Leaching reduction by smart irrigation in soil grown greenhouse crops.

Results of a multiple year monitoring project.

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Wageningen Greenhouse Horticulture

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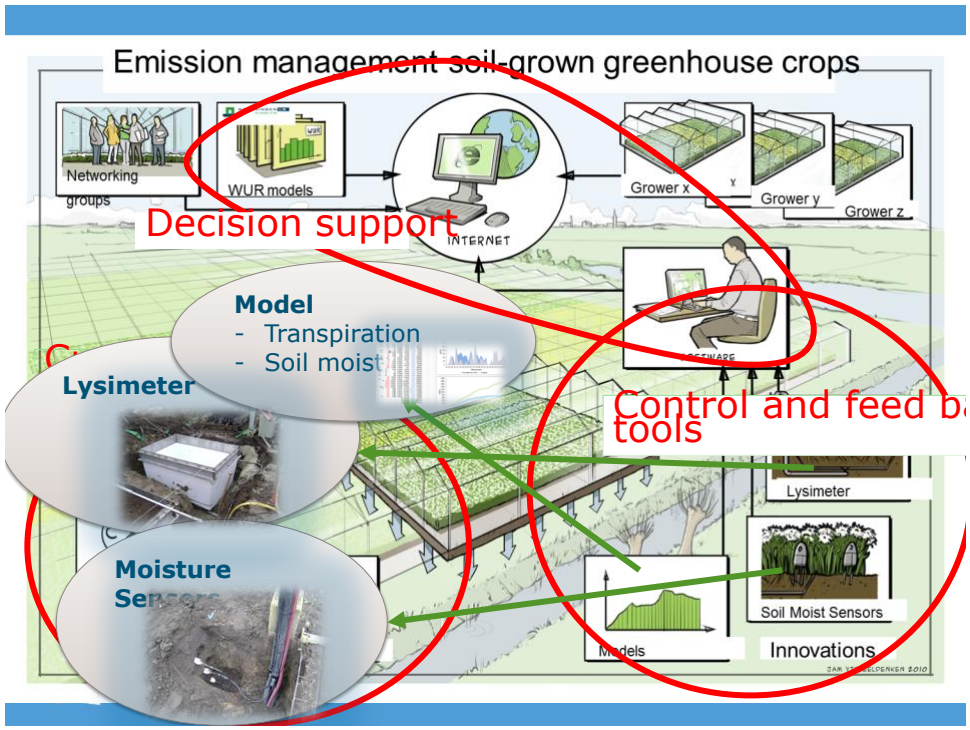
Case study
Dutch soil grown crops

GLASTUINBOUW WATERPROOF grondgebonden

- Closed water-chain as in soil-less inapplicable
- Control on inputs rather than output
- Emission reduction by controlling the waterflow
- Pragmatic approach, cooperate with growers and advisors (Learning by doing)



Simple approach:
No leaching of water, no leaching of nutrients and PPP's

Empirical transpiration model *(De Graaf et al 1982)*

$$E_{rad} = \left\{\left(\sum_{h=0}^{24} cf\ R\ 10^{-3}\right) - \left(\sum_{t=sc}^{so} sf\ cf\ R\ 10^{-3}\right)\right\}\left(\frac{L}{S}\right)$$

- Transpiration driven by radiation (correction for screens, lamps)
  - *cf*= crop specific factor
  - *so* , *sf* = screen closure
  - *sf* = screen
  - *L/S* = plant size
  - *R* = radiation

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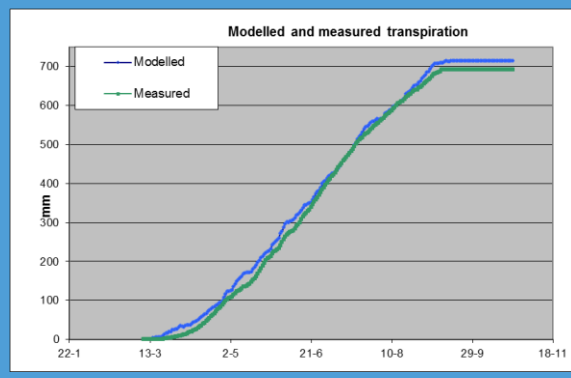
Example



Measured and simulated evapotranspiration, (organic soil grown) tomato greenhouse crop

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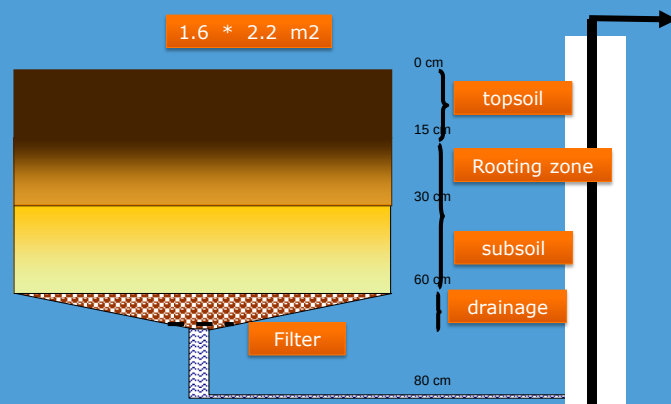
The 'greenhouse' lysimeter

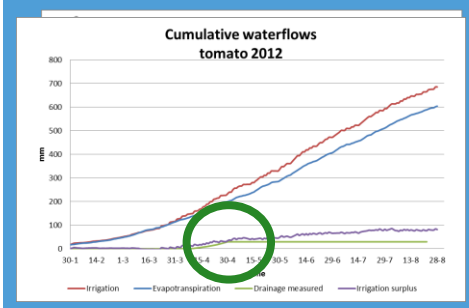
Quantity Analysis

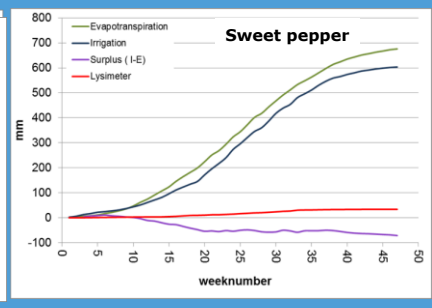


Project 2010 - 2017

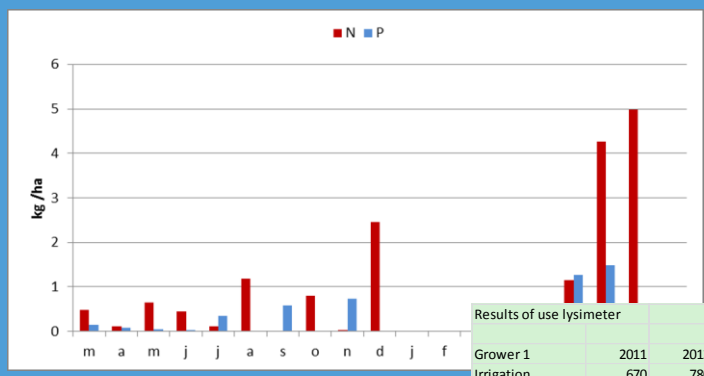
- Aim: Development Emission Management Tool
- Testing and implementation at 9 growers
  - Regions, crops, soil types, hydrology
- Dissemination by networking groups

Example (organic tomato)





Results of two growers



Results of use lysimeter				
Grower 1	2011	2012	2013	2014
Irrigation	670	780	790	645
drainage	25	42	21	3
WUE	96%	95%	97%	100%
N leaching kg/ha	5	23	35	6
P leaching kg/ha	0	0	0	0
2011-2013				
Grower 2	2013	2014		
Irrigation	654	700		
drainage	4	56		
WUE	99%	92%		
N emission kg/ha	1	38		
P emission kg/ha	0	0		

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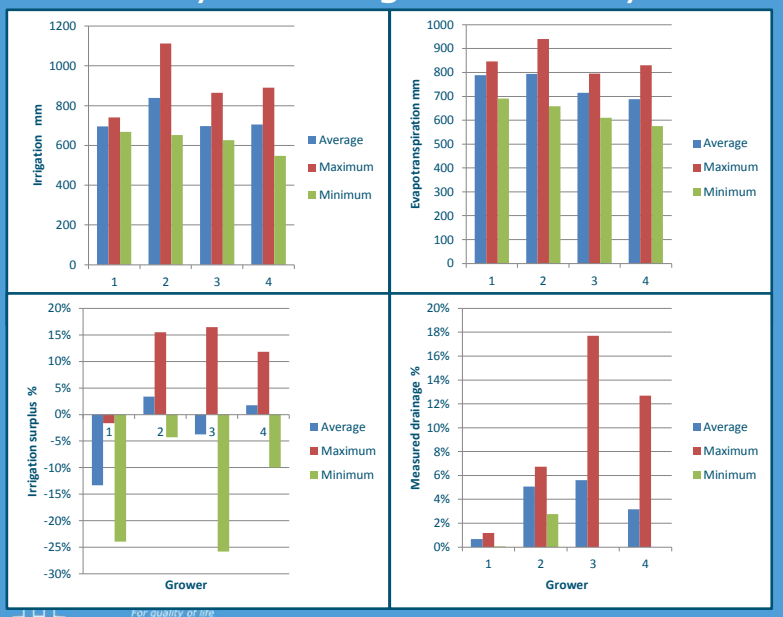
Summary of four growers six years



In conclusion

- Water management crucial topic for sustainable growing
- Water quality is of high importance (salinity).
- Irrigation management tuned to crop demand possible
- Lysimeter, sensors, models are useful tools
- N leaching can be under control,
  - ....though potential risk of salinity !

Questions ?