Plant health and Global Food security: *Best Ecological Means, a triple-win*

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Sustainable Development & Food Security

CPM, FAO April 4th 2016

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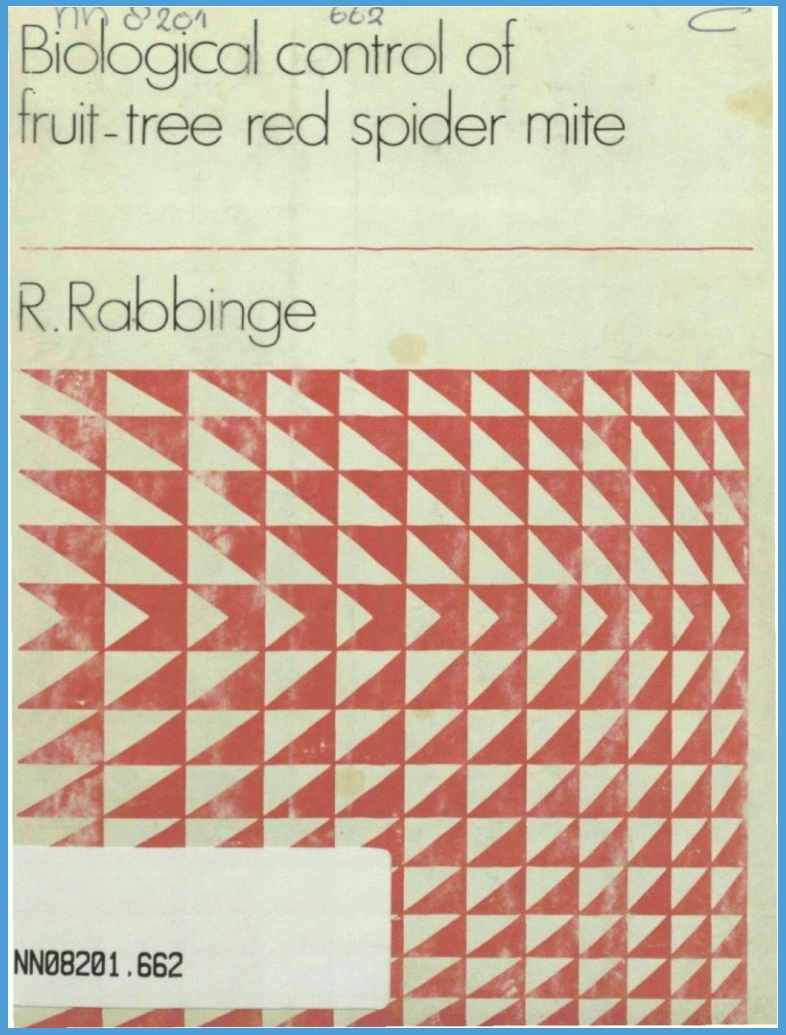
IPM October 22nd, 1976



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1 Agriculture & crop protection in historic and future perspectives

2 Megatrends in agriculture

3 Incremental vs transitional approaches

4 Crop protection developments

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6 Future oriented approaches

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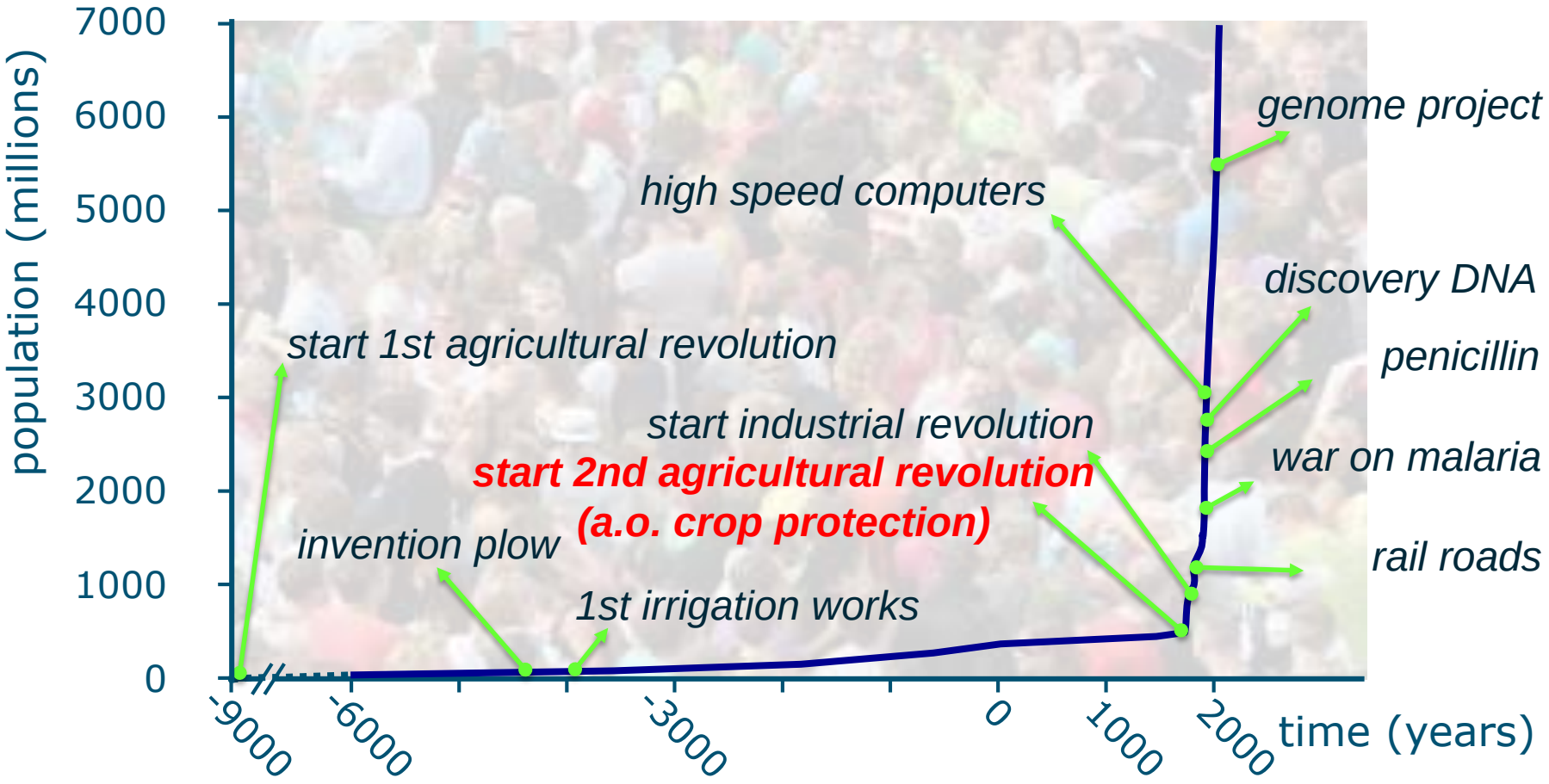
Population vs scientific developments



Adapted from: Fogel & Robbert 1999

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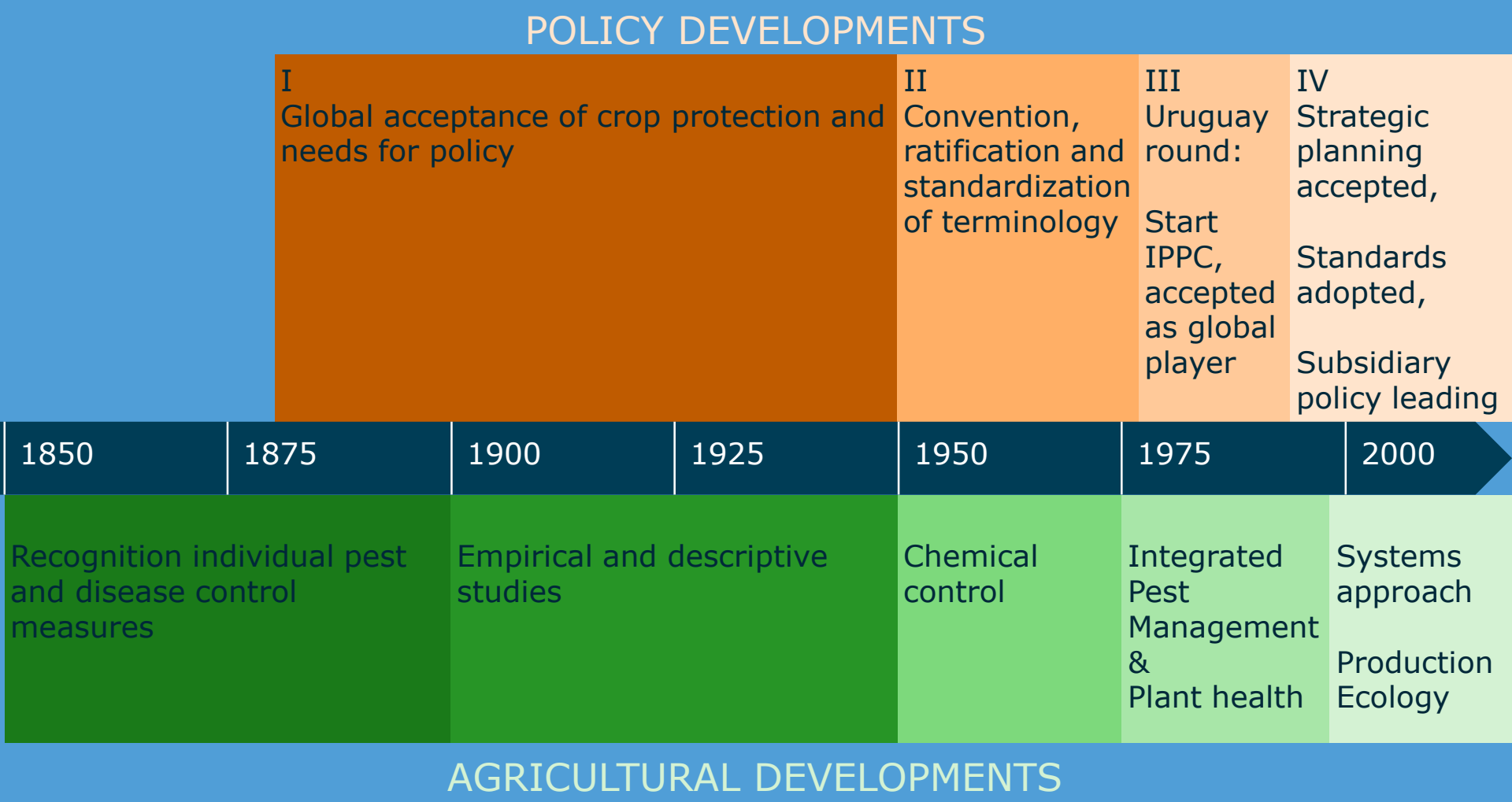
Development phases in crop protection



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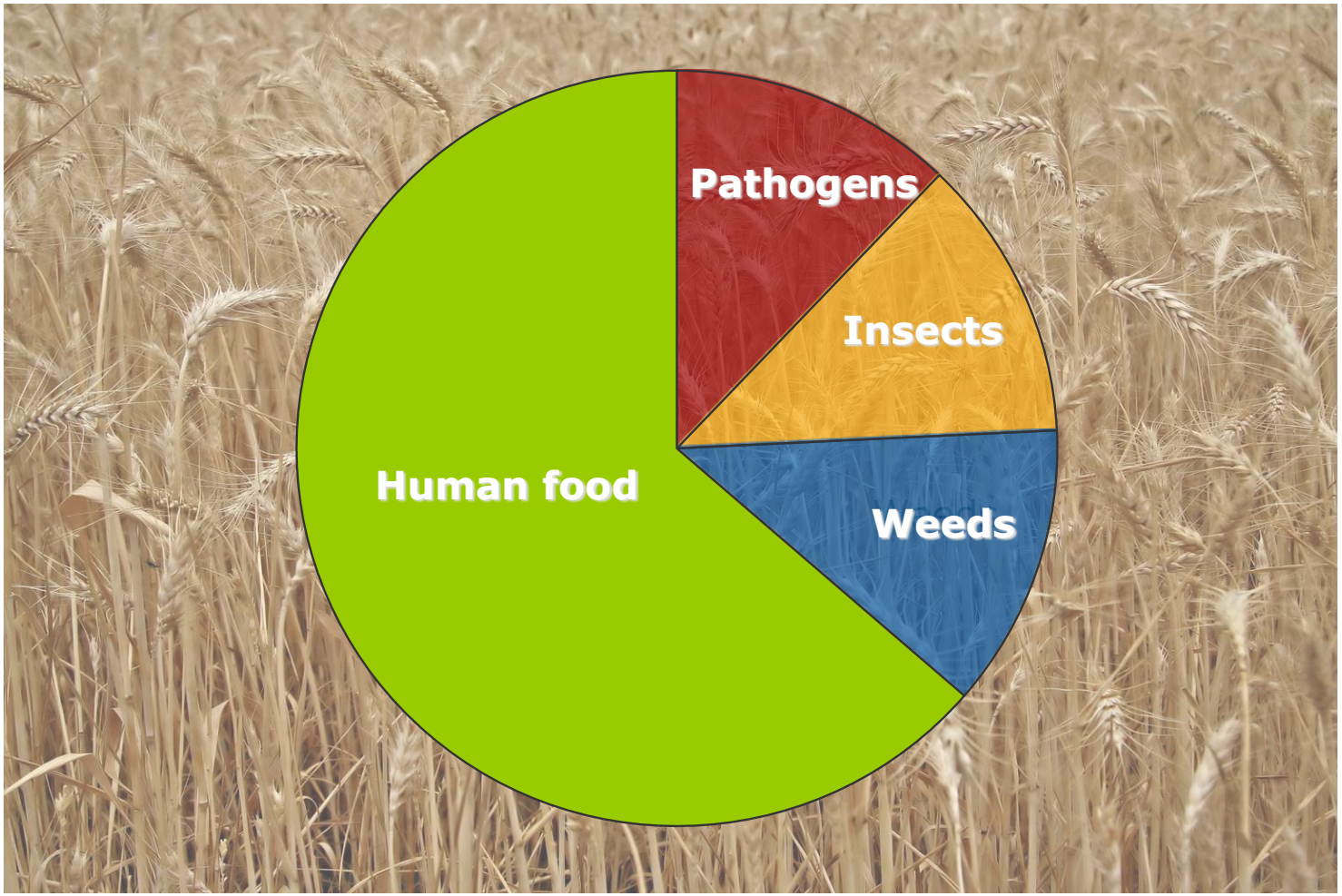
Two times...

Worldwide crop losses



Crop losses due to plant diseases and pests: € 450.000.000.000

Megatrends in agriculture

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Megatrends: Productivity rise

in the last centuries:

land productivity

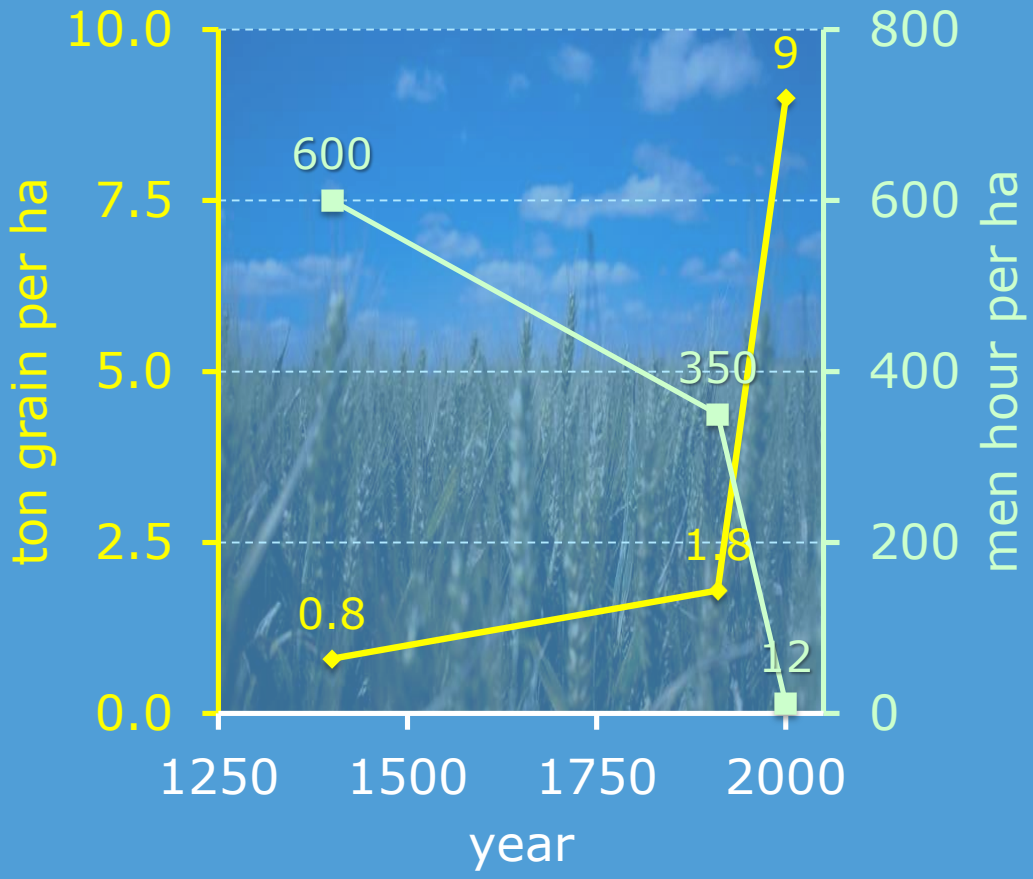
x 5 - 6

labor productivity

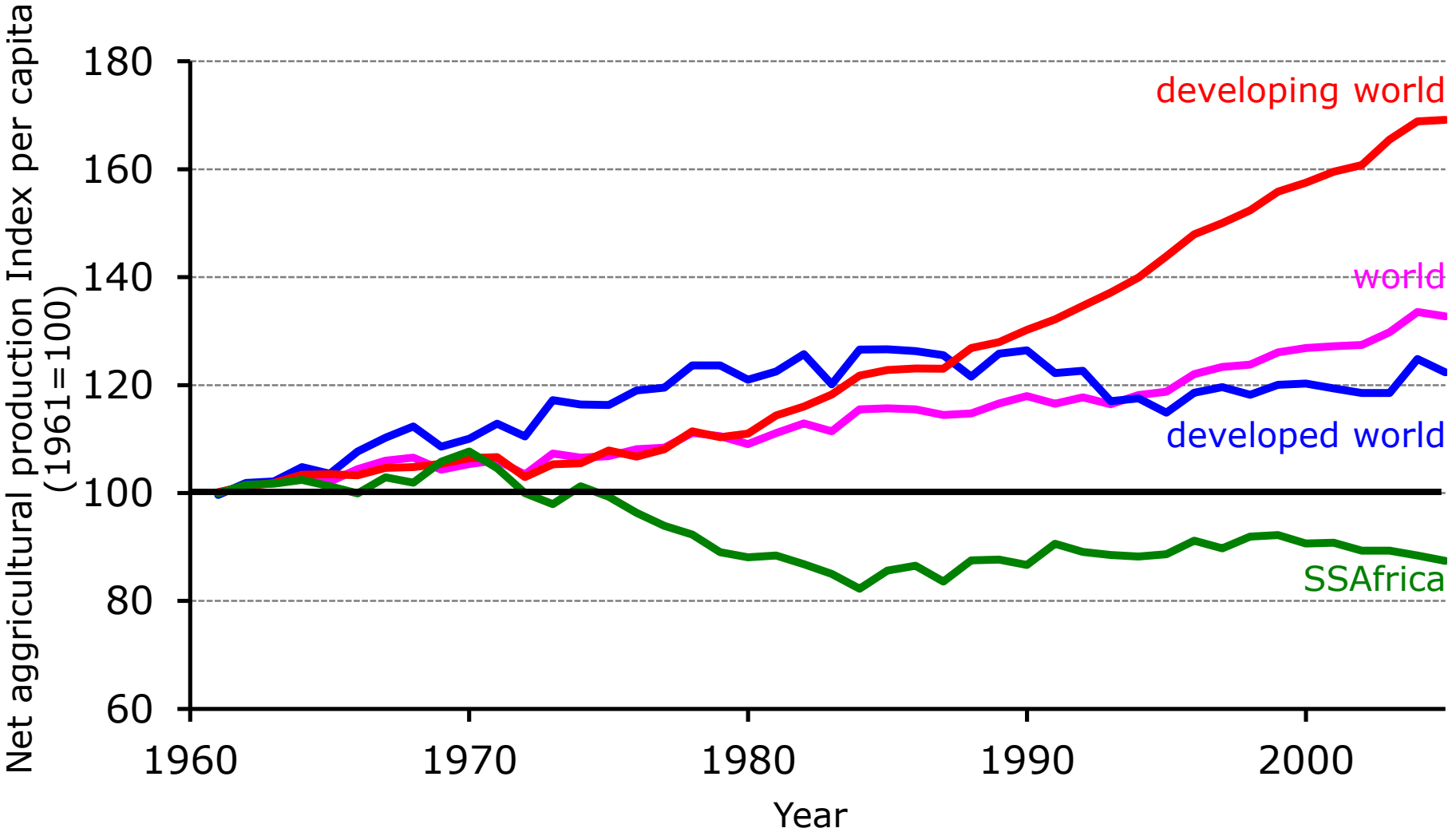
x 200 - 300

energy, other inputs

x 2 - 4



Food availability per person



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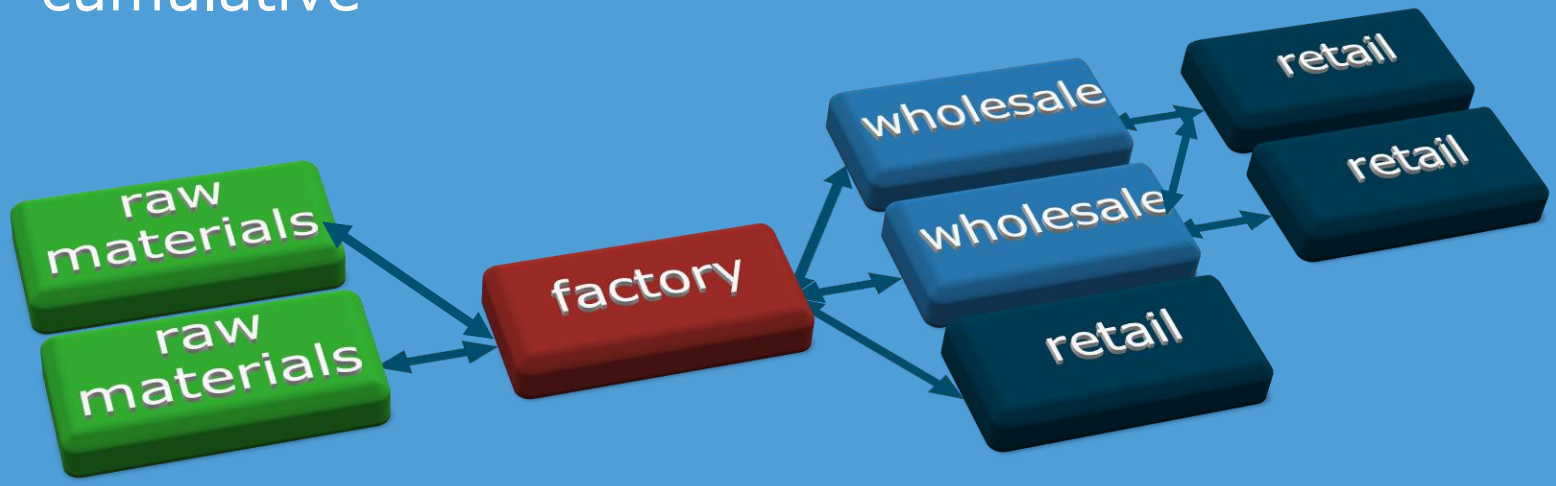
Megatrends (2): From craft to industry

- From adapting to environment to maximum control (fertilizer, pesticides, irrigation)
- Introduction of non-terrestrial agriculture

- High level of value-added !!
- Heterogeneity from liability to asset

Megatrends (3): Chain approach

- From spade to plate
- Reverse chain: consumer (or retail) driven
- Quality, food safety, convenience foods, etc.
- Logistic efficiency (on time delivery), unit cost of production
- Value-added on numerous stages of the chain → cumulative



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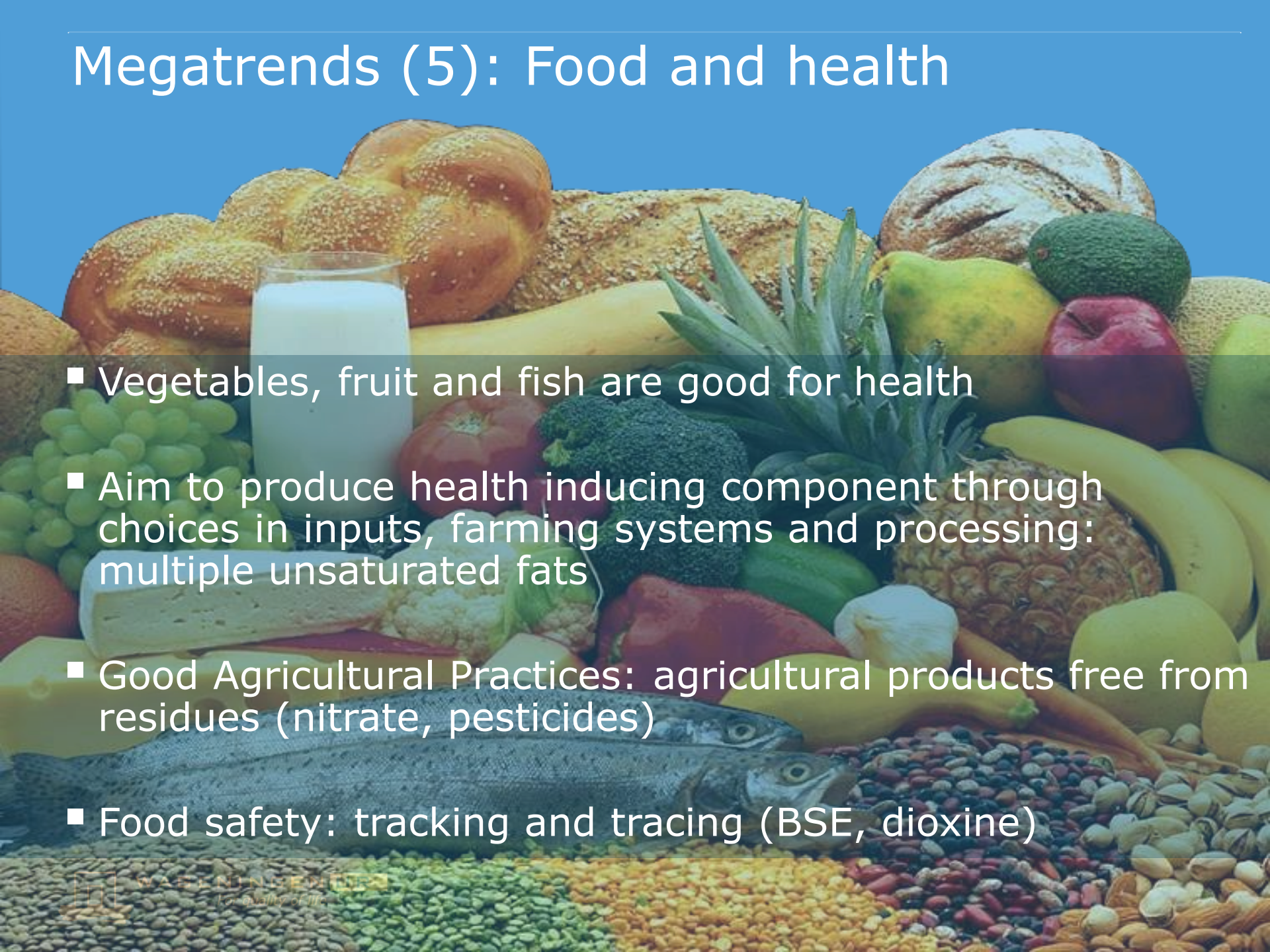
Megatrends (4): Multiple objectives

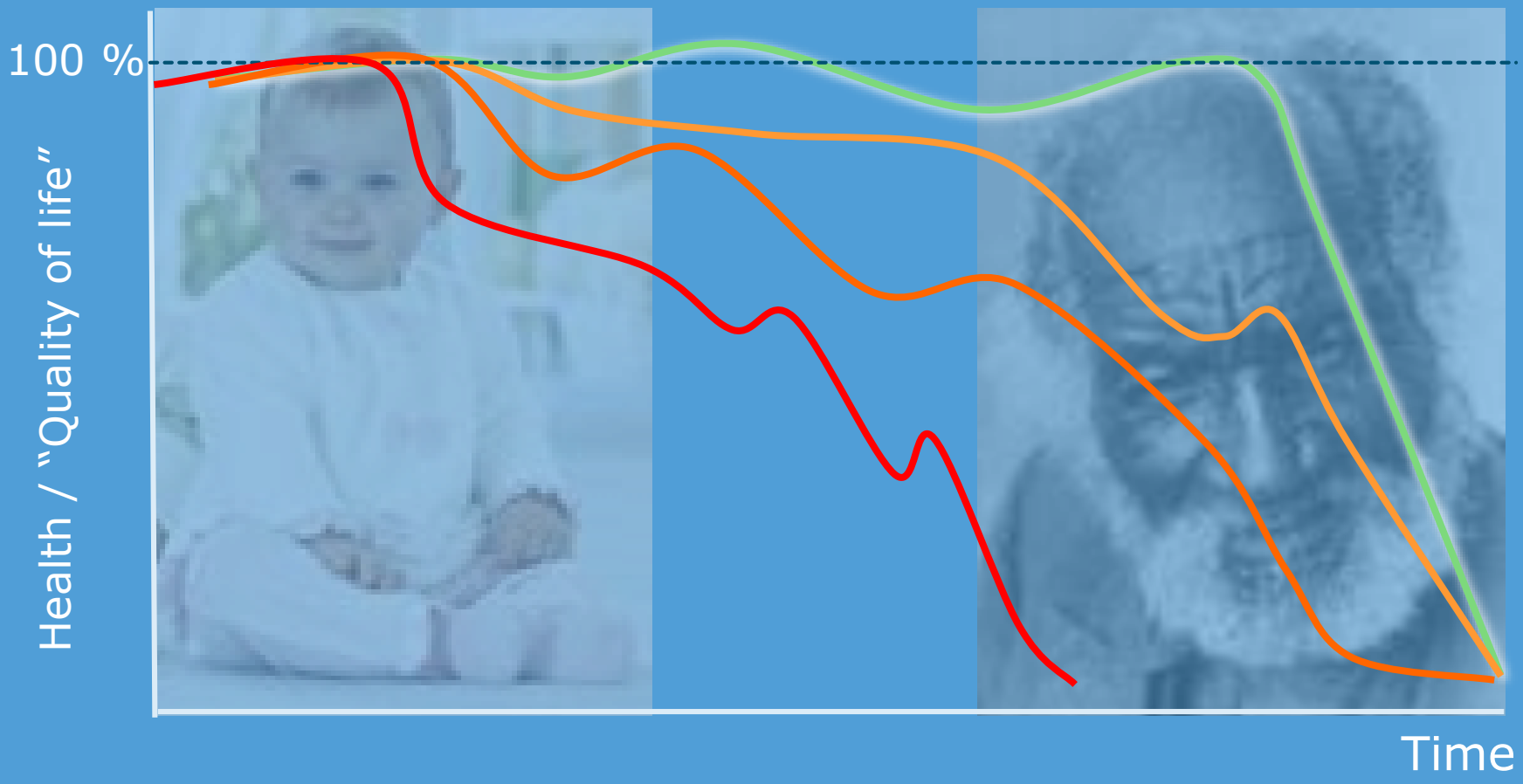
- Building on plant health
- Codex alimentarius
- Environmentally friendly
- Animal friendly
- Landscape

Megatrends (5): Food and health



- Vegetables, fruit and fish are good for health
- Aim to produce health inducing component through choices in inputs, farming systems and processing: multiple unsaturated fats
- Good Agricultural Practices: agricultural products free from residues (nitrate, pesticides)
- Food safety: tracking and tracing (BSE, dioxine)

Healthy food = healthy ageing



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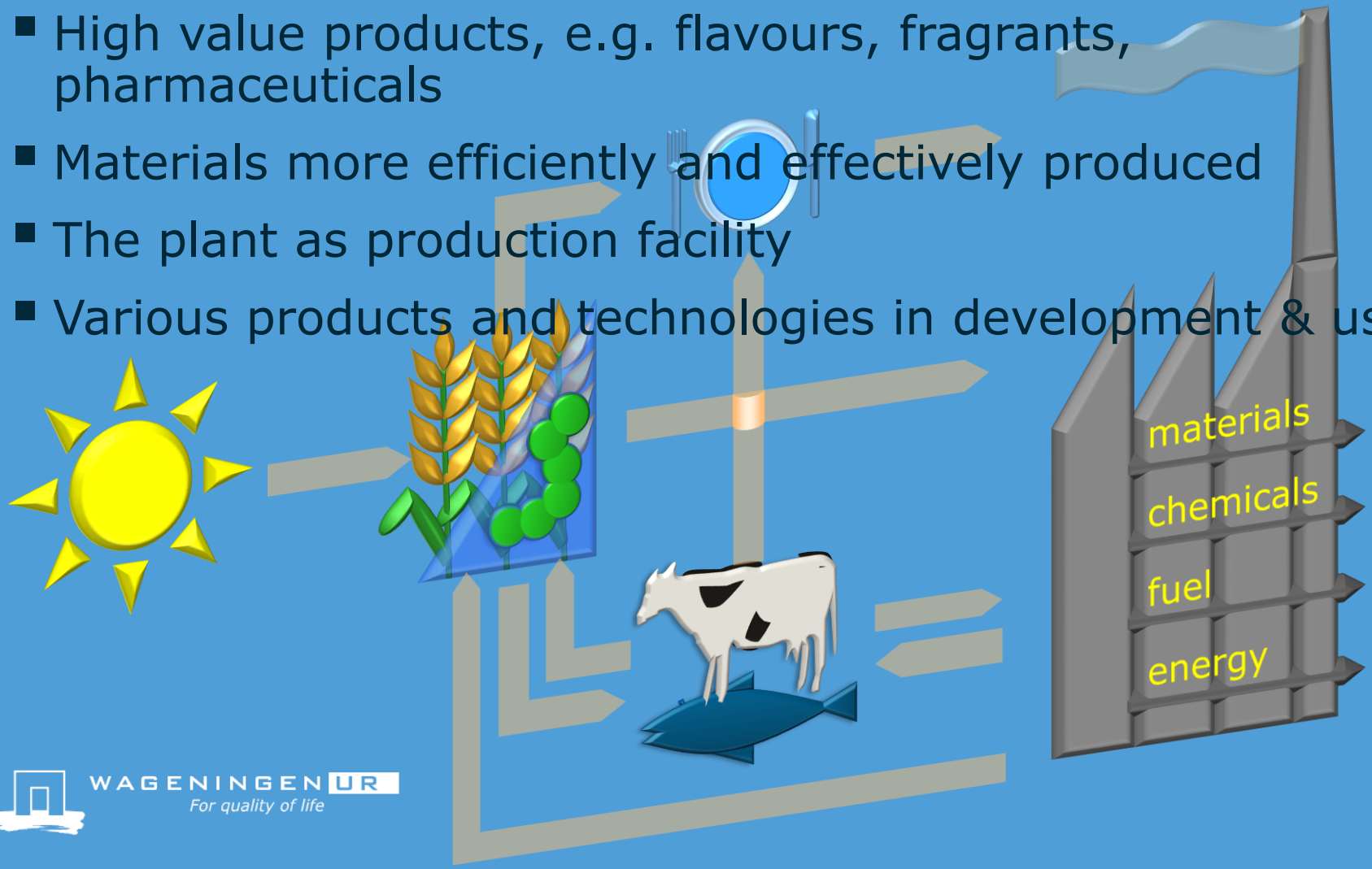
Megatrends (6): Biobased economy

- High value products, e.g. flavours, fragrants, pharmaceuticals
- Materials more efficiently and effectively produced
- The plant as production facility
- Various products and technologies in development & use



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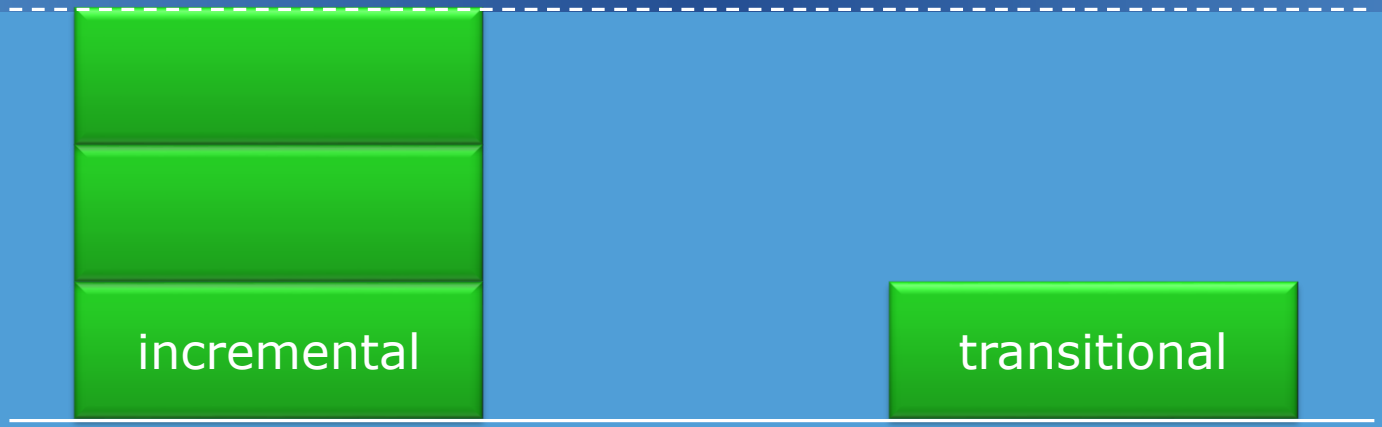
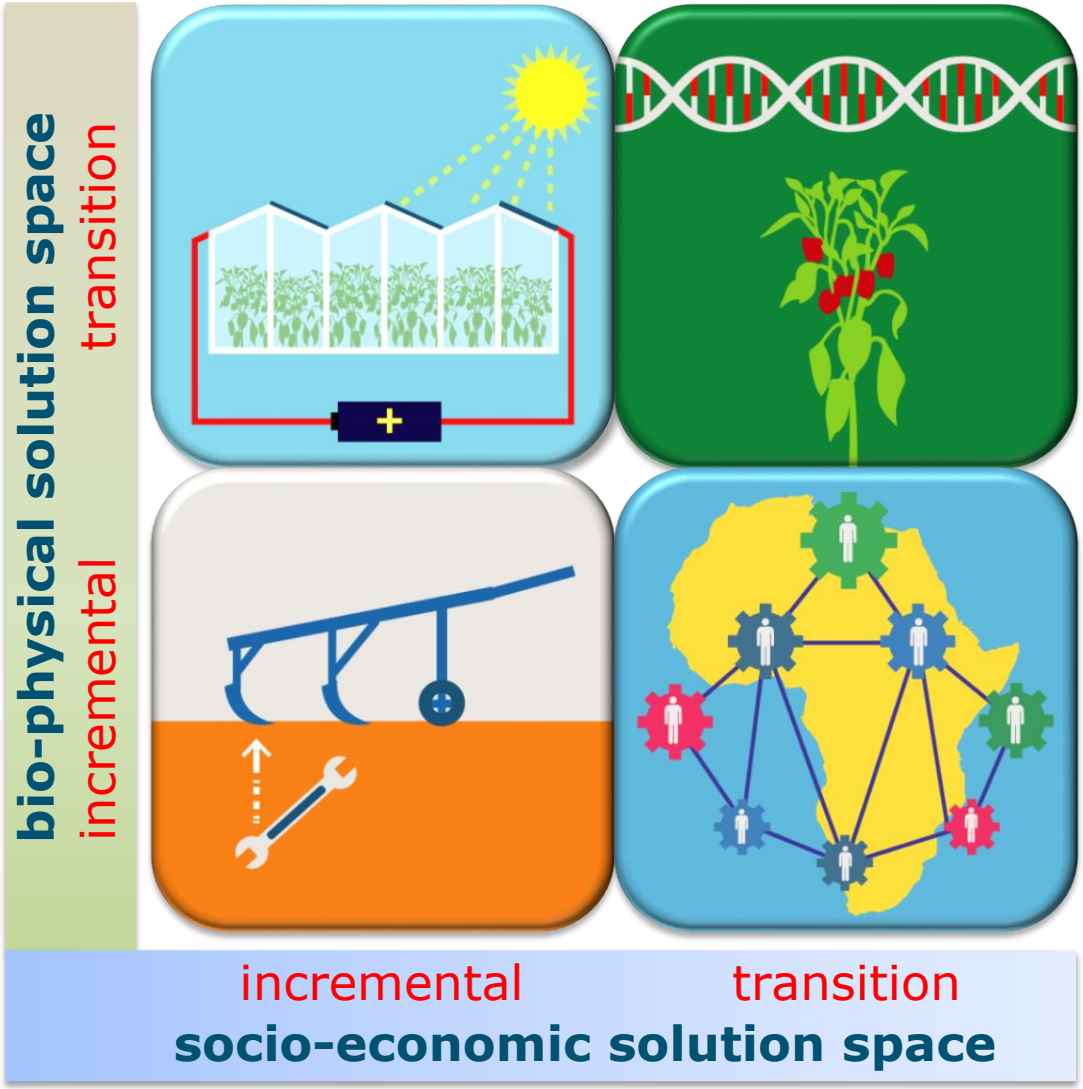
Incremental vs transitional approaches



Four solution spaces



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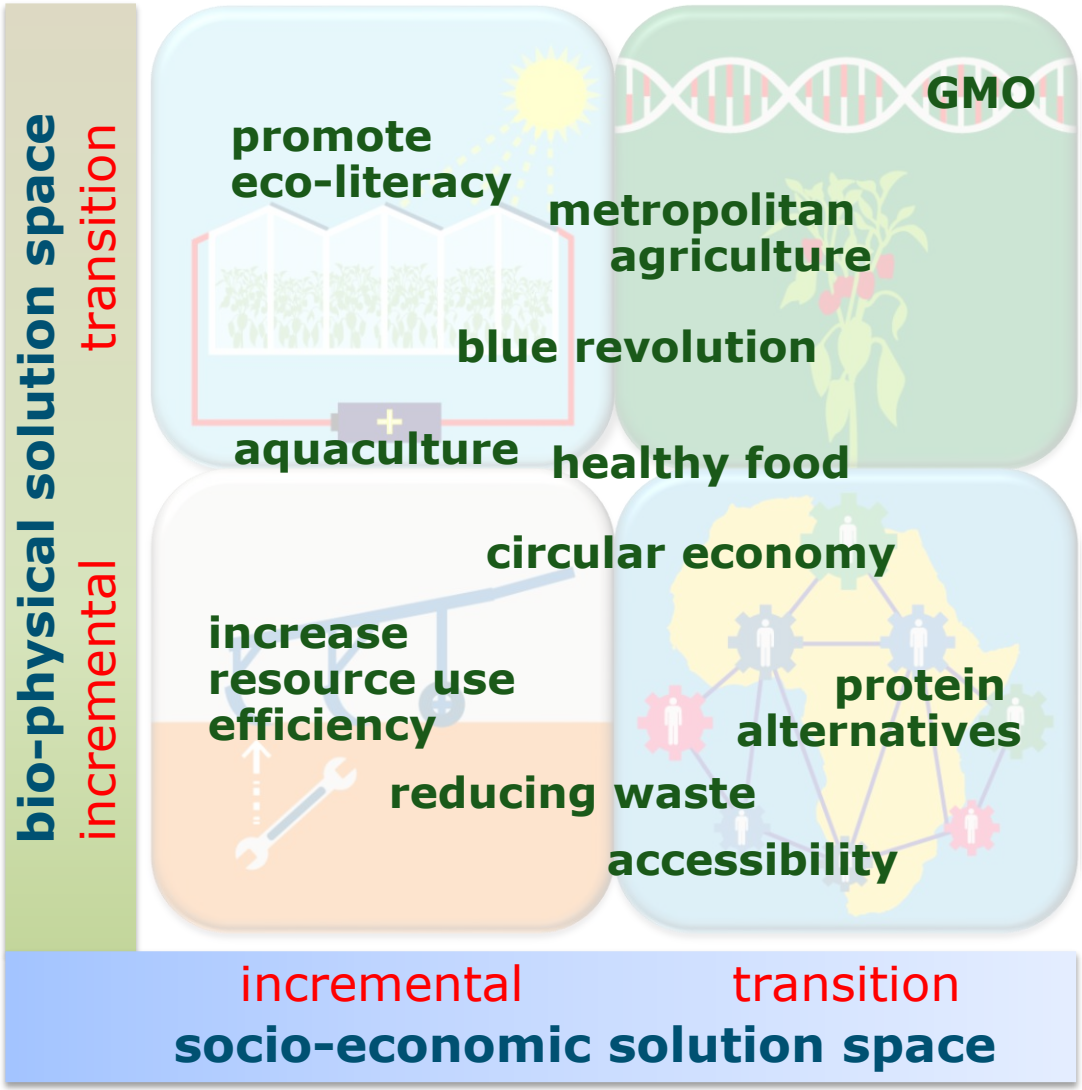


Crop protection developments

1850-1900: Recognize plant diseases

1900-1950: Empirical & descriptive studies

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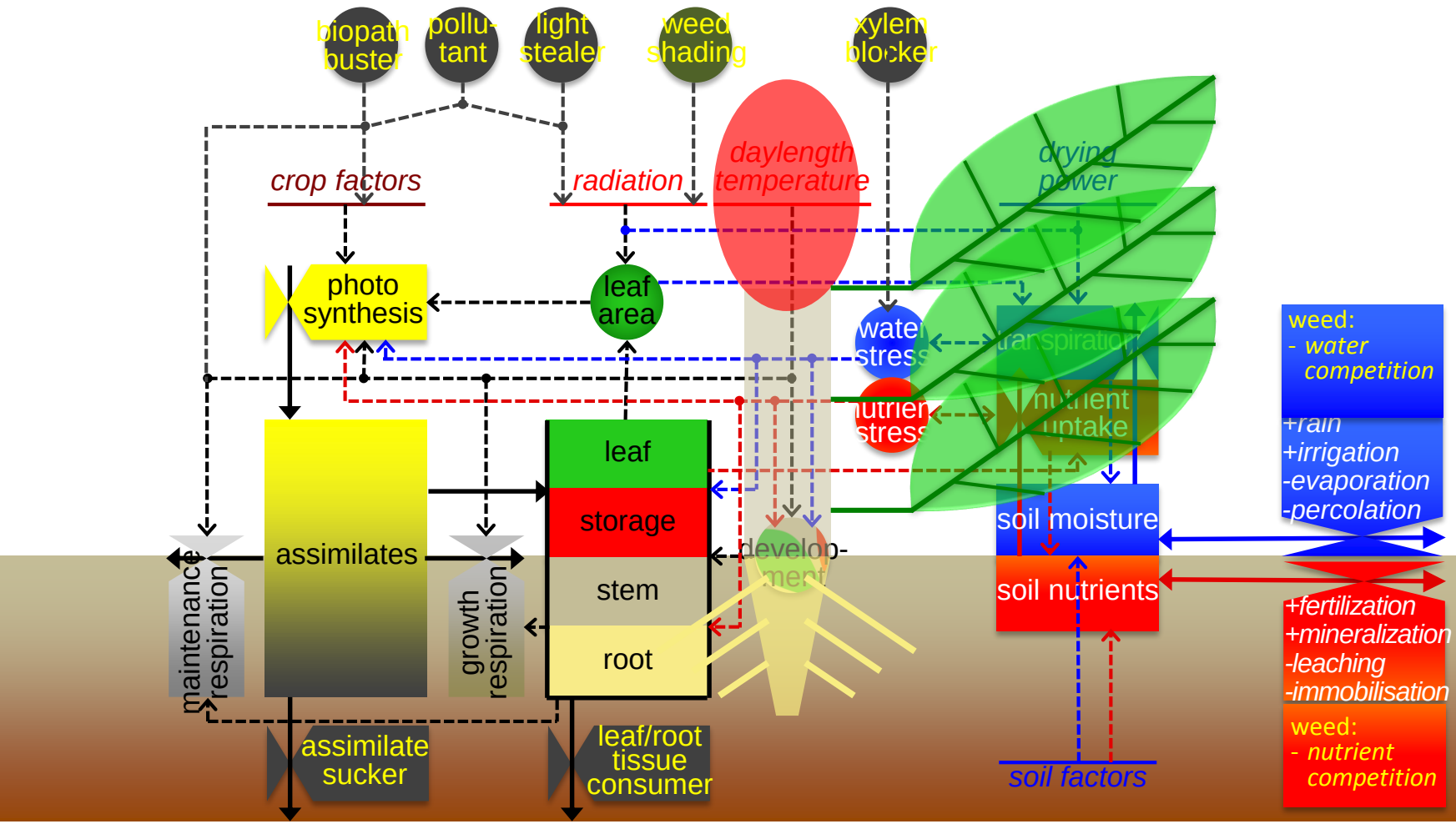
Wageningen UR Library: special collection wall charts

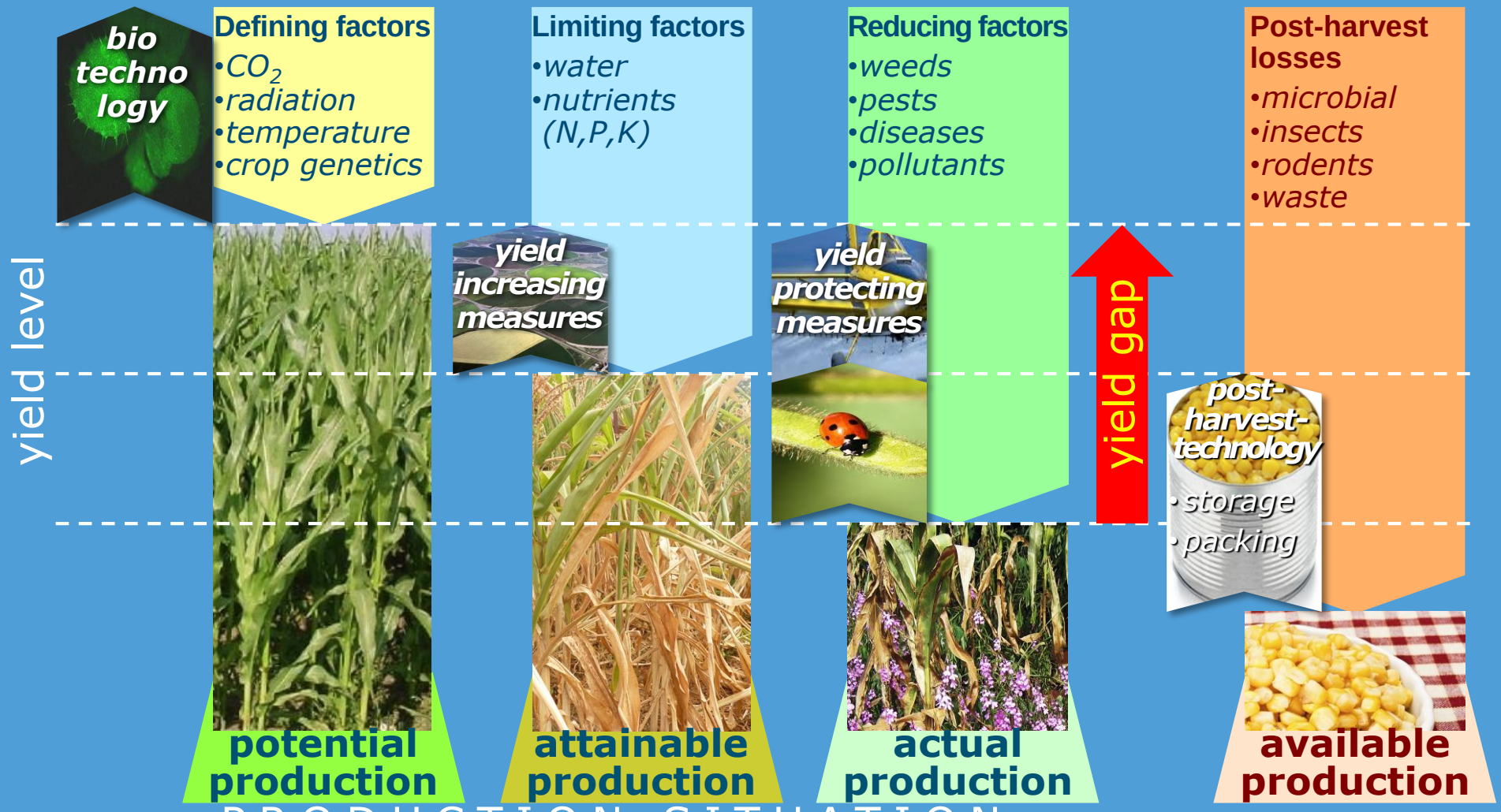
1950-1975: Chemical control

1975-1990: Integrated pest management & Plant health

>1990: Production ecological systems approach



Production ecological principles



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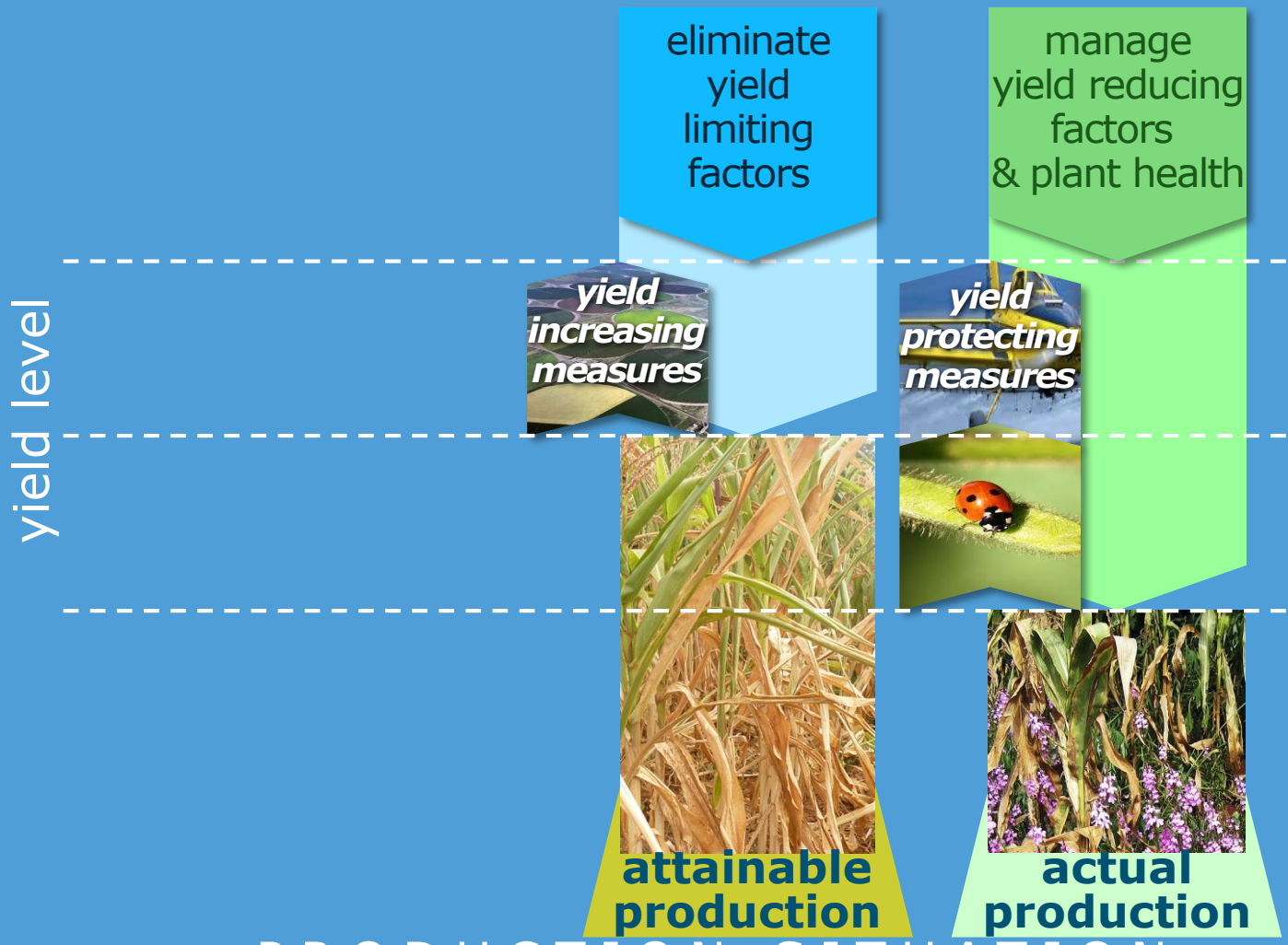
Approaches



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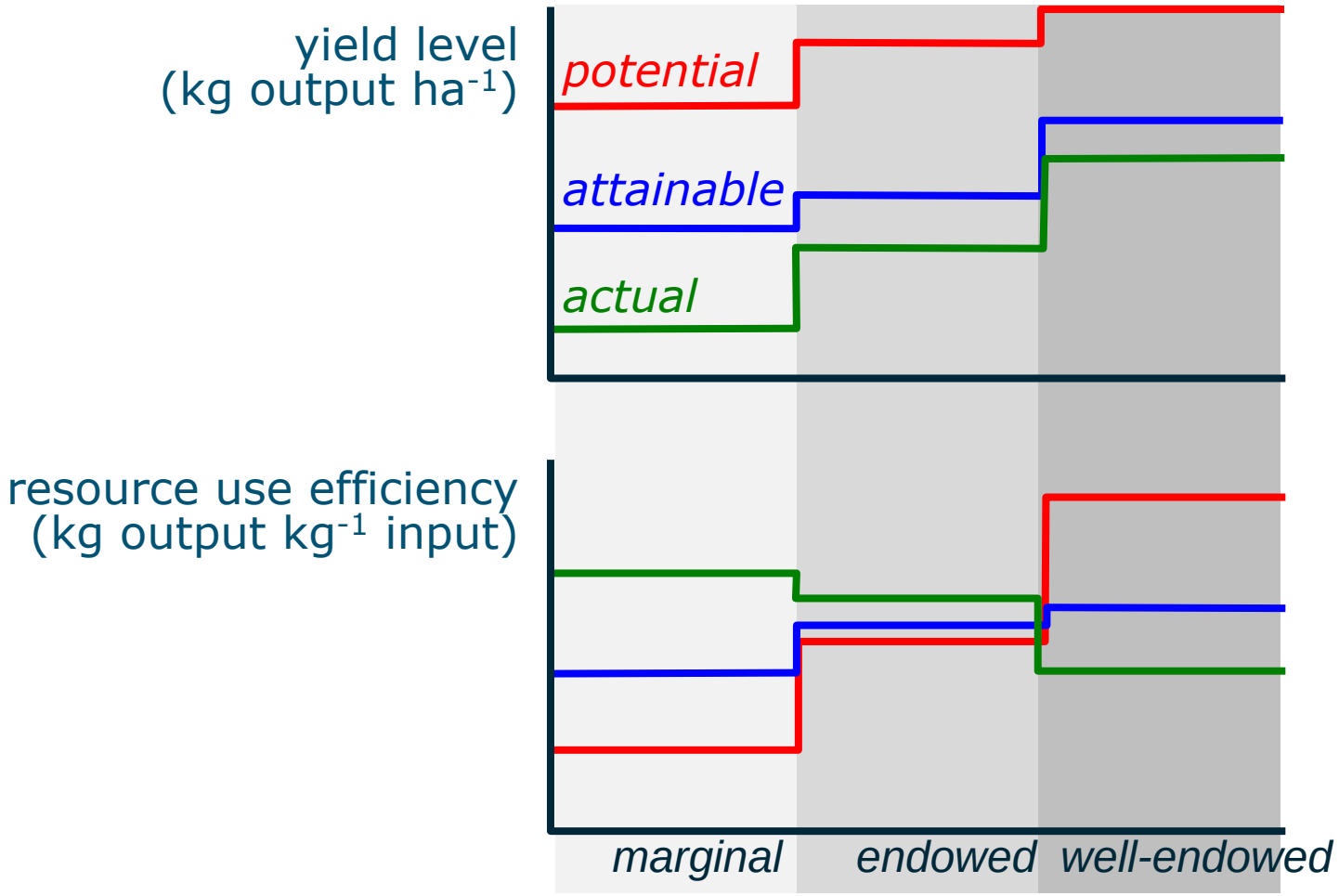
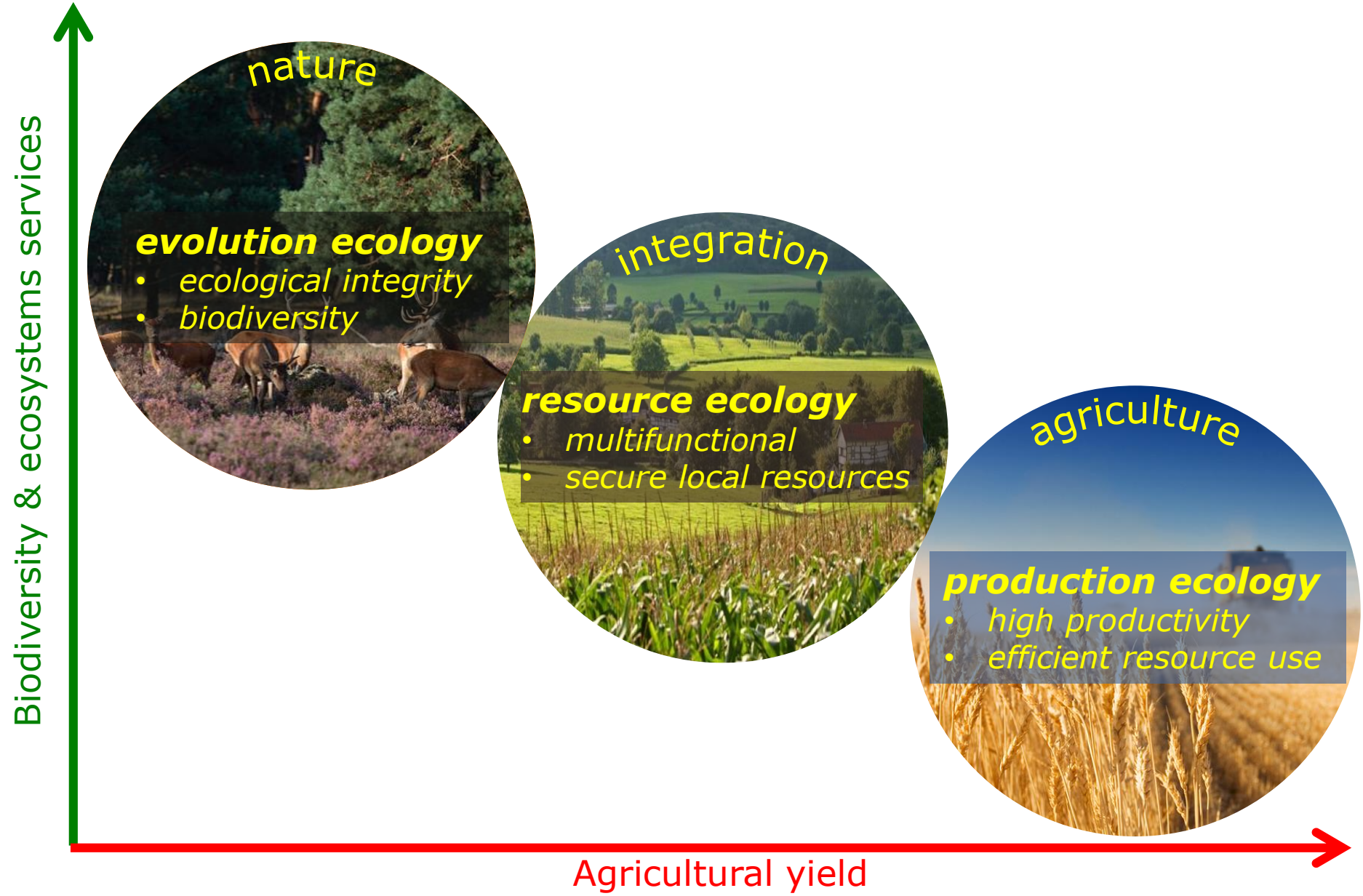
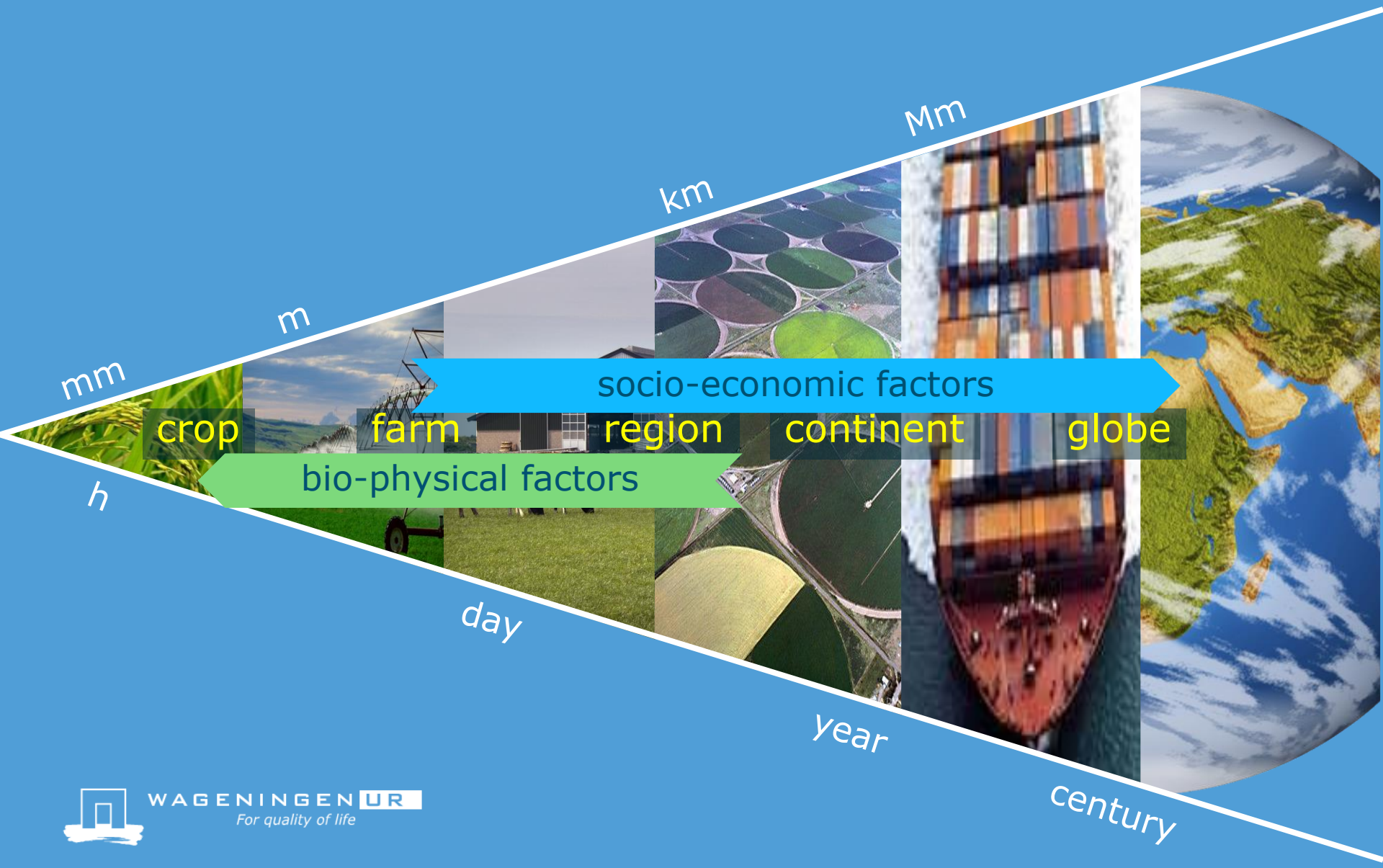
Production situation & resource input



To share or to spare



Interventions & issues at different levels



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Towards Best Ecological Means

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Cropping system

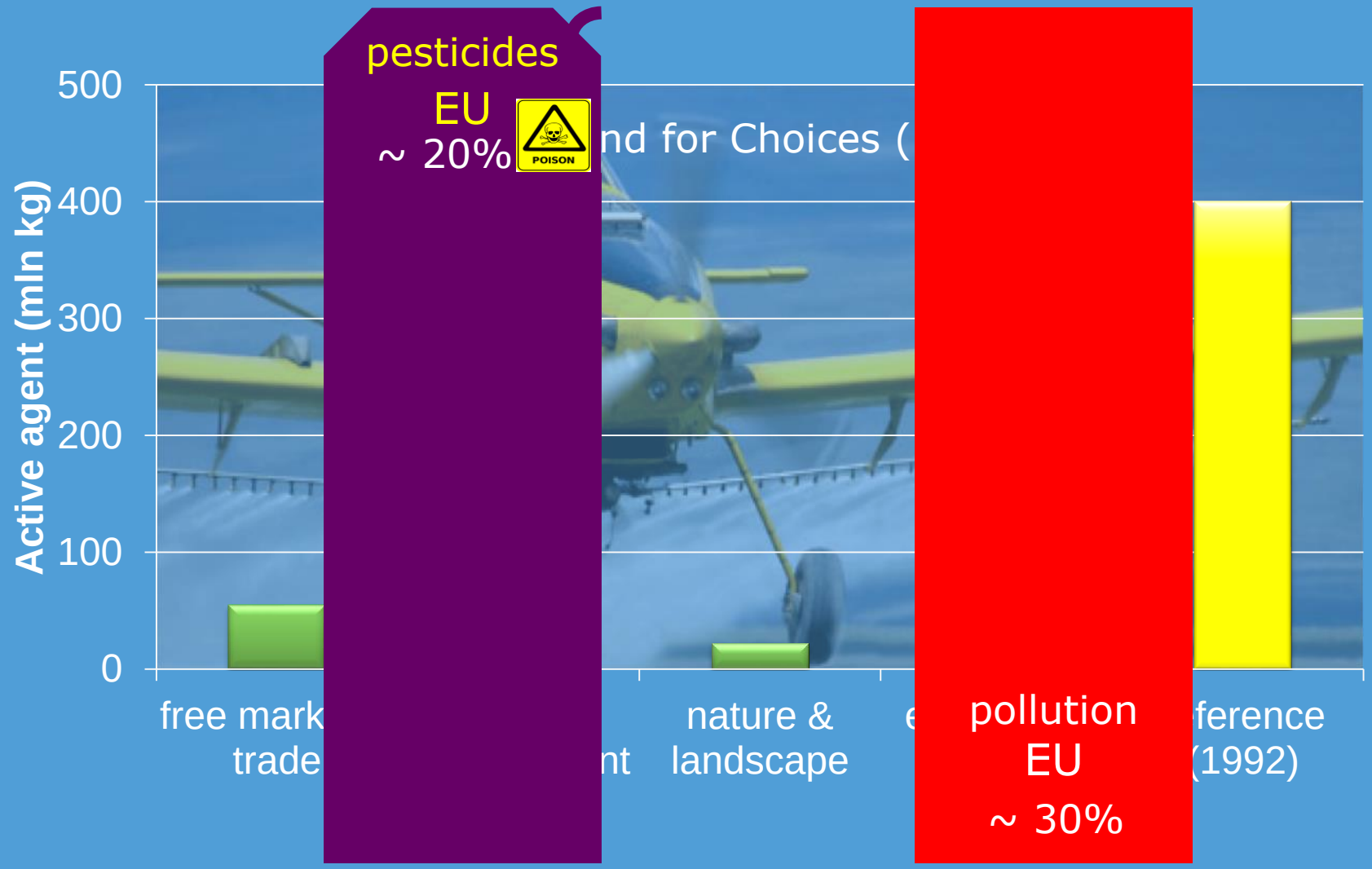
5 year rotation (e.g. wheat, potato, sugarbeet, onion and lucerne

- Increased efficiency
- Soil fertility
- Far less incidences of pests and diseases

Farm level

- Introduce plant health instruments
- Extend rotation period
- Reconnect / Disconnect
    - Reconnect plant & animal production
    - Disconnect purely crop/animal oriented approaches

Application Best Ecological Means



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Future oriented approaches

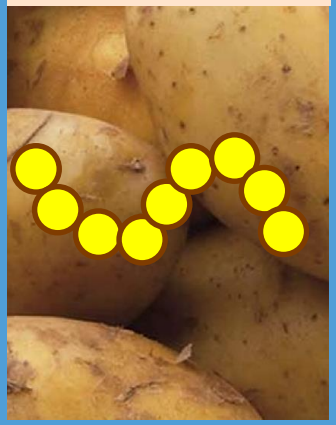
LED farming

Breed or spray against 'potato blight'

fungicide

BREEDING PROGRAM

'cultivated' potato



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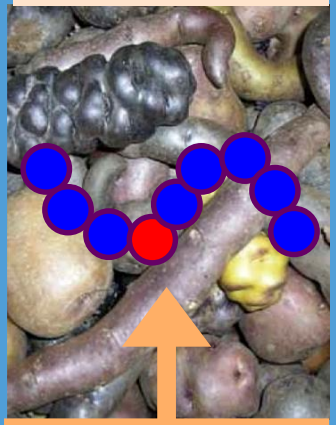
'wild' potato

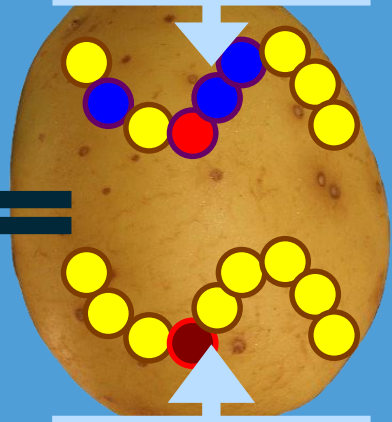


desired gene

=

TRADITIONAL BREEDING

many genes transferred



CIS-GENETIC MODIFICATION

only desired gene inserted

Adapted from: P. Boonekamp *et al.* (2010)

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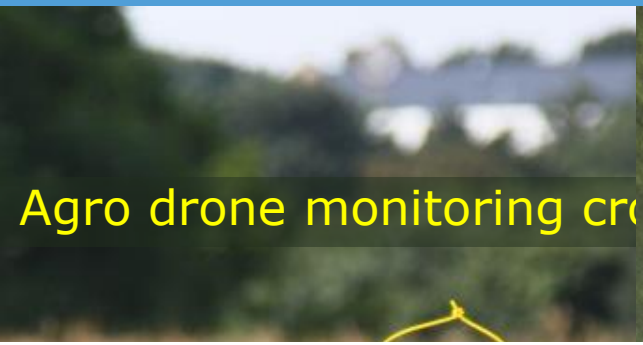
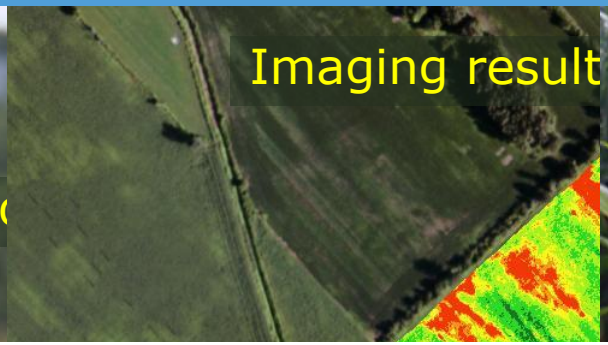
Farming bots





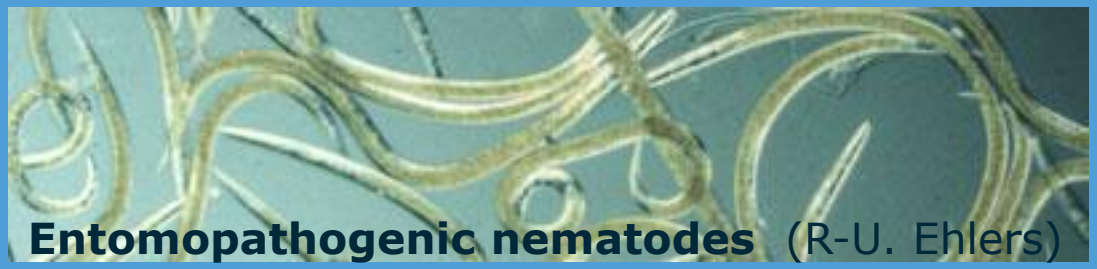
Pesticide by prescription using drones

Root microbes & plant heath

Berendsen et al. (2012)
Mendes et al. (2011)

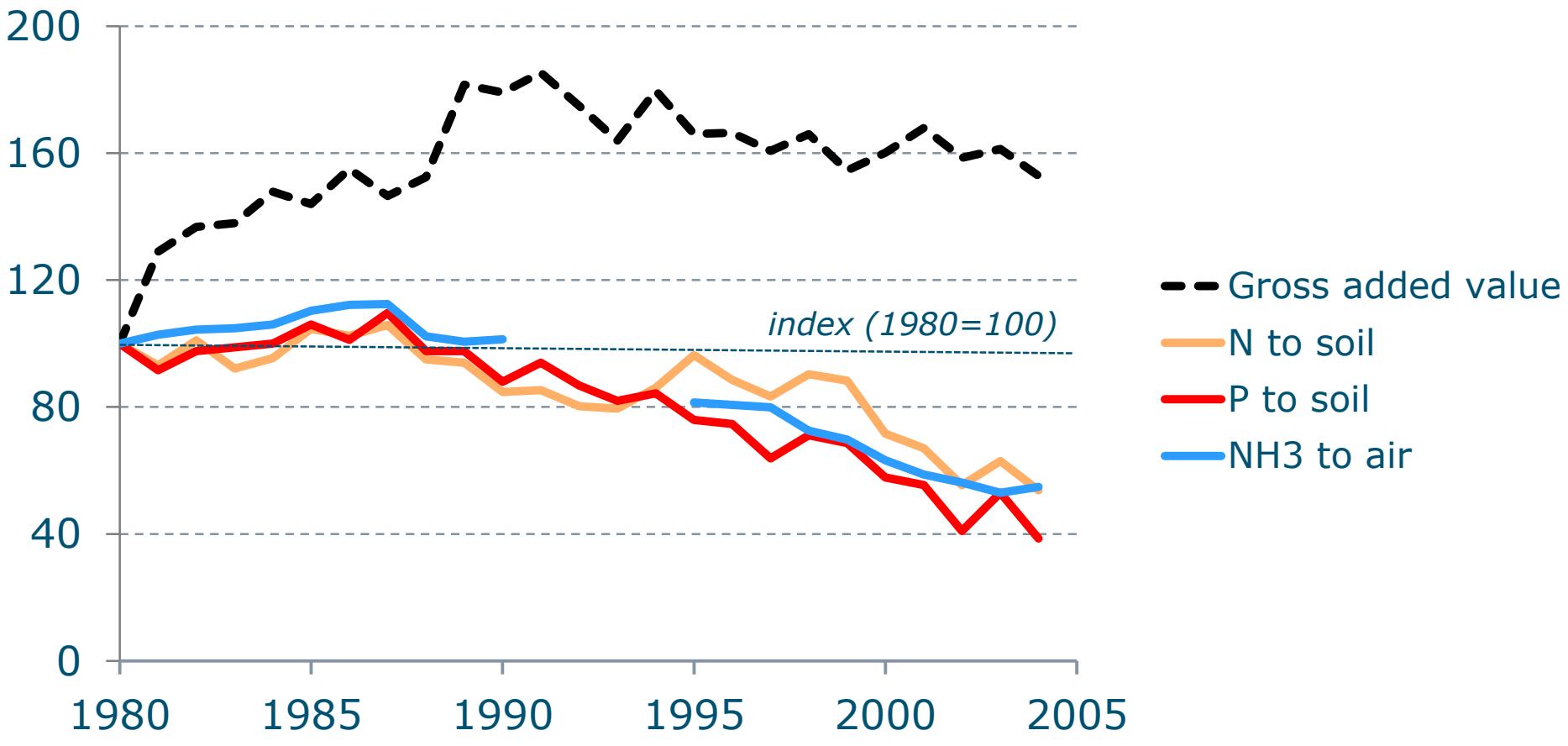
BIOCOMES: New biological control methods for sustainable farming & forestry

Entomopathogenic viruses (M. Züger)



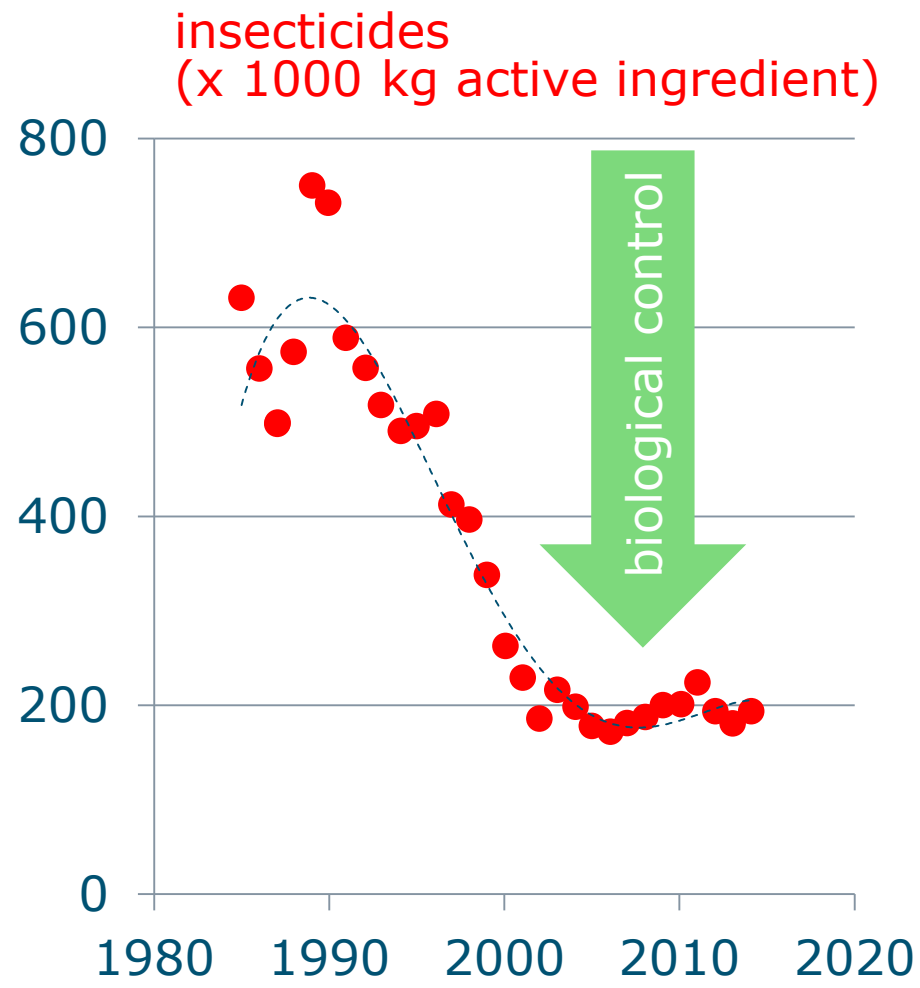
Entomopathogenic nematodes (R-U. Ehlers)

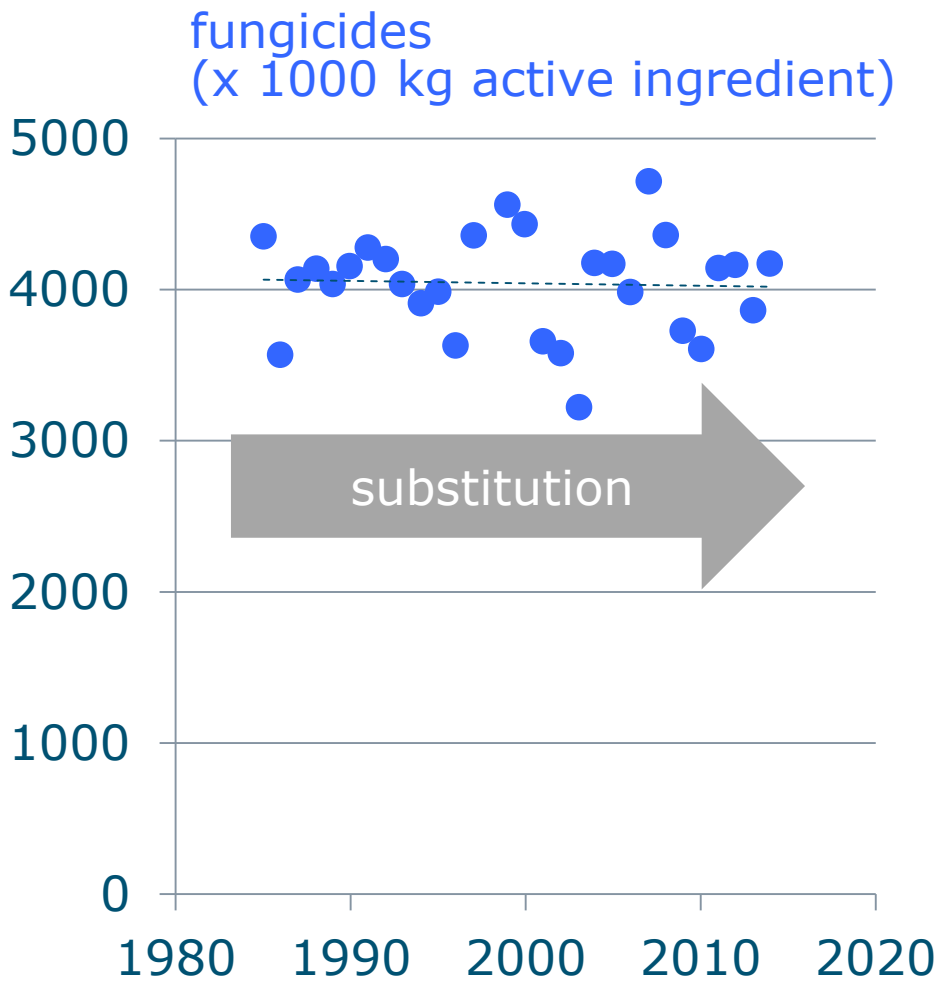
Nutrient emissions to the environment



Emissieregistratie (www.compendiumvoordeleefomgeving.nl)

Insecticide & fungicide use in the Netherlands





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source: www.clo.nl


...Conclusions...

Conclusions 1

- Megatrends continue
- Sufficient food of good quality possible
- Right decisions at all levels paramount
- Technical sciences offer opportunities

Conclusions 2

- Developments in ecological production techniques are impressive
- Sustainable systems may cause win-win-win-win situations
- *Best Ecological Means* just started
- Plant health pivotal
- Ecological literacy is the basis at all levels
- Best guarantee food security

Best Ecological Means: *triple win*

1. economically efficient
2. least detrimental for the environment
3. more space for biodiversity
4. best approaches for plant health
5. best guarantee food security

Thank you

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