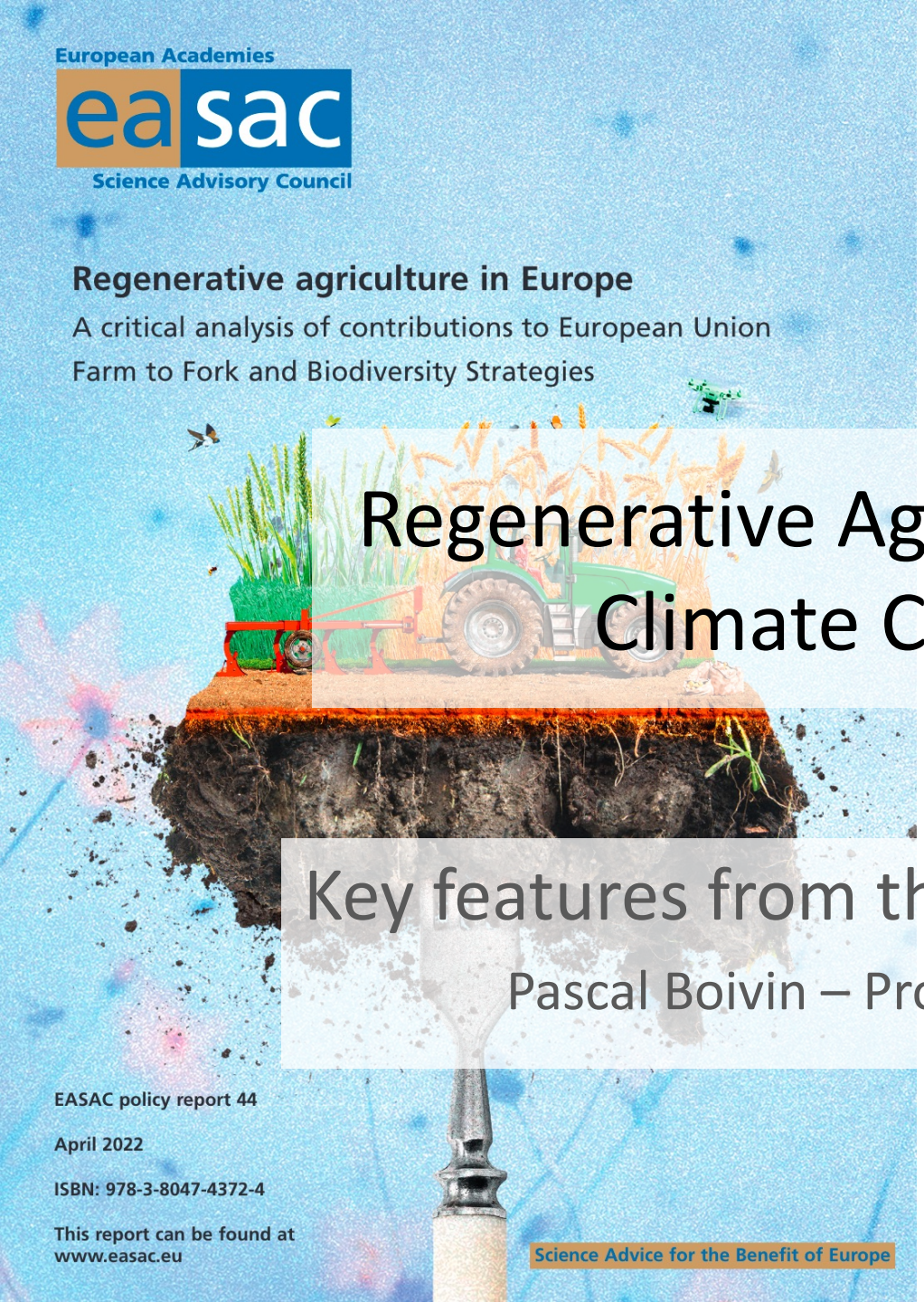


hepia - Agronomie

h e p i a

Haute école du paysage, d'ingénierie
et d'architecture de Genève

Regenerative Agriculture and Climate Change

Key features from the soil standpoint

Pascal Boivin – Prof. Soil Science

Hes·SO GENÈVE
Haute Ecole Spécialisée
de Suisse occidentale

académies suisses
des sciences

Regenerative Agriculture ?

- No consensus definition but major components
  - Soil restoration
  - Biodiversity restoration
- Principles found in agroecology
- Not a « quickfix » standard but a set of goals and tools to be matched – site dependent
- Soil restoration : conservation agriculture & more
  - Permanent green cover
  - Zero tillage
  - Plant diversity
  - Agroforestry etc.

What is soil quality?

« Capacity of the soil to function»

= **to fullfill its functions**

Soil Health refers to soil quality

Soils functions ?

- 95% of our food, 70% of antibiotics, textile fibres come from the ***soil***

Earth has lost a third of arable land in past 40 years, scientists say

Experts point to damage caused by erosion and pollution, raising major concerns about degraded soil amid surging global demand for food

Soil erosion takes effect on Suffolk farmland in the UK. Photograph: Alamy

mie

Soils ?

Hannes Grobe (CC BY-SA 2.5)

- Worsening Worldwide Land Degradation Now ‘Critical’, undermining Well-Being of 3.2 Billion People IPBES – 2018

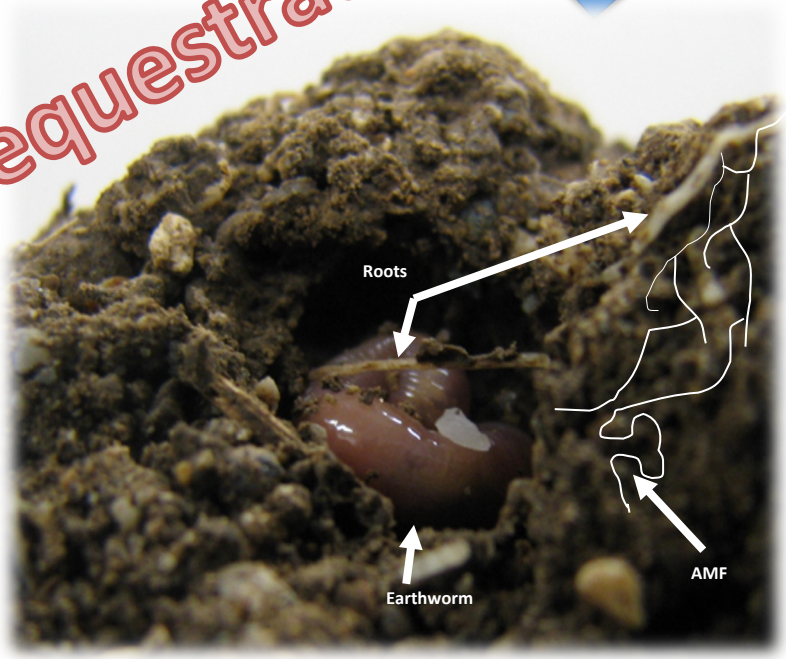
Guillaume Piolle (CC BY 3.0)

Soils: cornerstone of ecosystem services

Plants – soils & carbon cycle

Humification **Photosynthesis**

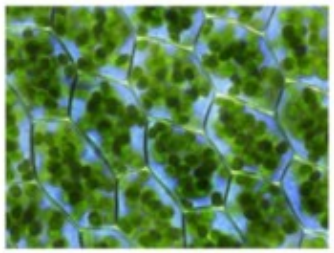
Sequestration ?



CO_2 O_2

Métabolites simples

- Glucides, Amidon, Cellulose
- Acides gras, Lipides
- Acides aminés, Protéines



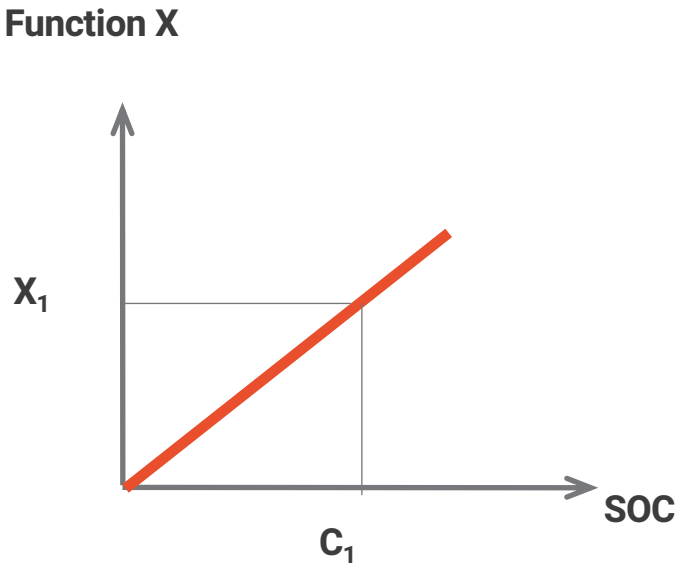
encyclopedie-environnement.org

Humus (Organic Matter): **60 % of Corg. 1t Corg = 3.66 t CO_2**

Soil Organic Matter & SOIL QUALITY

- **SOM is the major factor of soil quality and fertility**

- Porosity - Water retention
- Aeration - Infiltration
- Stability – mechanical properties
- Nutrients
- Biological activity - Biodiversity
- Water depuration
- Etc.



About 50 to 70% loss under intensive cropping

Guide values: OM/Clay

Resistance & resilience

Vulnerability

Top quality
Guide value

OM/clay = 24%

Acceptable limit
Trigger value

OM/clay = 17%

Highly vulnerable
Remediation

OM/clay = 12%

Adaptation to climate change

- Drought
- Extreme rain events
- Floods
- Erosion
- Extreme temperatures
- New pests
- Etc …
- Require to prepare resistant and resilient soils (low vulnerability) → more humus

Climate change mitigation

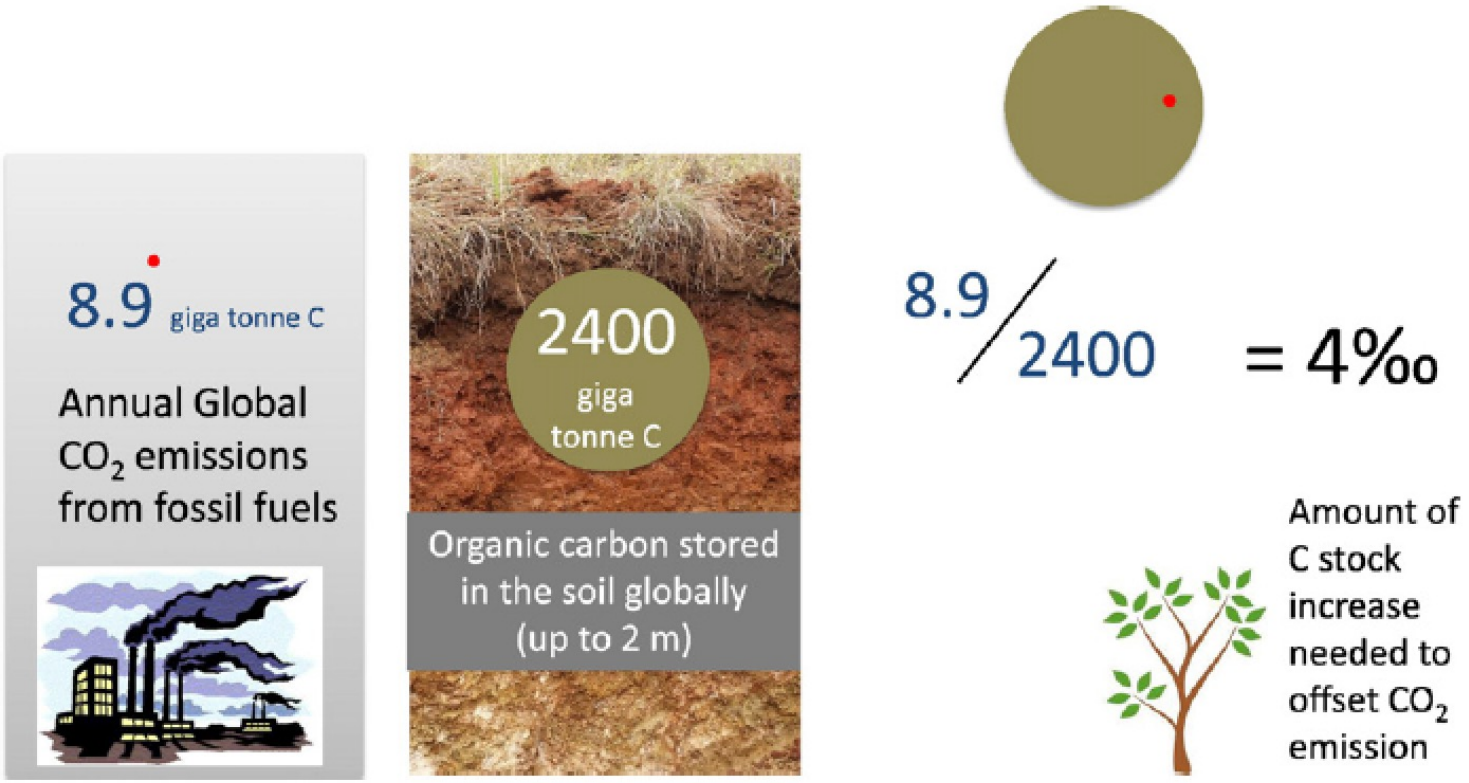
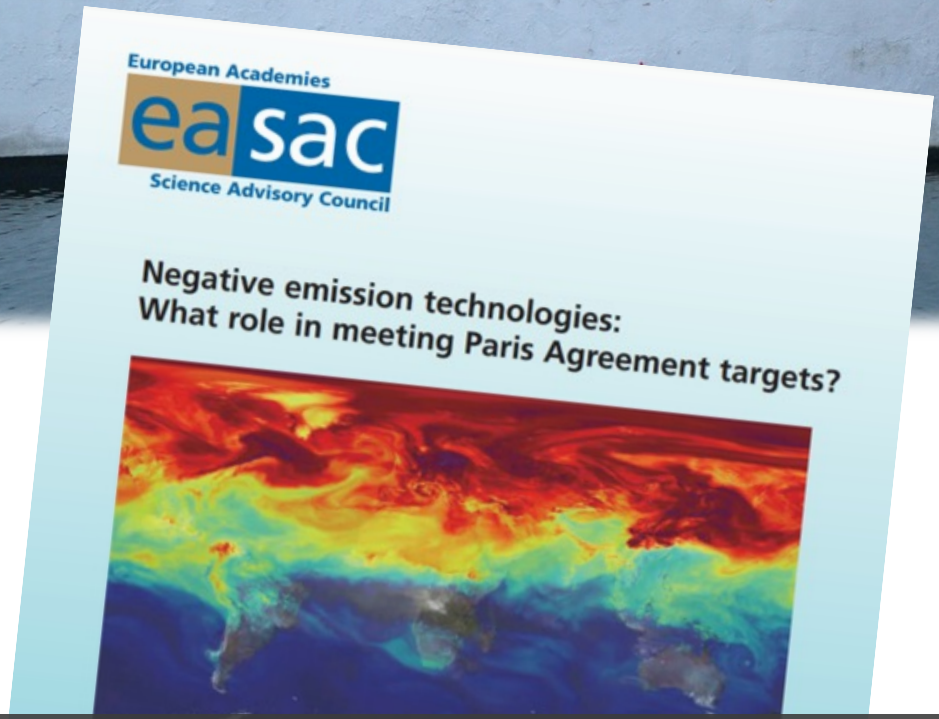


Fig. 1. The 4 per 1000 soil carbon sequestration initiative (adapted from Ademe, 2015).

Climate change and agriculture



4 PER 1000
SOILS FOR FOOD SECURITY AND CLIMATE

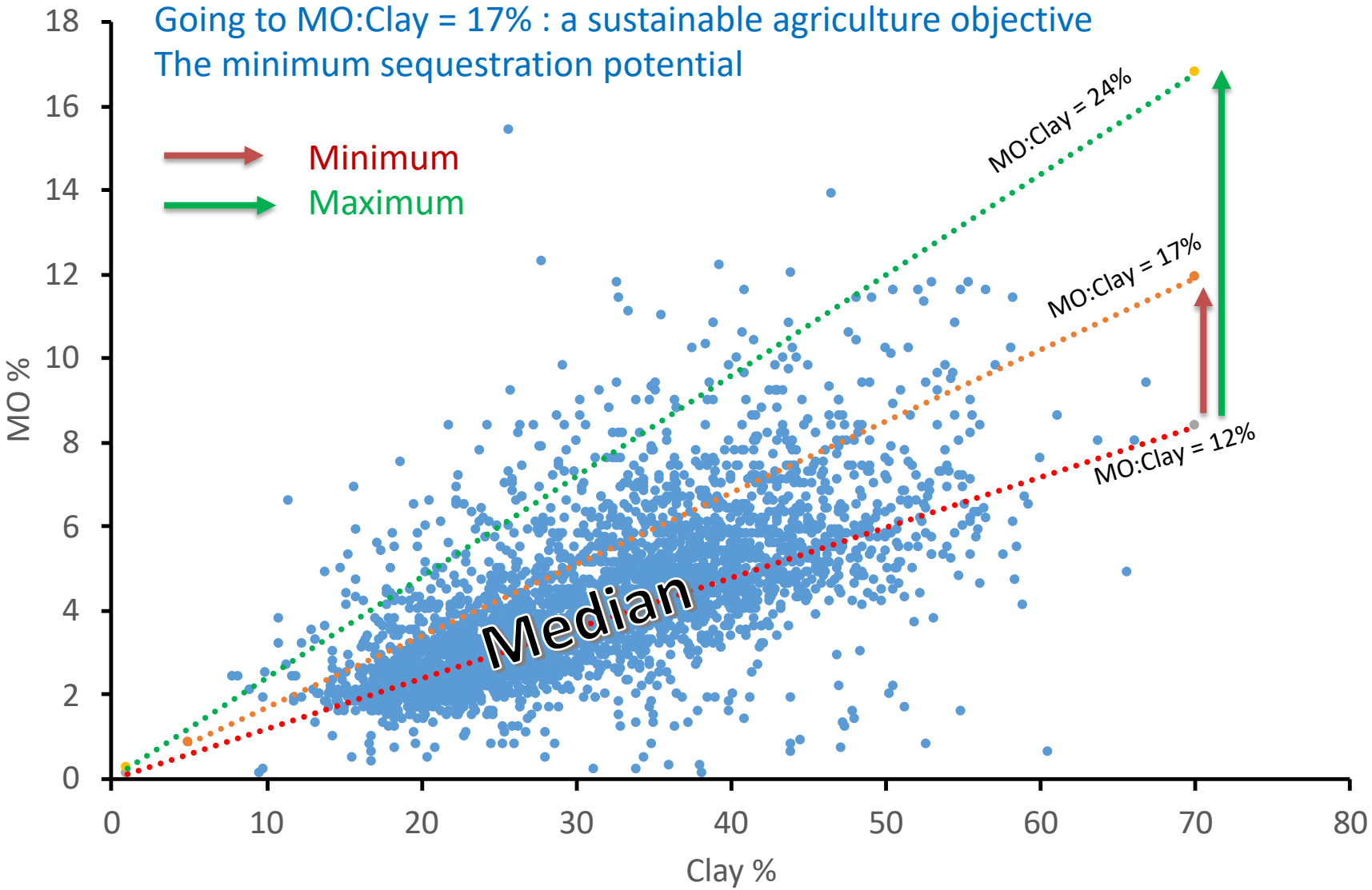
PARIS2015
UN CLIMATE CHANGE CONFERENCE
COP21·CMP11

Storing CO2 as soil organic matter (SOM) is the only NET that is both effective, affordable and immediately deployable at large scale

EASAC (2018-2019)

Soil sequestration potential

ex. Swiss Jura Cropland



C-sequestration & agriculture

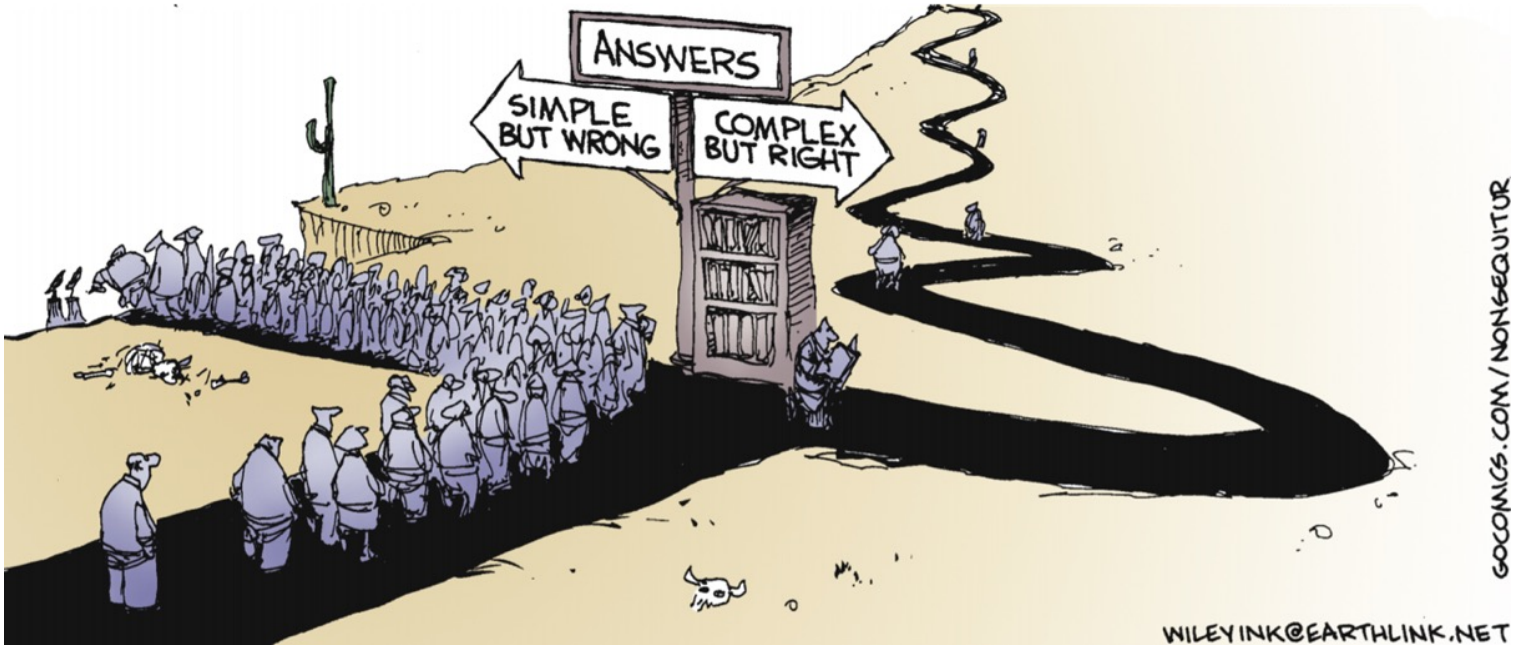
- Green manure +++
- Organic matter balance ++
- Soil tillage --

Principles of Conservation Agriculture

Can be > 40/$_{000}$ OM increase per y in CH farms

Upscaling soil regeneration

- This is not a technical issue: methods are known
- This is an agri-environmental management issue
- The “new-tech” we need is systemic management capacity



Soil regeneration & the value chains

- Value chains and the food web are determining agricultural practices and soil health.
- Stakeholders need a sound road-map and have to coordinate to support the transition in many ways
- They need capacity building on soils, agriculture and regeneration not to be easy preys for “magic thinking” business
- They need to coordinate. Regeneration occurs on farms and terroirs, not on single product value chain.

Agro-ecological transition : hierarchising the objectives

- Multiple non hierarchised expectations and commitments: GG, biodiversity, soil health, carbon sequestration, pesticide reduction etc.
- Wanting it all, right now, will block the transition
- Soil regeneration allows to develop most soil services *but* requires some herbicide
  - Future methods are developed by pioneers on this basis
- Soil regeneration is the gateway to conservation organic farming


Thank you for your attention