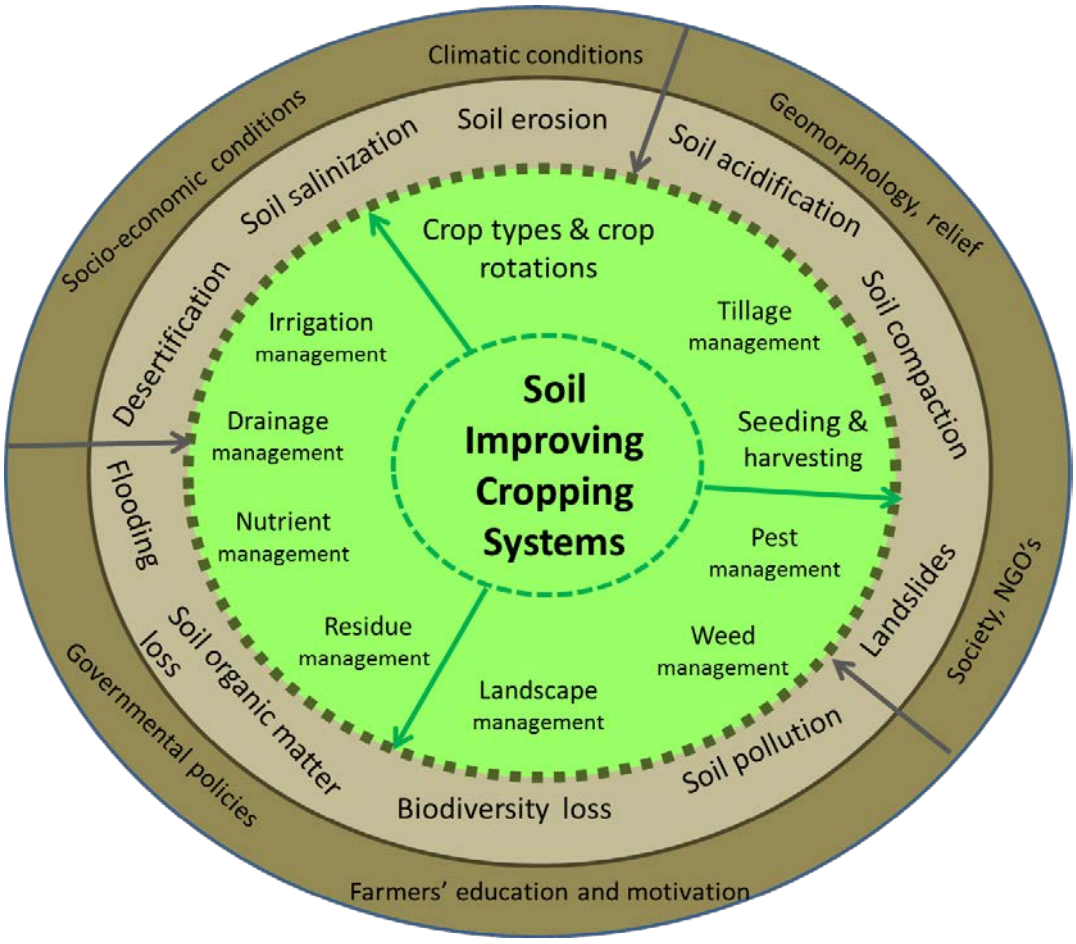
SoilCare
SOILCARE FOR PROFITABLE AND SUSTAINABLE CROP PRODUCTION IN EUROPE

Soil-improving cropping systems

Non-technical summary of a review



The Challenge

A global challenge is to increase crop yields and to minimize soil degradation and environmental pollution simultaneously. Soil Improving Cropping Systems (SICS) have been suggested as a strategy to halt soil degradation and environmental pollution. This document briefly summarizes the concept and opportunities of SICS. It is based on an extensive literature review[1]

The Concept

The premise of 'Soil Improving Cropping Systems' (SICS) is that there are cropping systems that improve soil quality and at the same time have positive impacts on profitability and sustainability. Cropping systems refer to a combination of crop types, crop rotation, and associated management techniques. There are many different crop types, crop rotations and management techniques, and hence also many cropping systems, but the diversity greatly depends on local socio-economic and environmental conditions. Soil improving cropping systems (SICS) are specific combinations of crop types, crop rotations and management techniques aimed at halting soil degradation and/or improving soil quality (Figure 1).

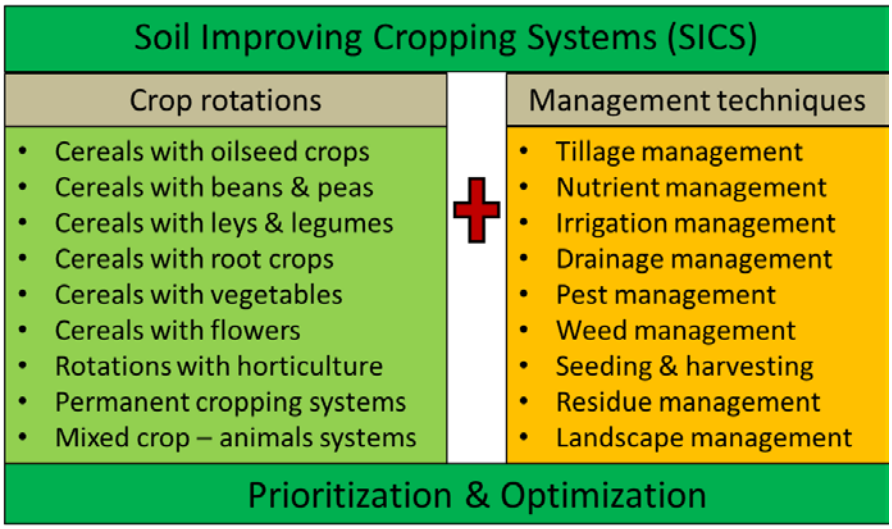


Figure 1. Concept of soil improving cropping systems; a combination of crop rotations and management techniques which have been prioritized and optimized so as to improve soil quality, profitability and sustainability of the cropping systems simultaneously.

The selection of specific crop types, crop rotations and management techniques is crucial for SICS. Management refers here to a coherent set of activities related to the cultivation of crops and land, and the handling and allocation of inputs, so as to achieve agronomic,

[1] https://www.soilcare-project.eu/soil-improving-cropping-systems

economic, environmental, and social objectives. The management must be target oriented; targeted at achieving the objectives, targeted at minimizing soil degradation and improving soil quality. The management techniques refer to the combination of software and hardware; a total of nine management techniques have been distinguished (Figure 1), including tillage, seeding and harvesting, fertilization, irrigation, drainage, pest, weed, harvesting, residue, and landscape management. All these management techniques have to be practiced using the right techniques, in the right way at the right time. The concept of SICS emphasizes the proper combination of crop rotations and management techniques. It is broader than the concepts of 'sustainable soil management'[2] and 'soil conservation'[3].

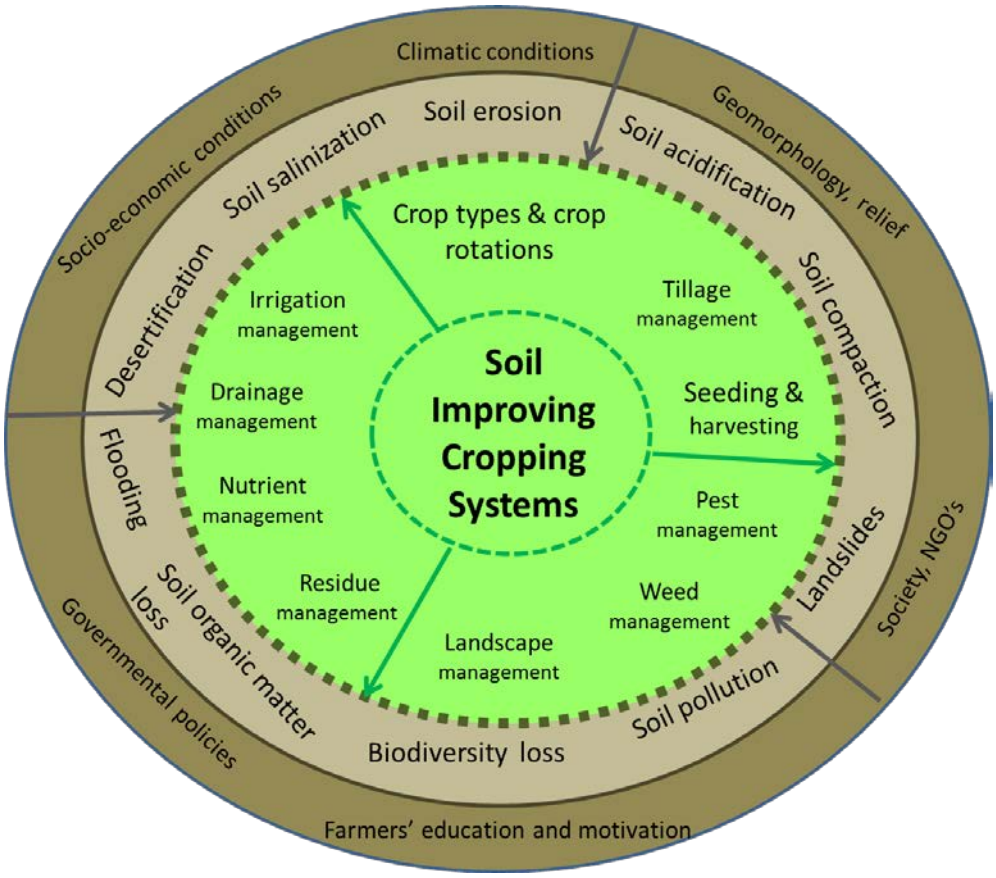


Figure 2. Illustration of the linkages between socio-economic and environmental conditions (outer circle), soil degradation (soil threats; 2nd circle) and soil improving cropping systems (inner circle). Influences of the socio-economic and environmental conditions are inwards directed, while the influences of soil improving cropping systems are outwards directed (indicated by arrows).

[2] FAO (2017). Voluntary Guidelines for Sustainable Soil Management. Food and Agriculture Organization of the United Nations, Rome, Italy, 26 pp.
[3] Blanco H, and R Lal (2008) Principles of Soil Conservation and Management. Springer. ISBN: 978-1-4020-8708-0, 256 pp.

The selection, prioritization and optimization of crop rotations and management techniques depends also on the prevailing socio-economic conditions (markets, policies, culture, infrastructure) and environmental conditions (climate, geomorphology, soil quality and soil threats). Hence, understanding the situation and diagnosing the key factors are crucial. SICS are flexible; the crop rotations and management techniques are adjusted to objectives and conditions. The linkages between socio-economic and environmental conditions, soil degradation (soil threats) and soil improving cropping systems are illustrated in Figure 2.

Our review is a first step in the development of robust SICS, so as to improve soil quality and its functions, and at the same time to have positive impacts on the profitability and sustainability of cropping systems. Testing of SICS in practice and further optimization of combinations of crop rotations and management techniques will be done within SoilCare across Europe during 2018-2020. Figure 3 outlines the foreseen process of the further optimization of the SICS in practice, through continuous 'learning by doing' cycle, which requires extensive monitoring.

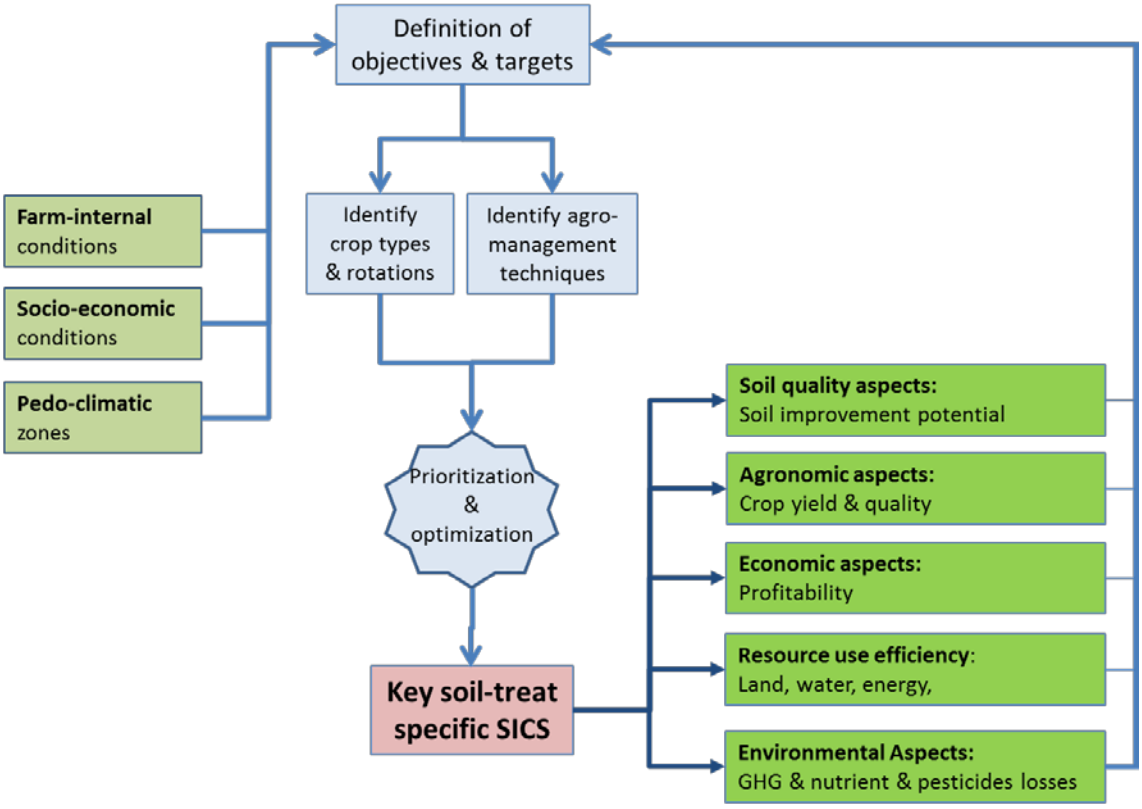


Figure 3. Conceptual outline of the further optimization of SICS in practice. The farmer, socio-economic and environmental conditions (on the left-hand side) define the initial objectives and targets of SICS, and are then tuned and modified on the basis of the outcome of the performance of SICS.