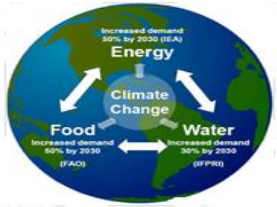
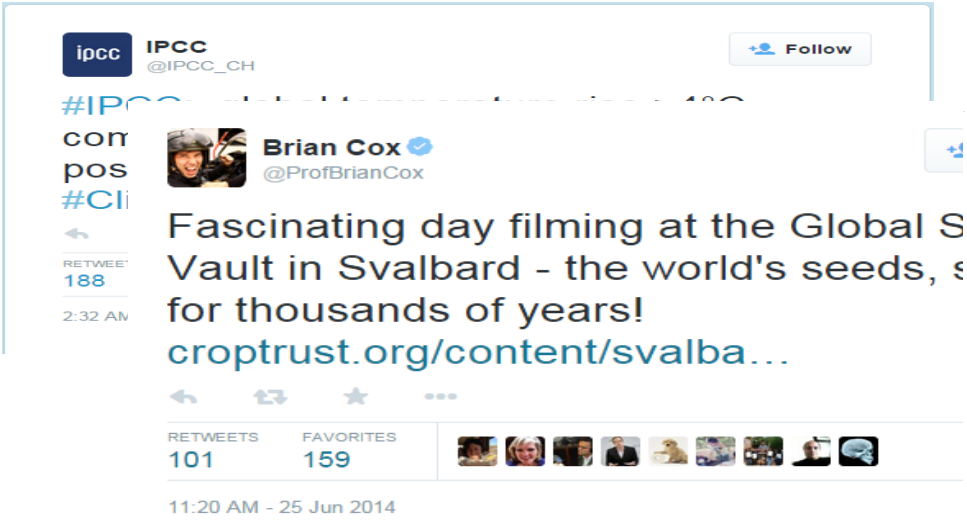
Dr Antje Fiebig

2017.05.09



Watering plants – the smart way

Food security and sustainable food production



Perfect storm scenario (John Beddington, 2009)

- Human population will grow from 7.2 billion (2013) to 8.3 billion (2030)
- Increased demand in energy, food and water

→ Agriculture accounts for **70 %** of the increased fresh water demand

→ Goal: high yield while using less water

INRES Gartenbauwissenschaft

UNIVERSITÄT BONN

What is a well-watered plant?

<u>Drained capacity</u>

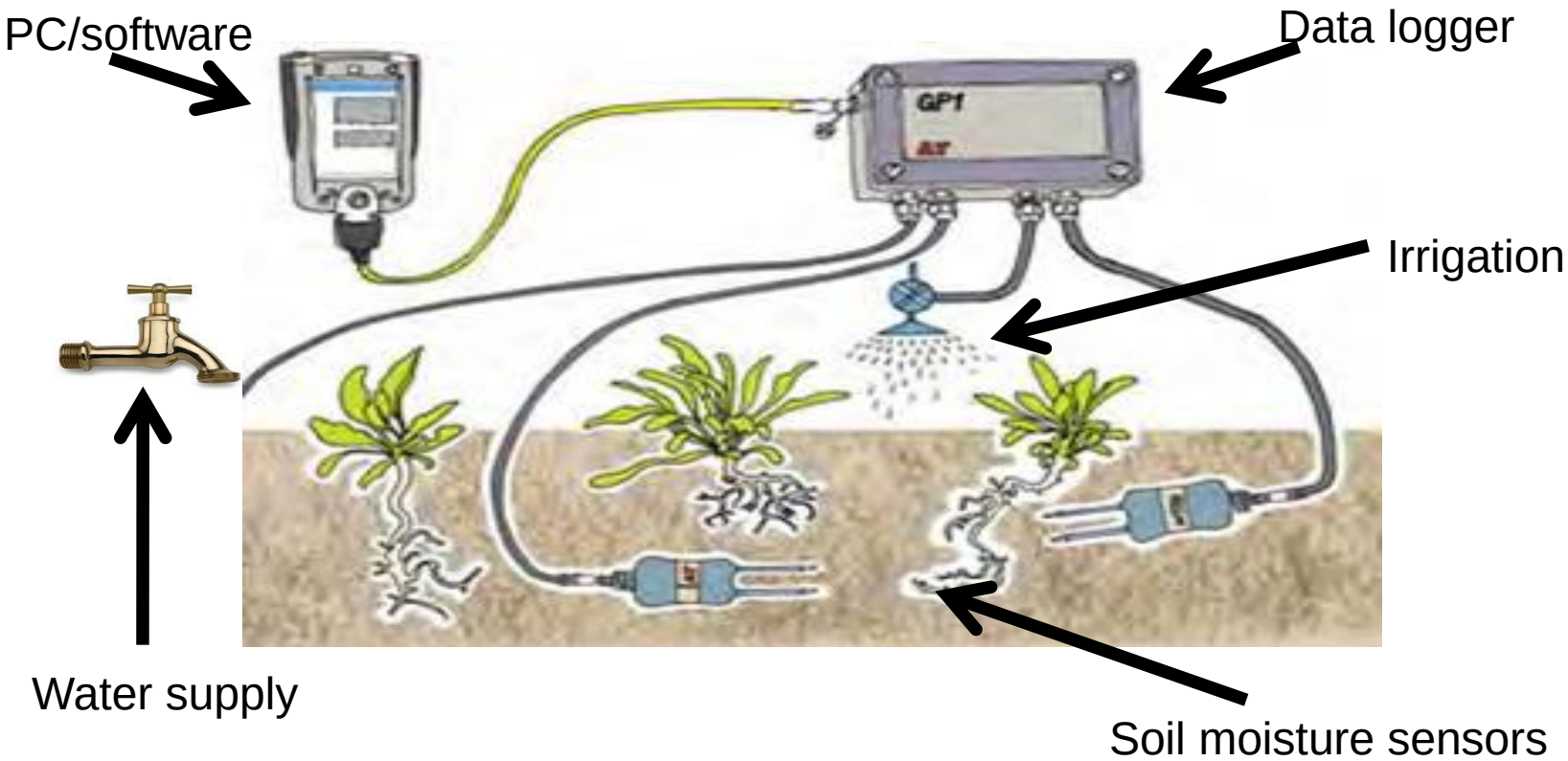
- Fill a pot with your substrate
- Water until it drains
- Leave for 24 h
- Determine soil moisture – this is your reference soil moisture

  (the soil moisture a well-watered plant should have)

How to water your plants (in a greenhouse)

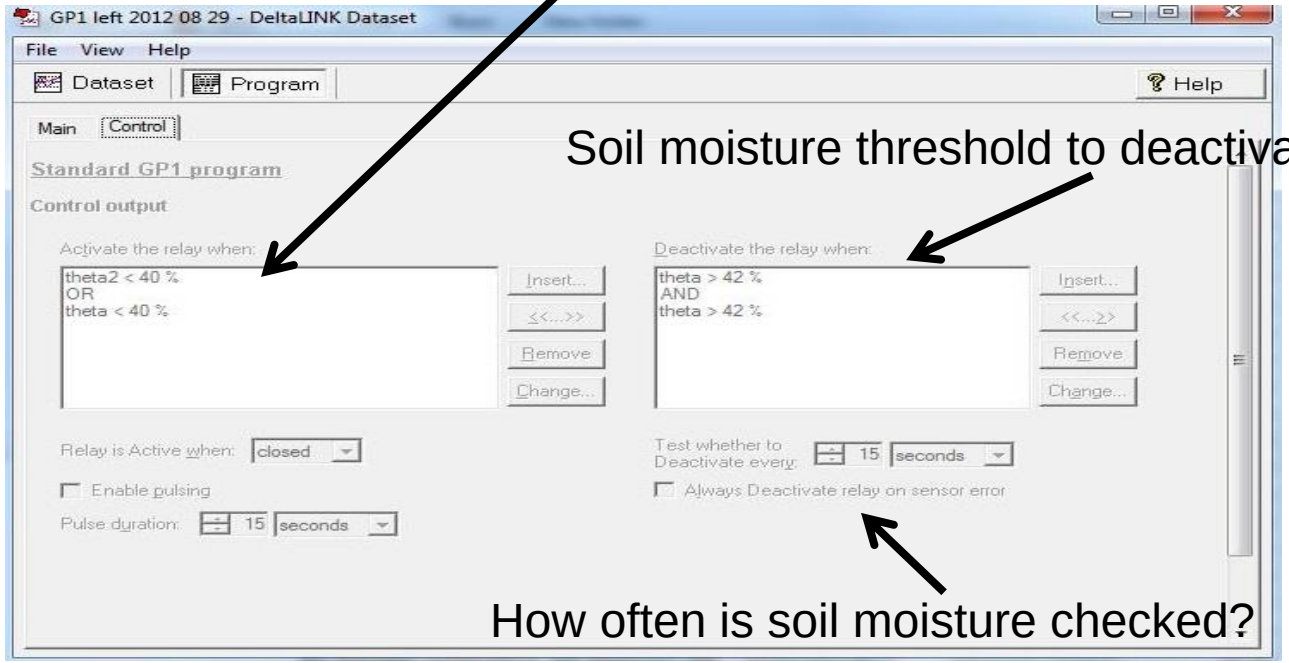
- By “experience”
- By time (of the day, since last irrigation event, etc.)
- According to environmental factors (temperature, sunshine)
- **By weight loss** – takes in to account transpiration, developmental stage of the plant, substrate
- **By soil moisture (the smart way?)** - takes in to account transpiration, developmental stage of the plant, environmental factors, substrate

Soil moisture based irrigation



Irrigation control

Soil moisture threshold to activate irrigation

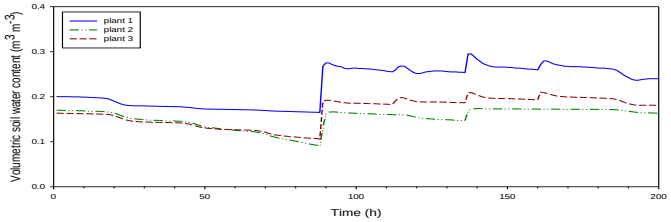


Soil moisture threshold to deactivate irrigation

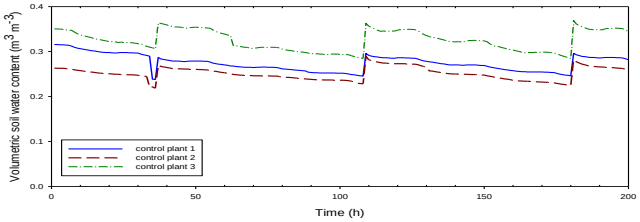
How often is soil moisture checked?

Practical use

Manual irrigation



Automatic irrigation

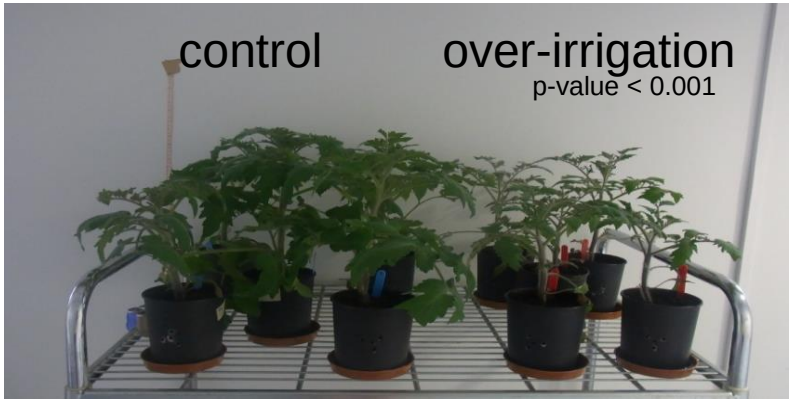


24.9 % **Coefficient of variation** **12.7 %**

INRES Gartenbauwissenschaft UNIVERSITÄT BONN

Projekt CP81 (Agriculture and Horticulture Development Board [AHDB])

Effect of over- and under-irrigation on tomato plant growth



Significantly decreased growth (62 %)

after 4 weeks of 150 % over-irrigation

Less growth inhibition (35 %)

after 4 weeks of 50 % under-irrigation

INRES Gartenbauwissenschaft UNIVERSITÄT BONN

Fiebig and Dodd, 2016a and b

So what?

- Increased fresh water demand, especially in agriculture
- Different irrigation strategies with the same goal: high yield while using less water
- Automatic irrigation via soil moisture can water plants according to their actual water needs – saves water, money and yet provides high yield

→ Future irrigation techniques?

Thank you very much for your attention

Fiebig, A. and I.C. Dodd (2016a) Inhibition of tomato shoot growth by over-irrigation is linked to nitrogen deficiency and ethylene. *Physiologia Plantarum* **156**: 70-83.

Fiebig, A. and I.C. Dodd (2016b) Feedback regulation of irrigation via soil moisture monitoring and its effects on plant growth and physiology**.** In: XXIX International Horticultural Congress on Horticulture: Sustaining Lives, Livelihoods and Landscapes (IHC2014): International Symposia on Water, Eco-Efficiency and Transformation of Organic Waste in Horticultural Production*. Acta Horticulturae* **1112**: 9-16.

Projekt CP81 (Agriculture and Horticulture Development Board [AHDB])

Lancaster University

The Lancaster Environment Centre

HDC Horticultural Development Company

EPSRC Engineering and Physical Sciences Research Council

a.fiebig@uni-bonn.de

LEVITY cropscience