wageningen soil conference

MASTERCLASS

M1: Hands in the mud

Name main contact: Toos van Noordwijk
Institution: Earthwatch Europe
Names of Co-organisers: Fraukje Steffen

Short description:
Earthwatch has developed a soil health toolkit that enables farmers and other non-scientists to measure soil health in an easy and intuitive way. The tool covers soil texture, colour, infiltration rate, earthworm count and vegetation cover and can be extended with further parameters. The tool inspires users to get hands-on and observe their soil close-up, which leads to new insights on what soil health means, how healthy local soils are and how soil health could be improved. The tool is used in inspiration projects and as a simple monitoring tool e.g. for regenerative agriculture projects. In this masterclass you will get your hands dirty and try the tool and accompanying app in the field. While playing in the mud, we will also be discussing how this tool can support soil health research and restoration projects, how it complements existing tools and how it could be further developed and improved.

Theme: Soils for society
Keywords: citizen science, soil health, app, insight, regenerative agriculture
Type of masterclass: Tutorial
Maximum number of participants: 30

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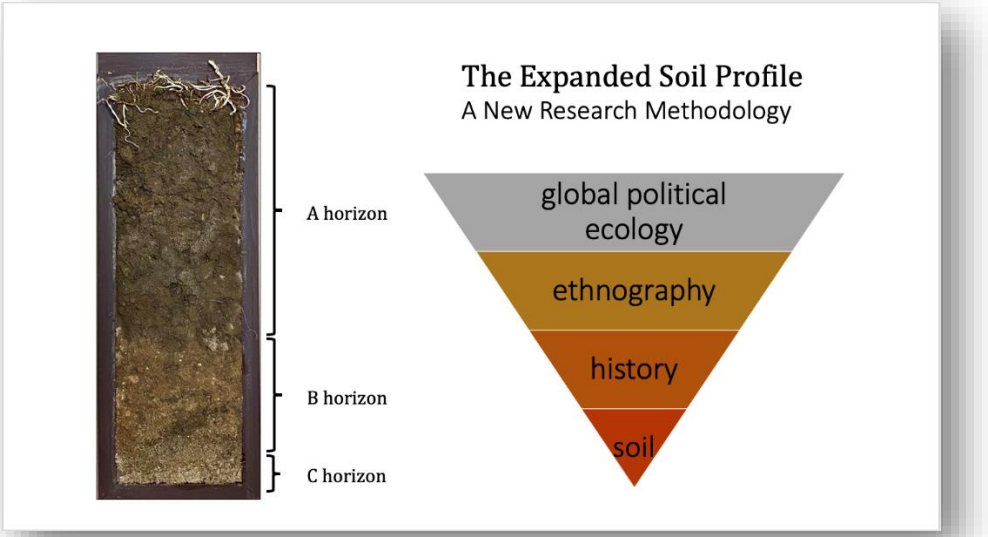
MASTERCLASS

M2: Mapping Soil Communities Using the Expanded Soil Profile

Name main contact: Katherine Lawless
Institution: Huron University

Short description:
Soils are increasingly being understood as complex living systems. This masterclass introduces the Expanded Soil Profile (ESP), a methodology for mapping the social and material relations –including political, cultural, economic, historical, and physiographic – that constitute any given soil. The ESP integrates methods from soil science (i.e., horizon classification, analysis of microbial activity, soil organic carbon, etc.) and social science (i.e., social network analysis, political economic analysis, historical analysis, etc.) to determine and analyze the range of agents and relations across multiple scales impacting the health and functioning of soil communities. Participants in this workshop will learn how to implement this methodology through a series of case studies in Canada.



Theme: Soils for society
Keywords: expanded soil profile; complex systems; multi-scalar analysis; soil communities
Type of masterclass: Tutorial
Maximum number of participants: 25

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MASTERCLASS

M3: Transformative Soil Science – Who am I in relation to my research?

Name main contact: Wietse Wiersma
Institution: Wageningen University
Names of Co-organisers: Diana Lopez Ramirez, Josie Chambers

Short description:
Transformative Research is a relatively new approach to co-create knowledge, which offers tools and ways of thinking to engage with the context, content and process of research, whether it is fundamental or applied. Transformative research is increasingly recognized as a powerful way to weave together multiple strands of knowledge, to pay attention to the politicalness of every type of research, and to connect scientific research with other knowledge systems and with society. During this workshop, you will learn what transformative research is, how it can be done and the potential it holds for contributing to sustainable soil futures. In return, we will include your input in an ongoing project that explores how transformative research practices can be used in soil science. The workshop will feature interactive activities and discussions designed by an interdisciplinary group of soil and social scientists.

Theme: Soils for society
Keywords: Transformative Research, Co-creating Knowledge
Type of masterclass: Discussion

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MASTERCLASS

M4: Practical application of fusing spectroscopic techniques in routine soil analysis: Lab-in-a-Box (LiaB) concept

Name main contact: Matteo Poggio
Institution: AgroCares
Names of Co-organisers: Michel Kok

Short description:
Modern spectroscopic techniques give an opportunity to analyse soil samples more time and cost effectively, while eliminating the need to use substances harmful to the operator and the environment. Above that, their simplicity of operation allows to expand the circle of users as no thorough knowhow" of analytical chemistry is needed. Most interesting is that these attributes do not have to come at the expense of accuracy. The improvements in instrument manufacturing, computing power and advanced calibration modelling algorithms have provided the tools to realize a sensor fusion concept combining mid-Infrared spectroscopy and X-ray fluorescence that meets these criteria: the Lab-in-a-Box (LiaB). In this workshop we will provide a hands-on experience of the analysis of soil samples using the LiaB from sample reception and preparation to analysis. For each step, we will briefly discuss the theoretical background, demonstrate the procedure, while highlighting the strengths and weaknesses of the process.

Theme: Advances in measuring and modelling soil processes
Keywords: spectroscopy, soil properties, XRF, MIR
Type of masterclass: Tutorial
Maximum number of participants: 30

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MASTERCLASS

M5: Comparability and compatibility (soil) data for food forest monitoring*

Name main contact: Jeroen Kruit
Institution: WENR
Names of Co-organisers: Isabelle van der Zanden: soil biodiversity PhD NIOO, Bastiaan Rooduijn: NMVB, Marieke Karssen: Voedseluithetbos, Jeroen Bruijnes, above soil biodiversity WENR, Arjen de Groot: Integrated Bio monitoring, WENR. Gerard Korthals, soil specialist, nematode WPR

Short description
Field trip to food forest Ketelbroek exploring the challenges we face with data comparability and compatibility in (soil) monitoring on food forests systems as well as different methods used in food forest monitoring compared with regular soil monitoring, scientific practices and the (possible) role of new techniques.

Inspired by the different grass root movements on re-integrating biodiversity in society we encounter "frustration among early adopters for being questioned on the validity of food forests in providing a valid alternative for current agricultural practices". We believe that gathering, interpreting, and visualizing data in a structured way is crucial to provide proof of the various values and services that food forests can offer. Apart from this, gathering these data obviously helps us understanding these new complex systems better. With this knowledge we can improve design and management and find inspiration for making other agricultural practices more resilient.

Although a lot of data is collected on these new systems most of it is anecdotal. Cost effective methods like citizens science are dependent on volunteers. The scientific methods used may be sound but contextual differences, including variation in soil type, previous land use and seasonal and climatic conditions while collecting the data hamper a proper comparison.

In this field trip to food forest Ketelbroek we want to address the challenge to find the best method fitting the goal you want to achieve with the data. On location we will be introduced to food forest Ketelbroek and some of the food forest principles by Wouter van Eck. We then will discuss together the challenges we face with data comparability and compatibility in (soil) monitoring on food forests systems. With explicit attention for methods used and promising new techniques.

Theme: Advances in measuring and modelling soil processes
Keywords: Monitoring, biodiversity, rich soil-food-web
Type of masterclass: Excursion and discussion
Maximum number of participants: ~ 25

* This is a field trip involving extra costs for transportation (expected ~25 eu p.p.) and you will not be back in time in Wageningen for the evening program.

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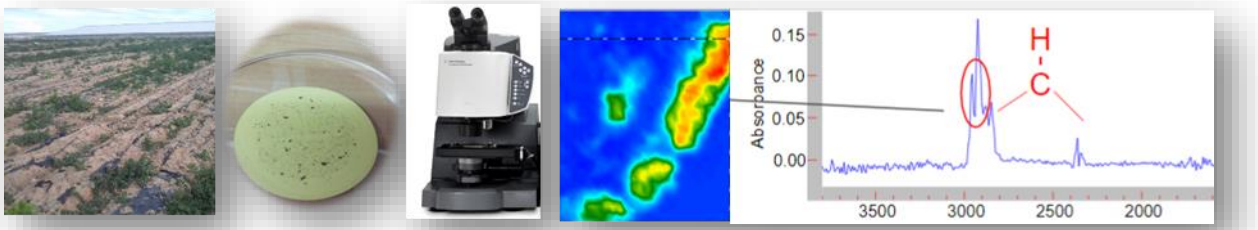
MASTERCLASS

M6: Plastic analysis in soil: from the field to the laboratory analysis and results

Name main contact: Nicolas Beriot
Institution: WUR
Names of Co-organisers: Meng Fanrong, Suzy Rebish, Davi Munhoz, Ayda Sakali

Short description:
Plastic residues assessment in soils has been intensively discussed in the past years and many protocols developed. It appears that there is no one-fit all solution.
In this workshop the participants will be able to select modules describing methods from the field sampling to the post processing of the data according to their interest. Modules will be hands in demonstrations in the lab and with the instruments including two different density separation protocols, one based on ZnCl2 used at the university of Cadiz and one based on NaBr used at WUR, Visual selection of microplastics under stereomicroscope, uFTIR and LDIR spectral acquisition and analysis.
In plenary we will discuss the best practices for different research objectives and future development of methods for plastic assessment.



Theme: Advances in measuring and modelling soil processes
Keywords: plastic detection soil
Type of masterclass: Lab visit
Maximum number of participants: 20

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MASTERCLASS

M7: Field description, classification and interpretation of the soil profile

Name main contact: Erika Michéli
Institution: Hungarian University of Agriculture and Life Sciences (MATE)
Names of Co-organisers: Stephan Mantel, ISRIC, Adam Csorba, MATE

Short description:
The masterclass will provide a short introduction and exercise to site-, and profile description and classification of soils. Participants will learn the horizon designations according to the FAO guidelines and practice the recognition of diagnostic units (horizons, properties and materials) and application of the classification key to determine the Reference Soil Groups of the WRB soil classification system. Description and classification will be followed by interpretation of soil genesis, soil functions and derived information relevant for land use and management. Soil sampling methods, and simple in situ soil property measurements will be demonstrated. The field exercise will take place in the vicinity of Wageningen.

Theme: Mapping and evaluation of soil functions across scales
Keywords: soil profile, soil functions, interpretation
Type of masterclass: Excursion
Maximum number of participants: 25

* This is a field trip involving extra costs for transportation (expected ~25 eu p.p.) and you will not be back in time in Wageningen for the evening program.

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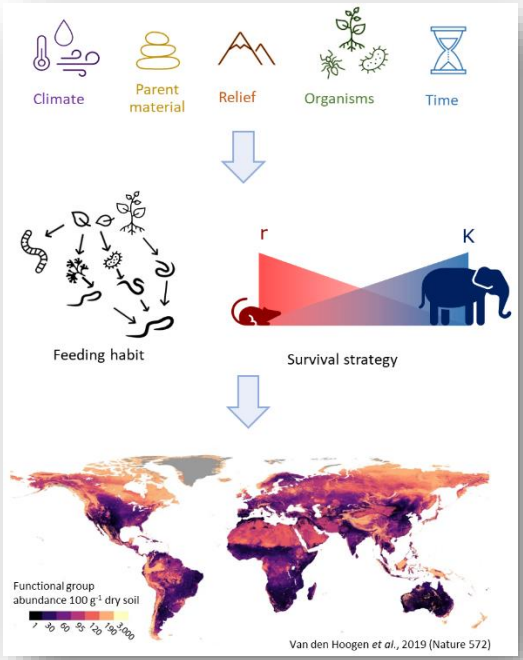
MASTERCLASS

M8: Topical Discussion on Functional Biogeography

Name main contact: Doina Mani
Institution: WUR (SBL and SGL)
Names of Co-organisers: Carmen Vazquez-Martin, Rachel Creamer, Titia Mulder

Short description:
Functional biogeography is the study the geographic distribution of functional traits of species (i.e. morphological, physiological and ecological characteristics) and the abiotic and biotic factors that drive this distribution. By studying the functional biogeography of soil organisms we can increase our understanding of soil health across diverse landscapes. In addition, the focus on trait rather than species diversity may facilitate the link between belowground biogeography and the spatial distribution of soil functions. With this workshop we aim to introduce the concept of soil functional biogeography, and discuss opportunities and pitfalls for its implementation in the field of soil ecology
The workshop will be divided into two sections. The first section in an interactive exercise in which we will explore functional biogeography by developing maps of different nematode functional groups. In the second section, we will have an open discussion about studying species versus functional diversity within the field of biogeography and their link to soil functioning, discussing questions such as:

- What can you do with the knowledge of species versus function diversity approach?
- What are the pitfalls of each approach?
- The underlying idea behind functional biogeography is that it can provide more insight into ecosystem functioning. Is that so?
- How do we disentangle the effects of land use from larger spatial patterns?



Theme: Mapping and evaluation of soil functions across scales
Keywords: Functional diversity, biogeography, soil biota
Type of masterclass: Discussion

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wageningen soil conference

MASTERCLASS

M9: Designing a Soil Health system across a range of spatial scales

Name main contact: Rachel Creamer
Institution: Wageningen University and Research
Names of Co-organisers: Titia Mulder, Carmen Vazquez Martin, Paolo Di Lonardo, Felix David

Short description:
A joint assessment undertaken by the EU Soil Health and Food (SH&F) mission board states that 60-70% of soils in Europe are currently considered unhealthy (A Soil Deal for Europe). Now the SH&F mission has set the goal to have 75% of European soils healthy or significantly improved by 2030. Meanwhile, the private sector too, is proposing explicit visions of regenerative food systems, which need scientific underpinning and quantification.
BUT, how can we measure soil health in a way that captures both the local context (and all its complexity), and a harmonised framework at larger regional, national and EU scales?
Come to our interactive workshop where we will test your knowledge of soil functions and agricultural land management in a design workshop. We will challenge you to think outside of the box, moving away from minimum dataset approaches to applying a range of context-specific indicator measurements from traditional sample based methods to novel earth observation techniques.

Theme: Mapping and evaluation of soil functions across scales
Keywords: soil health, indicators, design
Type of masterclass: Design workshop
Number of participants: 25

wageningen soil conference

MASTERCLASS

M10: Enabling Carbon farming: a hands-on masterclass on soil carbon monitoring

Name main contact: Tessa van der Voort
Institution: NMI Wageningen
Names of Co-organisers: Sven Verweij, Kees van den Dool, Yuki Fuijta, Matteo Poggio, Gerard Ros

Short description:
Additional carbon sequestration in soils is part of solutions for a more sustainable world: it mitigates climate change, can enhance water retention and support biodiversity. In order to facilitate this type of nature based solution it is crucial to determine soil organic carbon stocks rapidly, cost-effectively and robustly and at the farm level. In this masterclass we want to familiarise participants with soil carbon (sequestration) and give them hands-on experience with our Wageningen Soil Carbon STOck pRotocol (SoilCASTOR, soilcastor.com).
This approach enables the determination of soil carbon in a rapid (~5-10 min/ha), scalable (>30-100 ha farms) and robust fashion (high accuracy). Participants will get hands-on experience with a NearInfra-Red scanner and get acquainted with measuring and evaluating properties relevant to soil carbon stock. We will also discuss soil carbon credits and associated considerations.

Theme: Soils for nature-based solutions
Keywords: carbon farming, soil carbon, nature based solutions, four permille
Type of masterclass: Tutorial
Maximum number of participants: 15-20

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MASTERCLASS

M11: Development pathways towards a sustainable soil system

Name main contact: Myrjam de Graaf
Institution: Wageningen Environmental Research
Names of Co-organisers: Marlies van Ree

Short description:
Within the project KLIMAP (CLIMate Adaptation in Practice) we use 'Development Pathways' to plan towards climate-robust areas. Development pathways are a flexible and dynamic planning method that makes it possible to plan under uncertainty, such as what the exact climate change impacts will be. A key-skill needed for using development pathways is considering short-term choices in view of long-term plans and visions for the area. In this research, a serious game is developed to practise this skill. For this masterclass we made some adjustments to the game: the focus in this version is on achieving sustainable soils. What strategy will be most effective? And what influence will uncertainty have?

Theme: Soils for nature-based solutions
Keywords: development pathways, long-term goals, uncertainty, sustainable soil
Type of masterclass: Other, serious game
Maximum number of participants: 15

wageningen soil conference

MASTERCLASS

M12: How to cheat when assessing sustainability impacts

Name main contact: Carsten Paul
Institution: Leibniz-Centre for Agricultural Landscape Research (ZALF)
Names of Co-organisers: Veronika Strauss

Short description:
In sustainability impact assessments, the choice of system boundaries, impact areas and indicators has a strong influence on assessment results. Avoiding bias is very difficult. In this masterclass, we will therefore try the opposite and instead “fix” the result of a study to achieve a predetermined outcome. Using the same data, groups of participants will be tasked with “proving” that soil management option A is more sustainable than option B, or the other way around.
Finally, after identifying and successfully manipulating the relevant adjustment screws, we will discuss how to detect this type of bias in studies and how to avoid it in your own assessments.

Theme: Solis for society
Keywords: Impact assessment; Ecosystem Services; Sustainability; Exante; Agricultural Soil Management
Type of masterclass: Tutorial
Maximum number of participants: 25

wageningen soil conference

MASTERCLASS

M13: From the field to the frame: painting with your soil!

Name main contact: Tullia Calogiuri
Institution: Wageningen University & Research
Names of Co-organisers: Erne Blondeau, Karen Moran Rivera

Short description:
Have you ever wondered how it would feel to make a painting using the soil from your experiments, from your garden or just from the field where you were walking next to? Well, even if you haven't, this is your chance to find out! During this masterclass, after an introduction to the different soil types and their characteristics at World Soil Museum, you will receive a tutorial on how to paint with soil and you will be immediately be able to put in practice the knowledge you just gained. And of course, you will be able to take home your great piece of art! So, bring your favorite soils and start painting (and if you do not, we will provide some soils for you ;)).

Theme: Soils for society
Keywords: soil painting, soil types, art
Type of masterclass: Other: creative painting
Maximum number of participants: 20-25

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MASTERCLASS

M14: How to put the EU Soil Strategy to practise? Look Differently, Think Differently, Act Differently

Name main contact: Margot De Cleen
Institution: Ministry of Infrastructure and Water Management
Names of Co-organisers: Co Molenaar

Short description:
To achieve the EUSS goals a paradigm shift is needed in policy, science and practice. Incentives are the societal and policy transformations needed to achieve the SDGs, the pressure on land and soil services, the connection of environmental policies with spatial planning, a lack of holistic soil policies and the current business models based mainly on economic growth. In this masterclass we show and discuss ingredients to take up the challenge to achieve the paradigm shift, break down lock inns and give perspectives for a broad model based on welfare, wellbeing for humans and nature. What is the time frame? Who should be in the lead? What is the scale ? And what is the role for science? We show building blocks on how to look differently, think differently and act differently.

Theme: Soils for society
Keywords: Soil Strategy, Paradigm shift, science-policy interface,
Type of masterclass: Discussion
Maximum number of participants: 35

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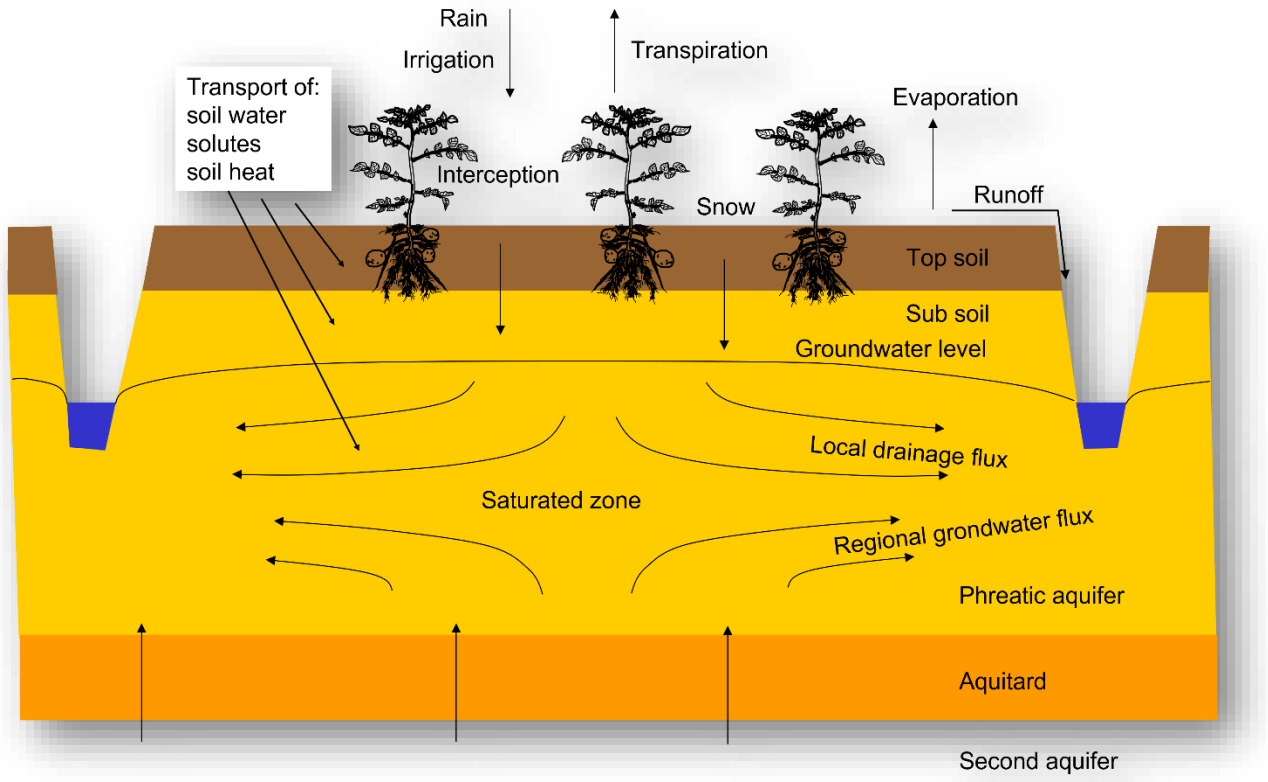
MASTERCLASS

M15: Hands-on tutorial SWAP model

Name main contact: Jos van Dam
Institution: Wageningen UR
Names of Co-organisers: Martin Mulder - Wageningen UR
Marius Heinen - Wageningen UR

Short description:
The SWAP (Soil Water Atmosphere Plant) model integrates current knowledge of soil physics, plant growth, evapotranspiration and drainage. Important applications are water and salinity stress of agricultural crops under various climatic and water management conditions, optimal irrigation and drainage, amounts of groundwater recharge, and ecohydrological gradients in a landscape. SWAP may function as a development platform to test innovative ideas on flow and transport in the biosphere. For instance, currently SWAP is used to explore the potential of microscopic root water uptake concepts with respect to traditional macroscopic root water uptake concepts. In this master class, we will show main features of SWAP, discuss topical applications, and let you work with typical examples.



Theme: Advances in measuring and modelling soil processes
Keywords: transport, biosphere, drought, evapotranspiration, water management
Type of masterclass: Tutorial
Maximum number of participants: 30

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MASTERCLASS

M16: Soil fertilization with micronutrients and inspiring practical tests with chelates to prove their function

Name main contact: Marcel Bugter
Institution: Nouryon Micronutrients
Names of Co-organisers: Marcel Bugter and Arjen Reichwein (Nouryon Micronutrients) and Walter Schenkeveld (Soil Chemistry and Chemical Soil Quality, Wageningen University)

Short description:
Theory and practical illustrative tests will be combined in this Masterclass, a cooperation between the Soil Chemistry and Chemical Soil Quality Chair group (Wageningen University, NL) and Nouryon Micronutrients (formerly called AkzoNobel Micronutrients).

We will learn:

- Which factors in the soil determine the availability of micronutrients,
- How we can assess micronutrient availability,
- What plants do to enhance micronutrient uptake in order to avoid deficiencies,
- Conceptual possibilities to enlarge the availability of micronutrients,
- Chelating ligands: Ideal carriers to promote availability,
- What makes chelating ligands specific for binding a target metal?
- Differences between iron chelates – do you know why the ortho-ortho isomer is so important?
- Differences (visual and explained) between complexes, partial chelation and full chelation of metals,
- Differences in adsorption of copper to peat

Theme: Advances in measuring and modelling soil processes
Keywords: Chelates, Soil-Availability, Micronutrients, Iron
Type of masterclass: Tutorial and experiments in groups
Maximum number of participants: 50

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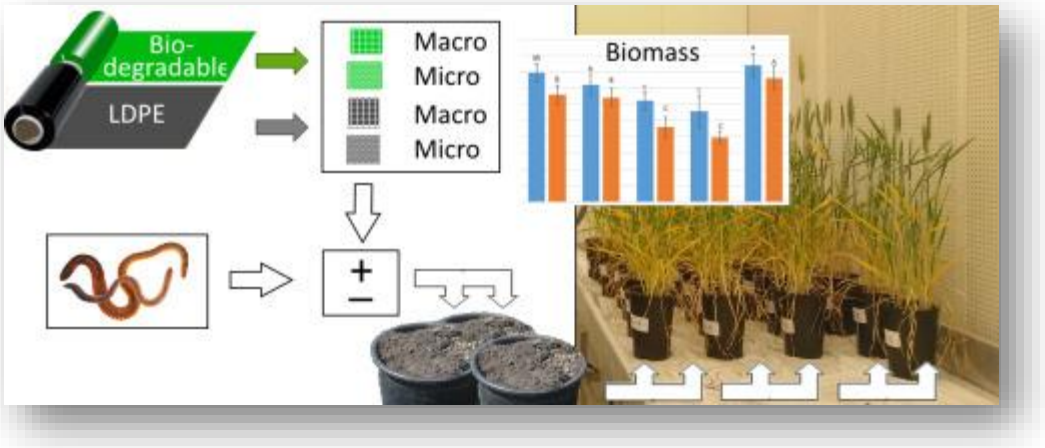
MASTERCLASS

M17: Assessing plastic fate in soil

Name main contact: Nicolas Beriot
Institution: WUR
Names of Co-organisers: Rozita Soltani Tehrani, Davi Munhoz, Esperanza Huerta Lwanga

Short description:
The Masterclass will be a discussion about Assessing plastic fate in soil. From very applied question to ethical issue we will answer the questions
• How to do spike the soil?
• Choosing environmental relevant concentration?
• Getting plastic to spike?
• Choosing soil and abiotic conditions?
• What ethical considerations to follow when spiking in the field?
• How to treat plastic contaminated soil?
The discussion will include a visit of lab to see an example of a column experiment to assess plastic transport and an incubation experiment to measure plastic degradation.



Theme: Advances in measuring and modelling soil processes
Keywords: Plastic fate; Plastic degradation; Plastic toxicity; Plastic transport
Type of masterclass: Discussion
Maximum number of participants 30

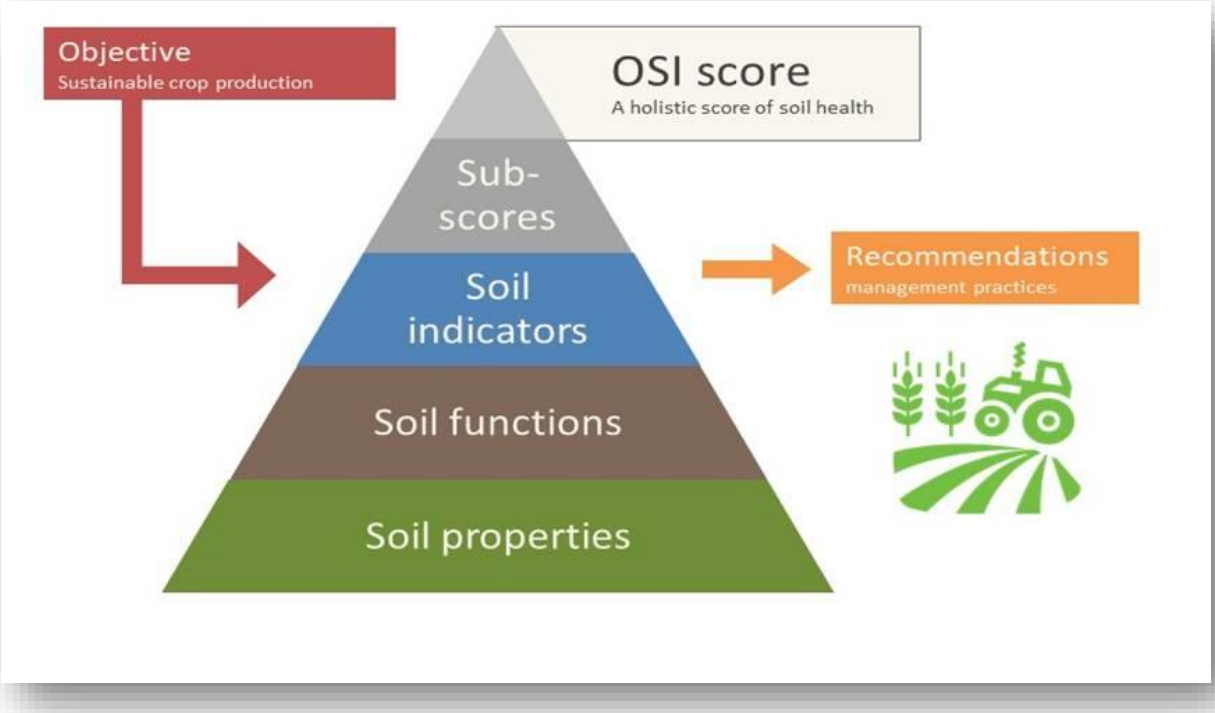
wageningen soil conference

MASTERCLASS

M18: Holistic soil health evaluation of agricultural fields with BLN 2.0 / Open Soil Index

Name main contact: Janjo de Haan
Institution: WUR
Names of Co-organisers: Gerard Ros, NMI

Short description:
Healthy soil in agricultural lands plays a crucial role not only in food production but also in many other ecosystem services. To promote and valorize soil health, a solid method to holistically evaluate soil quality has been designed and illustrated for the Netherlands. The framework gives insight in the distance to target for multiple soil functions related to crop production, climate mitigation, and nutrient retention and efficiency on the one hand, and recommendations for soil quality improvement as well. The framework has a modular structure and is open-source, which facilitates application for different regions and objectives.
This masterclass starts with a brief introduction about the frameworks to evaluate soil health, followed by hands-on exercises with the Dutch implementation version of BLN2. First, the participants will get familiar with the web-based tool by trying it out with real soil data of various types of fields. Subsequently, the participants will go deeper into selected topics as aggregation of scores, discussion on specific soil functions, contribution of visual soil assessments and application in Long Term Experiments. Finally, a discussion session is organized to exchange ideas on how country specific knowledge and needs can be incorporated to improve the assessment framework.



Theme: Soils for society
Keywords: soil functions, ecosystem services, soil quality, soil health,
Type of masterclass: Tutorial, also lot of room for discussion
Maximum number of participants: 25-30

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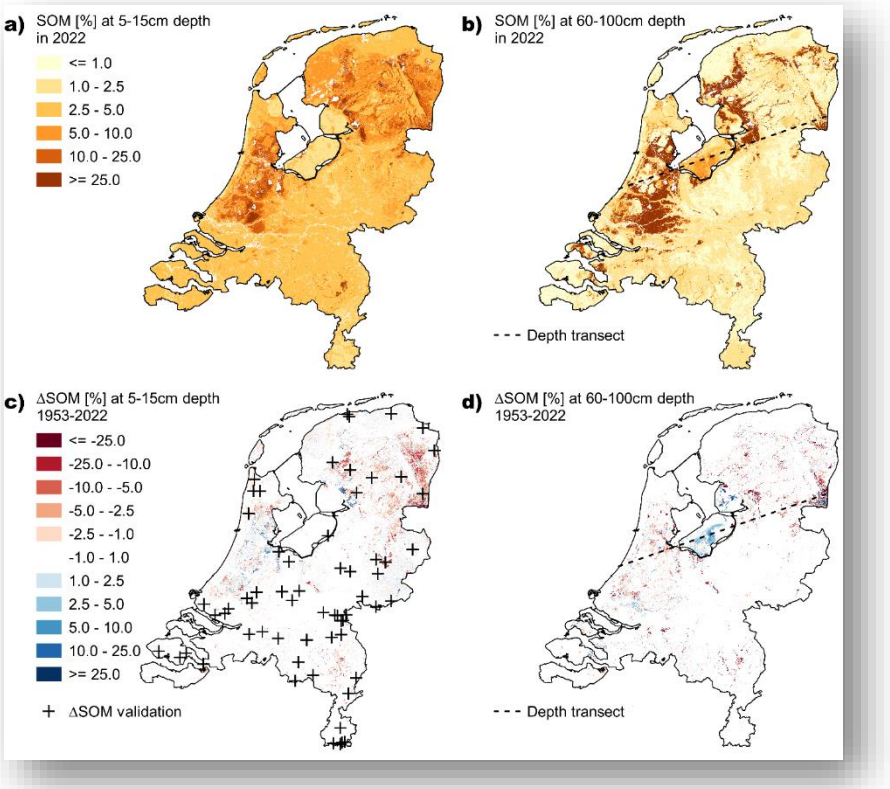
MASTERCLASS

M19: Digital soil mapping in 3D space and time: a hands-on tutorial

Name main contact: Anatol Helfenstein
Institution: Wageningen University and Research
Names of Co-organisers: Dennis Walvoort, Kees Teuling

Short description (max 150 words, optionally add a figure in the file upload below):
Soil maps are a key foundation for policies to ensure the sustainable use and protection of soil and to communicate the importance of soils to society. This computer practical introduces methods and tools for digital soil mapping of basic soil properties in the R environment for statistical computing. Participants will be guided through data preparation, model calibration and prediction using a machine learning algorithm and map visualization and accuracy assessment. We will use commonly-used digital soil mapping practices within the BIS-4D framework, a modelling and mapping platform for the Netherlands. The flexibility of BIS-4D allows for the prediction of soil properties and their uncertainty at any location, depth and time between 1953 and the present. The masterclass aims towards anyone interested in spatial modelling, but basic knowledge of the R programming language is beneficial.



Theme: Mapping and evaluation of soil functions across scales
Keywords: digital soil mapping, statistical modelling, machine learning
Type of masterclass: Tutorial

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MASTERCLASS

M20: Using farm data for soils research

Name main contact: Tom Scrope
Institution: Soil Benchmark
Names of Co-organisers: Dr Ben Butler - Soil Benchmark, Dr Rob Simmons – Cranfield, Prof. Jane Rickson - Cranfield

Short description:
We will walk through some experiences from the SMIS project (https://www.pgro.org/pea-downy-mildewdiversity-in-the-uk1/) on using data generated by farmers in their day to day operations (including their soil sampling) to build models that help them improve their soil management strategies and share best practice. Will be an interactive discussion with lots of opportunities for questions about the data we use, how we bring it into our model, and how we have built the model itself.

Theme: Mapping and evaluation of soil functions across scales
Keywords: Farm soils data
Type of masterclass: Tutorial
Maximum number of participants: 30

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MASTERCLASS

M21: Tropical soils and food security in times of extreme weather events

Name main contact: Ana Paula Turetta
Institution: Brazilian Agriculture Research Corporation (EMBRAPA)

Short description:
Soil is the basis for food production, which places this natural resource in a relevant position when we talk about food security. However, the numbers related to soil degradation are alarming; add to this context the projections of the increase in the demand for food and the impacts generated by climate change. Future projections indicate that the tropics will have a reduction in rainfall and an increase in temperature (from 1°C to 2°C), which will result in the shrinking of arable land and reduced productivity of several crops, thus compromising food security. This masterclass seeks to discuss the main threats regarding soil and how it affects the dimensions of food security and presents feasible solutions based on NbS (Nature based Solutions) for reconciling food production, maintenance of the soil's multiple ecosystem functions and the consequent increase in the resilience of tropical agricultural systems.

Theme: Soils for nature-based solutions
Keywords: food security; extreme weather events; nature based solutions
Type of masterclass: Discussion
Maximum number of participants: 20

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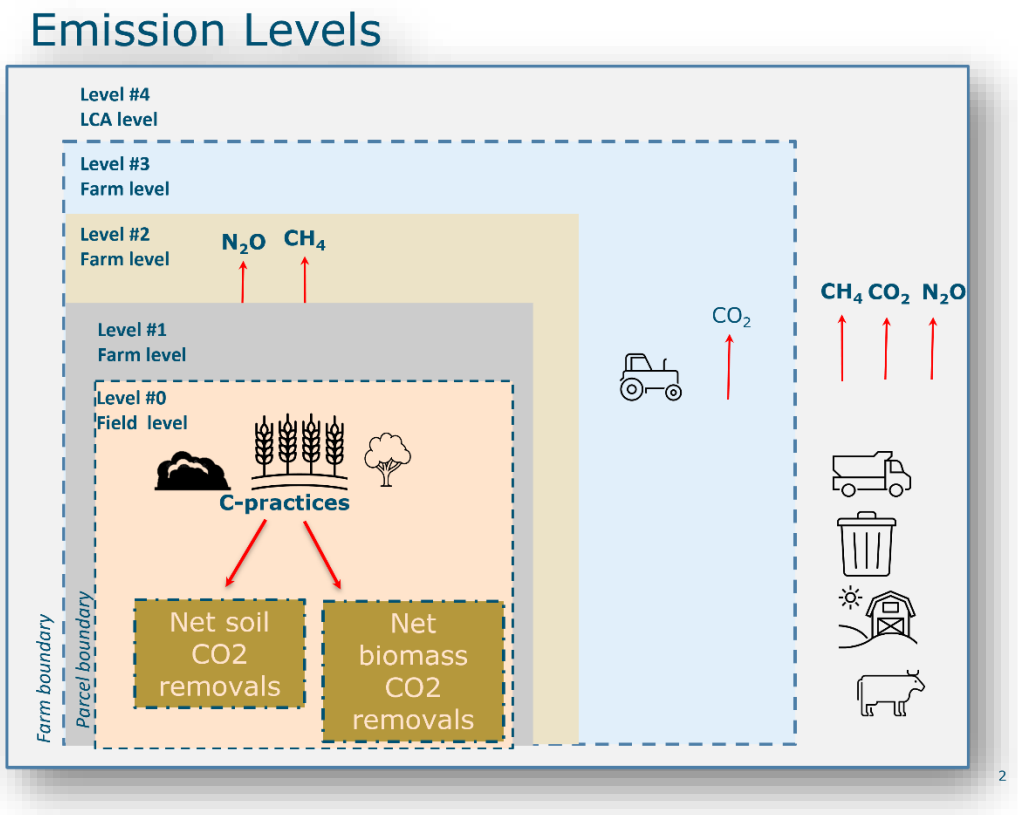
MASTERCLASS

M22: Carbon Farming

Name main contact: Jennie van der Kolk
Institution: Wageningen Environmental Research
Names of Co-organisers: Hanneke Heesmans, Martin Thorsoe, Peter Kuikman

Short description:
The European Commission recently published their proposal for a framework on carbon removal, placing Carbon Farming as a one of the solutions for climate mitigation in the agricultural and land use sector. Carbon Farming may be applied to sequester carbon to mineral soils and avoid greenhouse gas emissions from organic soils. In Europe, many projects on Carbon Farming are operational, albeit with major differences in scope, size, modes and payment schemes among these projects.
In this masterclass we will extend the focus on the potential of carbon sequestration methods to reviewing and discussing enabling conditions and implications and benefits for land-users and funders. This will include aspects of scheme design such as permanence, fairness, accountability, leakage and monitoring. We will present findings from ongoing European and National research projects and engage participants in working sessions to derive recommendations on how to refine and optimize the European framework on Carbon Farming.



Theme: Soils for nature based solutions
Keywords: carbon sequestration, business model, climate mitigation
Type of masterclass: Discussion
Maximum number of participants: 30-40

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MASTERCLASS

M23: Game-based learning for soil education: the Living Soil Workshop.

Name main contact: Linda Calciolari
Institution: Ludi Soli
Names of Co-organisers: Giulia Buongiorno and Corentin Bisot from WUR, Soil Biology group.

Short description:
Soils are a complex, and fascinating system and our scientific understanding of them is in rapid development. Yet, it is difficult to communicate these findings to a broader audience. It can also be difficult for people with different backgrounds to understand each other when talking about soil. That's where the Living Soil Workshop comes in. The Living soil workshop is a serious game developed to understand the causal relationships in the soil system and how our choices can influence them. It illustrates the complex life, chemistry, and physics of soils to different stakeholders in an interactive way. It also supports the creation of a common language to discuss solutions for sustainable soil management.
During this masterclass we introduce a game-based learning approach for soil education and play a session of the Living Soil Workshop.

Theme: Solis for society
Keywords: Game based learning, extension, education.
Type of masterclass: Tutorial
Maximum number of participants: 24

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MASTERCLASS

M24: Reliable decision support systems for dealing with complex soil health issues

Name main contact: Marko Debeljak
Institution: Jozef Stefan Institute

Short description:
Decision support systems (DSS) are very powerful tools that facilitate the decision-making process in the assessment and management of soil properties, processes, functions and health. Solving complex soil issues requires reliable and trustworthy DSS developed by validated modelling methods. The workshop will provide instructions for developing such a DSS and the participants will be guided through four key methodological steps that address the following questions related to soil health:

1. What are the soil-related problems and who is the owner of these problems?
2. What are the decision problems and what are the alternative solutions?
3. What method of decision analysis should be used and what input data are needed?
4. What criteria should the end user apply in selecting the most appropriate solution proposed by the DSS?

The DSS developed with the presented methodology can also be used as a knowledge graph that enables the digitised storage and exchange of soil expert knowledge.

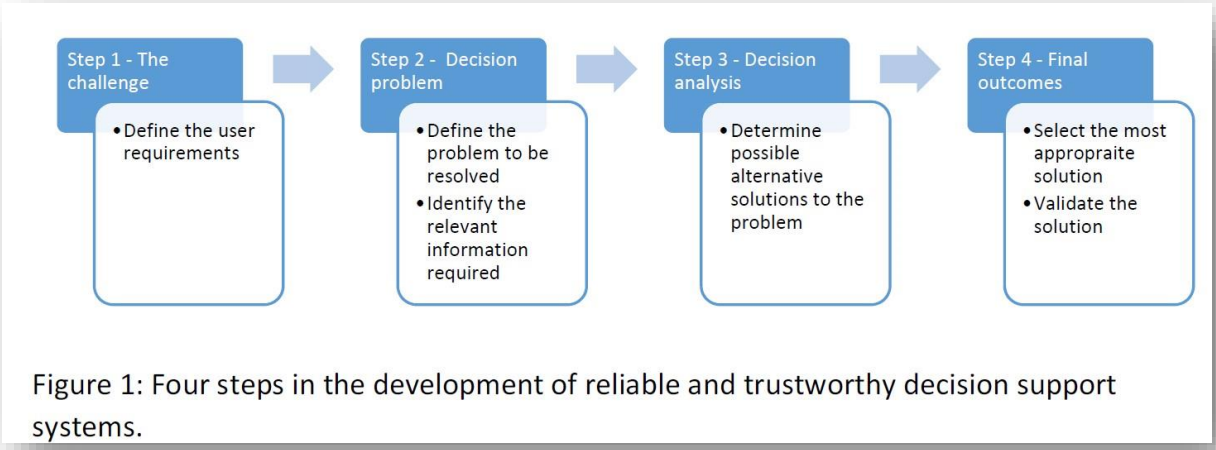

Figure 1: Four steps in the development of reliable and trustworthy decision support systems.

Theme: Advances in measuring and modelling soil processes
Keywords: soil health, decision support systems, decision modelling, methodology
Type of masterclass: Tutorial

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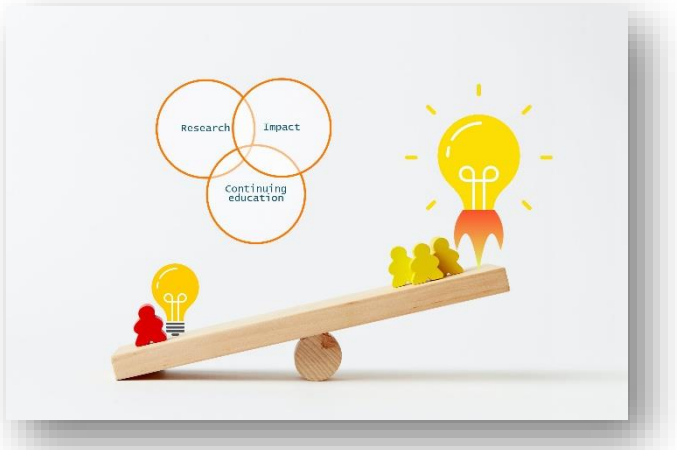
MASTERCLASS

M25: Creating impact through lifelong learning based on your research

Name main contact: Suzanne de Bruijn
Institution: Wageningen University & Research
Names of Co-organisers: Miel Hooijdonk

Short description:
Join this hands-on masterclasses on how to transform research outcomes into opportunities for lifelong learning thereby creating societal impact. How do you transform your research results into educational materials, especially for soil professionals already working? Which target audiences would be interested and how can you approach them? Join this hands-on masterclass where we guide you through the first steps of knowledge valorization by lifelong learning. Together with experiences pedagogical experts on lifelong learning and programme managers for lifelong learning you'll be able to transform your research into a basic idea for a lifelong learning opportunity for professionals.



Theme: Soils for society
Keywords: valorisation, lifelong learning, impact
Type of masterclass: Tutorial
Maximum number of participants: 40

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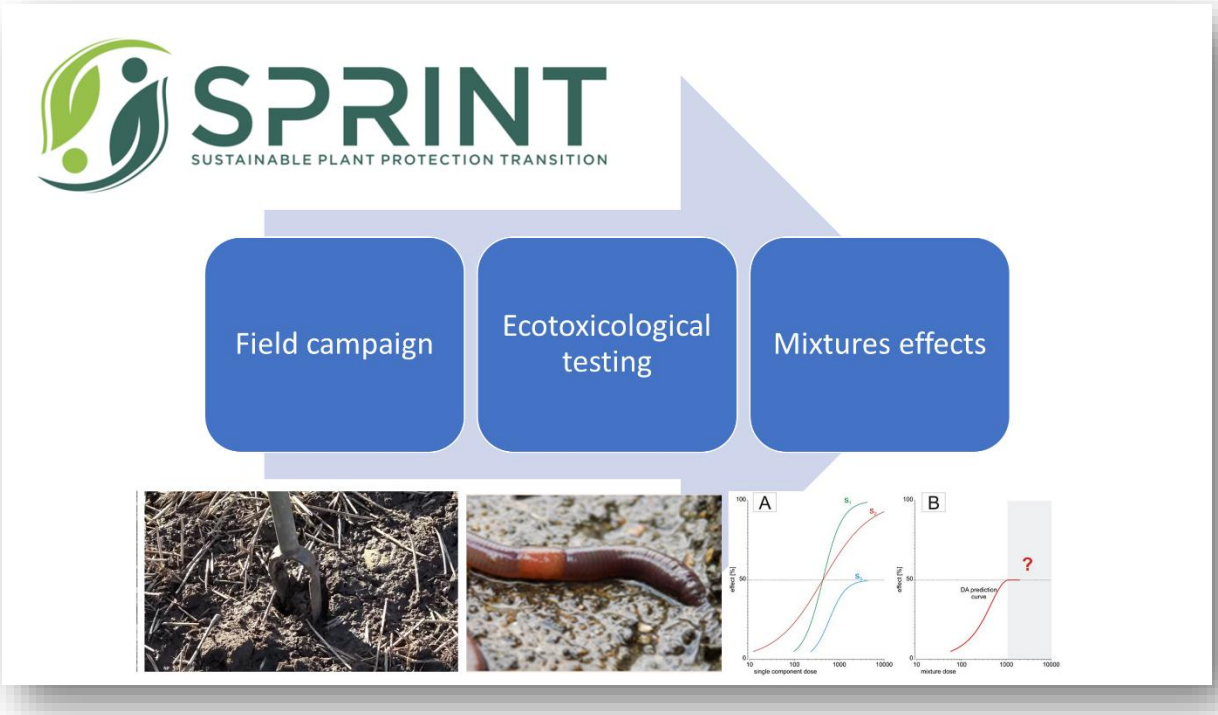
MASTERCLASS

M26: Pesticide residues in soil – prioritization of compounds to health assessment and mixture data analysis

Name main contact: Vera Silva
Institution: Wageningen University
Names of Co-organisers: Kayode Jegede, WUR; Paula da Silva Tourinho, MU

Short description:
Mixtures of pesticide residues are the rule rather than the exemption in the terrestrial ecosystem, but their biological meaning is still not clear. This course will provide a hands-on training about mixtures, from monitoring data to risk characterization. The course will elaborate on a prioritization method for pesticides, a requisite for multi-compound ecotoxicological assays. The participants will obtain a fast understanding of the theory, and method caveats, via an Excel-embedded prioritization function. The course will also focus on the data analysis and interpretation of the results of ecotoxicity experiments. The toxic unit approach will be applied, and data will be analysed by the dose addition model. For more complex mixtures, statistical analyses will be run in R. Final discussion will cover interactions of compounds, the challenges of mixtures assessments, and the regulations necessary to support the Farm to Fork goals (50% reduction in use and risk of pesticides).



Theme: Soils for society
Keywords: pesticides, mixtures, prioritization method, ecotoxicity, statistical analyses
Type of masterclass: Tutorial
Maximum number of participants: 20

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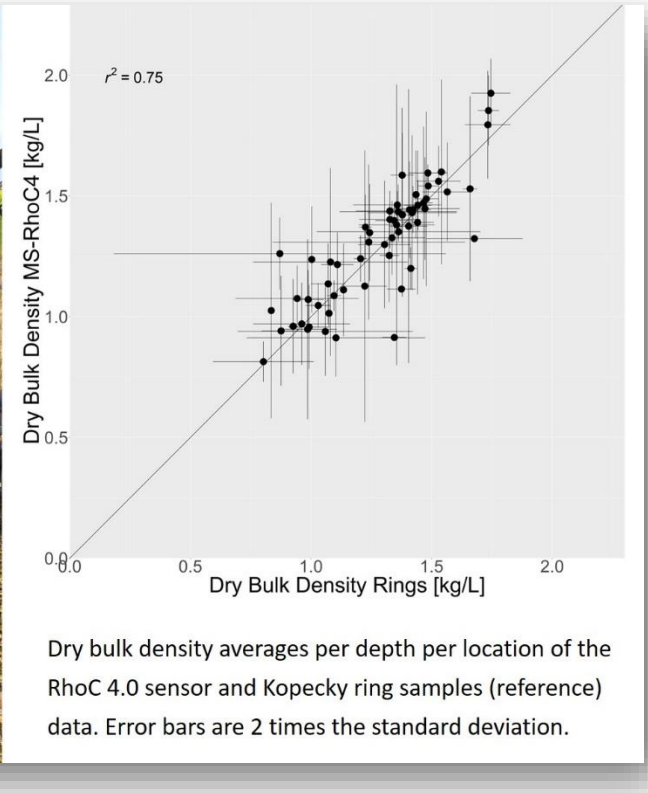
MASTERCLASS

M27: New soil bulk density sensor in comparison with conventional measurement techniques

Name main contact: Gera Van Os
Institution: Aeres University of Applied Sciences
Names of Co-organisers: K. Pepers, G. Staats, F. van Egmond, R. Koomans

Short description:
Soil compaction and soil bulk density are gaining in importance as soil parameters. On their own for soil water infiltration, retention and rootability properties related to food production and climate change adaptation, but also as input to soil carbon content calculations and pedotransfer functions. The standard measurement with rings is labour intensive and therefore expensive, sensor approaches require extraction of the soil core and are not widely used. As a possible solution to this challenge Medusa Radiometrics in 2017 have redesigned their earlier version of a soil bulk density sensor for in situ measurements on tidal flats, the RhoC or MS-Rho sensor, to make it suitable for in situ full soil profile measurements of bulk density every 5 cm up to 1 m depth, without the need to extract the soil core. All available measurement techniques will be discussed and demonstrated.



Dry bulk density averages per depth per location of the RhoC 4.0 sensor and Kopecky ring samples (reference) data. Error bars are 2 times the standard deviation.

Theme: Advances in measuring and modelling soil processes
Keywords: soil bulk density sensor measurement
Type of masterclass: Other, Tutorial combines with discussion and field excursion.
Maximum number of participants: 20

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MASTERCLASS

M28: Humic substances research - merits and controversies

Name main contact: Rob Comans
Institution: WU - Soil Chemistry
Names of Co-organisers: Nick Quist, Gerlinde Vink

Short description:
Fractionation of soil organic matter (SOM) in humic substances (HS) has been applied for decades in attempts to develop a better understanding of SOM functioning. While interpretations of the structure and properties of HS have advanced over the years, a strong debate has developed in recent years on whether their operational definition invalidates these substances from serving as meaningful proxies to study SOM dynamics and functioning. This masterclass will demonstrate the principles of the fractionation of HS and show examples of their use in modelling soil processes, as well as provide an outlook towards their further characterisation in terms of molecular structure and (thermal) stability. Introductory presentations, a laboratory demonstration of HS fractionation and a visit to analytical facilities for further HS and SOM characterisation, will be concluded with an interactive debate about the future of humic substances research.

Theme: Advances in measuring and modelling soil processes
Keywords: humic acid, fulvic acid, fractionation, SOM analysis and functioning
Type of masterclass: Other, Introductory lectures, lab visit and discussion
Maximum number of participants: 30

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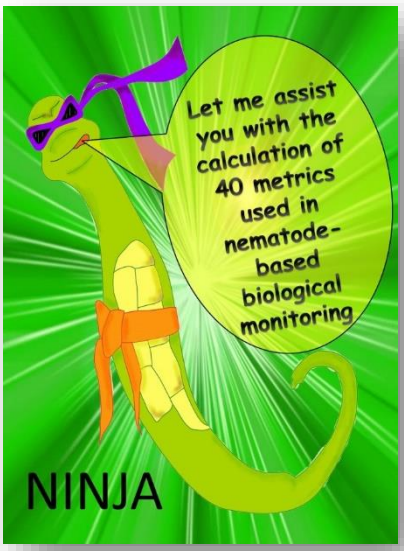
MASTERCLASS

M29: NemaNINJA game: interpretation of nematode-based soil quality indicators.

Name main contact: Ron de Goede
Institution: Soil Biology Group, Wageningen Uniververisty & Research
Names of Co-organisers: Gerard Korthals, Giulia Bongiorno

Short description:
Currently, there are many tools available to assess soil quality. Besides soil physical and chemical parameters, also soil biological information can provide information on the functioning of the soil ecosystem. Nematodes are perfectly suited for this and many nematode community-based indices are available (Du Preez et al. 2022, see: https://doi.org/10.1016/j.soilbio.2022.108640). Among the most popular indices are the Structure index and the Enrichment index. They can be presented in a 2-dimensional graph (food-web diagnostic square) that can be used to provide a diagnosis of your soil ecosystem. This afternoon you are invited to play the interactive board game NemaNINJA to learn how to relate ecosystem functioning to nematode community structure. While playing the game, you will also learn how to recognize some dominant nematode taxa. If you bring your laptop, you can also test your learned skills by analyzing a real dataset with the online tool NINJA (https://shiny.wur.nl/ninja/).
Material needed:
Participants need to bring their own laptop



Theme: Advances in measuring and modelling soil processes
Keywords: Bioindicators, Board-game, NINJA, Nematodes, Education
Type of masterclass: Playing an educational boardgame and data collection
Maximum number of participants: 32

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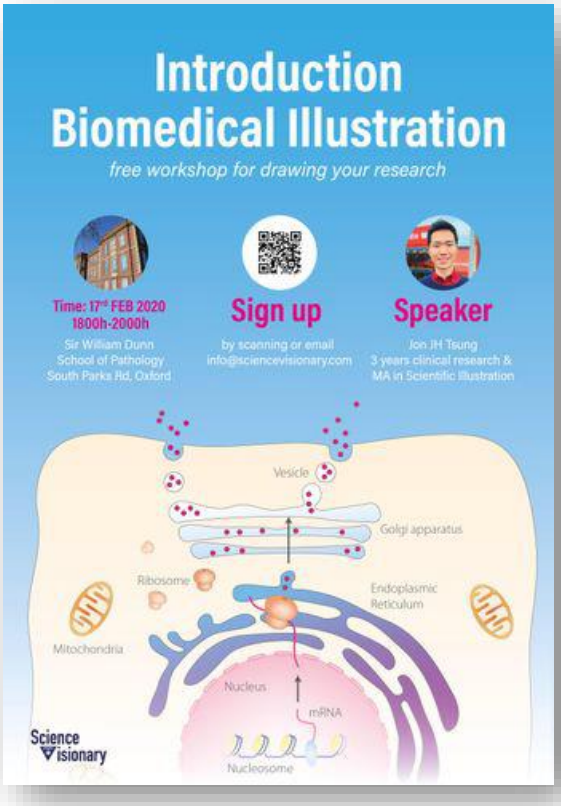
MASTERCLASS

M30: Scientific Illustration in PowerPoint

Name main contact: Jon Jieh-hen Tsung
Institution: Science Visionary B.V.

Short description:
This master call will teach researchers to make scientific illustrations in the Nature publication style IN POWERPOINT! Yes, it is possible to make professional graphical abstract for free with the Office app. The skills of making graphical abstract have become increasing important for researchers, because the journals and funding institutions are starting to request these scientific illustrations from the authors. This master class will be taught by a scientific illustrator Jon Jieh-hen Tsung (MA in Scientific Illustration, Maastricht University). This masterclass has been given at UvA, VU and University of Oxford, and now there is an opportunity to bring it to WUR.

Material needed :
Participants need to bring their own laptop with PowerPoint.



Theme: Mapping and evaluation of soil functions across scales
Keywords: Scientific illustration, scientific figures, manuscript preparation
Type of masterclass: Tutorial
Maximum number of participants: 20

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MASTERCLASS

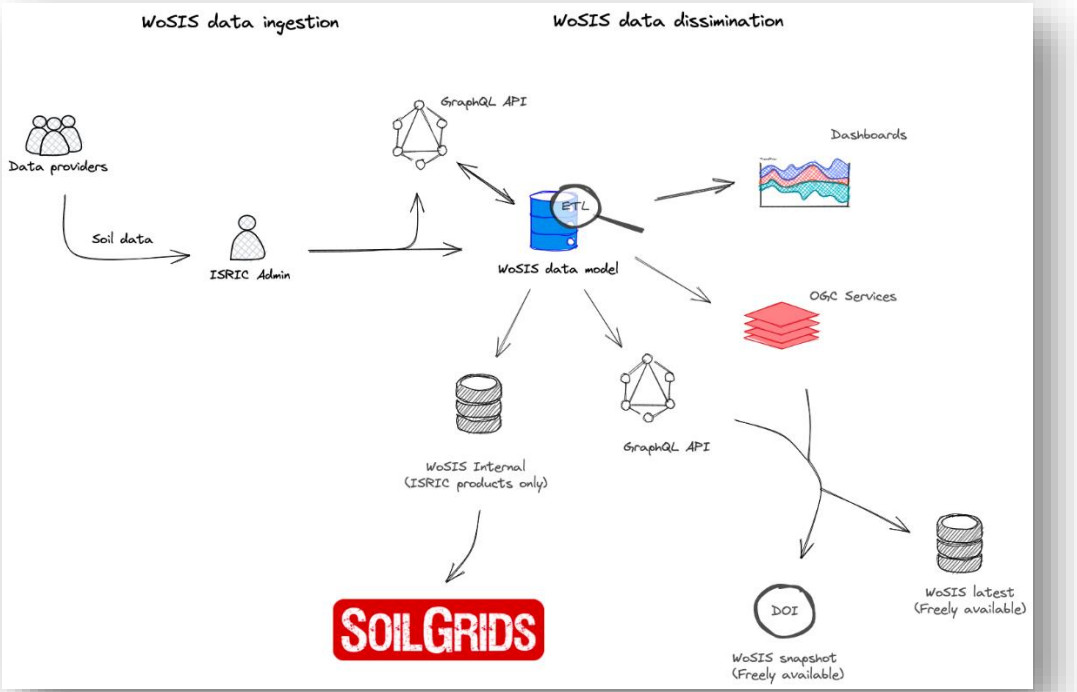
M31: Accessing WoSIS soil data using the GraphQL API

Name main contact: Luis Calisto
Institution: ISRIC – World Soil Information
Names of Co-organisers: Niels Batjes; Luis de Sousa

Short description:
The goal of this workshop is to demonstrate the exploration, use and integration of WoSIS through its GraphQL API. WoSIS (World Soil Information Service) is a large PostgreSQL database developed and maintained by ISRIC (WDC-Soils) that draws on contributions by a wide range of organisations. It provides a growing collection of quality-assessed and standardised soil profile data for the world that can be used for a wide variety of applications (see https://www.isric.org/explore/wosis/faq-wosis).
We will:

- Explain what WoSIS is and how standardised data are distributed;
- Explore WoSIS via the GraphQL API;
- Use the API to filter and retrieve WoSIS soil data;
- Integrate WoSIS data into a simple coding project (e.g., R or Python).

This workshop will be hosted in GitHub and is public access. Using guided steps, we will start by exploring the basics of WoSIS and GraphQL via a graphical interface. Then, we will move into a coding platform and create a simple project that uses soil data. From that point onwards we will slowly increase complexity and use WoSIS data in different scenarios.
The workshop requires no previous knowledge of WoSIS or GraphQL. However, it is advisable to have basic coding knowledge on the Python or R languages.



Theme: Mapping and evaluation of soil functions across scales
Keywords: WoSIS; Soil data; ISRIC; GraphQL
Type of masterclass: Tutorial
Maximum number of participants: 25

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MASTERCLASS

M32: Soil Engineering Management

Name main contact: Karrar Mahdi
Institution: WUR
Names of Co-organisers: Jantiene Baartman and Michel Riksen

Short description:
Soil erosion is a growing global problem that deteriorates our soil environment. Erosion causes local problems like loss of fertile soil, loss of land due to gully erosion, damage to crops, damage to roads etc. In arid and semi-arid regions erosion also causes problems with water availability for agricultural and domestic purposes. In this masterclass, we offer a Land Engineering Management training that focusses on prevention and/or minimization of the risk or damage caused by (human induced) water and wind erosion, and mass movements, and on the availability of water for crop production and domestic use. Hence, we will mainly focus on the design of mechanical soil and water conservation methods like terracing, check dams, storm ditches, grassed waterways and rain water harvesting structures. Also, during this masterclass, You are also invited to contribute your own case studies to this masterclass, so that we can work with you to apply the knowledge to design Soil & Water Conservation measures for a case study from your region.

Theme: Soils for nature-based solutions
Keywords: Erosion, Land engineering, soil conservation
Type of masterclass: Discussion
Maximum number of participants: 20

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MASTERCLASS

M33: Agricultural practices for increasing soil quality

Name main contact: Zwanet Herbert
Institution: Louis Bolk Instituut
Names of Co-organisers: Wageningen Research

Short description:
The Dutch government has set the goal to manage all agricultural soils sustainably by 2030. Additionally, these soils should also contribute to the Paris Climate Agreement of 2019 by sequestering 0.5 Mt CO2-equivalents per year by 2030. Various research programs have been set up to study the effectiveness and applicability of practices that contribute to sequestering carbon and/or improving/maintaining soil quality (Slim Landgebruik, PPS Beter Bodembeheer, ELP Soil).
In this workshop we would like to share the main results of these programs in a 3 hour program in which short presentations and interactive discussions are alternated. We want to focus on how the findings of these research programs can be translated to policy and practice, considering the applicability of practices are very dependent on regional soil type, climate and agricultural practices.

Theme: Advances in measuring and modelling soil processes
Keywords: Soil quality, carbon sequestration, effectiveness, agricultural practices
Type of masterclass: Discussion
Maximum number of participants: 30