Danish Agency for Higher Education and Science

GTR Transformative Chem-Bio Research Nagoya University

# SMARTHARVEST Symposium

# Sustainable Food Production under Climate Change
## From Soil Processes to Agroecosystem Innovation

**Date : April 13 (Mon) 14:00–17:00**
**Place: Nagoya University, Science and Agricultural Building SA329**
**理農館 SA329**

## Dr. Bhim Bahadur Ghaley

University of Copenhagen, Department of Plant and Environmental Sciences, Associate Professor

***Breaking New Grounds for Sustainable Intensification of Food and Fodder Production***

My research focuses on advancing sustainable intensification of food and fodder production through agroecology, agroforestry, and regenerative agriculture. I work on improving soil health, resource-use efficiency, and ecosystem services using approaches such as multispecies cropping, hydroponics, and aquaponics. Through international projects including REFOREST, ECOTWINS, HYDRALINK, TRACER, and SMARTHARVEST, I collaborate globally to develop innovative, climate-smart farming systems and quantify their environmental impacts, supporting the transition toward resilient and sustainable agricultural production.

## Dr. Marcelo Carvalho Minhoto Teixeira Filho

São Paulo State University (UNESP), Department of Plant Health, Rural Engineering and Soils, Associate Professor

***Use of Microorganisms to Increase Fertilizer Efficiency, Productivity and Quality of Agricultural Products for Global Food Security***

The purpose of this lecture will be to present the benefits of inoculation and co-inoculation with microorganisms on the plant nutrition, productivity and quality of agricultural products, as agronomic biofortification. Farmers are increasingly suffering due to climate change, soil degradation and high fertilizer prices. In this sense, thinking about the sustainability of the agroecosystem, researches that seeks to increase the efficiency of mineral fertilizers, especially nitrogen and phosphate fertilizers, are extremely important. Therefore, for this, the most sustainable and smart solution is the inoculation or co-inoculation of cultivated plants with beneficial microorganisms. These multiple mechanisms of action of microorganisms combined can increase the nutrient absorption and nutrient use efficiency, productivity and quality of agricultural products in tropical soils, enabling food security within the climate change scenario.

Keywords: plant growth-promoting bacteria, nitrogen fixation, nutrient solubilization, nutrient use efficiency, crop yield in tropical agriculture, and hydroponic.

## Dr. Luzia Valentina Modolo

Federal University of Minas Gerais, Department of Botany, Associate Professor

***Advancing Sustainable Agriculture through Urease Inhibitor and Biostimulant Technologies for Improved Crop Yield***

This talk presents the current advances in developing urease inhibitors and biostimulant technologies to enhance fertilizer efficiency and support sustainable agriculture. Emphasis will be placed on innovative compounds that reduce nitrogen losses, improve nutrient uptake, and increase crop productivity while minimizing environmental impacts. It will be discussed some recent advances in formulation strategies and field applications, highlighting how these technologies interact with soil systems. Attention will also be given to balancing soil microbiota activity, a prerogative to ensure agronomic benefits without disrupting ecological functions, thereby contributing to resilient, productive, and environmentally responsible agricultural practices for future food systems.

## Dr. Deepika Pandey

Amity University Haryana, Amity School of Earth & Environment Sciences, Associate Professor

***Element Mobilization during Weathering as a Process of Soil Formation***

Rock weathering constitutes a fundamental surficial Earth process that governs the formation of sediments and soils and sustains critical Earth system components, including air, water, soil, and life. The mobility and bioavailability of nutrient elements released during weathering are largely controlled by their chemical speciation within weathered products. The study from weathering profiles in humid and arid regions of tropical India indicate that micronutrients and non-nutrient elements are predominantly associated with relatively immobile phases, particularly crystalline and amorphous iron oxide fractions. In contrast, major nutrient elements are significantly enriched in exchangeable and organic fractions, reflecting their higher mobility and bioavailability. These findings highlight the inherent geochemical partitioning of elements during weathering, which plays a crucial role in regulating their distribution and availability within the environment, a natural way of increasing the fertility of farmland.

## Dr. Paulo Humberto Pagliari

University of Minnesota, Department of Soil, Water, and Climate, Professor

***Feeding the Future: Radical Transformations in Food and Society to Combat Climate Change***

The explosive global population growth, which is projected to reach 11 billion by 2050, combined with today's industrial food systems has shown to be unsustainable. Heavy reliance on synthetic nitrogen fertilizers and grain monocultures has triggered widespread soil erosion (many soils lasting only decades), severe water pollution (agriculture causes ~50% of U.S. impairments, including Lake Erie algal blooms and the Gulf of Mexico hypoxic zone), and major greenhouse gas emissions ($CH_4$ and $N_2O$) accelerating climate change. Those issues and potential for environmental disasters calls for radical transformational change: shifting toward diverse, regenerative systems inspired by pre-colonial landscapes, emphasizing grazing, fruits, vegetables, and possibly edible insects, to restore soil health, clean water, mitigate climate impacts, and improve nutrition, animal welfare, and societal well-being.

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