



# Reducing the emission of plant protection products from greenhouses

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# Sustainable use of pesticides

- Reduce use of pesticides & stimulation of IPM:
  - Several research programmes and projects (private & public funding)
    - New biocontrol agents, IPM strategies
    - Implementation of IPM
  - Growers' interest
    - Retail demands (vegetables)
    - Development of resistance to pesticides
    - Licence to produce & licence to deliver
- Increase in IPM (esp. ornamentals)



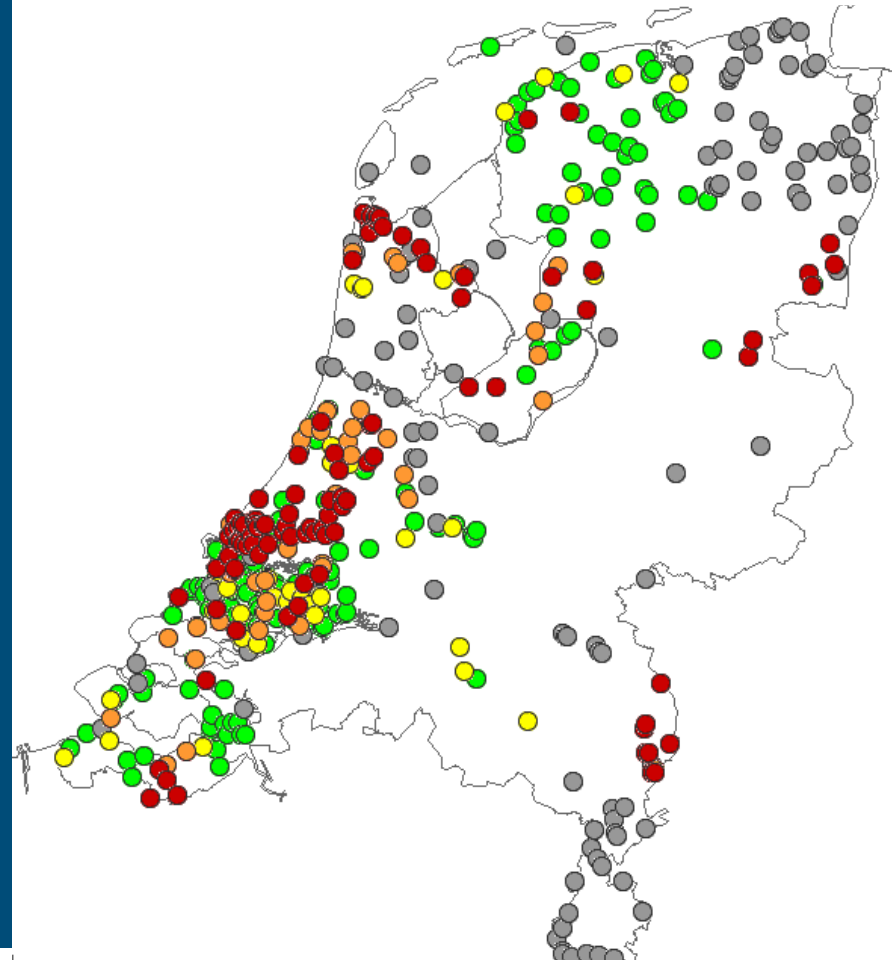


# But...

- Water quality in greenhouse areas still below environmental quality standard
  - Pesticides
  - Fertilizers (N, P)

Imidacloprid in surface water 2010

[www.bestrijdmiddelenatlas.nl](http://www.bestrijdmiddelenatlas.nl)

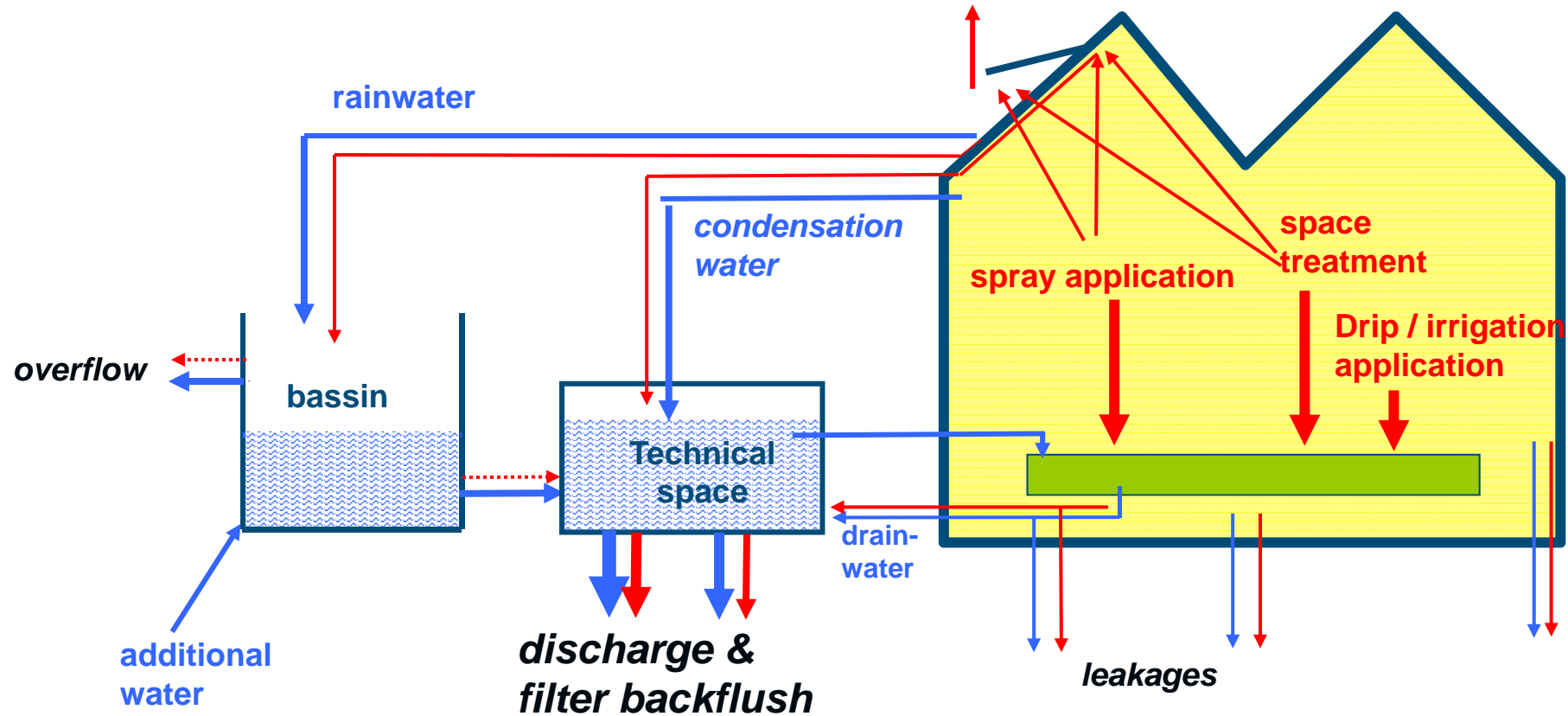


# EU - Water Framework Directive

- “Good chemical and ecological quality of surface water and groundwater by 2015 (or 2027)”
  - Registration of pesticides
    - 0.1% of applied = emission ?
    - Underestimation of the emission from greenhouses
- **2 – 50 x higher**



# Closed greenhouses?



**0 – 3000 m<sup>3</sup>/ha/year**

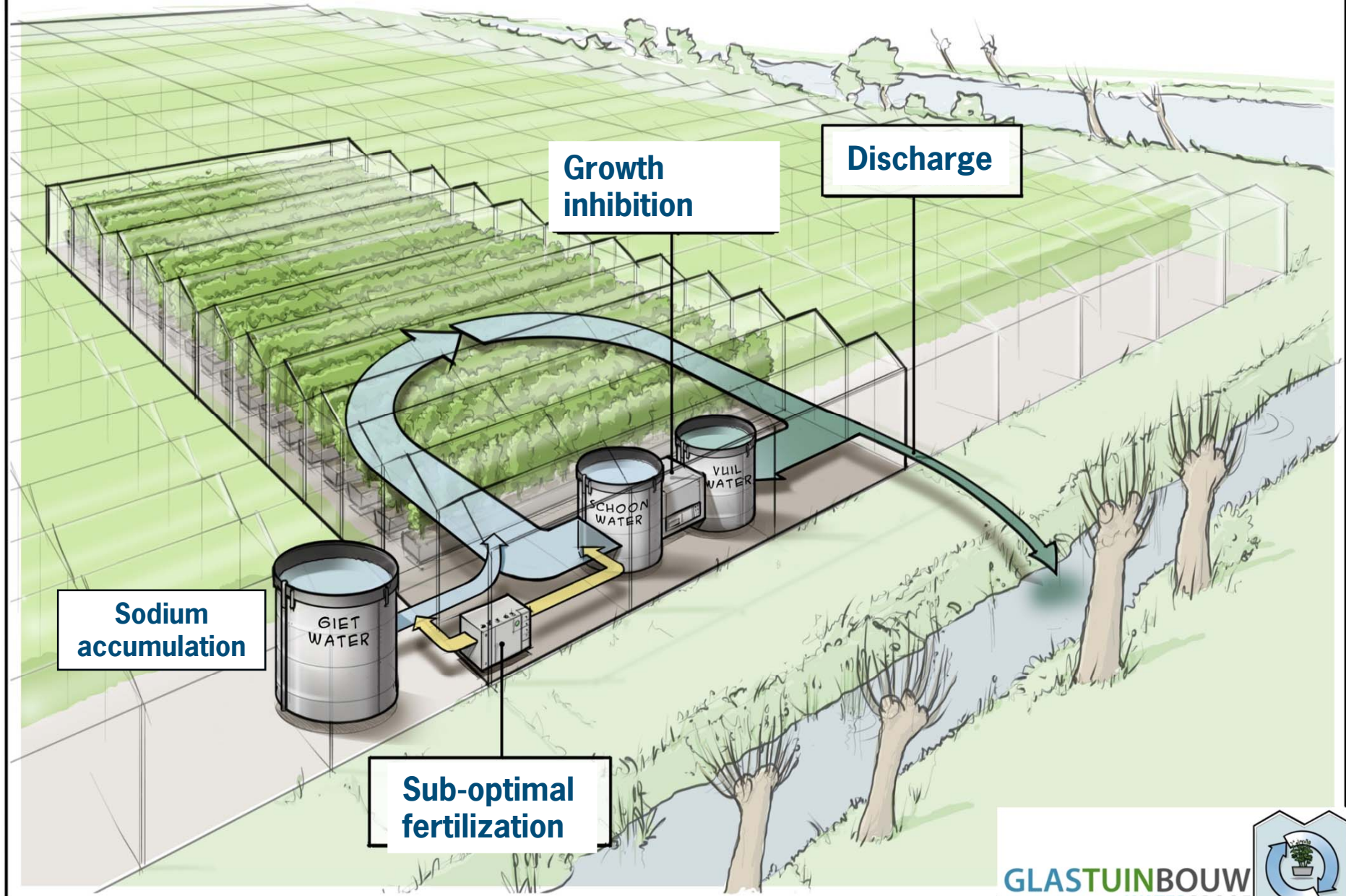
# Reduce environmental burden

1. Use alternatives
  - biological control
  - integrated pest management
2. Optimize application
  - precision spraying techniques
  - tune applications to discharge
3. Reduce discharge



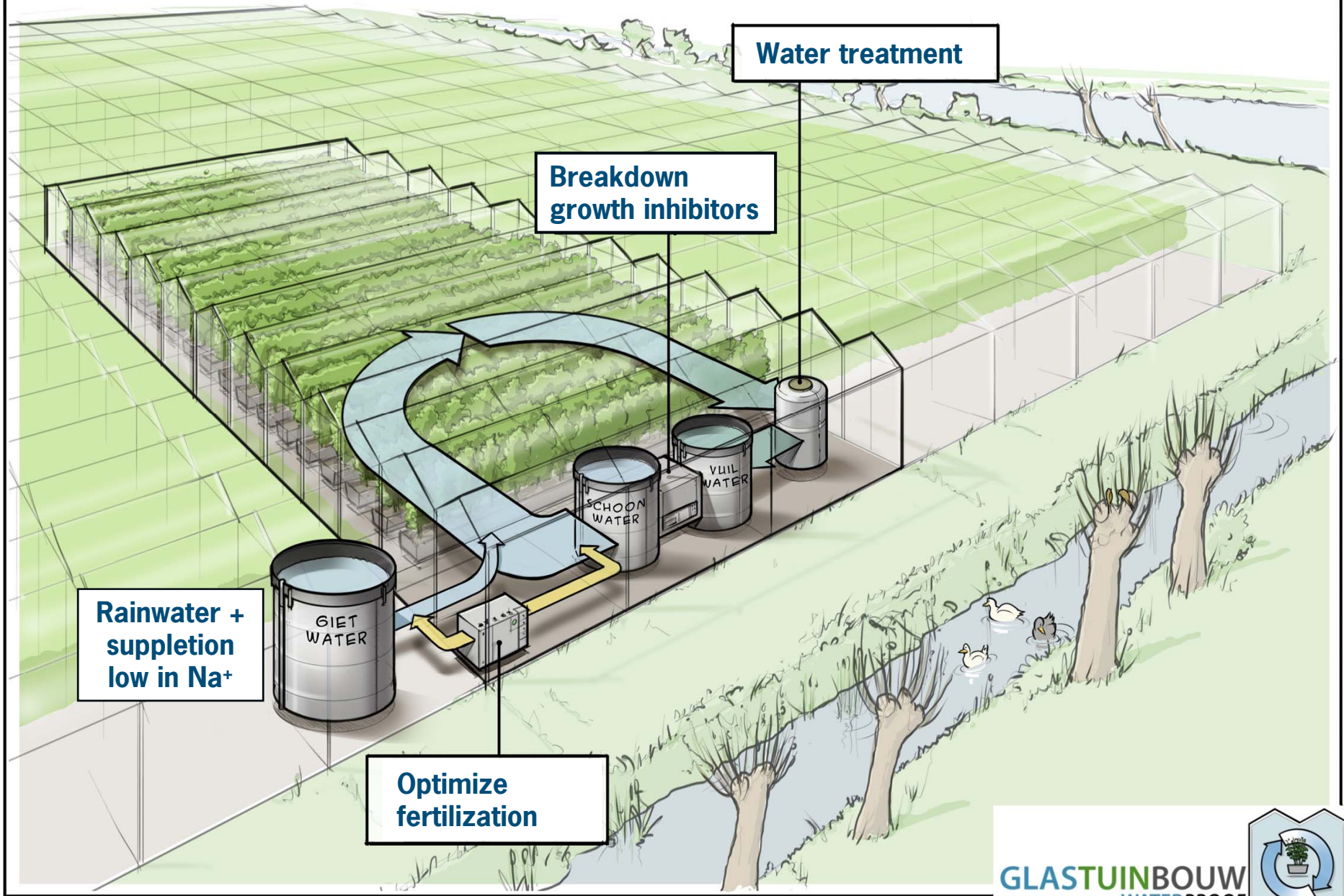


# Reasons for discharge





# Towards a zero-emission in substrate crops

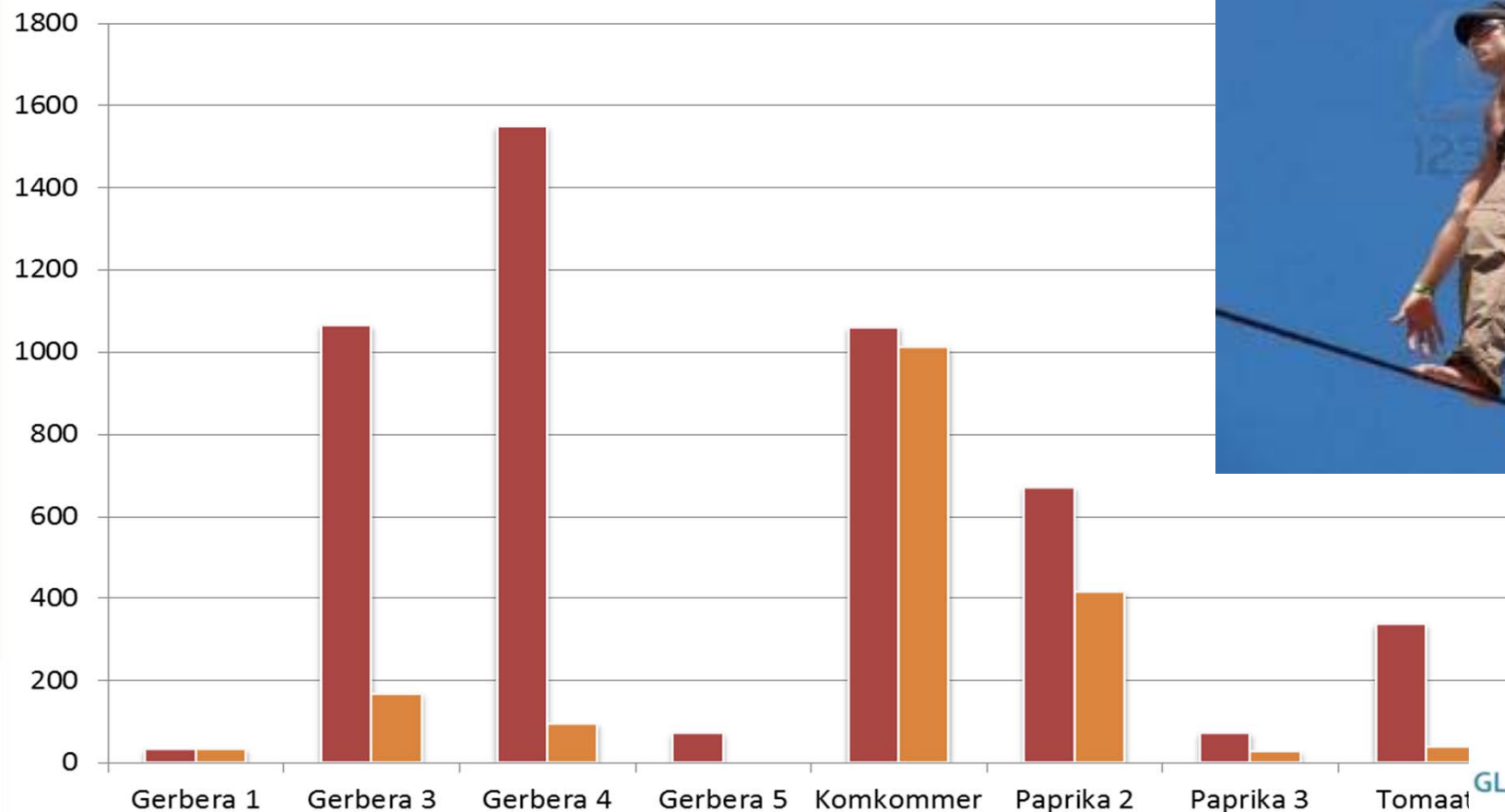




# Reduce discharge: prevent growth inhibition

- Treatment of recirculation water with  $H_2O_2$ -UV

Discharge in 2010 and 2011 ( $m^3/ha$ )



# 'Reduce discharge: 'end of pipe solution''

- Removing pesticides from discharged water
- Selection of techniques
- Test water: Standardised drain water
  - Macro and micro nutrients
  - 12 active ingredients of PPPs:  
*azoxystrobin, boscalid, kresoxim-methyl, carbendazim, imidacloprid, methiocarb, iprodione, methoxyfenozide, pirimicarb, pymetrozine, thiacloprid and tolclofos-methyl*
  - Organic pollution (humic acid, illite)



# 'End of pipe solution'

- Removing pesticides from discharged water
- Selected techniques:
  - Ozon ( $O_3$ ) + active carbon
  - UV +  $H_2O_2$
  - Electrochemical flocculation
- Rest products
- 80-90% breakdown enough?



# Conclusions



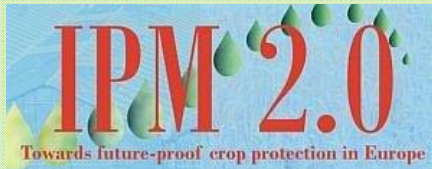
## ■ Short term

- Increase recirculation bij solving recirculation bottlenecks
- Breakdown of pesticides in discharge water

## ■ Long term

- Zero discharge
- Biocontrol / resilient crop protection with <<<pesticides





Thank you  
for your attention

[www.glastuinbouw.wur.nl/uk/](http://www.glastuinbouw.wur.nl/uk/)

