



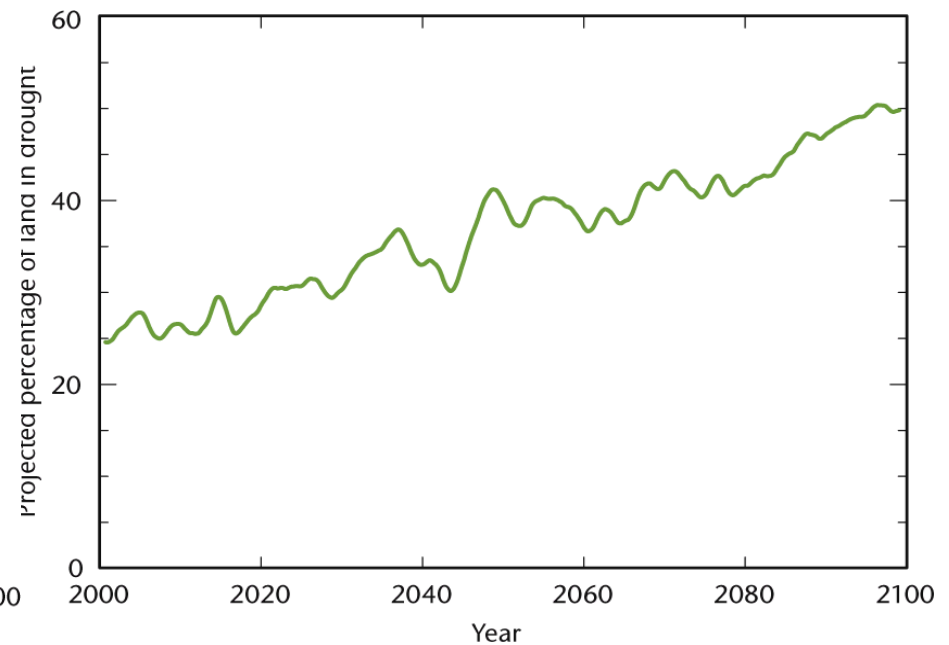
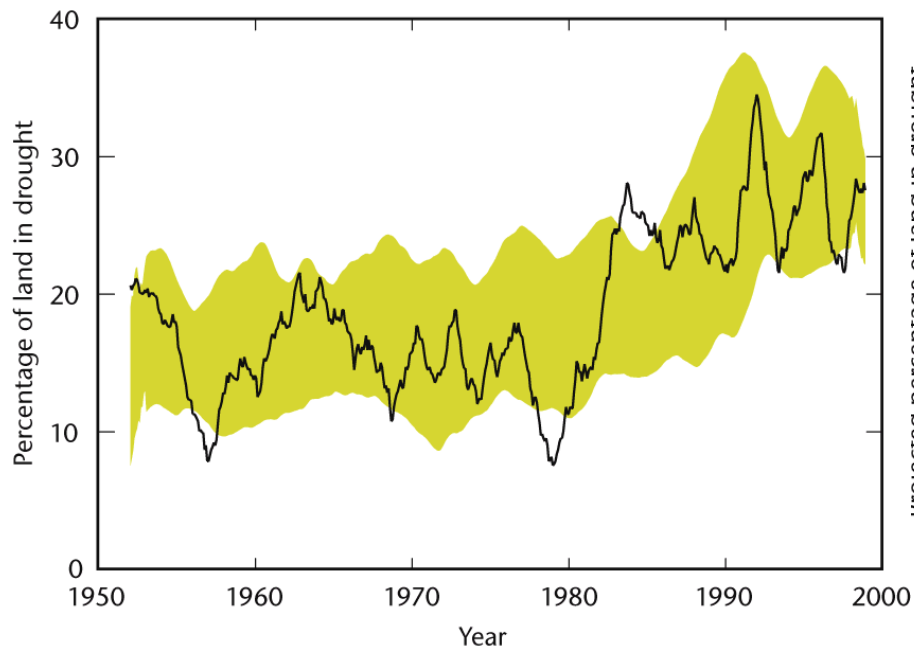
Management strategies to improve crop water use efficiency under water scarcity

Christian R. Jensen¹, Fulai Liu^{1*}, Yaosheng Wang¹, Sven-Erik Jacobsen¹, Finn Plauborg², Mathias N. Andersen²

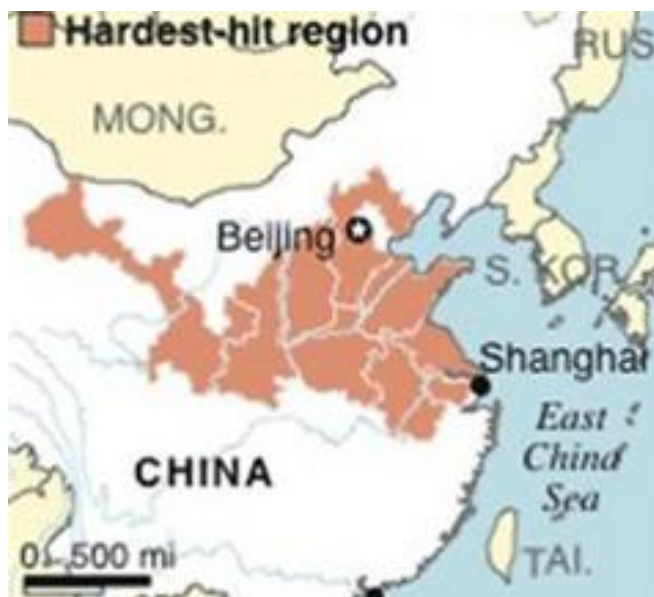
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Climate change predicts increase of arable land in drought



Recent severe drought in northern China



Severe drought

A serious drought is threatening large crop-growing areas in northern China, leaving about 4 million people without proper drinking water.

How to use limited water resource more efficiently?

- **Micro-irrigation technology**
- **Irrigation scheduling**
- **Deficit irrigation**
- **Reuse of wastewater**



Micro-irrigation techniques – save 20-35%



Surface drip



Sub-surface drip



Sub-surface drip with plastic mulching



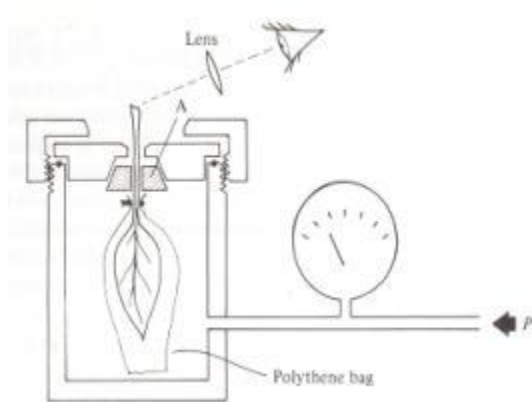
Irrigation scheduling – save 10%

To irrigate the crop at right time and right amount

- Monitor the crop
- Monitor the soil
- Monitor the weather

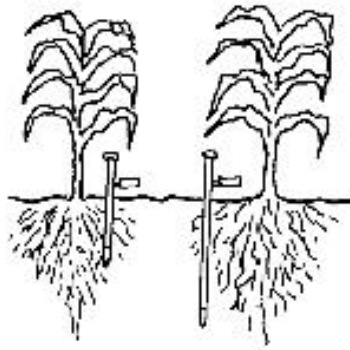


1. Monitor the crop



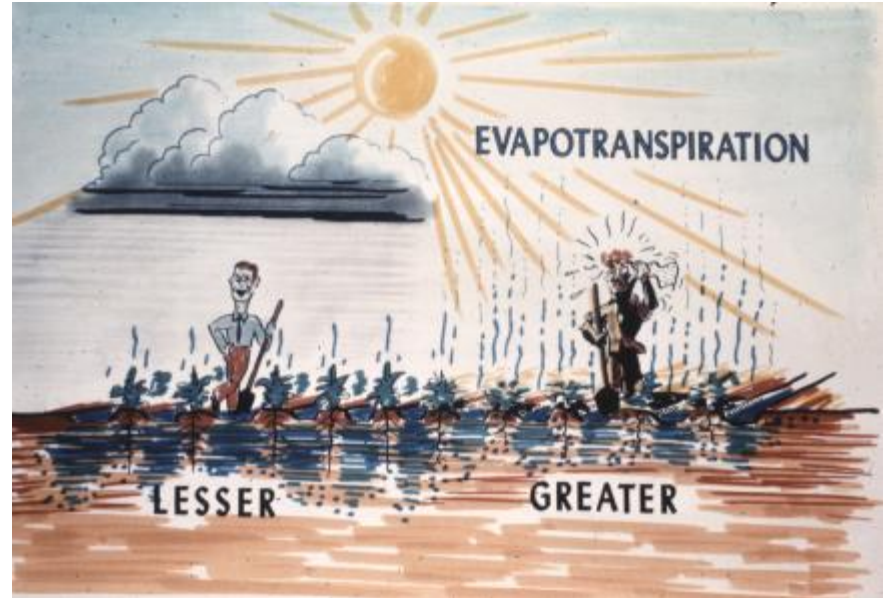
Measuring leaf water potential to determine when to irrigate

2. Monitor the soil



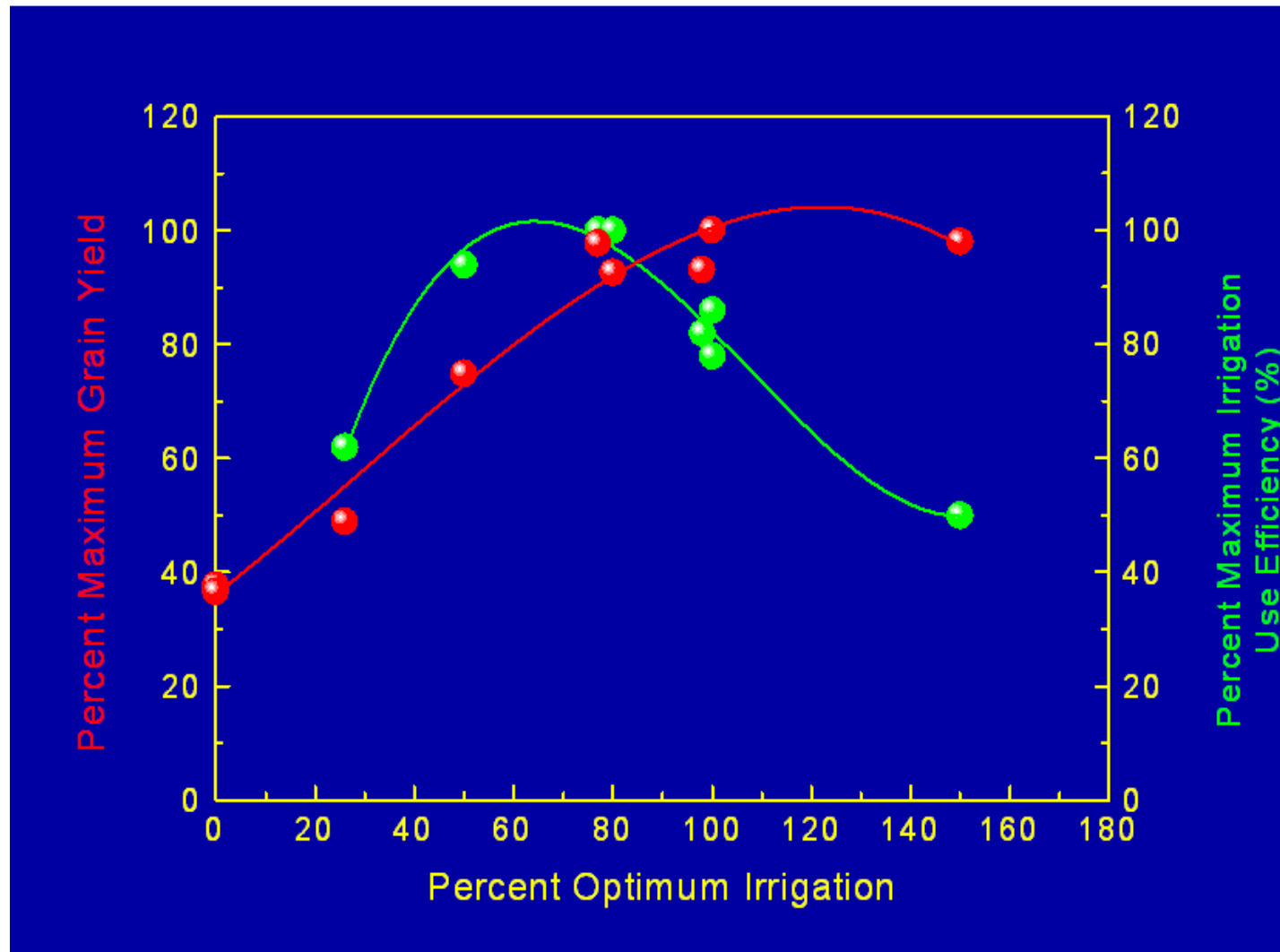
Monitor soil water potential to determine when to irrigate

3. Monitor the weather

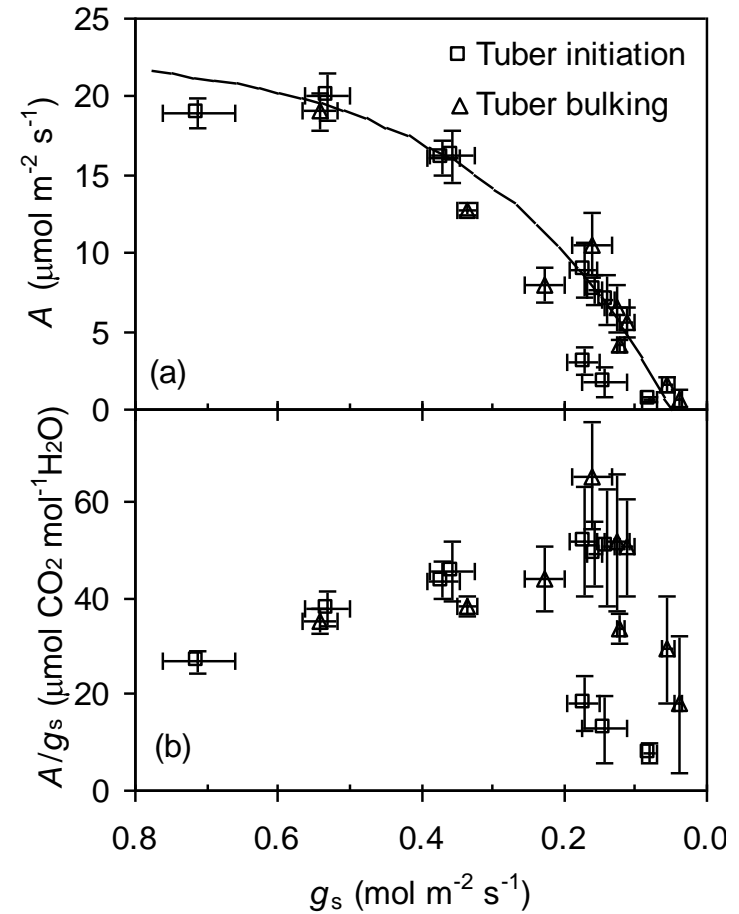
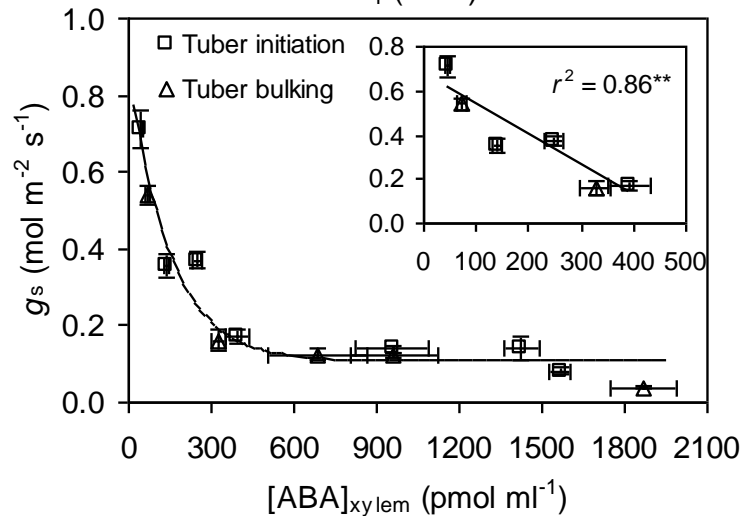
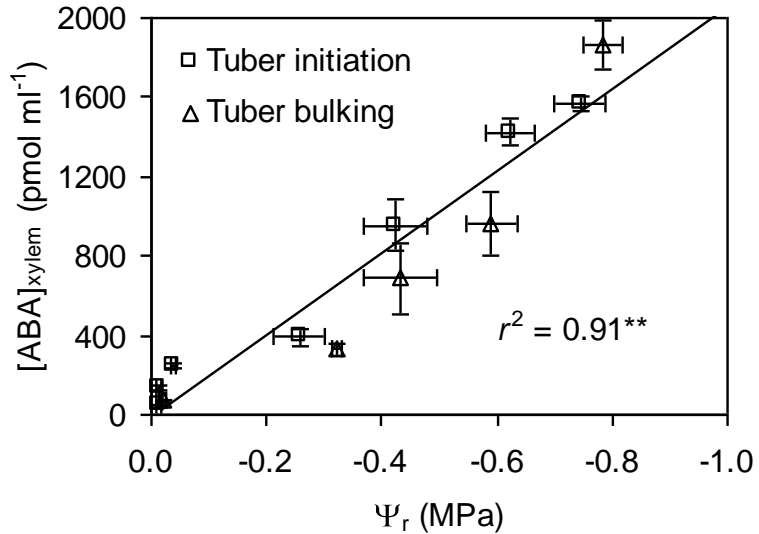


Monitor the weather to determine how much to irrigate

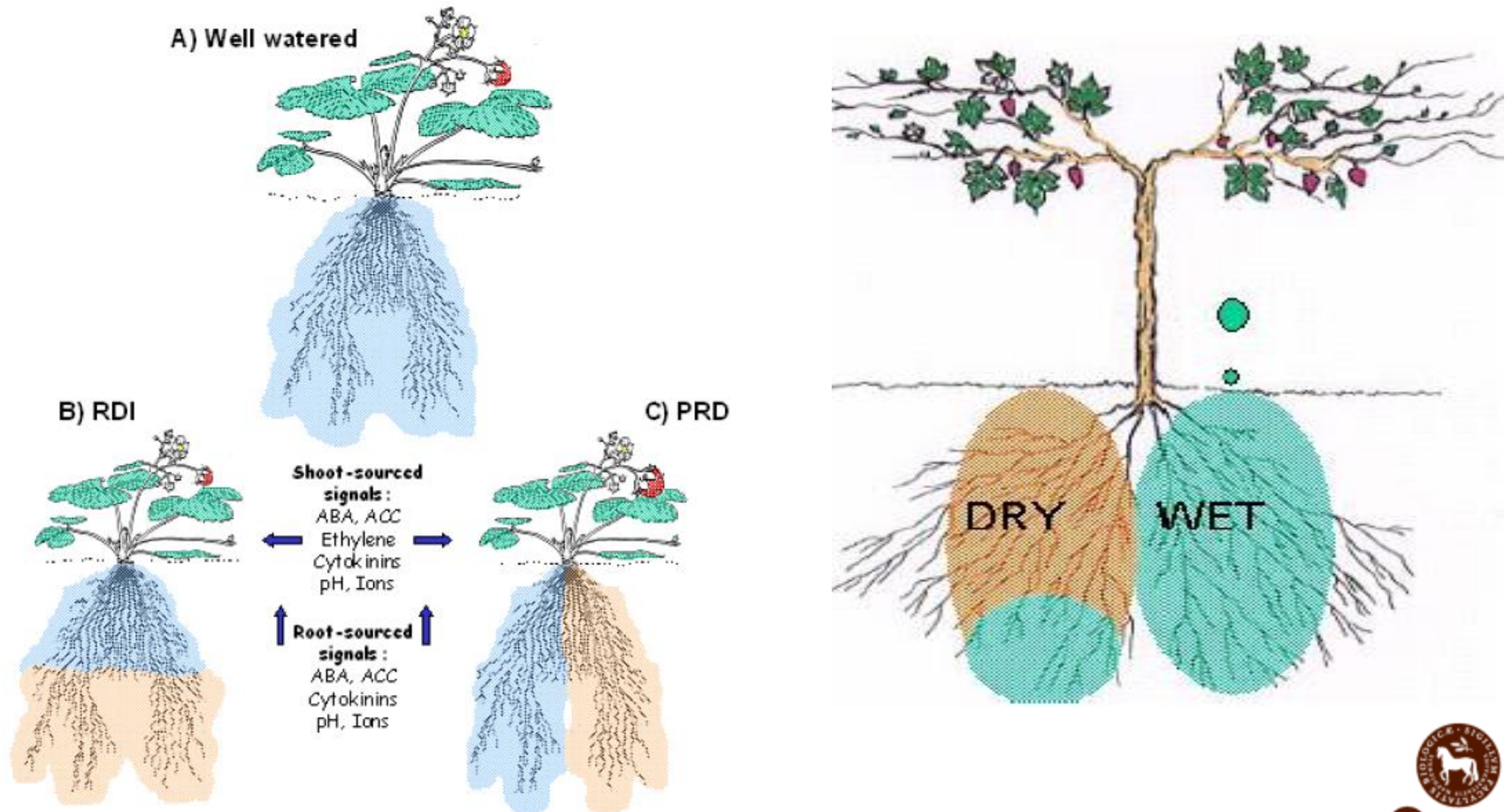
Deficit irrigation strategies



ABA-based root signaling induced partial stomatal closure enhances WUE



Principle of conversional deficit irrigation (DI) and partial root-zone drying (PRD) irrigation





Mobile rain-out shelter



Climate Station

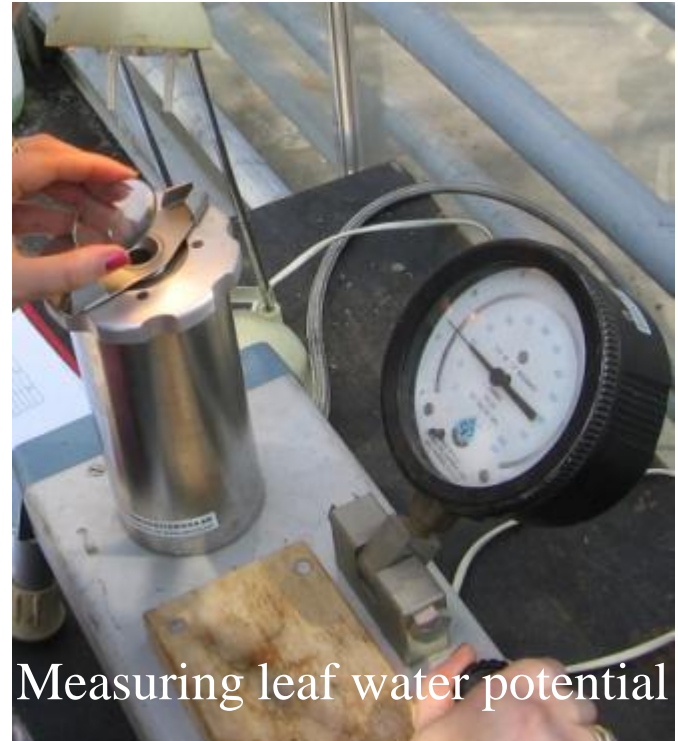


Soil moisture monitoring



Irrigation programming











Pot experiment on tomatoes



Transplanting to big split-root pots
(Inoculation with mycorrhizal fungi)



Start of treatment & sampling before treatment



Start of treatment



Fruit harvesting

DI and PRD on potatoes

Water saving

- PRD/DI save 25-30% water compared to fully irrigated controls without yield reduction; PRD is superior to DI.

Quality improvement

- PRD improves marketable tuber by 15%
- PRD increase antioxidants 10%

Soil Nitrogen availability increases by PRD



DI and PRD on fresh tomatoes

Water saving

- PRD/DI save 25-30% water compared to fully irrigation controls without yield reduction, PRD is superior to DI
- Gradual increasing saving during the season e.g., 20%(early), 30% (middle), 50% (late).

Quality improvement

- PRD/DI increase antioxidants (10%), reducing sugars, acidity and BRIX.
- PRD non-statistically better than DI



Use of wastewater for irrigation

Wastewater irrigation – Benefits

- Saves water
- Low-cost method for disposal of municipal wastewater
- Reduces pollution of rivers and other surface water
- Conserves nutrients, reduces the need for fertilizers
- Increases crop yields



Wastewater irrigation – Risks

- Health risks for the irrigators and consumers
- Creation of habitats for disease vectors (mosquitoes)
- Ground water contamination (nitrates)
- Build up of chemical pollutants in the soil



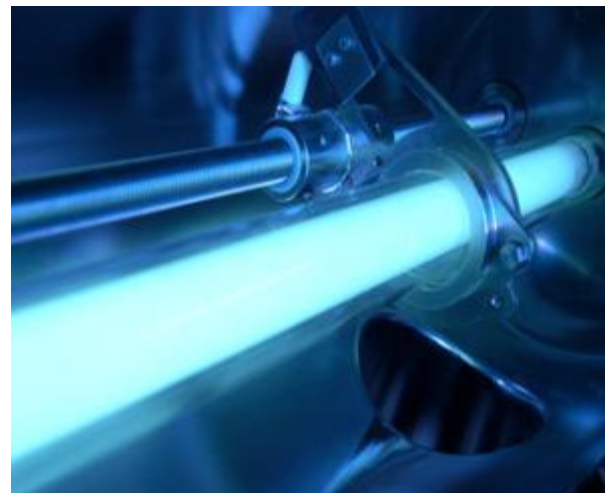
Treatment tools for wastewater before irrigation



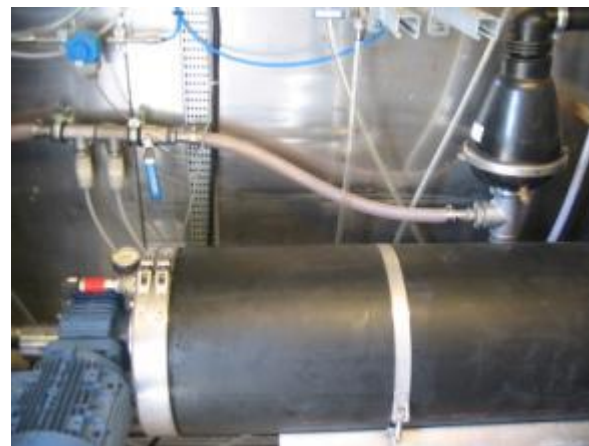
Gravel filter



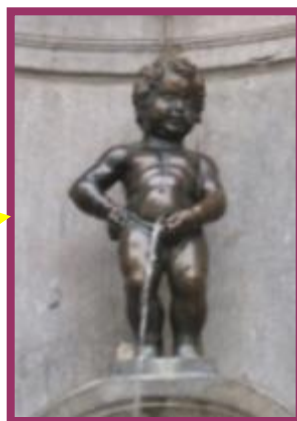
Heavy metal Removal



UV Disinfection



MBR – Bio-booster



*Efficient treatment
and advanced
irrigation tech.*

OUR MISSION



Slide borrowed from Adriano Battilani





**SIXTH FRAMEWORK PROGRAMME
PRIORITY 5
Food Quality and Safety**

**Safe and High Quality Food Production using
Low Quality Waters and Improved Irrigation
Systems and Management (SAFIR)**

Contract No. PL 023168 SAFIR



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