REDSIM

Layman's Report

"Halting desertification in Europe"

Scope and objective

Improving water productivity of irrigated land in semiarid areas in Spain and other countries of the Mediterranean Basin is considered a priority at European level. There is an urgent need to develop and implement practical measures and tools that support (i) a more productive and sustainable management of scarce water resources and (ii) the mitigation of desertification and the adaptation to climate change.

Especially under water scarce conditions, it is necessary to obtain an optimal Irrigation Water Productivity (IWP). This indicator is usually expressed in kg yield per m3 applied water. An optimal IWP means preventing over-irrigation and applying an adequate amount of irrigation water at the most favorable moments during the growth season. Innovative techniques can even further boost IWP and guarantee a high yield while saving water. One of them is Regulated Deficit Irrigation (RDI)

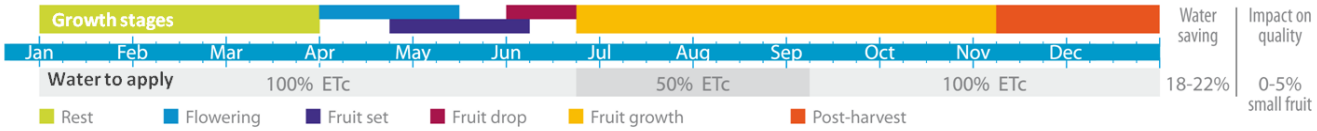
Regulated Deficit Irrigation (RDI) is an irrigation strategy that puts crops deliberately under a certain degree of water stress during 'drought-tolerant' growth stages while ample water is applied during 'drought sensitive' stages. Besides saving water, RDI allows to (i) save energy and fertilizers and (ii) obtain a higher water productivity.

The overall objective of the REDSIM project is to improve Irrigation Water Productivity (IWP) in two Spanish water-stressed basins, by developing and validating an Information-Decision Support System (REDSIM-IS) based on Remote sensing (RS) information and simplified water balance and crop models to assist growers in implementing and managing efficiently deficit irrigation (DI) techniques.

Activities

The following activities were carried out within REDSIM to meet the objectives

1. Setting up and calibration of the REDSIM information system (REDSIM-IS) and farm advisory tools
2. Mapping and prediction of soil and crop attributes, surface fluxes, rainfall, soil water balance and WP
3. The implementation and monitoring of the deficit irrigation treatments in pilot farms, for different key crops of the Mediterranean basin (citrus, melon, nectarines, grapevine)
4. On-farm evaluation of the acceptance of the REDSIM tools, using a participatory approach
5. Dissemination through stakeholder events, and a booklet with guidelines and outcomes of REDSIM presented to the targeted users (see next Figure)



Results

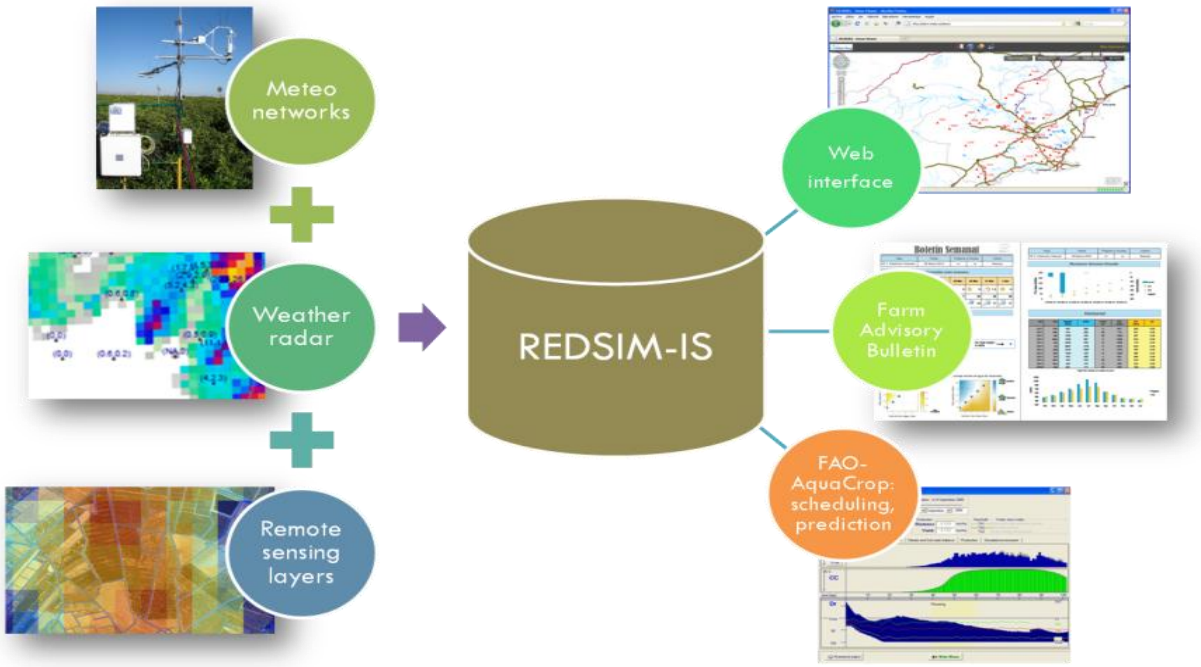
Various advisory information tools may support the fine-tuning of irrigation water supply or the implementation of RDI, to optimize irrigation water productivity. These tools should join different existing spatio-temporal information sources (meteorological networks, weather radar, satellite remote sensing) to provide up-to-date information on soil and crop. This allows a more appropriate decision by the farmer on when, where and how much water to apply and may also serve as learning-tools. The REDSIM project provides the following tools to the farmer:

- REDSIM-IS is a single web portal that integrates all available spatiotemporal information (meteorological networks, weather radar, satellite remote sensing, surveying, etc.) to provide updated information on soil and crops for better irrigation management, planning and scheduling by the farmer.

- This same web portal also includes a new innovative product that uses state-of-the-art algorithms to combine information from weather station networks with rainfall radar in real time. This way, the farmer knows with high accuracy the amount of rain that received his plot during the last hours and days.

- The REDSIM irrigation advisory bulletin is sent to the farmer by e-mail with synthesized and up-to-date information which supports decisions on irrigation planning. The bulletin includes: i) 7 days weather forecast with the forecasts of crop water needs, (ii) options in terms of dosage and frequency of irrigation to meet the predicted demand and soil water, and (iii) its impact on percolation and the a comparison between computed irrigation needs and applied amounts

- REDSIM allowed demonstrating the benefits of using the latest water productivity tool for practitioners (extension services, farmers, etc). This state-of-the-art tool “AquaCrop” is currently being developed by FAO together with researchers involved in REDSIM. It allows seasonal productivity predictions and supports the farmer in irrigation planning.



Key findings

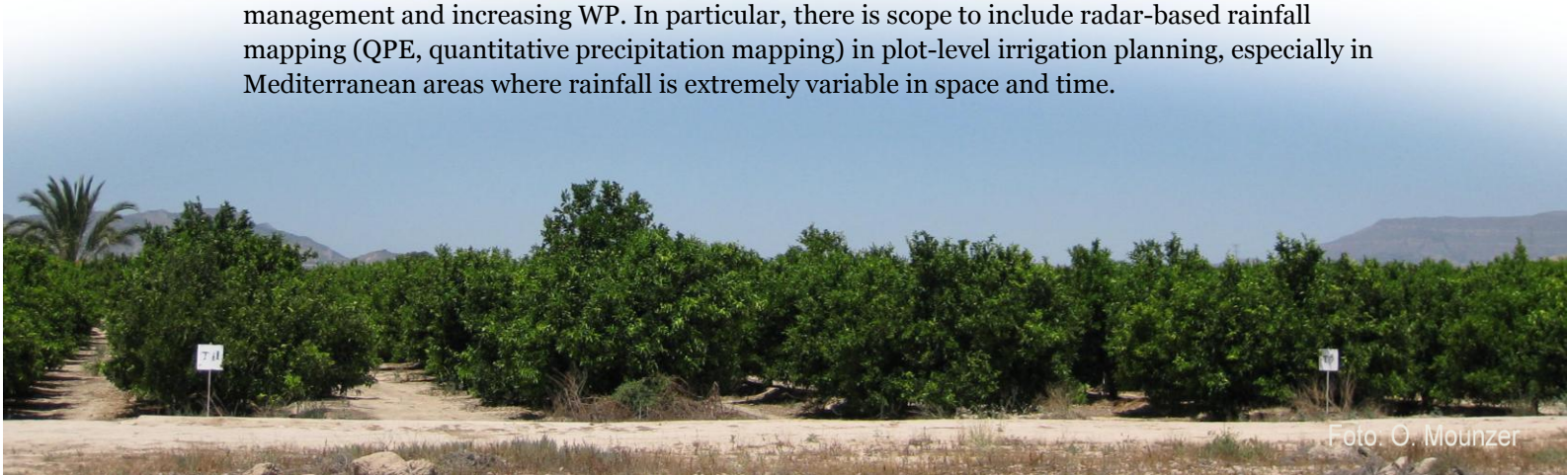
- The potential to increase water productivity by changing irrigation practices is substantial, even in irrigation districts equipped with modern infrastructure (e.g. Campo de Cartagena, S-E Spain) where drip irrigation is fully implemented. Over-irrigation is common and deficit irrigation techniques are hardly practised due to lack of proper crop-specific guidelines and information systems that provide the necessary information on crop water demands.

- Fine-tuned drip irrigation may, in combination with deficit irrigation techniques, ensure that these saving potentials are exploited. Water consumption can be reduced and IWP increased by up to 40% for different fruit crops. Farmer information and advisory systems are essential to support these water saving strategies.

- To this end, irrigators should become acquainted with the use of advanced irrigation management tools and become more familiar with deficit irrigation techniques, through better science communication, demonstration projects and capacity building. This is likely to have a beneficial impact on WP and sustainability of irrigated agriculture in semi-arid countries.

- Certainly, economic incentives are deemed necessary to motivate irrigators to adopt and successfully implement advanced irrigation methods and supporting tools. Also irrigators' associations can play a key role in fostering DI and its uptake by farmers.

- Combining and processing ground and RS-based spatial datasets of crop/soil indicators within integrated information/advisory systems is highly recommendable for optimizing irrigation management and increasing WP. In particular, there is scope to include radar-based rainfall mapping (QPE, quantitative precipitation mapping) in plot-level irrigation planning, especially in Mediterranean areas where rainfall is extremely variable in space and time.



Transferability

There is a potential to significantly increase irrigation water productivity in the Mediterranean basin by implementing techniques and tools studied and developed in REDSIM. No major technical barriers are foreseen for transferring the REDSIM tools to other water-scarce regions in Europe. However, the following issues are considered important for successful uptake:

- Risk-adversity and lack of knowledge of deficit irrigation techniques by farmers is a key barrier. Now, of many crops, enough knowledge is available that is yet to be communicated to farmers, though for example the REDSIM guidelines (Annex VII) and demonstration projects. Also, REDSIM confirmed that a participatory approach for the implementation of farm advisory support is recommended to adapt design to local preferences and knowledge

- Information on rainfall is currently scattered among different organizations and institutes within the same basin: in the Segura Basin, but also in several other drought-prone basins in Europe. A key outcome of REDSIM is the successful integration of all available networks, including remotely-sensed rainfall radar, providing a product that gives farmers plot-level information on the amount of rainfall during the latest hours. The key barrier to be dealt with is the institutional setting in each basin, that may limit the exchange of data for other purposes than those that are supported by the organization itself.

- Even if the investment needs are relatively low, farmers will only adopt new irrigation techniques when they find some type of economical incentive, depending on the marginal financial benefits in optimizing water use in each region.

For more information on the REDSIM project:

- contact with the project coordinator Alain Baille (alain.baille@upct.es) of the UPCT (Universidad Politécnica de Cartagena). Other partners were: IMIDA (Instituto Murciano de Investigación y Desarrollo Agrario); CEBAS-CSIC (Centro de Edafología y Biología Aplicada del Segura); UCO (Universidad de Córdoba); FutureWater; AFRE (Asociación de Fabricantes de Riego Españoles)
- or check www.redsim.net

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