

# Greenhouse horticulture and the Circular Economy

Our vision and goals for future research

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WAGENINGEN  
UNIVERSITY & RESEARCH



Circular  
Horticulture





# SUSTAINABLE DEVELOPMENT GOALS

1 NO POVERTY



2 ZERO HUNGER



3 GOOD HEALTH AND WELL-BEING



4 QUALITY EDUCATION



5 GENDER EQUALITY



6 CLEAN WATER AND SANITATION



7 AFFORDABLE AND CLEAN ENERGY



8 DECENT WORK AND ECONOMIC GROWTH



9 INDUSTRY, INNOVATION AND INFRASTRUCTURE



10 REDUCED INEQUALITIES



11 SUSTAINABLE CITIES AND COMMUNITIES



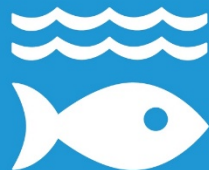
12 RESPONSIBLE CONSUMPTION AND PRODUCTION



13 CLIMATE ACTION



14 LIFE BELOW WATER



15 LIFE ON LAND



16 PEACE, JUSTICE AND STRONG INSTITUTIONS



17 PARTNERSHIPS FOR THE GOALS



SUSTAINABLE DEVELOPMENT GOALS



2 ZERO  
HUNGER



# Productivity & Nutrition





# Development & Export





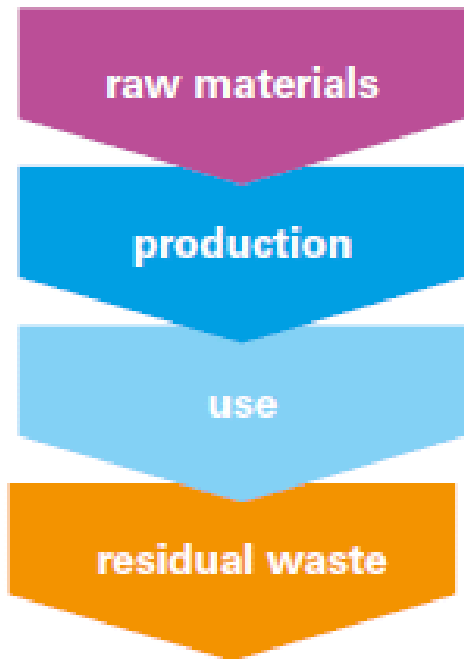


# Efficiency and Sustainable management

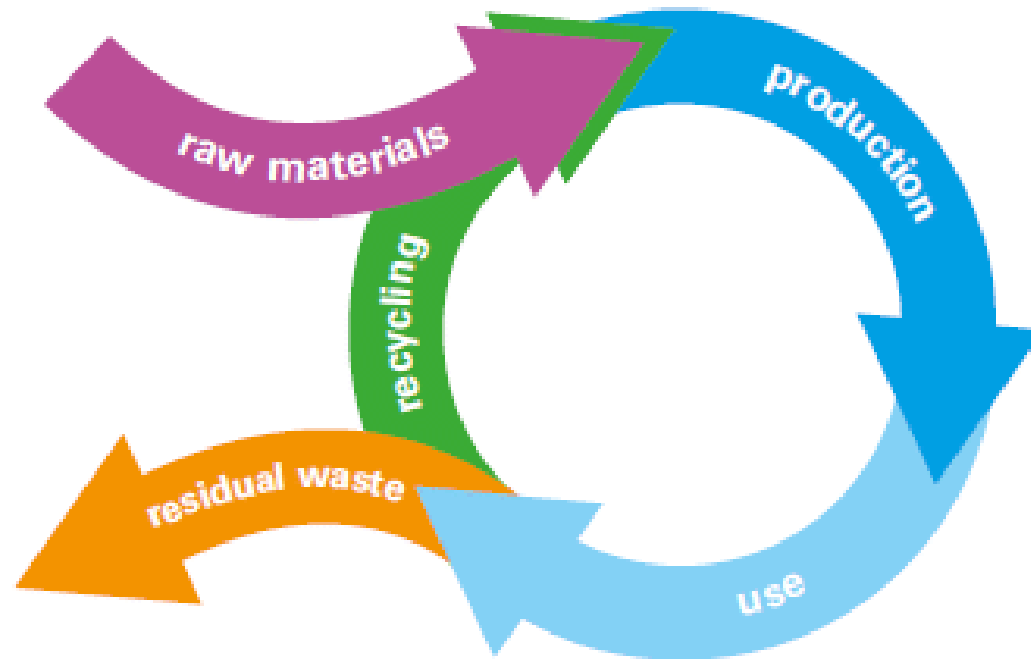


# Transition to a Circular Economy

LINEAR ECONOMY



ECONOMY WITH FEEDBACK LOOPS



CIRCULAR ECONOMY





# Efficient, Clean and Connected

## Incoming flows from:

- Other production or processing systems
- Natural cycles

## Outgoing flows as:

- Part of products
- Resource for other processes
- Part of natural cycles







**Efficient**



**Clean**



**Connected**



# Facilitating the Transition

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- **Develop** a practical, analytical approach analysis
- **Redesign** greenhouse production systems
- **Explore** cross-overs
- **Generate** new business cases

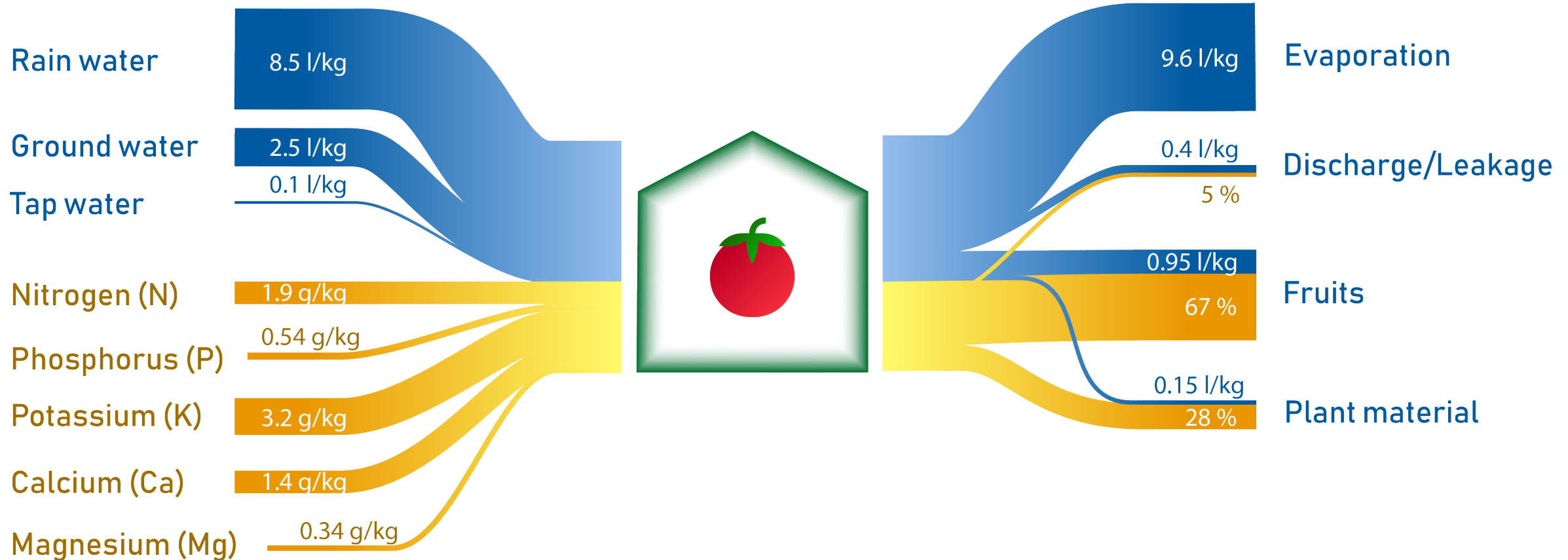


# Results: Greenhouse Horticulture Metabolism

- Water
- Minerals
- Biomass
- Substrates
- Plastics
- Paper products
- Plant protection products
- Cleaning products
- CO<sub>2</sub>
- Removable coatings

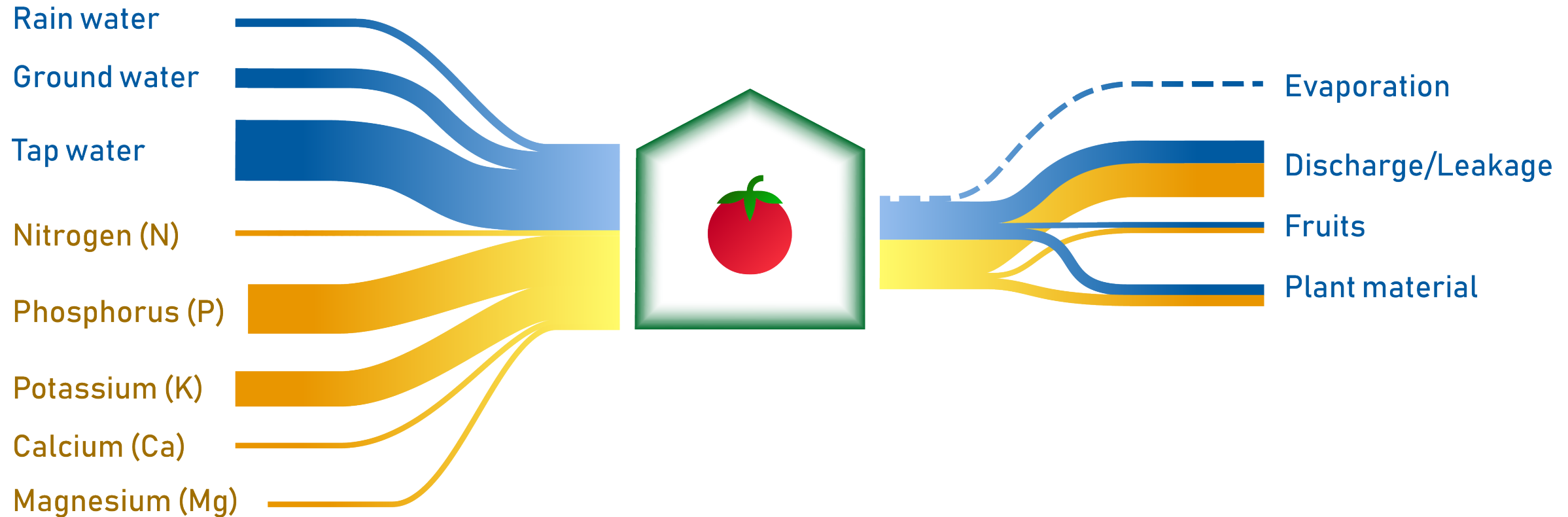


# Material Flow Charts – Quantitative





# Material Flow Charts – Estimated impacts





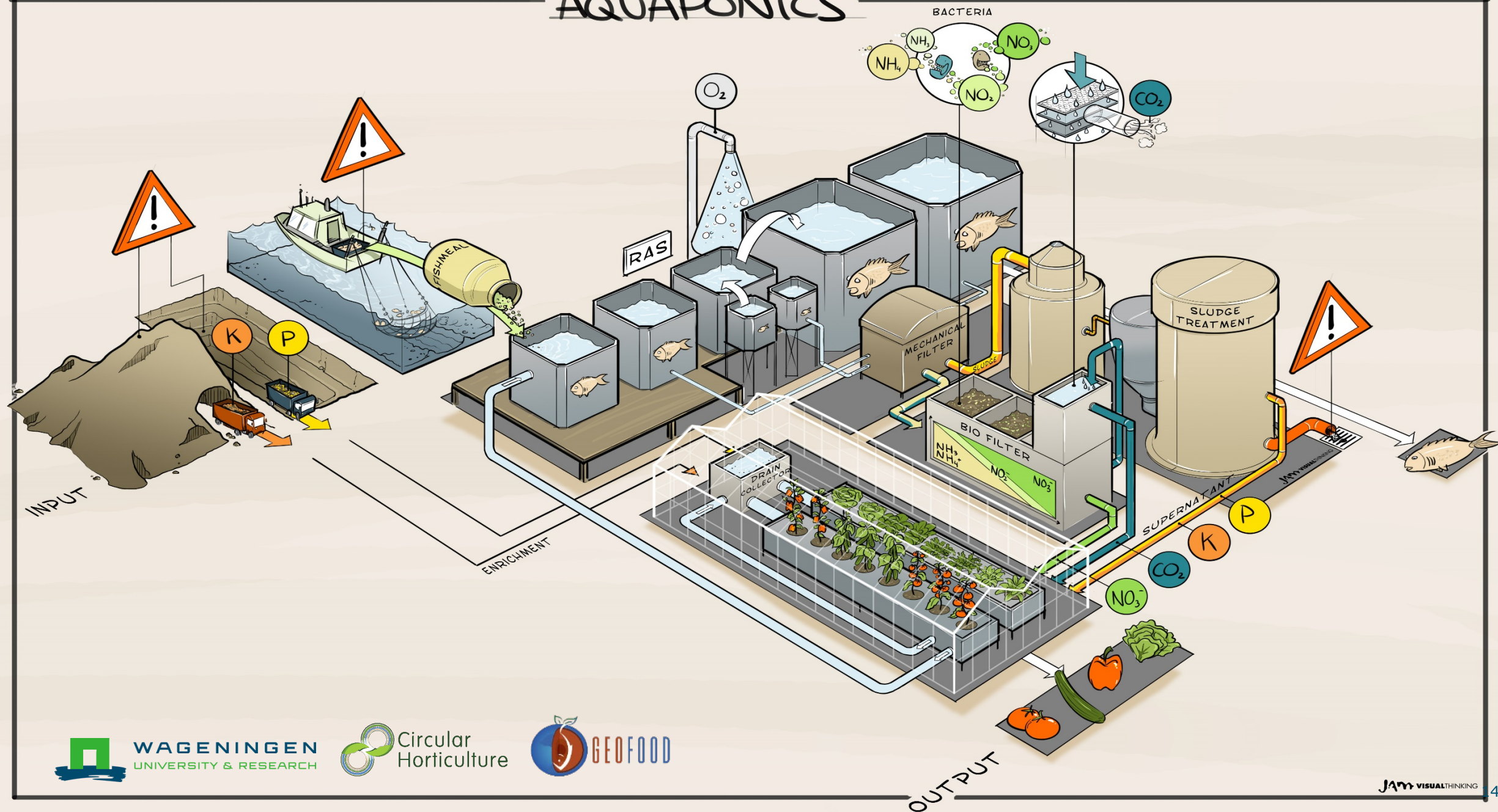
# Aquareuse



Source: [www.aquareuse.nl](http://www.aquareuse.nl)



# AQUAPONICS



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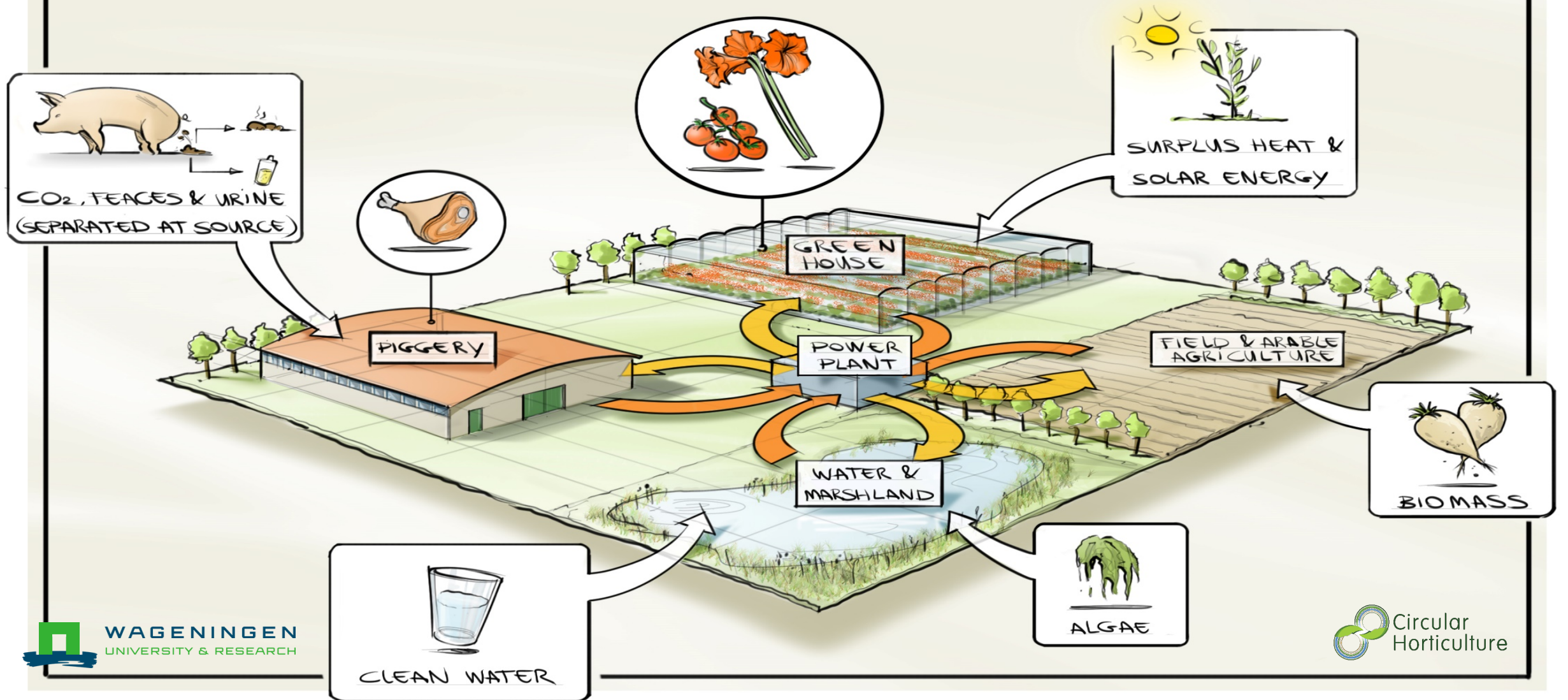
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GEOFOOD



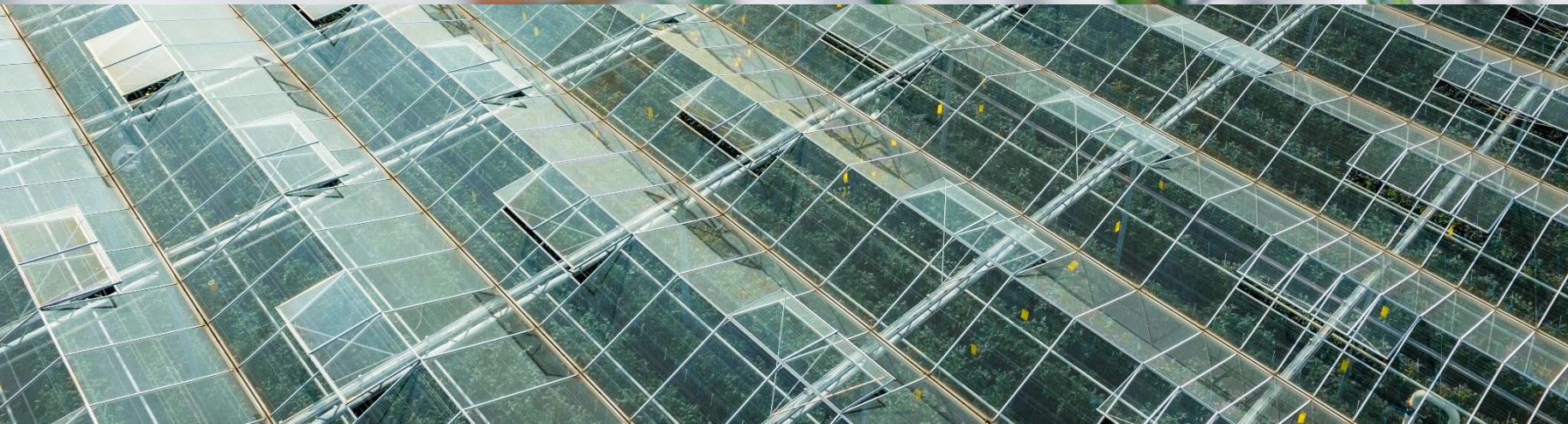
# CLOSED NUTRIENT & CARBON CYCLES IN ONE INTEGRATED AGRICULTURAL CONCEPT







**Efficient**



**Clean**



**Connected**



# Connected



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# Thank you

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Alexander Boedijn

Eric Poot

Ellen Beerling

Jim van Ruijven

Wouter Verkerke

