SSSA-SSSC Joint Webinar on Soil Health

Cross-cultural and international scientific cooperation is essential as we face global issues of climate change, food security, water security, and environmental restoration. We have much to learn from scientists around the world, and our efforts will be strengthened and more effective when soil scientists are working together. To promote such collaboration and communication in soil science, the Joint Working Group of Soil Science Society of America and Soil Science Society of China is pleased to announce the second scientific webinar jointly sponsored by the two societies.

The webinar will feature four invited speakers:

- Limei Zhang, Professor, Research Center for Eco-environmental Sciences, Chinese Academy of Sciences, "Soil health depends on inherent soil properties in the black soil region in Northeast China."
- Harold M. van Es, Professor of Soil Science, Cornell University, Former President of SSSA, "Factors of soil health and benchmarking approaches."
- Yuji Jiang, Professor, Institute of Soil Science, Chinese Academy of Sciences, "Community assembly and functional regulation of soil microorganisms and animals in farmland."
- Kristen Veum, Research Soil Scientist, USDA-Agricultural Research Service, ASA President-Elect, "The Soil Health Assessment Protocol and Evaluation (SHAPE): A national approach."

Date and Time (US Eastern Time): December 5, 2023, 8:00 – 10:00 AM
Date and Time (China Beijing Time): December 5, 2023, 21:00 – 23:00 PM

Webinar Link
All are invited to attend the webinar, accessible through Zoom at https://msu.zoom.us/j/98853166717

Live Streaming through the following links
YouTube: https://www.youtube.com/live/Z_9SCK2ZnRU
Koushare: https://www.koushare.com/lives/room/162258

Organizing Committee
Elizabeth Rieke, Soil Health Institute
Kristen Veum, USDA-Agricultural Research Service
Xiaoyuan Yan, Institute of Soil Science, Chinese Academy of Sciences
Yong-Guan Zhu, Research Center for Eco-environmental Sciences, Chinese Academy of Sciences

Contacts
Fang Wang (wangfang@issas.ac.cn), Institute of Soil Science, Chinese Academy of Sciences
Wei Zhang (weizhang@msu.edu), Michigan State University
Marie Johnston (mrjohnston@sciencesocieties.org), Soil Science Society of America

Webinar Program

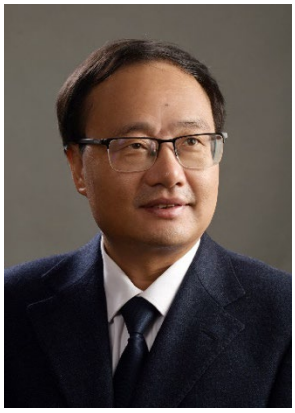
Opening				
Time		**Speaker**	**Topic**	**Moderator**
China Beijing December 5	USA Eastern December 5			
21:00 – 21:02 PM	8:00 – 8:02 AM	Technical Instruction		Wei Zhang
21:02 – 21:05 PM	8:02 – 8:05 AM	Jiabao Zhang President of SSSC Institute of Soil Science, CAS	Welcome remarks	Xiaoyuan Yan, Vice president and Secretary General of SSSC Institute of Soil Science, CAS
21:05 – 21:08 PM	8:05 – 8:08 AM	Michael Thompson President-Elect of SSSA Iowa State University	Welcome remarks	
21:08 – 21:10 PM	8:08 – 8:10 AM	Group photo (screen shot)		
Presentations (20 mins + 5 mins Q/A)				
21:10 – 21:35 PM	8:10 – 8:35 AM	Limei Zhang Research Center for Eco-environmental Sciences, Chinese Academy of Sciences	Soil health depends on inherent soil properties in the black soil region in Northeast China	Elizabeth Rieke, Soil Microbiome Scientist, Soil Health Institute
21:35 – 22:00 PM	8:35 – 9:00 AM	Harold Mathijs Van Es Cornell University	Factors of soil health and benchmarking approaches	
22:00 – 22:25 PM	9:00 – 9:25 AM	Yuji Jiang Institute of Soil Science, Chinese Academy of Sciences	Community assembly and functional regulation of soil microorganisms and animals in farmland	Fang Wang, Chair of International Collaboration Working Committee of SSSC, Institute of Soil Science, CAS
22:25 – 22:50 PM	9:25 – 9:50 AM	Kristen Veum USDA-Agricultural Research Service	The Soil Health Assessment Protocol and Evaluation (SHAPE): a national approach	
22:50 – 23:00 PM	9:50 – 10:00 AM	Yong-Guan Zhu Academician, Chinese Academy of Sciences	Concluding remarks	

Brief Introduction of Speakers and Moderators

Dr. Jiabao Zhang is the President of Soil Science Society of China. He is a Professor at Institute of Soil Science, Chinese Academy of Sciences. His research interests include soil water flow, material transport and transformation, ecosystem impact, soil information system, as well as science and technology on improving soil fertility and productivity of low- and medium-productivity land. He was elected as an Academician of Chinese Academy of Engineering in 2019.

Dr. Michael Thompson is the Soil Science Society of America President-elect beginning a three-year succession, He is a professor at Iowa State University where he teaches courses in soil, plant, and environmental chemistry at the undergraduate and graduate levels. His research program centers on environmental applications of soil chemistry and mineralogy. These studies seek to identify chemical and physical conditions that favor stability, transformations, and movement of nutrients, soil organic matter, and the anthropocentric contaminants in soils.

Dr. Yong-Guan Zhu is a Professor and the Director of Research Center for Eco-Environmental Sciences, Chinese Academy of Sciences. His research centers on soil-plant-microbe interactions and transport and cycling of nutrients and pollutants, and ecosystem and human health impacts of pollution in soil-plant systems. He has been working on the biogeochemistry of nutrients, metals and emerging pollutants (such as antibiotics and antibiotic resistance genes). Dr. Zhu is a leader in taking multi-scale and multi-disciplinary approaches to soil and environmental problems. He was elected as an Academician of Chinese Academy of Sciences in 2019.



Dr. Xiaoyuan Yan is a professor in the Institute of Soil Science, Chinese Academy of Sciences. He is also the vice president and secretary general of the Soil Science Society of China (SSSC) and the director of nitrogen working group of the SSSC. His research interests include nutrients (particularly carbon and nitrogen) cycles in terrestrial ecosystems and their responses to climate change drivers including elevated CO_2 concentrations and warming, mitigation of greenhouse gas and non-point source pollution at various scales. He has published more than 200 papers in peer-reviewed journals, including *Nature*, *Nature Geoscience*, *Nature Food*, *PNAS*, *Global Change Biology*, and *Environmental Science & Technology*, with >12000 citations and h index of 52. He was awarded for “Research Fund of Outstanding Young Scientists” supported by the Natural Science Foundation of China.

Dr. Limei Zhang is a professor at Research Center for Eco-Environmental Sciences, Chinese Academy of Sciences, China. Her research interests focus on the microbial processes and mechanisms of soil N cycle, microbiome and soil/plant health. Her research employs DNA- and RNA-based molecular ecology, amplicon sequencing, metagenomics and stable isotope probing (SIP) techniques to understand the diversity and function of N cycle related microorganisms in different soil and plant systems, and the assembly process of microbial community across soil-plant continuum, and the potential and mechanisms of microbiome manipulating to improve crop N use efficiency and soil health. Dr. Zhang is a recipient of NSFC "Excellent Young Scholars" award (2013), CAS "Advanced Fellowship of Youth Innovation Promotion Association" award (2016), and UK "Newton Advanced Fellowship" award (2018).

Dr. Harold van Es is a Professor of Soil Science, and served as Chair of the Soil and Crop Sciences Department and President of the Soil Science Society of America. He leads the Cornell Soil Health Initiative and was the lead developer of the Comprehensive Assessment of Soil Health (CASH) framework, and also co-authored the influential book Building Soils for Better Crops. He is also the lead developer of digital technology for crop nitrogen management (Adapt-N, licensed to Yara International) and spatially-balanced designs for field experiment (available through ARM software). He teaches courses on Soil and Crop Management and Impact Learning.

Dr. Yuji Jiang is a Professor at Institute of Soil Science, Chinese Academy of Sciences. Dr. Jiang has long been engaged in research on the predation mechanism of soil animals (protists, nematodes, and earthworms) on the microbial community, and the regulation of nutrient cycling, food web ecology and fertility cultivation in agroecosystems. In the past five years, he has published 27 first author and/or corresponding author SCI papers, such as PNAS, Nature Communications, Microbiome, ISME, and Soil Biology & Biochemistry. He has been granted 4 patents for inventions, edited 3 co-authored monographs, and received one of the second prize of Science and Technology Progress of Jiangxi Province and two of the Top Ten Papers of Chinese Ecosystem Research Network, Chinese Academy of Sciences. He has received the National Excellent Youth Science Fund and the Distinguished Youth Scholar Program of Jiangsu Province, and has been selected as an outstanding member of the Youth Innovation Promotion Association of the Chinese Academy of Sciences.

Dr. Kristen Veum is a research soil scientist with the USDA-Agricultural Research Service in Columbia, Missouri. Her research is cross-disciplinary and includes soil health assessment for agronomic sustainability and environmental protection. She focuses on cropping systems and the impact of land use and management practices on soil health and evaluates soil health indictors for use in farmer assessments. Currently she is collaborating with scientists from government and academia on the development of the Soil Health Assessment Protocol and Evaluation (SHAPE), a continental scale soil health scoring system. Dr. Veum founded the American Society of Agronomy (ASA) Soil Health Community in 2014 and she is the President-Elect of the ASA. Dr. Veum also serves as a scientific advisor for multiple public and private soil health initiatives.

Dr. Elizabeth (Liz) Rieke is a Soil Microbiome Scientist with a background in microbiology and engineering. Dr. Rieke's work focuses on unearthing how agricultural management impacts microbial drivers responsible for carbon and nutrient cycling. Additionally, she leads measurement standardization work at the Institute. Previously, she focused on the Northern Midwest and Northeast regions for the North American Project to Evaluate Soil Health Measurements. Dr. Rieke received her B.S. in Biological Systems Engineering from Virginia Tech and M.S. and Ph.D. in Agricultural & Biosystems Engineering from Iowa State University. She is a member of the Soil Science Society of America.

Dr. Fang Wang is a Professor at the Institute of Soil Science, Chinese Academy of Sciences, and University of Chinese Academy of Sciences. Her research work focuses on soil pollution and remediation, especially for organic chemicals and emerging contaminants. She is the author of 200 journal articles in The Innovation, Environ Sci Technol, Water Research, and Soil Biol Biochem, etc. Dr. Wang has been awarded the Alexander von Humboldt Fellow for Experienced Researcher from Germany; Shennong Young Talent from the Ministry of Agriculture and Rural Affairs of China; Distinguished Young Scholar from the Natural Science Foundation of Jiangsu Province of China; and a Young Talent of Lu Jia-Xi Award from Chinese Academy of Sciences. She serves on the Steering committee of UN FAO International Network on Soil Pollution and the standing committee of International Union of Soil Science. She is the Chair of the International Collaboration Committee of Soil Science Society of China (SSSC), Co-Chair of the working group of Collaboration between SSSC and Soil Science Society of America, and a member of the International Panel on Chemical Pollution.

Dr. Wei Zhang is an Associate Professor and Associate Chairperson in the Department of Plant, Soil and Microbial Sciences at Michigan State University, USA. His research focuses on environmental processes and impacts of environmental contaminants (e.g., engineered nanoparticles, pharmaceuticals, antibiotic resistance genes, prions, per- and polyfluoroalkyl substances, and toxic metals) in agroecosystems. Wei has published 108 peer-reviewed articles with ~5640 citations and an H-index of 40 in Google Scholar. He served as the 2020 Chair of the Soils & Environmental Quality Division. He currently serves as the SSSA Chair of SSSA-Soil Science Society of China Collaboration Committee.

Dr. Marie Johnston is the Education Project Manager and Content Creator at the Soil Science Society of America, where she manages the North American Proficiency Testing program and develops professional training in soils and agronomy. Prior to this role, Marie served as Assistant Editor for the *Soil Science Society of America Journal*, *Crop Science*, and the *Journal of Environmental Quality*. Her experience includes private consulting as an Environmental Scientist at Wood and research in forest ecology, soil physics, and ecohydrology at the University of Wisconsin-Madison Arboretum. Marie has a B.S. in Water Resources and B.S. in Mathematics from the University of Wisconsin-Stevens Point, and a M.S. in Soil Science and Ph.D. in Soil Science from the University of Wisconsin-Madison.

Presentation Abstracts

Soil health depends on inherent soil properties in the black soil region in Northeast China
By Limei Zhang

Soil health is the basis for food security, ecosystem services and planetary health, while its status in the Black soil area in northeast China, one of the four major black soil regions in the world, is rarely estimated. Here we evaluated soil health based on a large scale field survey and sampling across the Black soil region in northeast China. A minimum data set (MDS) containing 13 parameters were screened from around 51 soil physical, chemical and biological parameters based on principal component analysis (PCA) and correlation analysis, and then used for soil health index calculation for 768 agricultural soils. The results showed that soil health indexes exhibit a large spatial heterogeneity at the regional scale, showing a significant decline trend with mean annual temperature (MAT) increase. Further, soil health indexes were distinctly ordered by soil types, with 15 soil types phylogenetically clustered into three groups corresponding with high to low soil health grades. Random forest analyses suggested that natural environmental factors including climate and pedogenesis as well as the inherited soil properties are closely associated with soil health. We further find that soil respiration (R) combined with metabolic quotient (Q) are the best indicators to distinguish integrated differences of all tested soil properties, and that soil health index was the lowest in soils with high R and Q. Together, our study suggested that the current soil health state in the studied area is greatly dependent on the coevolution of inherent properties driven by natural environment factors.

Factors of soil health and benchmarking approaches
By Harold van Es

The adoption of soil health assessment in recent years has created databases that allow insights into the factors that affect soil health. They can generally be assembled into three groupings that also link to intervention options. The first relates to inherent properties of the soil as impacted by the commonly understood soil forming factors (parent material, climate, topography, etc.), which are mostly unchangeable. The second relates to land use, including cropping system, which is mostly a human-affected factor. In this, the level of cycling of carbon and nutrients appears to be a critical element. This factor is mostly fixed over time and only in rare cases changed (like from natural to human-managed, or from agricultural to urban). The third factor relates to how a land use system is managed, like through tillage practices, crop rotations, organic amendments, etc. This factor is most suitable for interventions. Soil health interpretations and benchmarking need to account for these differences to help identify soil resource concerns and intervention options.

Community assembly and functional regulation of soil microorganisms and animals in farmland
By Yuji Jiang

We conducted systematic works on the research of soil zoology, focusing on the key scientific problem of the assembly processes of soil multi-trophic biological networks and their functional regulation on soil fertility and health. Following the research idea of “diversity formation, network construction, and function enhancement” of soil organism groups, the mechanism of body size in influencing the assembly process of multi-trophic biological networks and the formation of community diversity was discovered for the first time, and a two-factor model of the metabolic theory of ecology coupled with temperature and pH was innovated; the general pattern of body size-driven construction of soil multi-trophic biological network was discovered, and the “dual-channel” action pathway of soil multi-trophic biological

interaction network on carbon, and phosphorus reservoir storage was revealed; and the knowledge of keystone species regulating the dual-channel functions of soil multi-trophic biological network was deepened, and the novel principle of keystone species mediating high functional efficiency of the biological network was explored. These results have developed the theoretical system and research methods for the construction and functional efficiency of soil biological networks.

The Soil Health Assessment Protocol and Evaluation (SHAPE): a national approach
By Kristen Veum

Soil health assessment and interpretation is challenged by several factors that vary across space and time. Climate, landscape, and inherent soil characteristics all play an important role at the continental scale. These site-specific factors define how a soil responds to management and land use practices. The Soil Health Assessment Protocol and Evaluation (SHAPE) was developed as a flexible tool that accounts for the interaction of inherent climate and edaphic factors when interpreting changes in soil health indicators. The Bayesian model-based SHAPE tool was initially developed for soil organic carbon and has been expanded to include permanganate oxidizable organic carbon, autoclaved citrate extractable protein, two aggregate stability methods, and four-day soil respiration. These new SHAPE scoring curves demonstrate sensitivity to management practices across multiple soil types and provide a regionally relevant interpretation of these key soil health indicators. Version 2.0 improves upon the original SHAPE curves with spatially-explicit models and efforts are underway to substantially expand the underlying dataset to improve representation of soils and systems across the U.S.