# Options for sustainable soil management from an agro-ecological perspective

Experience from the Netherlands

25 February, Janjo de Haan

WAGENINGEN
UNIVERSITY & RESEARCH

# Farming in the Netherlands

# Soils play role in many societal challenges

SUSTAINABLE DEVELOPMENT GOALS

2 ZERO HUNGER

6 CLEAN WATER AND SANITATION

15 LIFE ON LAND

13 CLIMATE ACTION

## European Union

- Mission board on soil health and food
- Farm to form strategy
- Climate & Energy Policy Framework

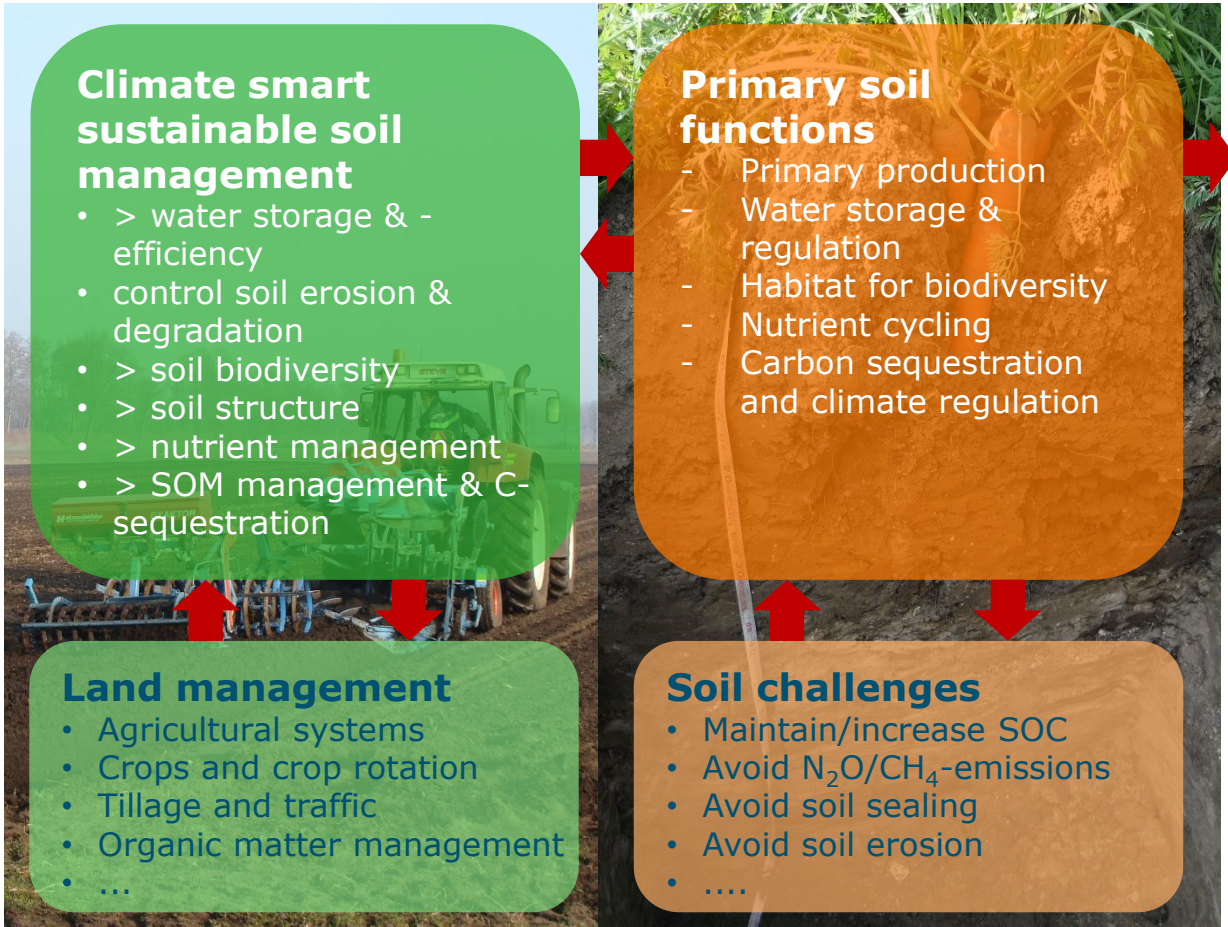

PARIS2015 UN CLIMATE CHANGE CONFERENCE COP21·CMP11

ipcc INTERGOVERNMENTAL PANEL ON climate change

WMO UNEP

WAGENINGEN UNIVERSITY & RESEARCH

# Linking soil management and soil challenges



**Climate smart sustainable soil management**

- > water storage & -efficiency
- control soil erosion & degradation
- > soil biodiversity
- > soil structure
- > nutrient management
- > SOM management & C-sequestration

**Primary soil functions**

- Primary production
- Water storage & regulation
- Habitat for biodiversity
- Nutrient cycling
- Carbon sequestration and climate regulation

***Objectives***

- *Climate change mitigation*
- *Climate adaptation*
- *Sustainable production*
- *Sustainable environment*

**Land management**

- Agricultural systems
- Crops and crop rotation
- Tillage and traffic
- Organic matter management
- …

**Soil challenges**

- Maintain/increase SOC
- Avoid $N_2O$/$CH_4$-emissions
- Avoid soil sealing
- Avoid soil erosion
- ….

Adapted from Roadmap EJP SOIL

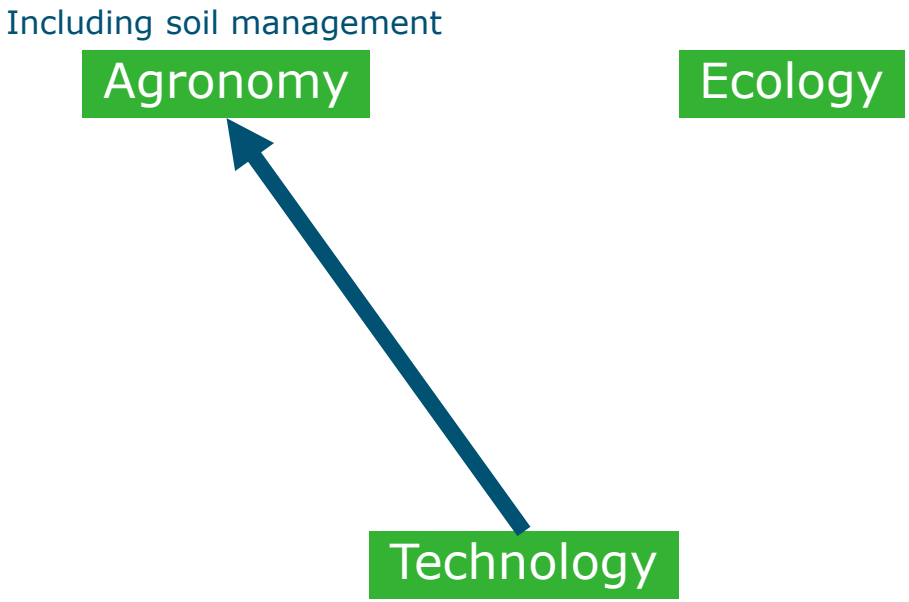
# Agro-ecology farming systems perspective

Current situation

*Ecology not used*

Leading to:

- Large monocultures
- Maximizing production
- More inputs
- Large external effects
- Domination by technology



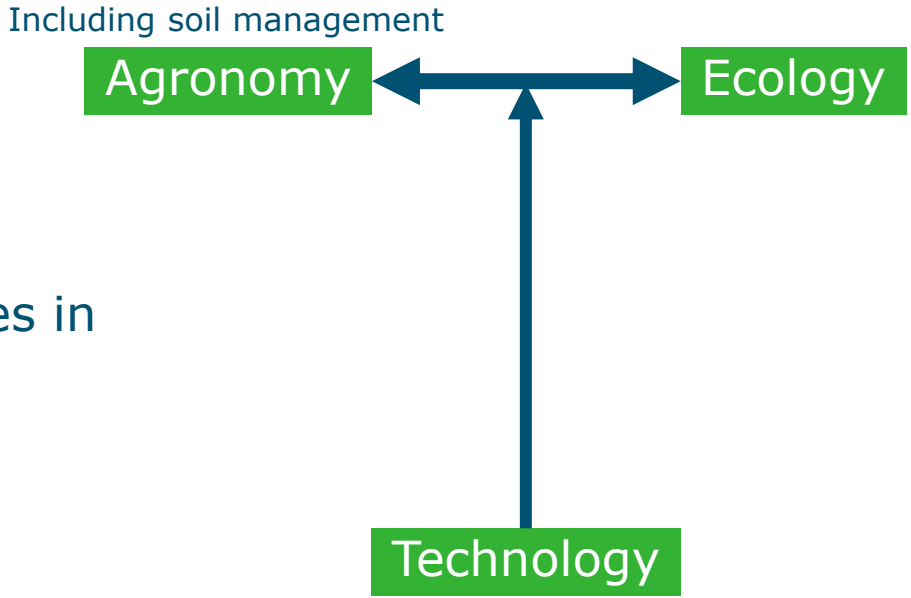
# Agro-ecology farming systems perspective

Desired situation

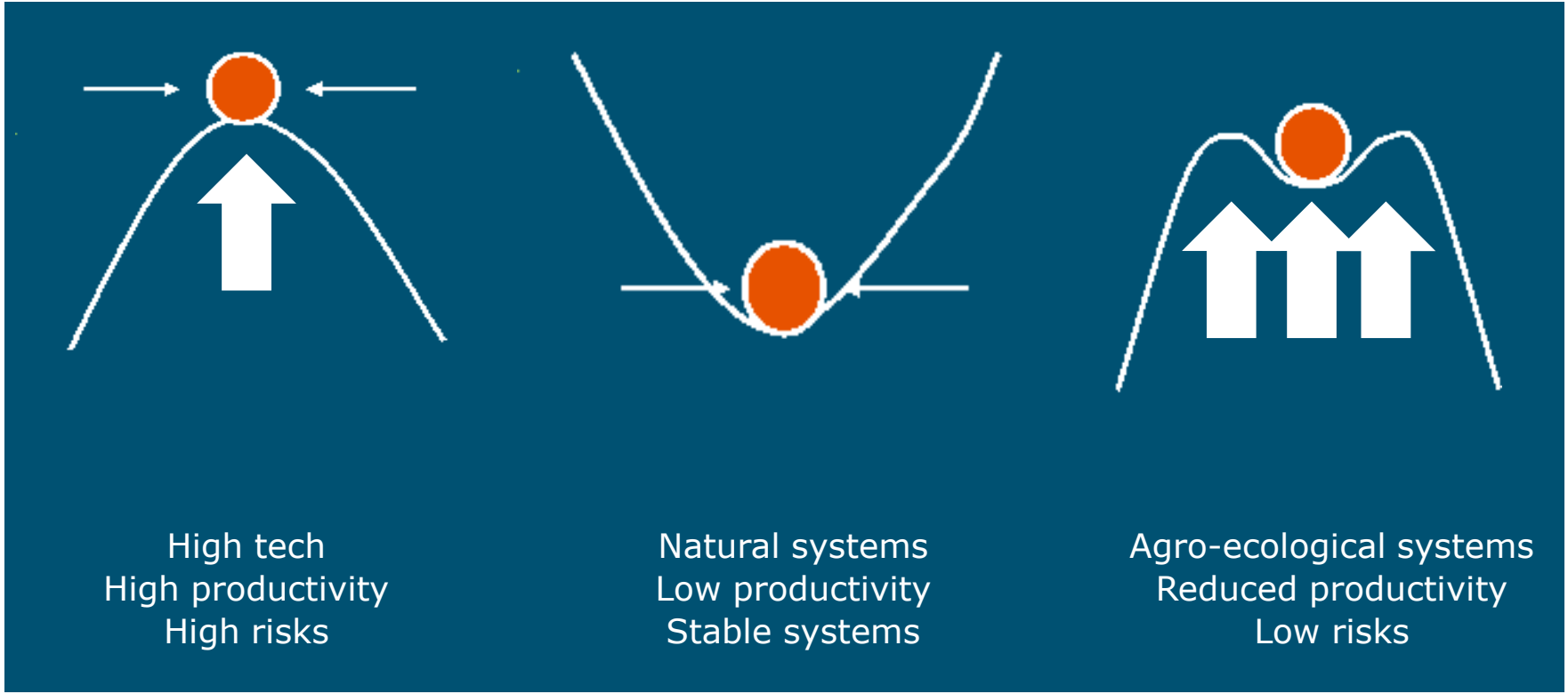
*Use of ecology*

Leading to:

- Use of ecological principles in agronomy
- Equal or better profit on longterm
- Technology serving agronomy & ecology



# High tech or agro-ecological



High tech
High productivity
High risks

Natural systems
Low productivity
Stable systems

Agro-ecological systems
Reduced productivity
Low risks

# Agro-ecology building blocks & system integration

## Buiding blocks


Landscape elements


Cover crops


Organic matter input


Strip cropping


Robust varieties


Reduced tillage


Agroforestry


Small machines


Mixed cropping


Crop Rotation


Controlled traffic system


Legumes

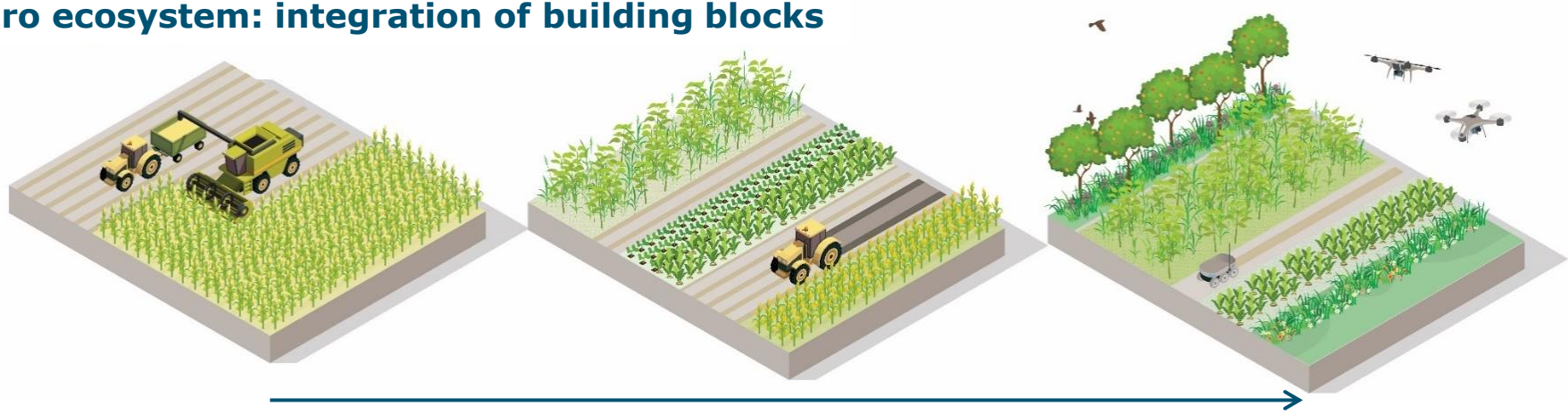

IPM 2.0


Natural enemies


DSS


Detection & monitoring

## Agro ecosystem: integration of building blocks



# Controlled Traffic Farming

WAGENINGEN
UNIVERSITY & RESEARCH

# Non inversion tillage on clay (left) & sand (right)

# Organic matter management

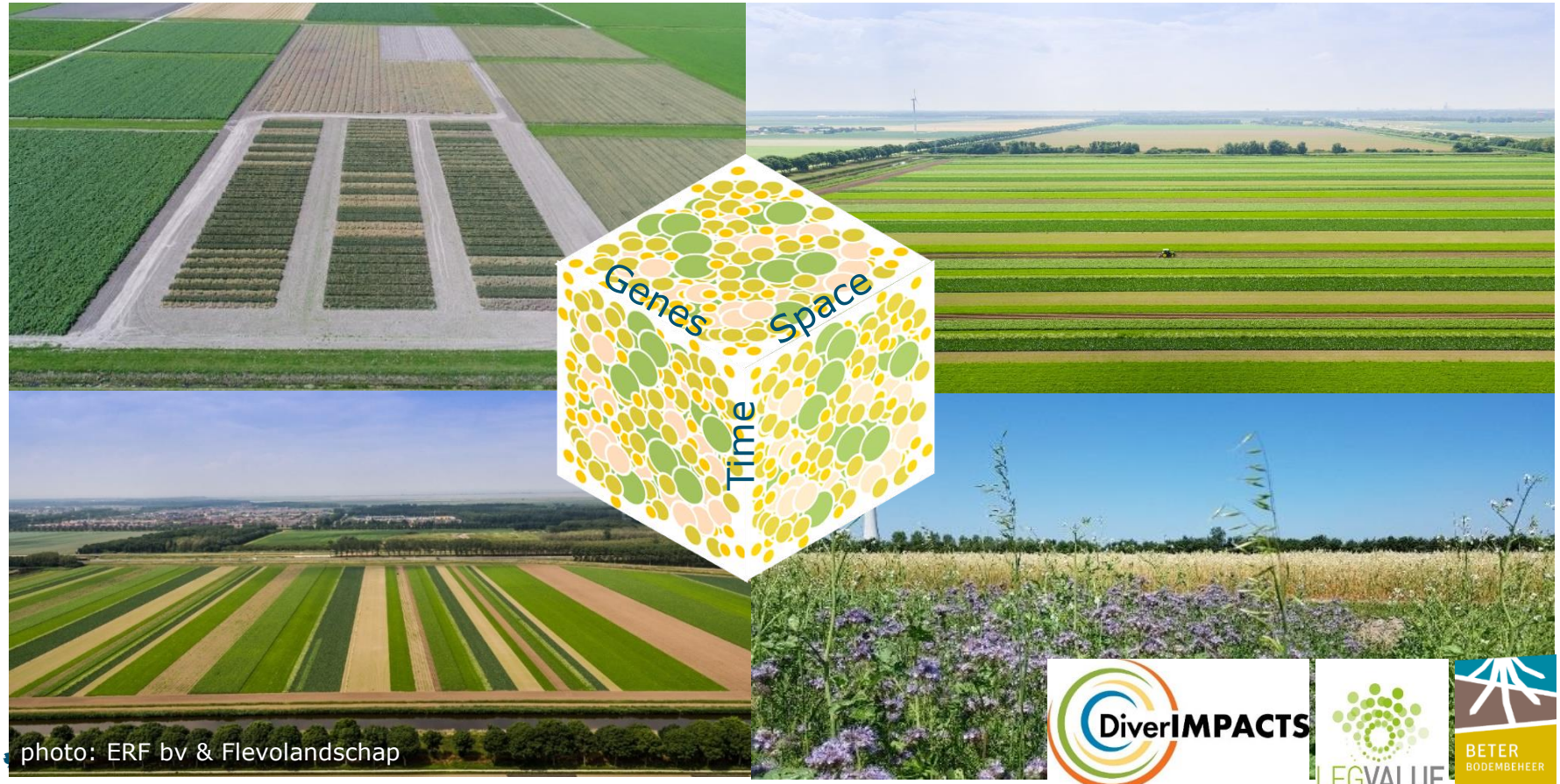

Crop residues


Cover crops


Solid organic manure


Slurry

# Strip cropping and crop diversification



# Concluding remarks

- Soil management is part of total crop production system
- Crop production and soil management is only sustainable when based on agro-ecological principles
- Technology is crucial for sustainable soil and crop management
- Diverse crop rotation, minimum soil tillage and optimal organic matter management most important aspects of sustainable soil management

# Thank you for your attention

*janjo.dehaan@wur.nl*