Field Lab AgroEcology and Technology

Research demonstration and dialogue for plant production systems of the future

Hilfred Huiting – Brussels 23 January 2020

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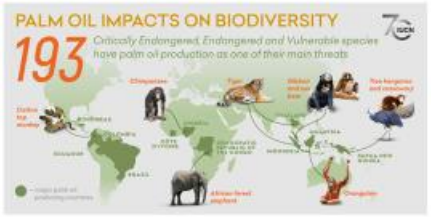
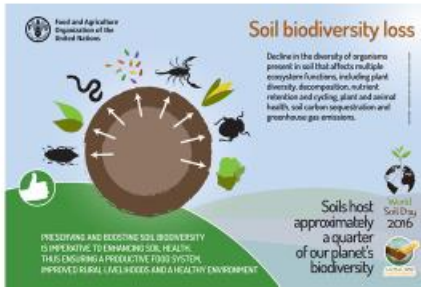
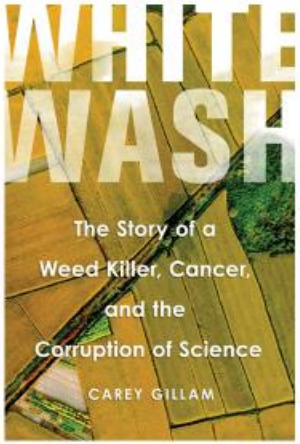
Concerns

Biodiversity decline





Societal concerns about pesticides



Soil quality and compaction

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Sector on the move

Vision documents

- Ministry of agriculture
- Dutch farmers organisation
- Interbranch Organsiation Arable crops

Vision

Minister of Agriculture, Nature and Food Quality

- *"Dutch farming, horticulture and fisheries are constantly innovating, making our country a global leader in these sectors. However, current production methods are not without cost. The Netherlands faces serious social and ecological challenges"*
- *"We need to prevent depletion of soil, freshwater supplies and raw materials, halt the decline in biodiversity and fulfil our commitments to the Paris climate agreement"*
- *"Circular agriculture is the answer"*

3 important goals:

Economic position of farmers

Appreciate food more

Innovation of production methods

Dutch Federation of Agriculture and Horticulture

LTO Nederland

- Healthy plants
- Healthy environment
- Economic perspective

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Dutch Federation of Agriculture and Horticulture

LTO Nederland

- Integrated approach

- No emissions
- Nature-inclusive
- Biodiversity

- Economic position

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Interbranch Organisation Arable Crops

brancheorganisatie akkerbouw

- **#1** To switch to a resilient cultivation system in which the basis is formed by healthy and robust crops and a vital soil, which will reduce the amount of crop protection agents needed.
- **#2** To reduce impact on the environment with the tailored administration of crop protection agents through the use of precision farming methods and a greener range of agents.
- **#3** To contribute to increasing biodiversity and helping to actively shape an attractive landscape.
- **#4** To make environmental performance more transparent for the market.

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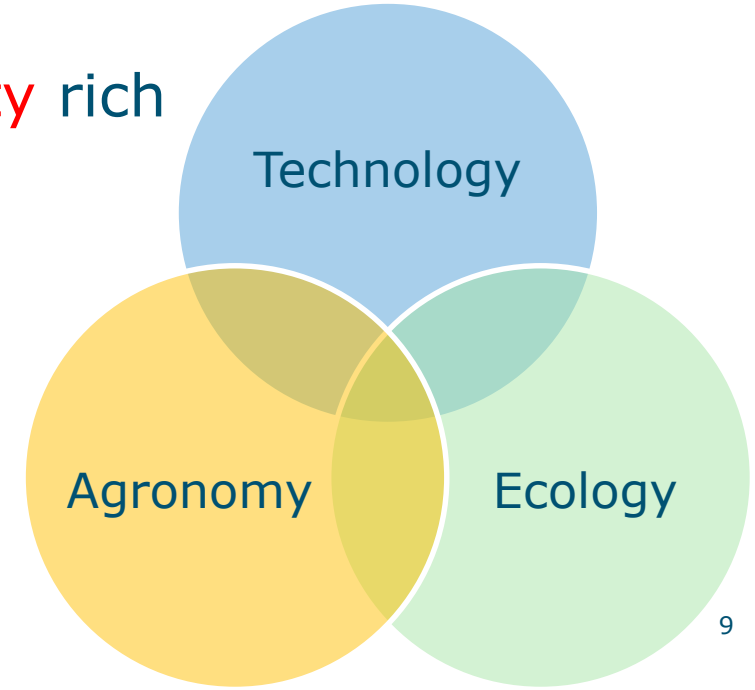
Challenges & Solutions

- 1 problem, 1 solution ⇨ system approach
- Reactive ⇨ pro-active: prevention
- Biodiversity poor ⇨ biodiversity rich

Ecology meets technology
meets agronomy



Proeftuin Agroecologie & Technologie

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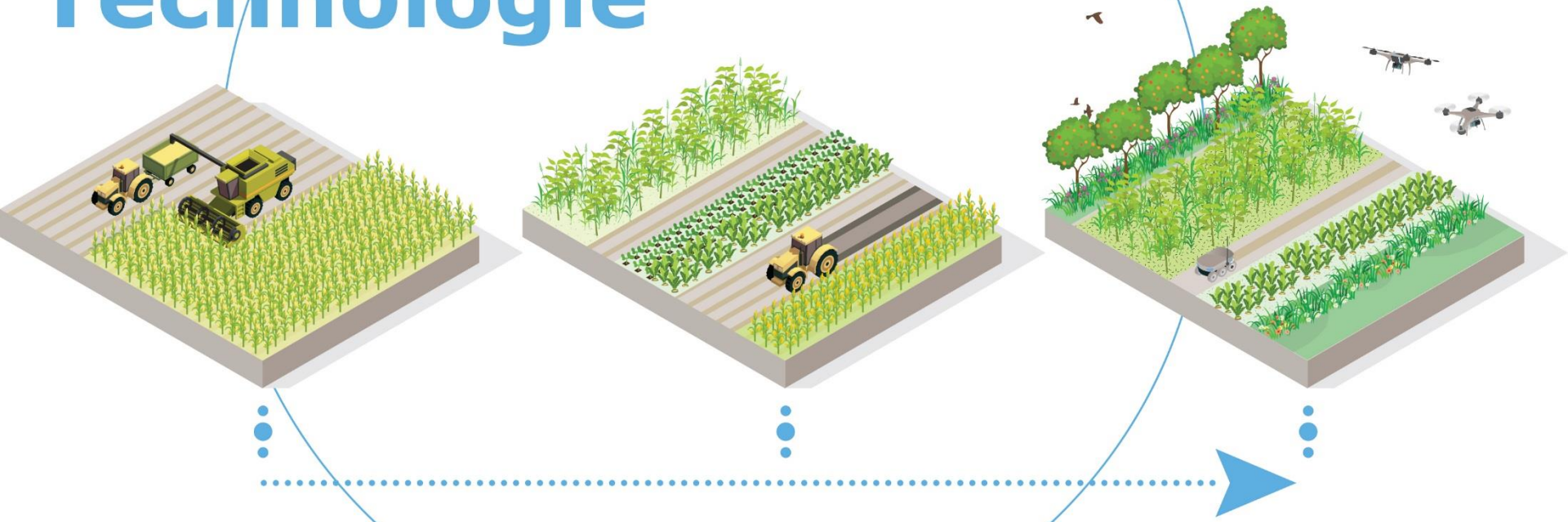

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Experimental site can contribute to many issues

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Agroecologische bouwstenen, ondersteund door technologie
Voor een toekomstbestendig, regeneratief landbouwsysteem.

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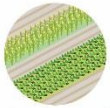
Bouwstenen


Landschapselementen & akkerranden


Groenbemesters


Organische stof aanvoer


Strokenteelt


Robuuste rassen


Gereduceerde grondbewerking


Agroforestry


Inzet van kleine, lichte machines


Mengteelt


Gezonde rotatie en bouwplan


Vaste rijpaden systeem


Vlinderbloemigen (voor stikstofbinding)


Slimme gewasbescherming, IPM 2.0

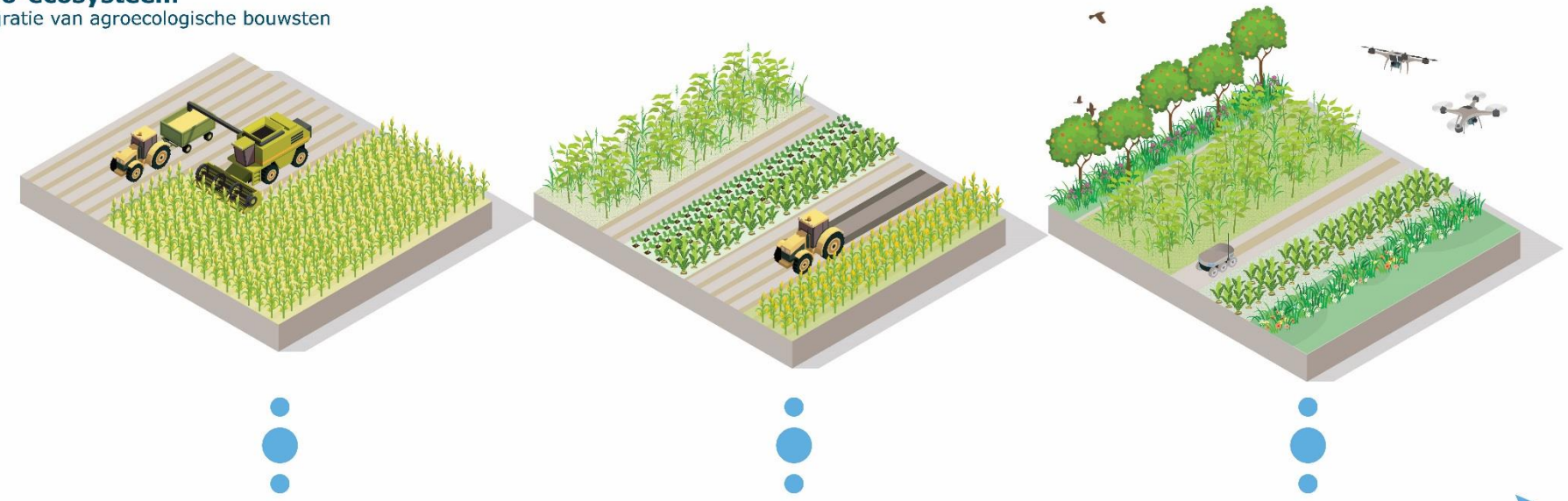

Vogels, bestuivers & natuurlijke vijanden


Beslissingsondersteuning & ICT


Detectie & monitoring met sensoren

Agro-ecosysteem

integratie van agroecologische bouwsten

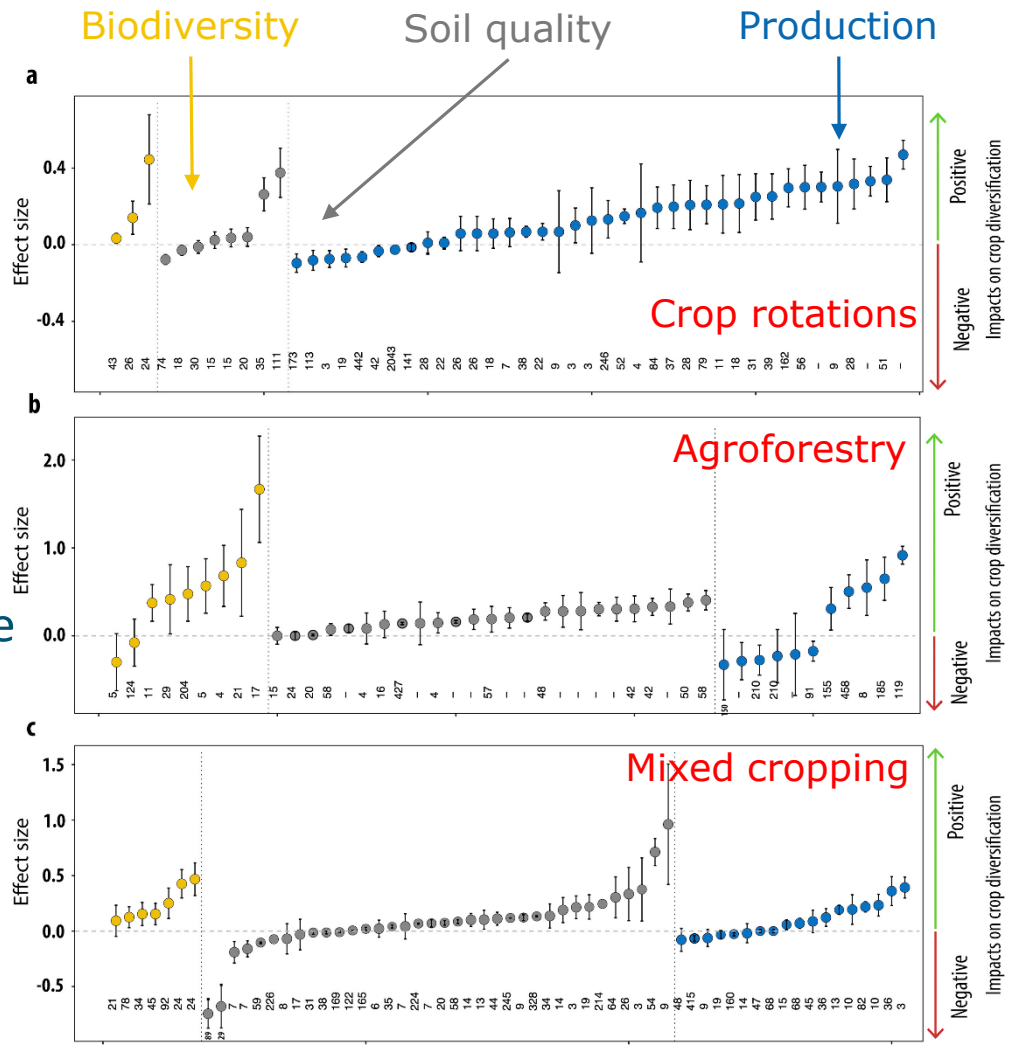


In toenemende mate meer divers, weerbaar en regeneratief

Diversity as a base

- Higher Resource use efficiency
- Higher Land Equivalent Ratio
- Potentially lower disease and pest pressure
- Larger biodiversity
- Better soil quality

But with current technology economically less efficient and increase in complication



DiverIMPACTS

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Beillouin et al 2019, DOI 10.1016/J.DIB.2019.103898

Research @PAET

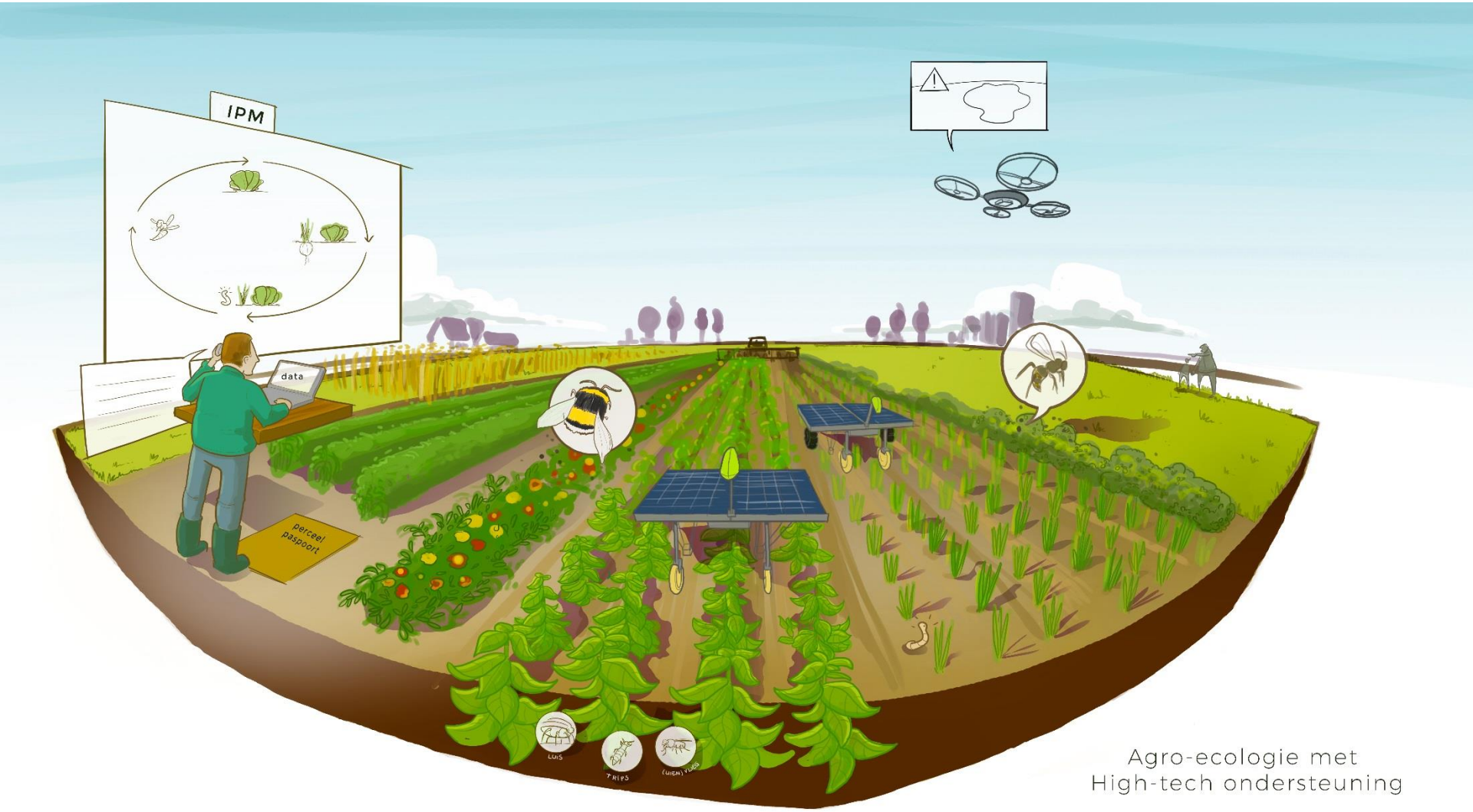
Sustainable soil

Crop health

Strip cultivation

Foto: Dirk van Apeldoorn

Green Crop Protection: vision for 2030



Goals Green Crop Protection

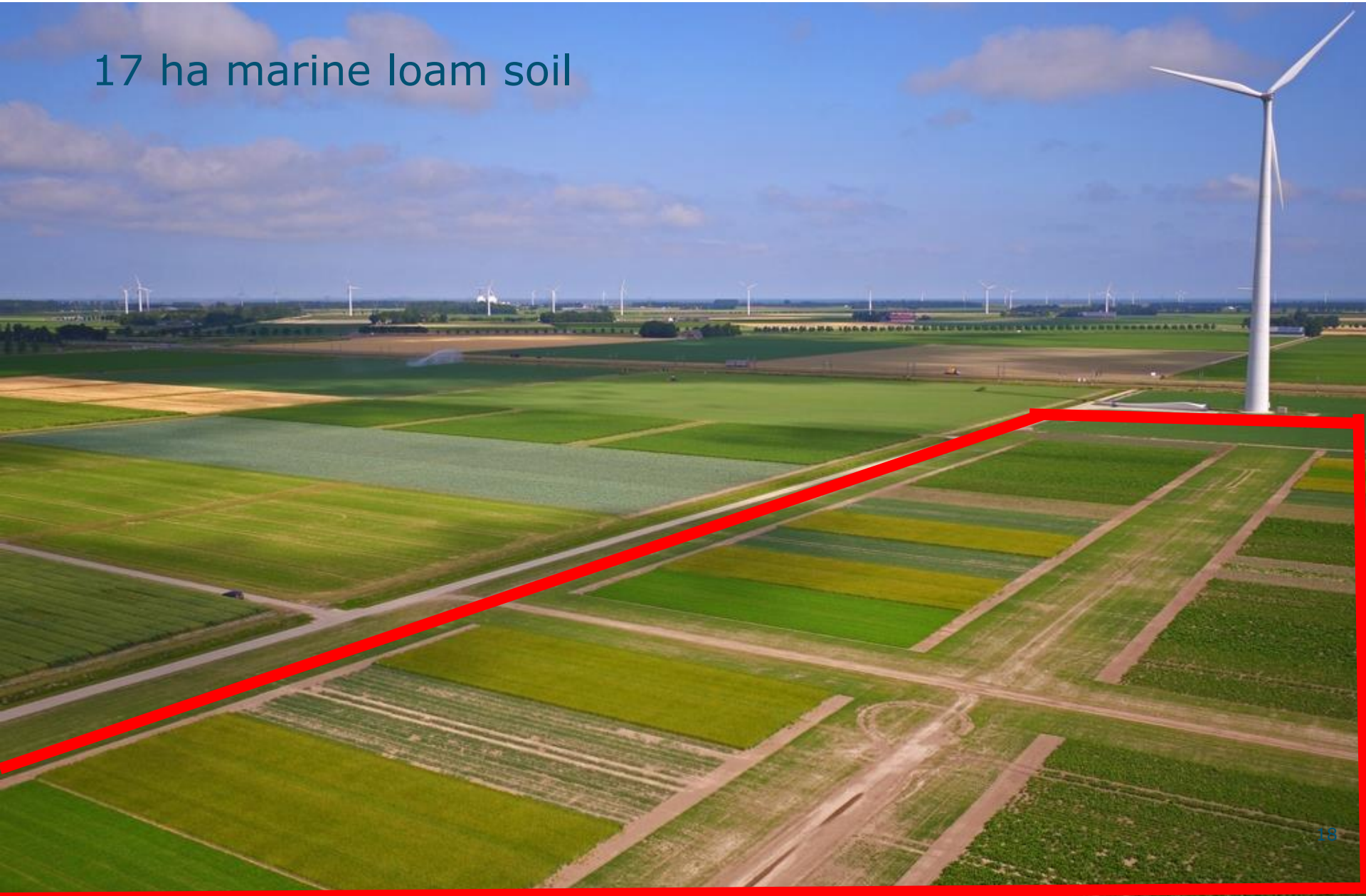
- Redesign farming system
  - Without Candidates for Substitution
  - Use natural enemies and biocontrol where possible
  - Use of guided control and prediction models
  - Economically viable

Field experiment

- Temporal Crop diversification
- Varieties resistant or tolerant to pests and diseases
- Biological, Green Control or reduced chemical control based on DSS
- Monitoring & Evaluation
- Functional Agrobiodiversity strips

4 year rotation	8 year rotation
Potatoes	Potatoes
Onions	Onions
Sugar beets	Sugar beets
Cereals	Cereals
Potatoes	Potatoes
Onions	Grass-clover
Sugar beets	Cabbage
Cereals	Carrots

Start 2018



Reducing impact of weeds on crop

Reduce seed return

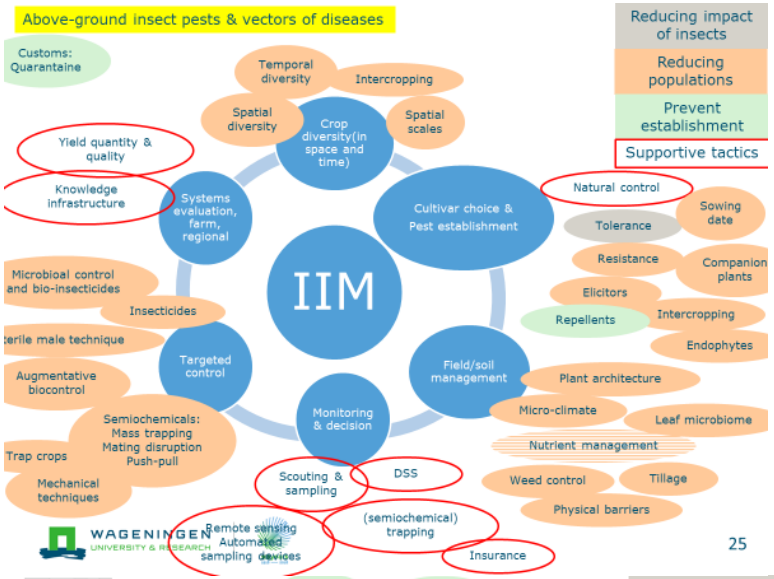
Prevent establishment

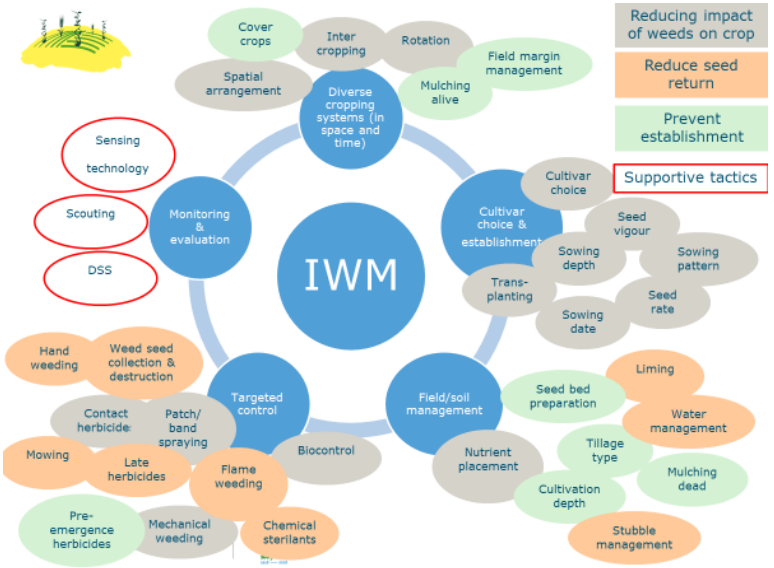
Supportive tactics

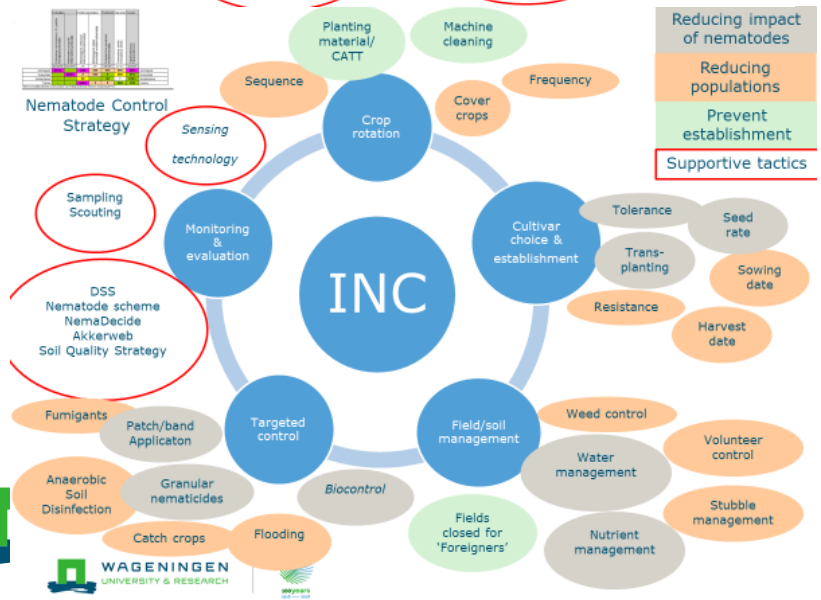
IWM

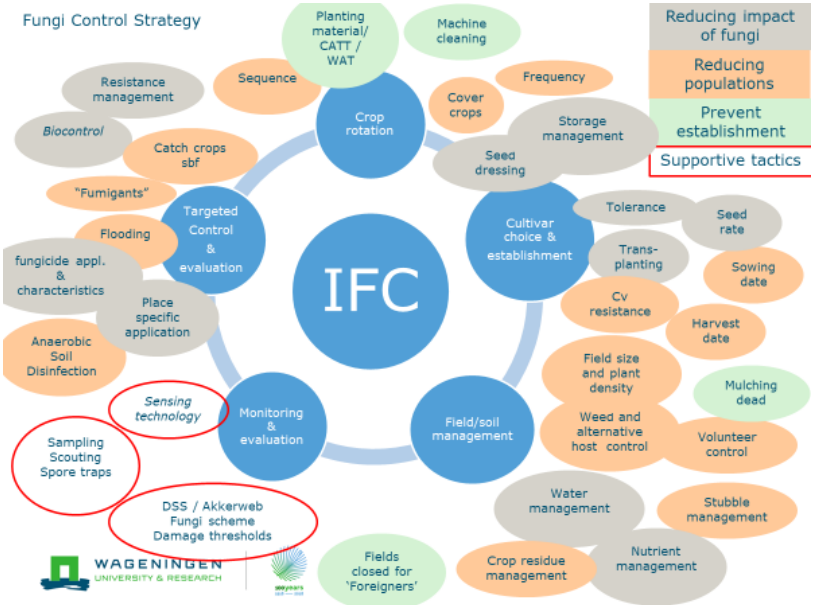
- Diverse cropping systems (in space and time)
  - Cover crops
  - Inter cropping
  - Rotation
  - Field margin management
  - Mulching alive
  - Spatial arrangement
- Cultivar choice & establishment
  - Cultivar choice
  - Seed vigour
  - Sowing depth
  - Sowing pattern
  - Trans-planting
  - Seed rate
  - Sowing date
- Field/soil management
  - Liming
  - Seed bed preparation
  - Water management
  - Tillage type
  - Nutrient placement
  - Mulching dead
  - Cultivation depth
  - Stubble management
- Targeted control
  - Hand weeding
  - Weed seed collection & destruction
  - Contact herbicides
  - Patch/ band spraying
  - Mowing
  - Late herbicides
  - Flame weeding
  - Biocontrol
  - Pre-emergence herbicides
  - Mechanical weeding
  - Chemical sterilants
- Monitoring & evaluation
  - Sensing technology
  - Scouting
  - DSS

Strategies for insects, weeds, nematodes and fungi







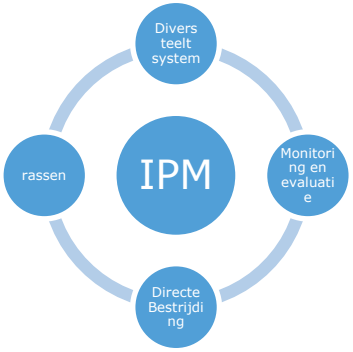


Approach Targeted Control

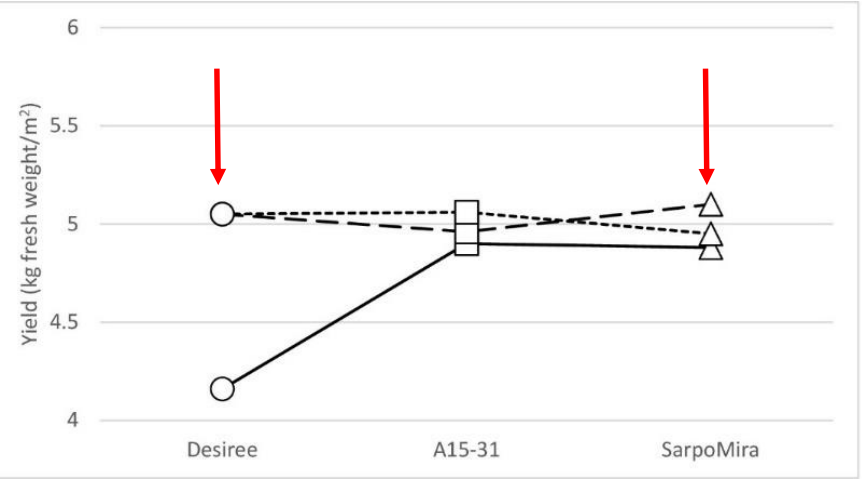
- Use of DSS
  - Blight app *P. infestans*
  - Degree day models
- Weakly monitoring of pests, diseases and weeds
  - Replace handwork by monitoring tools

- Biocontrol where possible
- Chemical control
- Mechanical control

Example: *P. infestans* control in Potato

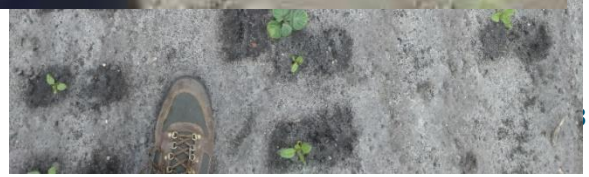


1. Use of a variety with R genes (SarpoMira)
2. Only treat when necessary:
   - Monitoring of *P. infestans* (presence of virulent *P. infestans*)
   - Prediction of infection based on weather and virulence
3. Comparison with traditional variety:
   - Fungicide reduction of 40-97% depending of year
   - Equal yields



Kessel et al 2018, Eur. J of Agr. 96

Precise application



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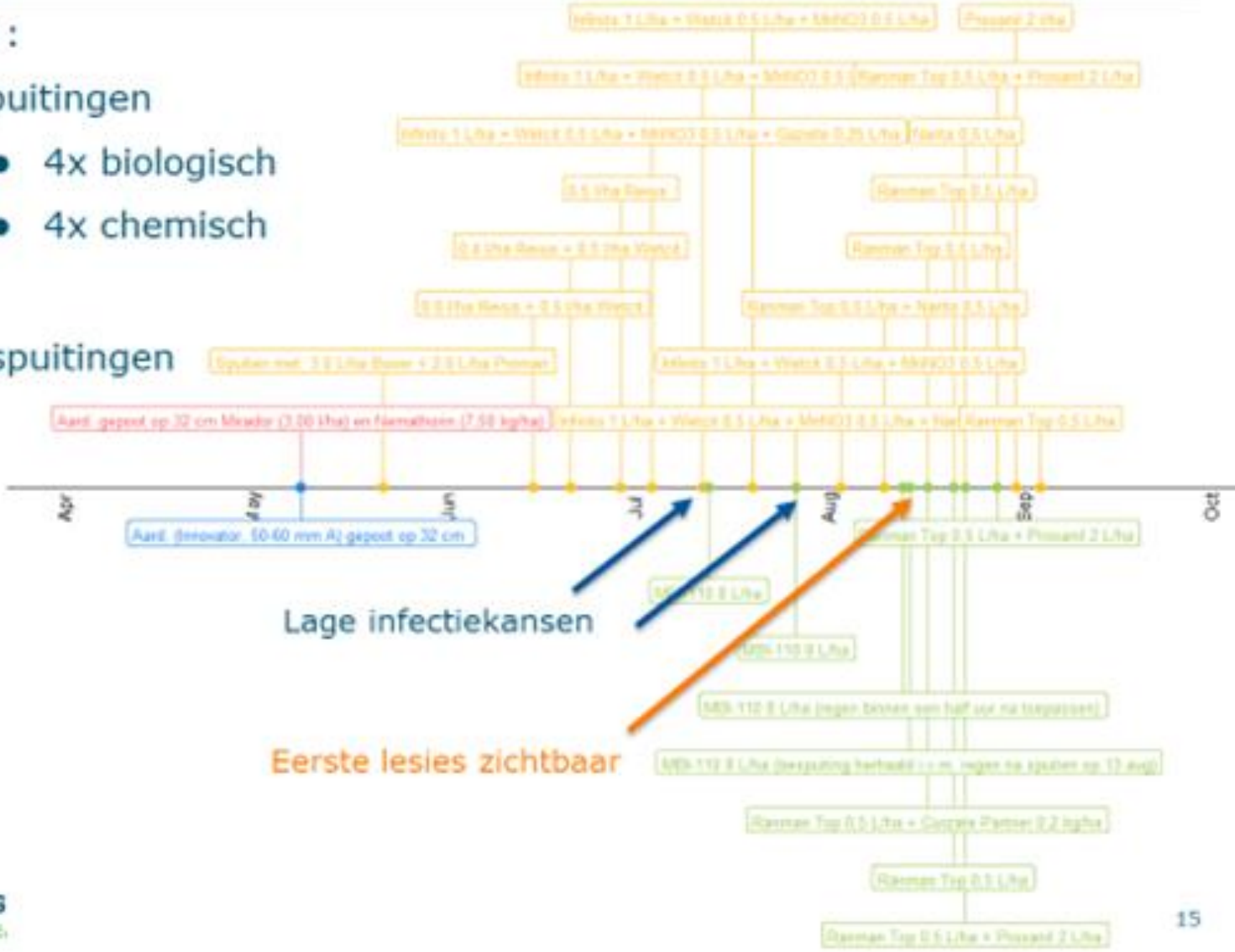
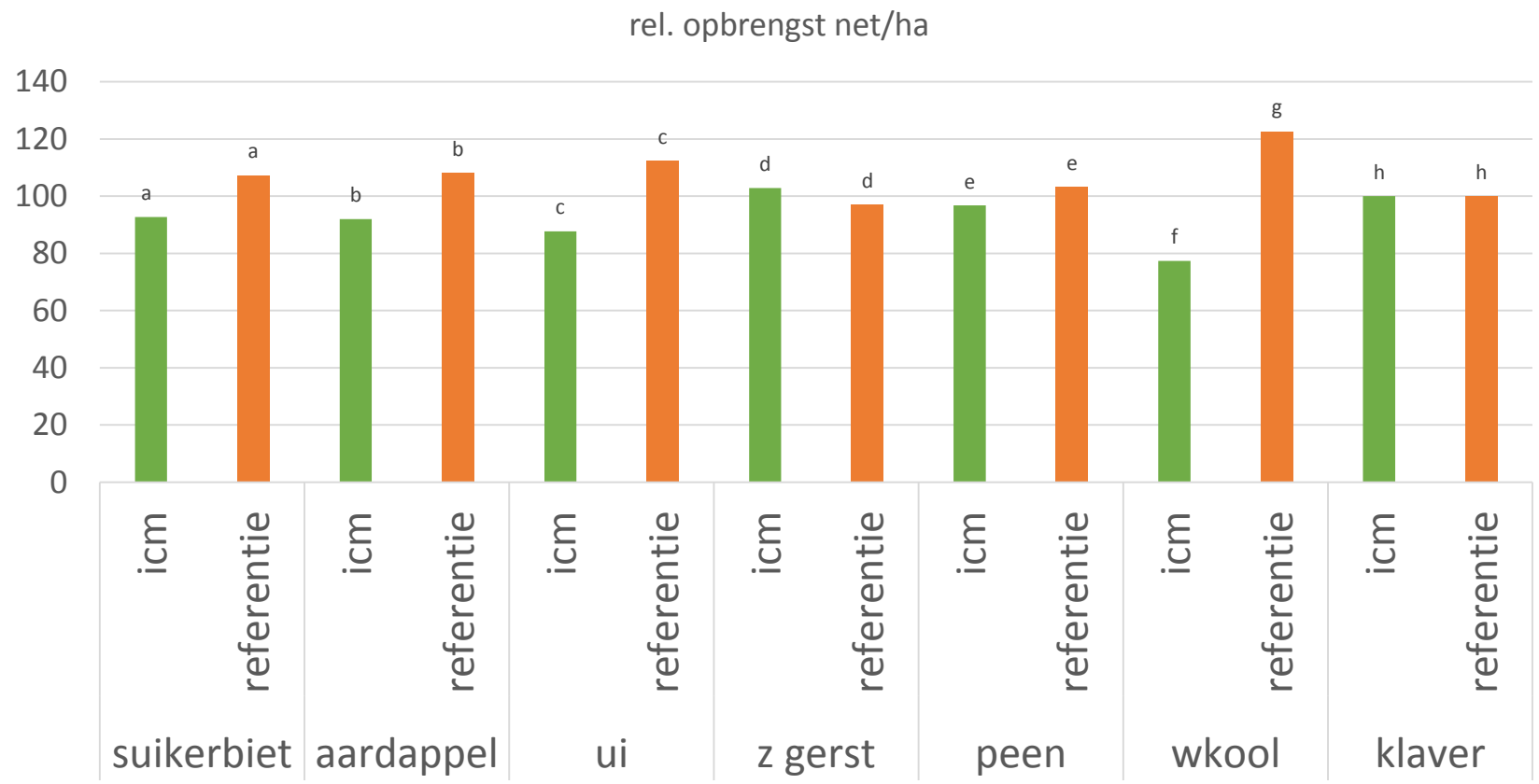
Robot platform with sensors and tools

Results: spray schedule Late Blight

- Plus systeem :
  - 8 bespuitingen
    - 4x biologisch
    - 4x chemisch
- Standaard :
  - 13 bespuitingen



Yields



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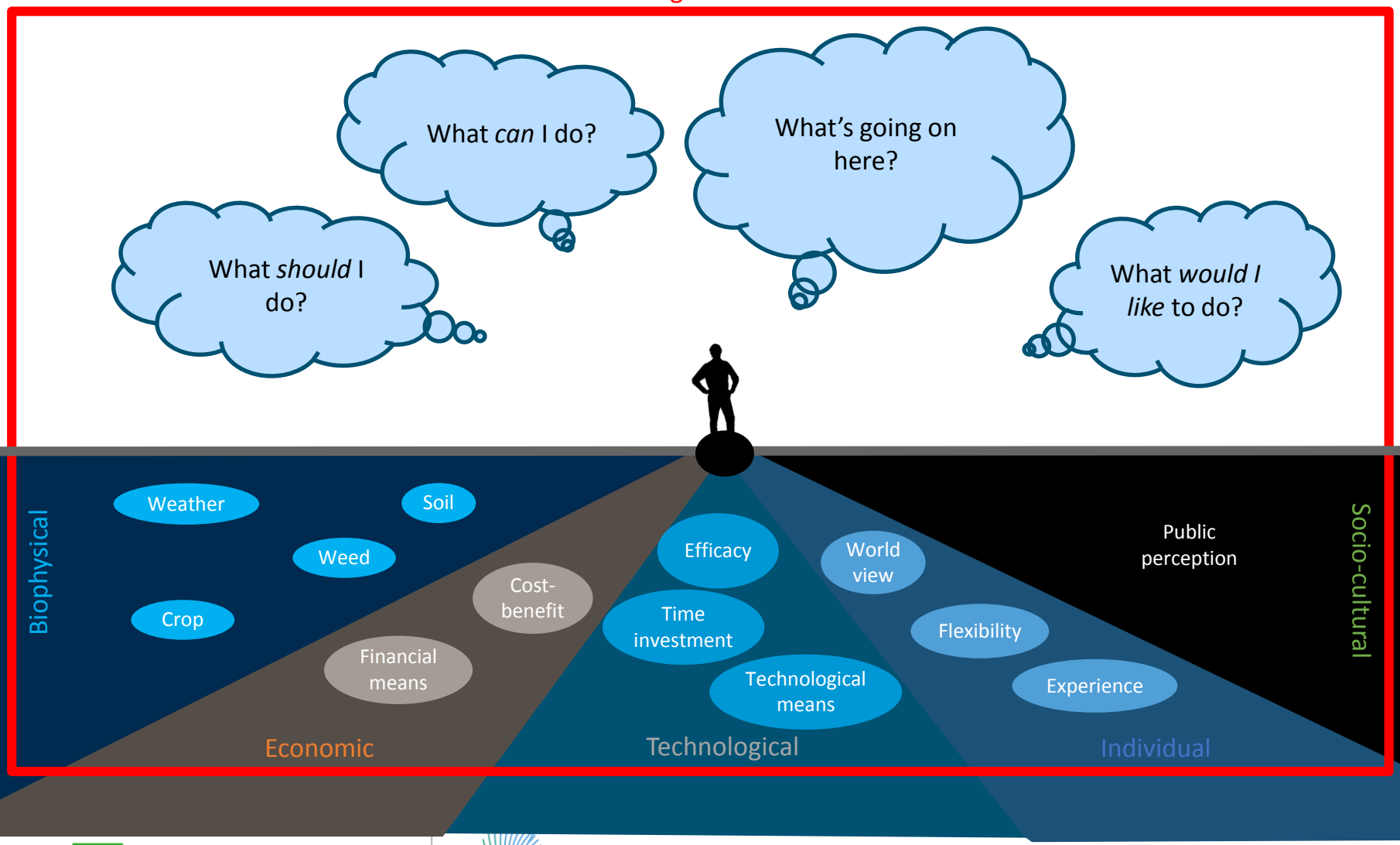
Farmers are the key to system change



Many visitors and activities

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marleen.riemens@wur.nl
+31 317 480499

Thanks for your attention

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Marleen.riemens@wur.nl; 0317 480499