‘Working together for emission-free cultivation’

Water Future & Ridder on route to sensible solutions for smart water treatment

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GreenTech 2021 Live & Online
27 September – Xpert Theatre

Horticulture with substrates – sustainability issues

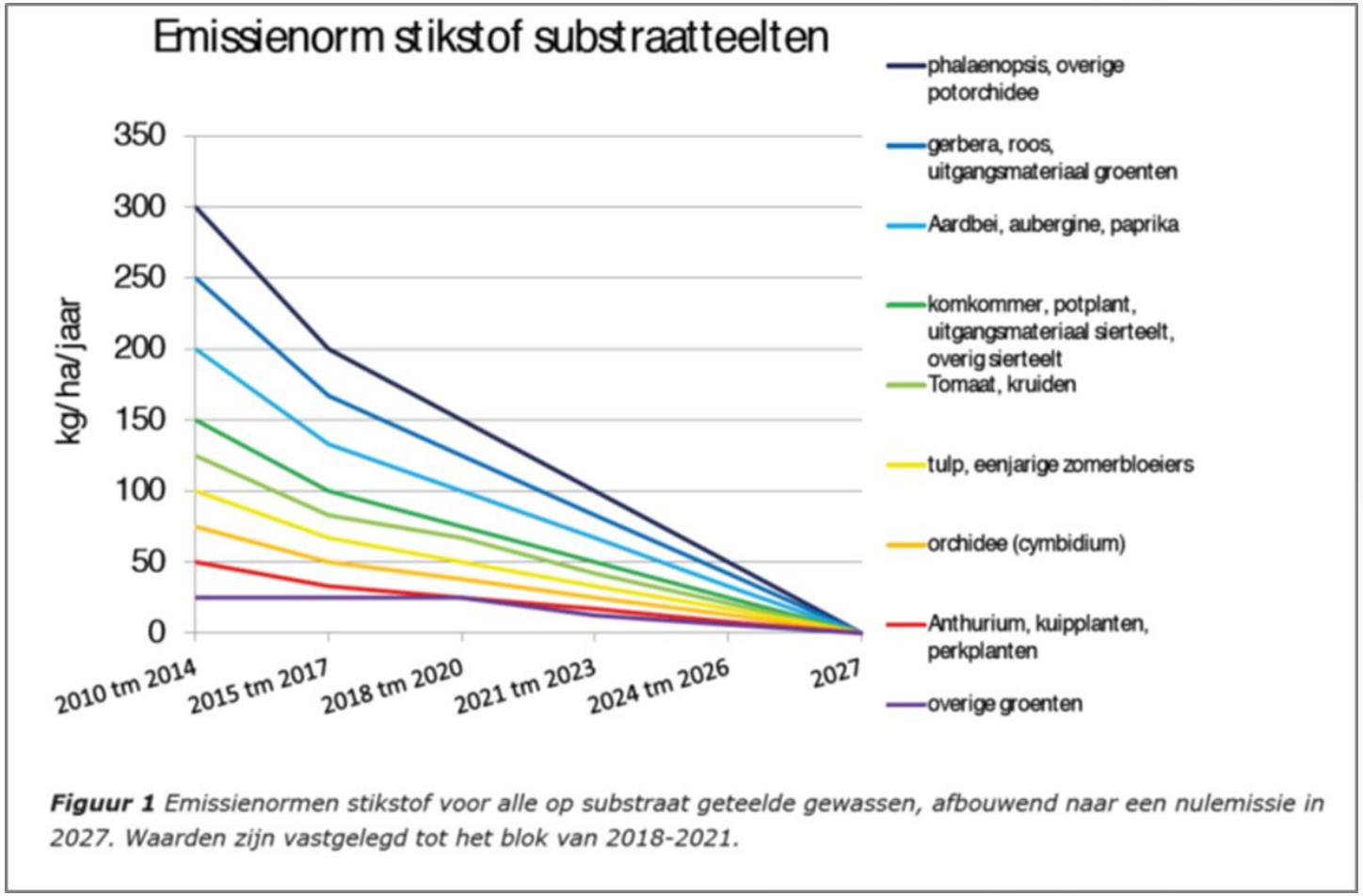
Most sustainable way !

- 90% water usage reduced
- double crop yields
- small foot print

Sustainability issues !

- Emissions – Pesticides
  - Crop protection agents
- Fresh Water shortage
  - good water quality needed
  - search for water alternatives
- Emissions - Nitrogen
  - Nitrate environment or decomposed till N2

Dutch legislation 2027 – emission to “zero” for Nitrogen and Water



Figuur 1 *Emissienormen stikstof voor alle op substraat geteelde gewassen, afbouwend naar een nulemissie in 2027. Waarden zijn vastgelegd tot het blok van 2018-2021.*

Cause:

Na^+ accummulation in drainwater

Solution(s):

1. common Na^+ practice
   - keep intake low
   - more tolerant crops
   - exceed Na^+ boundary limits

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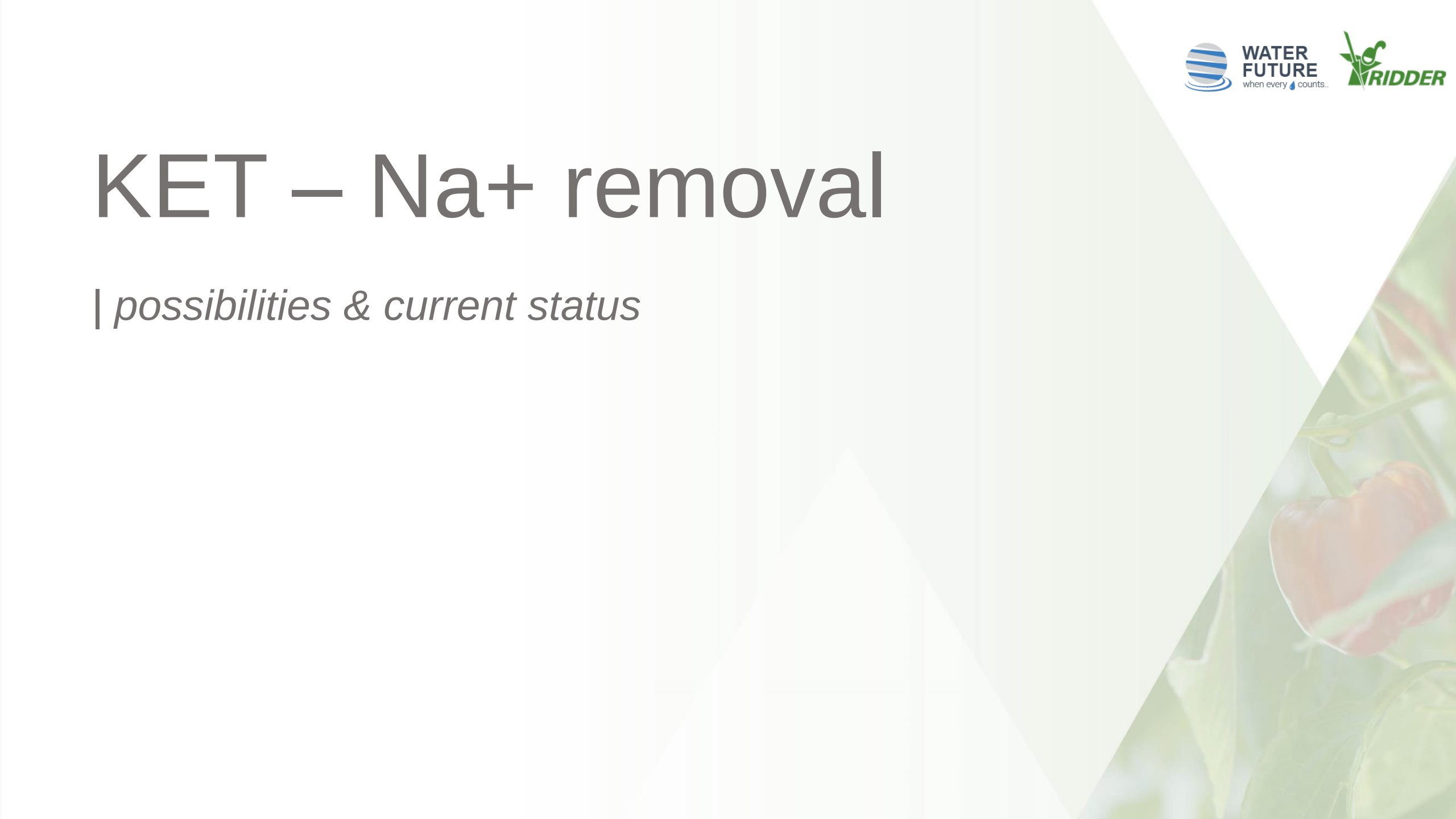
2. Key Enabling Technology (KET) needed to reach “zero”
   - Innovation award winners
   - 2018: NanoFiltration
   - 2019: Electrodialysis

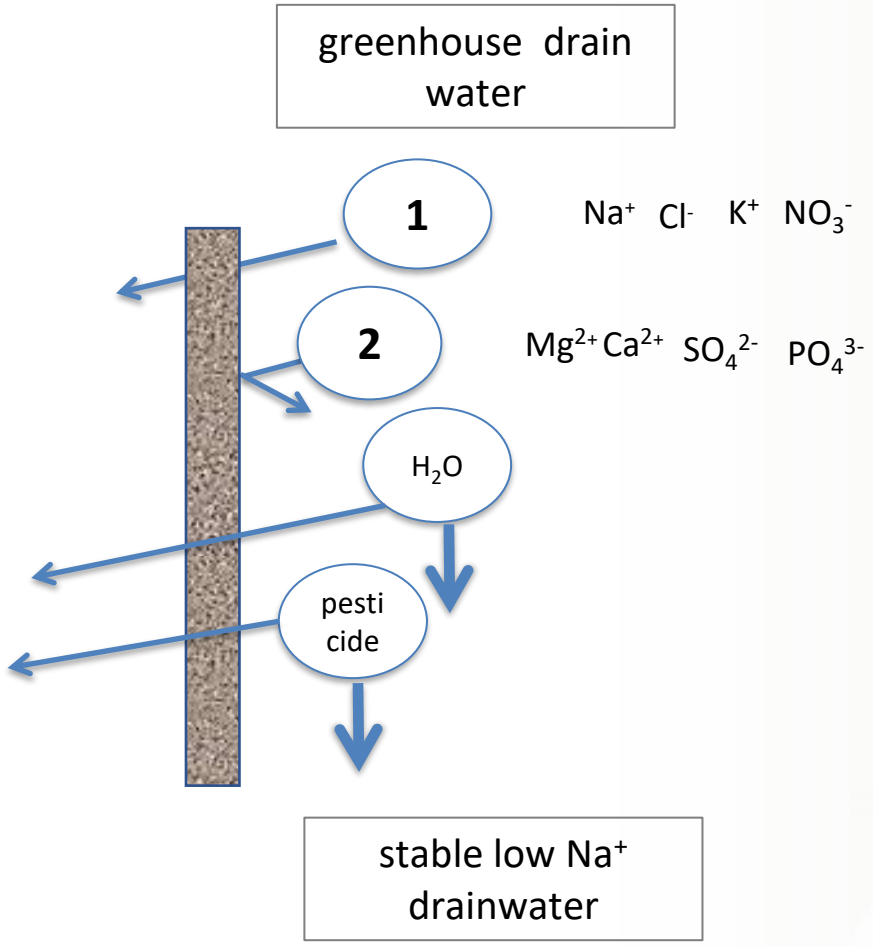
KET – Na+ removal

| *possibilities & current status*



1. KET - Na+ removal by Nanofiltration

Fundamental – nano porous membranes, pressure driven process



My personal opinion

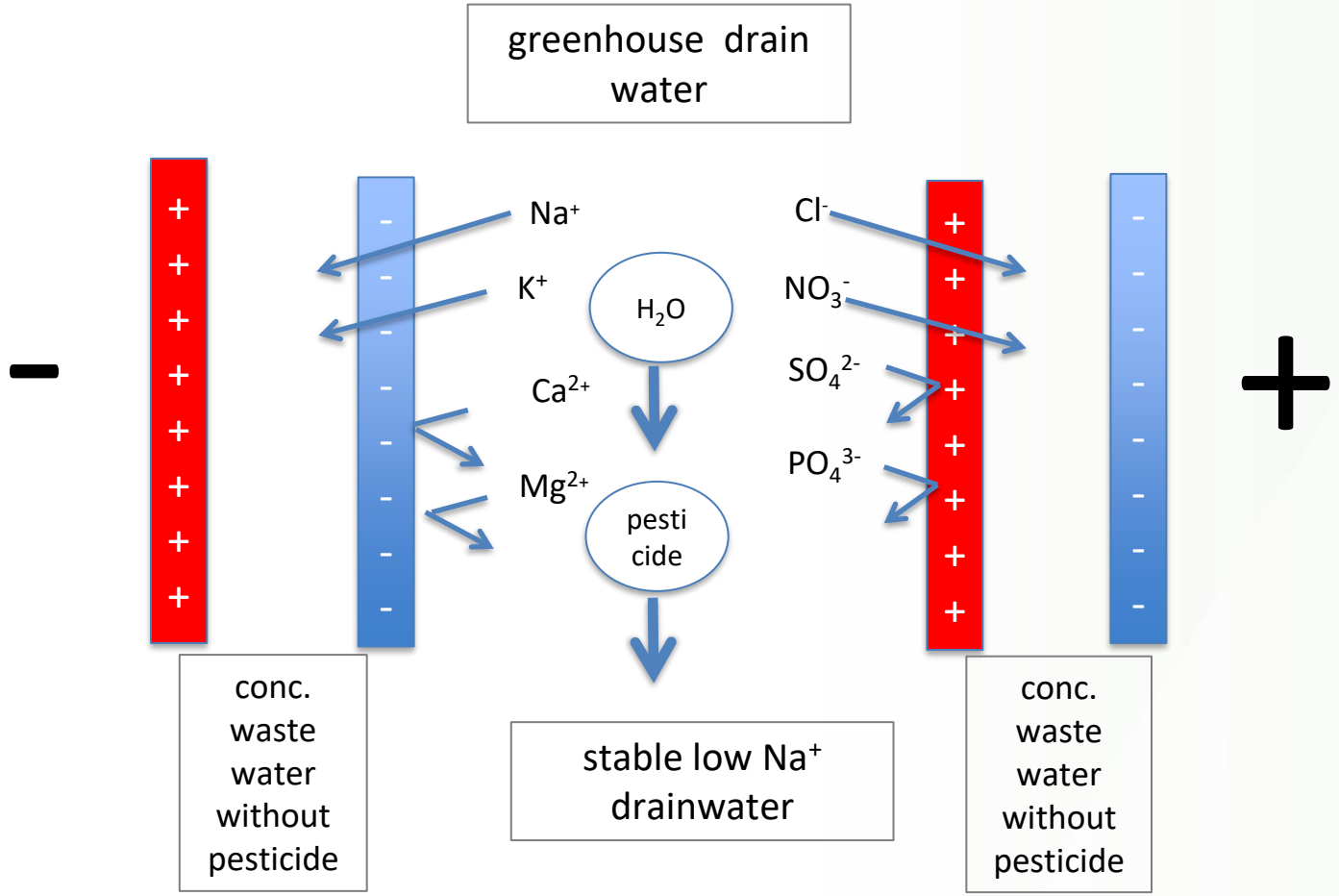
- good technology
- monovalent / multivalent separation
- proven in practice
- high Na+ removal capacity

My concerns

- RO needed to recover water
- Active Carbon needed to capture pesticide (BZG certified)
- sensitive for pore blocking, more flushing
- Nitrate loss to environment

2. KET - Na+ removal by Electrodialysis

Fundament - charged dense membranes, electricity driven (no pores, no water loss)



Our experiences

- names: NoNa$^+$ / Ecogreen
- monovalent / multivalent separation
- Na$^+$ removal capacity steady increased
- proven in long run fieldtests
- microfiltration sufficient
- high water yield
- no pesticide loss, BZG certified

Concerns

- Nitrate loss , emission

2. KET - Current status NoNa+ / EcoGreen

Tested on several crops: tomatoes, cucumber, sweetpepper, strawberries, orchids

Observed grower advantages

- stable Na+ content on desired level

to be expected

- more resistant crops against diseases
- better growing conditions
- prepared for alternative water (tap/well)

savings vs. emissions

- multivalent nutrients (>80%)
- micronutrients (> 80%)
- water savings (>90%)
- waste water (BZG certified), no treatment

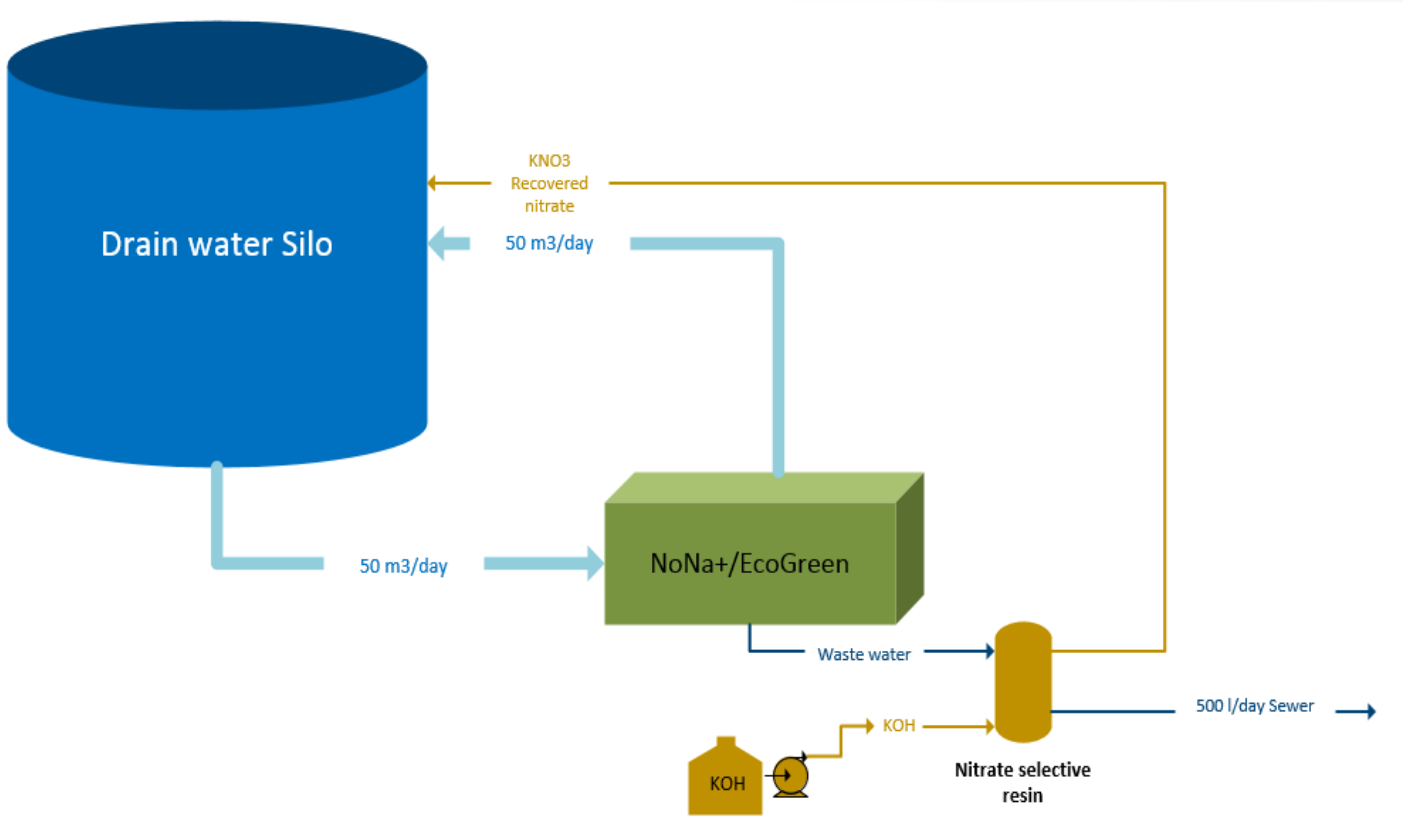
Concerns

- Nitrate loss , emission

Nitrate Recovery

| *pilot results*

2020: Nitrate recovery process developed



STOWA project – zero emission

- strawberry grower (NL)
- KNO3 loss high

- Pilot : Nitrate selective resin column
- Recovery with KOH
- One pass process

Results

> 90 % NO3 recovered

Proposed - Zero emission process

Drainwater recirculatie tank

EcoGreen/ NoNa+

Sodium removal

Nitrate recovery resin

Only 5% water loss, mainly KCl and NaCl

Project findings shared

02-2021: zero emission is attainable for horticulture (glastuinbouw)

02-2021: whitepaper issued
See www.waterfuture.nl

Zero Emission – Advantages for the grower

Drainwater treatment	Sodium removal (drainwater)	Nitrate recovery (waste water)
System	EcoGreen / NoNa⁺	developed resin column with regeneration
Water treated	Drain Water	Waste water from EcoGreen / NoNa⁺
Based on	Several large scale fieldtests	pilot experiment
Advantage grower	constantly low Sodium DW healthier crop, more resistant more crop yield mineral savings saving water less dependent on water sources	reuse nitrate prepared for zero emission legislation 2027

Conclusion

| *“Zero” emission of water and nitrogen in horticulture is attainable and attractive for growers !*

Thank you for your attention!

| *Learn more?*

Visit Ridder at GreenTech Booth 01.110

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