

Agroecology and 4 % initiative for soils
Franco-Japanese workshop
Tokyo, January 27th 2017

**General presentation of agroecology and its
links with the challenges of food security**



Etienne Hainzelin
In collaboration with Cirad researchers

Outline

- 1. A radically new way of looking at agriculture performance**
- 2. Agroecology enhances specific ecosystem services for production and is expected to lower negative externalities**
- 3. Some illustrative examples**
- 4. What does link agroecology with food security ?**
- 5. Few words of conclusion**

1. A radically new meaning of agriculture performance

Agriculture modernization in industrialized countries in the last 100 years

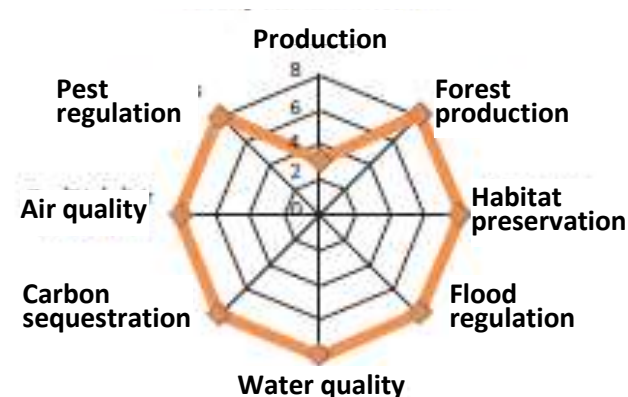


Uniformisation / segregation

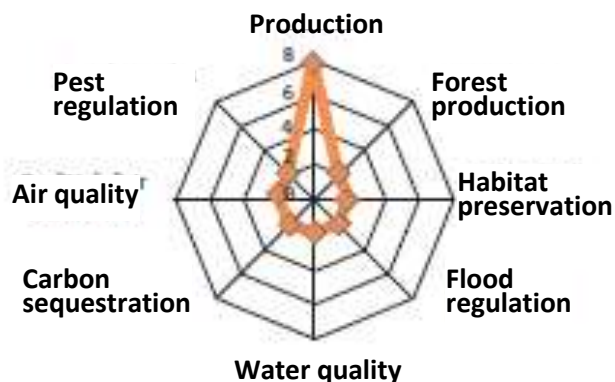


1. A radically new meaning of agriculture performance

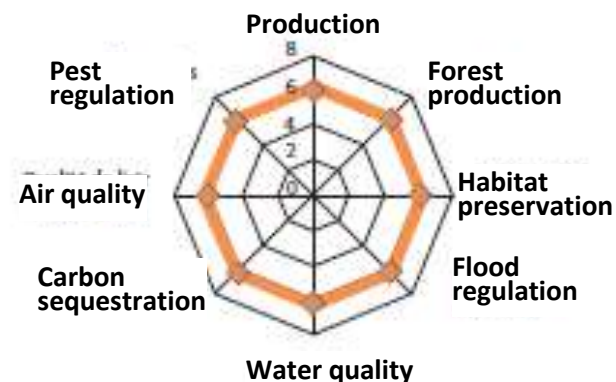
Natural ecosystems



Intensive cereal crop



Crop with restored ecosystemic services

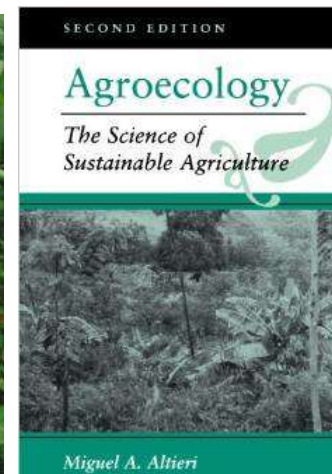
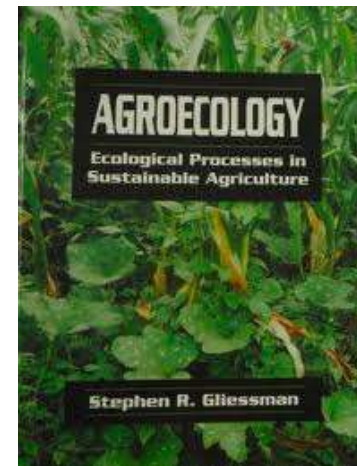
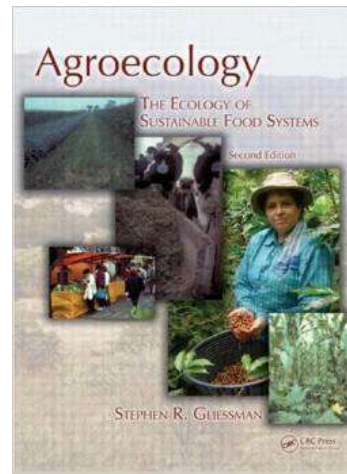


Visualisation of ecosystem services with different cropping systems
(service value from 0 to 8)

2. Agroecology mobilizes and enhances specific ecosystem services for production and is expected to lower negative externalities

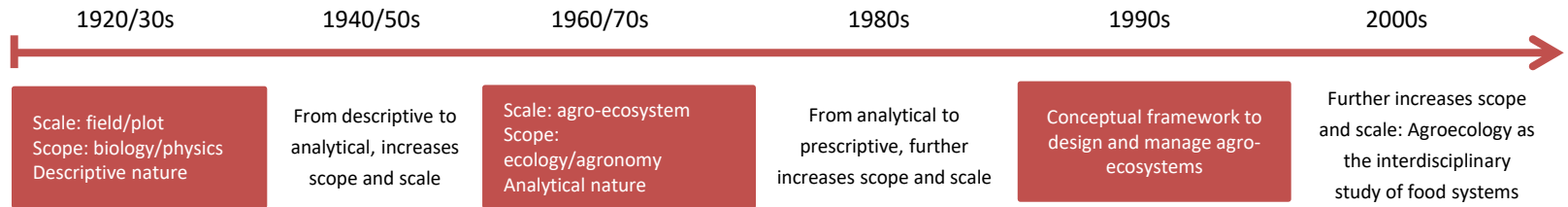
Principles of Agroecology (Altieri, Gliessman, ...)

1. Recycling biomass to optimise soil organic matter and nutrient cycling
2. Creating conditions for efficient soil biological activity
3. Enhancing biodiversity-mediated regulatory functions
4. Minimising losses of energy, water, nutrients and genetic resources
5. Managing agrobiodiversity and diversify the agroecosystem in space and time
6. Fostering interactions and synergies between system components

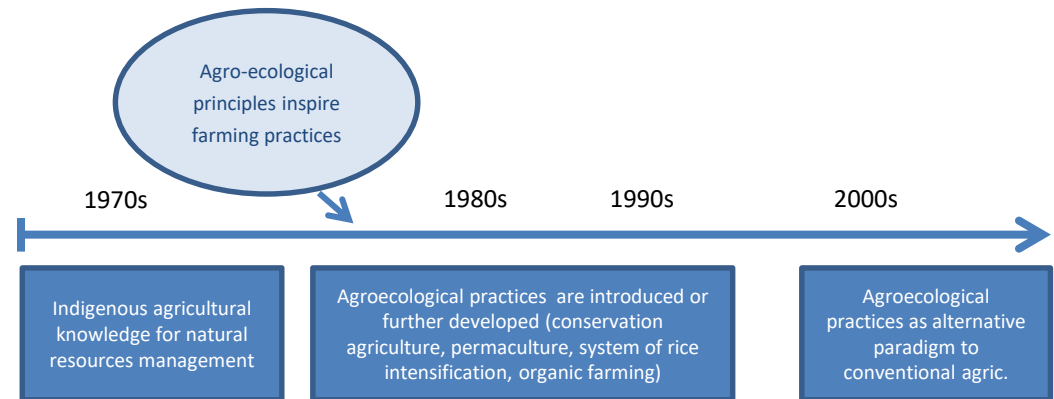


Historical perspective of the diverse incarnations of agroecology

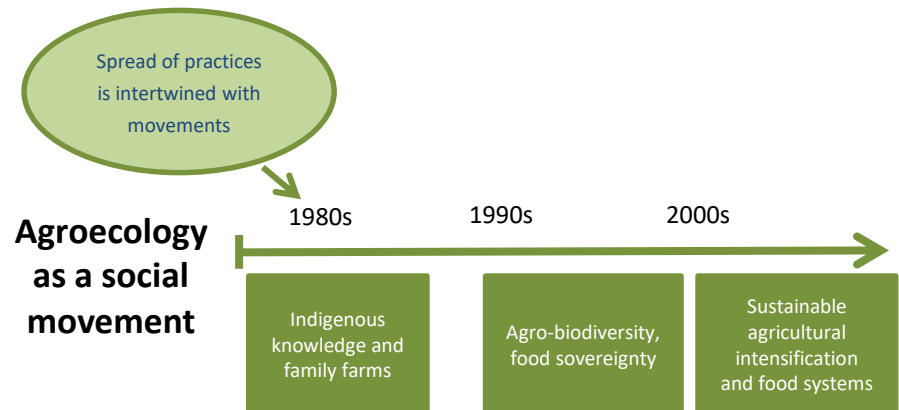
Agroecology as a scientific discipline



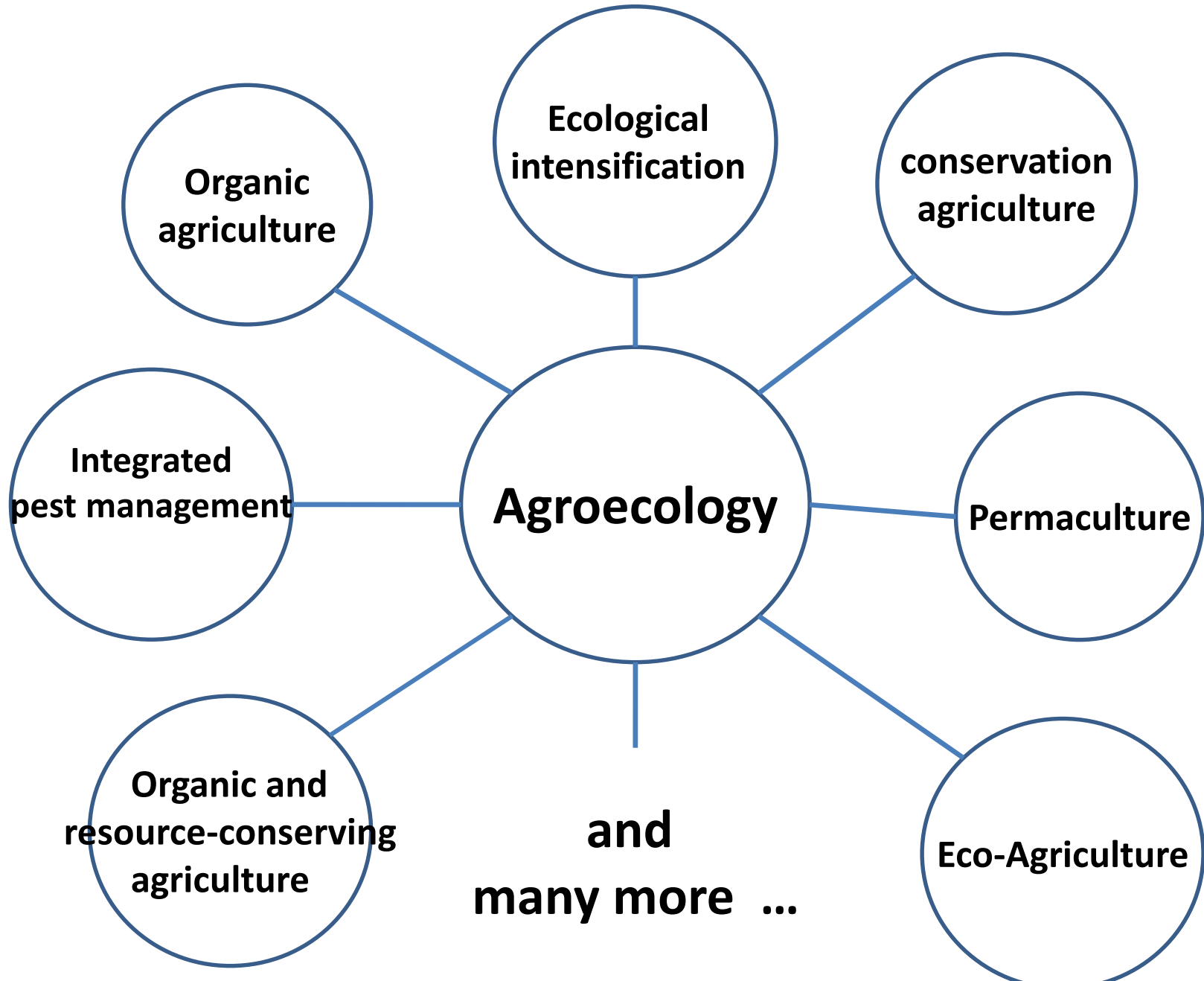
Agroecology as a set of practices



Agroecology as a social movement



The very diverse incarnations of 'Agroecology'



Agroecology themes

(2500 references 1975 – 2012)

Rebout et al. 2014

Soil Organic matter and mineralization

N and P balance, management and disponibility

Agroecological zone, agriculture forecast

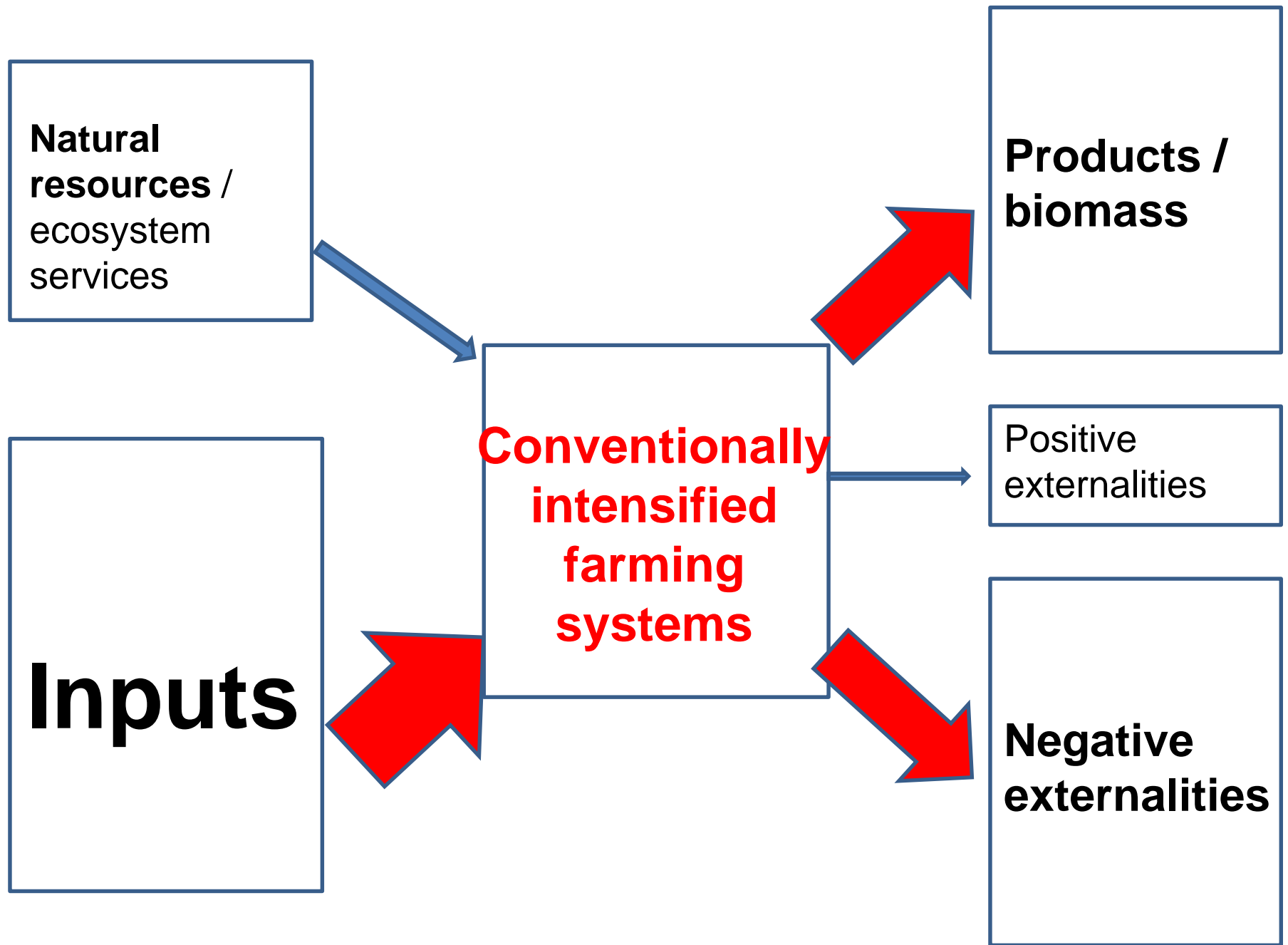
Agricultural systems & food production, organic

Cropping systems & rotation, management

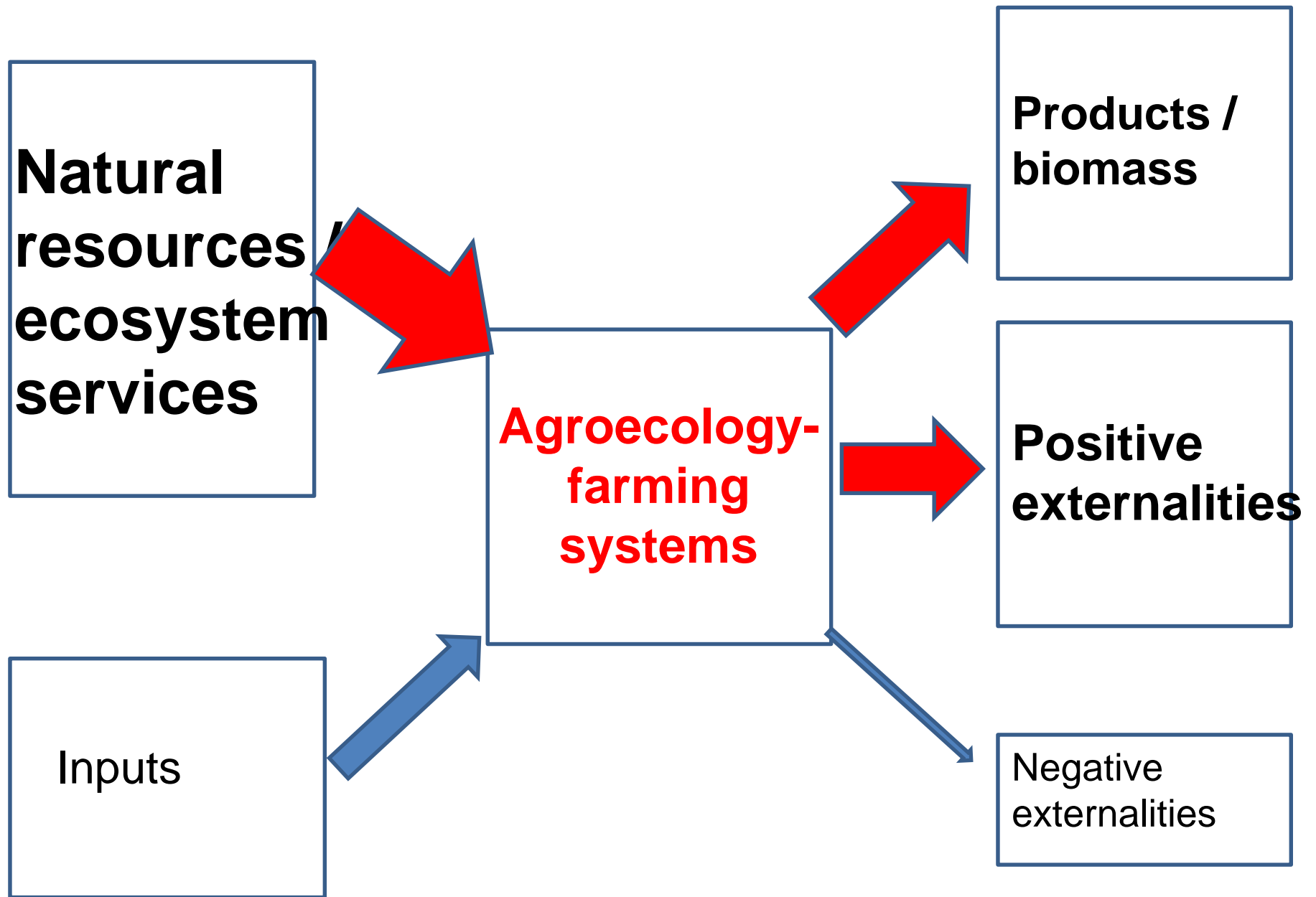
Biological control / pesticide use, intergated pest management

Ecosystem services & landscape management, Biological control & conservation

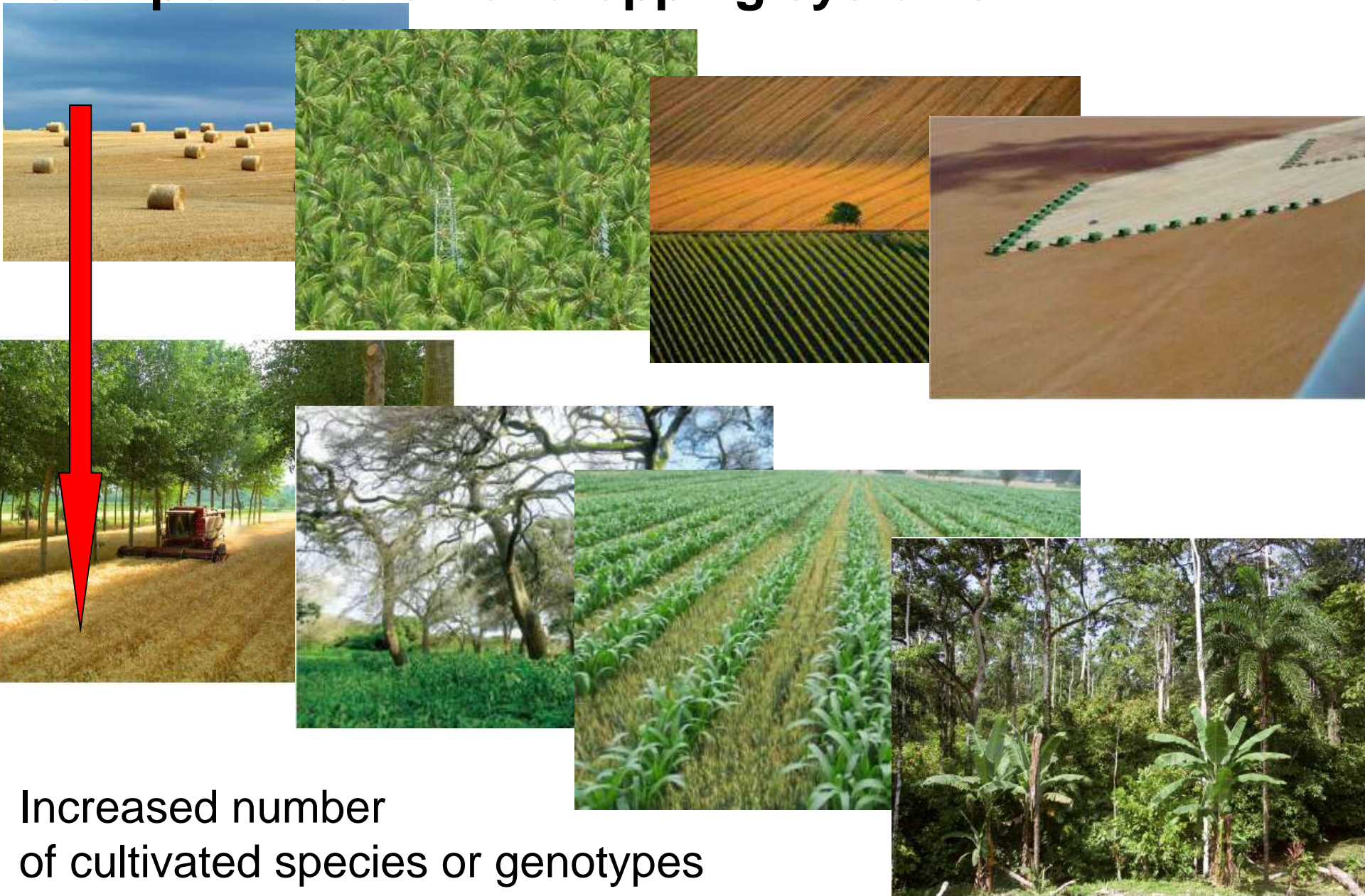
landscape management & natural habitats, biodiversity



Compared intensitivity of cropping systems (adapted from M. Griffon 2013)



Optimizing plant functional biodiversity, which means complexification of cropping systems

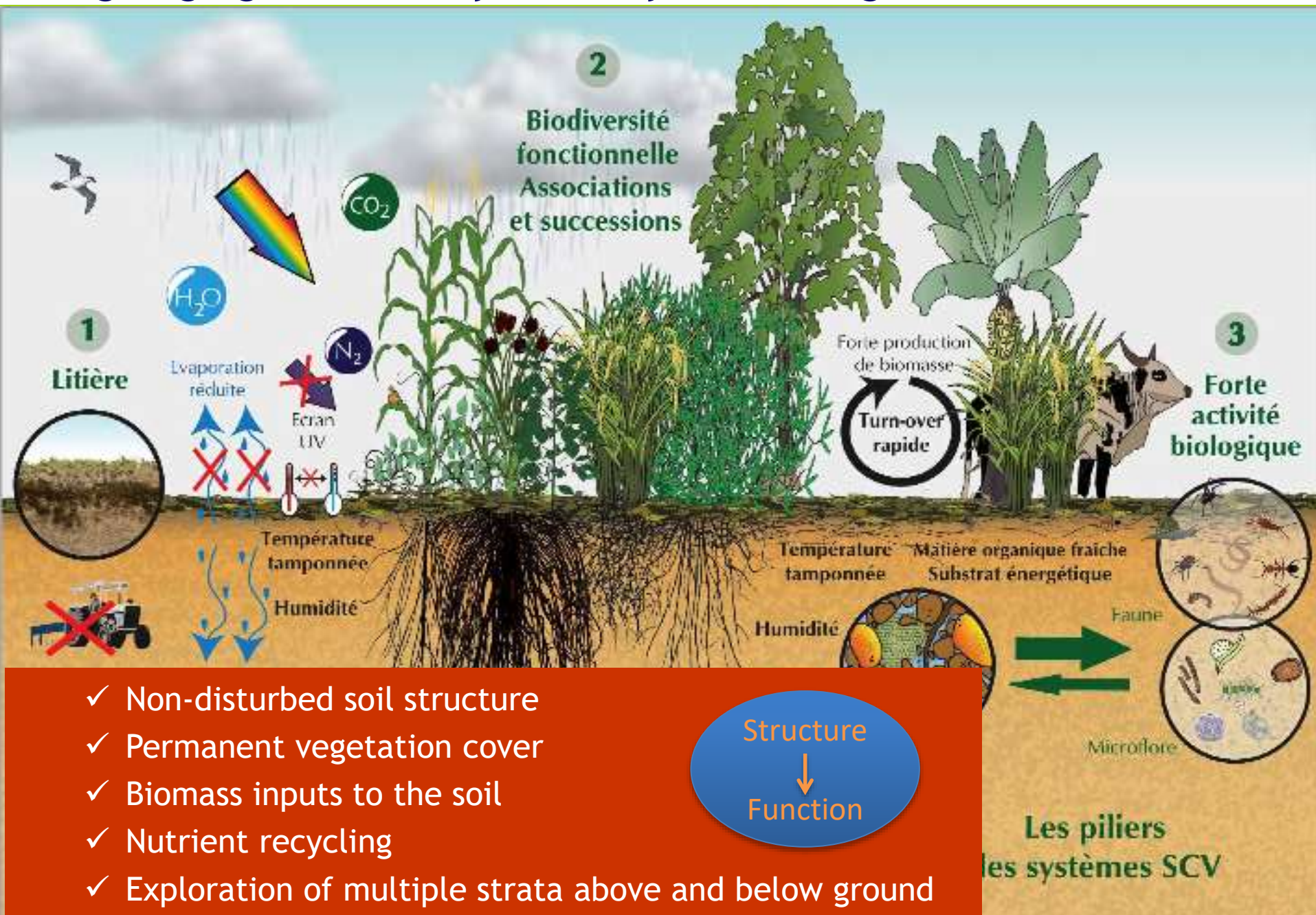


Increased number
of cultivated species or genotypes

Inventing new ways of dealing with crops aggressors using available biodiversity

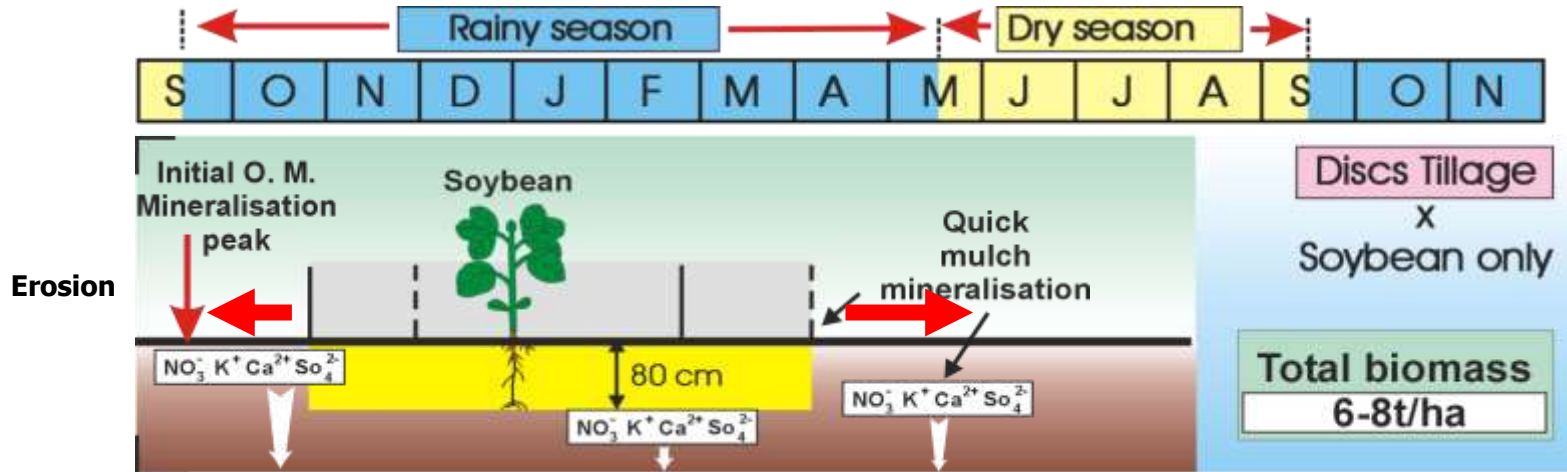


Designing agricultural systems by mimicking nature

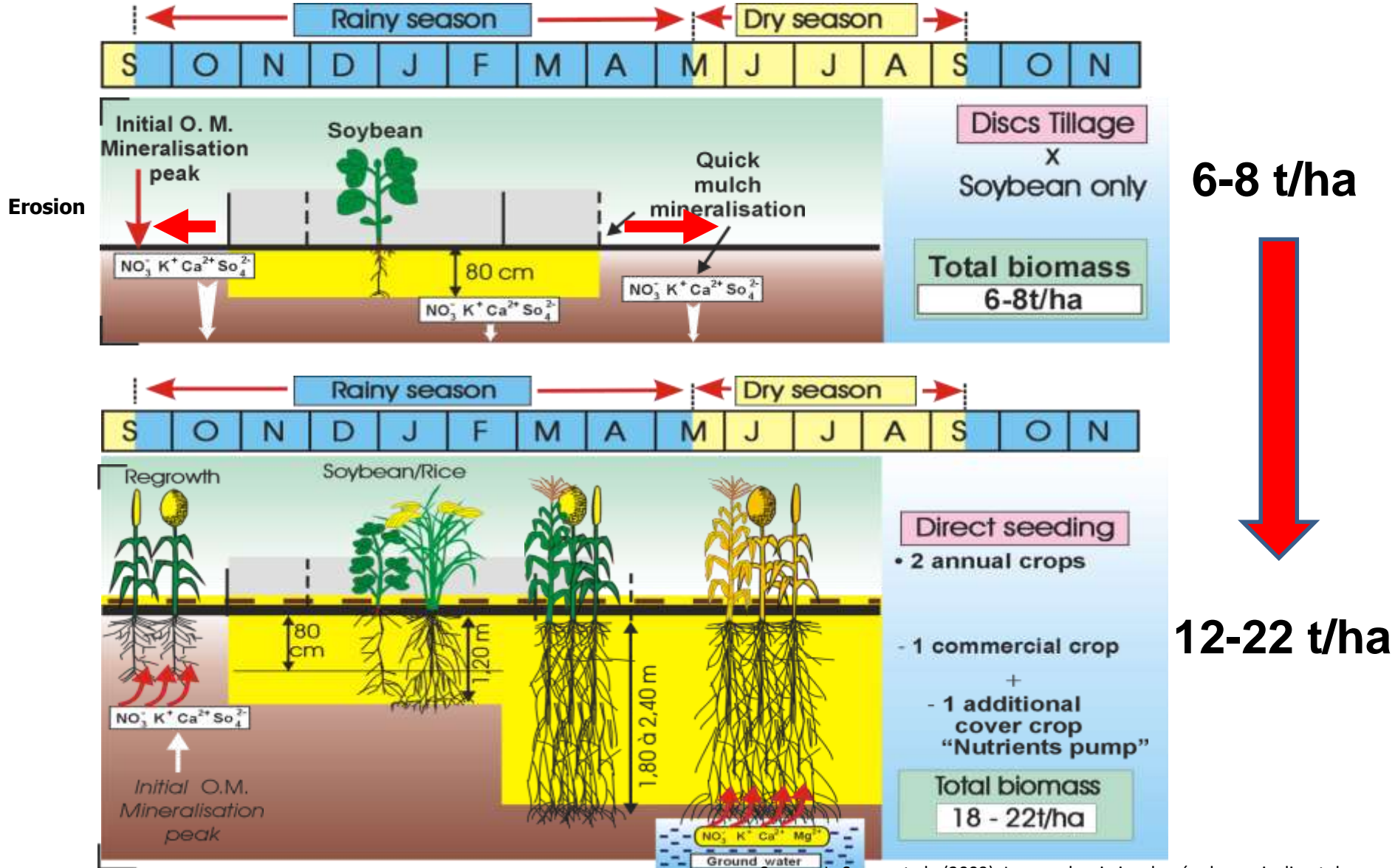


4. Some illustrative examples of agroecological systems

Example 1. conservation agriculture in Mato Grosso



Example 1. conservation agriculture in Mato Grosso



Source: L. Seguy et al., (2009) La symphonie inachevée du semis direct dans Brésil central http://agroecologie.cirad.fr/librairie_virtuelle

SOURCE: L. Seguy, S. Bouzinac, CIRAD-CA; A. Maronezzi, Agronorte - Sinop/MT - 2001



Conservation agriculture and ecosystem services

Principles

No-tillage



Mulch



Diversification



Functions and services

Labor and cost reduction

Increasing soil biological activity

Nutrient recycling

Erosion control

Water balance

Structure and C and N input in soils

Weed control (allelopathy)

Forage production

Pest and disease control

Example 2. Introduction of a « service plant » in a cropping system

Prototype of crop association for banana on highland degraded soils

Requested services: elimination nematods, increase of soil porosity, permanent cover crop to control weed and erosion

Selection of « service plant »

Stylosanthes G.



Traits:

- . Do not host nematods
- . High biomass production
- . Deep rooting
- . **Needs full sunlight**

Impatiens sp.



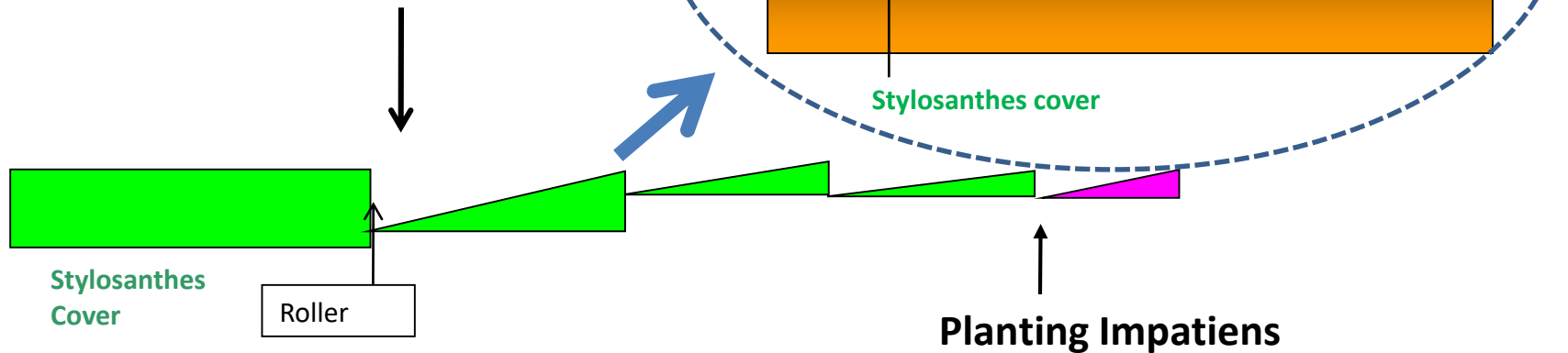
Traits:

- . Do not host nematods
- . low biomass production
- . shallow rooting
- . **Needs shade**

From functional traits to crop systems

System Banana/Stylosanthes/Impatiens

Plantation of banana on live
Stylosanthes cover



Example 3 Agroforestry: (re)-introducing trees in annual crops

From planned associated cropping to complex agroforests





Photo C. Dupraz

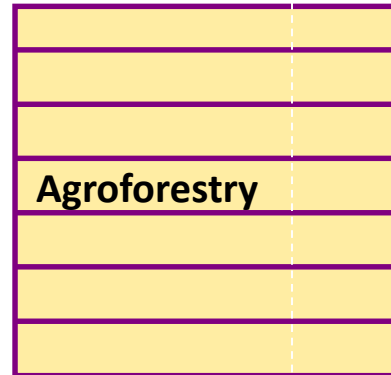


Photo C. Dupraz

100 ha
**Agroforestry with
intensive cereal crop**



160 ha
**Conventiional
separate cropping**

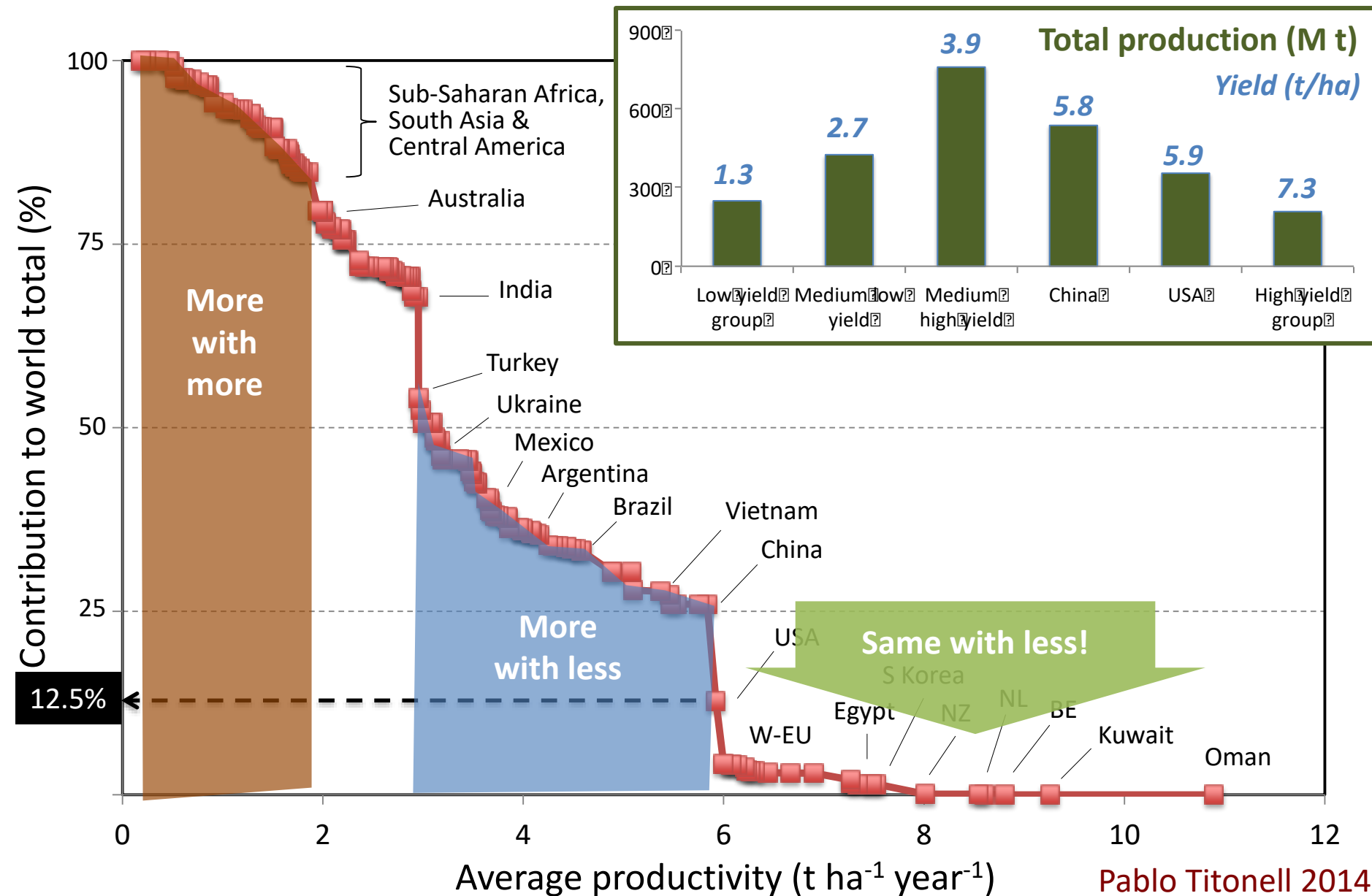


... 100 ha agroforestry can produce as much wood and food products as 160 ha conventional separate cropping.

4. What does link agroecology with food security ?



Disponibility: Who's producing our food?



Many other links to be explored and valued at different scales

AE is no silver bullet, but...

- Nutritional quality and security linked to cropping diversity
- Less environmental externalities -> preserved livelihoods and health
- AE helps convergence between adaptation and mitigation
- Transformation of agriculture // transformation of food systems
- AE generates less inputs, capital, fossil fuel, technology dependency
- Proven link between diversity and resilience
- Investing in agriculture = better leverage against poverty
- Family farming, first employer of the world. AE needs to create jobs and generate income
- ...

5. Few words of conclusion

- Agriculture of the world, in its huge diversity, is at the **nexus of Food and nutrition security / Climate change / social justice**. Its transformation is essential to achievements of sustainable developments goals.
- Agroecology represents the avenue for agriculture transformation. It is the science of complexity and of locality. It is the opposite of “applying recipes” or “one-size-fits-all”.
- Managing tradeoffs is key and criteria are not the same at different scales. Public policies are urgently needed to orchestrate and promote agroecological transformation.

Thanks for your attention