BLOCK A (9:00-10:45)

1. Carbon sequestration at national and European scale

Involved projects: CarboSeq, SIMPLE

Conveners: Sonja Keel (Agroscope), Felix Seidel (Thuenen)

Carbon sequestration in agricultural soils is a strategy that can contribute to climate change mitigation and generates large expectations on ecosystems to take up carbon dioxide from the atmosphere. The key for soil carbon sequestration is reaching 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 use of cover crops, increased incorporation of crop residues, addition of organic matter, optimization of varieties with increased root biomass, land use change, or introduction of agroforestry measures.

As these measures are affected by bio-physical (e.g. soil type, climate) and technical constraints (e.g. irrigation) a differentiated analysis at national and European scale is necessary in order to asses the true potential of agricultural measures that enhance soil carbon sequestration when implemented on large scale.

2. Using participatory design for developing farmer friendly tools for soil practices and schemes

Involved projects: ROAD4SCHEMES, IntoDIALOGUE, PRAC2LIV

Conveners: Sabina Asins (CSIC), Marjoleine Hanegraaf (WR), Martin Hvarregaard Thorsøe (AU)

EJP SOIL aims to promote the use of regionally specific tools to provide either qualitative or quantitative information on agricultural soil-based ecosystem services, e.g., climate change. The trend is for more complex decision support tools (DSTs) that focus on both agricultural production and environmental services. However, the level of implementation of DSTs and guidelines for sustainable soil management in Europe varies considerably among farmers and regions. This maybe partly due to different perspectives of land-users for, e.g., taking up C-farming practices and schemes as compared to monitoring bodies. Studies have identified a large variety in limiting factors for adoption of tools, including differences in advisory frameworks, country-specific data and calibration requirements, issues around language and farmers' ecological identity. Abstracts are invited to share the experiences of your projects in the end-users' involvement, as well as on the use of participatory design in the development and testing of DSTs.

3. Remote and proxy-sensing for the mapping of soil surface properties: how accurate or uncertain they areInvolved projects: STEROPES, ProbeField, Sensres

Conveners: Emmanuelle Vaudour (INRAE), Johanna Wetterlind (SLU), Luboš Borůvka (CZU)

The session will consider communications dealing with i) how accurate spectral approaches can be from varied observational scales: lab, field, airborne and/or spaceborne sensors, be they multispectral or hyperspectral, point or imaging measurements ; ii) to what extent a sensed soil property can be either mapped, or timely monitored or even spatially timely monitored. Special consideration will be given to soil organic carbon and stocks and in how degree to the disturbing factors (atmospheric conditions, soil moisture, texture...) intervene in such approach for diverse agroclimatic zones and agroecosystems. The session raises the accuracy that can be reached spectrally according to diverse ancillary factors, algorithms, spatial scales and time scales and the

various sources of uncertainty that spectral approaches accordingly underlie. It will also consider the use of soil spectral libraries in combination or not with remotely sensed images.

BLOCK B (11:15-13:00)

1. Soil carbon sequestration and trade-offs

Involved projects: INSURE, TRACE-SOILS, SOMMIT

Conveners: Felipe Bastida (CSIC), Miriam Gross (AGS), Cristina Aponte (CSIC), Eugenio Diaz-Pinés (BOKU), Tuula Larmola (LUKE)

The improvement of soil carbon (C) sequestration while reducing GHG emissions is a strategic target to mitigate climate change in agricultural lands. This can be pursued through a large range of management strategies, including minimizing soil disturbance, diversification of crop rotations, use of cover crops, incorporation of crop residues, addition of organic amendments, rewetting of organic soils, etc. Further, the increase of soil organic carbon stocks has a variety of co-benefits, beyond climate change mitigation, including improvement of soil health, fertility and water holding capacity. However, the environmental context, including biotic (biodiversity, microbial activity, crop type, etc.) and abiotic (soil physical and chemical properties, climate, etc.) factors can strongly shape the balance between C sequestration, CO2, N2O and CH4 fluxes, and N leaching. For instance, in cultivated peat soils warming is expected to intensify organic matter degradation and further reduce C-sequestration, while contributing to GHG release. In more arid environments, the application of organic amendments can improve carbon sequestration while impacting the GHG fluxes. In this session, we welcome contributions that give insights into how soil management influences C sequestration rates and non-CO2 GHG fluxes in agricultural lands. We welcome experimental, modelling or synthesis approaches addressing the causes and mechanisms of the observed trade-offs and/or synergies between GHG release and soil C sequestration. The session will be convened by scientists participating in projects within the European Joint Programme Cofund on Agricultural Soil Management

2. Closing nutrient and carbon cycles

Involved projects: EOM4SOIL, BIOCASH

Conveners: Sabine Houot (INRAE), Walter Rossi Cervi (WR)

The use of external organic matters (EOM) in agriculture has been realized since many years through the application of animal manures and slurries. Now it becomes mandatory to recycle biowastes from urban activities (from homes, restaurants, stores) and their application on soils after treatment contribute to nutrient cycling and bioeconomy in territories, together with organic carbon contribution to soils and climate mitigation. Before application, different treatments are applied to these organic wastes that could also produce services such as energy production with anaerobic digestion. Other innovative treatments like pyrolysis producing biochars or new sources of recycled materials like human urine increase the diversity of characteristics of the EOM applied on soils, increase or decrease the efficiency of nutrient recycling. Such EOMs may also carry contaminants (organic contaminants, impurities, trace elements) that needs to be known and controlled to prevent environmental impacts associated with EOM recycling. The use of EOM may also have impacts in relation with the nutrients fluxes (ammonia volatilization, N2O emission, nitrate leaching) and it is important to control and prevent these impacts. To ensure the uses of these EOMs in fertilizing practices with maximum nutrient use efficiency, positive carbon budget and economically viable without environmental impacts, recommendation for good management of organic wastes

treatment and use as fertilizers need to be produced for end users at the farm or territory scale together with policy recommendation at the territory or national level. The session will address these questions of best management practices in recycling EOMs to close nutrient and carbon cycles.

3. Indicators for ecosystem services

Involved projects: SERENA, MINOTAUR, ARTEMIS

Conveners: Costanza Calzolari (CREA), Klaus Jarosch (Agroscope)

Agricultural soils have the potential to convey ecosystem services (ES) mainly linked to provision of food, regulation of water regime, and climate mitigation by carbon sequestration. Agricultural intensification negatively affected the environment through soil degradation, loss of biodiversity and increased both greenhouse gas (GHG) emissions and nutrient leaching. Concurrently, a high soil quality status is required for ensuring 75% of soils are healthy by 2030 for food, people, nature and climate. In this context, the promotion of agro-ecological practices is crucial to re-design agricultural systems by increasing ecosystem resilience to mitigate climate change effects. This session aims to present and discuss different methodological approaches in collecting soil quality and crop productivity data for monitoring, modelling, and mapping European agro-ecological systems. Particularly, the definition and evaluation of indicators able to catch ES status at all scales and target values for healthy soils and sustainable agroecological systems are particularly welcome.

BLOCK C (14:00-15:45)

1. Carbon sequestration, roots and amendments

Involved projects: MixRoot-C, MAXROOT-C

Conveners: Rebecca Hood-Nowotny (BIOS/BOKU), Isabelle Bertrand (INRAE), Anna Wawra (BIOS-AGES)

2. Managing Plant-Soil Diversity and Interactions to Promote Ecosystem ServicesInvolved

Involved projects: AGROEcoSeqC, EnergyLink

Conveners: Alessandra Trinchera (CREA), Sebastien Fontaine (INRAE)

The concept of soil health is unavoidably connected to its multifunctionality, strongly dependent on soil biodiversity. The recently changed and still evolving environmental conditions call for management practices able to increase biodiversity and the functional redundancy of soil biological communities to ensure adequate ecosystem resilience, contemporary optimizing the synchronization of nutrients plant demand and availability in soils.

This breakout session will focus on the importance of soil biodiversity and related ecosystem services: contributions describing labelling methods, molecular markers, assessment of plant diversity, geno- and phenotypic profiling of soil microbial community, enzymatic activities, soil soluble C pools, plant-microbial symbiosis, greenhouse gas emission, and indicators of ecosystem services observed in long-term experiments from crop- and grasslands, as well as application of modelling and multivariate approaches, are welcome.

3. Sustainable soil management

Involved projects:
SoilCompaC, SCALE, SoilX

Conveners:
Lisbeth Johannsen (BAW), Lorena Chagas (SLU), Loraine ten Damme (AU)

Session text:
Sustainable soil management requires consideration of the multifunctionality of agricultural landscapes, in which the management of natural resources may be in conflict with environmental and socio-economic demands. The need for efficient, climate-smart and environmentally-friendly production of safe, high-quality agricultural products that benefit the social and economic conditions of the farmers and local communities, places high demands on soil functions and soil management. Furthermore, the challenges presented by climate change with projected increases in the occurrence and severity of extreme events, add complexity to achieving sustainable soil management. The multiple land uses and involvement of multiple stakeholders require an integrated approach between policy and practice to maintain or improve sustainable soil management.

Strategies for sustainable soil management aim at, among others, the prevention and mitigation of soil compaction, minimisation of soil erosion and improvement of soil water retention and infiltration capacity. While measures to achieve these strategic goals are generally known, a deeper understanding is needed on extents of sustainability gains as well as possible trade-offs with different sustainability targets in regional European contexts.

The already acute threat of soil compaction is expected to worsen in the future due to the continued trend towards heavier machinery and effects of climate change. Despite the well-documented negative consequences of compaction on key soil functions, there is limited data of the spatial extent, distribution and severity of soil compaction. Moreover, detailed information on the risk of soil compaction, as well as its impacts on key soil functions such as productivity, climate regulation and water cycling in a context of climate change is lacking. Therefore, obtaining a better knowledge of these questions is crucial for a better guidance of sustainable soil management and alleviation of soil compaction today and in future climate.

In the context of soil erosion, on-site soil management of agricultural fields also has potential off-site impacts. Water and sediment transport from agricultural fields to other landscape elements such as water courses or infrastructure depends both on soil management and the connectivity within the landscape. Additional knowledge of surface processes at multiple scales and across landscape elements is needed. Through modelling of soil erosion processes and the implementation of mitigation measures, the effects of soil erosion by water can be mitigated by increasing the focus on water and sediment connectivity in the landscape.

Measures such as cover cropping, organic amendments and reduced tillage are expected to benefit soil water retention and thus mitigate drought stress in cropping systems. Evidence of these benefits however is very limited. Furthermore, it is largely unknown to what extent such measures could mitigate future drought and precipitation extremes. Even when some measures may be more effective than others, they may not be equally acceptable for farmers. To enable transitions towards more sustainable soil management, possible inhibitors need to be identified and addressed through adjustments in governance.

In this session, we focus on sustainable soil management, especially in regard to these three themes and we kindly invite interested parties to submit an abstract with results of their novel research.