Ministerie van Landbouw,
Natuur en Voedselkwaliteit

Climate-smart Resource-efficiency in Sustainable Food Systems

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(foto: Fred Ernst)

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- Chief Policy Analyst at Wageningen Economic Research
- Member of the Council for the Environment and Infrastructure

- Former Chief Science Officer Ministry of Agriculture
- Member Advisory Committee Province of South-Holland on the quality of the Living Environment
- Board member of SKAL – Dutch organic certification body
- Fellow EAAE. Former Secretary General of the EAAE, now involved in managing its publications (ERAE, EuroChoices)

Global Political Challenges and Opportunities

Sustainable Development Goals

EU Priorities: Renew CAP and R&I

COP21+

World Food Day 2017

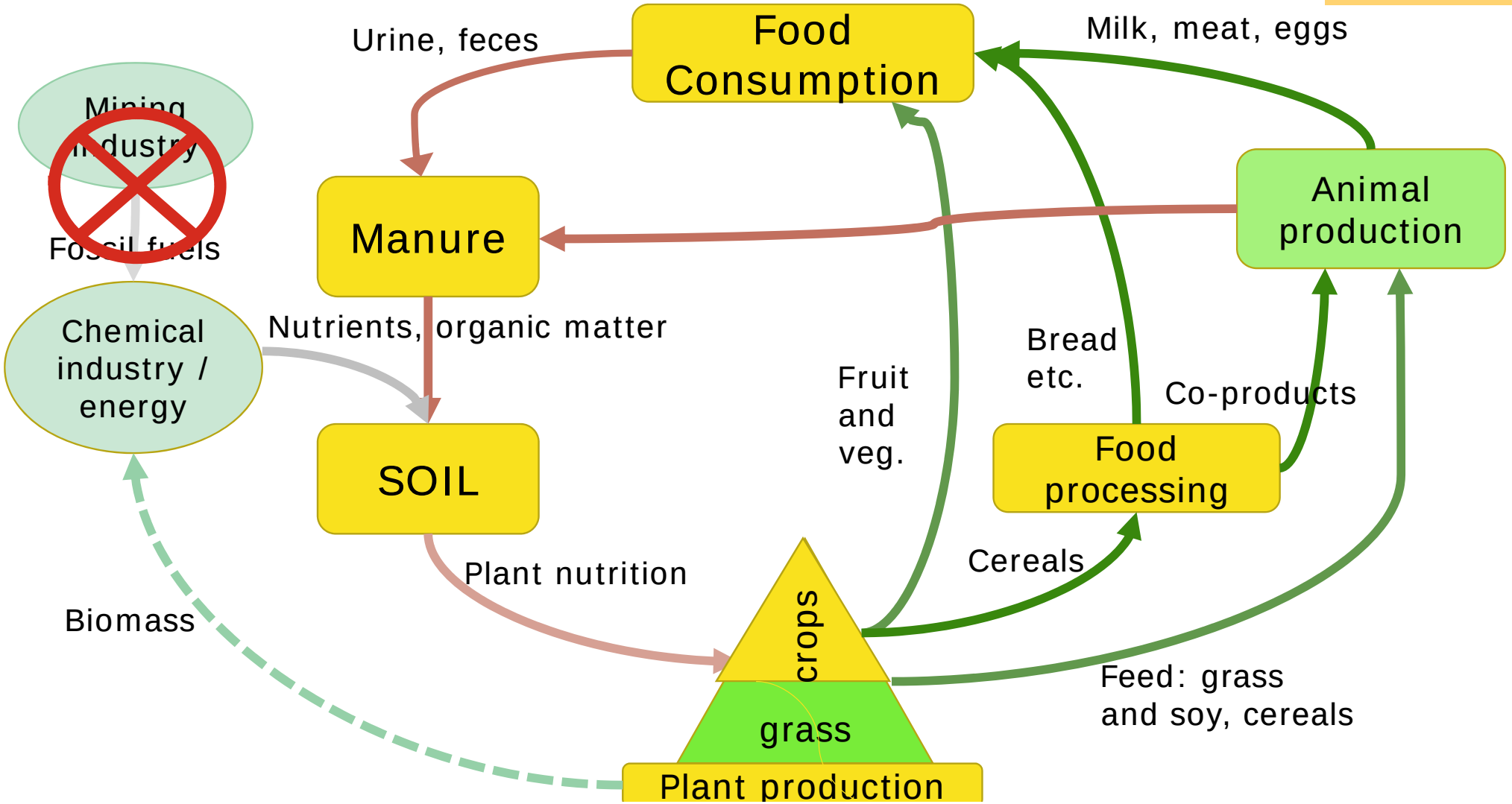
IPCC

Agriculture and Food: resource efficiency is key

- More production with less inputs / bad outputs (CO_2) >>efficiency
- Reduce food loss and food waste
- Economise on use of virgin materials: recycle and upcycle (by design)
  - Resource efficiency should also respect the local environment
  - The consumer can play a role too: sustainable consumption
    - (productivist versus sufficiency paradigm)
  - Agriculture produces more than food and feed: fibre, fuel, flowers etc., in short “biomass”

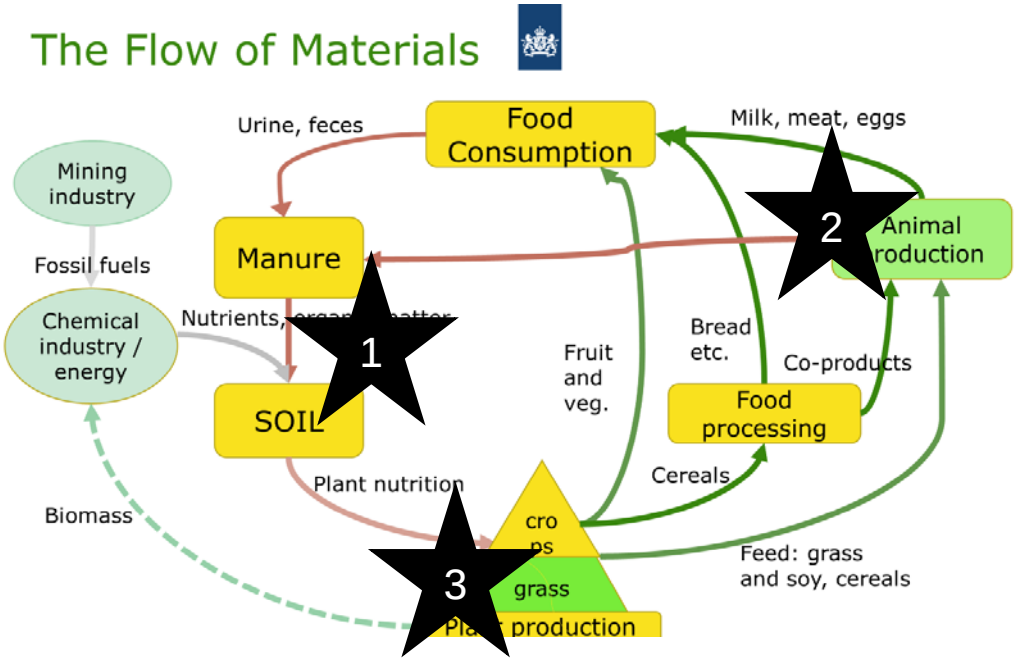
The Flow of Materials

Circular Bioeconomy Food Systems



3 main (out of many) issues to optimise the system

1. Prevent over-exploitation of soils
2. Rethink the role of livestock: providing manure for soil productivity based on feed originating from waste and non-edible products
3. Governance of the allocation of plant production: food first; unbiased competition between biomass and solar, wind energy.



Soil functions

Soils deliver ecosystem services that enable life on Earth

2015 International Year of Soils

fao.org/soils-2015

Food and Agriculture Organization of the United Nations

with the support of

Swiss Confederation

Federal Department of Economic Affairs, Education and Research EAER
Federal Office for Agriculture FOAG

Some issues regarding soil (productivity)

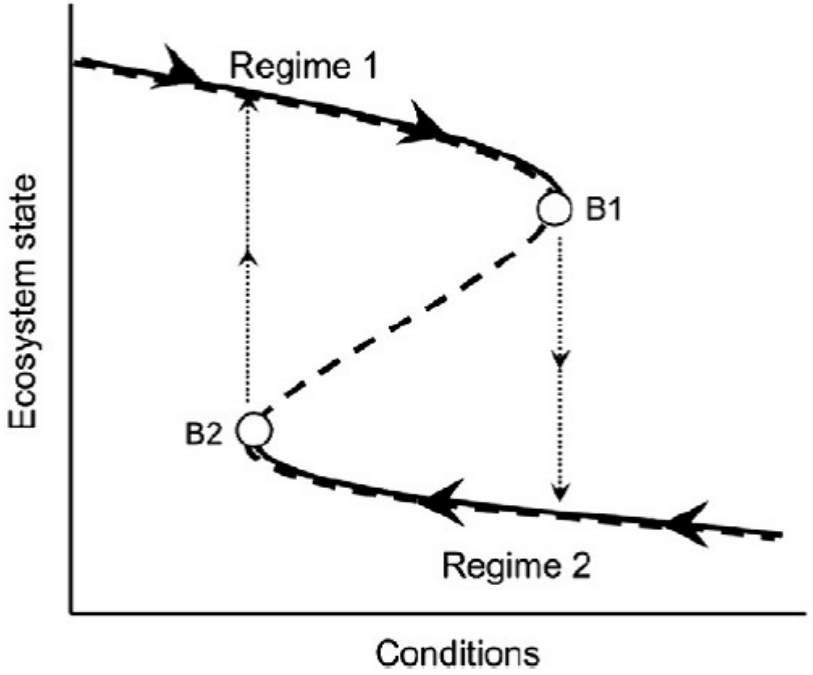
Land degradation due to

- Loss of organic matter and nutrients, when cycle is broken
- Salination due to (over-)irrigation and sea water rise (infiltration)
- Soil compaction due to heavy machinery
- Contamination with diseases, fungi, weeds and worse

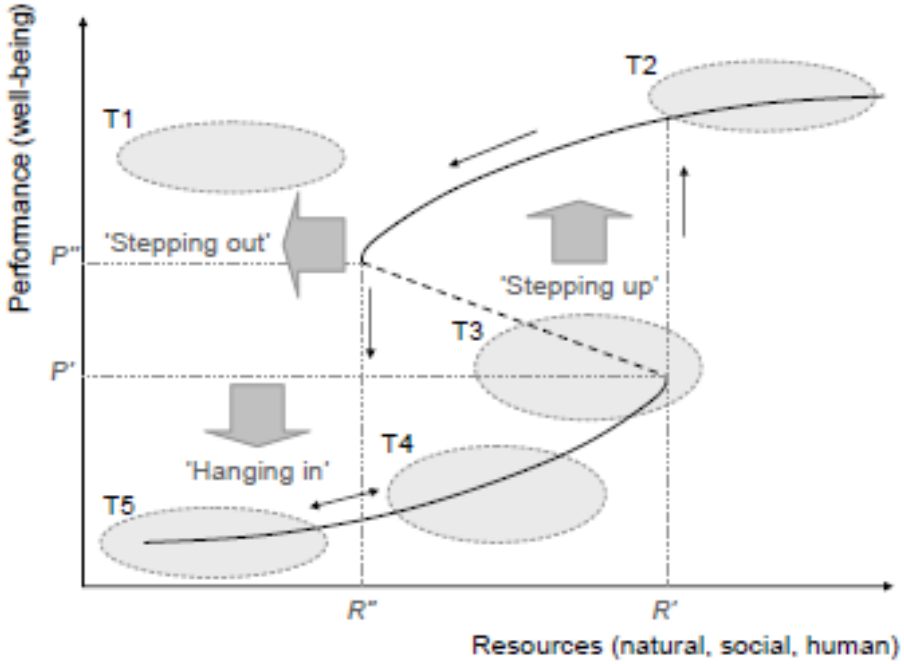
Release of greenhouse gasses in peat soils

Can soil management make a contribution to carbon storage?

Risk of collapse of systems due to low resilience



Grassland – water dynamic
Forest – savanna transition
Selective effects of agriculture
Fresh water algal blooms



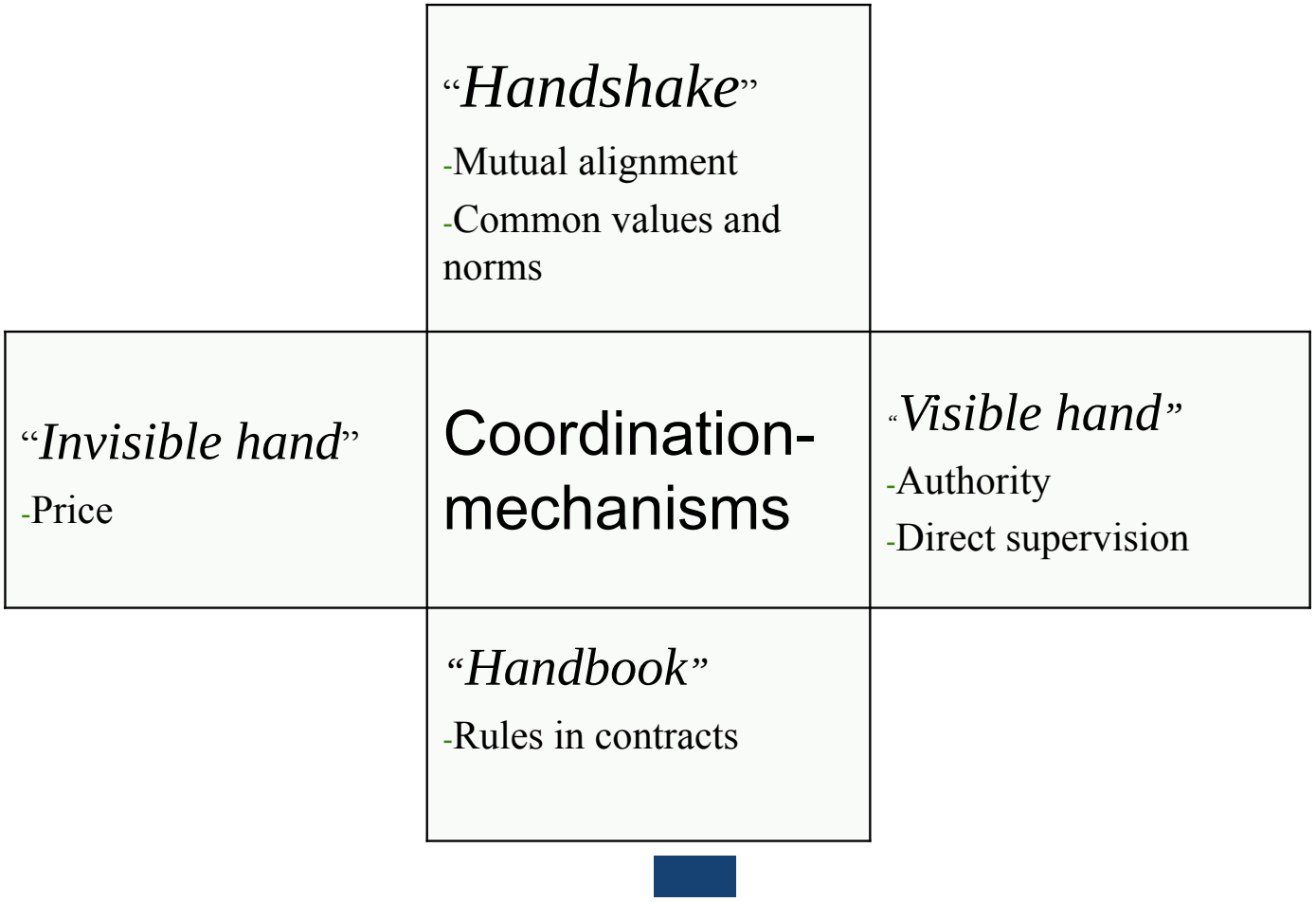
Rich and poor farmers in Africa

Tittonell 2010

Soils: a farmer's problem and a public issue?

- Farmer has the knowledge of his land and an income incentive
- But short termism can block optimal soil management
  - farms can be too small, land is rented in
- Interests of others (land owners, water authorities, food processors) are not fully taken into account in farm decisions

Potential coordination mechanisms



The challenges for research & innovation for sustainable and smart use of soils

Two pathways:

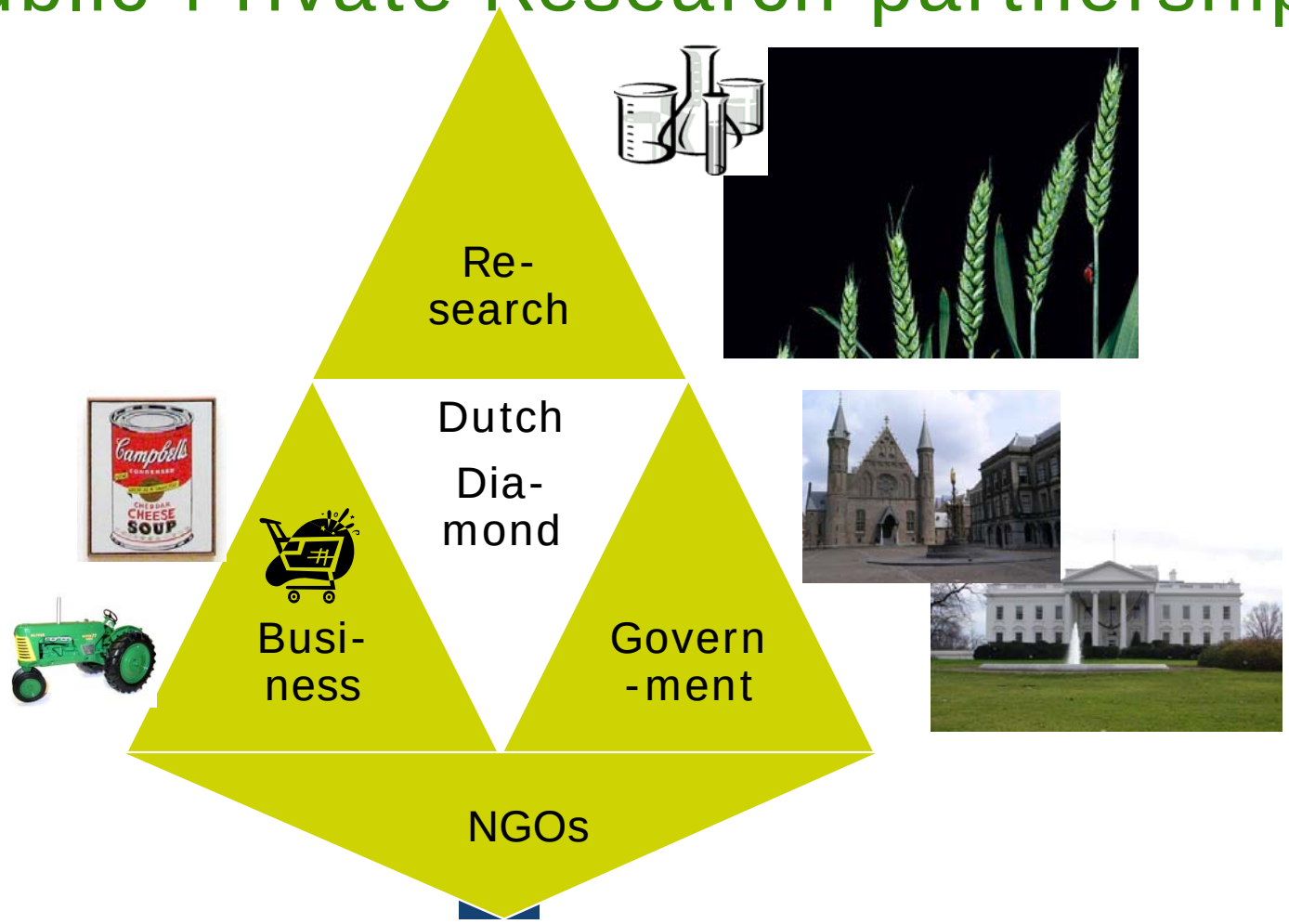
1. Increase soil carbon stocks by optimized management practices: capturing C as mitigation and adaption strategy in agriculture
   - Raise soil organic carbon content: reduction of soil loss due to water and wind erosion, less soil compaction, soil activity and biodiversity loss, better nutrient recycling and pest and disease control, humus formation, etc. (Bünemann et al., 2018)
2. Harnessing soil microbiome for sustainable use of phosphorus and nitrogen
   - An important route is better profiting from the soil microbiome for use and recycling of phosphorus and nitrogen (Schütz et al., 2018; Möller et al., 2018).

An example from Dutch research: intercropping

- Functional biodiversity (crop-crop / crop–weed)
- Reduces diseases compared to monocropping
- Permanent driving strips, for local compaction. Favours soil life and thus the crop.
- Robots could replace tractors
- © Wijnand Sukkel, WUR

THE POTENTIAL ROLE OF INTERNET OF THINGS: SENSING AND MONITORING

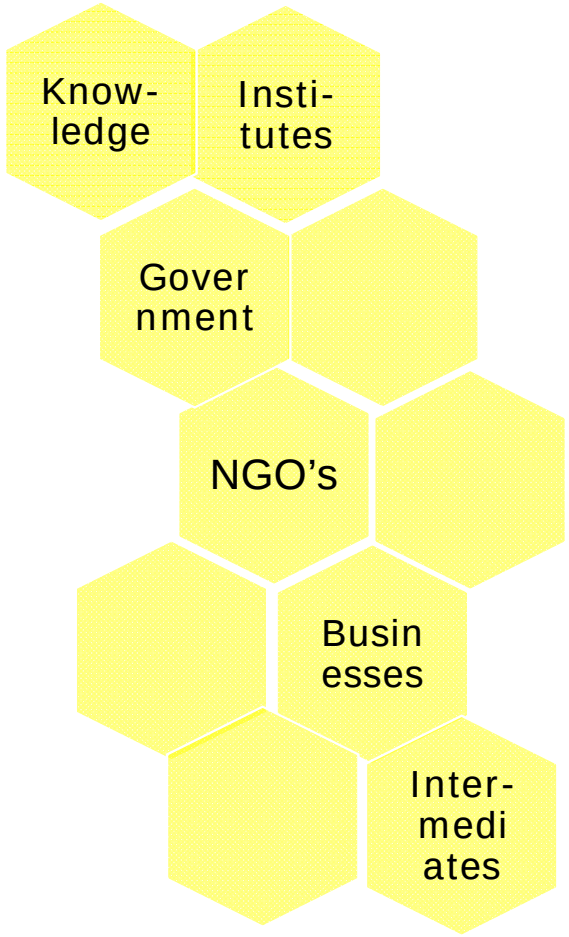
Many research projects are embedded in Public-Private Research partnerships



Our agro-innovation system and theory

- Innovation happens in a social system: “an institutional clustering of practices among the participants (not necessarily implying consensus)” (Anthony Giddens)
- Long-term infrastructural investment in ‘mental capital’ and its improvement is crucial for successful economic development and for competitive trade performance (Chris Freeman for OECD, quoting List, Keynes, and investigating historical cases in Europe and Asia)
- ‘Coupling mechanisms’ between the education system, scientific institutions, R&D facilities, production and markets have been an important aspect of the institutional changes introduced in successful ‘overtaking’ countries. (Freeman)
- Dutch agro-innovation system: PPPartners, linking principles en connection mechanisms (process design)

Linking public and private interests



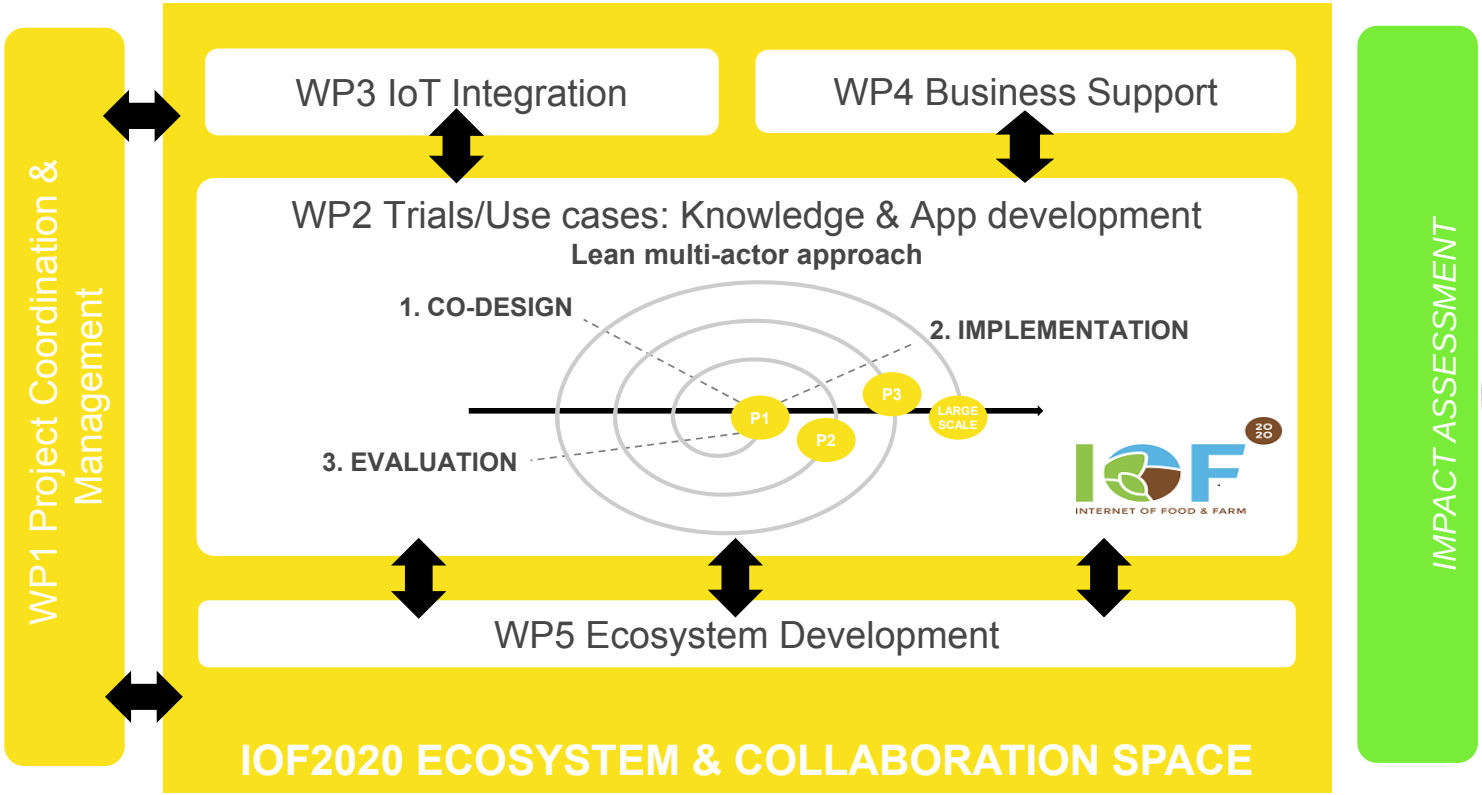
Linking principles:

- Openness
- Proximity
- Synergy
- Absorption capacity external info

Connection mechanisms:

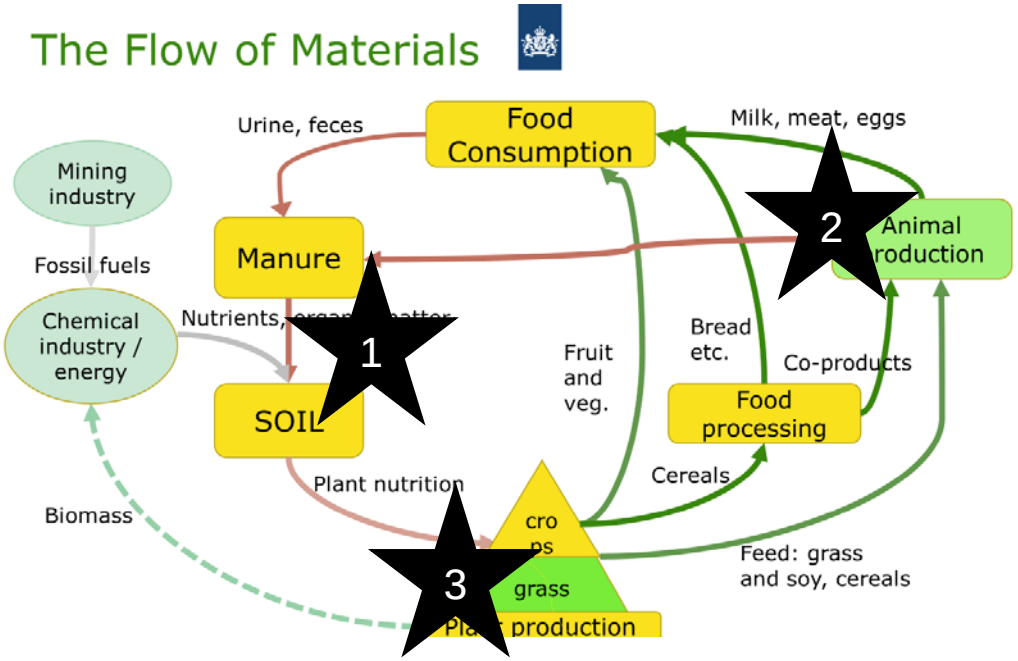
- Fora like Open Science Agenda etc.
- Strategic agenda Topsector
- Strat. Knowledge & Innovation Agenda (SKIA)
- Public-private investments
- Supporting institutional changes

Example: Innovation labs precision farming

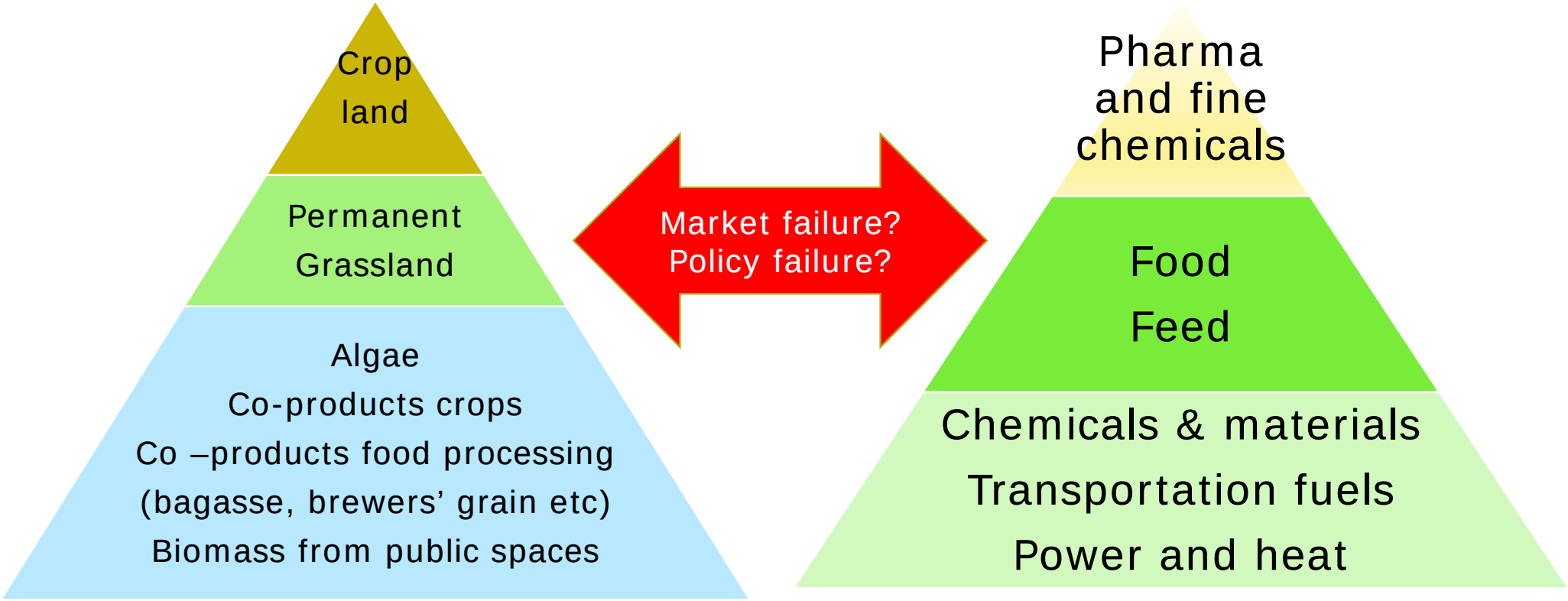


#3 Governance of the allocation of soils in plant production

- Demand for biomass increasing (SCAR-scenarios)
- Cascading the use of biomass: what is sustainable use?
- Global trade system leads to additional complexity



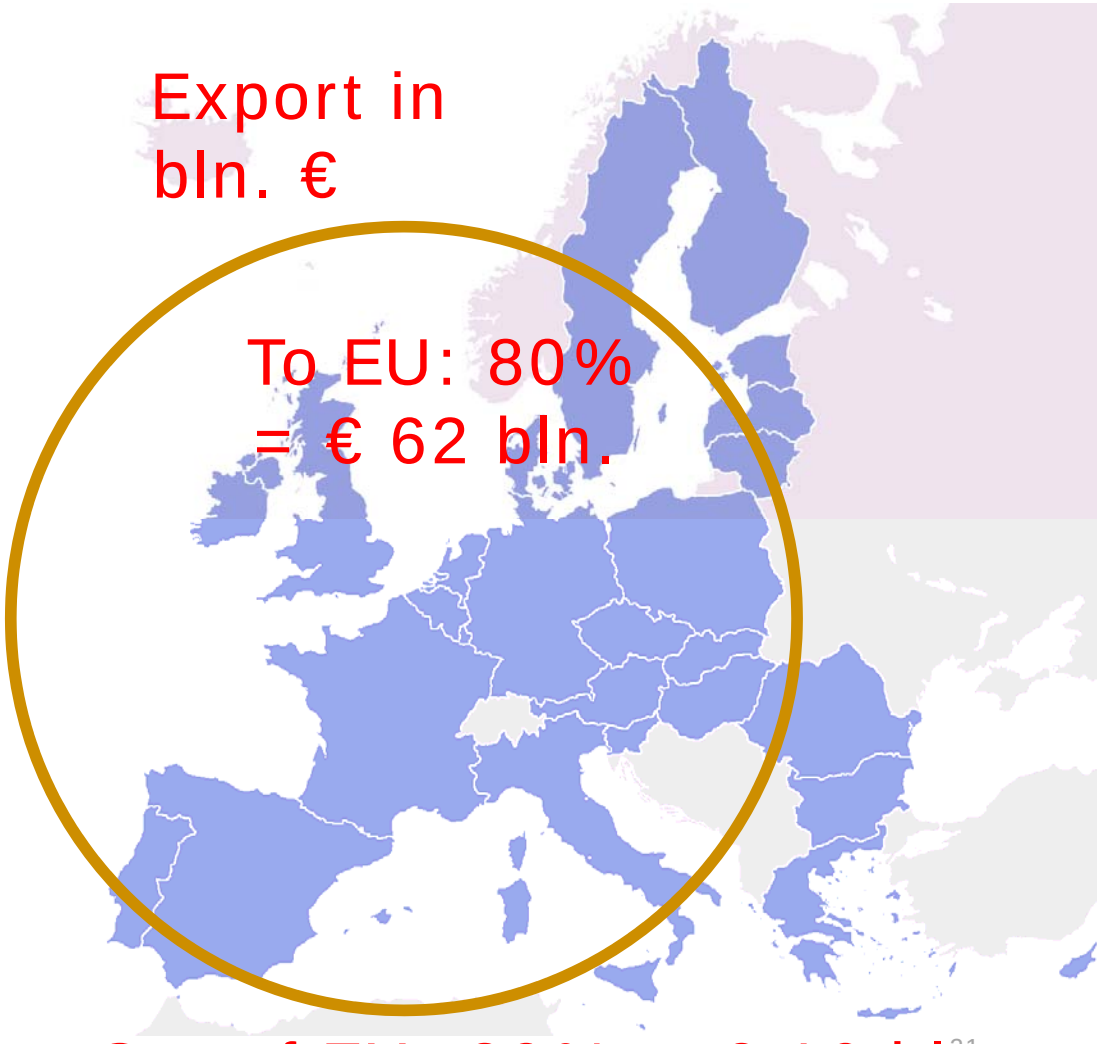
Cascading the use of biomass: what is sustainable use of our soils? Food First?



Source: Roland Berger, adaptation KJ Poppe

Some cycles hard to close in international trade

- At which scale do we close cycles?
- Governance of sustainbility: via prices or trade schemes like GlobalGap, FairTrade, Round Tables etc.?
- Need for criteria in trade and finance for “sustainable production” of biomass?
- Need for more scientific IPCC-like work to substantiate sustainability claims?



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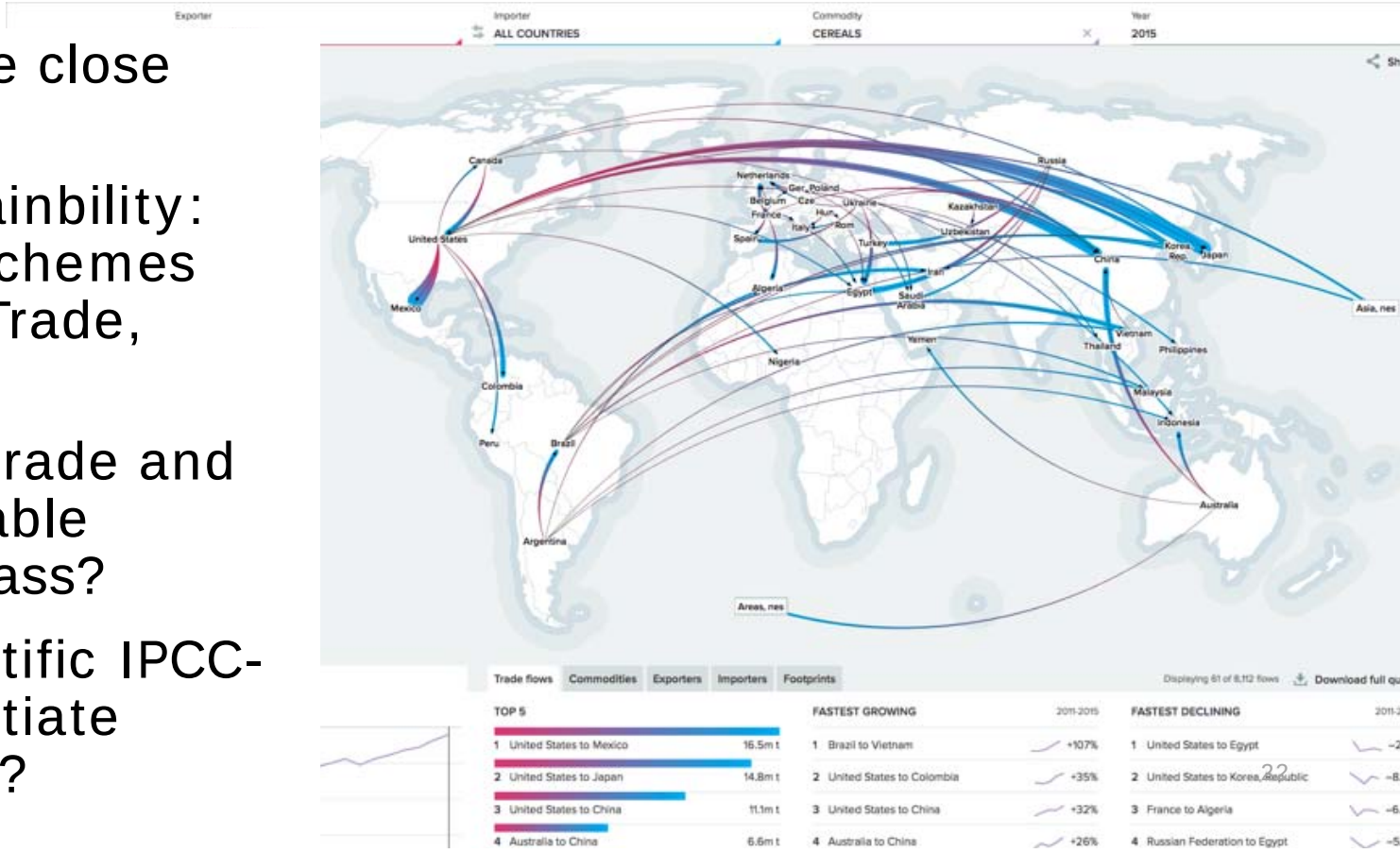

5 research strategies to generate insights into the issue of optimal allocation of soils and their biomass

- Monitoring and accounting (true costs, sustainability accounting)
- Uncertainty management for resilience (risks, resilience)
- Analysis of scenarios
- Incentives for change
- Social innovation for inclusive decision making

Policies are not optimally designed for the SDG / COP21 realities

(and sometimes favour non-renewable energy, fertilizers over manure etc.)

Source: Van Meijl et al. 2017

Conclusions

- SDGs and COP21 (Climate Change) signal challenges
- Resource Efficiency is key
- Close the material cycle
- Soils are a critical resource
- New techniques like ICT help
- Governance of biomass allocation at global scale asks our attention

Thanks for your attention

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