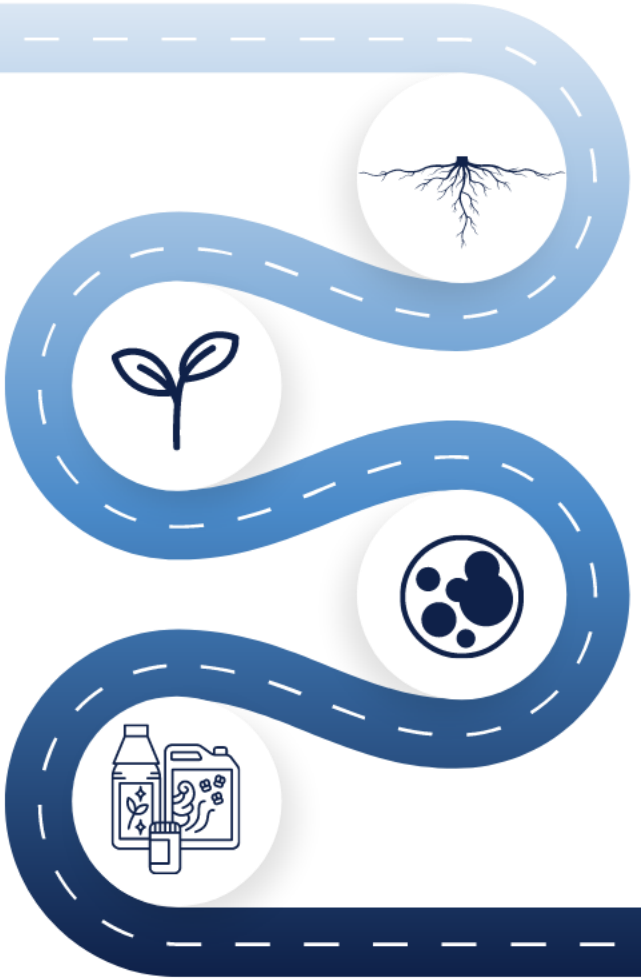
Innovative water solutions designed for horticulture

Fundamental Systems

What challenges are you facing?



ROOTS
Root problems caused by mold or oxidation

PRODUCTION
Crop loss or reduced production

WATER SYSTEM
Polluted water system, for example due to algae

SUBSTANCES
Many nutrients and/or chemicals are required

DIRECTIVES
WFD 2027
SDG's 2030

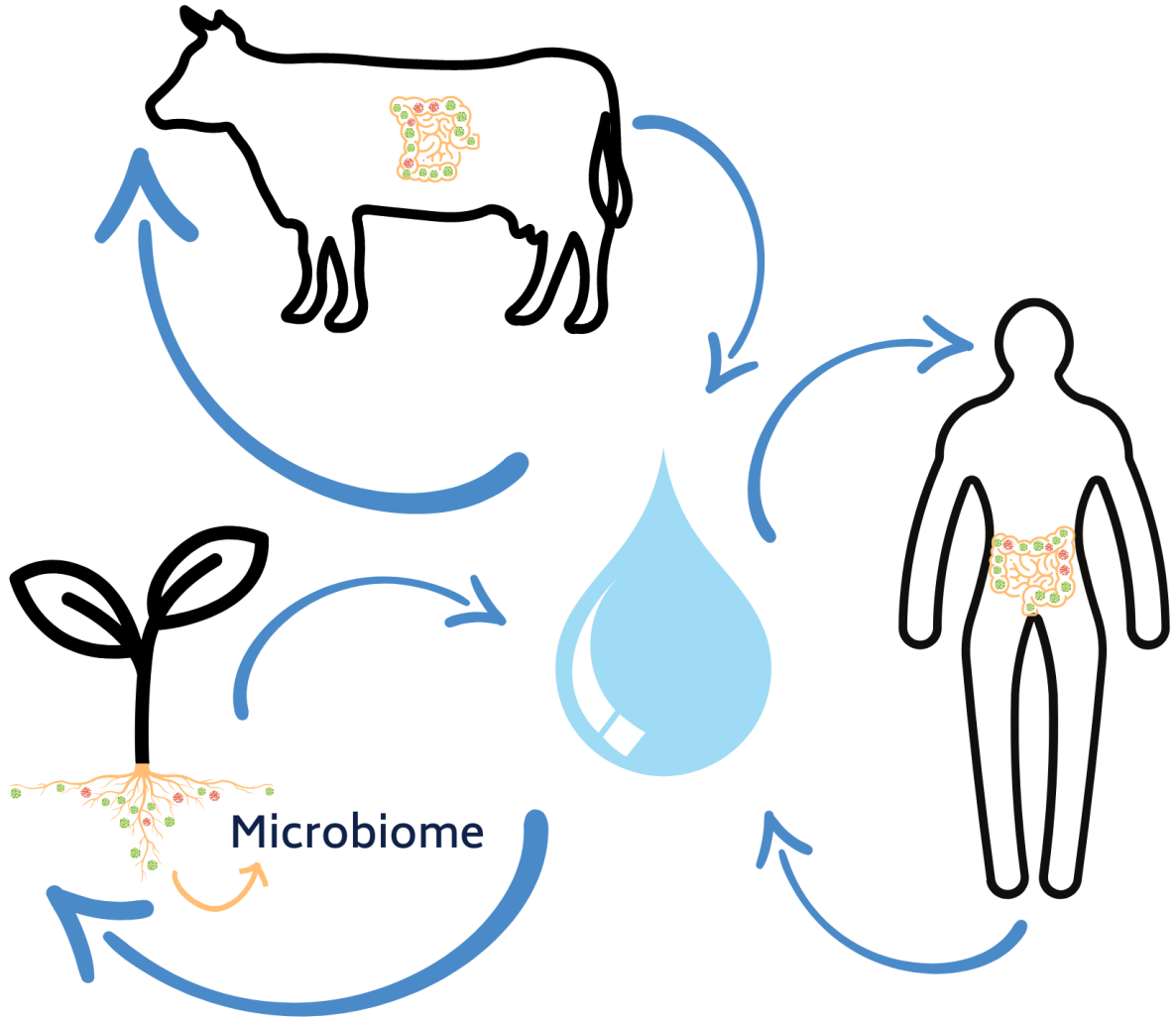
We bring people, animals, plants and their environment in balance with hydrogen and oxygen infused water.

People, animals and plants

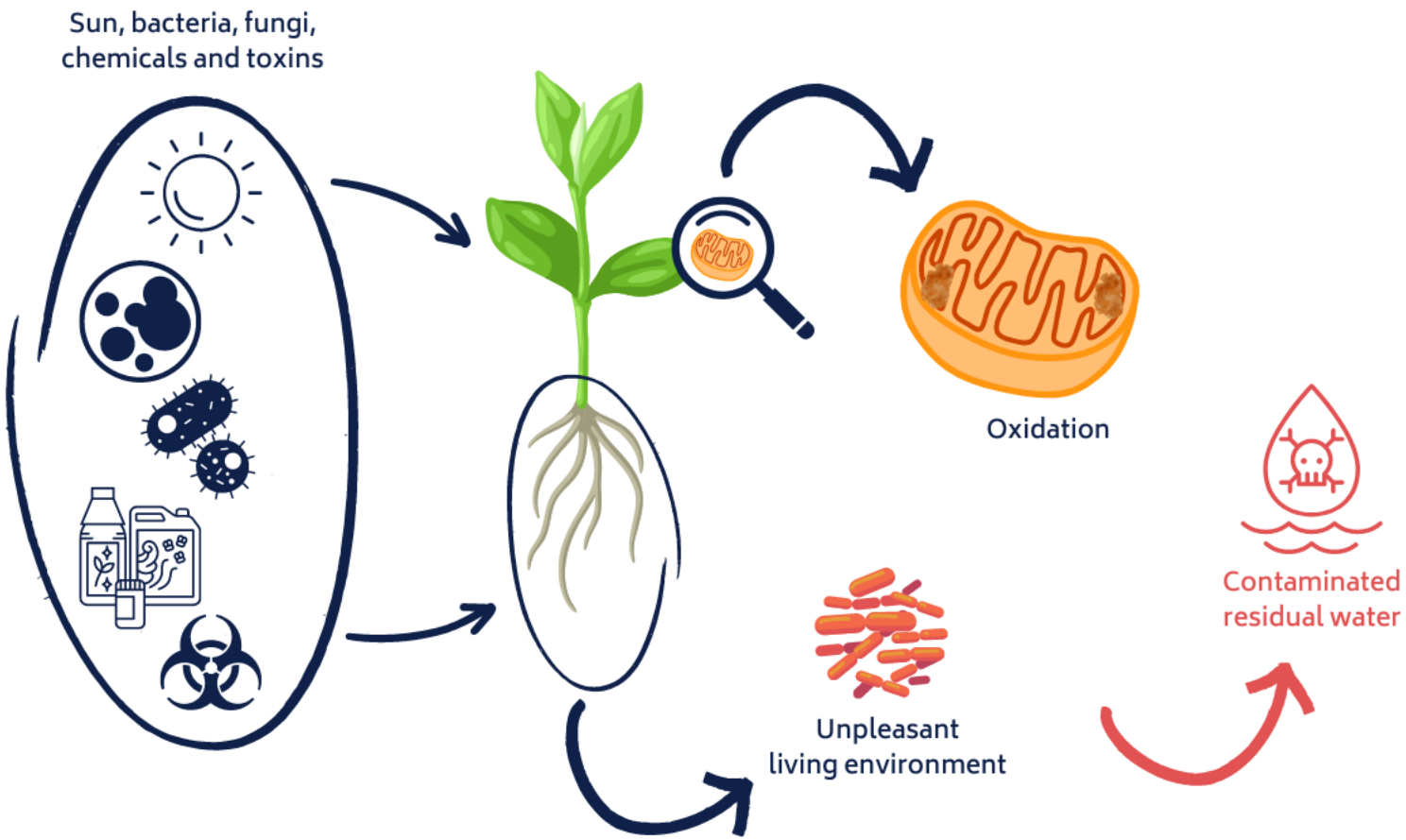
All life consists of a body with
a microbiome that absorbs food
and water and excretes residual substances. We are also all part of the same water system.

We focus on balancing regulated water systems with hydrogen and oxygen infused water.

This can contribute to complying with the EU regulations for circular water.



Unhealthy stressors

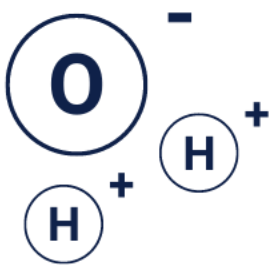


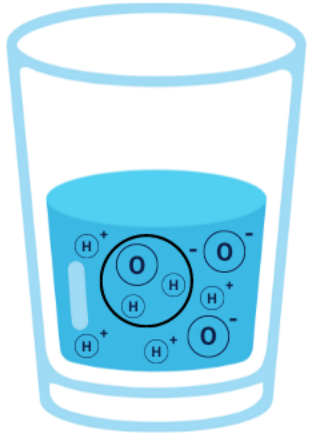
Our system infuses hydrogen and oxygen into water

Pure water

Molecular dissect

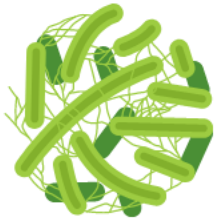
Oxygen and hydrogen



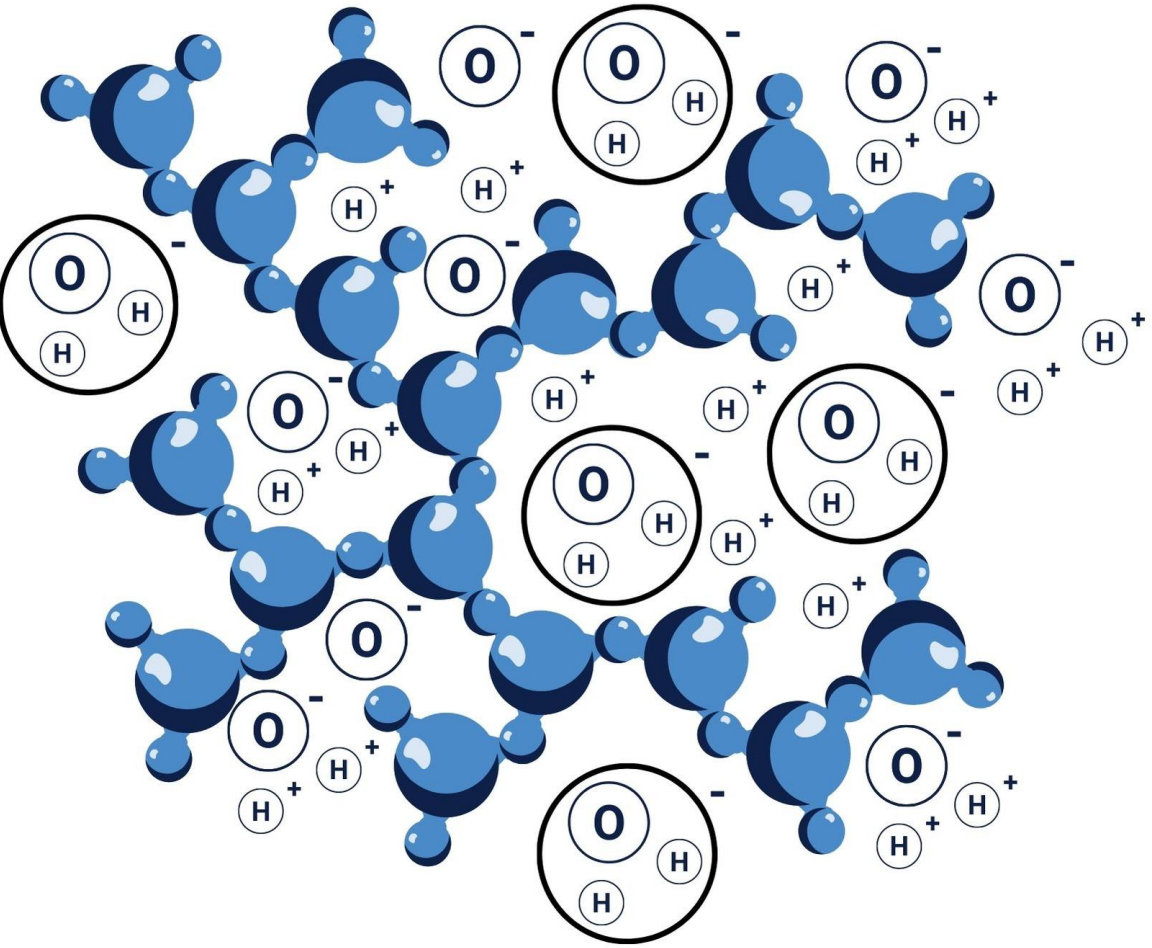


Dissolved and nano particles

Antioxidant



Invites good bacteria and other complementary organisms



Infused water with nano particles

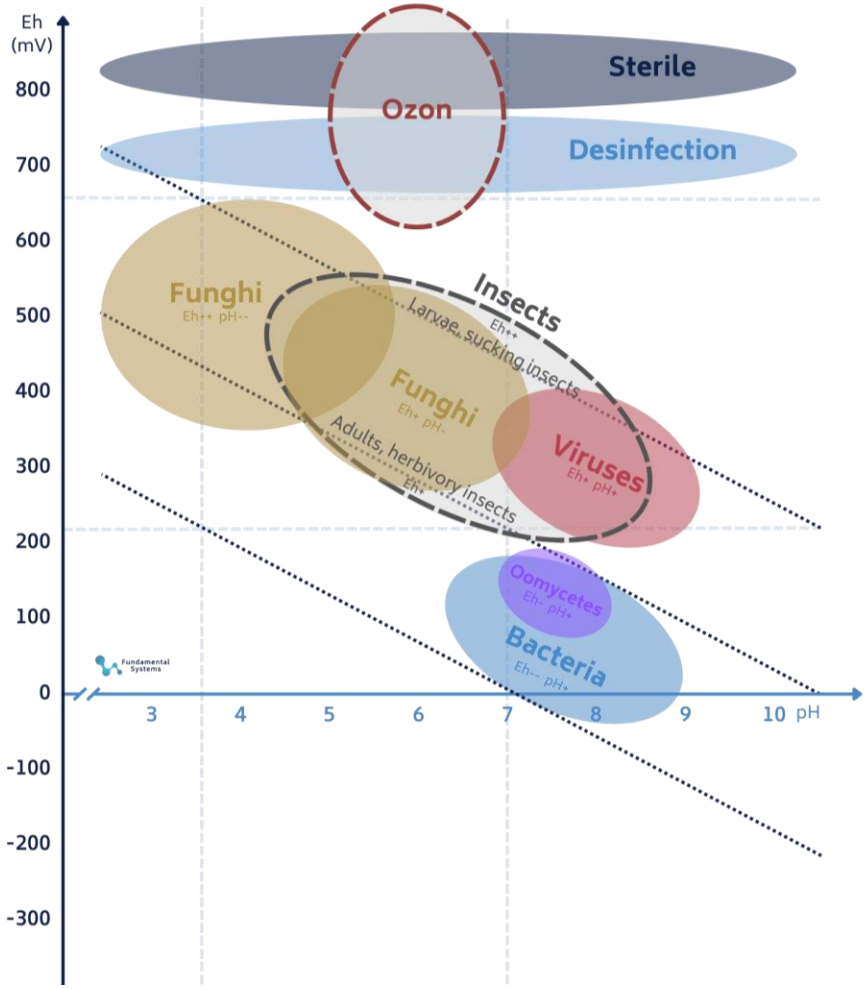
We make infused water with our forced dilution technology. This is water with dissolved hydrogen and oxygen molecules that can be absorbed directly.

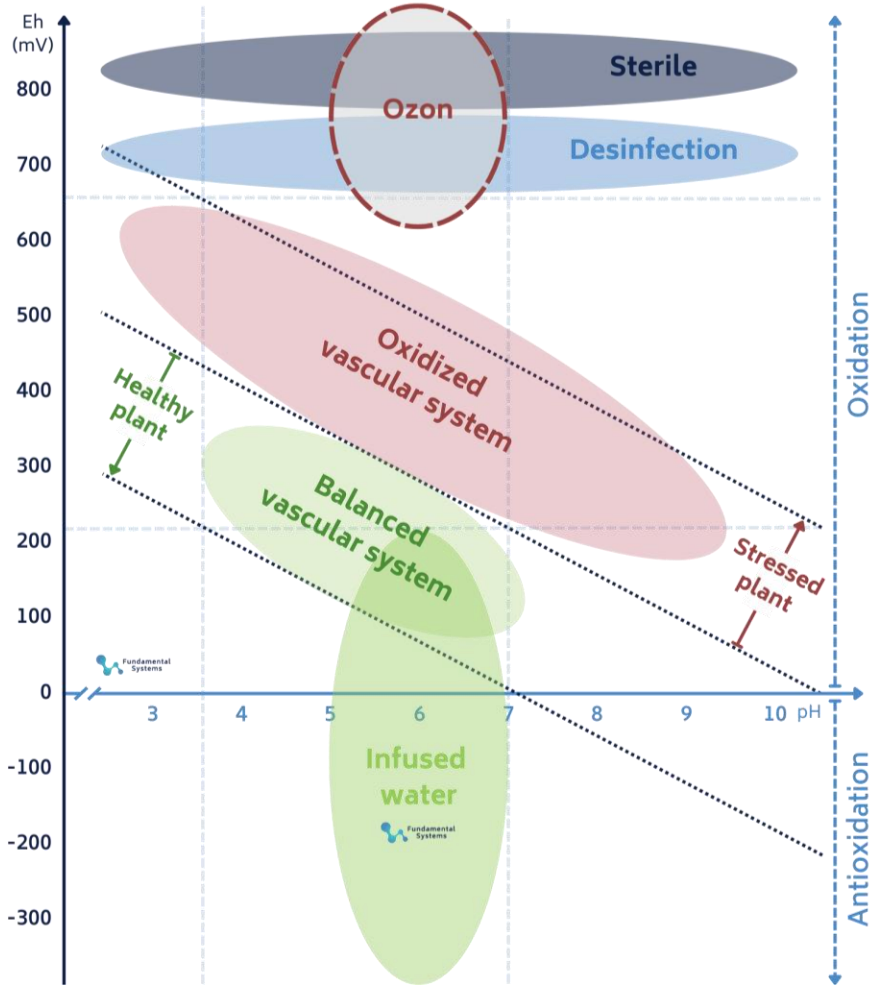
In addition, nano particles (80 Nm) allow us to add more hydrogen and oxygen and allow the molecules to travel further.

We can also enrich the water by dissolving other gases and liquids such as CO2, bases and acids.

Map of redox worlds

Eh-pH and plant health

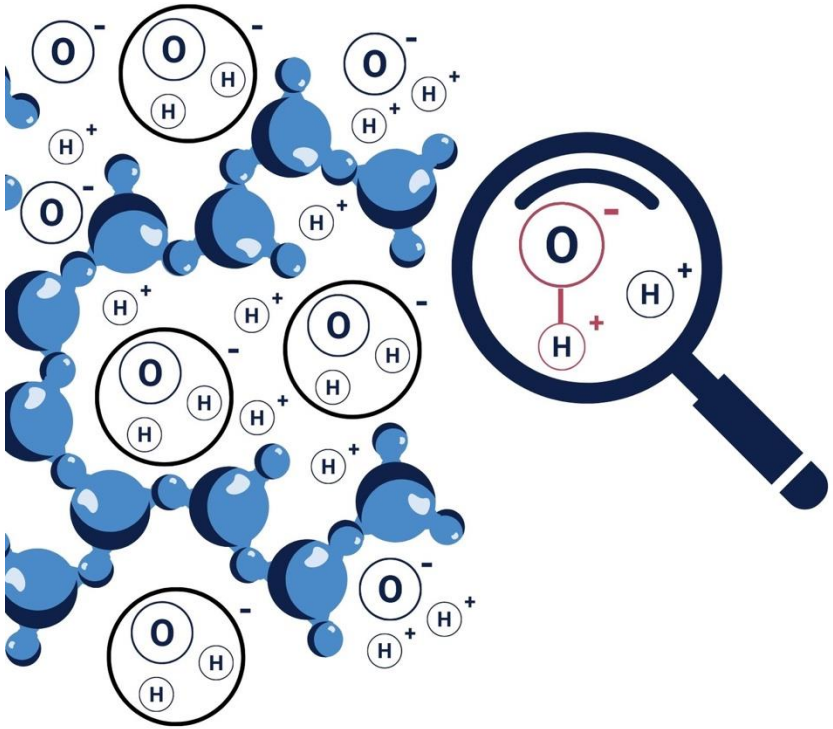




Oxidation

When an oxygen and a hydrogen molecule bind together, Hydroxyl (HO-) is formed.

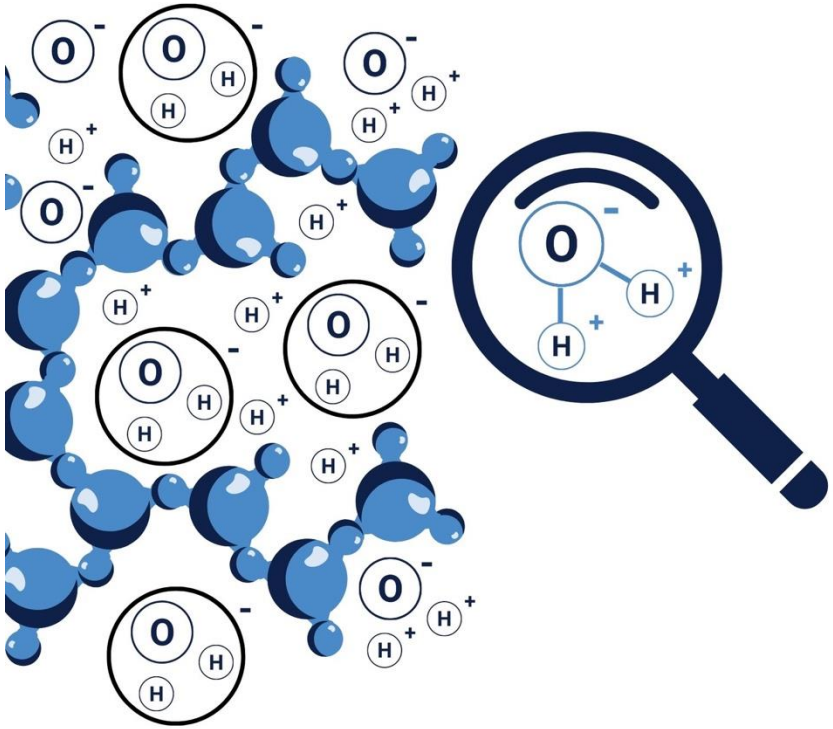
This is a free radical that can cause damage and this compound is irreversible.

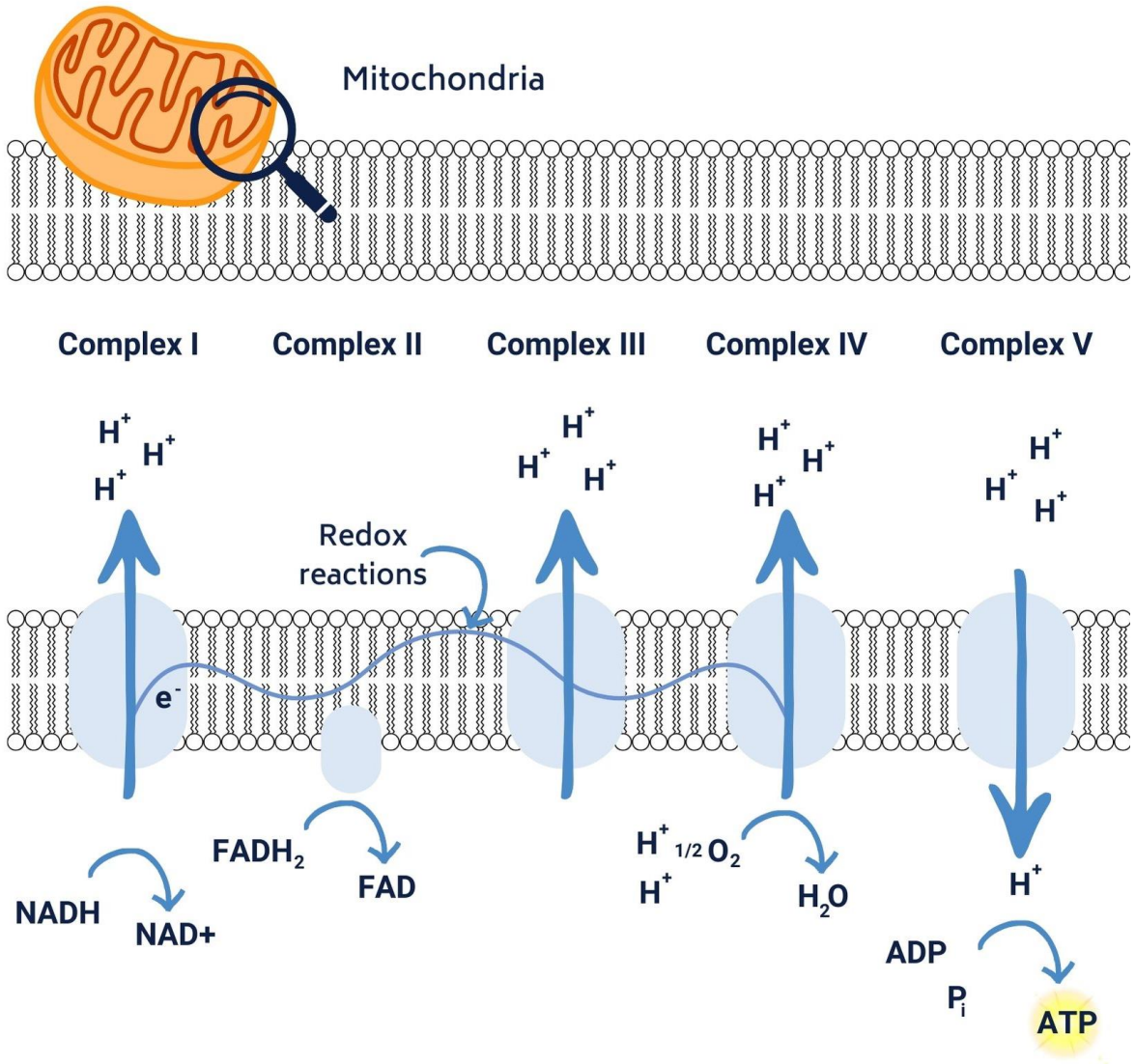


Hydrogen as antioxidant

Because there is sufficient hydrogen present, an H+ can bind to the free radical OH- and neutralize it by transforming into water (H2O). This reduces the oxidative stress.

This water is unique because it is coherent and cellular. This is called rejuvenating.





The mitochondria are the powerhouses of our cells

Energy production in mitochondria is complex. Different parts of the cell work together to break down nutrients.

The processing of glucose into energy (ATP) takes place in the mitochondria. If an oxidative imbalance occurs, the mitochondria work less well and the cell can eventually die.

By creating a good balance between oxidants and anti-oxidants, the redox reactions harm as less as possible and the cells remain healthy.

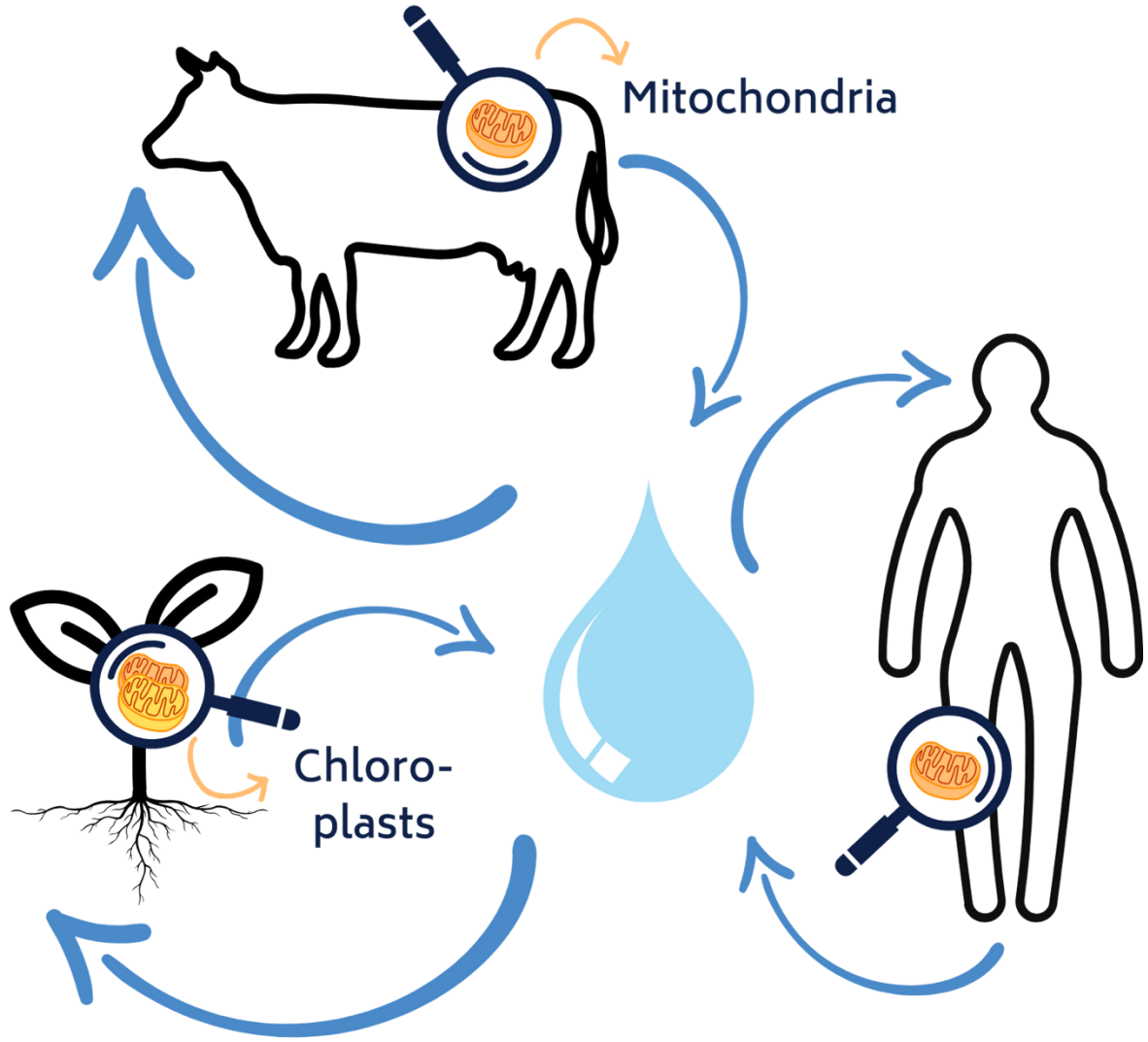
The goal is to achieve a balance between oxidants and antioxidants

Energy production in plant cells

All living organisms have mitochondria in their cells. Plants also have chloroplasts, this is where photosynthesis takes place.

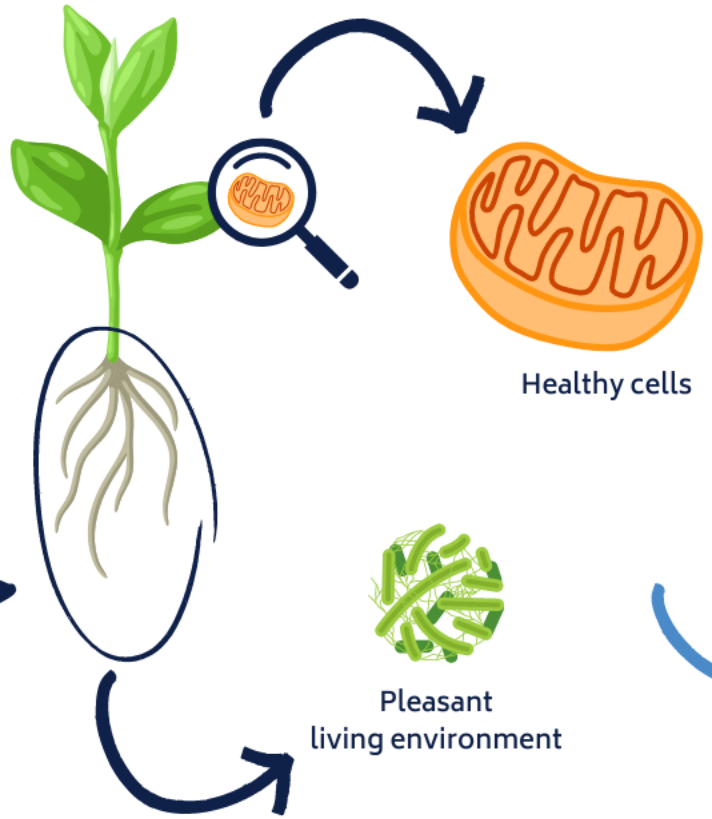
Mitochondria and chloroplasts work together, this helps plants to function efficiently under different light conditions.

Both forms of energy production are optimized by infused water.



Effects of infused water

Rain and tap water with infused water



Healthy cells

Clean residual water

Pleasant living environment

The advantages

Faster recovery from insufficient light

Higher resilience

Good bacteria and other complementary organisms in the microbiome

Better absorption of nutrition, therefore less or no fertilizer is required

Less or no chemicals and pesticides required

A healthy plant and circular water management

Effect of water treatment

- Temp 22,0
- SPC 1.03 -mS/cm
- C 0.98 -mS/cm
- PH 8.67
- PH –84.4 MV
- DO 82.5 %
- DO 7.19 Mg/L
- ORP 670.2.4

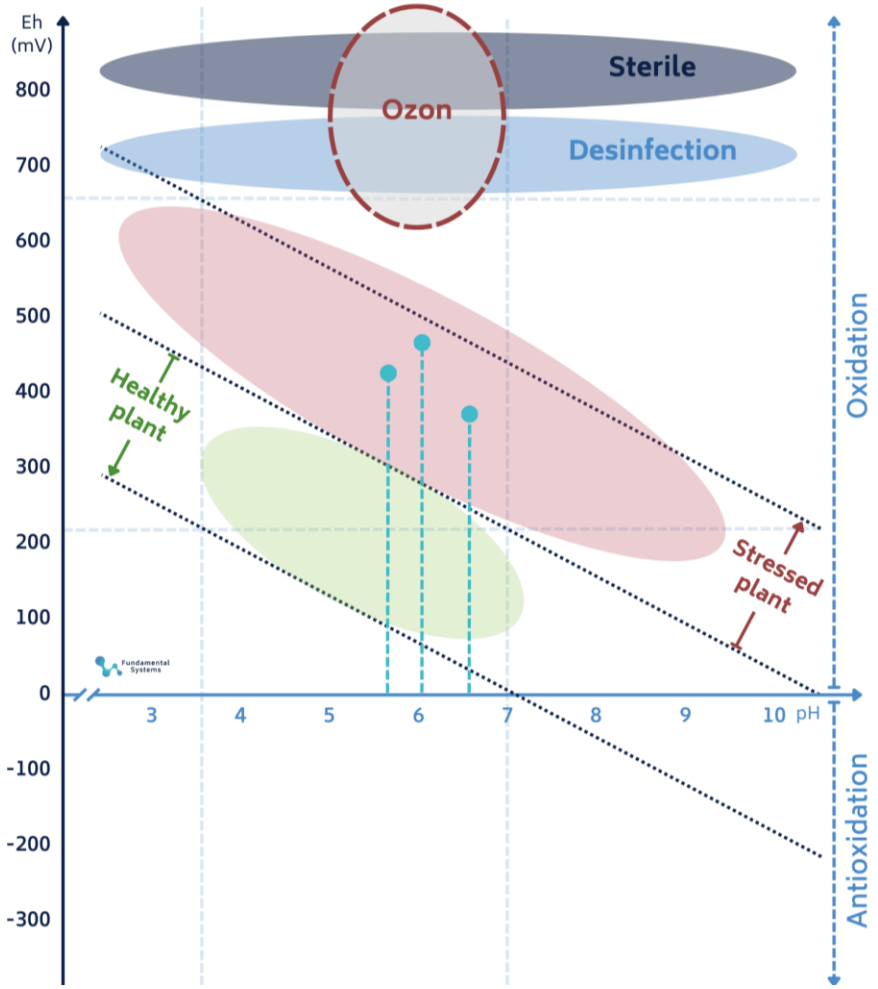
- Temp 26,6
- SPC 2.63 -mS/cm
- C 2.71 -mS/cm
- PH 6.21
- PH 51.5 MV
- DO 195,5 %
- DO 15.66 Mg/L
- ORP - 255.4

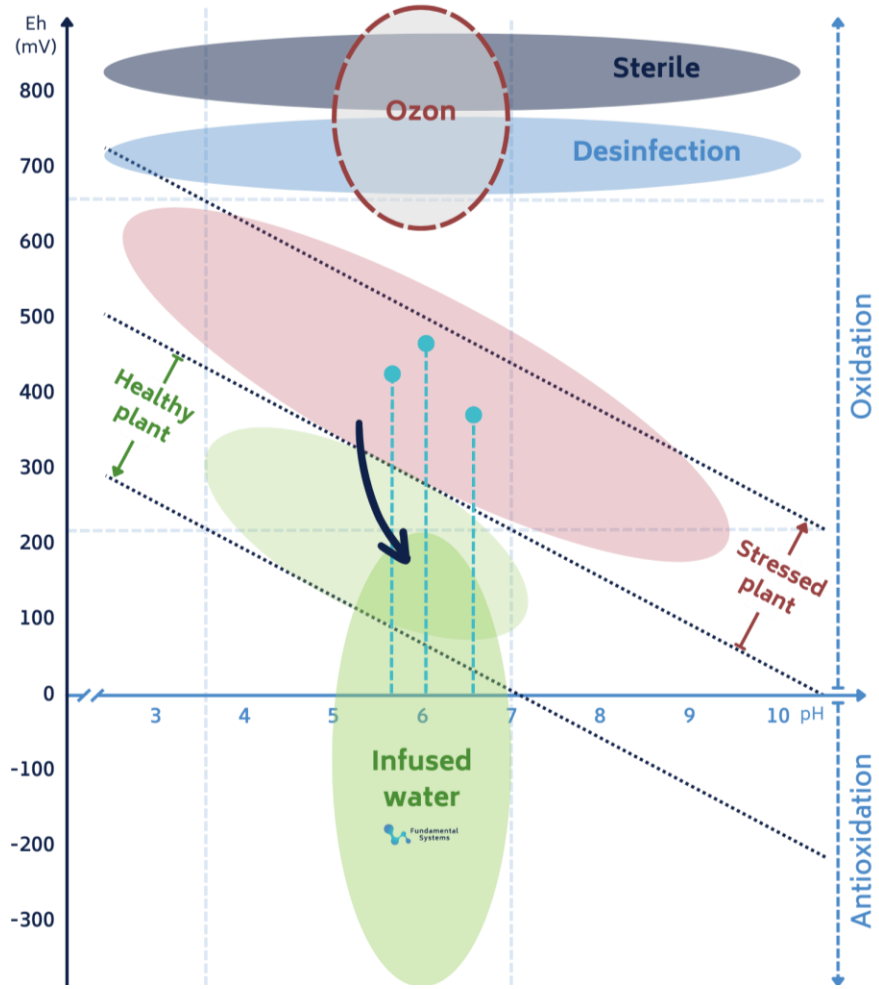
Oxygen

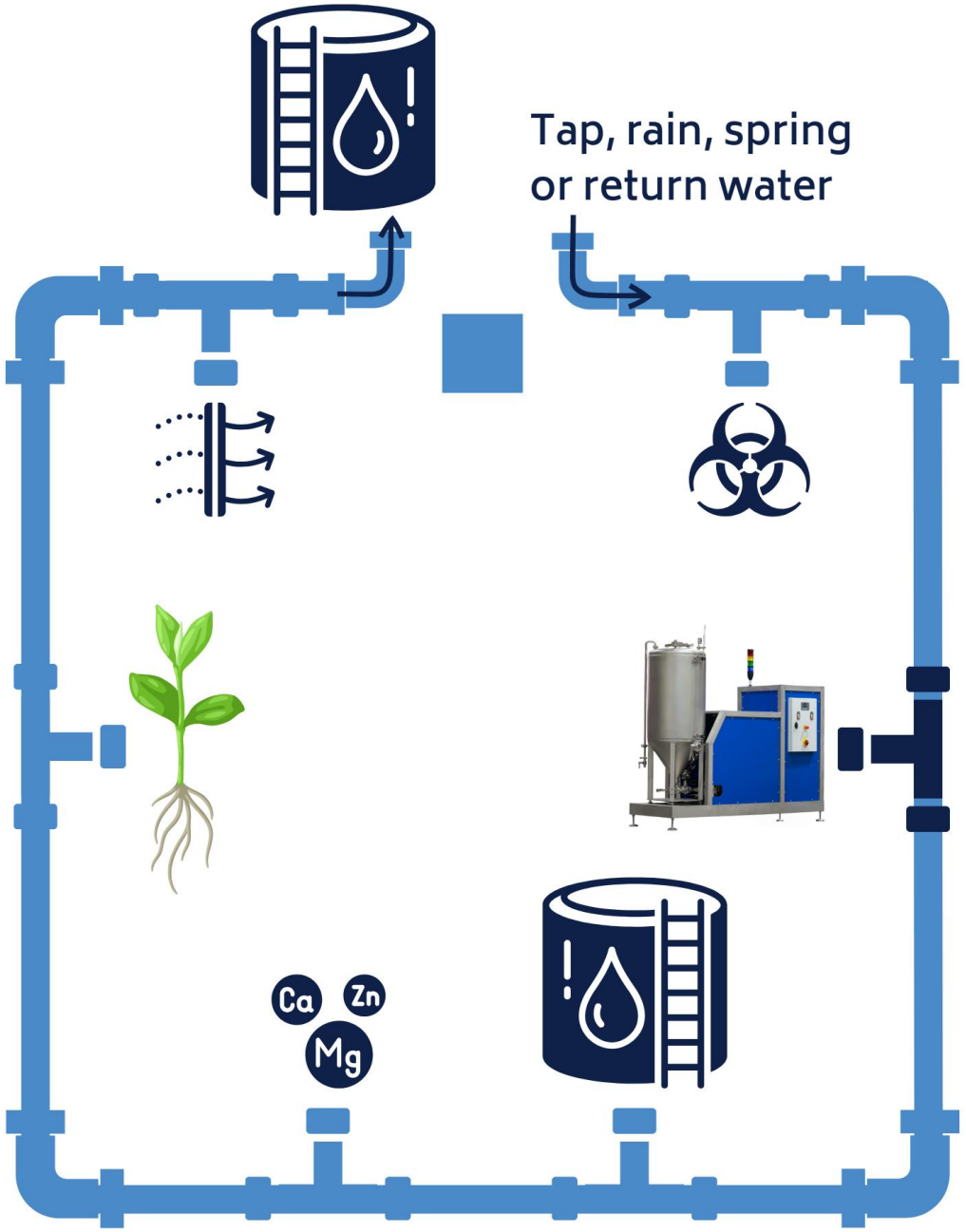
Hydrogen

Map of redox worlds

Eh-pH and plant health



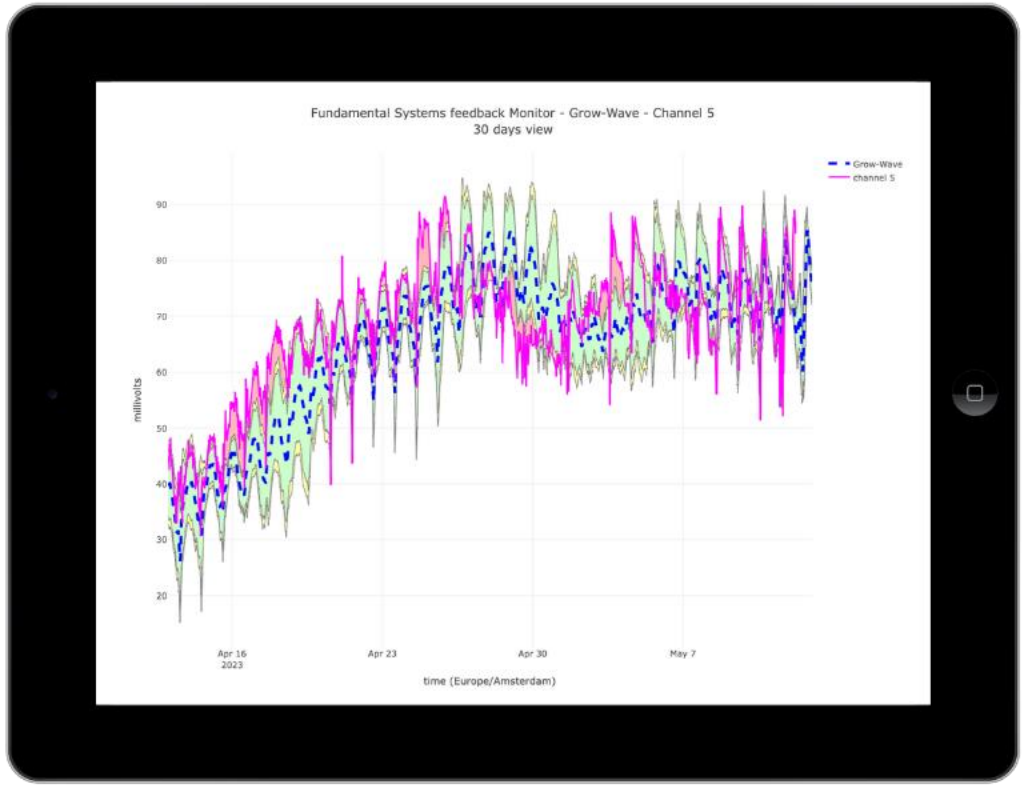


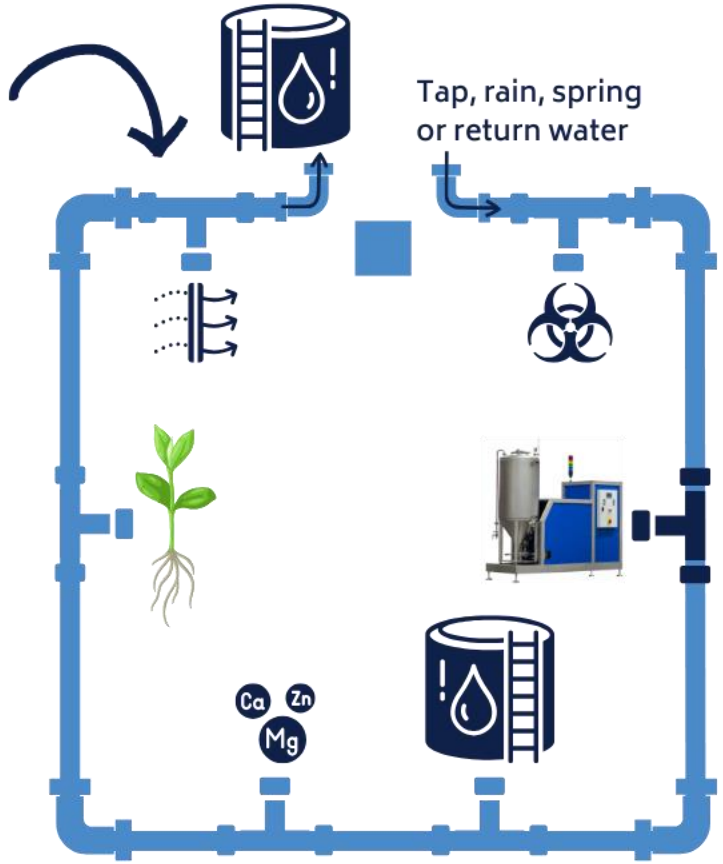


Integration of the system

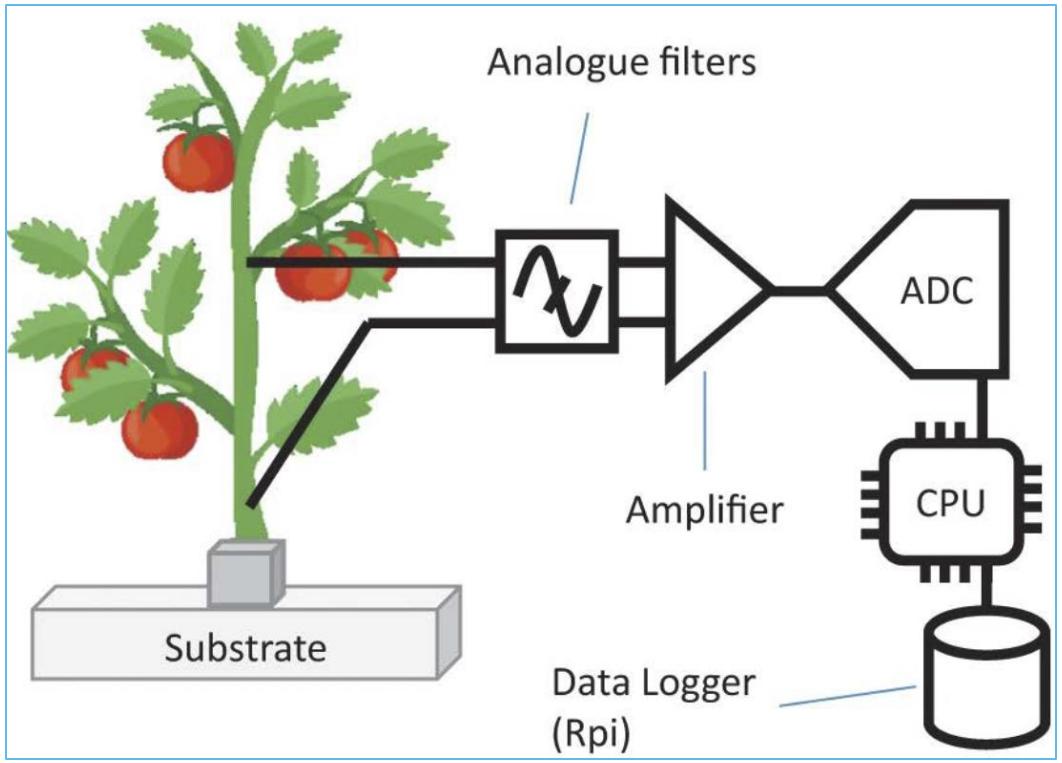
- Customized and integrated into existing water system
- Low footprint and floor space
- Cloud based
  - Real-time insight
  - From reactive to proactive
  - Continuous improvement
  - Research partners

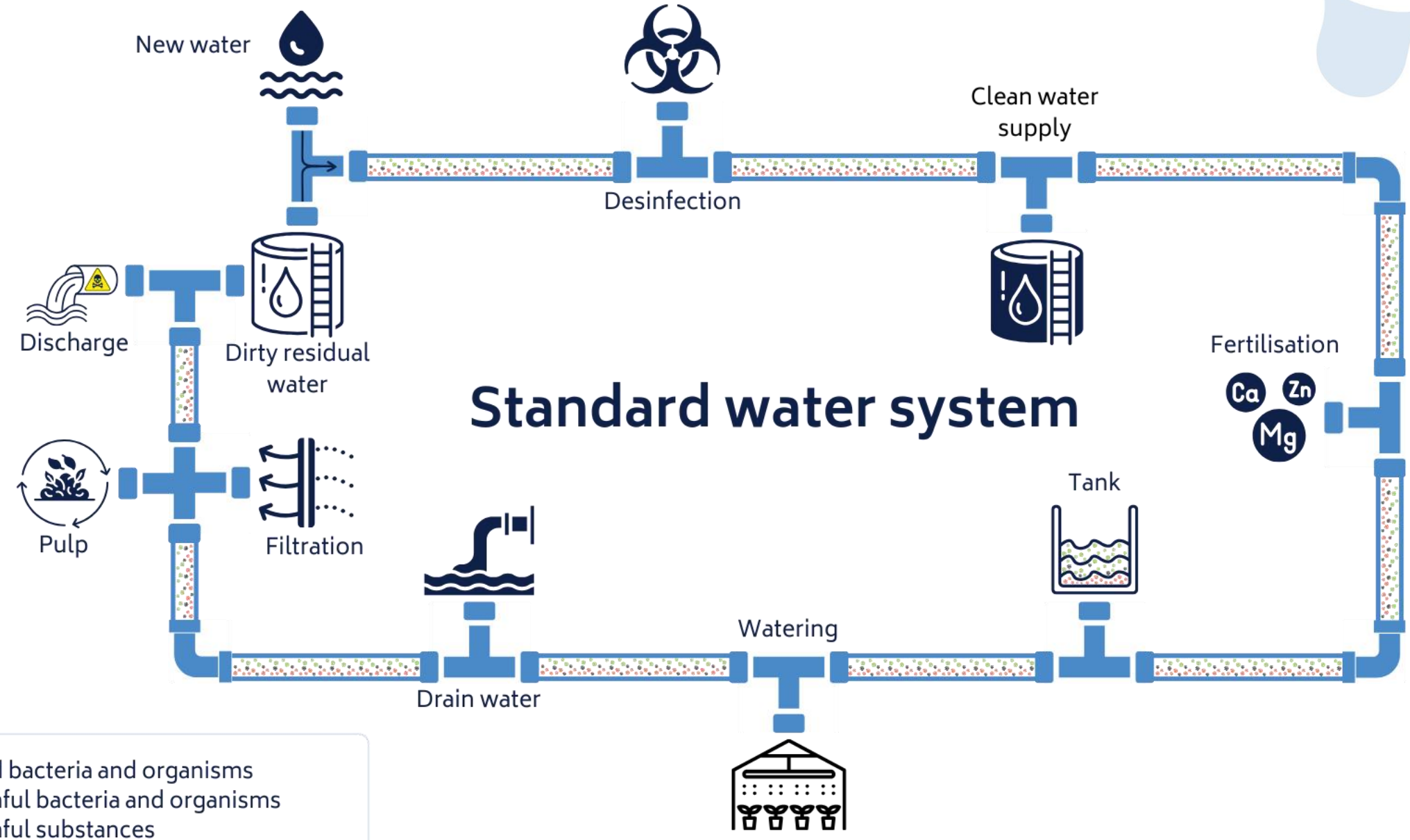
Possibility of real-time biofeedback

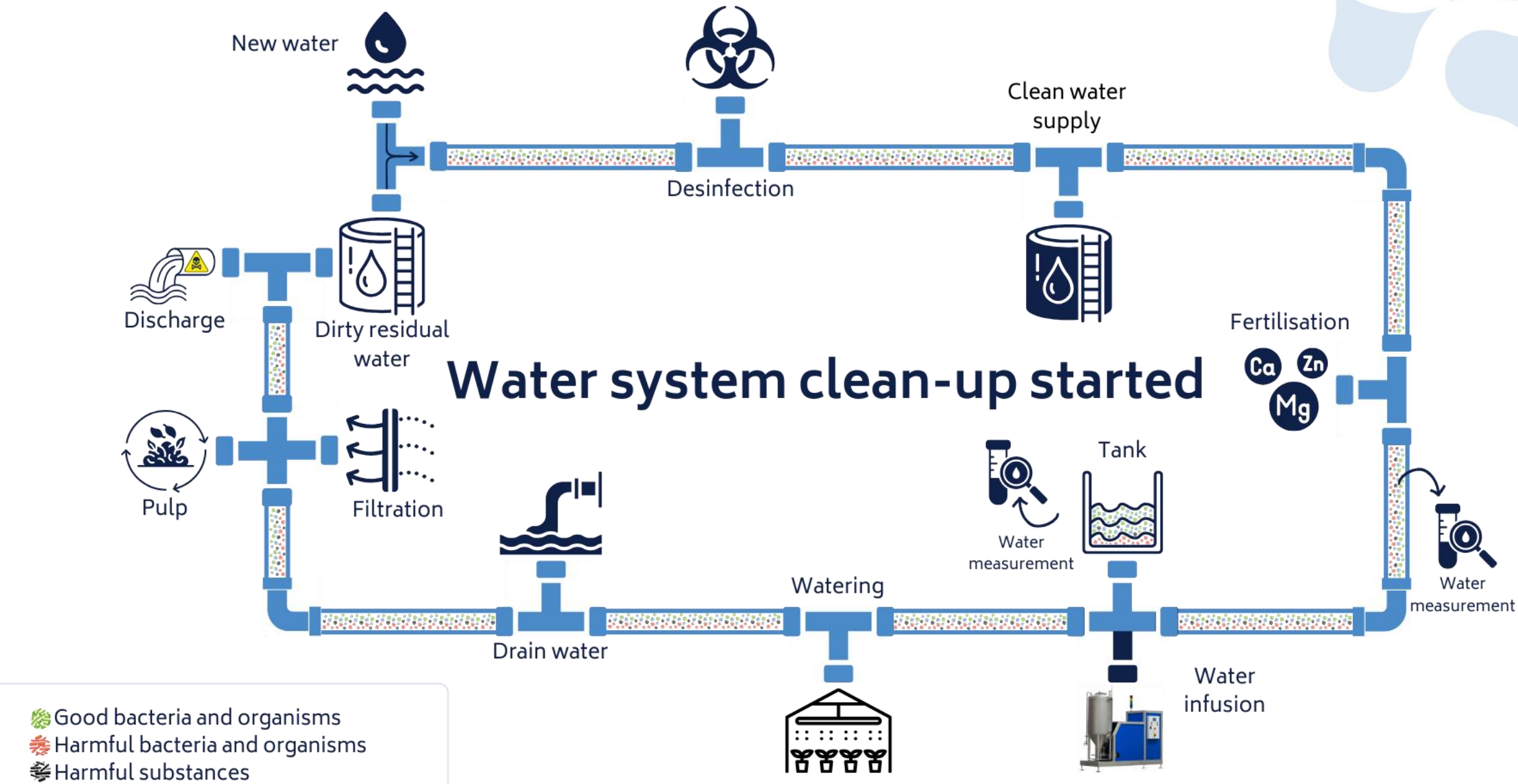




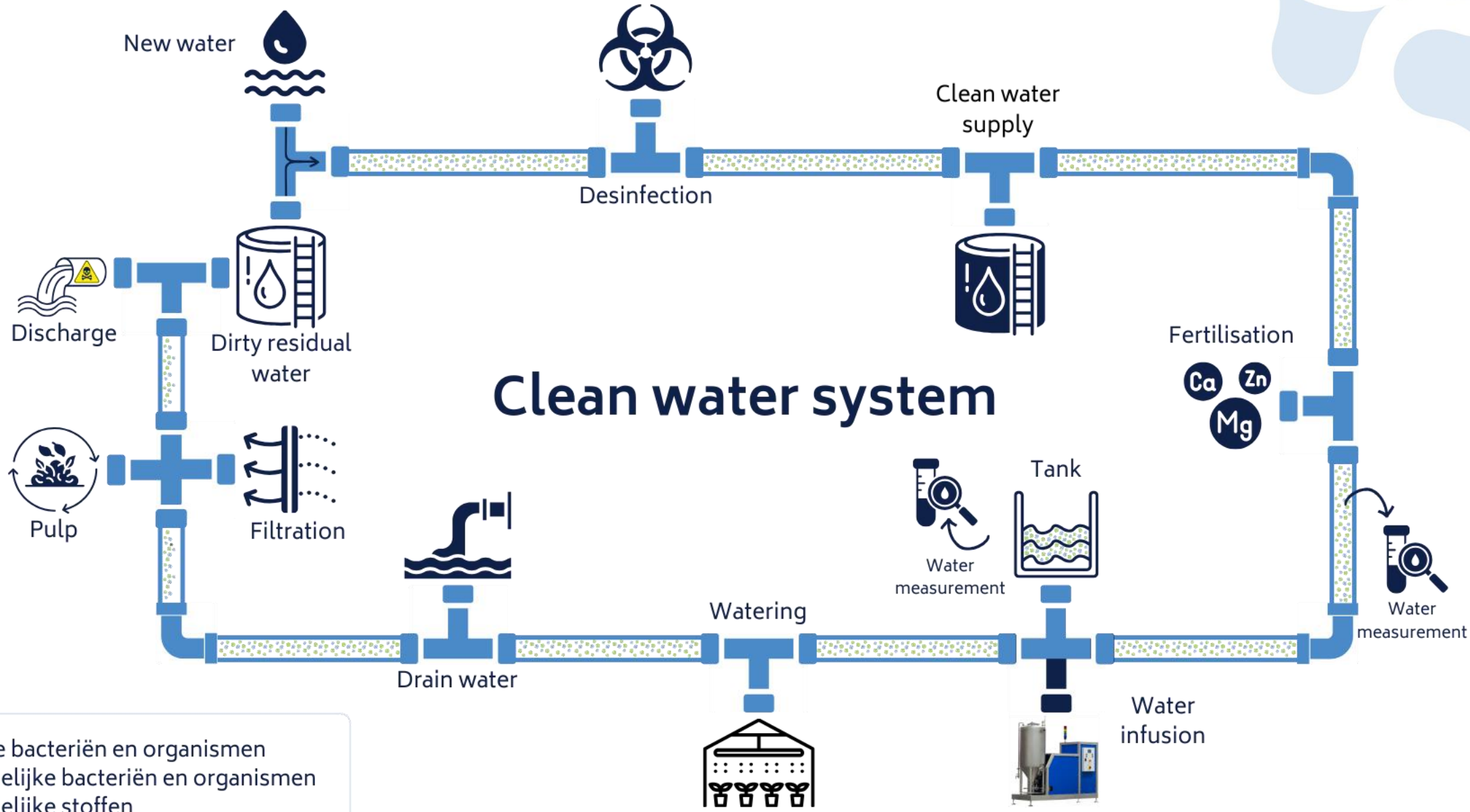
Biofeedback




New water
Desinfection
Clean water supply
Discharge
Dirty residual water
Fertilisation
Ca
Zn
Mg
Standard water system
Pulp
Filtration
Tank
Watering
Drain water
Good bacteria and organisms
Harmful bacteria and organisms
Harmful substances
Hydrogen and oxygen

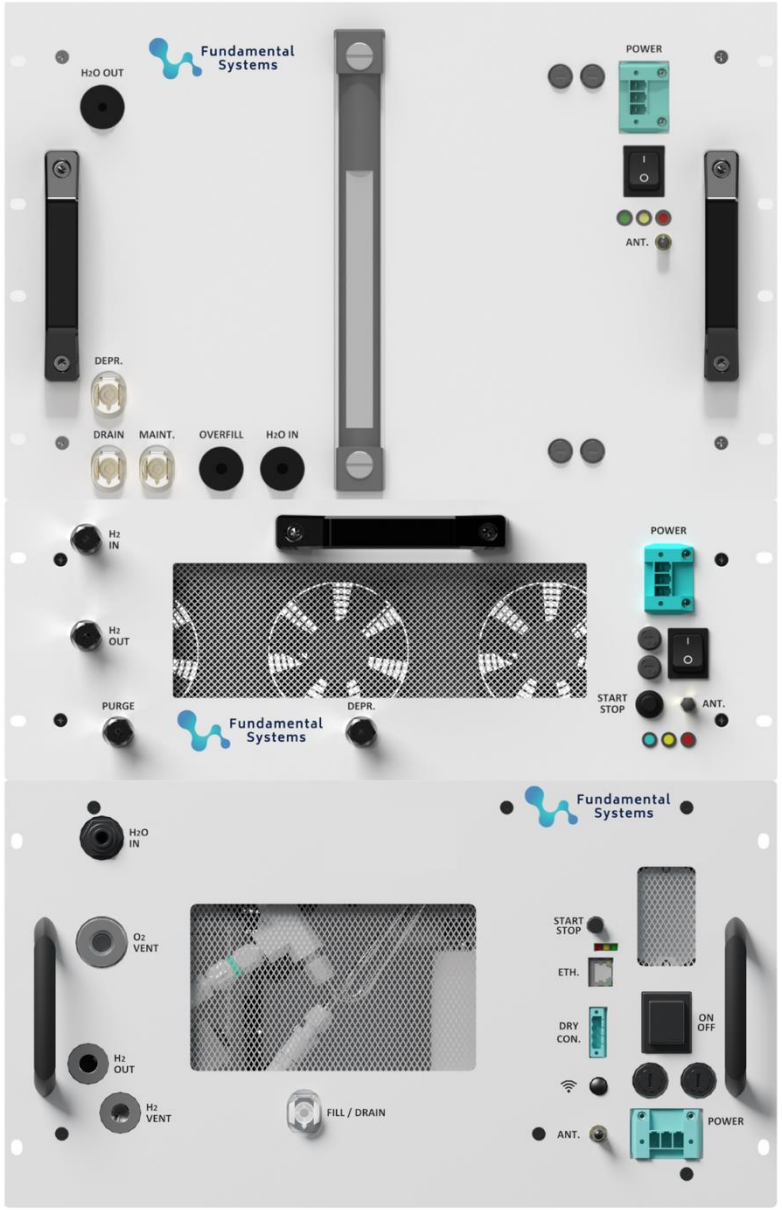

New water
Desinfection
Clean water supply
Discharge
Dirty residual water
Water system clean-up started
Fertilisation
Ca
Zn
Mg
Pulp
Filtration
Tank
Water measurement
Water measurement
Drain water
Watering
Water infusion
Good bacteria and organisms
Harmful bacteria and organisms
Harmful substances
Hydrogen and oxygen

Clean water system



- Goede bacteriën en organismen
- Schadelijke bacteriën en organismen
- Schadelijke stoffen
- Waterstof en zuurstof

Our systems



Modular system

- Electrolyser: stackable and flexible system to produce hydrogen and oxygen on site
  - 2,5 kW nominal
- Dryer: increases the hydrogen purity to 99,999%
  - 200 watt nominal
- Water tank: provides storage for 38 liters of demineralised water for the electrolyser
  - 35 watt nominal

Basic skid

Our basic skid treats tanks from 100,000 litres of water. By adjusting the recipe, one skid can infuse tanks of up to 1,000,000 litres.

Is the required quantity larger? Then multiple skids can be used, centrally or decentrally.

Our products are designed and assembled in the Netherlands. In addition, they comply with all relevant European standards and regulations.

Sample setup

Sample setup

Research results

Cultivation trials

We conducted research on tulips and tomato plants during six months in collaboration with Vivent, Vertify, STOWA and students of the Tesla Minor Team from the University of Amsterdam.

One half of the crop was treated with infused water and the other half acted as a control group. The crops were treated with infused water containing 67% hydrogen and 33% oxygen.

The cultivars

Crop **Tomato**	Name **Bronsino F1**
Type **Bunch**	Fruits per bunch **5, joined**
Type of plant **Powerful and brief**	Tolerance **Si**
Shape **Round**	Weight **130-150 gr**
Resistances HR **ToMV:0-2/Ff:A-E/Fol:0,1/For**	Resistances IR **TSWV/On**

Crop **Tulip**	Name **Strong Gold** **Purple Prince** **Silver Dollar**
Size **10-11**	
Length **42 cm**	Root length **5 cm**
Weight **25 gr**	Weight per cm **0,6 gr**
Dropout **1,8%**	Remarks **No ruptures** **Firmer leaves**

Tomato

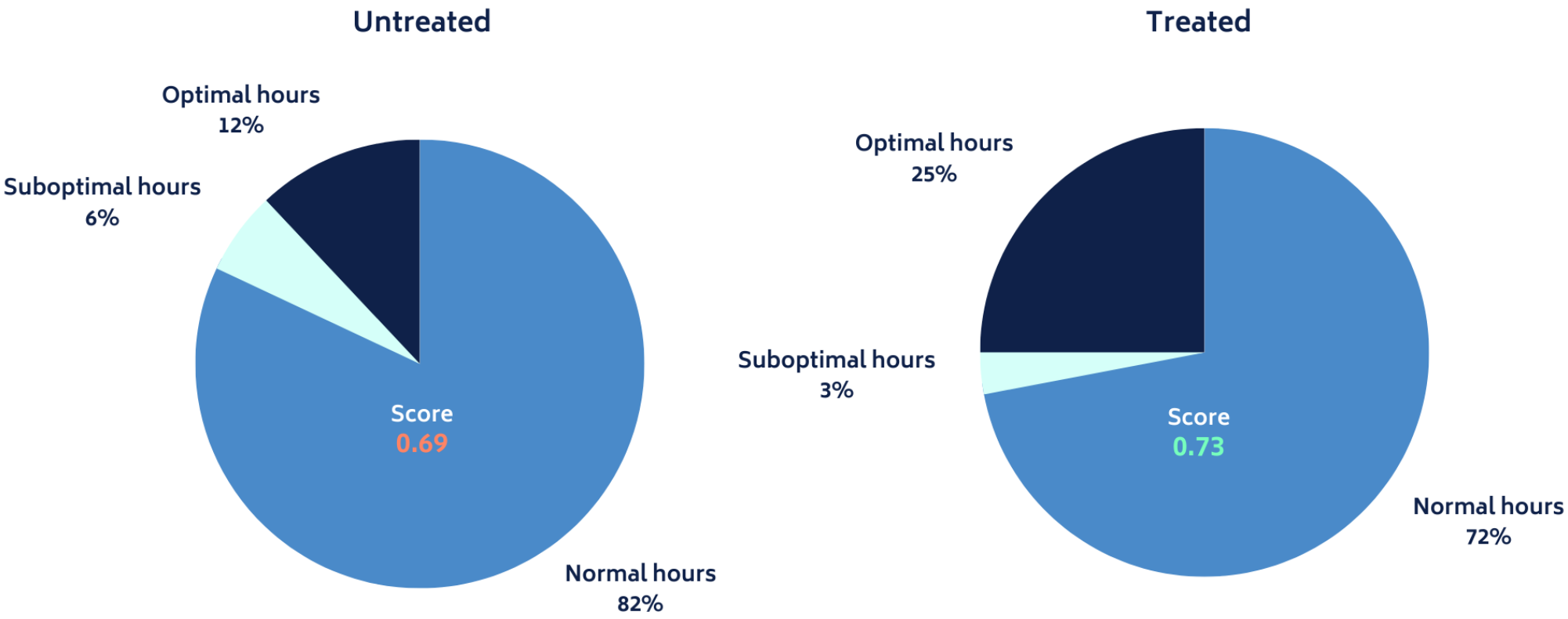
- Full life cycle: from seed to harvest
- Drip irrigation in a greenhouse
- Effect of treatment on plants measured via biofeedback
    - Plant rhythm and activity profile measured
    - Despite exposure to high stress, crops remained good quality
    - Analysis by Vivent’s plant scientists

Untreated

Treated

Plant rhythm score tomato

"Treated plants have a more stable plant rhythm, a stong link to big changes in climate" – Team Vivent



Key takeaways

- Treatment helps in reducing plant response to stressors and changes in climate and stressors: they gain higher resilience

- Treated plants
  - Have a more stable plant rhythm
  - Show higher activity
  - Have a higher yield:
    - +12% harvested weight per plant
    - +10% more tomatoes per plant

Key takeaways

In the treated plants, we saw a higher

- Nutrient index balance
- Photosynthetic activity

And they required less

- Chemical intervention
- Plant protection products

No negative effect was found from water infusion on the

- Plant
- Microbiome around the roots
- Water balance
- Composition of nutrients

Tulips

Full production cycle with semi-eb and flood system in crates with overflow

Water

- Circular water system
  - Brew and pull
- Microbiome shifted to bulbous
- No intervention in water necessary
- Nutrients unaffected by infusion

Root system

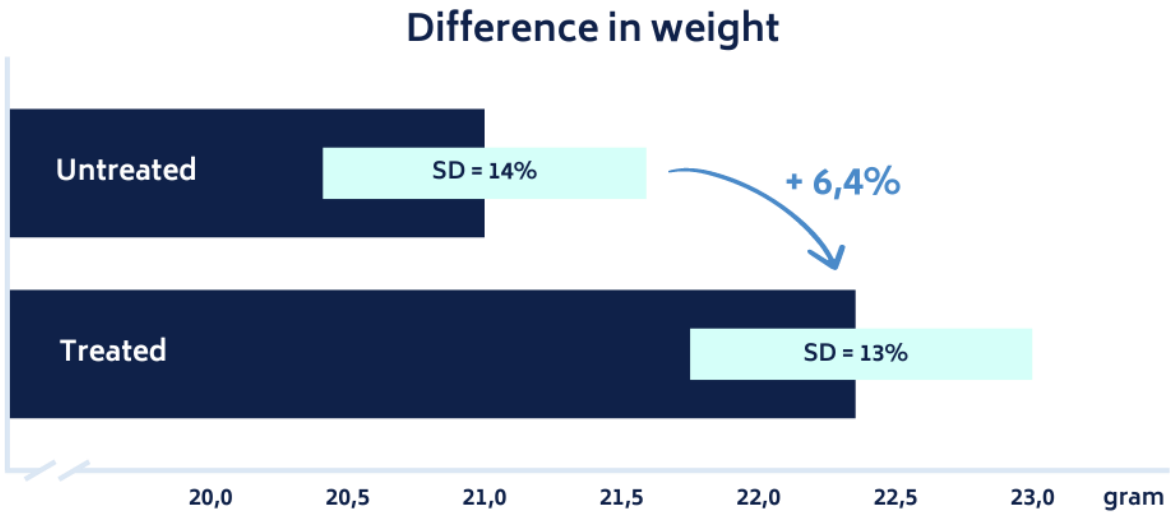
- Smaller root development
- White fresh roots
- More energy from bulb for growth

Results from the field

Tulips forager Wesselman Flowers has started working with our system. Together we tested what effect the treated was has on his tulips. We gave half of the bulbs treated water and the other half untreated water.

The treated tulips:

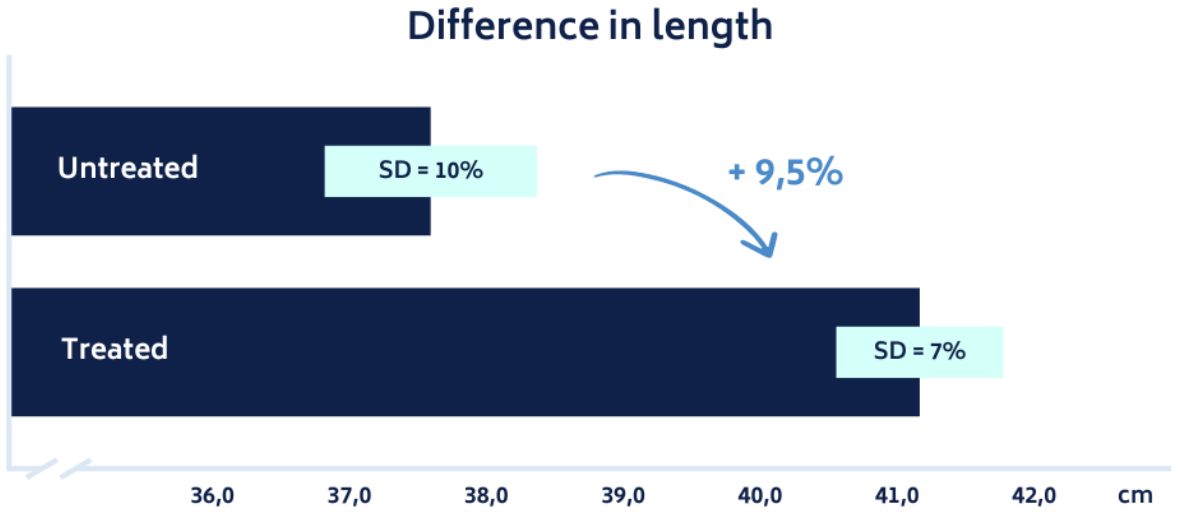
- Were heavier, longer and more uniform
- Had less phenolic pressure and lower failure rate
- Had higher root quality and smaller root development



The results

Wesselman flowers

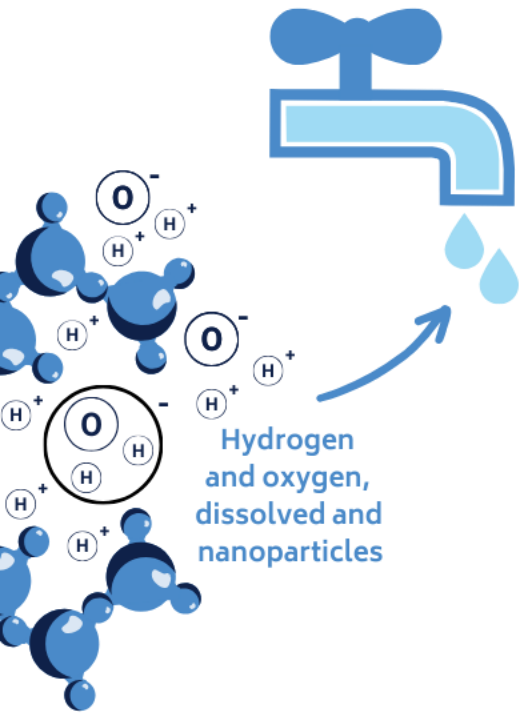
Partner Tulpen.nl



Recap

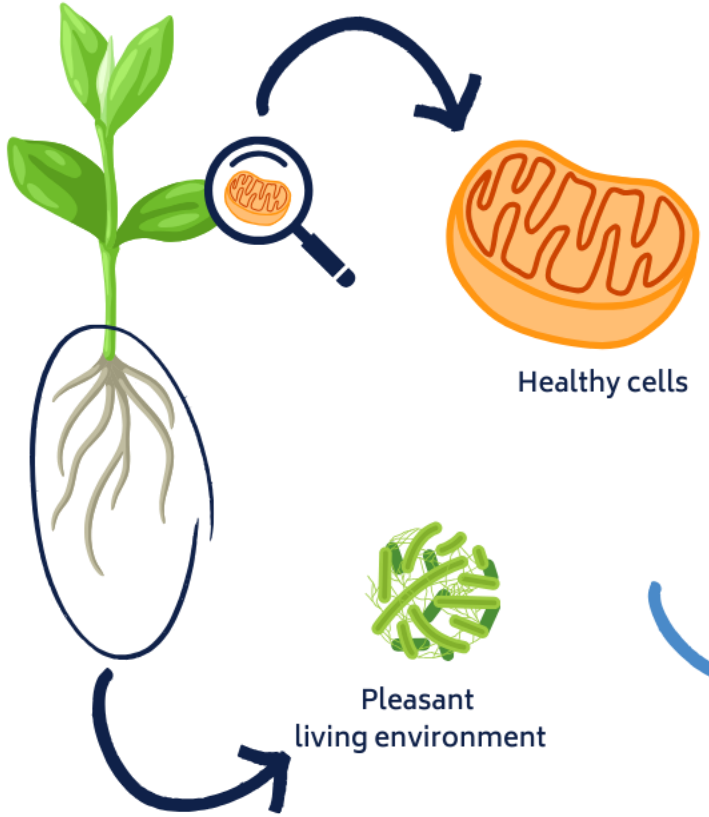
This is how our water treatment works

Rain and tap water with infused water



Hydrogen and oxygen, dissolved and nanoparticles

Antioxidant



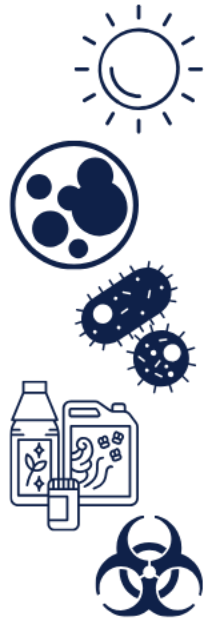
Healthy cells

Pleasant living environment

Clean residual water

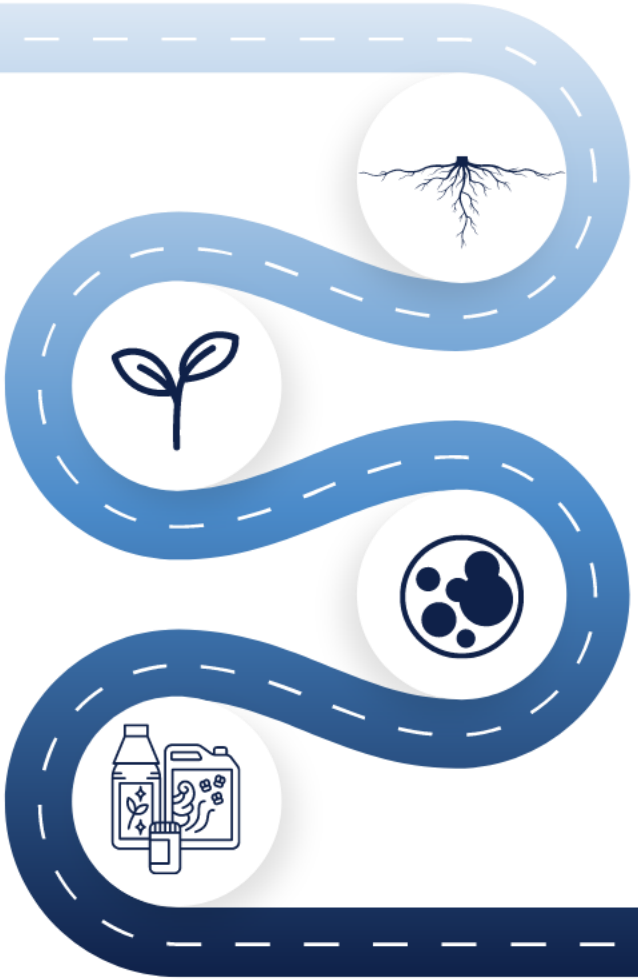
A healthy plant and circular water management

The advantages



- Faster recovery from insufficient light
- Higher resilience
- Good bacteria and other complementary organisms in the microbiome
- Better absorption of nutrition, therefore less or no fertilizer is required
- Less or no chemicals and pesticides required

The benefits of our water treatment



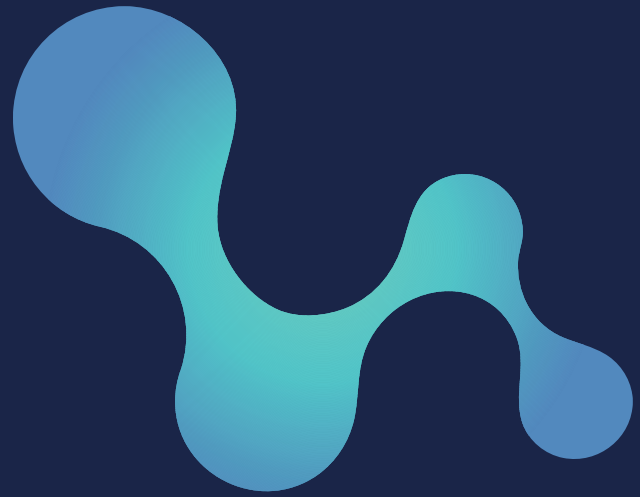
ROOTS
Good rooting with healthy, small root package

PRODUCTION
Greater expression with up to 15% more yield

WATER SYSTEM
Circular water system, only coarse filter cloth needed

SUBSTANCES
Minimal interventions, no negative impact on nutrients

DIRECTIVES
WFD 2027
SDG's 2030



Fundamental
Systems