ULTIMATE

WATER SMART INDUSTRIAL SYMBIOSIS

TRANSITION FROM LINEAR TO CIRCULAR ECONOMY

in the nexus of the water sector & intensive water consuming industries.

CS2 – Nieuw Prinsenland

KWR · GHENT UNIVERSITY · Coöperatieve Tuinbouw Water Zuivering De Vlot · NIEUW PRINSENLAND · Glastuinbouw Nederland

Fig 1. ULTIMATE CS2 process flow diagram

Background

→ Netherlands is the 2nd largest exporter of agriculture products in the world (mostly grown in greenhouses)
→ The sector is characterized by high resource efficiency
→ By 2027, greenhouses will need to remove nutrients from their wastewater before discharge
→ Valuable water and nutrients from greenhouses can be recovered

Objective

→ Produce water suitable for irrigation from greenhouse wastewater (fig 4)
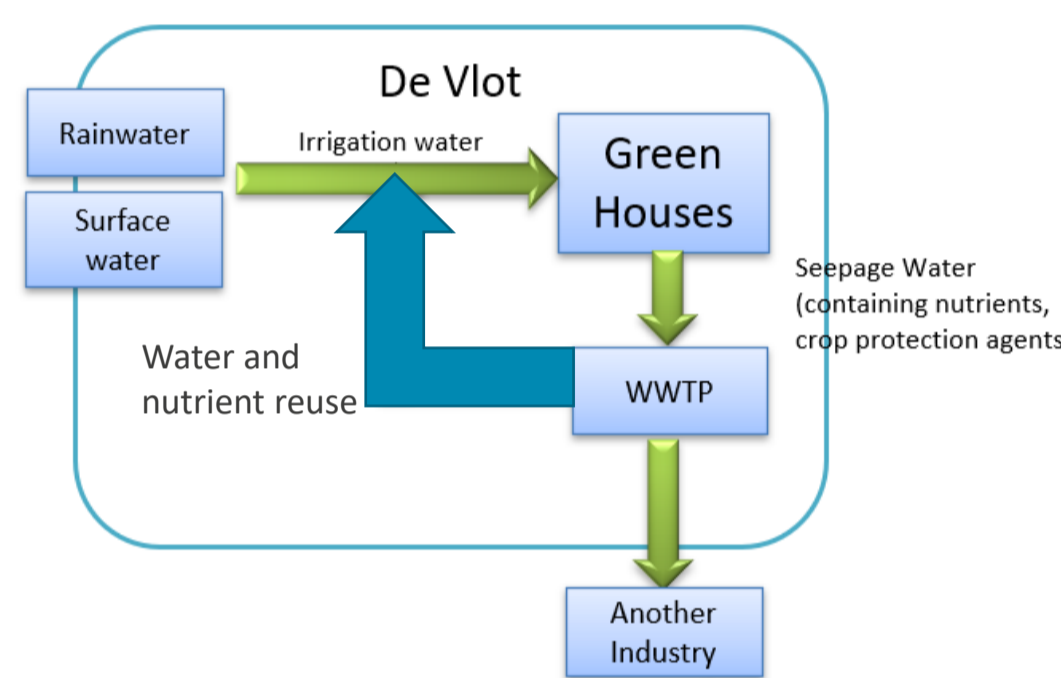→ Optimising water and nutrient recovery from agro-food industries (fig 3)

Fig 2. Greenhouse wastewater treatment site (De Vlot)

Fig 3. Water and nutrient flow cycle at De Vlot

Sodium is harmful for plant growth. It is important to reduce it to low concentrations
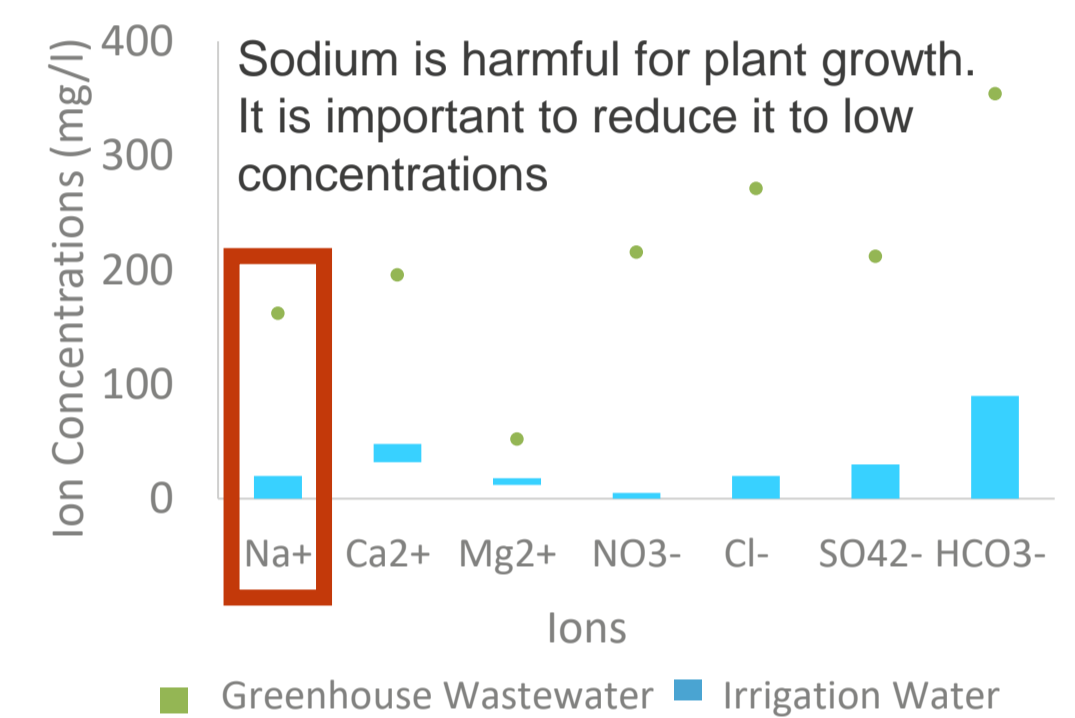
Fig 4. Irrigation water and De Vlot greenhouse wastewater composition
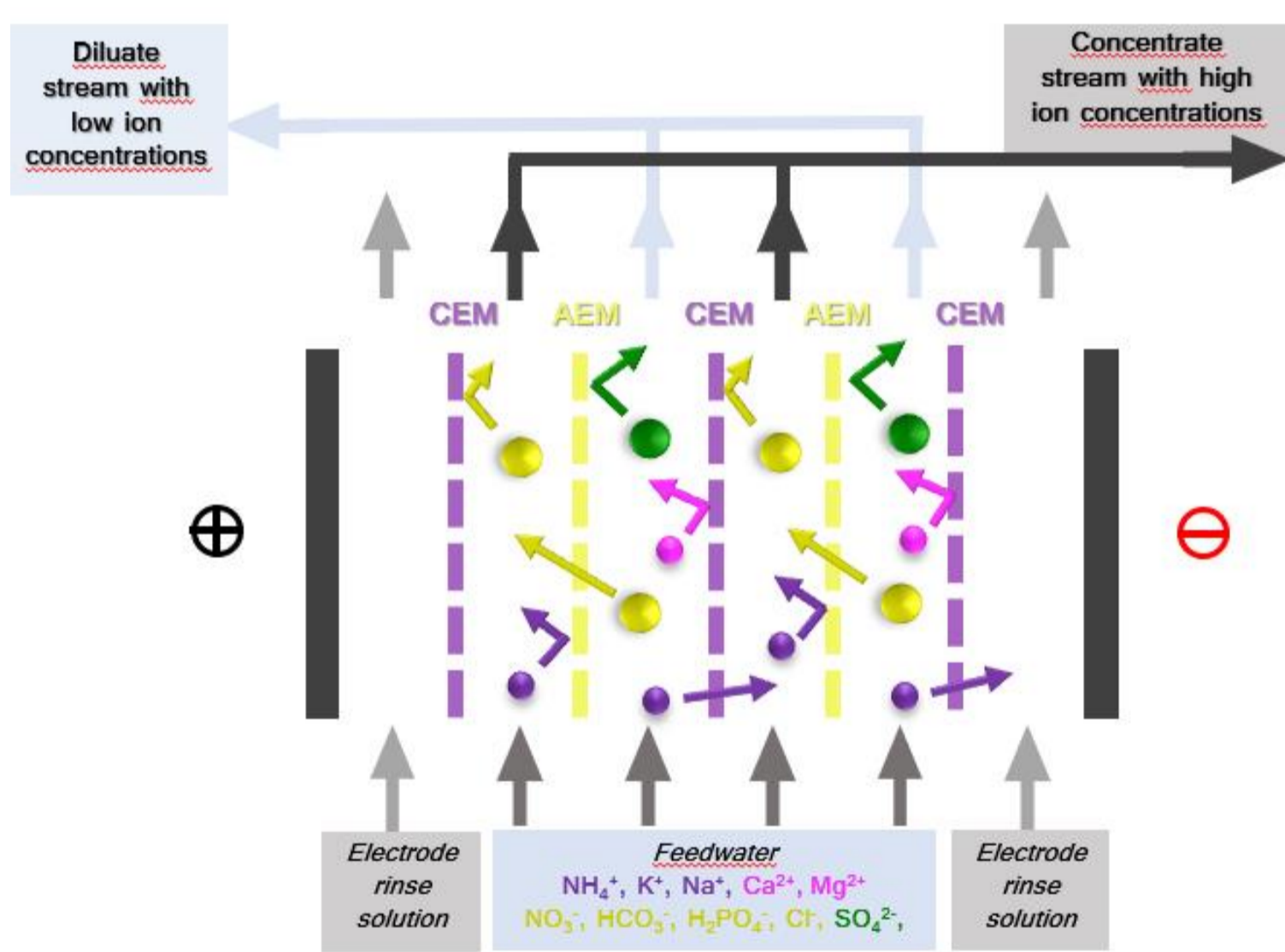
Lab-scale Electrodialysis

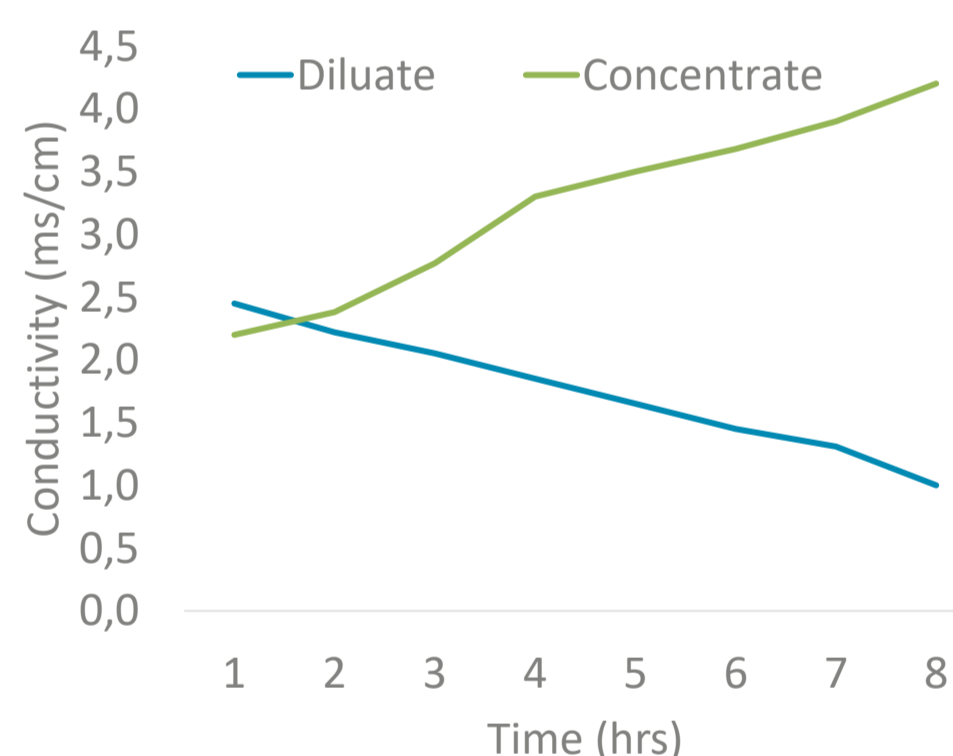Fig 5. Lab-scale ED cell depicting greenhouse wastewater ion separation

Fig 6. Conductivity over time for ED experiments with simulate greenhouse wastewater
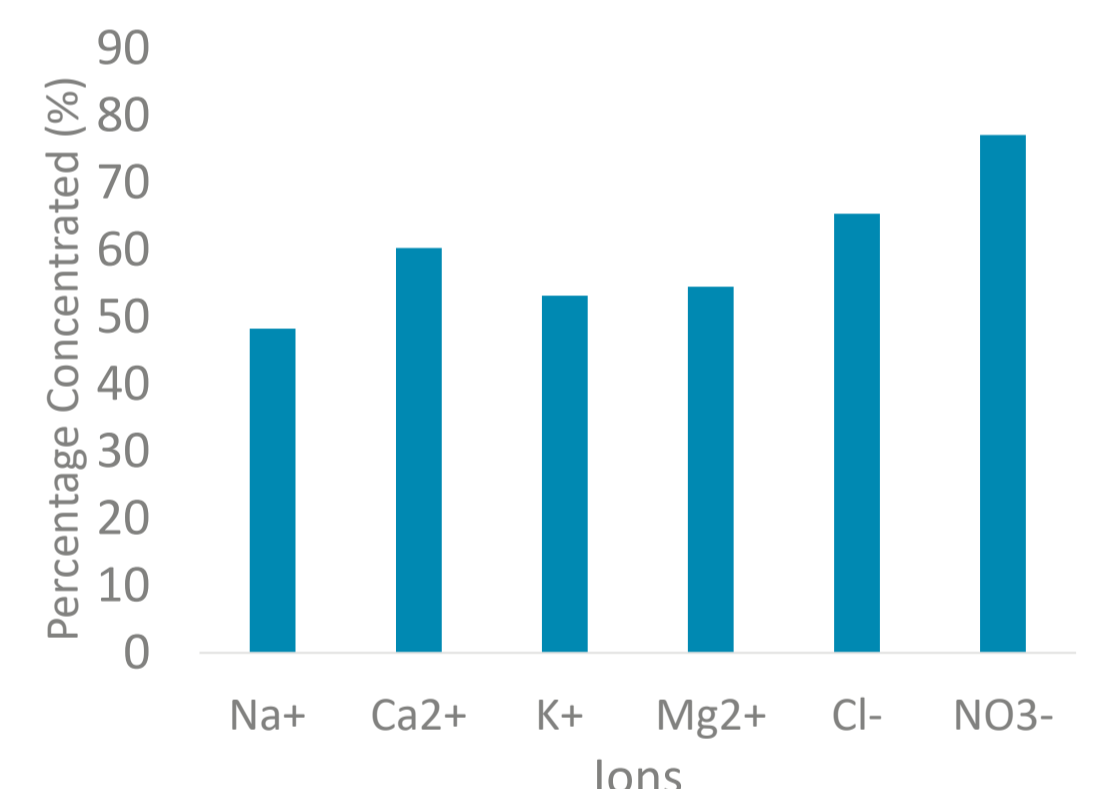

Fig 7. Ions concentrated for ED experiments with simulated greenhouse wastewater

→ ED operating parameters determined for treating greenhouse wastewater
→ Sodium separation observed with ion-exchange membranes (class 3 irrigation water quality reached)
→ Investigating selective membranes testing to optimize selective nutrient recovery (Na/K separation)
→ Lessons form lab-scale included in pilot designed and construction (0.1 m3/day)

Lessons Learnt

→ Pilot results are essential for feasibility assessment
→ Need to include innovation on selective membranes
  Comprehensive techno-economical analyses is crucial for uptake
→ Survey conducted shows that water and nutrients are not the main concern for the growers

Important for Replication

→ Performance for feed compositional and seasonal variability to be assessed
→ Generate data on long term performance
→ Business case feasibility