

Annual EJP SOIL Science Days 2022

8 & 9 June 2022, Palermo, Italy and online

Annual Science Days (preliminary) programme

Day 1, 8/6, morning: **“Soils in Europe: European outlook and EJP SOIL results”**: -9:00 – 12:xx

WHO? Both physical and online events are open to a broader audience. Registration is required for both.

Time	What
9:00	Opening speech
9:15	Keynote speaker
9:35	European Soil Observatory presentation
10:05	Results of (nearly) finished projects
10:35	Break
10:55	New internal and external project presentations
11:15	Panel on carbon farming
11:45	Q&A
12:00 (or later depending on keynotes)	Lunch break

Day 1, 8/6, afternoon: **13:00 – 18:00**

BREAKOUT SESSIONS

WHO? EJP SOIL consortium + external call partners

Time	What
13:30 (earlier if morning session ends at 12)	Parallel breakout sessions 1 <ul style="list-style-type: none">• Carbon sequestration and trade-offs (session A)• Innovative management practices• Landscape approaches for soil health and ecosystem services
15:00	Break
15:15-15:45	Poster sessions linked to breakout sessions 1 and 2
15:45-17:15	Parallel breakout sessions 2 <ul style="list-style-type: none">• Roots and carbon sequestration

	<ul style="list-style-type: none"> • Climate change adaptation and soil management • Bridging Proximal and Remote Sensing for Soil Properties mapping and Monitoring
17:15-18:00	Poster session for day 2

Day 2, 9/6, morning: **9:00 – 12:30**

BREAKOUT SESSIONS AND PLENARY CLOSING

WHO? EJP SOIL consortium + external call partners

Time	What
9:00-10:30	Parallel breakout sessions 3 <ul style="list-style-type: none"> • Carbon storage and trade-offs (session B) • Soil indicators and assessing ecosystem services • Soils and education
10:30-10:45	Break
10:45-12:15	Parallel breakout sessions 4 <ul style="list-style-type: none"> • Incentives for carbon sequestration and soil health • Carbon sequestration and amendments • Soil biodiversity and ecosystem services
12:15-12:30	Plenary closing sessions – outlook EJP SOIL activities

List of breakout sessions with description

- Carbon sequestration and trade-offs
(this session will be split into two sessions, more information on the concept will soon be available)
 - **Session conveners:** Felix Seidel (Thuenen, CarboSeq project), Alessandra Lagomarsino (CREA, SOMMIT project)
 - **Internal EJP SOIL projects with main link to this theme:** CarboSeq, SOMMIT, TRACE-SOILS, INSURE
 - **Description**
Carbon sequestration in agricultural soils is a strategy that can contribute to mitigate climate change. The key for soil carbon sequestration is having a positive balance between carbon inputs and outputs. Enhanced inputs of organic matter to the soil can be achieved by improved management options, such as minimizing soil disturbance, use of cover crops, incorporation of crop residues, addition of organic matter, or optimization of varieties with increased root biomass. In cultivated peat soils, rewetting is needed to decrease carbon outputs and therefore achieve carbon sequestration.

Increasing soil organic carbon has several co-benefits, beyond climate change

mitigation, including improvement of soil health, fertility and water holding capacity. On the other side, agricultural strategies aimed at increasing carbon sequestration affect soil N₂O, CO₂ and CH₄ fluxes, and N leaching. These trade-offs of carbon sequestration may hamper climate change mitigation efforts. Thus, the overall effect of management practices needs to be evaluated to appropriately quantify their environmental impact.

In this session, we welcome contributions that give insights into the topic of soil carbon sequestration in agricultural lands. A special focus will be given to management practices affecting this process, as well the trade-offs (especially N₂O and CH₄ fluxes as well as N and P losses) associated with changes in soil carbon

Carbon sequestration and amendments

- **Session conveners:** Sabine Houot (INRAE, EOM4SOIL)
- **Internal EJP SOIL projects with main link to this theme:** CarboSeq WP3, EOM4SOIL
- **Description**

Besides C input to soil coming from plant biomass (crop residues, cover crops, root biomass), the application of organic amendments can also enhance carbon sequestration in soils. These organic amendments are mainly issued from exogenous organic matters (not directly produced from the soil where application occurs), coming from organic wastes or by-products related to other activities and often treated before application for different purposes (sanitation, stabilisation of organic matter,...). Their production and application also provide other services such as the recycling of nutrients thus contributing to circular economy, the production of renewable energy with the development of anaerobic digestion. Their efficiency at increasing carbon stocks in soils or providing nutrients varies with the characteristics of their organic matter thus with their origin and treatment applied before application. On the other hand, side-effects can occur related to their application (input of contaminants, excess of nutrients and losses through gas emission or leaching...), but also to modification of the cropping systems associated with anaerobic digestion and potential consequences on food production, enhanced contamination... These side-effects could be minimized through improved process treatment before application, management practices. Multi-criteria evaluation tools should be developed in order to balance benefits and side-effects. Contributions for this session are expected to better understand the efficiency of organic amendments at providing services (C storage and associated others), explore the associated side-effects and how the treatment process may contribute to enhance the benefits and decrease the potential impacts, propose multicriteria evaluation tools potentially useful to define best management practices of organic amendments use in crop production.

- Roots and carbon sequestration

- **Session conveners:** Rebecca Hood-Nowotny (BOKU, MaxRoot C), Isabelle Bertrand (INRAE, MixRoot C)
- **Internal EJP SOIL projects with main link to this theme:** MaxRoot C, MixRoot C, CarboSeq T9.2
- **Description**

Roots are the hidden part of plants. Because they i) decompose slower than aerial plant parts, ii) produce C through rhizodeposition and turnover, and iii) colonize subsoils, they drive soil microbial activity and contribute to soil fertility and mitigate

climate change through C sequestration in soil.

Despite the importance of these processes, our current knowledge on soil-root interactions in agroecosystems is poor. How root biomass and traits relate to soil nutrients and C contents in shallow and deeper soil horizons needs to be better investigated. What are the main root traits related to SOC? Are the predictors different in mixed versus single species agroecosystems? How varietal selection may impact root biomass, C stocks and drought resistance? Do cover crops increase C stocks in the different soil horizons? Do diversified agroecosystems have a higher potential for soil C sequestration, what is the relative contribution of roots? In different agroecosystems what are the main tradeoffs between root C inputs and yield? How to model root C contribution to soil? All these research questions still need to be addressed.

In this session we will welcome all results focusing on soil and root interactions in agroecosystems. Contribution from students are highly welcome.

- Incentives for carbon sequestration and soil health

- **Session conveners:** Martin Hvarregaard Thorsoe & Morten Graversgaard (AU, Road4Schemes)
- **Internal EJP SOIL projects with main link to this theme:** Road4Schemes
- **Description**
Enhancing the potential of soils to store more carbon while maintaining existing SOC levels, especially on peatlands and other carbon-rich soils, is a key lever for mitigating climate change. To maintain and increase SOC content there is a need for integration of research into policy design as well as policy implementation ensuring mutual benefits for stakeholders, soils and society. This is relevant and across Europe where carbon farming is emphasised in current policy strategies.

In order to ensure acceptance among land-users and policymakers, there is a need to understand how such practices can be implemented in current farming systems, along with the necessary monitoring, reporting and verification systems.

In this session, we welcome contributions that discuss opportunities for designing Carbon Farming schemes as a means for increasing carbon sequestration and prevent emissions of GHG in the agro-food system. Particular attention will be given to the opportunities to develop result-based carbon farming schemes where payment levels reflect the actual impact of the management practices on carbon stocks (relative to a benchmark).

- Climate change adaptation and innovative practices

- **Session conveners:** Frederic Vanwiderkens (CRAW, i-SoMPE), Guillaume Blanchy (ILVO, CLIMASOMA)
- **Internal EJP SOIL projects with main link to this theme:** i-SoMPE, CLIMASOMA, SoilCompac
- **Description**

Sustainable agricultural management practices are needed to improve ecosystem services and minimize threats on soil and water resources in the context of climate change adaptation. This session will focus on three main aspects of this topic: (i) the

development of innovative or established agricultural practices, their expected benefits and possible limitations (e.g. case studies); (ii) the evaluation of the effect of innovative practices and systems of practices on measured productive and environmental variables; and (iii) the dynamics of dissemination of these practices and the identification of the drivers and barriers related to their adoption by farmers.

- Soil biodiversity and ecosystem services

- **Session conveners:** Alessandra Trinchera (CREA, AGROECOSeqC), Anke Hermann (SLU, EnergyLink)
- **Internal EJP SOIL projects with main link to this theme:** AGROECOSeqC, EnergyLink
- **Description**

Soil microorganisms are key players in governing the terrestrial carbon cycle as they are responsible for the decomposition of both organic inputs from plants and of soil organic matter. However, there is still no consensus about how to explicitly represent their role in terrestrial carbon cycling and whether plant diversity may shape microbial community. This breakout session will focus on the importance of soil biodiversity, their influence on ecosystem services such as climate regulation and food security: for example, evaluating the role of fungal communities in agroecosystems, promotion of beneficial plant-microbe symbioses, including biological nitrogen fixation and improving our understanding between the link of above-ground crop diversification and below-ground soil processes.

Contributions using labelling methods, molecular markers, assessment of plant diversity, geno- and phenotypic profiling of soil microbial community, soil soluble C pools, greenhouse gas emission, such as indicators of supplied ecosystem services making use of long-term experiments from crop- and grasslands as well as application of modelling and multivariate approaches are welcome.

- Soil indicators and assessing ecosystem services

- **Session conveners:** Isabelle Cousin (INRAE, SERENA), Stefano Mocali (CREA, MINOTAUR)
- **Internal EJP SOIL projects with main link to this theme:** SIREN, SERENA, MINOTAUR
- **Description**

Soil functions contribute to provide (soil-based) ecosystem services (ES), here defined as the benefits human obtain from the ecosystem. Although most of these functions are related to the soil biological activity, the current status and trends in soil biodiversity across Europe are poorly known, and adequate taxonomical and functional indicators are needed to evaluate the vulnerability of soils and its ES to climate change. Thus, in order to assess the health status of soils, i.e. its capacity of continuous provision of ecosystem services, there is the need to define robust indicators for assessment and monitoring, in joint programming with participating Member States' national policy and programmes for soil quality monitoring, with taking into account not only biological processes but embracing all the bio-chemical-physical processes occurring in soils. As soil-based ecosystem services co-occur in space and overlap interacting at different spatial and temporal scales, their spatial distribution, as well as their spatial synergies and trade-offs must also be known.

The aim of this call is then collecting contributions on functional indicators their modelling and mapping, as well as methodological approaches and applications aimed to the characterization of bundles of soil ES and soil threats The definition and

evaluation of indicators including specific references to soil biodiversity and target values for healthy soils are particularly welcome.

- Landscape approaches for soil health and ecosystem services

- **Session conveners:** Lisbeth Johanssen & Elmar Schmaltz (BAW, SCALE)
- **Internal EJP SOIL projects with main link to this theme:** SCALE
- **Description**

Sustainable land management at different scales requires consideration of the multi-functionality of landscapes, in which natural resources management may compete with environmental and socio-economic demands. The multiple land uses and involvement of multiple stakeholders call for an integrated approach between policy and practice to maintain or improve soil health and ecosystem services.

As different landscape elements are often linked to each other, the concept of connectivity throughout the landscape becomes very important. For example, in the context of soil erosion, water and sediment transport from an agricultural field to other landscape elements such as water courses or infrastructure depends on the connectivity within environmental systems or landscapes. Additional knowledge of surface processes at multiple scales and across landscape elements is needed. Only in this way, is it possible to ensure resilience of the landscape through the implementation of mitigation measures and policy adaptation.

In this session, we focus on landscape approaches related to soil conservation, soil erosion as well as sediment and hydrologic connectivity and would like to invite interested parties to submit an abstract with results on novel research.

- Bridging Proximal and Remote Sensing for Soil Properties mapping and Monitoring

- **Session conveners:** Emmanuelle Vaudour (INRAE, STEROPES), Mogens Humlekrog Greve (AU, SENRES)
- **Internal EJP SOIL projects with main link to this theme:** STEROPES, SENSRES, Probefield
- **Description**

Traditional mapping and monitoring methods are expensive and time consuming, and much faster, high throughput methodologies of soil characterization are needed to meet the needs of soil policies and agricultural management. Remote and proximal sensing include a number of methods and techniques that allow for collecting soil information over larger areas or denser than what could be achieved using traditional soil sampling methods. Where a proximal sensing approach can capture spatial variation in the smaller scale (e.g. within field), remote sensing has the advantage of managing both detailed and larger scales (e.g. regional or even nation). Using the advantages in the two approaches, linking proximal and remote sensing techniques can be a way for both up and down scaling and to improve model performance.

In the session, we aim to discuss current understanding and knowledge gaps around the possibilities of using, and possibly linking, remote and proximal sensors for soil monitoring and/or soil mapping

- Soils and education

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