

## Activities of the IUSS at the Global Forum for Food and Agriculture 2022

The IUSS has organized the first Expert Panel “Global perspectives on sustainable soil management towards food security” at the Global Forum for Food and Agriculture 2022 on the 24<sup>th</sup> of January 2022. The panel received a remarkable interest, witnessed by an audience of 176 people. Read more here: [https://www.gffa-berlin.de/en/fachpodien\\_2022/iuss/](https://www.gffa-berlin.de/en/fachpodien_2022/iuss/)

The panel was moderated by Edoardo A.C. Costantini, President Elect of the IUSS and senior researcher at the CNR-IBE of Florence, Italy, and saw the participation of four outstanding colleagues of the IUSS: Dr. Lillian Øygarden, researcher in the department “Soil and Land use” at Norwegian Institute of Bioeconomy Research, chair of the IUSS commission “Soil and Water Conservation”; Dr. Bruce Lascelles, Director of Sustainable Land Management at Arcadis and President of the British Society of Soil Science; Dr. Christina Siebe, senior researcher at the Department of Soil and Environmental Sciences of the Institute of Geology of the National Autonomous University of Mexico; Dr. Rattan Lal, Distinguished University Professor and Director of the Center for Carbon Management and Sequestration, the Ohio State University, and former President of the IUSS.

Dr. Costantini introduced the IUSS. The IUSS is a global organization that puts together the soil science societies of 80 countries and has about 50,000 members, all people who are very passionate about the knowledge of soil and the preservation of its health; since they do believe that it is soil health that grants life on earth and at the same time grants the achievements of all the sustainable development goals set by the United Nations. The four IUSS prominent soil scientists presented global perspectives on sustainable soil management towards food security with different geographic and thematic perspectives.

Dr. Øygarden reported on soil and water conservation under Northern Climatic conditions- sustainable land management to secure high yields and improve soil protection. When there is pressure on available areas for food production it is important with high yields on the existing areas to ensure sustainable utilization of input resources and save nature areas from new cultivation. The expected changes in climate give new challenges with wet and cold conditions for agricultural management and also to an expected increase in soil erosion. There is a need to protect soil better for changed precipitation and runoff conditions to secure land for food production and minimize pollution of surface, drinking water.




Figure 1- Strategies to reduce erosion presented by Lillian Øygarden

Dr. Lascelles talked about the role of soils in supporting the creation of greener developments – under the perspective of a temperate country like the UK. Clear planning for soil management and re-use is critical in


retaining the potential value of soils. This requires knowledge of the soils and specialist input to soil handling strategies, and a wider understanding of how new developments can be designed to maximise the extent of soil included, the health of that soil and how it can be used to support the community, from green spaces for climate adaptation to local food production.

## The importance of soils in supporting the creation of greener developments

Northwest Bicester: Zero Carbon Masterplanning



- Understand site, history, character and context
- Garden Communities principles
- Movement & connectivity – active travel and public transport opps
- Integrate Green & Blue infrastructure
- Biodiversity
- Natural capital
- Place-based design for health and wellbeing
- Nature based solutions (NBS)
- Carbon storage & sequestration
- The value of trees
- Food security
- Circular economy



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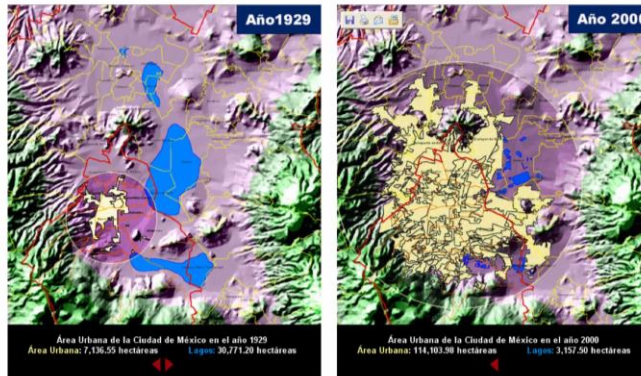
Figure 2- A slide of Bruce Lascelles showing the importance of soils in supporting the creation of greener developments

Dr. Siebe presented the issue of urban soils, which is pertinent to every part of the word but particularly in megacities. The title of her presentation was “The role of soils for the sustainability of periurban and urban areas in megacities”. The human population is not only increasing but becoming predominantly urban. In 2030 more than 70% of the world’s population is expected to live in urban areas and there will be at least 24 megacities (> 10 million inhabitants). Urbanization is sealing fertile land and impeding water infiltration and aquifer recharge jeopardizing the food, water, and energy supply of city dwellers. In urban environments, large quantities of very different kinds of waste materials are produced. Among them are organic wastes and wastewater, which are assets of utmost importance to increase agricultural productivity. Yet they need to be appropriately prepared or treated previous to their application to soil, to protect human and ecosystem health. Fertile soil sealing has to be avoided and waste materials should be properly used to construct soils of gardens, green roofs and green areas. Organic wastes can be either composted or used to generate energy, while the resulting biochar is applied to soil capture C. The reuse of treated wastewater in periurban agriculture sets high-quality water-free for human consumption. It has become mandatory to recognize and preserve urban soil functions to achieve sustainability.

## Urbanization and loss of soil functions

350 million ha (2.7%) of the world's land is urbanized.

- Urban growth occurs dominantly on fertile soils
- Surface sealing affects ground water recharge and increases flood risks
- Inadequate storm water management pollutes rivers (jeopardizes water supply)
- Land use change leads to loss of habitats (biodiversity) and carbon storage



Urban area of Mexico City in 1929

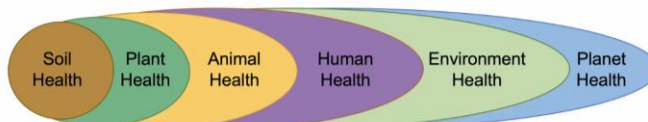
Urban area of Mexico City in 2000



Figure 3- Relationships between urbanization and soil functions showed by Christina Siebe

Dr. Lal's lecture changed the perspective to the global issue about Transforming the World Food Systems by a Soil-Centric Strategy. Between 1961 and 2020, the per capita cereal production increased 32% to 376 kg/yr when the human population increased by 2.5 times but cereal production 3.3 times over the same period. However, the quantum jump in agronomic productivity depended on the increase by 9 for use of nitrogenous fertilizer and by ~ 5 for P and K fertilizers, while the irrigated land area increased by a factor of 2.4. Soil degradation affects one-third of the ice-free land, and 30% of all greenhouse gases emitted are attributed to global food production systems. The "One Health" concept states that "health of soil, plants, animals, people, ecosystems and planetary processes is one and indivisible". Therefore, rather than a problem, the adoption of recommended management practices for diverse agricultural regions can be a part of the solution. Therefore, there is a strong need for the transformation of global food systems. Based on the concept of regenerative agriculture and agroecology, the Green Revolution of the 21st century must be soil centric, ecosystem-based, and driven by science and aimed at producing more from less, practising nutrition-sensitive agriculture, and returning some land and water back to nature. It is also important to grow soil C as a farm commodity that can create another income stream for land managers.

### Soil, Human, Planet-Health Nexus



In addition to socio-economic factors, Food security research must also address environmental and resource management issues

(Lal 2020)



Figure 4- The nexus linking the health of soil, human, planet presented by Rattan Lal

The discussion that followed the presentations highlighted the increasing competition for the use of natural resources, in primis soil and water, which exacerbates the conflictual relationship between rural and urban areas, and between the regions at different degrees of development and richness. This crisis also involves the management of wastes and wastewaters and has become so evident that local and global authorities, as well as citizens and laypeople, have increasingly concerned and trying to find solutions. Unfortunately, though, the role of soil is not yet fully acknowledged, at all decisional levels, despite the many scientific shreds of evidence, like those shown in this expert panel, which highlight the relevance of soil knowledge and the failure of policies that ignore it. The challenge is to translate scientific knowledge into practice. The panellists showed several examples of soil-based approaches and best practices, based on scientific knowledge and cooperation with authorities and stakeholders, which can mitigate or resolve the conflicts.



Figure 5- The IUSS moderator and speakers at the expert panel

Acknowledgement: All the pictures were taken by E. Costantini from the online presentation