Soil organic carbon sequestration in EU agriculture

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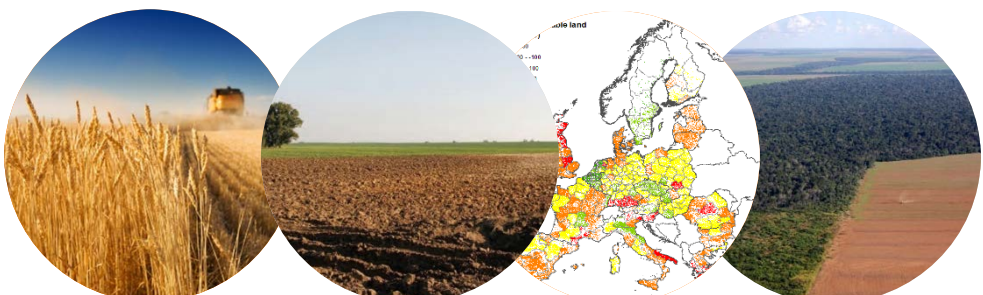
and SmartSoil partners



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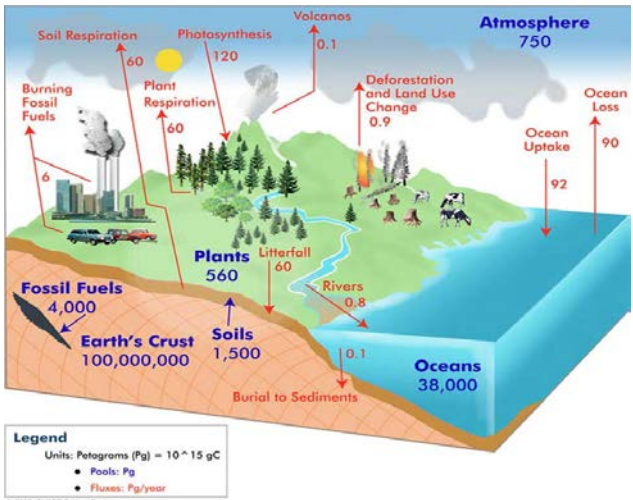
COP21, Paris, 1-12-2015

Global carbon cycle

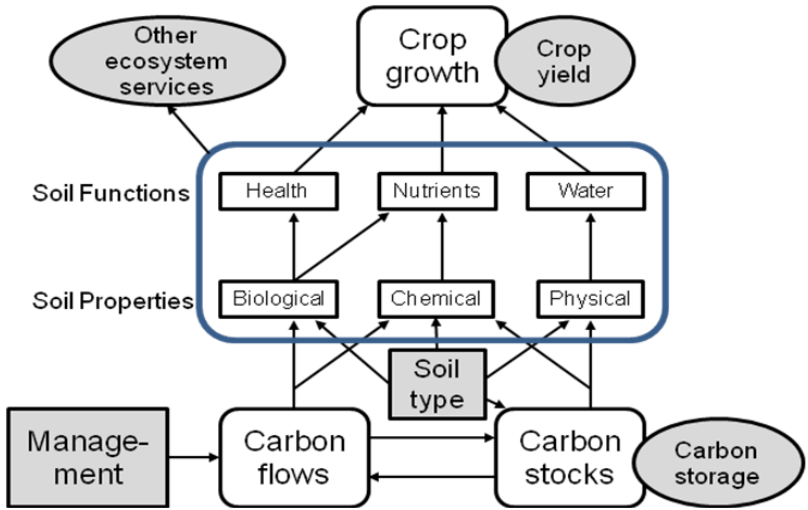


- Soils store twice the amount of carbon compared to atmosphere and vegetation
- Annual C flow to and from soils is 10 times emissions from burning fossil fuels
- Small increase in SOC stock can potentially sequester much CO_2
- Changes in land management required

4 ‰ initiative: soils for food security and climate

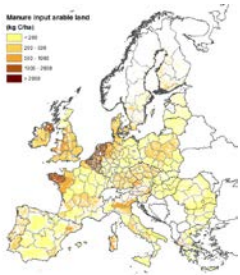
- Initiative by French minister of agriculture for COP21
- Aims to show that food security and combating climate change are complementary and to ensure that agriculture provides solutions to climate change.
- A "4 ‰ " annual growth rate of the soil carbon stock would make it possible to stop the present increase in atmospheric CO_2
- Focus on agricultural land and restoration of degraded land
- Voluntary action plan under the Lima Paris Agenda for Action and strong and ambitious research program

Interlinkages between SOC and crop yield

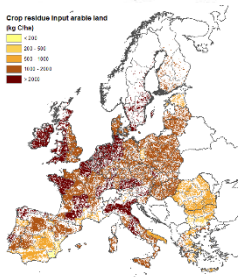


C inputs and SOC balance arable land

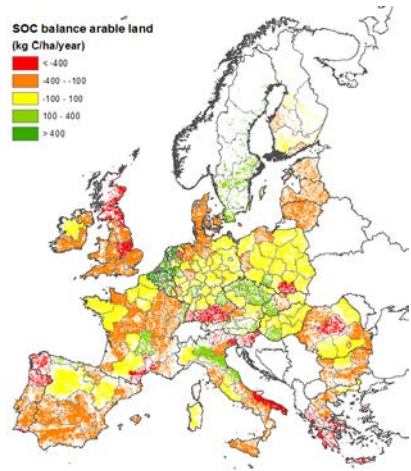
Manure



Crop residues



SOC balance: **-100** kg C/ha/yr



Based on RothC SOC modelling and MITERRA-Europe data

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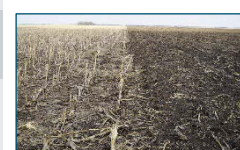
Options for increasing SOC

Options	Considerations
Reduced or zero tillage	Debate on effectiveness
Cover/catch crops	Yes, if conditions allow
Additional C input (manure, compost, sewage sludge)	Availability is limited
Increase production (fertilizer, irrigation, improved cultivars)	Yes, sustainable intensification
No crop residue removal	Competion with bioenergy
Land use change (e.g. rotation with grassland)	Risk on leakage (iLUC)



4 ‰ initiative: how realistic?

- EU SOC stock arable land ~53 ton C/ha (top 23 cm)
  - 4 ‰ = 210 kg C/ha/year → ~80 Mton CO_2
  - Equivalent to 1.7% of reported total GHG emissions EU
  - EU can only compensate small part of its emissions
- Effect of some options:
  - All straw removed vs left on the soil ~220 kg C/ha/yr
  - 5% increase in crop yield ~22 kg C/ha/yr
- Restoration of degraded soils, higher potential, but mainly outside Europe
- SOC stocks reach new equilibrium → temporal solution

Key messages

- Increasing organic carbon content of soils can potentially sequester large amounts of CO_2 and improve soil quality
- Arable soils in the EU are currently a small CO_2 source → start with reducing losses (incl. organic soils)
- 4 ‰ initiative will be challenging to achieve in large scale conventional agriculture
- Region specific approach and targets needed
- Wageningen UR with its expertise and (global) data is willing to contribute and take up the 4 ‰ challenge

Thank you

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