SmartSOIL

Sustainable farm Management Aimed at Reducing Threats to SOILs under climate change

Incorporating stakeholder perspectives and local contexts to develop effective decision-support for policy and farmers

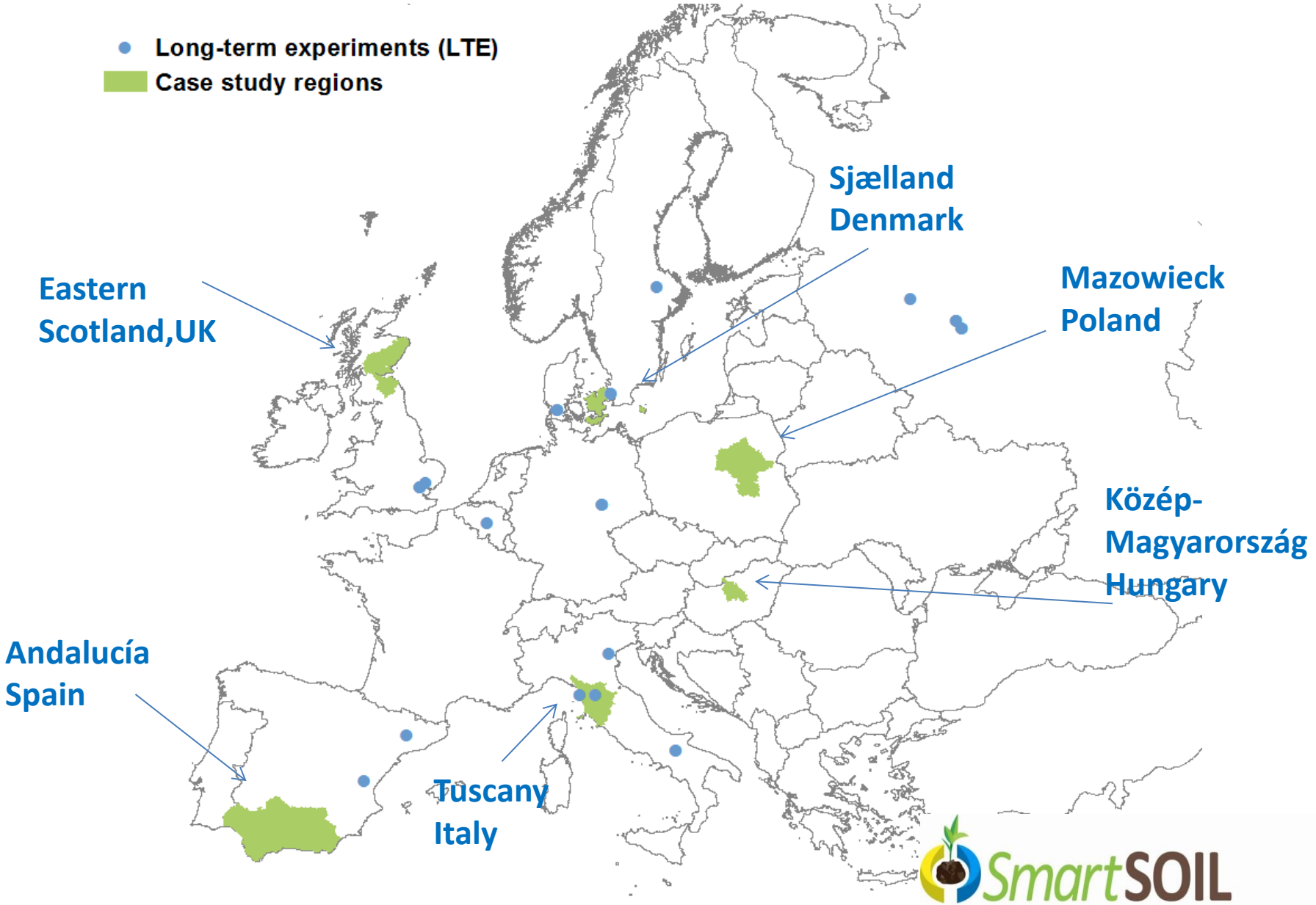
Julie Ingram, CCRI, University of Gloucestershire, UK

Stakeholder consultation

Stakeholders - advisers, leading farmers, farmer representatives, policy makers

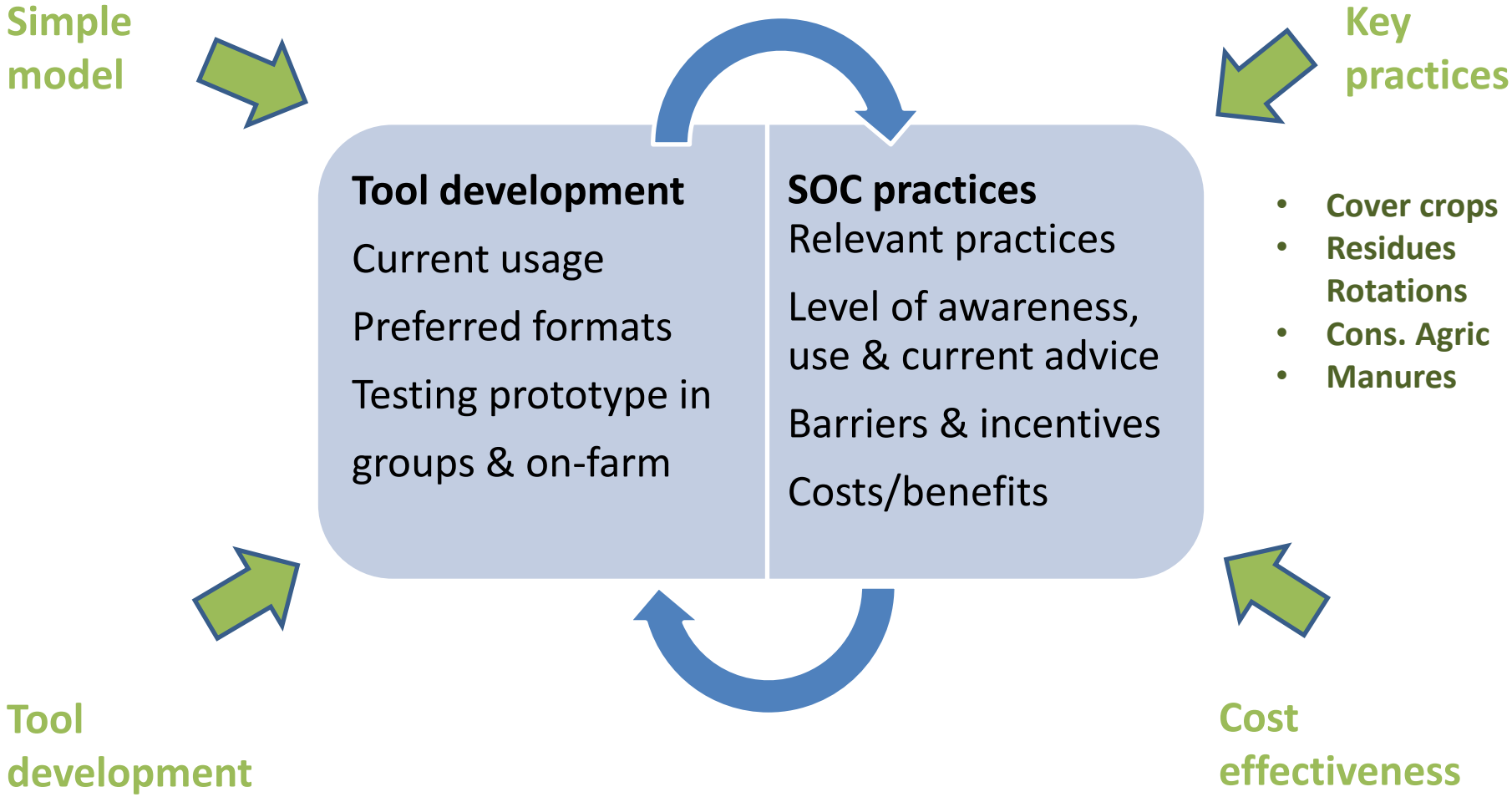
- Interviews
- Stakeholder Workshops

Stakeholder consultation: case studies



SmartSOIL
Sustainable farm Management Aimed at Reducing Threats to SOILs under climate change

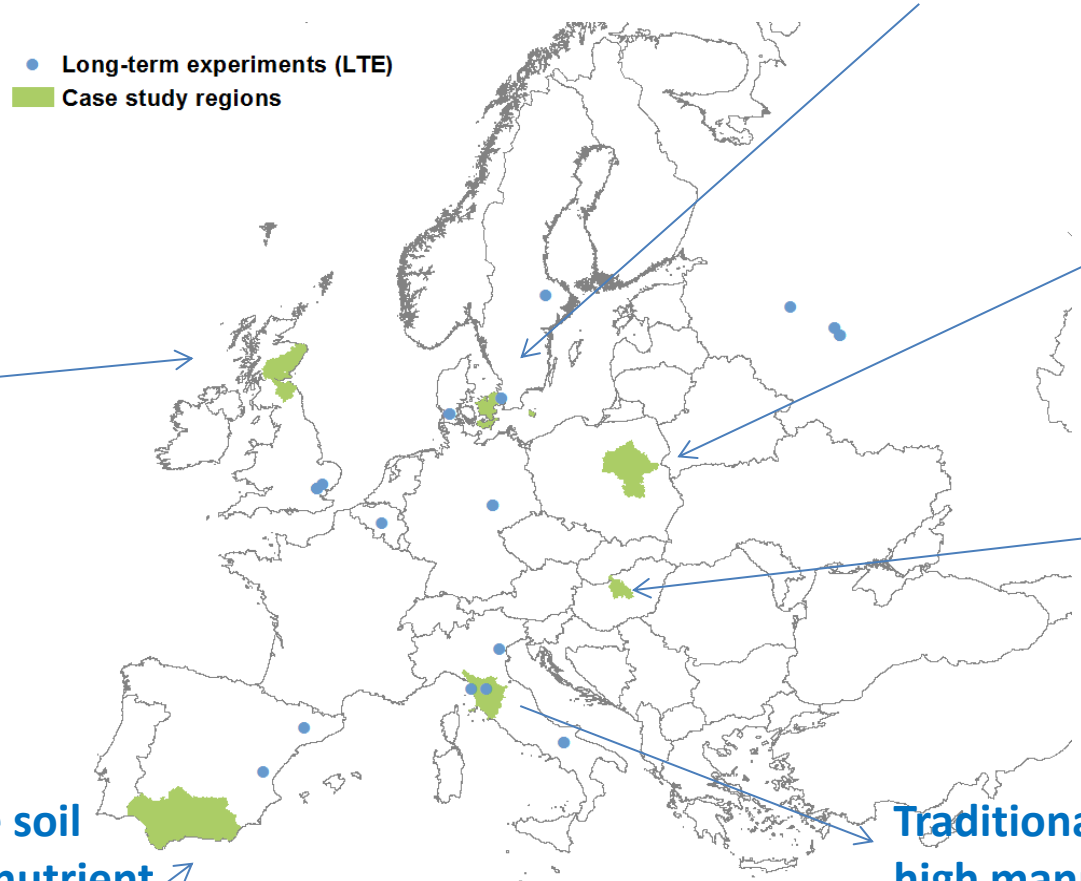
Stakeholder consultation: iterative testing and refining



Stakeholder consultation: key messages

- Perception of **scientific uncertainty** about practices
- Lack of real or '**best practice'** examples and informed advice
- Difficulty of demonstrating impact on **productivity and profitability**
- Difficulty of demonstrating economic benefits over a **long time scale**
- Practices perceived as **uneconomic, impractical** or needing **investment**
- Soil **carbon** is of **low importance** to farmers
- **Limited knowledge** about/familiarity with practices
- Difficulty in **integrating practices** into farm systems

Stakeholder consultation: diverse contexts



Min-till look “messy”

High cover crop establishment costs

Cover crops hard to establish

Straw has high economic value

Cover crops reduce soil moisture & create nutrient competition between crops

Traditional farmers; high manure handling costs

SmartSOIL
Sustainable farm Management Aimed at Reducing Threats to SOILs under climate change

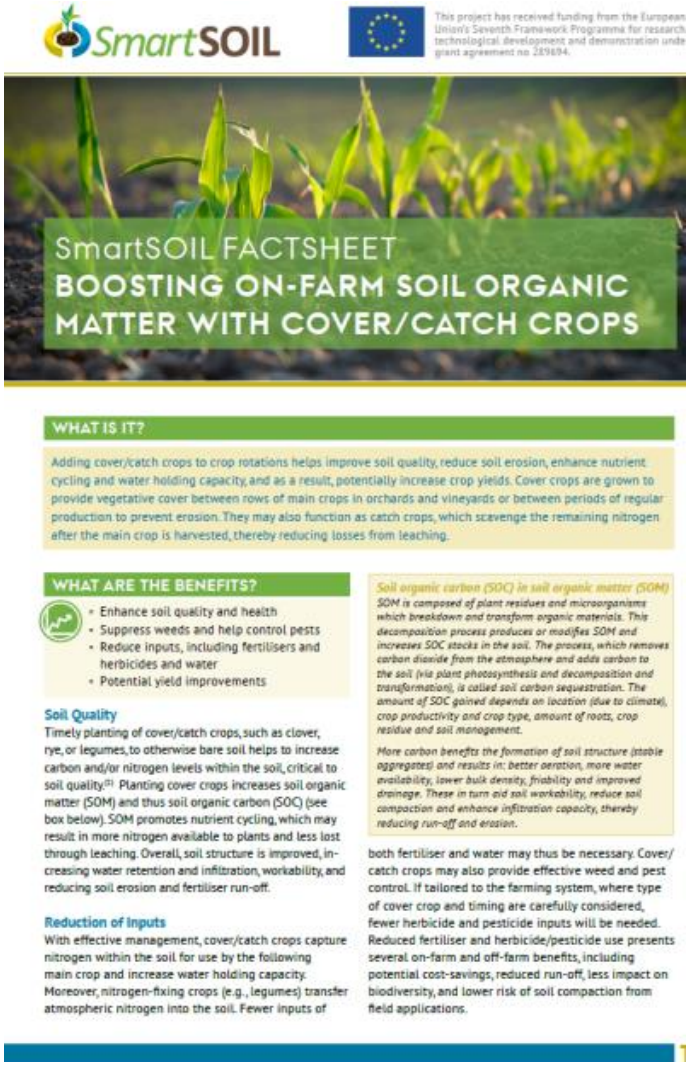
SmartSOIL Tool→Toolbox development–end-user needs

- What are the **most cost-effective practices** in terms of highest income relative to costs of practice, optimal crop productivity and carbon sequestration?
- What is the link/relation between agriculture and CC and resulting need for/benefits of increased carbon sequestration?
- Visual presentation of the **effects of practices** (on carbon storage and other services) in the short and long-term
- **Real life case studies** of farmers using certain practices
- **Priority list of practices in terms of win-wins and trade-offs** with other environmental objectives under regional conditions

SmartSOIL Toolbox: Real Life Cases

Common messages:
Invest time in learning
Talk to other farmers
Consult an adviser

SmartSOIL Toolbox: FactSheets



SmartSOIL

This project has received funding from the European Union's Seventh Framework Programme for research, technological development and demonstration under grant agreement no 289694.

SmartSOIL FACTSHEET

BOOSTING ON-FARM SOIL ORGANIC MATTER WITH COVER/CATCH CROPS

WHAT IS IT?

Adding cover/catch crops to crop rotations helps improve soil quality, reduce soil erosion, enhance nutrient cycling and water holding capacity, and as a result, potentially increase crop yields. Cover crops are grown to provide vegetative cover between rows of main crops in orchards and vineyards or between periods of regular production to prevent erosion. They may also function as catch crops, which scavenge the remaining nitrogen after the main crop is harvested, thereby reducing losses from leaching.

WHAT ARE THE BENEFITS?

- Enhance soil quality and health
- Suppress weeds and help control pests
- Reduce inputs, including fertilisers and herbicides and water
- Potential yield improvements

Soil organic carbon (SOC) in soil organic matter (SOM)

SOM is composed of plant residues and microorganisms which breakdown and transform organic materials. This decomposition process produces or modifies SOM and increases SOC stocks in the soil. The process, which removes carbon dioxide from the atmosphere and adds carbon to the soil (via plant photosynthesis and decomposition and transformation), is called soil carbon sequestration. The amount of SOC gained depends on location (due to climate), crop productivity and crop type, amount of roots, crop residue and soil management.

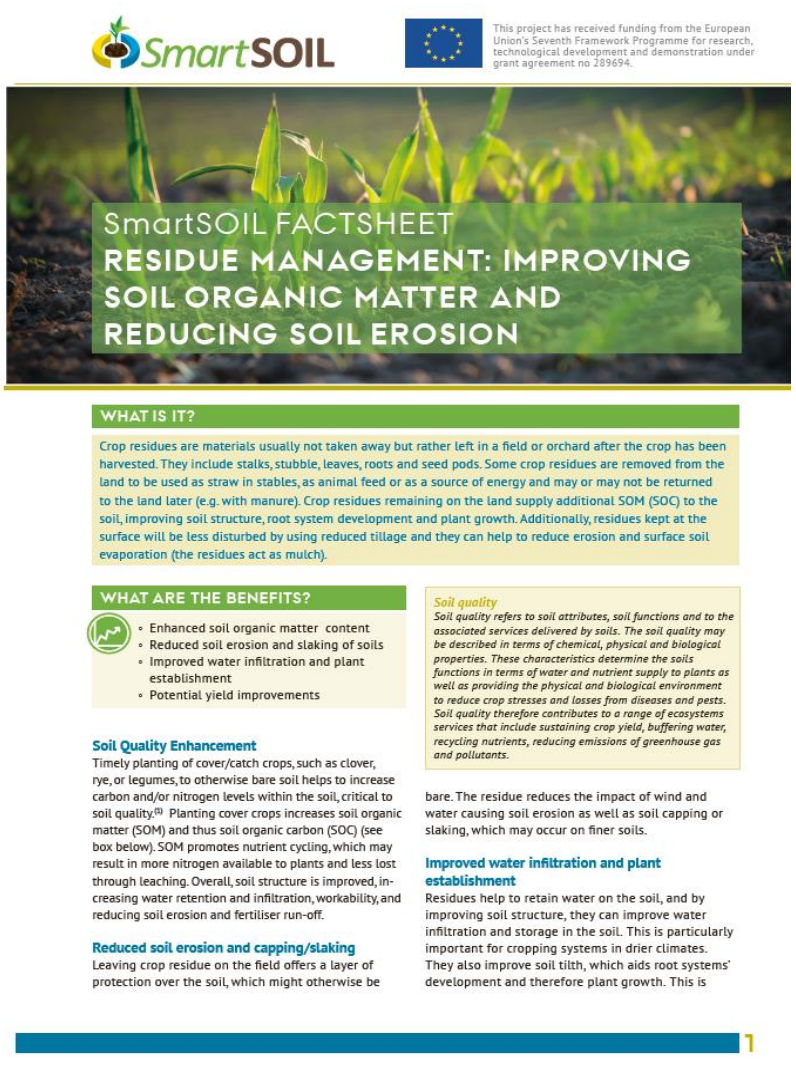
More carbon benefits the formation of soil structure (stable aggregates) and results in: better aeration, more water availability, lower bulk density, friability and improved drainage. These in turn aid soil workability, reduce soil compaction and enhance infiltration capacity, thereby reducing run-off and erosion.

Soil Quality

Timely planting of cover/catch crops, such as clover, rye, or legumes, to otherwise bare soil helps to increase carbon and/or nitrogen levels within the soil, critical to soil quality.[1] Planting cover crops increases soil organic matter (SOM) and thus soil organic carbon (SOC) (see box below). SOM promotes nutrient cycling, which may result in more nitrogen available to plants and less lost through leaching. Overall, soil structure is improved, increasing water retention and infiltration, workability, and reducing soil erosion and fertiliser run-off.

Reduction of Inputs

With effective management, cover/catch crops capture nitrogen within the soil for use by the following main crop and increase water holding capacity. Moreover, nitrogen-fixing crops (e.g., legumes) transfer atmospheric nitrogen into the soil. Fewer inputs of both fertiliser and water may thus be necessary. Cover/catch crops may also provide effective weed and pest control. If tailored to the farming system, where type of cover crop and timing are carefully considered, fewer herbicide and pesticide inputs will be needed. Reduced fertiliser and herbicide/pesticide use presents several on-farm and off-farm benefits, including potential cost-savings, reduced run-off, less impact on biodiversity, and lower risk of soil compaction from field applications.



SmartSOIL

This project has received funding from the European Union's Seventh Framework Programme for research, technological development and demonstration under grant agreement no 289694.

SmartSOIL FACTSHEET

RESIDUE MANAGEMENT: IMPROVING SOIL ORGANIC MATTER AND REDUCING SOIL EROSION

WHAT IS IT?

Crop residues are materials usually not taken away but rather left in a field or orchard after the crop has been harvested. They include stalks, stubble, leaves, roots and seed pods. Some crop residues are removed from the land to be used as straw in stables, as animal feed or as a source of energy and may or may not be returned to the land later (e.g. with manure). Crop residues remaining on the land supply additional SOM (SOC) to the soil, improving soil structure, root system development and plant growth. Additionally, residues kept at the surface will be less disturbed by using reduced tillage and they can help to reduce erosion and surface soil evaporation (the residues act as mulch).

WHAT ARE THE BENEFITS?

- Enhanced soil organic matter content
- Reduced soil erosion and slaking of soils
- Improved water infiltration and plant establishment
- Potential yield improvements

Soil quality

Soil quality refers to soil attributes, soil functions and to the associated services delivered by soils. The soil quality may be described in terms of chemical, physical and biological properties. These characteristics determine the soils functions in terms of water and nutrient supply to plants as well as providing the physical and biological environment to reduce crop stresses and losses from diseases and pests. Soil quality therefore contributes to a range of ecosystems services that include sustaining crop yield, buffering water, recycling nutrients, reducing emissions of greenhouse gas and pollutants.

Soil Quality Enhancement

Timely planting of cover/catch crops, such as clover, rye, or legumes, to otherwise bare soil helps to increase carbon and/or nitrogen levels within the soil, critical to soil quality.[1] Planting cover crops increases soil organic matter (SOM) and thus soil organic carbon (SOC) (see box below). SOM promotes nutrient cycling, which may result in more nitrogen available to plants and less lost through leaching. Overall, soil structure is improved, increasing water retention and infiltration, workability, and reducing soil erosion and fertiliser run-off.

Reduced soil erosion and capping/slaking

Leaving crop residue on the field offers a layer of protection over the soil, which might otherwise be bare. The residue reduces the impact of wind and water causing soil erosion as well as soil capping or slaking, which may occur on finer soils.

Improved water infiltration and plant establishment

Residues help to retain water on the soil, and by improving soil structure, they can improve water infiltration and storage in the soil. This is particularly important for cropping systems in drier climates. They also improve soil tilth, which aids root systems' development and therefore plant growth. This is

Stakeholder consultation: iterative testing and refining