



# SmartSOIL Team



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For further information, please  
refer to the project website:  
[www.SmartSOIL.eu](http://www.SmartSOIL.eu)

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



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Soils provide the most indispensable function of supporting the production of food and feed for a growing human population. At the same time they provide a range of regulating and supporting functions related to climate change and removal of greenhouse gases. The majority of the soil functions are closely linked to the flows and stocks of soil organic carbon (SOC); low levels of both flows and stocks may seriously interfere with several of the essential soil functions and thus affect the ecosystem services that soils deliver. Soil degradation is considered a serious problem in Europe and a large part of the degradation is caused by intensive cultivation practices in agriculture.

### Objectives of SmartSOIL

The aim of SmartSOIL is to contribute to reversing the current degradation trend of European agricultural soils by improving soil carbon management in European arable and mixed farming systems covering intensive to low-input and organic farming systems. This entails two overall aims:

- To identify farming systems and agronomic practices that result in an optimized balance between crop productivity, restoration and maintenance of vital soil functions (fertility, biodiversity, water, nutrient cycling and other soil ecosystem services) and soil carbon sequestration and storage.
- To develop and deliver a decision support tool and guidelines to support novel approaches, techniques, and technologies adapted to different European soils and categories of beneficiaries (farmers, farm advisory and extension services, and policy makers).

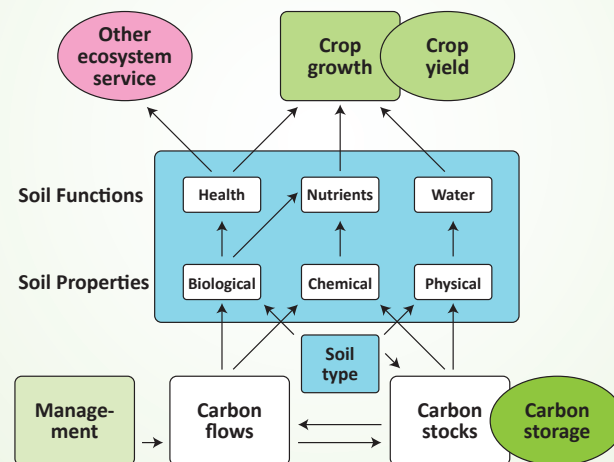


Fig. 1: Stocks and flows concept.

SmartSOIL focuses on carbon in soils of arable and mixed farming systems in Europe. It will develop an innovative approach using the soil carbon stocks and flows concept (Fig. 1) to assess the impact of carbon management on crop productivity, soil organic carbon stocks and other ecosystem services. This concept distinguishes carbon flows and stocks, which we hypothesize to have distinctly different effects on biological, chemical and physical soil functions. By separating the roles of carbon flows from the role of carbon stocks, we aim to much better identify critical levels, not only of soil carbon stocks, but also critical levels of carbon inputs.

This is expected to directly relate to needs for crop and soil management measures. We further hypothesize that critical soil carbon stocks are linked to soil mineralogy through complexed organic carbon on clay and silt surfaces.

We finally hypothesize that critical levels of soil carbon flows are related to specific cropping systems and environmental conditions. We will test these hypotheses using existing data from European long-term experiments supplemented with new measurements in some of these experiments.

SmartSOIL will identify and develop options to increase carbon stocks and optimize carbon flows whilst maintaining sufficient and sustainable carbon stocks. This concept and long-term data will be used to improve existing soil and crop simulation models and test them against independent data from long-term experiments. The models and data will be used to derive a simplified model to estimate the short- and long-term effects of management on crop productivity and SOC storage.

Other ecosystem services such as soil biodiversity, as linked to soil carbon levels, will also be investigated. Scenarios of management systems in Europe for improved productivity and enhanced SOC sequestration will be evaluated under current and future climate. The cost-effectiveness of alternative options for managing SOC flows and stocks will be assessed. Guidelines and a decision support tool to enable farmers, advisors and policy makers select appropriate and cost-effective practices for particular farming systems, soils and climates will be developed and based on the simplified model with input from stakeholders in six case study areas in Europe.