



REDSIM

# **Guidelines for an optimal irrigation water productivity**

Recommendations, strategies and information systems for deficit irrigation



# CONTEXT

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.

# PROBLEM-SOLUTION

Especially under water scarce conditions, it is necessary to obtain a high productivity of irrigation water. This is usually expressed in terms of kg yield per m3 water applied. There are several techniques that guarantee a high yield while saving water, thus increasing irrigation water productivity. One of them is Regulated Deficit Irrigation (RDI)

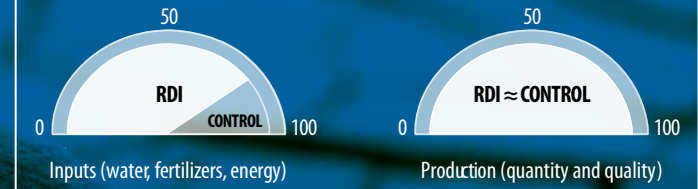
# RDI

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 an optimal water productivity.

## WHY APPLY RDI ?

- Save water, energy and fertilizers
- Maintain a high production with reduced water



## Effects on plants

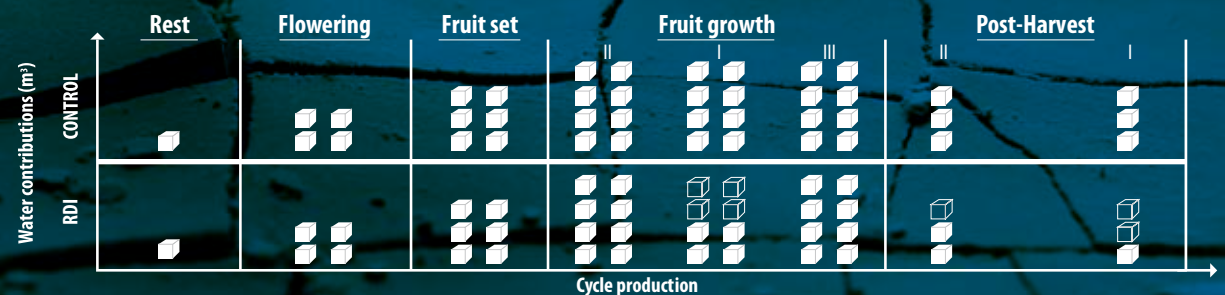


- Less vegetative growth
- Less foliage and transpiration
- Improves aeration and light to enter



- More buds
- Reduce the fallen fruit

The RDI consists in reducing inputs of irrigation during the growing stages less sensitive to water deficit without losses in the final production.



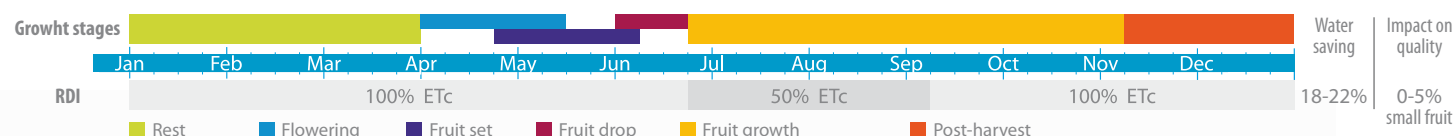


# 1. How to perform deficit irrigation in Mandarin?

## RDI MANDARIN

CEBAS-CSIC / [www.cebas.csic.es](http://www.cebas.csic.es)

The crop response to water deficit of several citrus species is well characterized. Therefore, application of RDI may be accomplished by a simple modification of the irrigation scheduling at the right moment. Studies on the application of deficit irrigation in citrus showed the potential to save between 10 and 28% water. It is possible to achieve these savings without seriously affecting the performance and quality. In mandarin for example, application of RDI resulted in a slight increase in the concentration of vitamin C without affecting other quality parameters relevant to the market and without reducing the total yield. In the years with a higher production than average, the fruit size experienced a slight decrease.



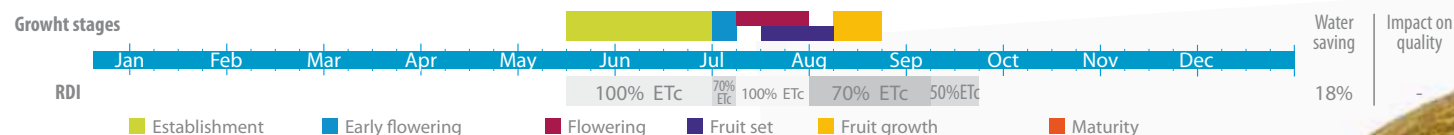
**Crop:** Mandarin  
**Variety:** Orogrande  
**Rootstock:** Carrizo  
**Age of trees:** 8-12 years  
**Experimental site:** Campotéjar  
**Soil:** Silty loam  
**Irrigation system:** drip

## 2. How to perform deficit irrigation in the melon tree?

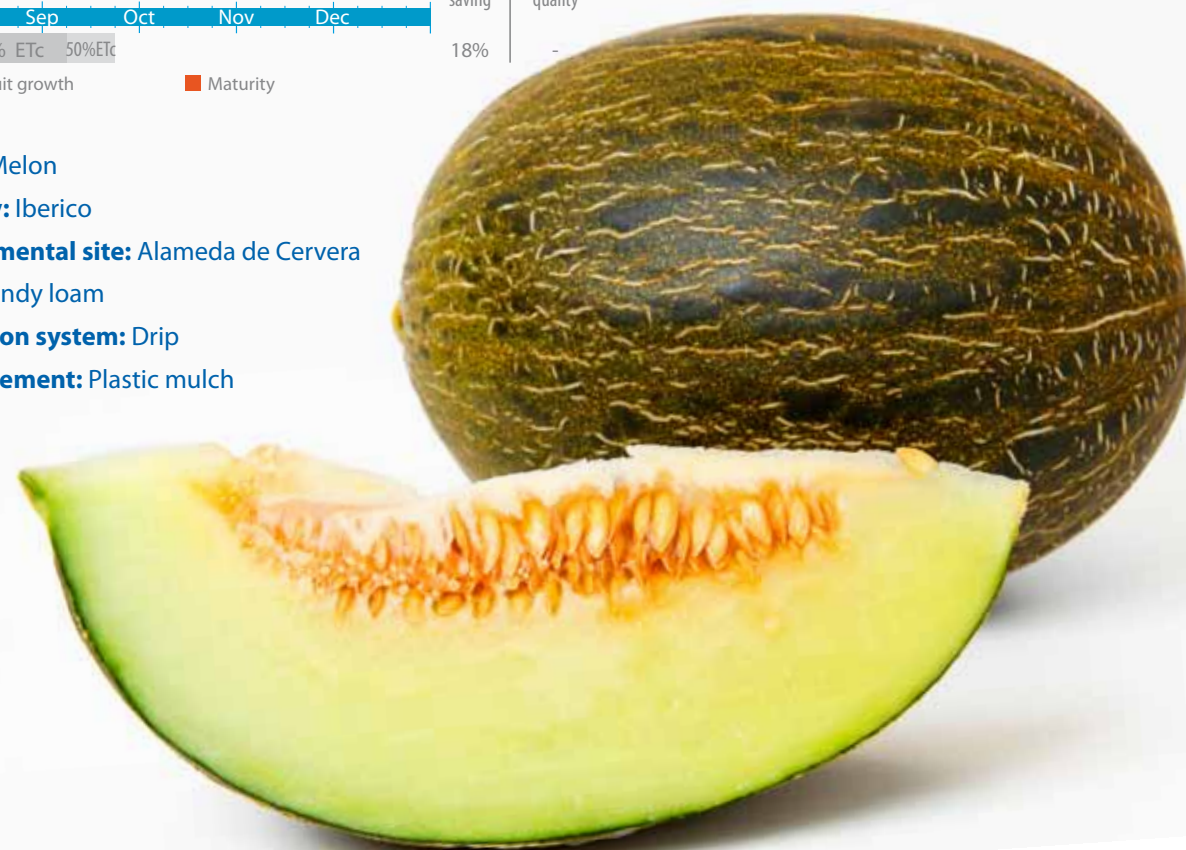
### RDI MELON

Universidad de Córdoba / [www.uco.es](http://www.uco.es)

Generally, the selected irrigation strategy is considered one of the most important factors controlling yield and fruit quality in melon. RDI in melon is a promising irrigation strategy to achieve the best possible performance using less water without compromising on productivity. Studies on the application of the RDI in melon showed the potential to save up to 18% water without reducing yield or fruit quality. Also, a controlled amount of water stress during the ripening period can significantly improve the fruit quality, causing a slight increase in the concentration of soluble solids, mainly in the sugar content of the fruit pulp.



**Crop:** Melon  
**Variety:** Iberico  
**Experimental site:** Alameda de Cervera  
**Soil:** Sandy loam  
**Irrigation system:** Drip  
**Management:** Plastic mulch





### 3. How to perform deficit irrigation in vineyards?

## RDI VINEYARD

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The vine is one of the species best adapted to water stress conditions, so RDI is an appropriate strategy for efficient irrigation management of this crop. RDI saves water, control vegetative growth, balances production and improves the quality of the grapes (especially in red varieties). Studies on the application of deficit irrigation in vineyards showed the possibility of saving about 60% water reducing production slightly (about 5%). In turn, some quality parameters of grape (Brix, anthocyanin content, acidity and total polyphenol index) can be enhanced due to the effects of moderate stress.



**Crop:** Vineyard

**Variety:** Sauvignon, Tempranillo y Macabeo

**Age of vines:** 12 years

**Soil:** Sandy clay-loam

**Irrigation system:** Drip

**Management:** Padded saucer

**Planting system:** Espalier



## 4. How to perform deficit irrigation in nectarines?

### RDI NECTARINE *ETSIA - UPCT / www.upct.es*

Deficit irrigation in nectarine can be applied during the post-harvest period. During this period the applied amounts can be reduced by up to 50% of crop water demand, which results in a total water saving between 15 and 25%. These savings can be achieved without affecting yield and product quality. Also during phases I and II of fruit growth the applied irrigation water can be reduced, with the aim to increase the soluble solids in the fruits, and thus increase the final product quality.



**Crop:** Vineyard

**Variety:** Viowhite

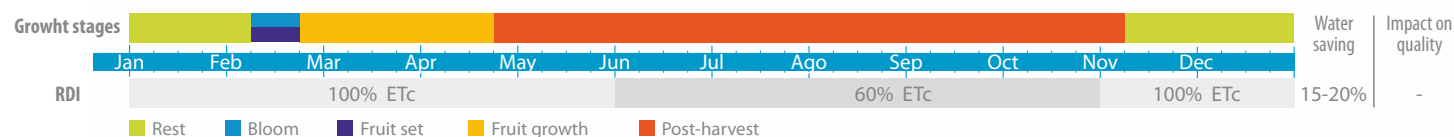
**Porta-graft:** Puebla de Soto 101

**Age of vines:** 8-12 years

**Place:** Molina de Segura, Murcia

**Soil:** Silty loam

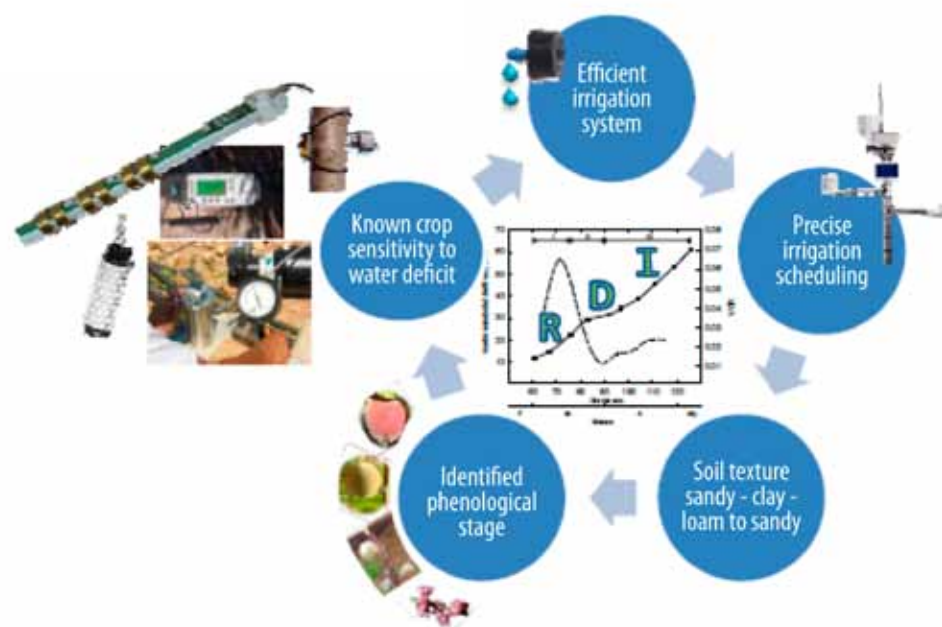
**Irrigation system:** Drip





## 5. Supporting tools for RDI - REDSIM

### WHAT DO I NEED?



To implement RDI, the farmer needs adequate information on his field, the crops and the water requirements. REDSIM provides several information and advisory tools to support the farmer in implementing this irrigation strategy. These tools join different existing information sources and simulation tools to provide up-to-date and local data and predictions.

For more info, check [www.redsim.net](http://www.redsim.net)

#### What data is available on my plot?



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.

#### How much rain received my crop?



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.

#### When and how to irrigate?



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

#### How affects irrigation my productivity?



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.

# REDSIM



[FOR MORE INFORMATION](#)

check [www.redsim.net](http://www.redsim.net)

or contact the project coordinator

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