

Fertilisation and water management in organic greenhouse horticulture

Current situation in the Netherlands.

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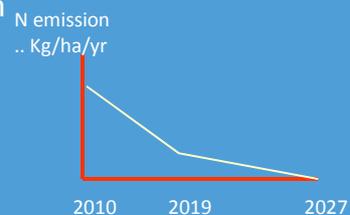
Regulations

- Animal manure (N) max 170 kg N ha⁻¹ yr⁻¹
- Total N and P supply limited: input limits
- Obligation: to irrigate and fertilise according to crop demand

- **Emission reduction**

- Background: WFD, ND
- Final goal 2027 zero emission

	kg/ha/yr	
	N	P
Tomato	1590	381
Cucumber	1590	324
Sw. pepper	1550	228
Lettuce	500	88



Specific regulations

Organic farming

- Organic farming:
 - 50 % A-list
 - organic manure
 - compost
 - 50 % B-list
 - additional fertilisers
- Goal 100 % A-list 20xx



Water management



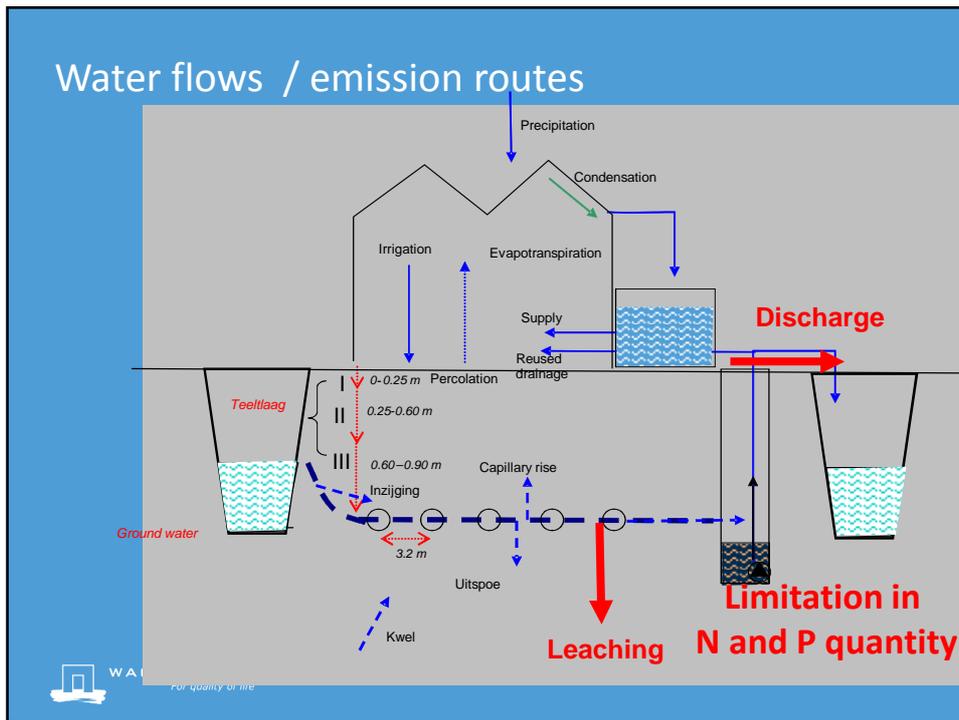
■ Emission reduction

- Final goal 2027 zero emission

N emission
? Kg/ha/yr



Water flows / emission routes



Legislation

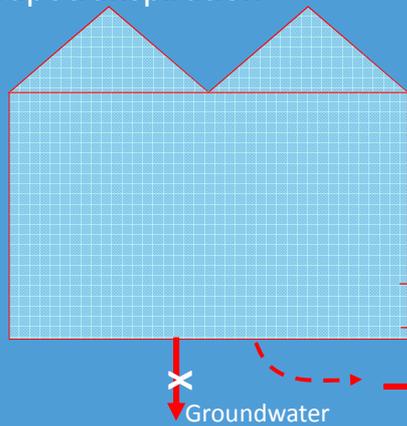
EU Waterframework Directive, Nitrate Directive
Dutch application

- 2000 – 2010 Targets for N and P use
- > 2010 Regulation on total N and P emission
- 2027.... Zero emission from greenhouse crops



Improving Water Use Efficiency:

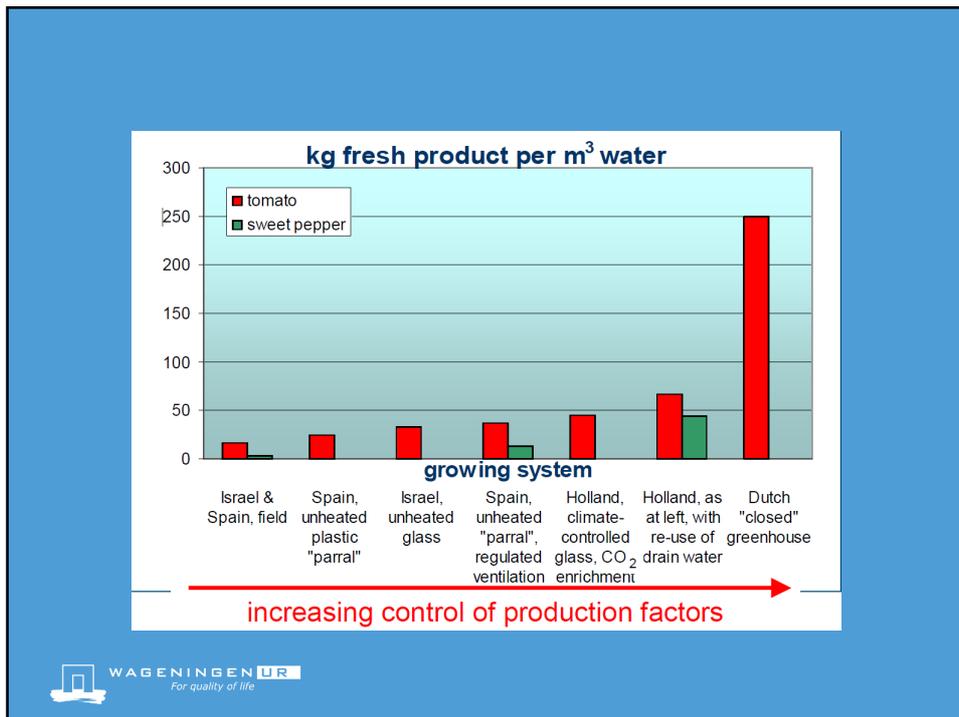
Irrigation tuned to crop demand :
evapotranspiration



Development in water and nutrient use

- Completely closed greenhouse
no ventilation, mechanical cooling
- Semi - closed greenhouse
minimized ventilation + mechanical cooling
- 'The new growing'
(low ventilation, de-humification, mechanical cooling)

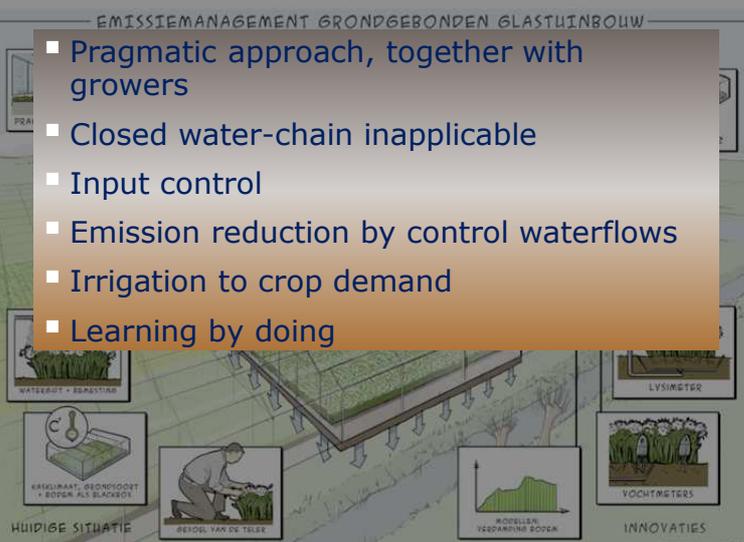




Soil grown crops (organics)

Aim and approach

- Pragmatic approach, together with growers
- Closed water-chain inapplicable
- Input control
- Emission reduction by control waterflows
- Irrigation to crop demand
- Learning by doing



MODERN GLASTUINBOUW

Models

- Transpiration
- Soil moisture

SOEWARE

LYSIMETER

VOCHTMETERS

MODELEN: AARDING BODEM

INNOVATIES

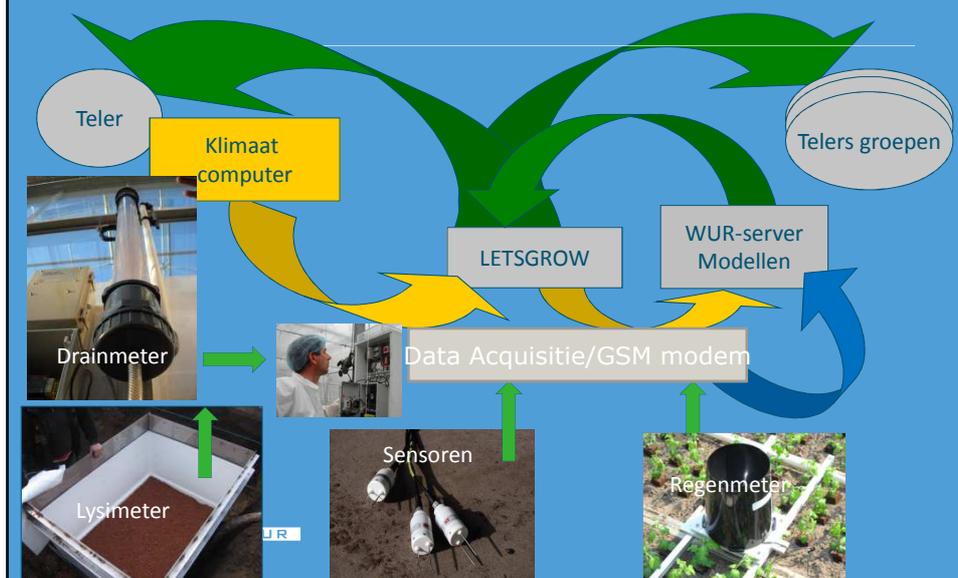
ZAK VERGELIJKEN 2010



- Development Emission Management Tool
- Test at 9 nurseries
 - Regions, crops, soil types, hydrology
 - 2 organic growers
- Networking groups growers

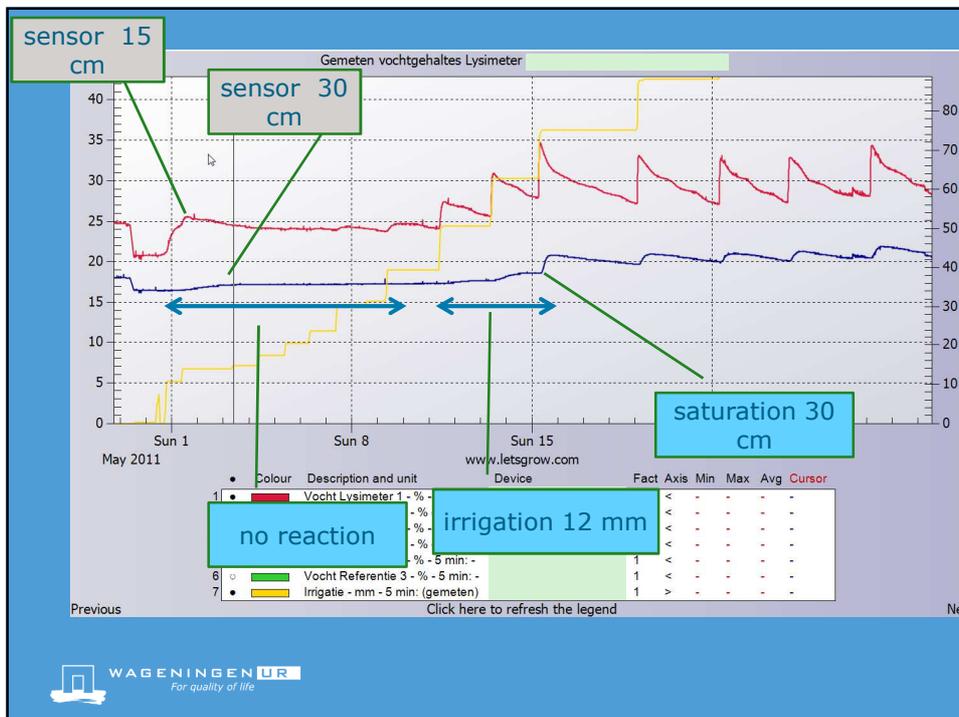
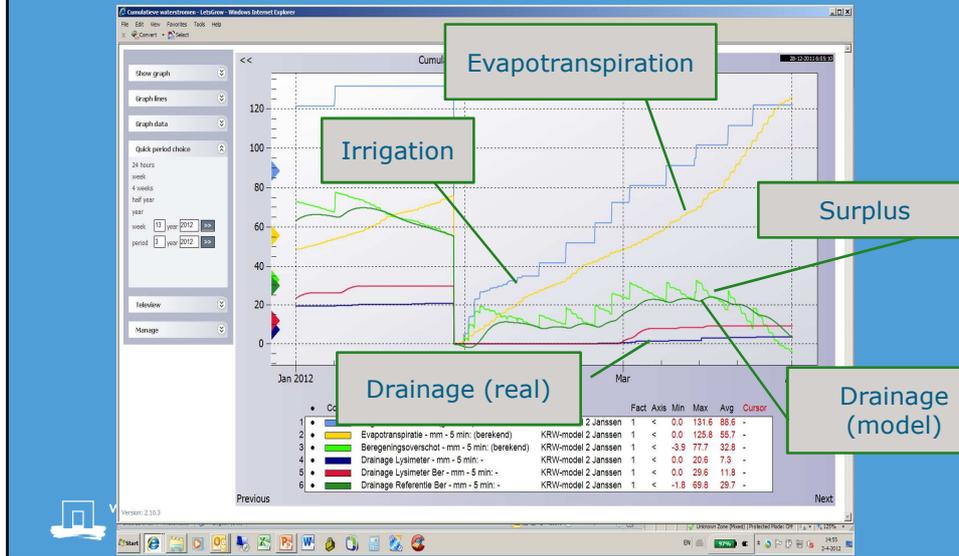


Tool: Emission Management System



Graphical tool decision support system

Course irrigation, crop (evapo)transpiration, surplus and drainage



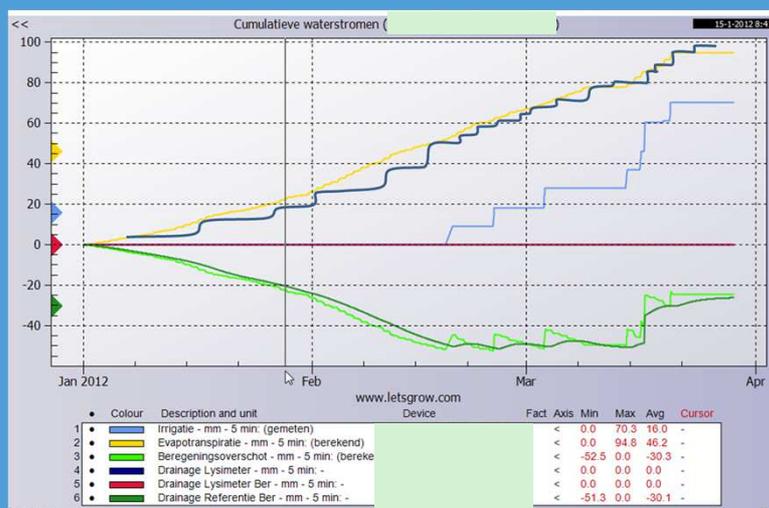
Some results

■ 3 grower types

- **'alert grower'**:
limits irrigation deliberately
crop, soil, sustainable awareness
- **'searching grower'**:
seriously looking for improvements
not always succesfull
- **'wet grower'**:
No concessions, *"limitations cause reduction"*

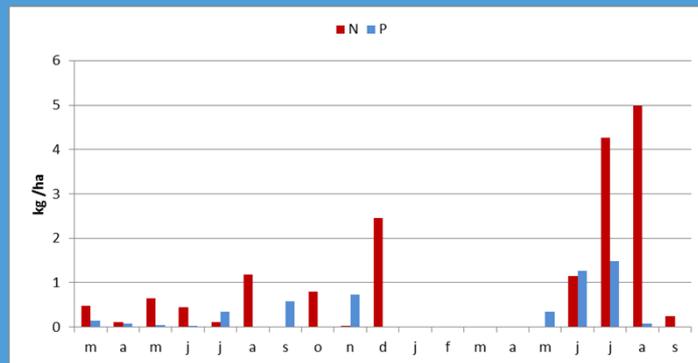


Alert grower



Emissions

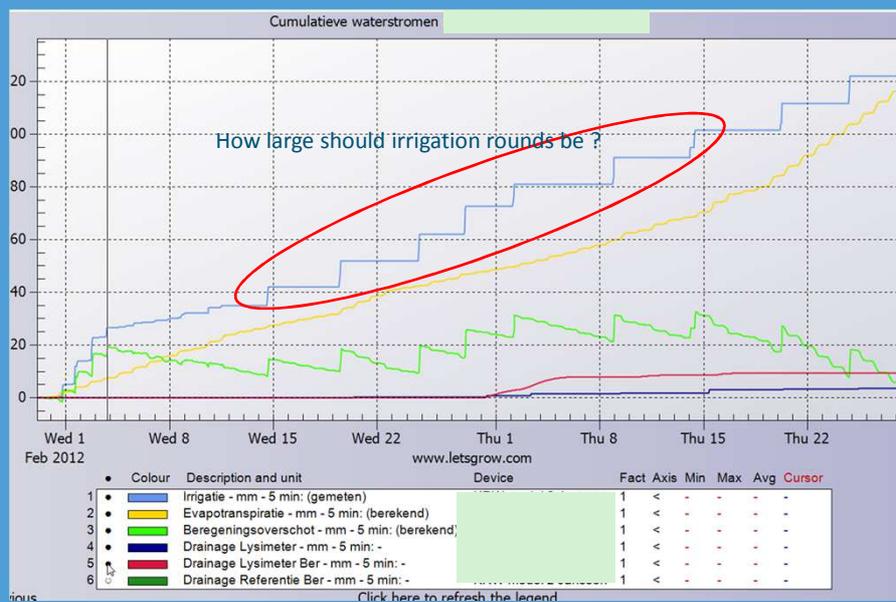
alert grower



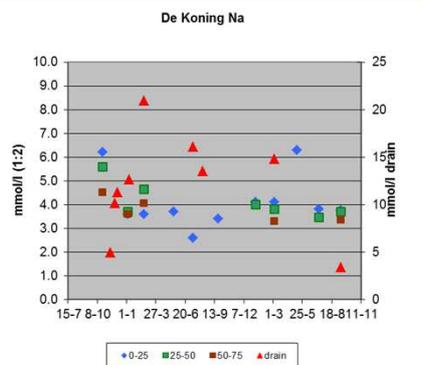
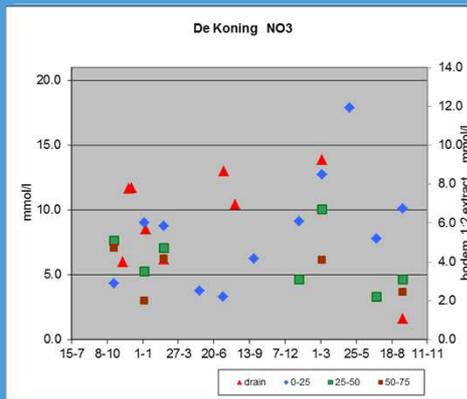
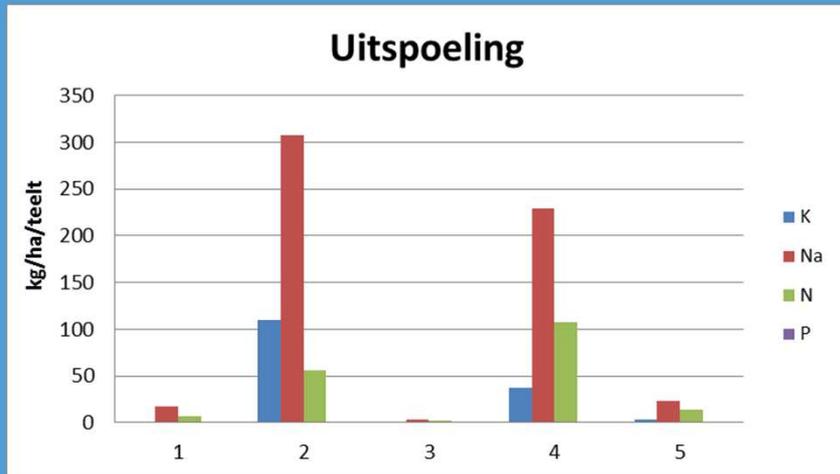
Emissionen 1.5 jaar only 17 kg N /ha!



Searching grower



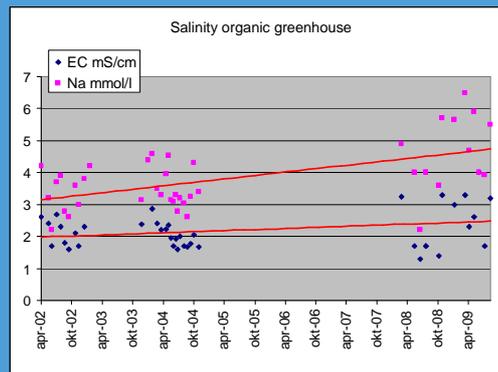
Emission searching grower



Bottle neck:

Salinity problem

Na (SO_4 , Cl) quantity in manure, compost, add. fertilizers



In conclusion

- Organic greenhouse growers low emissions
- Irrigation management tuned to crop demand
- Lysimeter, sensors, models usefull tools
- However: Potential low NUE and WUE (compared to conventional)
- Easy, excess in P supply (relation to soil buffer)
- Risk of salinity problems

Required:

- Balanced fertilization plan, Combined with "smart" irrigation
- Organic compost (certification)
- Variety of fertilizers low in Na, Cl, SO_4



Questions ?

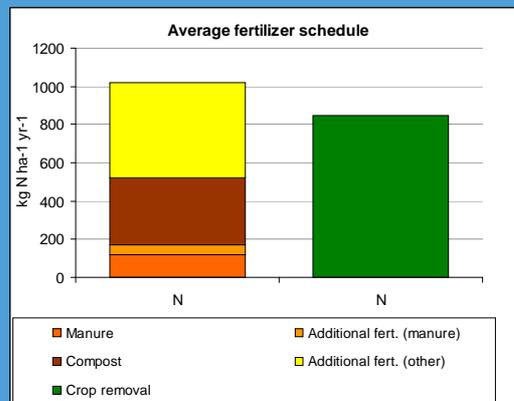


Regulation of organic manure

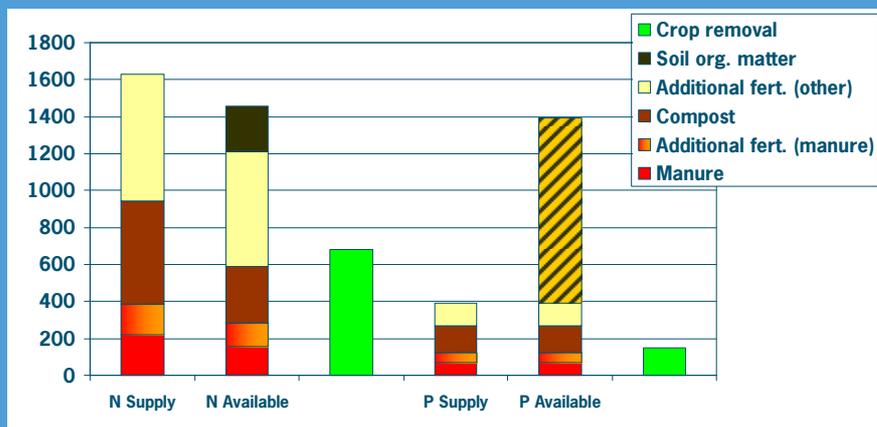
Manure is limited to 170 kg N

Serious problem, if compost is not accepted as A fertilizer

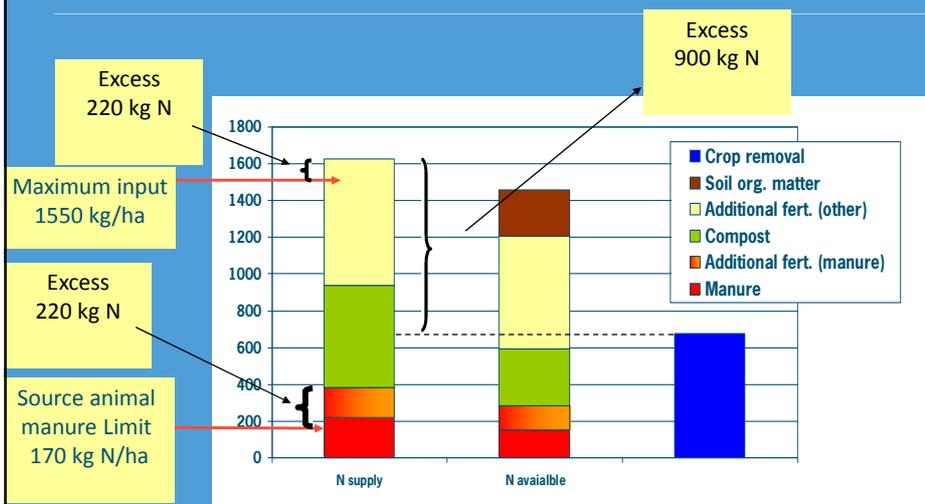
Manure+compost
+/- 50 %



Average yearly N and P inputs and uptake at eight organic greenhouse growers (> 5 years)

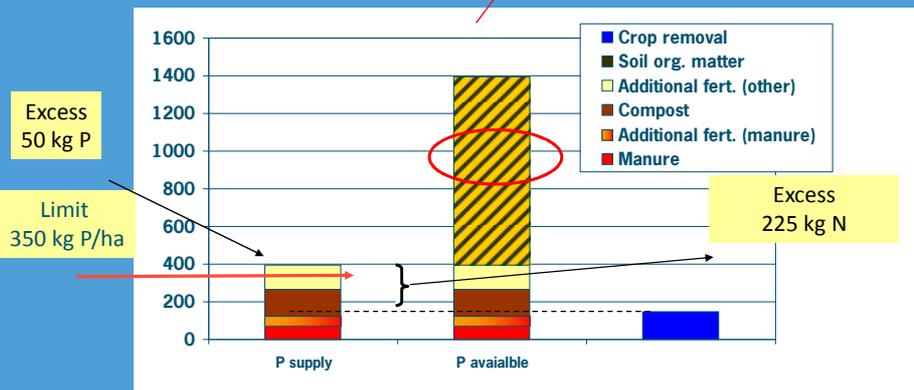


N input and legislative standards

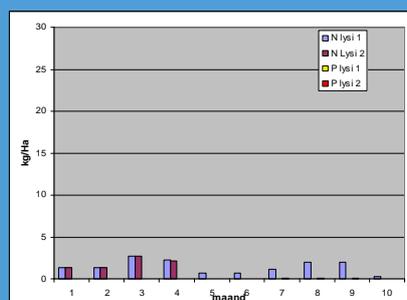
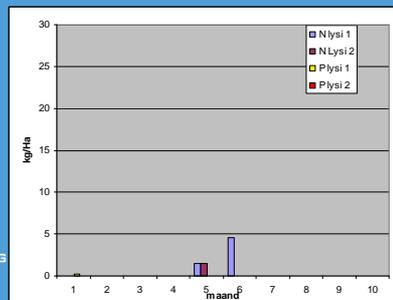
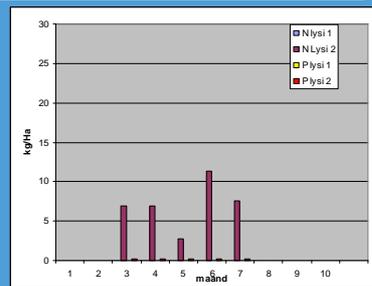
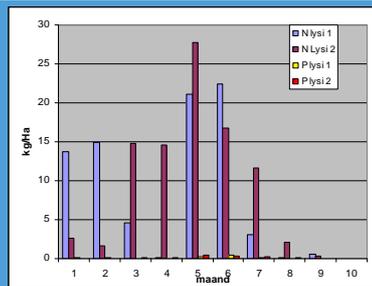


P inputs and legislative standards

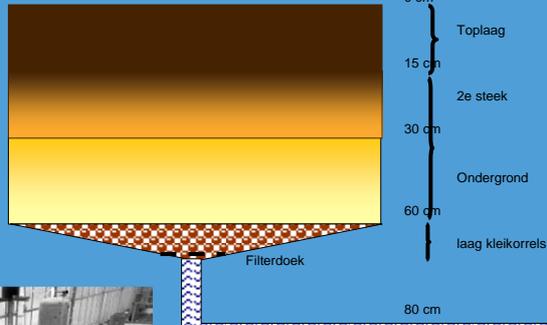
Standard fertilizer recommendation:
zero P application !



Results at four organic growers



Hoe ziet een lysimeter er uit ?

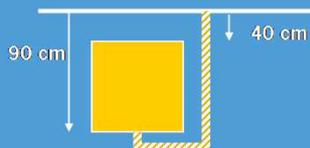


Voorbeeld chrysant

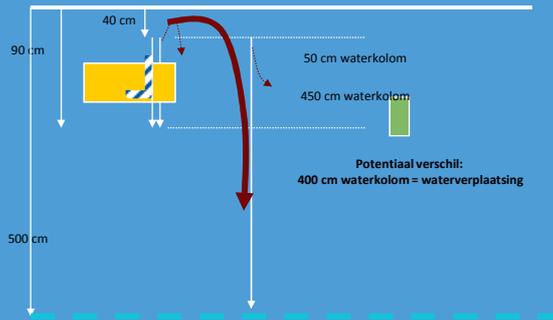
Probleem



Compromis



Bij theoretisch evenwicht geldt:



Plaatsing bovenrand

Bij theoretisch evenwicht geldt:

