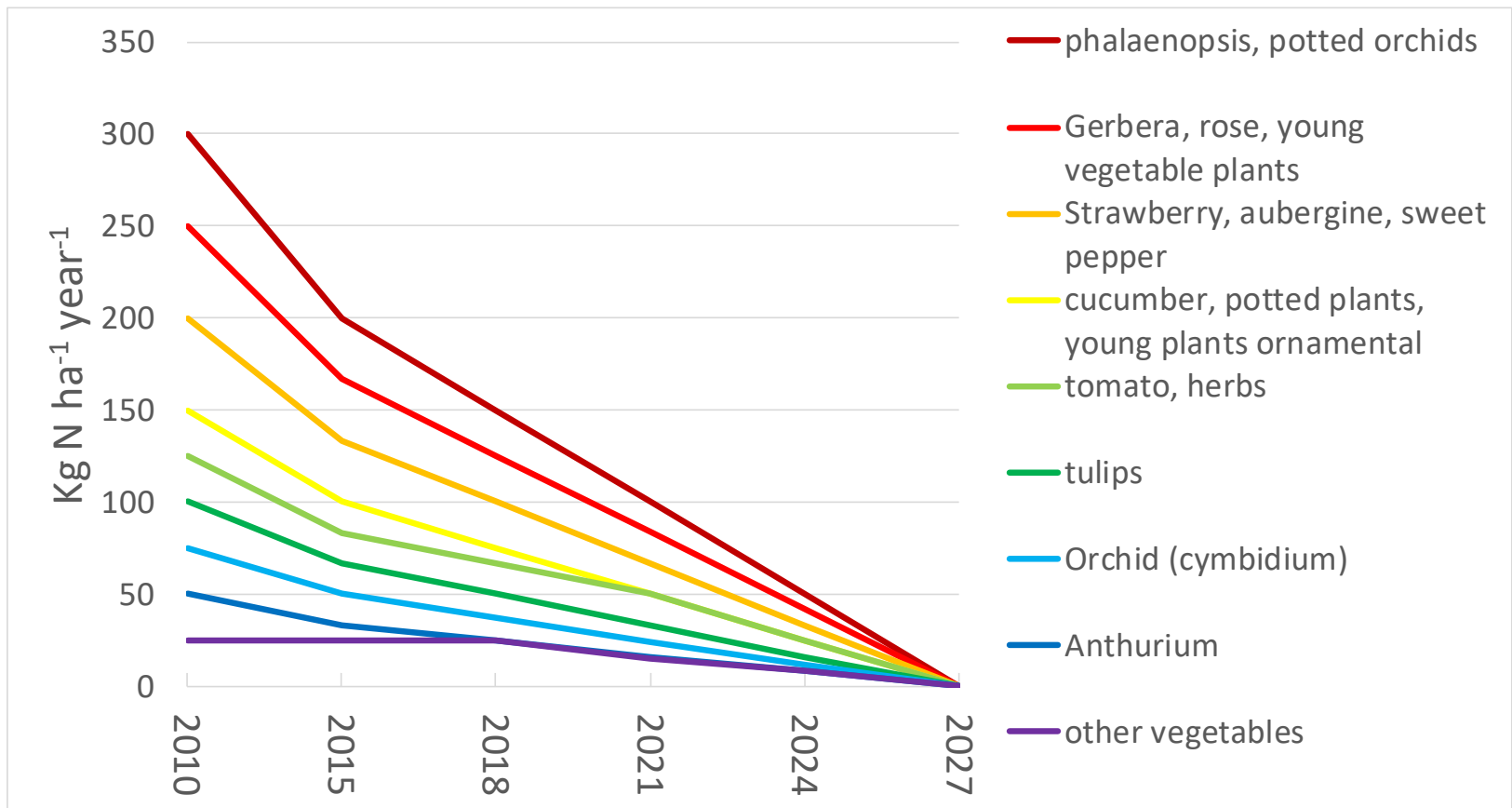


# Zero emission cultivation in greenhouse horticulture

## Status and future developments

31-01-2023, [Caroline van der Salm](#), Jim van Ruijven

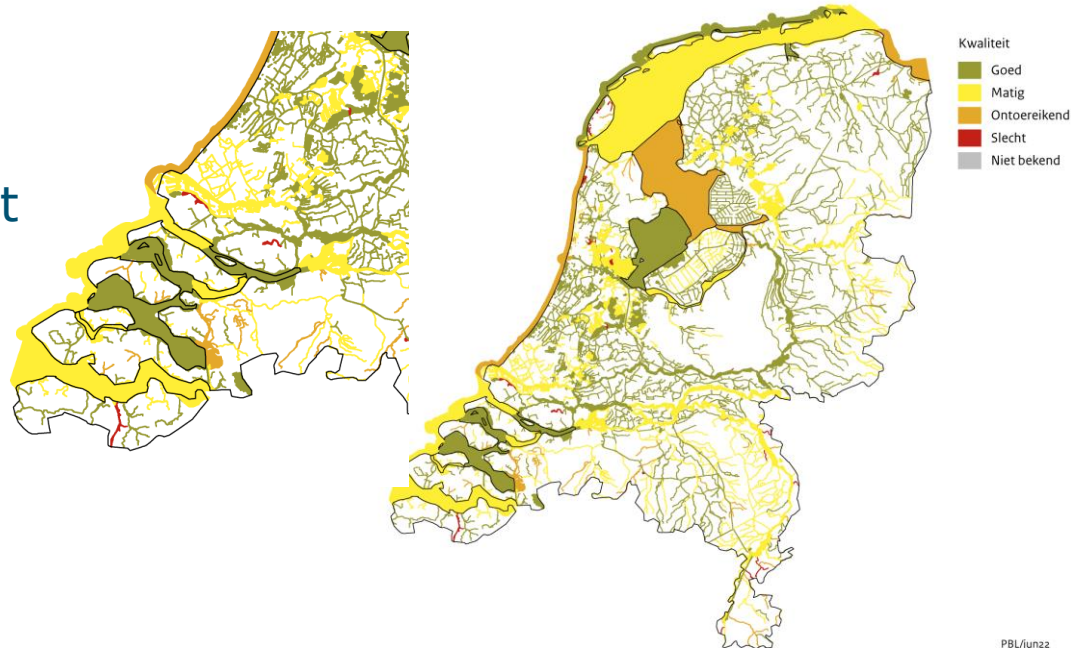




# Current situation

- N still too high in major greenhouse area
- Also still (too) high for plant protection products

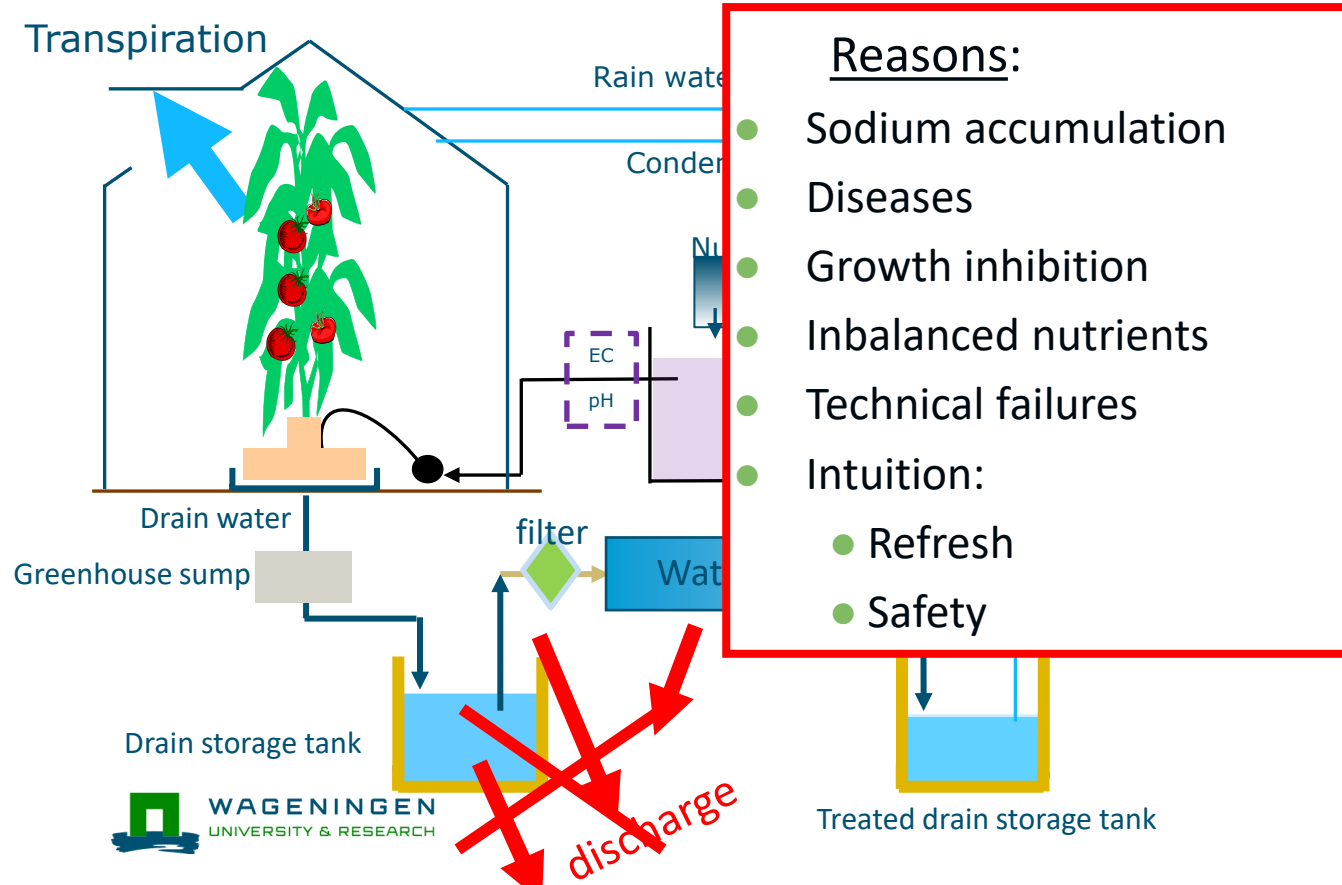
Beoordeling stikstof, Kaderrichtlijn Water, 2021



Bron: IHW (waterschappen, RWS); bewerkt door PBL

PBL/jun22  
www.clo.nl/nl025217

# Soilless cultivation



## Reasons:

- Sodium accumulation
- Diseases
- Growth inhibition
- Inbalanced nutrients
- Technical failures
- Intuition:
  - Refresh
  - Safety

## Discharge:

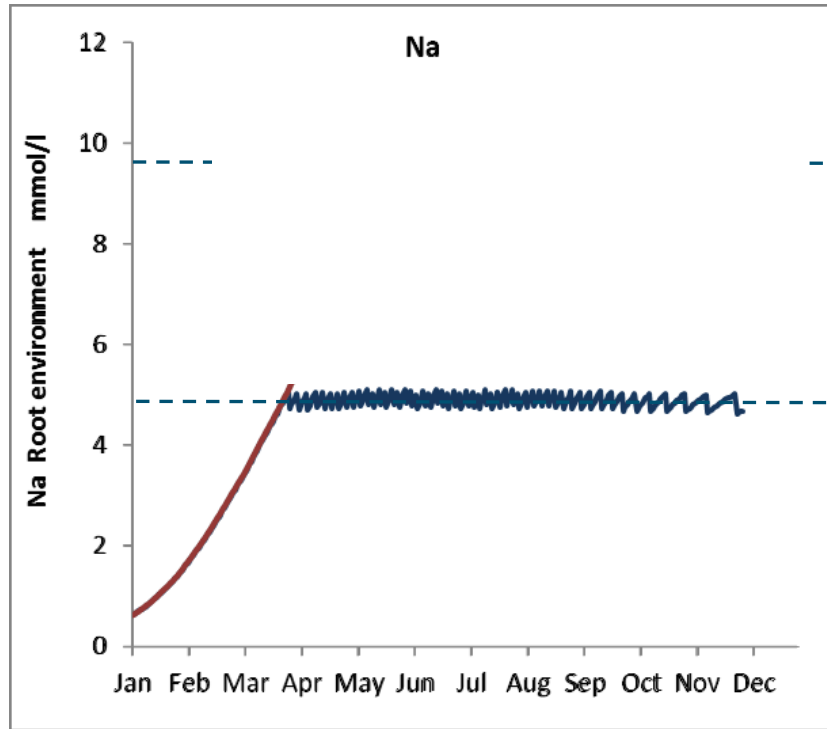
- 1-10% of water and fertilizers discharged
- Water treatment required

# Sodium: What is the problem?

- EC-controlled fertigation
  - Calcium
  - Potassium
  - Ammonium
- Direct toxicity



# Sodium – Increased threshold



Sodium threshold 10 mmol/L  
(40 m<sup>3</sup>/ha discharge)

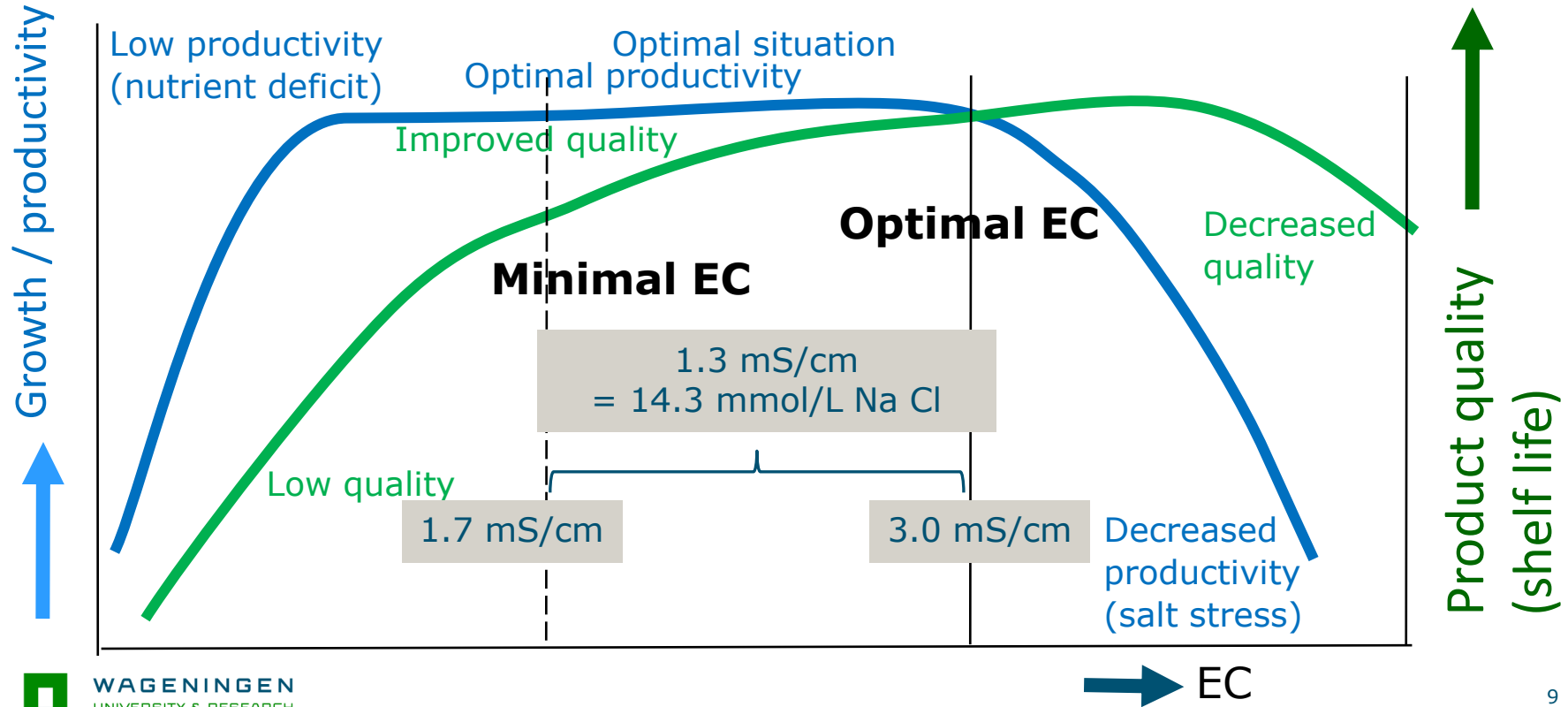
Sodium threshold 5 mmol/L  
(530 m<sup>3</sup>/ha Discharge)

# Sodium: What is the problem?

- Input – uptake = accumulation

Crop	Threshold (mmol/L)	Uptake (mmol/L)
Tomato	10 → 20	1
Rose	4 → 6 - 10	0.3
Gerbera	10 → 15	0.4
Potted orchid	2 → 6 - 10	
Sweet pepper	10	
Source: Sonneveld & Voogt 1990 + recent research Wim Voogt		

# Sodium: what options do we have?



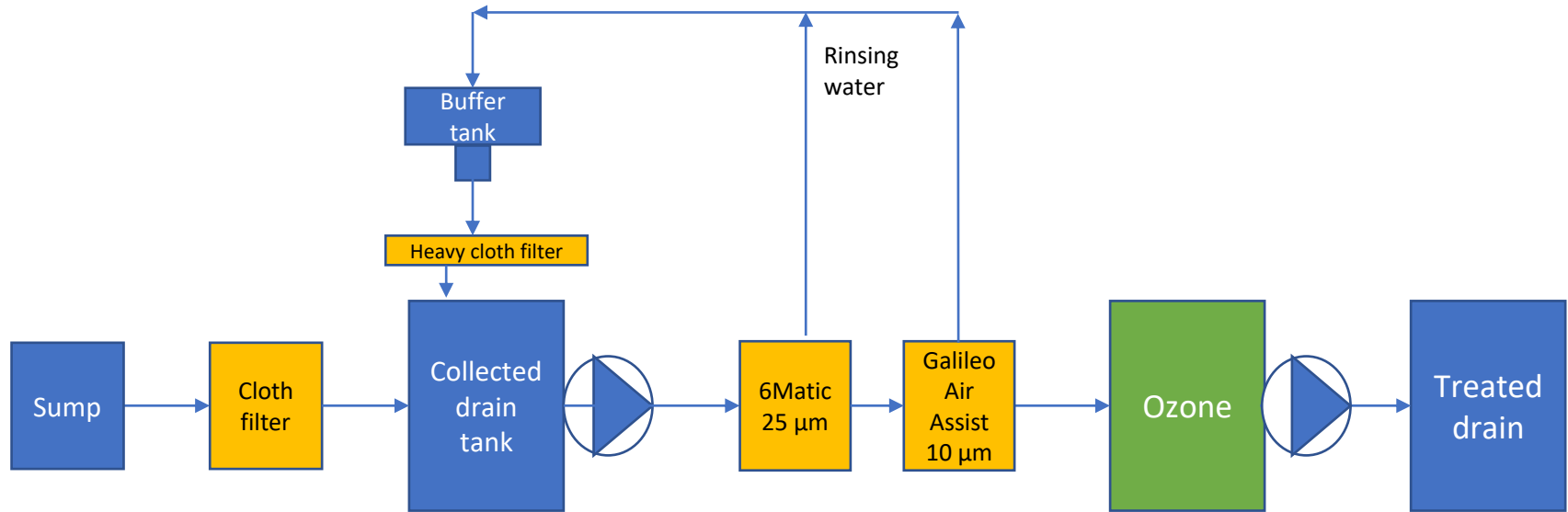
# Potential accumulating substances

- Zinc
- Boron
- Cleaning agents



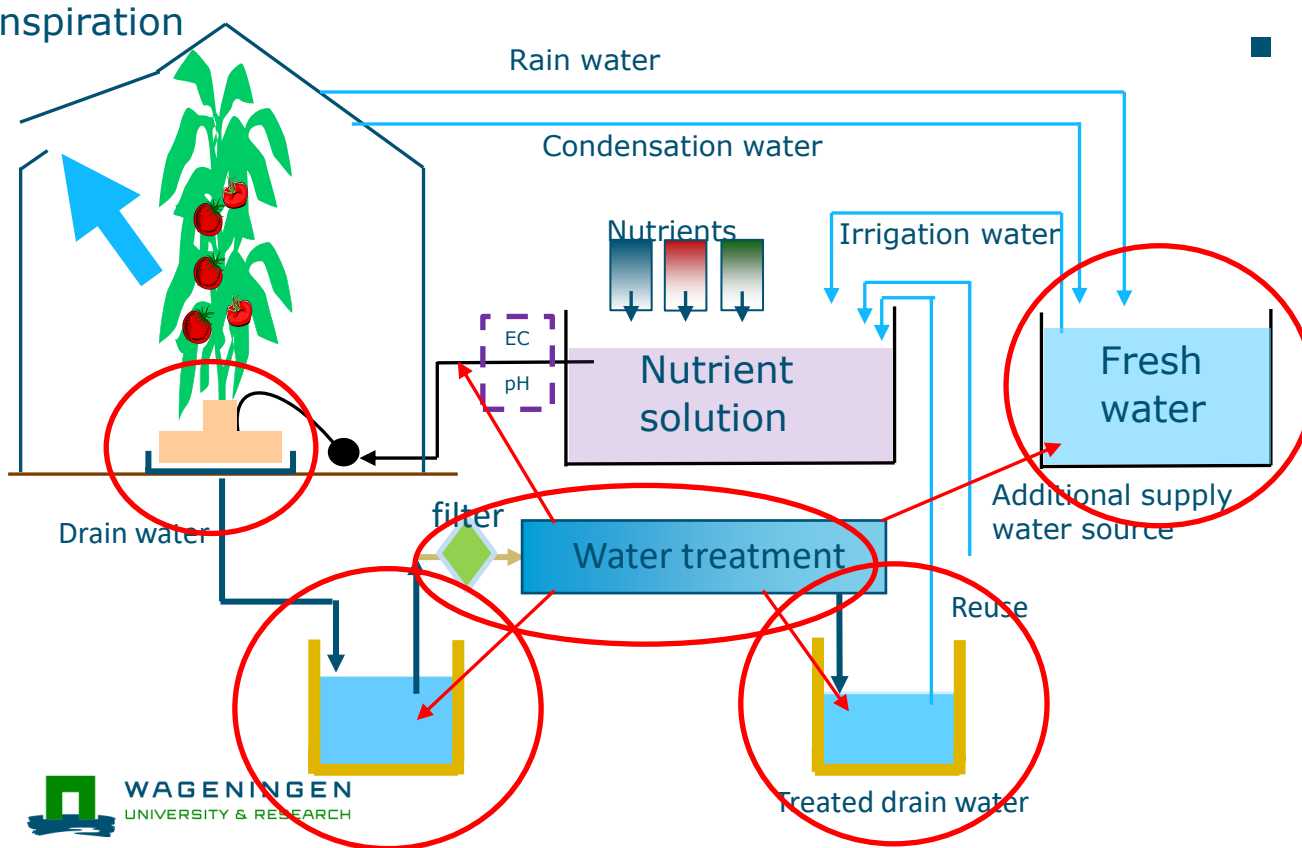
Phytotoxicity testkit

# Filter rinsing water



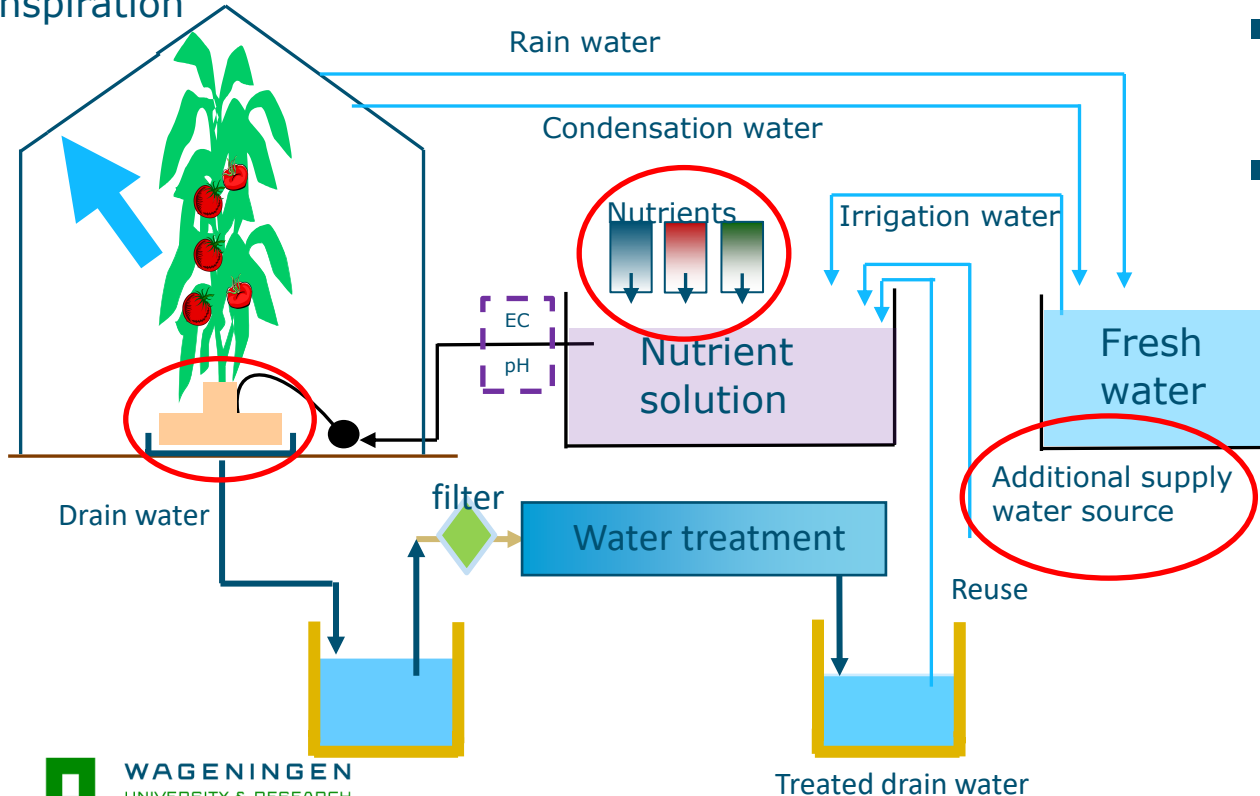
# Future developments in high tech greenhouses

## ■ Microbial ecosystem management



# Future developments in high tech greenhouses

Transpiration



- Microbial ecosystem support
- Circular economy

# Thank you for your attention!

## Questions?

