

EU CAP Network Workshop 'Circular water management'

Seville, Spain
12 - 13 March 2024



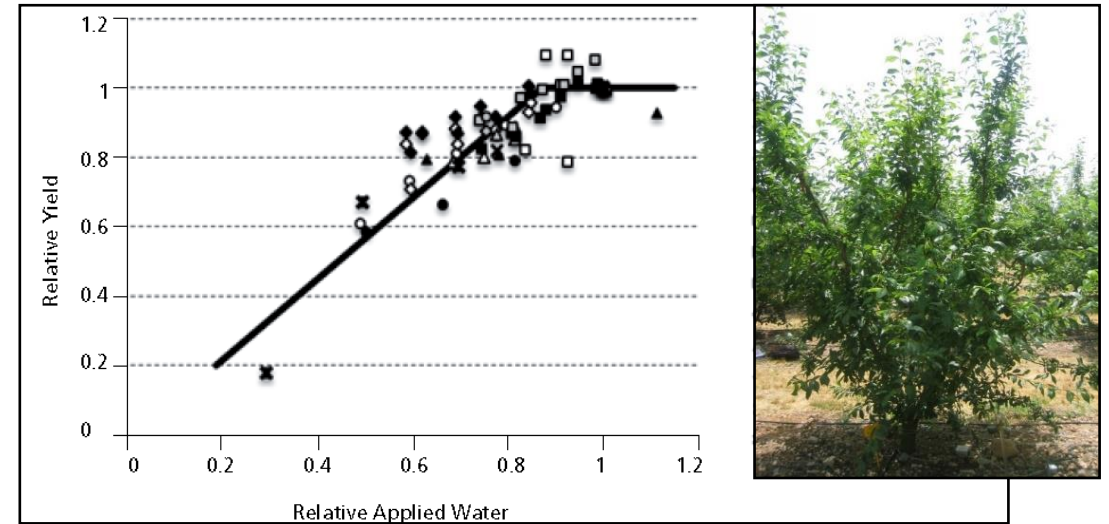
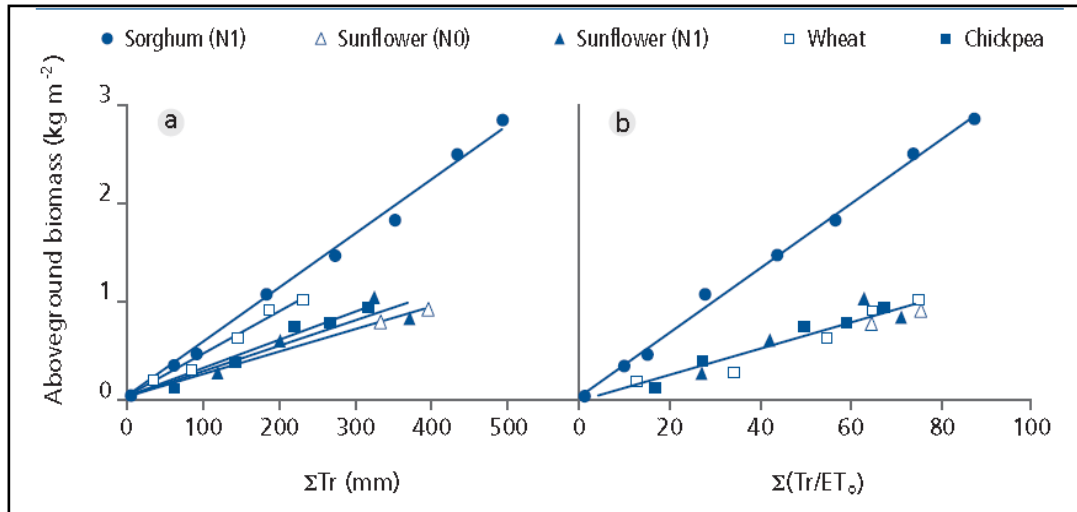
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Inspirational and introductory talk

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Support Facility 'Innovation & Knowledge exchange | EIP-AGRI'

Transpiration (water use) is required for crop production

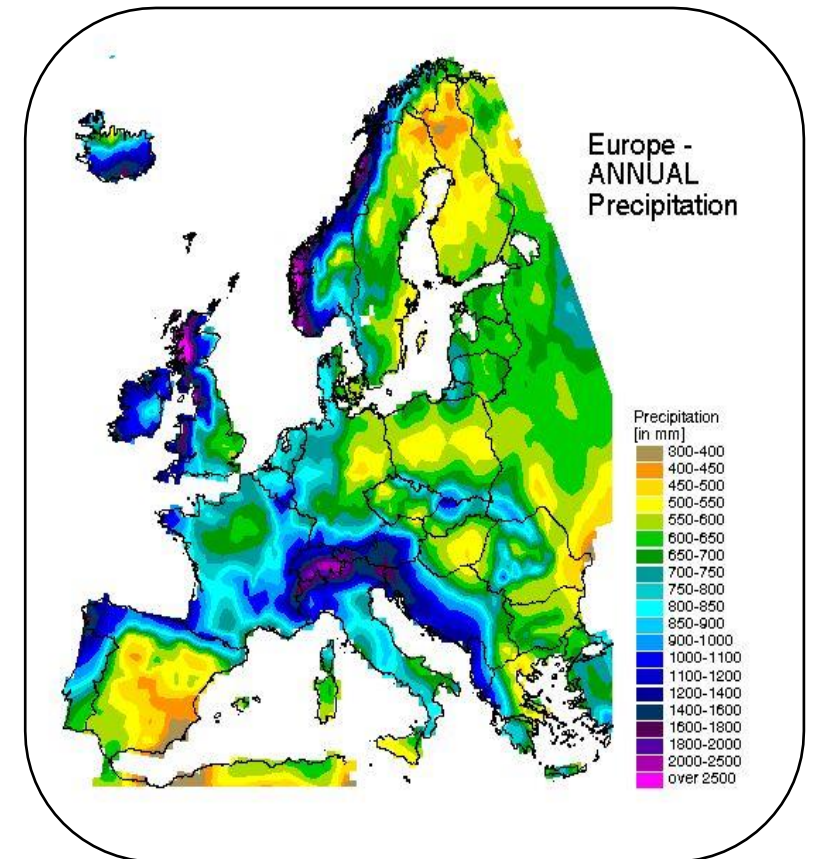


- › In annual crops, the response is linear
- › In woody perennials, there is room for reducing water applications by regulated deficit irrigation without compromising yield



Where does water for transpiration come from? The water colors

- **Blue water.** It is the surface or underground allocated to agriculture by irrigation
- **Green water.** The precipitation on land that does not runoff or recharge the groundwater but is stored in the soil or temporarily stays on top of the soil or vegetation
- **Grey water.** It is an indicator of freshwater pollution that can be associated with the production of a product over its full supply chain
- ...but runoff water can be re-introduced in the system (circularity). This workshop!



Management of water resources in agriculture

Source

- Superficial and ground water resources
- Water transfers (within and between basins)
- Reservoirs
- **Water recycle (Circular water management)**

Until the 90s, water management activities were mainly related to increase the source availability with dams, water transfers...



Demand

- Distribution networks
- Irrigation systems
 - Irrigation engineering
 - Irrigation agronomy
 - *Irrigation physiology*



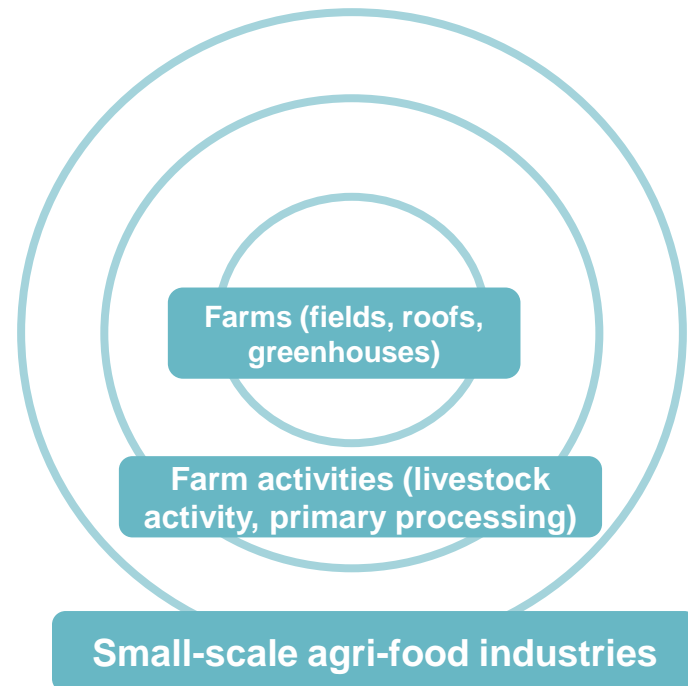
- From 2000, the pillar for agriculture water management is more based on increasing water use efficiency.
- From 2024, **circular water management** will gain significance



Circular water management – reuse and recycle for agricultural production

How do we improve the reused and recycled water from the environment close to the farm?

The scale:



Key questions:

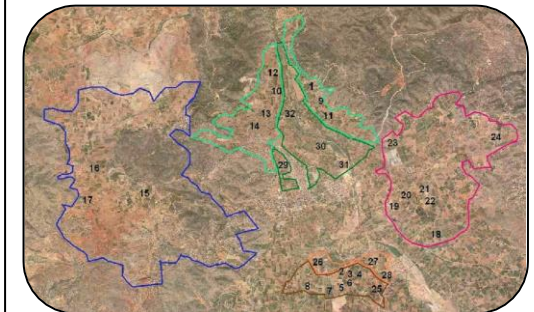
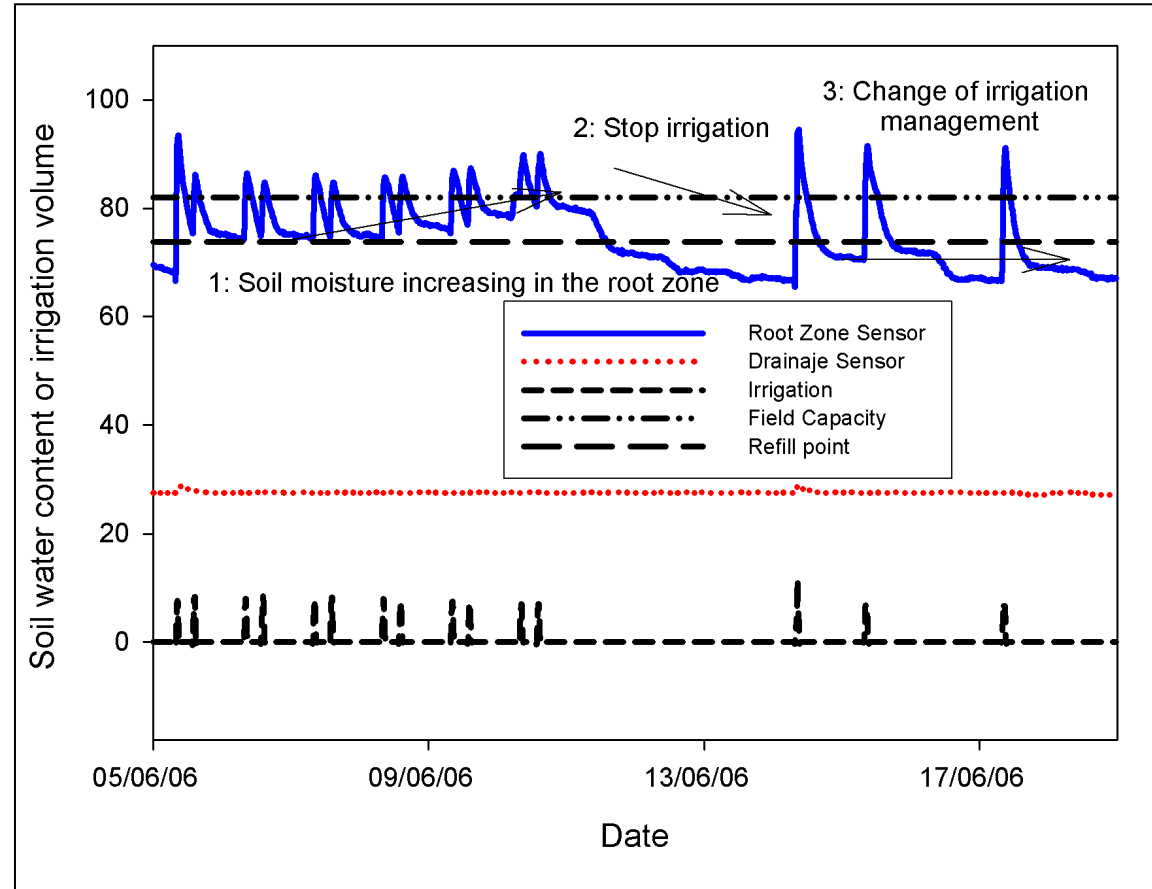
- How to optimize the (**blue**) water allocated at the farm level and field level?
- What are the circular solutions to increase the (**green**) water availability at the farm, water catchments and the basin level?
- How to increase the use of (**grey**) water coming from the **nearby** small agri-food industries?





Soil water sensors (FDR probes)

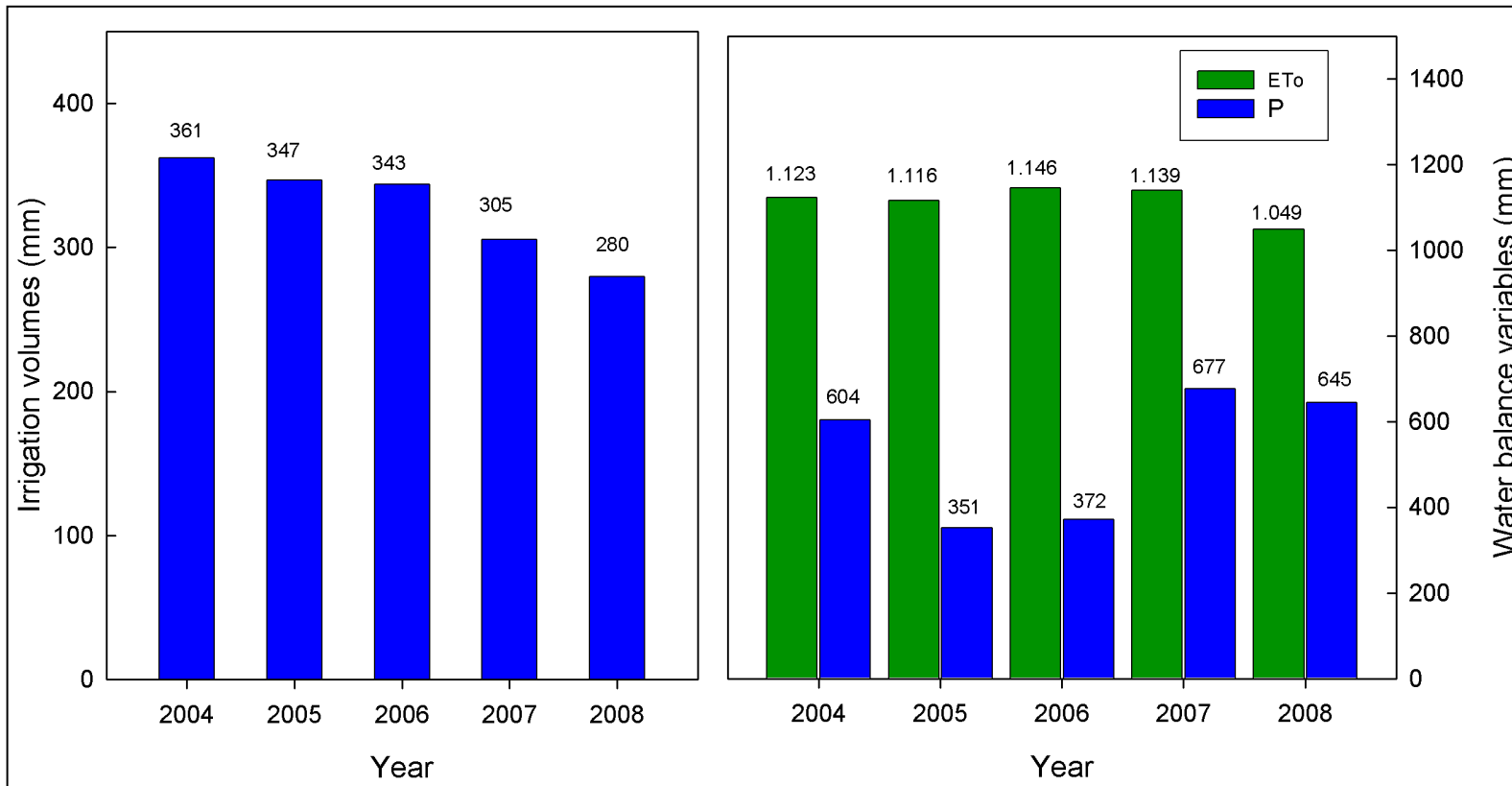
Technology transfer project aimed at developing a net of soil moisture sentinel points in citrus irrigation districts in southeastern Spain



Location of the soil probes within the irrigation districts.



Soil water sensors (FDR probes)



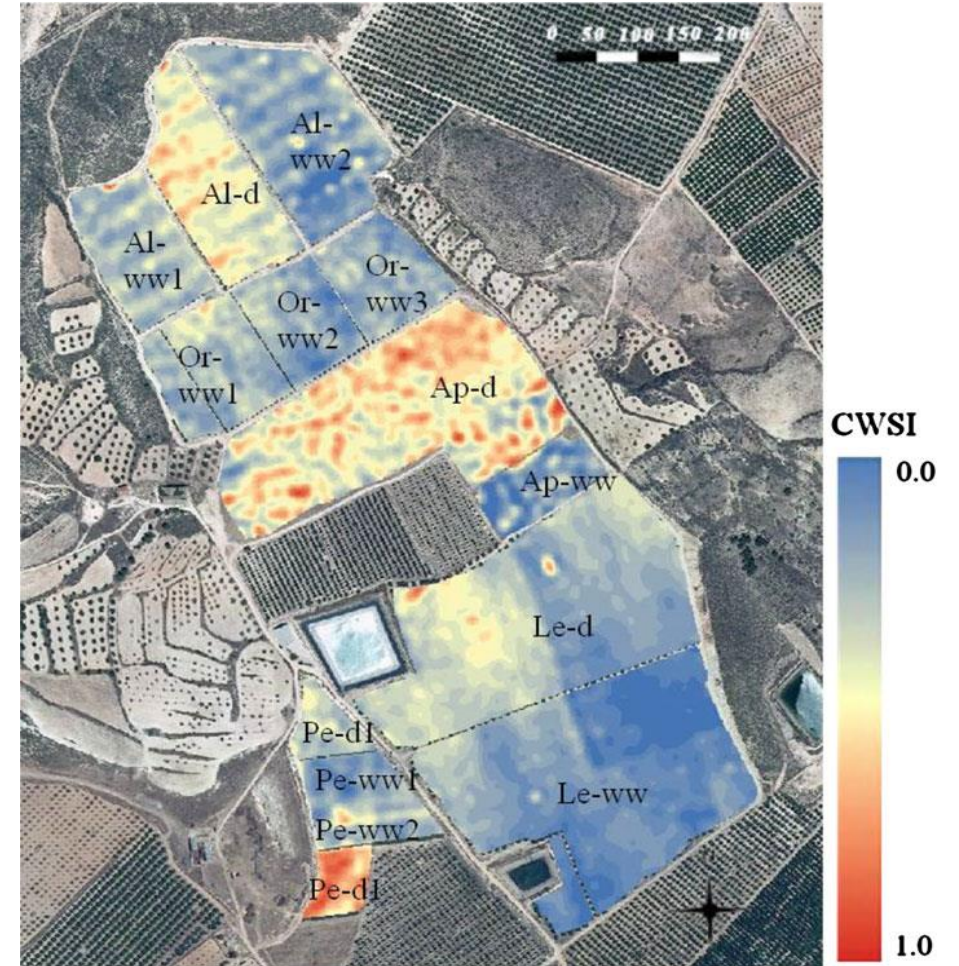
- > Irrigation volumes applied and climatic conditions during the course of the experiment
- > From 2005 onwards, irrigation was scheduled on the base of soil water content trends provided by the capacitance probes



Upscaling with Remote Sensing



- > By using drones and other remote sensing technologies, it is possible to map the field-to-field and within field variability in plant water status/water use
- > We can adjust watering needs at the plant level achieving maximum efficiency (optimizing the demand)



Gonzalez-Dugo et al. 2013. Using high resolution UAV thermal imagery to assess the variability in the water status of five fruit tree species within a commercial orchard. *Precision Agriculture*: 14:660–678



Soft measures to increase water availability are needed

- › Circular water management is an option for increasing the **green water** availability for crops
- › Solutions can be searched at the farm level
 - › Soil management (cover crops, mulching, intercropping...)
- › **Additional solutions can be defined combining off-farm with on-farm solutions**
 - › Cascade cropping
 - › Water harvesting
 - › Water recycle from the farms and the agro-food industries
 - ›



Soil management for reducing soil evaporation



- **Cover crops** can help increasing soil water infiltration but they can compete with the main crops for water & nutrients

- **Soil mulching** with pruning waste reduced evapotranspiration (ET) by 16-20%
- Plastic mulch reduced ET by 25-29%, but it is not an environmental friendly practice

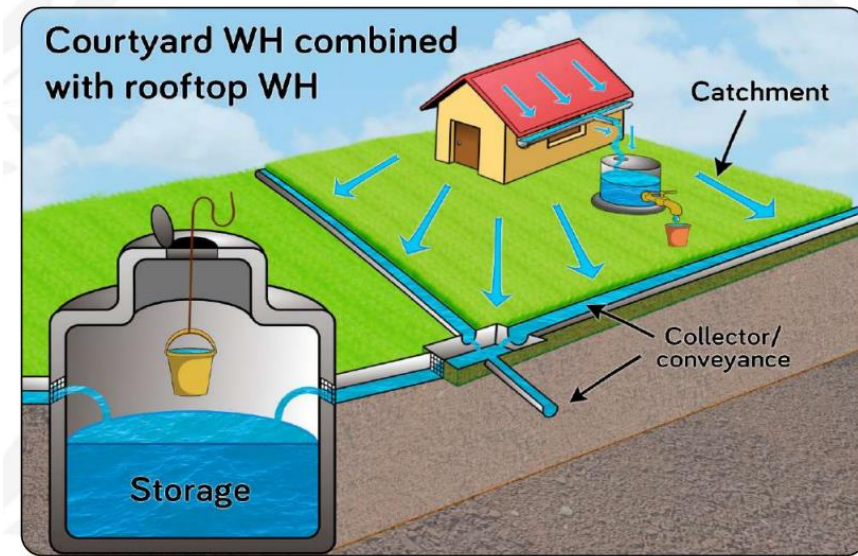


- Lopez-Urrea et al. 2020. Effect of using pruning waste as an organic mulching on a drip irrigated vineyard evapotranspiration under a semi-arid climate. *Agr. For Meteorology*. <https://doi.org/10.1016/j.agrformet.2020.108064>
- Rubio-Asensio et al. 2022. I. Effects of Cover Crops and Drip Fertigation Regime in a Young Almond Agroecosystem. *Agronomy*. <https://doi.org/10.3390/agronomy12112606>



Soil management for water harvesting

- > The aim of water harvesting is to collect runoff or groundwater from areas of surplus or where it is not used, store it, and make it available when and where there is water shortage.
- > This results in an increase in water availability by either:
 - > (a) impeding and trapping surface runoff, and
 - > (b) maximizing water runoff storage or
 - > (c) trapping and harvesting sub-surface water (groundwater harvesting).



Soil management for water harvesting

- Several options on-farm and off-farm

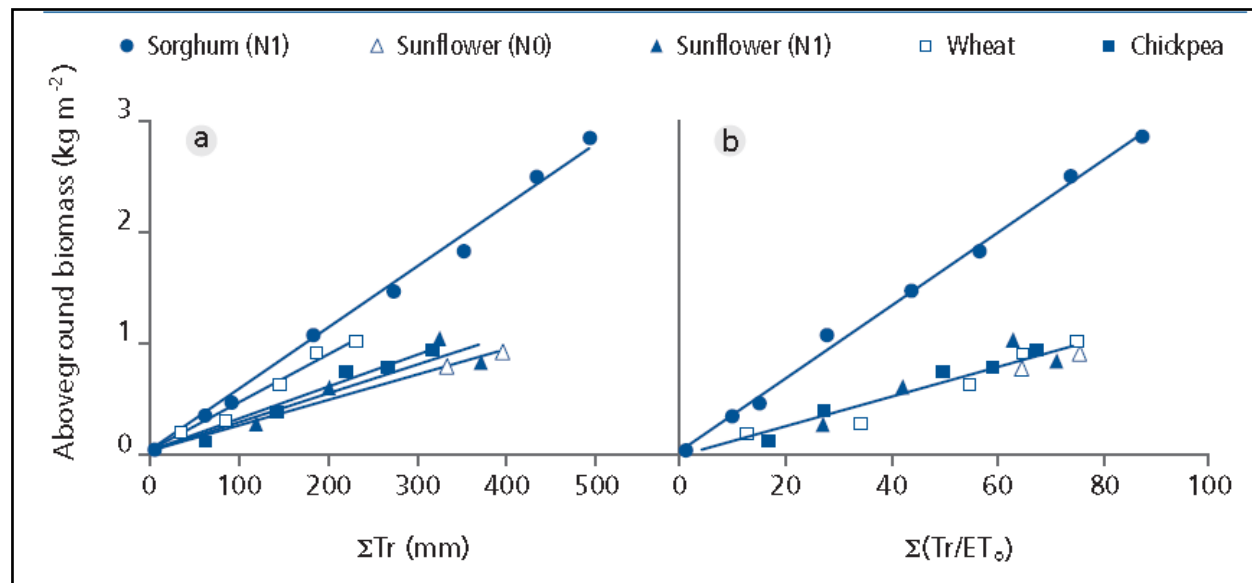


- Research conducted for instance on Horizon SHUI Project. Gomez et al. 2021 Best Management Practices. [10.20350/digitalCSIC/13964](https://doi.org/10.20350/digitalCSIC/13964)
- In this workshop, we will learn about **solutions actually applied on-the-ground**



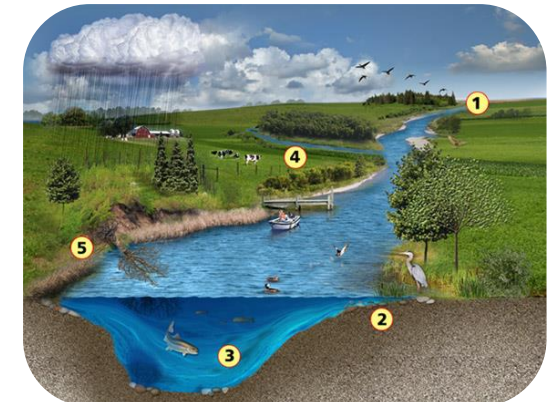
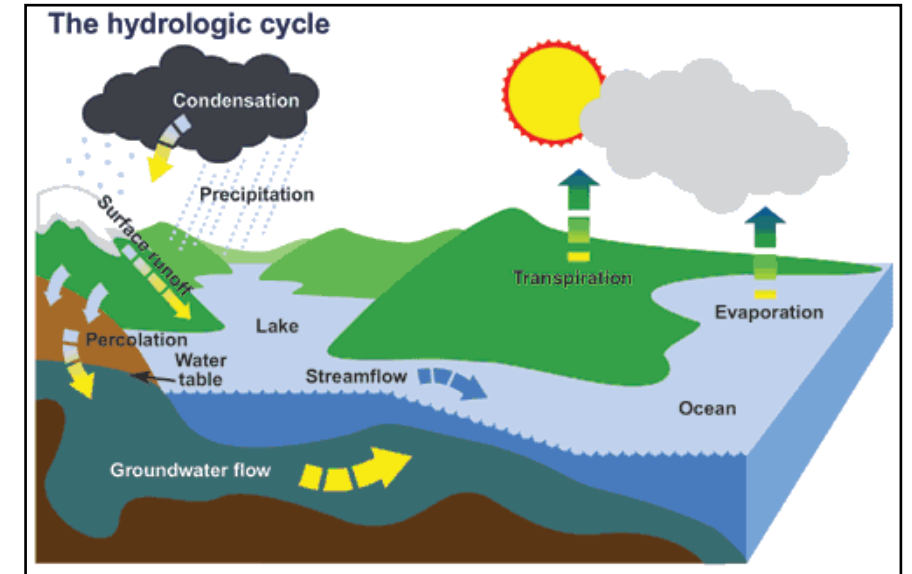
Integrated water management

- Crop transpiration is a consumptive water use because it is required for biomass production
- Transpired water cannot be “recycled” and exits the basin water cycle.
- Re-using water for irrigation might increase the pressure on water resources but improves agriculture production (with large positive economic and social consequences)



Integrated water management

- > ... from an integrated and whole water basin point of view, reusing treated water is not “free” water....
- > The alternative uses should be considered in case recycled/treated water is not used for irrigation:
 - > Aquifer recharge
 - > Ecological river flow
 - > Dumping to the sea... in coastal areas





Integrated water management

Water accounting
Source, demand, reuse



Establishing limits in water use ensure sustainability
Water productivity, social and environmental protection



Water use efficiency and circular management tools and models
Technologies and governance





Thank you

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All information on the workshop is available on the event webpage:

<https://eu-cap-network.ec.europa.eu/events/eu-cap-network-workshop-circular-water-management>

