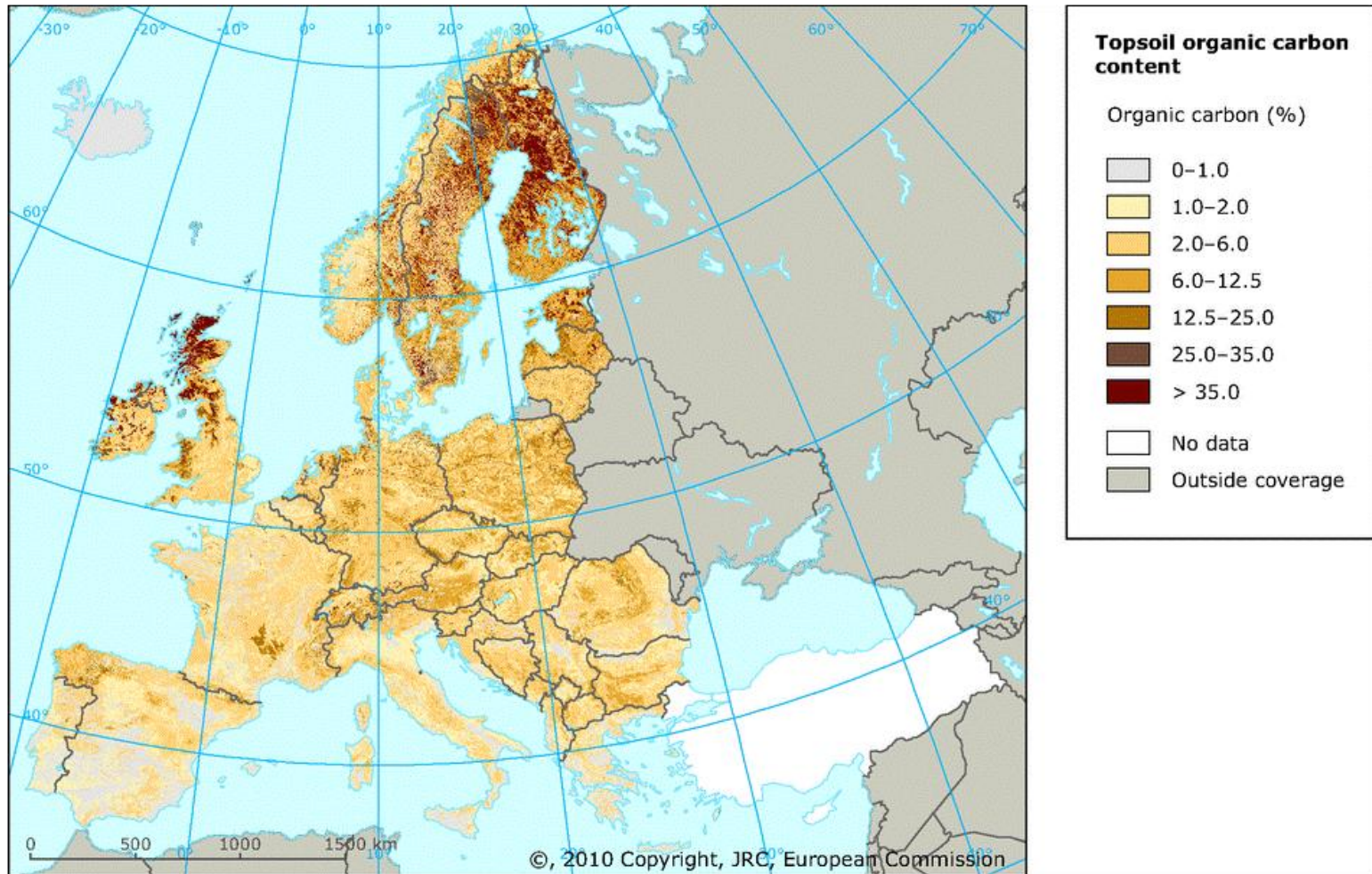


Key messages from SmartSOIL

Professor Jørgen E. Olesen



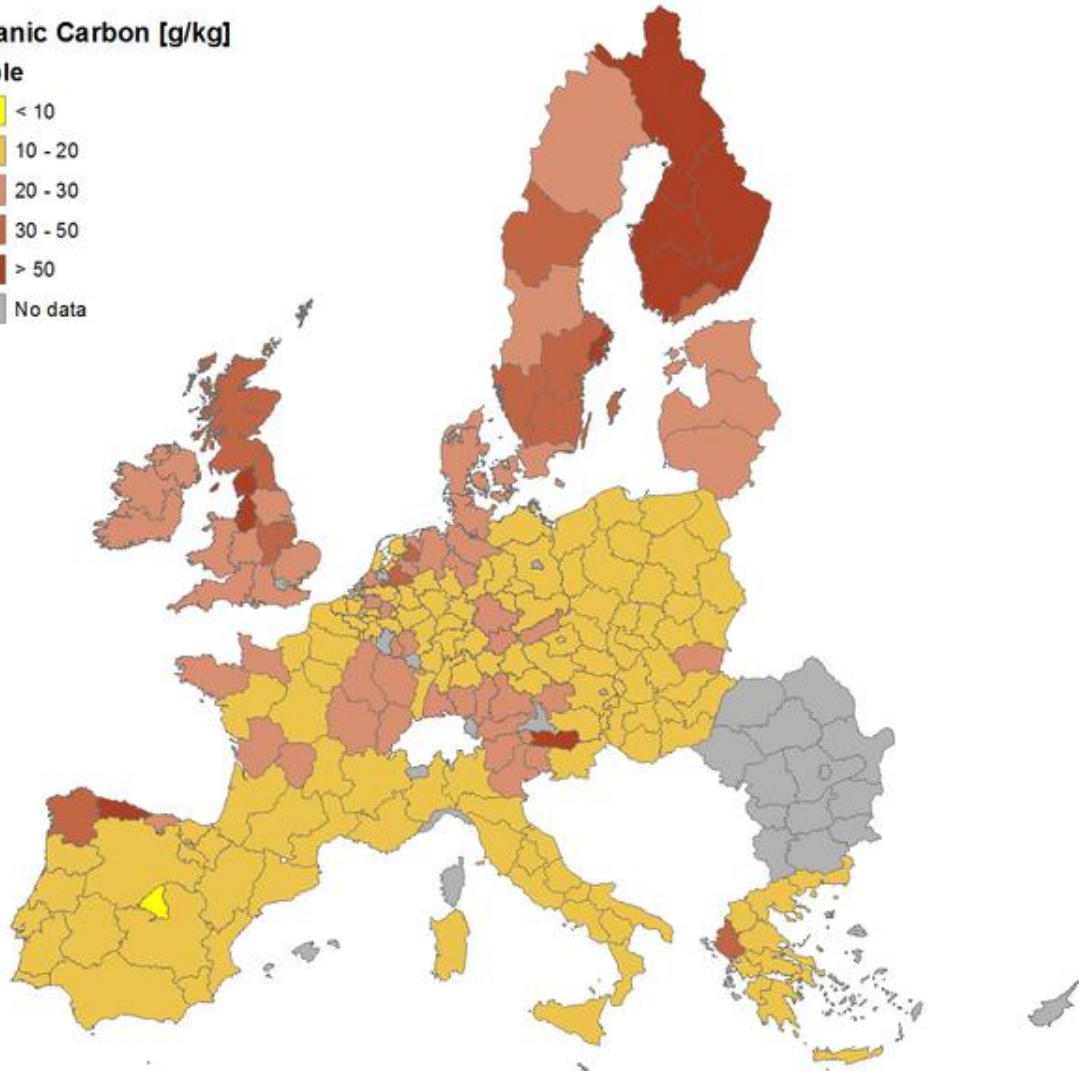
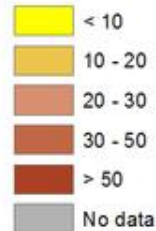
Changes in Soil organic C (SOC) contributes to the greenhouse gas balance
SOC affects soil functioning and thus productivity



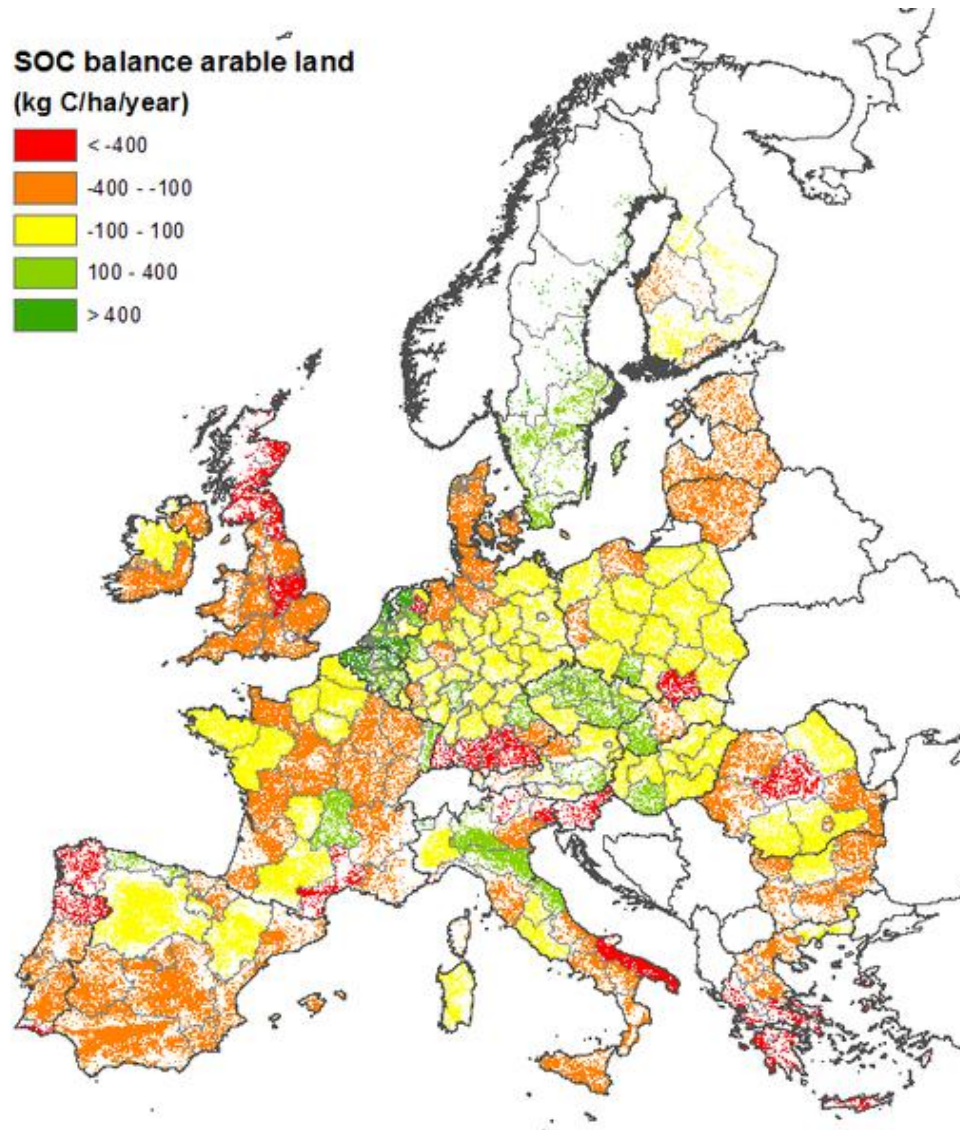
SOC contents on arable land

Organic Carbon [g/kg]

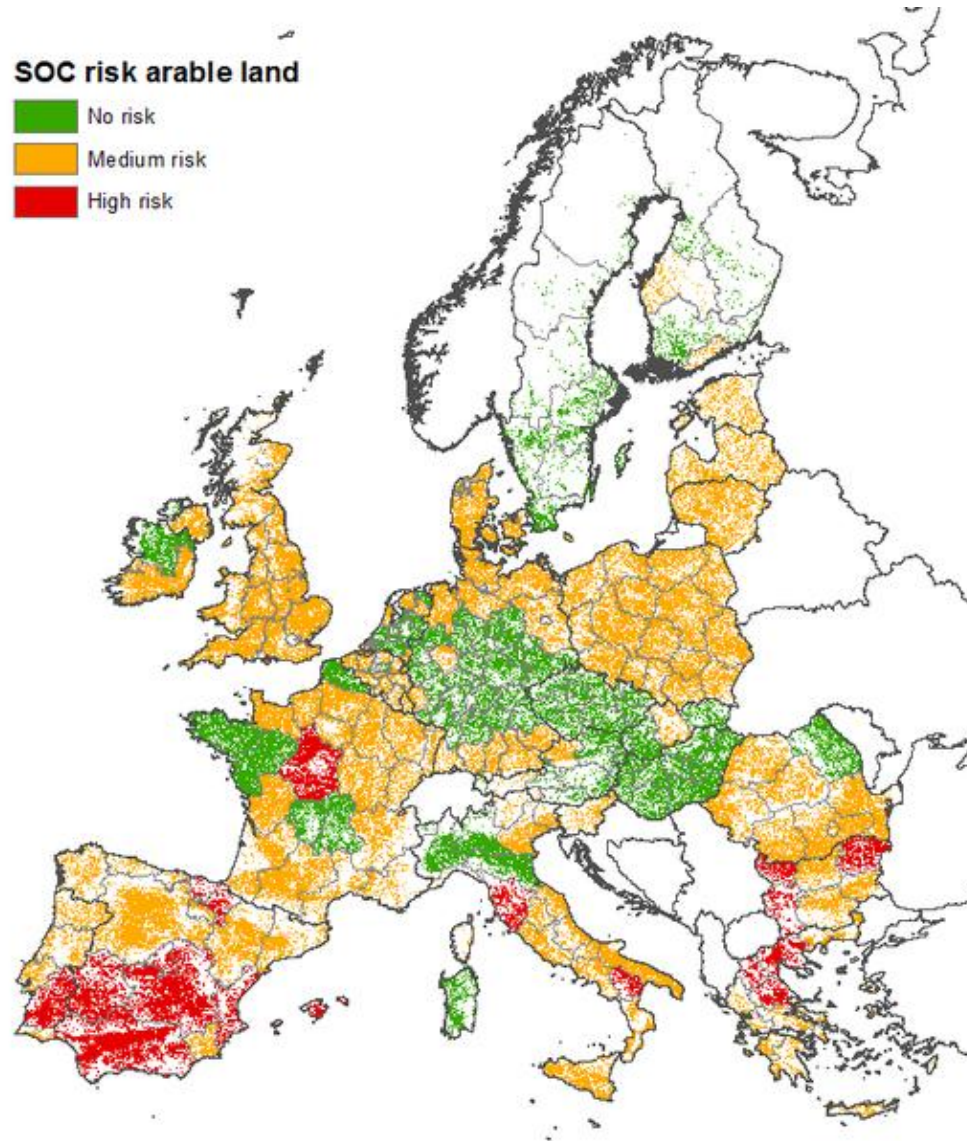
Arable



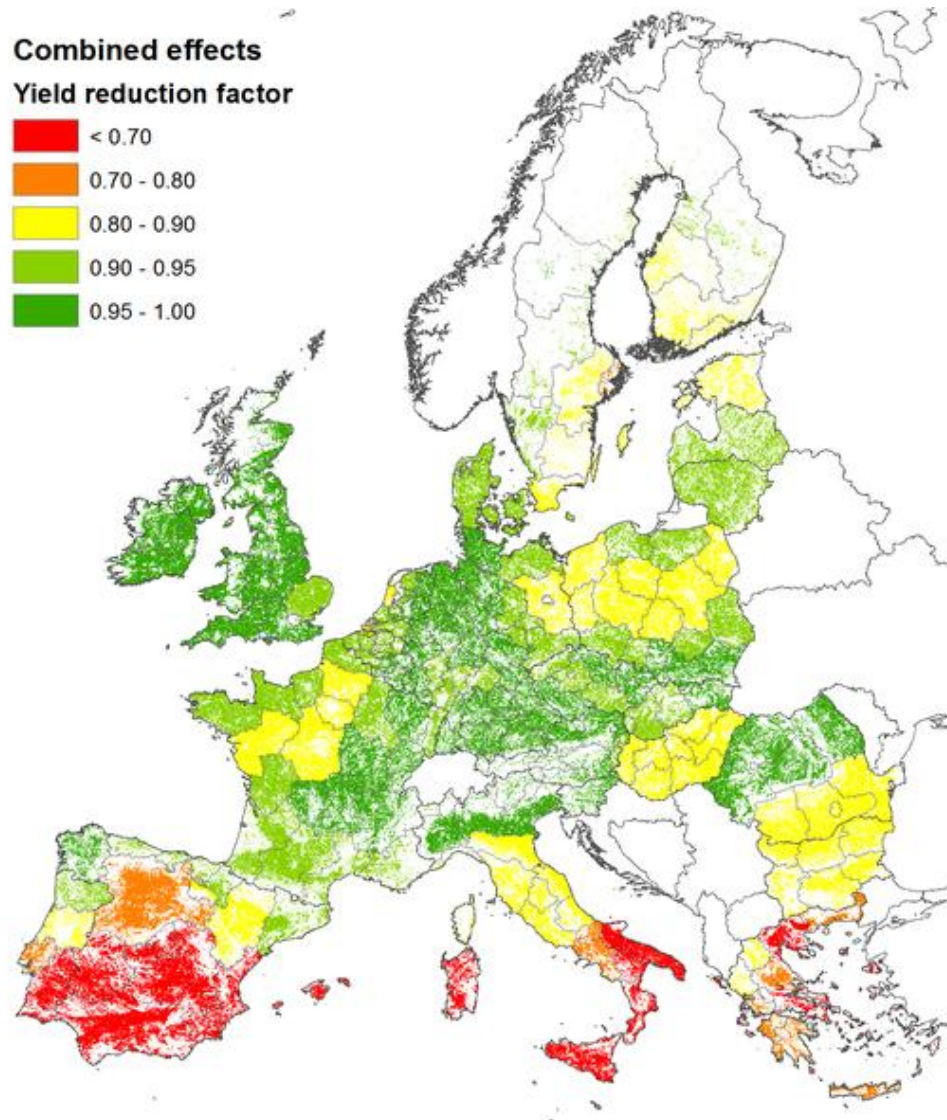
SOC balance on arable land



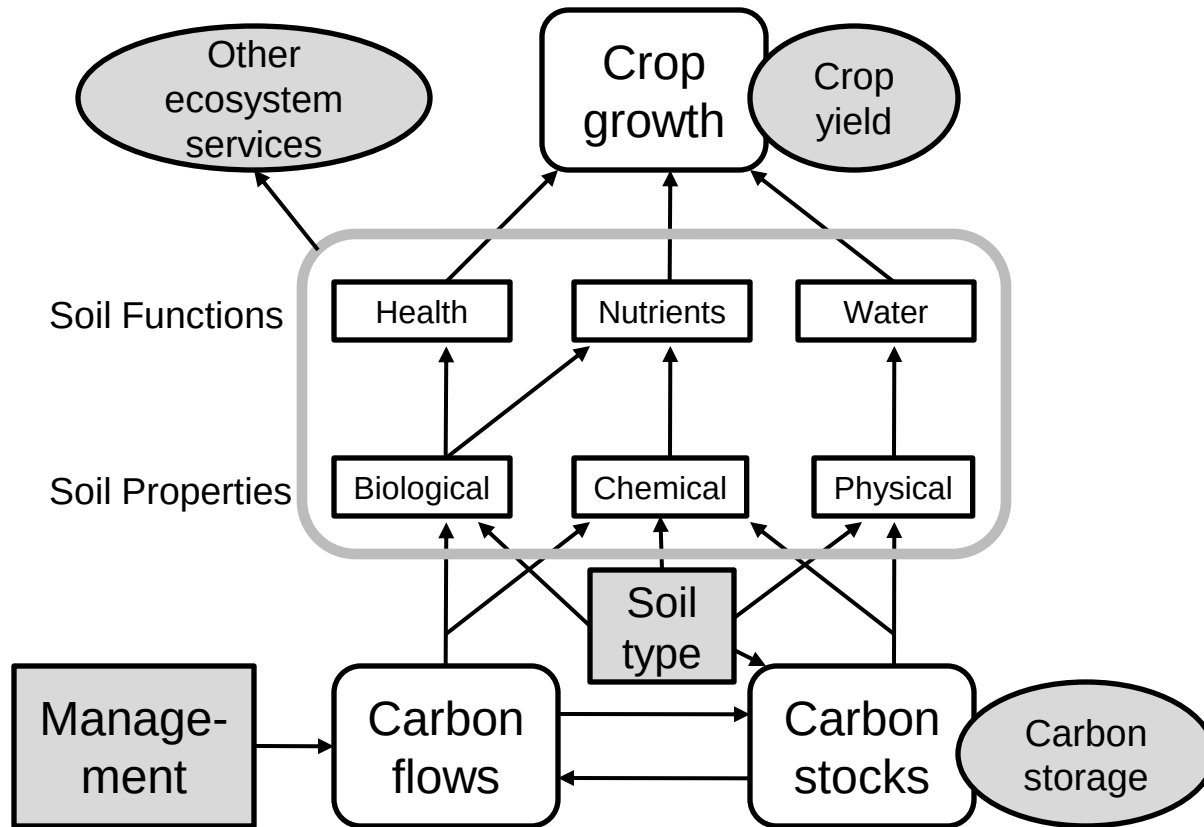
Soils at risk (low SOC and negative balance)



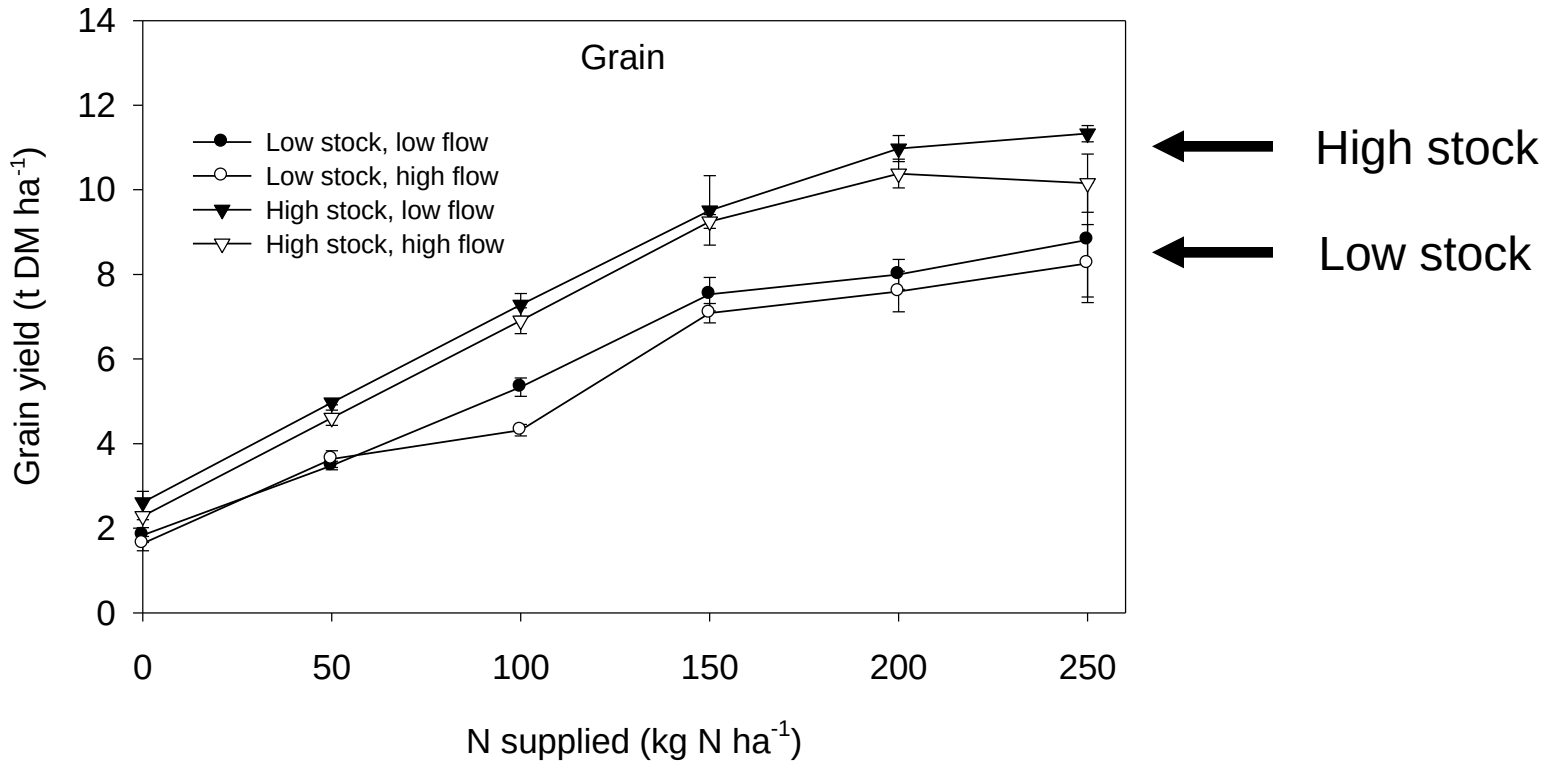
Yield impact of SOC (SmartSOIL model)



Understanding soil functions

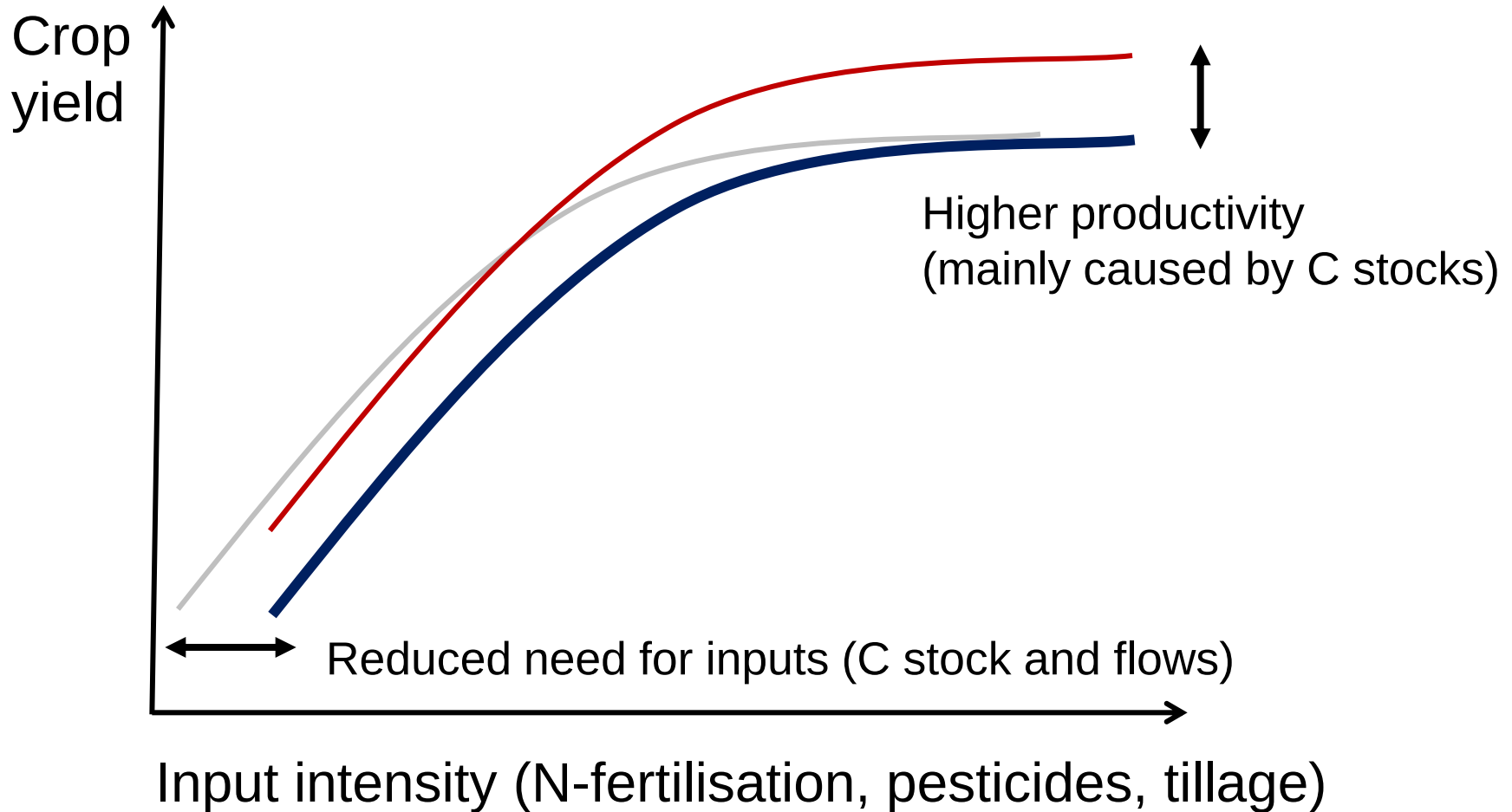


SmartSOIL stock and flow experiment (Askov)



- High carbon stock increased grain yield of wheat, both at low and high N supply
- Adding straw (high flow) slightly reduced N yield (possibly N immobilisation)

How soil carbon affects crop yield

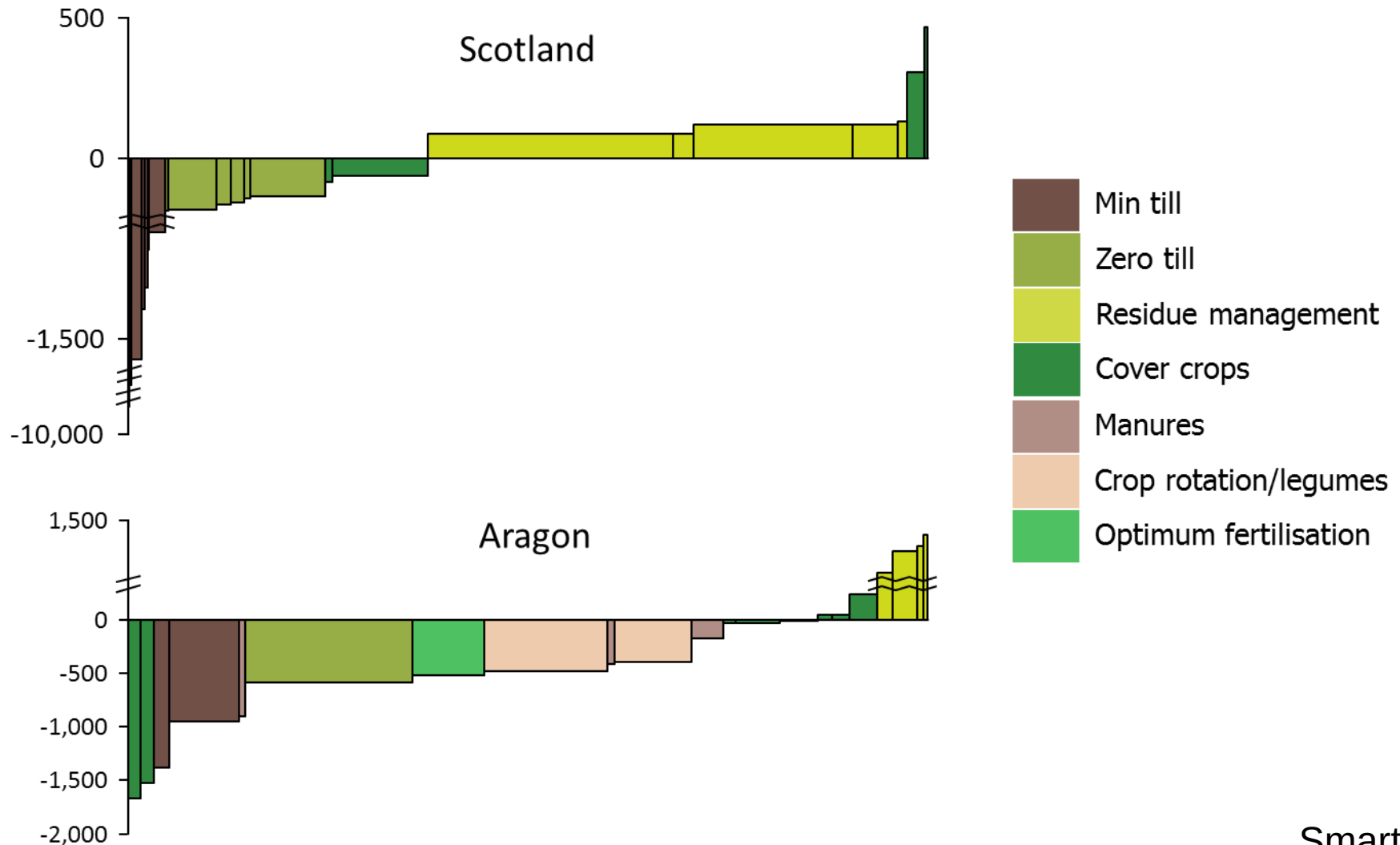


Management practices

- › Organic manures and compost
- › Choice of crops:
 - › Cover crops
 - › Perennial crops (grasses, bioenergy crops)
 - › Legumes (root biomass; N-rich)
- › Incorporation of crop residues incl. straw
- › No-tillage practices (enhance surface C)



Marginal Abatement Cost Curve (€/t CO₂)



Understanding and influencing farmer behaviour

Farm and farmer heterogeneity

Soil heterogeneity

Short-term farm business versus long-term benefits

Engaging
Farmers



Barriers for management changes

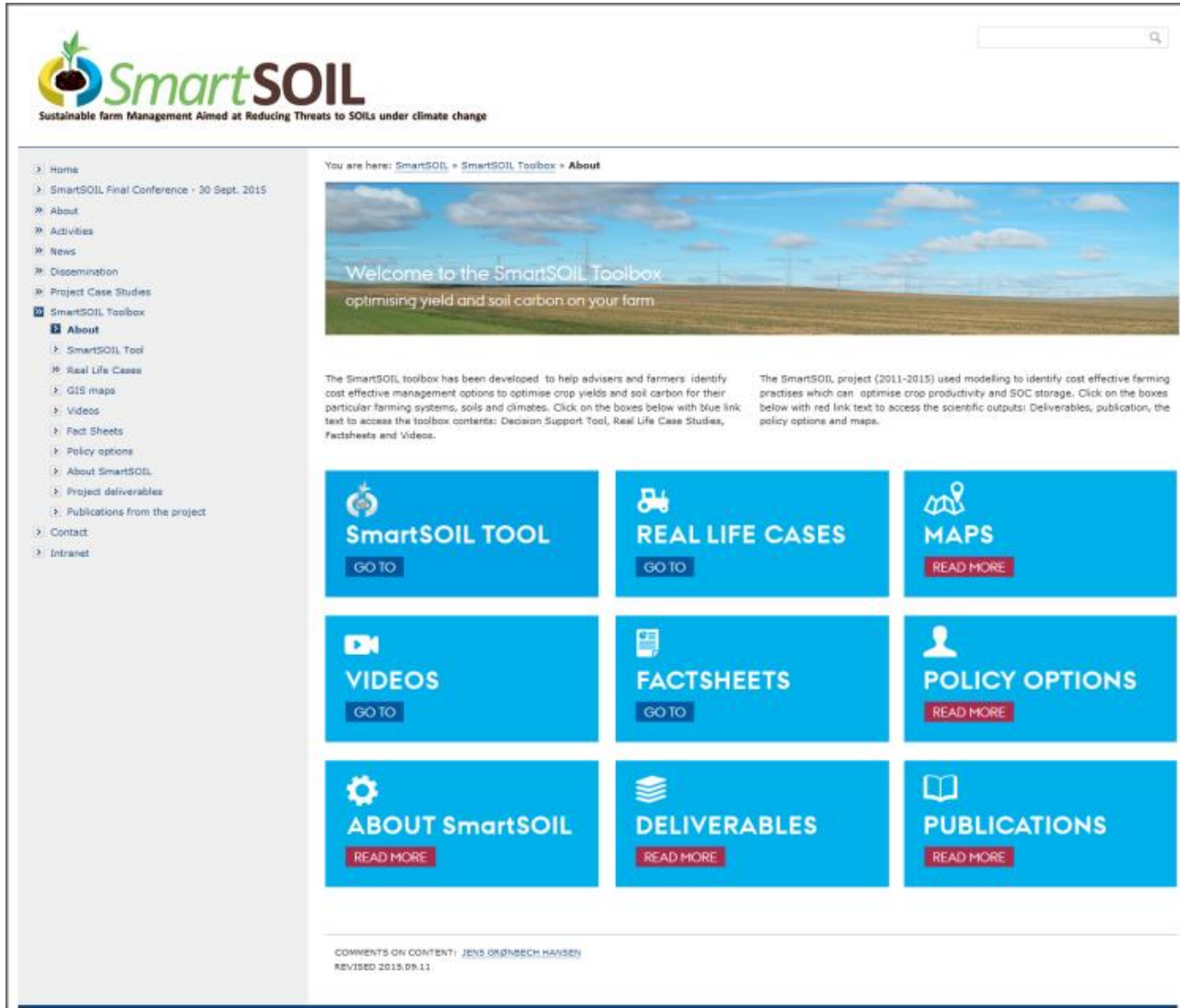
- Perceived **scientific uncertainty** about benefits of managing soil for carbon
- Difficulty demonstrating the effects and economic benefits **over a long time** of managing soil carbon
- Farmers' **perceptions, priorities, knowledge and lack of familiarity** of managing the soil for carbon.
- Farmers unconvinced of benefits

Incentives to overcome barriers

- **Financial incentives**
- Use **simple language and quantify impact**
- Evidence of benefits – impact on **productivity and profitability**
- **Integrating advice** into existing advice channels, policies and regulations
- Real life **case study** examples
- **Learning** among farmers



SmartSOIL Tool and Toolbox (SmartSOIL.eu)



The screenshot shows the SmartSOIL website interface. At the top left is the SmartSOIL logo, which consists of a stylized green plant growing from a blue and green circular base, followed by the text "SmartSOIL". Below the logo is the tagline "Sustainable farm Management Aimed at Reducing Threats to SOILs under climate change". A search bar is located in the top right corner.

On the left side, there is a navigation menu with the following items: Home, SmartSOIL Final Conference - 30 Sept. 2015, About, Activities, News, Dissemination, Project Case Studies, SmartSOIL Toolbox (highlighted), About (sub-item), SmartSOIL Tool, Real Life Cases, GIS maps, Videos, Fact Sheets, Policy options, About SmartSOIL, Project deliverables, Publications from the project, Contact, and Intranet.

The main content area features a breadcrumb trail: "You are here: SmartSOIL > SmartSOIL Toolbox > About". Below this is a large banner image of a field under a blue sky with clouds. The banner text reads: "Welcome to the SmartSOIL Toolbox" and "optimising yield and soil carbon on your farm".

Below the banner, there are two columns of text. The left column states: "The SmartSOIL toolbox has been developed to help advisers and farmers identify cost effective management options to optimise crop yields and soil carbon for their particular farming systems, soils and climates. Click on the boxes below with blue link text to access the toolbox contents: Decision Support Tool, Real Life Case Studies, Factsheets and Videos." The right column states: "The SmartSOIL project (2011-2015) used modeling to identify cost effective farming practices which can optimise crop productivity and SOC storage. Click on the boxes below with red link text to access the scientific outputs: Deliverables, publication, the policy options and maps."

Below the text are nine blue rectangular buttons arranged in a 3x3 grid. Each button has an icon, a title, and a link:

- SmartSOIL TOOL** (icon: gear and leaf) with a "GO TO" link.
- REAL LIFE CASES** (icon: tractor) with a "GO TO" link.
- MAPS** (icon: map) with a "READ MORE" link.
- VIDEOS** (icon: video camera) with a "GO TO" link.
- FACTSHEETS** (icon: document) with a "GO TO" link.
- POLICY OPTIONS** (icon: person) with a "READ MORE" link.
- ABOUT SmartSOIL** (icon: gear) with a "READ MORE" link.
- DELIVERABLES** (icon: stacked papers) with a "READ MORE" link.
- PUBLICATIONS** (icon: book) with a "READ MORE" link.

At the bottom of the page, there is a small text block: "COMMENTS ON CONTENT: JENS ORSHEDCH HANSEN REVISED 2015.09.11".

SmartSOIL 7 principles of C management (1)

Soil organic carbon is sustained through sufficient inputs of organic matter in roots, crop residues, manure and compost to (out) balance losses from decomposition of soil organic matter.



SmartSOIL 7 principles of C management (2)

Soil organic carbon contributes to sustaining soil productivity by enhancing soil water retention and nutrient supply.

Also soil organic carbon enhances soil structure and soil workability on soils with high clay content.



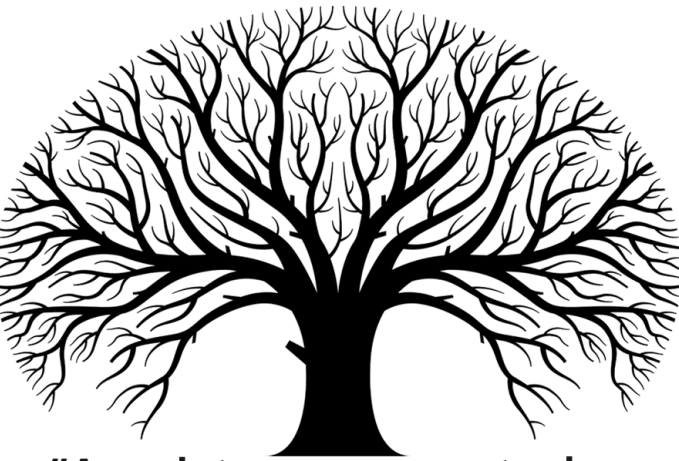
SmartSOIL 7 principles of C management (3)

Soil organic carbon contributes to sustaining soil biodiversity, which also influences pests and diseases (positively and negatively) requiring management targeted to local conditions.



SmartSOIL 7 principles of C management (4)

Effective management of soil organic carbon requires a long-term effort and this commitment is more effective if it is a key element in strategic farm management.



"A society grows great when old men plant trees whose shade they know they shall never sit in." Greek Proverb

SmartSOIL 7 principles of C management (5)

Effective matter management depends on current soil carbon levels.

On soils with **acceptable or good soil carbon**, measures should target maintaining these levels of soil carbon and avoiding losses, e.g. through modified and adapted crop rotations and cover crops and residue retention.

On soils with **low soil carbon**, effective measures involve both securing carbon already in soil in combination with enhancing soil carbon inputs, e.g. through crop rotations, manure application, residue retention and cover crops.

Such measures may be combined with no-tillage practices to further enhance soil carbon and improve soil structure in **surface-near soil layers**.

SmartSOIL 7 principles of C management (6)

Soil organic carbon management also involves management of nitrogen and phosphorus.

Where soil carbon levels are targeted to be enhanced, this will only be effective if supported with sufficient input of nitrogen and phosphorus to ensure this carbon storage.



SmartSOIL 7 principles of C management (7)

The full benefit of enhanced soil organic carbon on crop yield is only fully captured, if the measures are timed well to provide the water and nutrients (in particular nitrogen) that the crop needs, and aligned with appropriate management to prevent weeds, pests and diseases.

This requires adaptation of the management measures to local soil and climatic conditions as well as to (region) specific farming systems.



SmartSOIL partners

smartsoil.eu

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