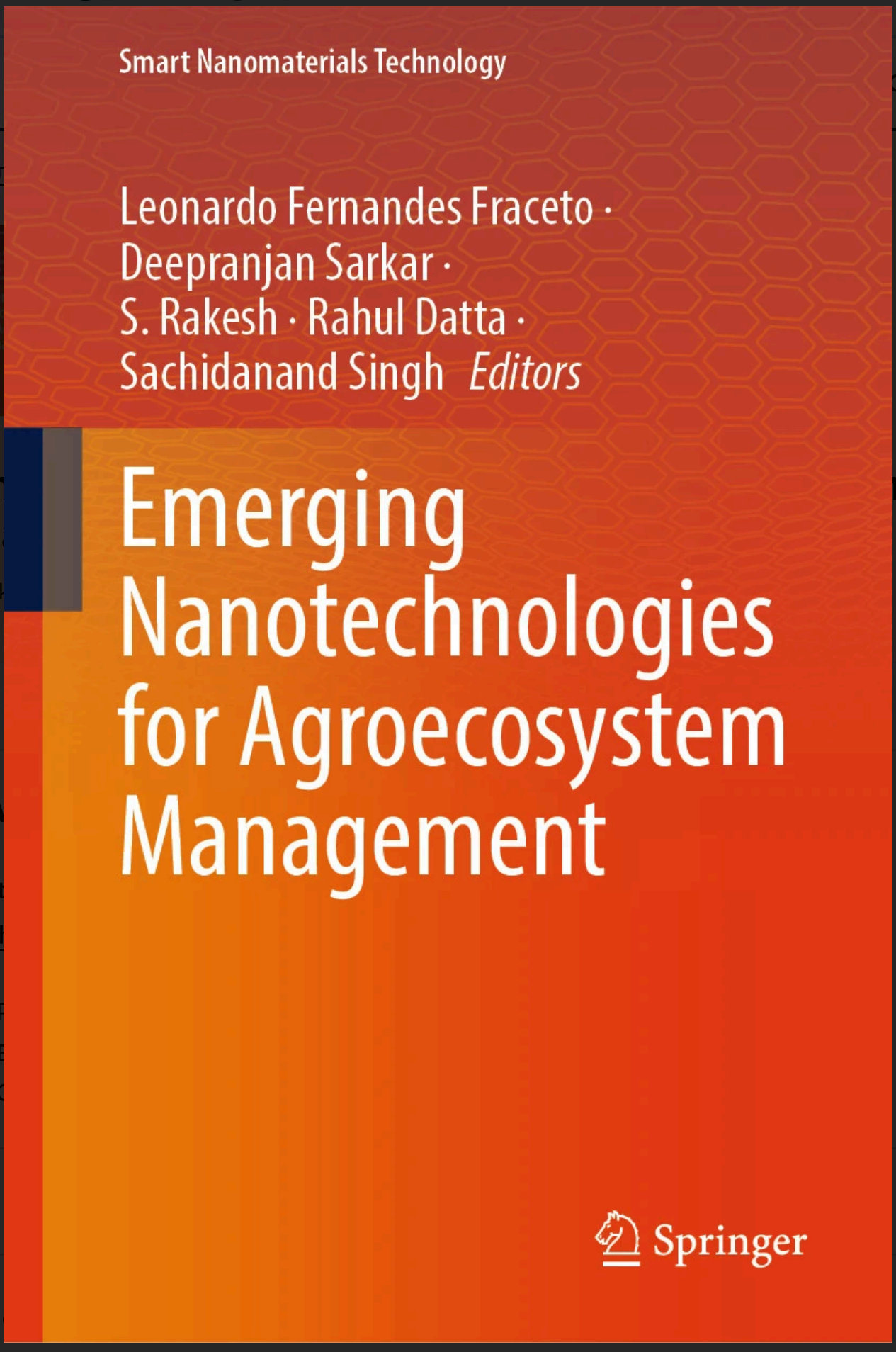
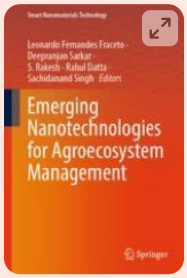

Smart Nanomaterials Technology
Leonardo Fernandes Fraceto ·
Deepranjan Sarkar ·
S. Rakesh · Rahul Datta ·
Sachidanand Singh Editors
Emerging Nanotechnologies for Agroecosystem Management
Springer



Emerging Nanotechnologies for Agroecosystem Management

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Accessibility Information

Overview

Editors: Leonardo Fernandes Fraceto, Deepranjan Sarkar, S. Rakesh, Rahul Datta, Sachidanand Singh

- Provides a comprehensive assessment of nano-enabled agriculture
- Explores interactions, toxicity, and fate of nanoparticles in diverse agroecosystems
- Covers risk assessment and regulatory policies of nano-based agro-products

Part of the book series: Smart Nanomaterials Technology (SNT)

About this book

This book covers the challenges and applications of nanotechnology for managing agroecosystems from maintaining seed quality and ends with food

packaging and processing. It covers the use of nanocomposites to manage seed germination, nutrition, biotic and abiotic stresses, and the productivity of crops and the use of nanosensors in detecting pests, pathogens, and pollutants and forecasting soil and crop health. In addition, it also focuses on the risk assessment and regulatory policies of nanoparticles to explore the potential of smart delivery systems in agroecosystems. The book is helpful for students, researchers, growers, policymakers, in the field of nanotechnology in agriculture, sustainable agriculture, soil science, and environmental science.

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Sachidanand Singh

About the editors

Leonardo Fernandes Fraceto earned a bachelor's degree in Chemistry (1997), a master's degree in Functional and Molecular Biology (2000), and a Ph.D. in Functional and Molecular Biology (2003) from the State University of Campinas, Brazil. He is currently an Associate Professor at the Institute of Science and Technology, São Paulo State University (UNESP), Campus Sorocaba, where he teaches in the Environmental Engineering undergraduate program and the postgraduate program in Environmental Sciences. He also served as Coordinator of the Postgraduate Program in Environmental Sciences at UNESP–Sorocaba from 2012 to 2016. His research expertise spans chemistry

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Deepranjan Sarkar is working as a Postdoctoral Research Fellow at the Department of Food, Agriculture and Natural Resources, School of Environment, Resources and Development, Asian Institute of Technology (AIT), Thailand. Before joining AIT, he served as an Assistant Professor (Soil Science) at the Integral University, Lucknow, India, and also as a Consultant at the International Rice Research Institute (IRRI), India. He received M.Sc. (Ag.) in Soil Science and Agricultural Chemistry degree from Uttar Banga Krishi Viswavidyalaya and Ph.D. from Banaras Hindu University, India. His research interests include soil fertility, plant nutrition, regenerative agriculture, carbon sequestration, climate change, and UNSDGs. During his Ph.D. program, he performed a comprehensive assessment of bio-priming technology in the Middle Gangetic Plains of India and presented his research at several national and international conferences. Dr. Sarkar is involved in teaching soil science courses at UG and PG levels. Currently, he is working on prioritizing adaptation options to address expected future climate challenges in agroecosystems. He has received prestigious awards from BHU, IIT-KGP, TWAS, and the Soil Science Society of America. He is a Life Member/Member of AMI-India, ISCA-Kolkata, IUCN, etc. He has authored more than 30 peer-reviewed publications. He serves on the Editorial Board of Discover Agriculture (Springer Nature) and Modern Agriculture (Wiley), is a Review Editor in Frontiers journals, and regularly reviews manuscripts for journals published by Springer, Elsevier, Taylor & Francis, Wiley, and others.

S. Rakesh is currently serving as an Associate Scientist in the Department of Resilient Farming Systems at the International Crops Research Institute for the

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Rahul Datta is an Assistant Professor of Soil Science at Mendel University, Brno, Czech Republic, recognized for his notable contributions to sustainable agriculture. His research addresses critical challenges such as drought stress, heavy metal toxicity, and greenhouse gas emissions, significantly enhancing the quality and yield of crops like wheat, maize, barley, rice, mangoes, spinach, and cotton. With over 200 peer-reviewed publications and more than 10,000 citations worldwide, including acknowledgments from institutions like the USDA, Dr. Datta has earned an H-index of 54, underscoring the impact of his work. His achievements also earned him a place in the Top 2% of Scientists as per Stanford University Ranking of World Scientists, recognizing his global influence in the field. Dr. Datta has authored 10 books, contributed to 20 book chapters, and holds 6 patents, further solidifying his leadership in agricultural

science. In addition to his research, Dr. Datta holds several editorial roles. He is an Academic Editor for the Turkish Journal of Agriculture and Forestry, serves on the Editorial Board of BMC Plant Biology, and is an Editor for Open Agriculture (De Gruyter) and Phyton-International Journal of Experimental Botany. As a member of the Soil Science Society of America, Dr. Datta remains at the forefront of advancing soil science and sustainable agriculture through his research, publications, and editorial contributions.

Sachidanand Singh is currently working as an Associate Professor and Head in the Department of Biotechnology, School of EnergyTechnology, PanditDeendayal Energy University, Gandhinagar, Gujarat, India. He has an engineering background, having earned a B.Tech in Biotechnology and an M.Tech in Bioinformatics, followed by a PhD, and completed postdoctoral research at The Ohio State University, College of Pharmacy, USA. He has more than 14 years of experience in teaching, administration, and research. He has previously served as Professor and Head Internal Quality Assurance Cell and Dean of Allied Sciences at Sankalchand Patel University, Gujarat, Dean of Biotechnology and Agriculture Sciences, NAAC SSR Head, and Research Coordinator at Shri Ramswaroop Memorial University. Work experience includes Karunya University, Shri Ramswaroop Memorial University, Vignan University, and Sankalchand Patel University. His research area includes Plant Biotechnology, metagenomics, Systems Biology, Network Biology, Micro RNA-based studies, Expression Data Analytics, Nextgeneration Sequencing, and Statistical Genetics. His present focus also includes understanding the Canonical and non-canonical pathways of miRNABiogenesis, Dynamics, and mechanisms of miRNA-mediated Gene Regulation. He teaches different subjects, especially Genomics and Proteomics, Microarray and Image Analysis, Drug Design, and Molecular Modeling for graduate and postgraduate students. He has been involved in various assignments given by the University authority from time to time, such as Online teaching platform, Research Initiatives, Biogas Plant, NAAC, NBA, and other council approvals. He has published more than 60 research and review articles in peer-reviewed journals, 9 Patents

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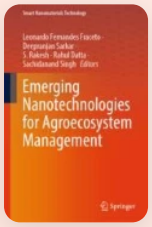

Emerging Nanotechnologies for Agroecosystem Management

Faria Fatima & Manaal Zahera

Part of the book series: Smart Nanomaterials Technology ((SNT))

Abstract

The fields of materials science and nanotechnology have shown a great deal of potential in hybrid nanomaterials, a novel category originating from the combined action of organic and inorganic components at the nanoscale. This combination makes it easier to design buildings with enhanced functionality. Because of their cutting-edge and sustainable qualities, these materials play a crucial role in the field of sustainable agriculture and in environmental detection. This chapter explores their invaluable role in addressing

agricultural and environmental issues through the utilization of nanomaterials' varied features. Due to their huge surface area, amazing sensitivity, and tuneable features, hybrid nanomaterials are promising options to act in the field of nano-agrochemicals. In the agricultural sector, hybrid nanomaterials are employed to increase crop yields, and towards pollutant detection, keeping pests away from plants and enhancing nutrient delivery. These chemicals offer effective, tailored treatments such as smart insecticides and slow-release fertilizers by combining organic and inorganic components. They promote sustainable agricultural practices and aid in lessening the negative environmental effects of conventional farming techniques.