



Centre for Soil Ecology



## WORKSHOP ON SOIL SUSTAINABILITY IN A BIO-BASED SOCIETY

**Date:** 26 to 28 February 2018

**Objectives:** a) to understand broad soil sustainability concepts, involving chemical, physical, and biological aspects related to crops used for bioenergy production, focusing on sugarcane; b) to develop integrated perspectives and to put sustainability concepts into practice; c) to foster cooperation between scientists working in The Netherlands and Brazil.

**Target public:** post-graduate students, scientists and professionals working in bioenergy and other bio-based industries.

**Number or participants:** 30-50

**Venue:** Agronomic Institute of Campinas (IAC), Campinas, SP, Brazil

**Organizers:** Wim van der Putten, Heitor Cantarella, and Hans van Veen

**Support:** BE-Basic, IAC, Nipe/UNICAMP and Agropolo Campinas-Brazil

**Set-up:** Every day there will be presentations followed by discussions, moderated by Hans van Veen. For every discussion, two of the course participants will be asked to make a detailed preparation of questions, also using two papers provided by the speaker, to promote a lively discussion. Then, in the second half of the afternoon, course participants will have discussions in small groups of approximately 5 persons to review the presentations of that day, and prepare for the next day, so that they will have clear expectations of the subjects to be presented.

### Program:

#### 26 Feb 2018 (Monday)

Overview of current practices and sustainability status in sugarcane production, comprising soil management and recycling of plant and industrial residues in view of an industry undergoing transformation due to mechanized harvesting and increasing demand for crop material for energy production.

**8h30 – 9h00:** Welcome Coffee

- ✓ **9h00 – 9h45:** Rafaella Rossetto (APTA Piracicaba): Current practices in sugarcane production and residue management
- ✓ **9h45 – 10h30:** João Luis Nunes Carvalho (CTBE): straw management options in a changing industry

**10h30 – 11h00:** Coffee break

- ✓ **11h00 – 11h45:** Isabella C. de Maria (IAC): the challenge of soil conservation in sugarcane
- ✓ **11h45 – 12h00:** Discussion of morning section presentations

**12h00 – 13h30:** Brunch

- ✓ **13h30 – 14h15:** Tsai Miu Sui (CENA/USP): Microbiology in sugarcane soils
- ✓ **14h15 – 15h00:** Carlos Eduardo Cerri (ESALQ): Advances in our understanding of soil organic matter.

**15h00 – 15h30:** Coffee break

- ✓ **15h30 – 17h00:** Group discussions. Each speaker will indicate two papers which the students could use for the discussion. prepare conclusions on current practices in sugar cane production systems for bio-based economy purposes, formulate questions and challenges, and prepare expectations for the next day

## 27 Feb 2018 (Tuesday)

Overview of basic science and concepts in soil ecology that relate to the various management issues of biomass production for a bio-based economy: soil biodiversity, soil ecosystem functions and promoting ecosystem multifunctionality.

- ✓ **9h00 – 9h45:** Mirjam Pulleman (Wageningen University): Linking soil biodiversity to soil physics and chemistry.
- ✓ **9h45 – 10h30:** Newton La Scala Jr. (UNESP, FCAV): How sugarcane practices affect soil organic matter
- 10h30 – 11h00:** Coffee break
- ✓ **11h00 – 11h45:** Eiko Kuramae (NIOO): Advances in linking soil-borne microbiome to sustainability
- ✓ **11h45 – 12h00:** Discussion of morning section presentations
- 12h00 – 13h30:** Brunch
- ✓ **13h30 – 14h45:** Arjen Biere (NIOO): Plant-microbe interactions: back to the roots and further
- ✓ **14h45 – 15h00:** Paul Bodelier (NIOO): Greenhouse gas production by bio-based production systems
- 15h00 – 15h30:** Coffee break
- ✓ **15h30 – 17h00:** Group discussions: prepare conclusions on how to apply novel scientific concepts and prepare discussions for the next day

## 28 Feb 2018 (Wednesday)

In the final day, we will explore the practical and ecological concepts from a broad and integrated perspective to evaluate how sustainability concepts may guide us towards sustainable soil management while developing a more bio-based economy

- ✓ **9h00 – 9h45:** Heitor Cantarella (IAC): Sugar cane production: The challenge of integrating soils and sustainability (including crop rotation and use of straw for 2<sup>nd</sup> generation bioethanol)
- ✓ **9h45 – 10h30:** Wim van der Putten (NIOO): Enhancing sustainability of land management by learning from nature
- 10h30 – 11h00:** Coffee break
- ✓ **11h00 – 11h45:** Luís C. Schiesari (USP, Environmental management): Biodiversity and ecological impacts in sugarcane.
- ✓ **11h45 – 12h00:** Discussion of morning section presentations
- 12h00 – 13h30:** Brunch
- ✓ **13h30 – 14h15:** Patricia Osseweijer (TU-Delft): Combining industrial, ecological, and socio-economic research approaches to develop sustainable systems for producing biofuel for aviation: results from the BE-Basic Horizontal Integration Project
- ✓ **14h15 – 15h00:** Manoel Regis L. M. Leal (CTBE, Brazil): Overview of important sustainability questions regarding bioenergy production. How soil sustainability issues fit the overall picture and can be transformed into practical actions.
- 15h00 – 15h30:** Coffee break
- ✓ **15h30 – 17h00:** Group discussion on conclusions about novel perspectives for sustainability. Closing of the workshop



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## WORKSHOP ON SOIL SUSTAINABILITY IN A BIO-BASED SOCIETY

### Speakers and Panelists

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**Wim van der Putten**  
NIOO, Wageningen, The Netherlands

Wim van der Putten graduated at Wageningen University in 1984 with a degree in ecology and then moved to the Institute for Ecological Research at Oostvoorne, The Netherlands. In 1989 he gained his PhD and Wageningen University and currently, he is head of the Terrestrial Ecology at the Netherlands Institute of Ecology (NIOO) and extraordinary professor in Functional Biodiversity at Wageningen University. Wim's main interest is in aboveground-belowground multitrophic interactions, plant-soil feedback, succession, (soil) biodiversity, invasions, and climate change-induced range shifts. In 2004, he was awarded a VICI grant in order to study consequences of rapid range shifts due to current climate warming and in 2012 an ERC Advanced grant on community re-assembly under climate warming. In 2015 he was elected member of the Royal Netherlands Academy of Arts and Sciences. Wim has co-authored an overview report on soil biodiversity for the [EC DGXI](#), and is co-editor of both the European and Global Atlases of Soil Biodiversity. He co-founded the [Wageningen Centre for Soil Ecology](#) and the Global Soil Biodiversity Initiative (<https://globalsoilbiodiversity.org/>)



**Heitor Cantarella**  
Soils and Environmental Resources Center, IAC, Campinas, Brazil

Heitor Cantarella is a Soil Scientist with a Ph.D. degree in Soil Fertility from Iowa State University, USA. He is head of the Soils and Environmental Research Center at Agronomic Institute of Campinas, part of the coordinating group of FAPESP's Bioenergy Program (BIOEN), and coordinator of the Nutrients for Life Initiative in Brazil. He is co-editor of the Fertilizer and Liming Recommendation Guidelines of the State of São Paulo and has published more than 130 journal articles. His present research projects involve studies on crops for renewable energy production, fertilizer use efficiency, sugarcane nutrition, and environmental impacts and greenhouse gases emissions from fertilizers and residues. Among recent professional recognitions are the Heroes of the Brazilian Green Revolution (2015), IPNI Award on Plant Nutrition (2016) and IFA's Norman Borlaug Award (2017).



**Arjen Biere**  
NIOO, Wageningen, The Netherlands

Graduated from the University of Groningen, The Netherlands, with an MSc in Microbiology and PhD at the same University in 1991 in Evolutionary Ecology. During a one-year post-doc period at Duke University (NC, USA) he studied aspects of the maintenance of disease-resistance polymorphisms using both theoretical models and field experiments. He then moved to the Institute for Ecological Research in Heteren, The Netherlands, as researcher and later Head of the Department of Plant Population Biology. In 2005 he moved to the group now named the Department of Terrestrial Ecology at the Netherlands Institute of Ecology (NIOO), headed by Wim van der Putten, as a senior scientist. Arjen's main interest is in the ecology and evolution of plant-microbe and plant-insect interactions, the evolutionary ecology of plant defense and induced resistance, maintenance of plant mutualisms with mycorrhizae and pollinators, and ecological and evolutionary consequences of altered biotic interactions during plant invasions. In 2011 he organized an ESF exploratory workshop to bring together researchers working on plant-microbe-insect interactions from the molecular to the ecosystem level and in 2015 he became coordinator of a European network (COST Action FA1405) on using three-way interactions between microbes, insects and plants to enhance crop protection and production



**Carlos Eduardo Cerri**  
ESALQ/USP, Piracicaba, Brazil

Carlos Eduardo is an associate professor at the Soil Science Department at the University of Sao Paulo, where he teaches three courses for undergraduate students and four disciplines for master and PhD students. His main lines of research are related to soil organic matter dynamics in tropical regions, mathematical modeling applied to soil science, soil properties spatial variability and global climate change. He published more than 140 scientific articles, 1 book and 35 book chapters. Finally, the academic is member of the Sociedade Brasileira de Ciência do Solo, International Humic Substances Society, Soil Science Society of America, American Society of Agronomy and Crop Science Society of America. He is also an affiliate member of the Brazilian Academy of Sciences



**Eiko Kuramae**  
NIOO, Wageningen, The  
Netherlands

PhD from the State University of São Paulo (UNESP, Brazil) in 1996 in Biological Science, area Genetics, and MS from Vrije Universiteit of Brussels (VUB) in Molecular Biology. Young Scientist for Emergent Centers–FAPESP, first to receive the prestigious “FAPESP-Young Scientist” grant to build her own scientific group and molecular lab on Molecular Plant Pathology and Genomics (FCA-UNESP). She received awards: Young Geneticist Award by the Brazilian Genetics Society (1996), Scientific and Technological Honor Award from the Brazilian president of republic Fernando Henrique Cardoso - *Xylella fastidiosa* Genome (2000), Honor Award from the University of Sao Paulo State (UNESP, Brazil) as coordinator of sequencing laboratory BF and annotation of *Xylella fastidiosa* Genome Project (2000), Award Summa Phytopathologica (2005). Since 2007, she is at Netherlands Institute of Ecology (NIOO-KNAW) leading national and international projects on Microbial Ecology – Soil Microbiome. She leads projects in bilateral programs with Brazil (NWO-Fapesp, NWO-CNPq, BeBasic-Fapesp, CAPES/Nuffic, China (Chinese Academy of Science) and Africa. She is CAPES-Special Visiting Professor at University of Maranhao State (UEMA) and at Catholic University of Brasilia (UCB) and, FAPESP-Special Visiting Researcher at Agronomic Institute of Campinas (IAC). Three of her shared PhDs with Brazilian professors have received awards: Award CAPES best PhD thesis in Agro Science 2013, Honor Award CAPES PhD thesis in Agro Science 2015, and International Plant Nutrition Institute (IPNI) Award 2015. Her vision on research is that unravelling microbial interactions at the level of communities, both taxonomically and functionally, will help to understand the functioning of the ecosystem among which the soil environment. Her major research topics are Effects of Changes in Land Use and Global Climate, Microbial Diversity Loss and Bioinformatics.

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**Isabella C. de Maria**  
Soils and Environ. Resources  
Center, Campinas, IAC,  
Brazil

Isabella De Maria is an Agronomist and Soil Scientist with a Ph.D. degree in Soils and Plant Nutrition from ESALQ/USP. She is a researcher at the Soils and Environmental Research Center and professor at the Graduate Program in Tropical and Subtropical Agriculture at Agronomic Institute of Campinas (IAC). She is editor and reviewer of scientific journals. and technical advisor of several funding agencies. She has experience in Agronomy, focusing on soil management and conservation, acting on the following subjects: soil erosion, soil conservation and erosion control, no-tillage, conservation agriculture, soil quality, and soil physics.

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**João Luis Nunes Carvalho**  
CTBE, Campinas, Brazil

João Luís Nunes Carvalho is a Soil Scientist with a Ph.D. degree in Soil Science from University of São Paulo (ESALQ/USP). He is researcher at Brazilian Bioethanol Science and Technology Laboratory (CTBE/CNPEN). His research line involves studies on soil management practices aiming to increase biomass production and mitigate greenhouse gas emissions. Currently he is involved in projects evaluating crop residues management, biomass production, soil quality indicators, and greenhouse gas emissions.

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**Luís César Schiesari**

School of Arts, Science and Humanities, USP, São Paulo, Brazil

Master in Zoology (University of São Paulo, 1996) and Ecology (University of Michigan, USA, 2000), PhD in Ecology and Evolutionary Biology (University of Michigan, USA, 2004); Professor of Ecology (University of São Paulo, 2010), with postdoctoral degree in Ecotoxicology (University of Veterinary Medicine, Vienna, Austria, 2004). He is currently Associate Professor of Environmental Management at the University of São Paulo (since 2005) and Advisor of the Postgraduate Program in Ecology at the University of São Paulo (since 2006). His research focuses on theoretical and applied ecology in aquatic systems, at all levels of biological organization (sub-individual, individual, population, and community attributes), and combining analysis and reanalysis of published data, field sampling, and experiments in laboratory, mesocosmos and field. Currently conducts research on the organization of communities and metacommunities in aquatic systems, as well as their regulatory mechanisms. Within this framework has been investigating the ecology of modified environments, focusing on agroindustrial systems, and especially regarding the consequences of contamination by pesticides and fertilizers, hydrological alterations, and microclimatic changes. He acts as a referee for several high profile international journals, such as Ecology, Journal of Animal Ecology, Functional Ecology, Journal of Tropical Ecology, Oecology, Conservation Biology and Freshwater Biology, among others, as well as national and international research funding agencies.



**Mirjam Pulleman**

Wageningen University, Wageningen, The Netherlands

Physical Geographer by training with a PhD in Production Ecology and Natural Resource Conservation (specialization in Soils) at Wageningen University in 2002. Her PhD research focused on the relations between soil organic matter dynamics and soil structure in soils under different land use and conventional versus organic management. After obtaining her PhD she worked in a national monitoring program for water quality and subsequently she specialized in the use of micromorphological techniques to study soil processes including the role of soil fauna. In 2004 she moved to Mexico to take a scientist position at CIMMYT, the International Maize and Wheat Improvement Center. She investigated the effects of Conservation Agriculture on soil physical and biological processes and quality indicators, as well as ways to adapt the principles of Conservation Agriculture in different agroecological and social contexts. At the same time she had a postdoc position at Wageningen University where she coordinated a research program on the role of soil biota in affecting nutrient and water use efficiencies in East and West African cropping systems. Her research continued to focus on the relations between agricultural systems, soil management practices, soil biota and soil quality indicators, first in the Netherlands and then in Latin America. Since 2014 Mirjam has a shared position between Wageningen University and The International Center for Tropical Agriculture in Colombia. She is based in Colombia most of the year and working across different countries in South and Central America. Her research is aimed at understanding soil – plant interactions at multiple scales from the plot to the farm and landscape level, and how functional soil ecology contributes to multiple ecosystem functions and services. Her main focus is on tropical smallholder agroecosystems and related challenges. Based on these approaches she aims to contribute to science-based solutions for ecological intensification and land restoration in an agricultural landscape context. Mirjam also teaches academic courses on Agrobiodiversity and Integrated Natural Resource Management at Wageningen University and has supervised numerous MSc and PhD students. She is on the editorial board of Applied Soil Ecology. At CIAT she has the responsibility for three laboratories focusing on Soil Physical, Soil Biological and Soil Chemical Analyses.

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**Newton La Scala Jr.**  
FCAV, UNESP, Jaboticabal,  
Brazil

Full Professor at São Paulo State University (UNESP), at Jaboticabal. Research activities focused on the characterization of soil CO<sub>2</sub> emission and on the greenhouse gas balance in agricultural areas, based on the emission's inventory. Recently he spent more than 8 years as one of the Coordinators of São Paulo Research Foundation (FAPESP) Global Climate Change Program, which funds projects for advancing knowledge and assist in scientifically orienting decisions and policy related with Global Climate Change. He has served as referee or member of the Editorial Board of several scientific journals.



**Patricia Osseweijer**  
TU Delft University, Delft,  
The Netherlands

Patricia has a PhD in science communication (Free University Amsterdam) and a Master degree in molecular biology (Utrecht University). She is full professor and Leader of the Section Biotechnology and Society in the Department of Biotechnology, at the Faculty of Applied Sciences of the Delft University of Technology. Her drive is to link technological innovation in biobased production with societal challenges to build a sustainable bioeconomy. Research interest focus on integral impact assessment, with a focus on social sustainability, the role of values, trust and responsibility in achieving sustainability, stakeholder and public interaction, public opinion forming, novel designs of public communication and their relevance for policy making and ethics. In 2015 she was awarded the Royal Academy of the Netherlands distinguished Lorentz fellowship for integrating social sciences and technology. Patricia is Ambassador of TU Delft Brazil. Together with her colleague Luuk van der Wielen she led the development of an extensive collaborative program of research and education activities, including a Dual Degree PhD program



**Paul Bodelier**  
NIOO, Wageningen, The  
Netherlands

PhD at the University of Nijmegen in 1997 focusing on nitrogen cycling in the rhizosphere of wetland plants. From 1997-1999 the scope of his work was expanded to methane cycling in rice paddies during a post-doc stay at the Max-Planck Institute for terrestrial Microbiology in Marburg, Germany. The MPI period was followed by a post-doc position at the Centre for Limnology of the Netherlands Institute of ecology in Nieuwersluis, the Netherlands which was continued in 2008 by tenured position at the same Institute. Past and present research topics are reflected in his broad interest and perspective on ecology and interactions between microbes and their biotic and abiotic environment. His work has always spanned multiple levels of biological organization. His main topic is the functional Ecology of microbial communities involved in biogeochemical cycles in terrestrial and aquatic ecosystems, with a strong focus on greenhouse gas emission and methane in particular. For these studies he uses microbiological, biogeochemical, molecular biological, analytical chemical as well as isotopic approaches spanning the organization levels from gene to ecosystems. He coordinated a European project consortium on ecology of methane consuming microbial communities. He is chief editor of *Frontiers in Terrestrial Microbiology*; Section editor at *Plant and Soil*, editorial board member at *ISME Journal* and *Applied and Environmental Microbiology*, and ad hoc reviewer (30 journals)



**Raffaella Rossetto**  
APTA, Piracicaba, Brazil

Raffaella Rossetto is an Agronomy Engineer with PhD in Sugarcane Nutrition and Fertilization from the University of Florida, USA. She is currently a senior scientific researcher at APTA-Polo Regional Centro Sul, Piracicaba, SP, Brazil, working in the Sugarcane Program of the Agronomic Institute of Campinas. She works in the in the field of fertilization, nutrition, wastes recycling and environmental impacts of the residues uses in sugarcane. She actively participates in several government commissions for São Paulo state, defining agronomic and environmental norms for public policies. As vice president of the Society of Sugar and Alcohol Technicians of Brazil - STAB, she actively participates in the dissemination of technical and scientific knowledge.



**Tsai Miu Sui**  
CENA/USP, Piracicaba, Brazil

Agronomist with a Master and Ph.D degrees from the University of São Paulo. From 1989 to 1992 she was a pos-doc at the University of California-Davis, USA. Currently she is Full Professor at the Laboratory of Molecular and Celular Biology, at CENA/USP, from where she just finished a term as Director. Member of the Management Committee of the Sectorial Agribusiness Fund as representative of the academic-scientific sector of the MCTI-DF. Recipient of the Scientific and Technological Merit Medal, the 2008 Scopus Prize and the 2050 Challenge in Agribusiness Award (FAO). Elected member of the Brazilian Academy of Sciences in May 2008. Areas of study: Agronomy, with emphasis on Microbiology and Microbial Molecular Ecology, working mainly on the following topics: plant-microorganism interactions, symbioses, molecular markers, genome sequencing, genes plant defense, microbial biodiversity with emphasis on microbial community structures, soil quality bioindicators as a function of land use conversion with a focus on biogeochemical cycles. Studies with common bean concentrate on the determination of tolerance to water stress in elite genotypes in association with microsymbionts.



**Manoel Regis L.M. Verde**  
NIPE, Unicamp & CTBE,  
Campinas, Brazil

**Dr. Manoel Regis Lima Verde Leal** is a Researcher for the LACAF Project at the Interdisciplinary Center of Energy Planning of the University of Campinas and at the Brazilian Bioethanol Science and Technology Laboratory (CTBE). At CTBE he acted initially as Coordinator of the CTBE Sustainability Program and later as Project Manager. His work is focused on the study of potential evolution of the technologies applied in the exploiting sugarcane as energy source for the production of ethanol and electricity aiming at the improvement of sustainability indicators of bioethanol. He worked at Copersucar Technology Center (CTC) from 1986 to 2004 and Promon Engenharia from 1974 to 1986. Prior to that, he held teaching positions at the Aeronautical Institute of Technology (ITA) and Federal University of Ceará. He is the ISSCT Co-Products Commissioner and he was the National Team Leader representing Brazil in the Task 38 (Climate Change Effects of Biomass and Bioenergy) of the IEA (International Energy Agency) Bioenergy from 2009 to 2015. He graduated in Aeronautic Engineering at the Aeronautical Institute of Technology (Brazil) and holds a PhD in Mechanical Engineering from Kansas State University (USA).

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