

# Dynamics of Soil Carbon Sequestration in Tropical and Temperate Agricultural ABSYSs

## OBJECTIFS

The overall goals of the project are

- to develop sustainable agricultural systems tailored for both higher productivity and higher C sequestration
- to raise awareness of the role of soil management for the mitigation of GHG emissions
- to assemble various research units from the Agropolis Foundations' scientific network and their partners in addressing major challenges with climatic change and food security.

The main research question is: What are effective and socially acceptable strategies to foster soil C sequestration in agricultural systems?

To answer to this question, we consider that:

- Efficient soil carbon sequestration (SCS), that is a net positive soil-plant systems C balance over a long period of time, can be achieved in ways that are economically, socially and environmentally sustainable and diffusible.
- The SCS strategies concern both farmers' practices at the field and farm level, and the local institutional arrangements, at the territory level.
- Prerequisites for farmers and local institutions to adopt SCS practices are: (i) the long-term soil C impact of present agricultural systems are known, (ii) technical changes or social arrangements enhancing SCS are identified and evaluated, (iii) social, economic and environmental impacts of targeted innovating SCS farmer practices or social arrangements are assessed.

Consequently, the following knowledge is needed:

- Long-term SCS dynamics and their determinants at the field, farm and landscape levels;
  - Determinants of individual and collective capacity to adopt new practices over the long term;
  - Indicators and tools helping multi-actors to assess and decide objectively the best strategies to intensify SCS;
- The present project will identify and examine interactions between biophysical and socio-economic drivers and processes across the temporal and spatial scales to better understand the determinants and social and institutional conditions of adoption of soil C enhancing farming and institutional strategies. Studying processes and interactions implies transdisciplinary work using a conceptual social-ecological systems framework.

The DSCATT project will be carried out on 3 study sites in Sub Saharan Africa and 1 site in the mediterranean region of France.

Specific objectives:

- To quantify and analyze the soil C sequestration dynamics in different agricultural systems at the field, farm and territory scales
- To implement crop-soil, farm and landscape models to simulate long-term SCS
- To deliberate amongst stakeholders about soil carbon sequestration pathways
- To share knowledge to scale out and to scale up innovate

## RESULTATS

expected results :

- ▶ Documented strategic pathways to foster soil carbon sequestration
- ▶ Adjusted multi-stakeholders approaches on land use management and soil carbon sequestration
- ▶ Toolkits that help local and institutional actors to consider soil carbon sequestration issues in their development strategies
- ▶ Databases and multi-scale models on long-term dynamics of soil carbon

## PERSPECTIVES

More knowledge, relevant field measurements and data at multiple scales are needed to better simulate and assess soil carbon sequestration issues and impact in future agricultural intensification pathways.

Farmer's decisions and farm activities are the results of synergies and tradeoffs (for instance yield versus labor, benefits and risks). These affect carbon and nutrients cycles, and consequently the soil carbon sequestration potential, and in fine the sustainability of the agricultural systems. So, a multi-actors and a systemic approach is necessary to define relevant agricultural practices that jointly address farmers' objectives and global stakes (food security, ecological conservation, climate change mitigation...) in changing conditions (demographic, markets, climate)

**Responsable :**

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