PROSIM project coordinator in Spain and researcher at CEBAS-CSIC's Irrigation Department. He proceeded by thanking NARC for hosting the event and all the project partners for their hard work and collaboration over the years.

Dr. Francisco Pedrero began with a brief presentation of the difficult situation facing the country in terms of irregular rainfall and water shortage due to climate change, with Spain representing one of the driest regions in Europe, as shown in the photo below.

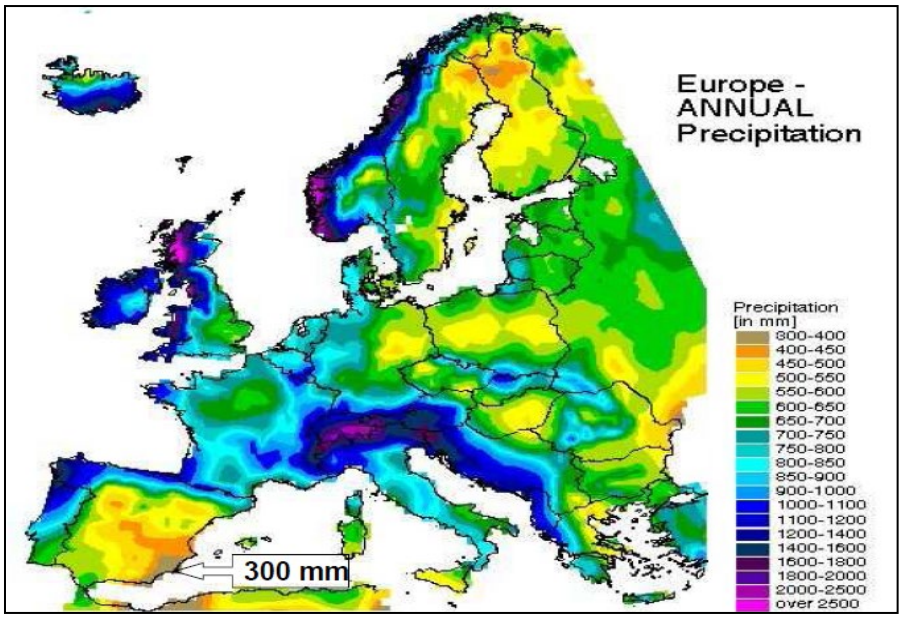

Figure 19. *Europe annual precipitation (Source: Dr Francisco Pedrero presentation)*

To cope with the water shortage, the country's strategy was to focus on reclaimed water, with 98% of water needs in Mucia, and on deficit irrigation management strategies. Numerous projects have been implemented in Spain to promote sustainable irrigation management and non-conventional water use in the Mediterranean. PROSIM is one of the key projects in Murcia, implementing innovative solutions for water desalination and efficient irrigation systems.

Figure 20. *PROSIM project demonstration activities in Spain (Source: Dr Francisco Pedrero presentation)*

Dr. Francisco Pedrero then represented the two activities that were implemented and demonstrated in Spain, as part of PROSIM project:

F. Innovative Solution proposed under WP4 in Spain

II.3.1 Demonstration of drip irrigation system (IS2) with CWs and NCWs (WP4, Output 4.1, A 4.1.2)

Dr. Francisco Pedrero presented the objective of this activity in the study the effect of the combined use of saline reclaimed water and deficit irrigation strategies on the cultivation of mandarin (Orogrande/Carrizo) and grapefruit (Star Ruby/Macrophyla) where The physiological and agronomic effects of irrigating a commercial grapefruit orchard with saline reclaimed water (RW) and transfer water (TW) combined or not with a regulated deficit

irrigation (RDI) strategy under drip irrigation (DI) and subsurface drip irrigation (SDI) were analyzed. Different living labs were implemented to introduce alternative crops.

Dr Francisco pointed out that results showed that the RDI treatment and the use of RW combined with SDI, which allowed reaching an average annual water saving of 40% and 25% N, 15% P and all the K needs, did not negatively affect vegetative growth, yield, and fruit quality, which might be of great economic and competitive significance for agriculture.

Figure 21. *Demonstration of surface drip irrigation (IS2) and Subsurface drip irrigation (IS1) in Spain with PP4*

Dr. Franciso Pedrero explained that on the living lab commercial carob tree farm, the implementation of SDI, improve the physiological parameters and vegetative growth of the trees and the salinity aspects from the soil. Yield and fruit quality parameters will be analyzed at the end of the season.

The second activity implemented under PROSIM project in Spain is:

G. Innovative solution proposed under WP5 in Spain

II.3.2 Development and demonstration of advanced DSS (WP5, Output 5.3, Activity 5.3.1, IS9) for water mixing

Dr Francisco explained that Decision support system was developed in the framework of PROSIM project to help users in improving water-soil-crop management by optimizing the mix of water of different quality, consider several scenarios and easily evaluate which strategy best suits the farm's requirement.

The user obtains as outputs (yields, soil infiltration, use of water and fertilizers).

Different level of the system was developed by PP4 ranging from the simplified system to the advance one depending on the context of the country.

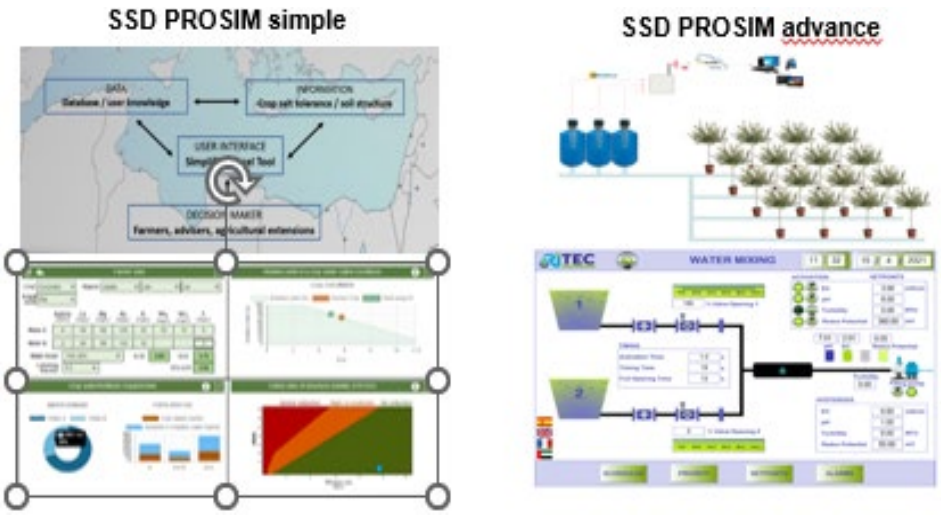

Figure 22. *Decision support system (IS9) developed and demonstrated in Spain by PP4*

Dr. Francisco Pedrero presented then methodology of the system based on the mixing of the Brine and reclaimed water to reach the best quality to irrigate carob tree in combination with SDI. On the picture can see an example of a mix at 30% brine (7,3 dS/m) and 70% reclaimed water (1,77 dS/m) to reach a water quality of (4,5 dS/m).

Figure 23. *Advanced DSS (IS9) implemented in Spain under PROSIM project.*

Regarding dissemination activities, Dr Franciso highlighted the multiple Visits, training days, international and e-learning courses, summer schools, MsC, phD that were implemented and where PROSIM Project technologies were demonstrated. Also, scientific articles were published based on the data and results collected during the project.

Dr Francisco underlined the importance of Future long-term studies to corroborate the effects of this management practices combination on food safety, water savings and cost reduction, and the possible trend of soil salinization and sodification.

III. Synergy with Greenland-ENI CBC MED project in Jordan

The next intervention was led by Eng. Alaa Wahbeh, project coordinator in Jordan regarding the synergy of PROSIM project with other ENI CBC MED program projects, where the Greenland project is implemented at NARC under priority 3.1 Fight Against Poverty.

Eng. Alaa presented the objectives of the project in the adaptation to climate change and the fight against poverty by building resilient communities and empowering the vulnerable, enabling to pave the way for a sustainable future that uplifts both people and the planet.

The project priorities are basically to:

- Identify employment opportunities in the domain of GaCE.
- Identify associated skill gaps to improve the overall socio-economic conditions at the community/ local level.
- Reducing the mismatch between the labor market and skills in NEETs and women by ensuring the availability of necessary provisions needed to facilitate access into the labor market.
- Equipping target groups with marketable skills via training courses, e-learning services, coaching, mentoring, and traineeships.

Signature of the Memorandum of Understanding MoU in Jordan with PP1 (WP3, Output 3.4, A 3.4.1)

On the 12th of June 2023, a Memorandum of Understanding (MoU) was signed in Jordan between public and private stakeholders acting in the field of water and agriculture to reaffirm the joint commitment in introducing and developing investment and support for farmers. The MoU was signed by NARC Director General Dr. Nizar Al Haddad and ICU Director Dr. Daniele Bonetti, also by the Agricultural Credit Corporation "ACC" Director General, Eng. Muhammed Dojan and the Jordanian Cooperative Corporation "JCC" Director General, Eng. Abdulfattah Alshalabi, as well as the Baladna Association, one of the water users' associations, represented by Mr. Nidal Abada.

Dr. Nizar Al Haddad explained the importance of this Memorandum of Understanding in promoting cooperation and sustainable development in light of the difficult economic crisis facing the country. He added that water scarcity affects both irrigated areas and farmers, raising the need to work together in finding effective solutions to address these challenges. Dr. Nizar Al Haddad also pointed out that one of the lessons learned was that nothing is possible without collaboration when it comes to integrating innovation into agriculture.

Dr. Daniele Bonneti, Director of ICU, also highlighted the common objectives of the organization and NARC in promoting sustainable irrigation and helping farmers to cope with climate change issue. He also outlined the close collaboration between NARC and ICU, which has enabled the project to achieve significant results in Jordan.

Both the Agricultural Credit Corporation and the Jordanian Cooperative Society also welcomed the initiative and recognized the importance of involving all stakeholders and working together for sustainable development of the country. Farmers have also expressed their enthusiasm for the initiative, which will help them to meet the challenges of climate change and water scarcity in Jordan.

Round table: Capitalising on the results of PROSIM project to draft the capitalisation plan (WP2, Output 2.4, Activity 2.4.2)

A round table was organised with the participation of the partners and the Egyptian associate partner. The aim of this round table was to identify measures to be applied in each of the implementing countries to ensure the sustainability, proper functioning and use of the equipment and actions put in place during PROSIM. The meeting also highlighted obstacles that had prevented all results from being achieved, or that had led to delays in certain activities, so that these could be avoided in future projects.

Fruitful discussions took place during the round table, with partners actively expressing their proposals and suggestions. Among the partner's main suggestions was the importance of reusing the brine produced from desalination units, as it represents an environmental issue and should therefore be used to irrigate high-salinity-tolerant crops such as halophytic plants, which can be used as animal feed or in pharmaceuticals. Brine can also be used in hydroponic and aquaponic systems.

The partners also stressed the importance of mapping and identifying discharge areas that do not affect the environment and groundwater in new project proposals that include a water treatment component, to avoid delays in technology implementation.

The partners further proposed to develop success stories and publish articles on the results of the project to ensure its sustainability and to extend information sharing with other public and private organisations.

The Tunisian partner also proposed using desalination units to irrigate high-value crops, as this is an expensive technology that consumes energy.

On the other hand, the Spanish partner, CEBAS, presented the importance of drip irrigation systems for more efficient irrigation and to avoid water losses. He also presented the main

problem with these systems, namely clogging, which affects their performance, which is why many companies are currently carrying out tests to develop new ideas and improve these systems to solve the clogging problem.

The partners also suggested that future projects should include the Internet of Things and smart irrigation, which make irrigation easier for farmers and can be programmed automatically to give the plant the specific amount of water to meet its water needs.

The partners also pointed out that one of the obstacles is the limited cross-border meetings and visits, hence the importance of developing them in the future.

The partners stressed that the results of the project will be shared via an online application that will be developed or is being developed with other organizations such as the FAO and others.

Realisation of the cross-border thematic field visit in Jordan (WP3, Output 3.1, A 3.1.3)

Figure 24. *Field visit in Al Balqa Governorate*

On June 13, PROSIM project partner NARC (PP1) organized the cross-border field visit to Balqa, Jordan, to showcase the demo plots and technologies implemented as part of the PROSIM project, and to share expertise and experience with other PPs.

The visit group consisted of representatives from the Jordanian partner (PP1), the Tunisian partner (PP3), the Spanish partner (PP4), the Egyptian associate partner (AP01) and farmers from the "Baladna" water users' association.

a) Visit to a Permaculture Farm in Balqa, Jordan

The field visit began with a permaculture farm producing compost and biochar that was designed during the covid to feed 20 families, and where the recycling mechanism was presented.

The farm is characterized by its unique idea where the Azola plant, an excellent feed for animals and fish, is also grown without consuming a lot of water. On this farm, nothing is wasted.

Figure 25. *Visit to permaculture farm in Balqa.*

b) Visit to the Drip irrigation system and Evaporation Pan (WP4, IS2, IS3)

The group then visited one of the farms that benefited from the drip irrigation system (IS2) combined with the evaporation tank (IS3). Together with the evaporation tank, the drip irrigation system installed in the greenhouses proved to be an effective method of optimizing irrigation, giving the plant its exact requirements, and preventing water losses, especially considering that water is not always available to farmers, and it is therefore extremely important to adopt these technologies.

According to the data collected by the partner, the results have been very significant: 25% of water has been saved, yields have increased by 20-30% and farmers diversified their production pattern thanks to the system installed as part of PROSIM project.


Figure 26. *Visit to demo plots of the drip irrigation system (IS2) and Evaporation pan (IS3) in Balqa*

c) Visit to the Reverse Osmosis desalination Unit (WP5, IS6)

The group then continued its visit to the solar reverse osmosis unit, the sixth innovative solution implemented as part of the PROSIM project, with a recovery rate of 80% for 4 farmers. According to data shared with the group, the system has reduced energy costs by 70% and improved yields by 50% compared with previous years without the desalination unit.



Figure 27*. PV powered Reverse Osmosis desalination unit (IS6) implemented in Jordan under PROSIM project.*

d) Visit to the weather station and sensors (WP4, IS4)

The group then visited one of the farms that had benefited from the weather station and the sensors for irrigation scheduling, one of the technologies enabling users to save water and determine the exact crop requirement on the basis of the weather parameters provided by the station's various climate sensors.

***Figure 28**. Demo plot in Balqa for the weather station and sensors (IS4)*

The weather station includes sensors for wind speed and direction, precipitation, solar radiation, temperature, and atmospheric pressure.

***Figure 29.** Weather station (IS4) implemented in Balqa in the framework of PROSIM project.*

The Software installed in the data logger enables the calculation of potential evapotranspiration. Also, Real-time data can be tracked via an online platform or cell phone, making it easy to access the data.

The results shared with the partners were remarkable in terms of water savings and improved yields. Farmers expressed their satisfaction with the results obtained in their plots.

e) Visit to the Wastewater treatment plant in the Jordan Valley

To conclude the field visit, the study group visited the major water treatment facility in the Jordan Valley, where engineers explained the treatment mechanisms, with wastewater passing through sedimentation tanks, then pre-treatment and filtration before finally being pumped to irrigate date and vegetable farms.

Numerous discussions took place between the partners to share experience on water treatment technologies and capitalize on solutions.

Figure 30. *WWTP in Jordan Valley*

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