In agriculture, microbial biotechnology covers a wide array of subjects ranging from biofertilizers to biological control of pests and diseases; from biological N₂-fixation to lignocellulose degradation; from production of biomass and biofuels to genetically engineered plants. Similarly, microbial biotechnology in aquaculture touches several aspects.

This volume covers recent findings on the mutualistic plant–microbe interactions and how they can be utilized for sustainable agriculture practices including land reclamation. The book contains a large number of plant growth promoting microorganisms (PGPMs) including both the symbiotic bacteria and fungi and their role in mobilization of nutrients, provision of protection to the crops from phytopathogens and abiotic stresses. PGPMs play important roles in survival and health of the plant. These useful microorganisms improve the quality of products, protect them from pathogens and help them combat abiotic stresses. It is important that these mutualistic interactions between plant and soil microbes are well understood so as to develop reliable products in the form of biostimulants and biopesticides, as well as managing biotic and abiotic stresses in crops. Apart from enhancing crop productivity, plant–microbe interactions can also perform activities such as reclamation of degraded lands, degradation of pollutants and remediation of saline or marginal lands. This book is of interest to teachers, researchers, plant scientists and microbiologists. Also, the book serves as additional reading material for undergraduate and graduate students of agriculture, microbiology, biotechnology, ecology, soil science and environmental sciences.

Microorganisms are a major part of the Earth's biological diversity. Although a lot of research has been done on microbial diversity, most of it is fragmented. This book creates the need for a unified text to be published, full of information about microbial diversity from highly reputed and impactful sources. Recent Advancements in Microbial Diversity brings a comprehensive understanding of the recent advances in microbial diversity research on different body systems, such as the gut. Recent Advancements in Microbial Diversity also discusses how the application of advanced sequencing technologies is used to reveal previously unseen microbial diversity and show off its function. Gives insights into microbial diversity in different body systems.

This book provides an all-inclusive collection of information, this book will be important for students, academicians, researchers working in the field of sustainable agriculture, microbial biotechnology, nanotechnology and genetic engineers. It will also be of use for policymakers in the area of food security and sustainable agriculture. Introduces new microorganisms as plant biostimulants and biopesticides, as well as managing biotic and abiotic stresses in crops. Apart from enhancing crop productivity, plant–microbe interactions can also perform activities such as reclamation of degraded lands, degradation of pollutants and remediation of saline or marginal lands. This book is of interest to teachers, researchers, plant scientists and microbiologists. Also, the book serves as additional reading material for undergraduate and graduate students of agriculture, microbiology, biotechnology, ecology, soil science and environmental sciences.

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application to the alleviation of different abiotic stresses (salt, drought, nutrient deficiency, heavy metal, etc.) in plants. Discusses about psychrophilic microbes, endophytic microbes, and total plant microbiome and their uses as biostimulants for improving plant health.

Microbial communities and their functions play a crucial role in the management of ecological, environmental and agricultural health on the Earth. Microorganisms are the key identified players for plant growth promotion, plant immunization, disease suppression, induced resistance and tolerance against stresses as the indicative parameters of improved crop productivity and sustainable soil health. Beneficial belowground microbial interactions with the rhizosphere help plants mitigate drought and salinity stresses and alleviate water stresses under the unfavorable environmental conditions in the native soils.

Microorganisms that are inhabitants of such environmental conditions have potential solutions for them. There are potential microbial communities that can degrade xenobiotic compounds, pesticides and toxic industrial chemicals and help remediate even heavy metals, and thus they find enormous applications in environmental remediation. Microbes have developed intrinsic metabolic capabilities with specific metabolic networks while inhabiting under specific conditions for many generations and, so play a crucial role. The book Microbial Interventions in Agriculture and Environment is an effort to compile and present a great volume of authentic, high-quality, socially-viable, practical and implementable research and technological work on microbial implications. The whole content of the volume covers protocols, methodologies, applications, interactions, role and impact of research and development aspects on microbial interventions and technological outcomes in prospects of agricultural and environmental domain including crop production, plan-soil health management, food & nutrition, nutrient recycling, land reclamation, clean water systems and agro-waste management, biodegradation & bioremediation, biomass to bioenergy, sanitation and rural livelihood security. The covered topics and sub-topics of the microbial domain have high implications for the targeted and wide readership of researchers, students, faculty and scientists working on these areas along with the agri-activists, policymakers, environmentalists, advisors etc. in the Government, industries and non-government level for reference and knowledge generation. Beneficial Microbes in Agro-Ecology: Bacteria and Fungi is a complete resource on the agriculturally important beneficial microflora used in agricultural production technologies. Included are 30 different bacterial genera relevant in the sustainability, mechanisms, and beneficial natural processes that enhance soil fertility and plant growth. The second part of the book discusses 23 fungal genera used in agriculture for the management of plant diseases and plant growth promotion. Covering a wide range of bacteria and fungi on biocontrol and plant growth promoting properties, the book will help researchers, academics and advanced students in agro-ecology, plant microbiology, pathology, entomology, and nematology. Presents a comprehensive collection of agriculturally important bacteria and fungi Provides foundational knowledge of each core organism utilized in agro-ecology Identifies the genera of agriculturally important microorganisms.

The book, Environmental and Agricultural Microbiology: Applications for Sustainability is divided in to two parts which embodies chapters on sustenance and life cycles of these microorganisms in various environmental conditions, their dispersal, interactions with other inhabited communities, metabolite production and reclamation. Though books pertaining to soil & agricultural microbiology/environmental biotechnology are available, there is a dearth of comprehensive literature on behavior of microorganisms in environmental and agricultural realm. Part 1 includes bioremediation of agrochemicals by microalgae, detoxification of chromium and other heavy metals by microbial biofilm, microbial biopolymer technology including polyhydroxalkanoates (PHAs) and polyhydroxybutyrates (PHB), their production, degradability behaviors and applications. Biosurfactants production and their commercial importance are also systematically represented in this part. Part 2 having 9 chapters and facilitates imperative ideas on approaches for sustainable agriculture through soil functional microbes, next generation crop improvement strategies via rhizosphere microbiome, production and implementations of liquid biofertilizers, mitigation of methane from livestock, chitinases from microbes, extremozymes, an enzyme from extremophilic microorganism and their relevance in current biotechnology, lithobiontic communities and their environmental importance have been comprehensively elaborated. In the era of sustainable energy production biofuel and other bioenergy products play a key role and their production from microbial sources are frontiers for researchers. The last chapter unveils the importance of microbes and their consortia for management of solid waste in amalgamation with biotechnology. Microbial biotechnology is an important contributor to global business, especially in agriculture, the environment, healthcare, and the medical, food, and chemical industries. This volume provides an exciting interdisciplinary journey through the rapidly changing backdrop of invention in microbial biotechnology, covering a range of topics, including microbial properties and characterization, cultivation and production strategies, and applications in healthcare, bioremediation, nanotechnology, and more. Key features: Explains the diverse aspects of and strategies for cultivation of microbial species Describes biodiversity and biotechnology of microbes Provides an understanding of microorganisms in bioremediation of pollutants Explores various applications of microbes in agriculture, food, health, industry, and the environment Considers production issues and applications of microbial secondary metabolites Underscores the importance of integrating genomics of microorganisms in ecological restoration of contaminated environments.

This book presents a collection of cross-disciplinary researches, with contributions addressing all key features of the plant/microbe/ENP nexus in agro-ecosystems. The uptake, transport and transformation of nanoparticles in plants has attracted more and more attention in the past several years. Especially, the impact of Engineered Nanoparticles (ENPs) on bioprocesses; low-, medium- and high-level dose responses in the microbial community of soil; and long-, medium- and short-term exposure responses, particularly microbial nitrogen transformations, are just a few of the aspects involved. Since ENPs are used in many industries, including cosmetics, agriculture, medicine, food technology and waste management, their transport through biogeochemical cycles is an important focus of many studies today. Specifically, ENP–microbe interaction has been analysed with regard to disease treatment for plants; it plays a vital role in disease inhibition by releasing metal ions that act through many pathways – e.g. reactive oxygen species (ROS) generation, DNA transformation and disruption of the cell cycle – to stop cell growth in the pathogen. Due to these properties, ENPs are also used as slow release or delayed release pesticides and fungicides, and as carrier systems for growth-promoting hormones. Despite their multiple uses in various industries, the negative effects of ENPs are still a major concern for the scientific community and consumers alike. For example, their transport to various food chains has been reported to have adverse effects. This raises a degree of doubt concerning a rapidly growing scientific field with major applications in many industries. From a sustainable development perspective and particularly to ensure food security in light of the uncertainty accompanying climate change, it is imperative to address these diverse effects by focusing on the plant/microbe/ENP interaction.

Crop Improvement through Microbial Biotechnology explains how certain techniques can be used to manipulate plant growth and development, focusing on the cross-kingdom transfer of genes to incorporate novel phenotypes in plants, including the utilization of microbes at every step, from cloning and characterization, to the production of a genetically engineered plant. This book covers microbial biotechnology in sustainable agriculture, aiming to improve crop productivity under stress conditions. It includes sections on genes encoding avirulence factors of bacteria and fungi, viral coat proteins of plant viruses, chitinase from fungi, virulence factors from nematodes and mycoplasma, insecticidal toxins from Bacillus thuringiensis, and herbicide tolerance enzymes from bacteria. Introduces the principles of microbial biotechnology and its application in crop improvement Lists various new developments in enhancing plant productivity and efficiency Explains the mechanisms of plant/microbial interactions and the beneficial use of these interactions in crop improvement Explores various bacteria classes and their beneficial effects in plant growth and efficiency.
productivity. Focusing on these environmentally-friendly approaches, the book explores their potential in changing climatic conditions. It presents the exploration and regulation of beneficial microbes in offering sustainable and alternative solutions to the use of chemicals in agriculture. The beneficial microbes presented here are capable of contributing to nutrient balance, growth regulators, suppressing pathogens, orchestrating immune response and improving crop performance. The book also offers insights into the advancements in DNA technology and bioinformatic approaches which have provided in-depth knowledge about the molecular arsenal involved in mineral uptake, nitrogen fixation, growth promotion and biocontrol attributes.

Microbes and Microbial Technology explores the importance of microbial genomes studies in agricultural and industrial applications of microbial functional diversity in different systems. Highlights important microbes and their role in enhancing agricultural productivity. Provides understanding to the basics with advance information of microbial biotechnology. Microbial biotechnology Explores the importance of microbial genomes studies in agricultural and industrial applications.

Microbial biotechnology is known as any technological application that uses microbiological systems, microbial organisms or their derivatives, to manufacture or modify products or processes for specific use. Understanding the utilization of microorganisms and microbial biotechnology in improving the quality of life has been recognized at global. Now days, what is urgently required is a searching of new microbes and novel genes for solving some of the major challenges of recent years with particular reference to sustainable agriculture, the environment and human health. Hence, it is realized that a book dealing microbial biotechnology must be made available to meet the critical gap in applied microbiology and quality of life for students, researchers and technology development professionals. The book covers a broad area which includes microbial concrete production, applications of nanotechnology in food microbiology, microbial technology of biofertilizer, Probiotics for Oral health, microbial surfactants and its potential application, Regulation of circadian rhythm by gut microflora.

The collection of essays in Microbes in Agriculture and Environmental Development explores the applications of microbes for the improvement of environmental quality and agricultural productivity through inoculants and enzymes. These are useful for the conservation and restoration of degraded natural and agricultural ecosystems, crop yield extension, soil health improvement, and other aspects of agriculture and the environment. It discusses the effective use of microbial technology, wastewater treatment, and recycling of agricultural and industrial wastes. It provides detailed accounts of recent trends in microbial applications and diversity, environmental bioremediation, microbial biotechnology, and biodegradation of environmental contaminants. Provides understanding to the basics with advance information of microbial technology. This book intends to bring the latest research advancements and technologies in the area of microbial technology in one platform, providing the readers an up-to-date view on the area.

This edited book, is a collection of 20 articles describing the recent advancements in the application of microbial technology for sustainable development of agriculture and environment. This book covers many aspects like agricultural nanotechnology, promising applications of biofuels production by algae, advancements and application of microbial keratinase, biocontrol agents, plant growth promoting hizobacteria, bacterial siderophore, use of microbes in degradation of persistent pollutants, bio-surfactants, biofilms, bioremediation degradation of phenol and phenolic compounds and bioregulation of phytohormones. This book intends to bring the latest research advancements and technologies in the area of microbial technology in one platform, providing the readers an up-to-date view on the area. This book would serve as an excellent reference book for researchers and students in the agricultural, environmental and microbial technology fields.

The rapid increase in microbial resources along with the development of biotechnological methods has revolutionized the field of microbial biotechnology. Genome characterization methods and metagenomic approaches further illustrate the role of microorganisms in various fields of research. Recent Advancement in Microbial Biotechnology: Agricultural and Industrial Approach provides an overview on the recent application of the microorganisms in agricultural and industrial improvements. The purpose of this book is to integrate all these diverse areas of research in a common platform. Recent advancement in Microbial Biotechnology targets researchers from both academia and industry, professors and graduate students working in molecular biology, microbiology and biotechnology. gives insight in the exploration of microbial functional diversity in different systems. Provides understanding to the basics with advance information of microbial biotechnology. Explores the importance of microbial genomes studies in agricultural and industrial applications.

Visits in the exploration of microbial functional diversity in different systems. Highlights important microbes and their role in enhancing agricultural productivity. Provides understanding to the basics with advance information of microbial biotechnology. Explores the importance of microbial genomes studies in agricultural and industrial applications.
Role of Plant Growth Promoting Microorganisms in Sustainable Agriculture and Nanotechnology explores PGPMs (actinomycetes, bacteria, fungi and cyanobacteria) and their multidimensional roles in agriculture, including their increasing applications in sustainable agriculture. In addition to their traditional understanding and applications in agriculture, PGPMs are increasingly known as a source of nanomaterials production that are gaining significant interest in their ability to provide more economically, environmentally friendly and safe technologies to crop growers. The book considers new concepts and current developments in plant growth, thus promoting microorganism research and evaluating its implications for sustainable productivity. Users will find this to be an invaluable resource for researchers in applied microbial biotechnology, soil science, nanotechnology of microbial strains, and evaluating the role of PGPMs. Presents basic and applied aspects of sustainable agriculture, including nano-technology in sustainable agriculture. Identifies molecular tools/omics approaches for enhancing plant growth promoting microorganisms Discusses plant growth promoting microorganisms in bioactive compounds production, and as a source of nanoparticles.

Microbial applications encompass areas including biotechnology, chemical engineering, and alternative fuel development. Research on their technological developments cover many aspects of work using microbes as cell factories. The fields of biotechnology, chemical engineering, pharmaceuticals, diagnostics and medical device development also employ these microbial products. There is an urgent need to integrate all these disciplines that caters to the need of all those who are interested to work in the area of microbial technologies. This book is a step forward to integrate the aforesaid frontlines into an interdisciplinary research work quenching the academic as well as research thirst of all those concerned about microbes in the respective area of biotechnology, chemical engineering, and pharmaceuticals. All the chapters in this book are related to important research on microbial applications, written by international specialists for researchers and academics in the concerned disciplines. This publication aims to provide a detailed compendium of experimental work and information used to investigate different aspects of microbial technologies, their products as well as interdisciplinary interactions including biochemistry of metabolites, in a manner that reflects the recent developments of relevance to researchers/scientists investigating microorganisms.

Recent developments in our understanding of the role of microbes in sustainable agriculture have created a highly potential research area. The soil and plant microorganisms have a significant role in plant growth promotion, crop yield, soil health and fertility for sustainable developments. The microbes provide nutrients and stimulate plant growth through different mechanisms, including solubilization of phosphorus, potassium, and zinc; biological nitrogen fixation; production of siderophore, ammonia, HCN and other secondary metabolites which are antagonistic against pathogenic microorganisms. This new book provides an indispensable reference source for engineers/bioengineers, biochemists, biotechnologists, microbiologists, agronomists, and researchers who want to know about the unique properties of this microbe and explore its sustainable agriculture future applications. Introduces the principles of microbial biotechnology and its application in plant growth and soil health for sustainable agriculture. Explores various plant microorganisms and their beneficial impact on plant growth for crop improvement. Explains the mechanisms of plant-microbe interaction and plant growth promotion. Includes current applications of microbial consortium for enhancing productivity of crop in eco-friendly manners.

Over the last few decades, the rapid and vast development of advanced microbial bioresources and metagenomics techniques has completely transformed the field of microbial biotechnology. Our understanding of microbial diversity, evolutionary biology, and microbial interaction with their host has increased with the advent of new technologies. This new volume, Advances in Microbial Biotechnology: Current Trends and Future Prospect, focuses on the application of microorganisms for several purposes: for plant protection and improvement, for sustainable agriculture, and for the improvement of human health. Various applications of microorganisms are covered broadly and have been appropriately reflected in depth in different chapters. The book is divided into four major sections: applied microbiology in agriculture, microbes in the environment, microbes in human health and microbial nanotechnology. The book provides insight into the diverse microorganisms that have been explored and exploited in the development of various applications for agricultural improvements. The book also looks at the application of microorganisms for the removal of pollutants and the recovery of metals and oils. Also discussed is the detection and exploitation of microorganisms in the diagnosis of human diseases, providing possible holistic approaches to health. This new volume will provide a wealth of information on new research on the application of microbial biotechnology today.

Recent years have seen tremendous progress in unraveling the molecular basis of different plant-microbe interactions. Knowledge has accumulated on the mecha nisms of the microbial infection of plants, which can lead to either disease or resistance. The mechanisms developed by plants to interact with microbes, whether viruses, bacteria, or fungi, involve events that can lead to symbiotic association or to disease or tumor formation. Cell death caused by pathogen infection has been of great interest for many years because of its association with plant resistance. There appear to be two types of plant cell death associated with pathogen infection: a rapid hypersensitive cell death localized at the site of infection during an incompatible interaction between a resistant plant and an avirulent pathogen, and a slower, non-symptomatic cell death that spreads beyond the site of infection during compatible interactions involving a susceptible plant and a virulent, necrogenic pathogen. Plants possess a number of defense mechanisms against pathogen infection, such as (i) production of phytoalexin, (ii) formation of hydrolyases, (iii) accumulation of hydroxypoline-rich glycoprotein and lignin deposition, and (iv) production of pathogen-related proteins, (v) production of oligosaccharides, and various other phenolic substances, and (vi) production of toxin-metabolizing enzymes. Based on these observations, the single suitable gene in a particular plant has yielded promising results in imparting resistance against specific infection or disease. It appears that a signal received after microbe infection triggers different signal transduction pathways.

Microbial Endophytes: Prospects for Sustainable Agriculture and Nanotechnology discusses the practical and theoretical aspects regarding the use of endophytic microorganisms in agriculture, providing insights on the biotechnological applications associated with long-term crop production. Chapters deal with the various aspects of endophytic microorganisms, including isolation, enumeration, characterization procedures, diversity analysis, and their role as biofertilizer, biocontrol agent and microbial inoculants. Framed to discuss the present and future potential of microbial endophytes in biotic and abiotic stress management, bioremediation, bioactive compounds production, and in nanotechnology, this book provides a single-volume resource that will be valuable to academics and researchers interested in microbial technology, agricultural sciences and biotechnology. Explores aspects of sustainable agriculture by using endophytic microorganisms such as bacteria, fungi and actinobacteria. Presents insights into the use of endophytes as biofertilizer and biocontrol agents in sustainable agriculture. Relates endophyte organisms and nano-technology. Considering the ever-increasing global population and finite arable land, technology and sustainable agricultural practices are required to improve crop yield. This book examines the interaction between plants and microbes and considers the use of advanced techniques such as genetic engineering, revolutionary gene editing technologies, and their applications to understand how plants and microbes help or harm each other at the molecular level. Understanding plant-microbe interactions and related gene editing technologies will provide new possibilities for sustainable agriculture. The book will be extremely valuable to researchers and practitioners in the fields of biotechnology, agricultural sciences, environmental biology, and related disciplines.
useful for researchers working in the fields of plant science, molecular plant biology, plant-microbe interactions, plant engineering technology, agricultural microbiology, and related fields. It will be useful for upper-level students and instructors specifically in the field of biotechnology, microbiology, biochemistry, and agricultural science. Features: Examines the most advanced approaches for genetic engineering of agriculture (CRISPR, TALAN, ZFN, etc.). Discusses the microbiological control of various plant diseases. Explores future perspectives for research in microbiological plant science. Plant-Microbial Interactions and Smart Agricultural Biotechnology will serve as a useful source of cutting-edge information for researchers and innovative professionals, as well as upper-level undergraduate and graduate students taking related agriculture and environmental science courses.

Microbes in Land Use Change Management details the various roles of microbial resources in management of land uses and how the microbes can be used for the source of income due to their cultivation for the purpose of biomass and bioenergy production. Using various techniques, the disturbed and marginal lands may also be restored eco-friendly in present era to fulfill the feeding needs of mankind around the globe. Microbes in Land Use Change Management provides standard and up to date information towards the land use change management using various microbial technologies to enhance the productivity of agriculture. Needless to say that Microbes in Land Use Change Management also considers the areas including generation of alternative energy sources, restoration of degraded and marginal lands, mitigation of global warming gases and next generation -omics technique etc. Land use change affects environmental conditions and soil microbial community. Microbial population and its species diversity have influence in maintaining ecosystem balance. The study of changes of microbial population provides an idea about the variation occurring in a specific area and possibilities of restoration. Meant for a multidisciplinary audience Microbes in Land Use Change Management shows the need of next-generation omics technologies to explore microbial diversity. Describes the role of microbes in generation of alternative source of energy Gives recent information related to various microbial population and their diversified applications Provides thorough insight in the problems related to landscape dynamics, restoration of soil, reclamation of lands mitigation of global warming gases etc. eco-friendly way using versatility of microbes Includes microbial tools and technology in reclamation of degraded, disturbed and marginal lands, mitigation of global warming gases

The book addresses current public concern about the adverse effect of agrochemicals and their effect on the agro-ecosystem. This book also aims to satisfy and contribute to the increasing interest in understanding the co-operative activities among microbial populations and their interaction with plants. It contains chapters on a variety of interrelated aspects of plant-microbe interactions with a single theme of stress management and sustainable agriculture. The book will be very useful for students, academicians, researcher working on plant-microbe interaction and also for policy makers involved in food security and sustainable agriculture.

New and Future Developments in Microbial Biotechnology and Bioengineering: Phytomicrobiome for Sustainable Agriculture provides a comprehensive overview of the phytomicrobiome and a holistic approach for its various mechanisms, including plant growth, nutrient content, crop yield improvement, soil fertility, and health management. This book explores the genus- and species-specific endophytic microbes for developing an efficient indigenous microbial consortium for enhancing the productivity of sustainable agriculture. An essential resource for students, researchers, and scientists in the fields of biotechnology, microbiology, agronomy, and the plant protection sciences, New and Future Developments in Microbial Biotechnology and Bioengineering: Phytomicrobiome for Sustainable Agriculture highlights the plant growth-promoting activities of the phytomicrobiome and focuses on both its basic and applied aspects and the significant role they play in plant protection. Emphasizes up-to-date research on sustainability, proteomics and genomics, and functional and molecular mechanisms of plant-microbe-soil interactions Covers multidisciplinary features of plant microbiology, plant physiology, soil science, and sustainable agriculture Includes the significance of microbial secondary metabolites for enhancing plant growth attributes Focuses on the most recent developments in biotechnology to enhance the action of the phytomicrobiome as an alternative to chemical fertilizers for agriculture and forestry

Microbiome Under Changing Climate: Implications and Solutions presents the latest biotechnological interventions for the judicious use of microbes to ensure optimal agricultural yield. Summarizing aspects of vulnerability, adaptation and amelioration of climate impact, this book provides an important resource for understanding microbes, plants and soil in pursuit of sustainable agriculture and improved food security. It emphasizes the interaction between climate and soil microbes and their potential role in promoting advanced sustainable agricultural solutions, focusing on current research designed to use beneficial microbes such as plant growth promoting microorganisms, fungi, endophytic microbes, and more. Changes in climatic conditions influence all factors of the agricultural ecosystem, including adversely impacting yield both in terms of quantity and nutritional quality. In order to develop resilience against climate changes, it is increasingly important to understand the effect on the native micro-flora, including the distribution of methanogens and methanotrophs, nutrient content and microbial biomass, among others. Demonstrates the impact of climate change on secondary metabolites of plants and potential responses Incorporates insights on microflora of inhabitant soil Explores mitigation processes and their modulation by sustainable methods Highlights the role of microbial technologies in agricultural sustainability

Bridging the gap between laboratory observations and industrial practices, this work presents detailed information on recombinant micro-organisms and their applications in industry and agriculture. All recombinant microbes, bacteria, yeasts and fungi are covered. The book Microbes in Soil and Their Agricultural Prospects is a collection of advantageous, informative, simulative and holistic viewpoints presenting basic and applied aspects of microbial functioning in soil. This book covers physiological, biochemical and molecular mechanisms of microbiomes pertaining to the production of available nitrogen (nitrogen fixation), phosphorus (P mobilization) and plant-growth promoting hormones for adaptation in agricultural soil. Responses between microbiomes and plants (known as plant-microbe interaction) corresponding to signal molecules and plant reactions to bacterial quorum sensing have been intricately presented as well. This book covers most of the agriculturally important microbes (Bacteria, Frankia, Burkholaderia, Cyanobacteria, Arbucusus Mycorrhizal (AM) fungi, Bacteriophages, Trichoderma). It addresses various issues in agricultural practices to make it more understandable for various levels of academia. Analysis of microbial diversity and advances in development of microbial fertilizers have
also been incorporated to introduce young researchers with biofertilizer. This expert compilation of data analyzes most of the microorganisms supporting soil fertility and crop productivity that is of significant value for sustainable agronomic practices. It is invaluable not only for experienced scientists, research leaders, and agriculturalists, but also undergraduate, postgraduate and postdoctoral researchers beginning their careers. Each chapter in this book has been a contribution from a qualified teachers or researchers of multiple expertise. The chapters are concentrated on microbial metabolism and its agricultural prospects. Concerted efforts have been made to make a quality compilation and presentation of microorganisms in soil. A lot of common queries and practices have been addressed to make it more interesting as well. Microbes in Soil and Their Agricultural Prospects will certainly serve as an invaluable, suitable and sustainable resource for students, teachers, and various scientists interested in sustainable agricultural practices for production of healthy foods.

Microbiome Stimulants for Crops: Mechanisms and Applications provides the latest developments in the real-world development and application of these crop management alternatives in a cost-effective, yield protective way. Sections address questions of research, development and application, with insights into recent legislative efforts in Europe and the United States. The book includes valuable information regarding mechanisms and the practical information needed to support the growing microbial inoculant and biostimulant industry, thus helping focus scientific research in new directions. Provides methods for finding and testing endophytic and growth promotional microbes Explains the mechanisms of microbes and other biostimulant function in promoting plant growth Evaluates methods for treatments of plants with microbes and microbiome stimulants Identifies areas for new research

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