

Earthworm Vermicompost A Sustainable Alternative To Chemical Fertilizers For Organic Farming Agriculture Issues And Policies

Attaining sustainable agricultural production while preserving environmental quality, agro-ecosystem functions and biodiversity represents a major challenge for current agricultural practices; further, the traditional use of chemical inputs (fertilizers, pesticides, nutrients etc.) poses serious threats to crop productivity, soil fertility and the nutritional value of farm produce. Given these risks, managing pests and diseases, maintaining agro-ecosystem health, and avoiding health issues for humans and animals have now become key priorities. The use of PGPR as biofertilizers, plant growth promoters, biopesticides, and soil and plant health managers has attracted considerable attention among researchers, agriculturists, farmers, policymakers and consumers alike. Using PGPR as bioinoculants can help meet the expected demand for global agricultural productivity to feed the world's booming population, which is predicted to reach roughly 9 billion by 2050. However, to provide effective bioinoculants, PGPR strains must be safe for the environment, offer considerable plant growth promotion and biocontrol potential, be compatible with useful soil rhizobacteria, and be able to withstand various biotic and abiotic stresses. Accordingly, the book also highlights the need for better strains of PGPR to complement increasing agro-productivity.

Food Bioconversion, Volume Two in the Handbook of Food Bioengineering series is an interdisciplinary resource of fundamental information on waste recovery and biomaterials under certain environmental conditions. The book provides information on how living organisms can be used to transform waste into compounds that can be used in food, and how specialized living cells in plants, animals and water can convert the most polluting agents into useful non-toxic products in a sustainable way. This great reference on the bioconversion of industrial waste is ideal in a time when food resources are limited and entire communities starve. Presents extraction techniques of biological properties to enhance food's functionality, i.e. functional foods or nutraceuticals Provides detailed information on waste material recovery issues Compares different techniques to help advance research and develop new applications Includes research solutions of different biological treatments to produce foods with antibiotic properties, i.e. probiotics Explores how bioconversion technologies are essential for research outcomes to increase high quality food production

This book describes the latest advances, innovations and applications in the field of waste management and environmental geomechanics as presented by leading researchers, engineers and practitioners at the International Conference on Sustainable Waste Management through Design (IC_SWMD), held in Ludhiana (Punjab), India on November 2-3, 2018. Providing a unique overview of new directions, and opportunities for sustainable and resilient design approaches to protect infrastructure and the environment, it discusses diverse topics related to civil engineering and construction aspects of the resource management cycle, from the minimization of waste, through the eco-friendly re-use and processing of waste materials, the management and disposal of residual wastes, to water treatments and technologies. It also encompasses strategies

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for reducing construction waste through better design, improved recovery, re-use, more efficient resource management and the performance of materials recovered from wastes. The contributions were selected by means of a rigorous peer-review process and highlight many exciting ideas that will spur novel research directions and foster multidisciplinary collaboration among different waste management specialists.

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Current Developments in Biotechnology and Bioengineering: Current Advances in Solid-State Fermentation provides knowledge and information on solid-state fermentation involving the basics of microbiology, biochemistry, molecular biology, genetics and principles of genetic engineering, metabolic engineering and biochemical engineering. This volume of the series is on Solid-State fermentation (SSF), which would cover the basic and applied aspects of SSF processes, including engineering aspects such as design of bioreactors in SSF. The book offers a pool of knowledge on biochemical and microbiological aspects as well as chemical and biological engineering aspects of SSF to provide an integrated knowledge and version to the readers. Provides state-of-the-art information on basic and fundamental principles of solid-state fermentation Includes key features for the education and understanding of biotechnology education and R&D, in particular on SSF Lists fermentation methods for the production of a wide variety of enzymes and metabolites Provides examples of the various industrial applications of enzymes in solid state fermentation

This book in two sections represents the current trend of research in ecology and biology of earthworms. In section "Ecology and Diversity" the authors reported the ecological and geographical uniqueness and diversity of earthworms in different environmental terrains of Siberia and Mexico. Functional interaction between earthworms and soil nematodes was elucidated with reference to vermicomposting and agricultural systems. Importance of digital library was highlighted for inventorization and taxonomical identification of earthworms. In section "Vermicomposting" the importance of maintaining pure cultures was discussed from the viewpoint of growth rate and the reproduction of composting species. This section includes article describing the management-related issues like roles of physicochemical parameters of soil and feed mixture on growth and reproduction of commercially important species of earthworm.

Choice Reviews, Outstanding Academic Title Techniques and systems for processing food scraps, manure, yard debris, paper, and more Turning waste into wealth sounds too good to be true, but many worm farmers are finding that vermicomposting is a reliable way to do just that. Vermicast—a biologically active, nutrient-rich mix of earthworm castings and decomposed organic matter—sells for \$400 or more per cubic yard. Compare that to regular compost, sold at about \$30 a cubic yard, and you'll see why vermicomposting has taken root in most countries and on every continent but Antarctica. Vermicomposting is also one of the best sustainable solutions for organic waste management. Vermicomposting manure and crop wastes on farms improves crop yields while reducing demand for off-farm inputs. Vermicast has higher nutrient

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levels and lower soluble salt content than regular compost, and it improves soil aeration, porosity, and water retention. Plus, vermicast suppresses plant diseases and insect attacks. Municipalities, businesses, community gardens, schools, and universities can set up vermicomposting operations to process food residuals and other waste materials. The Worm Farmer's Handbook details the ins and outs of vermicomposting for mid- to large-scale operations, including how to recycle organic materials ranging from food wastes and yard trimmings to manure and shredded office paper. Vermicomposting expert Rhonda Sherman shares what she has learned over twenty-five years working with commercial worm growers and researchers around the world. Her profiles of successful worm growers across the United States and from New Zealand to the Middle East and Europe describe their proven methods and systems. This book digs into all the details, including: Choosing the right production system Regulatory issues and developing a business and marketing plan Finding and managing feedstocks Pre-composting: why and how to do it Monitoring an active worm bed Harvesting, screening, testing, packaging, and storing vermicast Markets for earthworms and vermicast Food security: how vermicast benefits soils and plants Keys to success: avoiding common pitfalls From livestock farms and restaurants to colleges, military bases, and prisons, Sherman details why and how commercial-scale vermicomposting is a fast-growing, sustainable solution for organic waste management. The Worm Farmer's Handbook is the first and only authoritative how-to guide that goes beyond small-scale operations and demystifies the science and logistics of the fascinating process that is vermicomposting.

This book provides updated and comprehensive information on the effective functioning of earthworms used alone or in combination with other biological systems/microbes, as well as factors affecting the process and performance of vermiremediation under a range of conditions. It also compares earthworm assisted vermifiltration with other conventional biochemical methods. Presenting cutting-edge research on the earthworm assisted remediation of industrial and municipal effluents and sludges, along with its role in solid waste management (SWM), the book will benefit readers from the research community and industrial sector alike, familiarizing them with the latest remediation techniques for wastewater and different types of solid waste.

Toxic substances threatens aquatic and terrestrial ecosystems and ultimately human health. The book is a thoughtful effort in bringing forth the role of biotechnology for bioremediation and restoration of the ecosystems degraded by toxic and heavy metal pollution. The introductory chapters of the book deal with the understanding of the issues concerned with the pollution caused by toxic elements and heavy metals and their impacts on the different ecosystems followed by the techniques involved in monitoring of the pollution. These techniques include use of bio-indicators as well as modern techniques for the assessment and monitoring of toxicants in the environment. Detailed chapters discussing the role of microbial biota, aquatic plants, terrestrial plants to enhance the accumulation efficiency of these toxic and heavy metals are followed by remediation techniques involving myco-remediation, bio-pesticides, bio-fertilizers, phyto-remediation and rhizo-filtration. A sizable portion of the book has been dedicated to the advanced bio-remediation techniques which are finding their

way from the laboratory to the field for revival of the degraded ecosystems. These involve bio-films, micro-algae, genetically modified plants and filter feeders. Furthermore, the book is a detailed comprehensive account for the treatment technologies from unsustainable to sustainable. We believe academicians, researchers and students will find this book informative as a complete reference for biotechnological intervention for sustainable treatment of pollution.

Now-a-days the use of chemical fertilizers and pesticides in agriculture has reached its peak. This harms the human health as well as environment. The process of agricultural modernization has been an important contributing factor towards this. This deprives the land from its fertility and leaves it unfit for further agricultural operations. Hence, a better alternative of such chemical monsters is required to overcome these ill-effects. Therefore, a shift from chemical to organic farming is appreciated. Production efficiency, economic efficiency and employment generation efficiency of any system is a direct measure of its preferability. Therefore, this study deals with the requirements, methods, advantages, etc. of vermicomposting as well as its applications in agriculture. The main purpose of this process is the quick and efficient conversion of the organic waste materials into the nutritious fertilizer for plants.

Sustainability of environment is an emerging global issue at present.

Unsustainable or deteriorating environment is a matter of concern as it has threatened the survival of living creatures. Recently, climate change has been a matter of great concern at a global platform owing to imbalances in natural environment. Increasing population has increased the demand for energy, which has ultimately put pressure on natural resources and caused a paradigm shift from resource generation to exploitation. Emerging Energy Alternatives for Sustainable Environment aims to address the role of sustainable technologies in energy generation options for clean environment. It covers a wide spectrum of energy generation approaches, with an emphasis on five key topics: (i) renewable energy sources and recent advances, (ii) emerging green technologies for sustainable development, (iii) assessment of biomass for sustainable bioenergy production, (iv) solid waste management and its potential for energy generation, and (v) solar energy applications, storage system, and heat transfer. This book provides essential and comprehensive knowledge of green energy technologies with different aspects for engineers, technocrats and researchers working in the industry, universities, and research institutions. The book is also very useful for undergraduate and graduate students of science and engineering who are keen to know about the development of renewable energy products and their corresponding processes. Please note: This volume is Co-published with The Energy and Resources Institute Press, New Delhi. Taylor & Francis does not sell or distribute the Hardback in India, Pakistan, Nepal, Bhutan, Bangladesh and Sri Lanka

Co-edited by international earthworm expert Clive A. Edwards, Vermiculture

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Technology: Earthworms, Organic Wastes, and Environmental Management is the first international, comprehensive, and definitive work on how earthworms and microorganisms interact to break down organic wastes on a commercial basis. Many books cover the importance of composting

Earthworm's vermicompost is a nutritive organic fertiliser rich in NKP, micronutrients, and beneficial soil microbes. They are scientifically proven to be excellent growth promoters and protectors for crop plants. In experiments with corn and wheat crops it displayed excellent growth performances in terms of height of plants, colour and texture of leaves, as well as the appearance of fruiting structures. There is also less incidences of pest and disease attack and reduced demand of water for irrigation. This book discusses and presents data which suggest that the vermicompost of earthworms contributes to an increase in the yield of crops when used as a fertiliser.

Sustainable Resource Recovery and Zero Waste Approaches covers waste reduction, biological, thermal and recycling methods of waste recovery, and their conversion into a variety of products. In addition, the social, economic and environmental aspects are also explored, making this a useful textbook for environmental courses and a reference book for both universities and companies. Provides a novel approach on how to achieve zero wastes in a society Shows the roadmap on achieving Sustainable Development Goals Considers critical aspects of municipal waste management Covers recent developments in waste biorefinery, thermal processes, anaerobic digestion, material recycling and landfill mining

Industrial and Municipal Sludge: Emerging Concerns and Scope for Resource Recovery begins with a characterization of the types of sludge and their sources and management strategies. This section is followed by specific chapters that cover Emerging contaminants in sludge (Endocrine disruptors, Pesticides and Pharmaceutical residues, including illicit drugs/controlled substances), Bioleaching of sludge [with an enriched sulfur-oxidizing bacterial community, Recovery of valuable metals (Bioleaching and use of sulfur-oxidizing bacterial community, and Biogas production by continuous thermal hydrolysis and thermophilic anaerobic digestion of waste activated sludge. In addition, the book includes numerous tables and flow diagrams to help users further comprehend the subject matter. Includes numerous tables and flow diagrams to assist in the comprehension of new and existing sludge treatments and resource recovery technology Covers biogas production by continuous thermal hydrolysis and thermophilic anaerobic digestion of waste activated sludge Presents information on the recovery of valuable metals from sludge (bioleaching and the use of a sulfur-oxidizing bacterial community) Includes opportunities and challenges in the biorefinery-based valorization of pulp and paper sludge

A rapidly growing population, industrialization, modernization, luxury life style, and overall urbanization are associated with the generation of enhanced wastes. The inadequate management of the ever-growing amount of waste has degraded

the quality of the natural resources on a regional, state, and country basis, and consequently threatens public health as well as global environmental security. Therefore, there is an existent demand for the improvement of sustainable, efficient, and low-cost technologies to monitor and properly manage the huge quantities of waste and convert these wastes into energy sources. Innovative Waste Management Technologies for Sustainable Development is an essential reference source that discusses management of different types of wastes and provides relevant theoretical frameworks about new waste management technologies for the control of air, water, and soil pollution. This publication also explores the innovative concept of waste-to-energy and its application in safeguarding the environment. Featuring research on topics such as pollution management, vermicomposting, and crude dumping, this book is ideally designed for environmentalists, policymakers, professionals, researchers, scientists, industrialists, and environmental agencies.

The earth's biodiversity is a degree of ecosystem health which is vital to ecology and environmental sustainability. The microbial world is the largest unexplored reservoir. The agro-ecosystem enriched with rhizosphere implicit abundant and species-rich component of microbial diversity. Its global exploration designs a worldwide framework for agricultural sustainability adjoining benefits in its conservation. Agricultural sustainability requires a major share from ecosystem management which is better paid by microbial diversity and conservation. Diversity of bacteria influences plant productivity providing nutrient convenience from soil instead altering per se community and diversity in the rhizosphere where they may influence mechanistic competent and antagonistic micro-flora. The potential species among the diversity are therefore, essential subjective to their maintenance for use around the globe. Microbial population in agro-ecosystem is influenced by stresses, reduce functionality as a component. It is therefore, important to explore secrets of planned strategy so as to unravel the microbial diversity and conservation in agricultural development. Microorganisms are minute, pervasive in nature and alleged as disease host instead tiny recognize as employee of agro-ecosystem, indulge in agricultural development and potential contributor in world of ecological and economical wealth creation. This step pertinently would help to launch scientific motivation needed to support the refrain of microbial diversity and conservation.

This book focuses on value addition to various waste streams, which include industrial waste, agricultural waste, and municipal solid and liquid waste. It addresses the utilization of waste to generate valuable products such as electricity, fuel, fertilizers, and chemicals, while placing special emphasis on environmental concerns and presenting a multidisciplinary approach for handling waste. Including chapters authored by prominent national and international experts, the book will be of interest to researchers, professionals and policymakers alike.

Since the publication of the highly-successful first edition of Earthworm Ecology, there were two international symposia and an increased number of publications on the subject, demanding a revision of the book that addresses the most rapidly developing areas of earthworm research. Earthworm Ecology, Second Edition updates the most comprehens

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Meeting the food requirements of an ever-increasing population is a pressing challenge for every country around the globe. Soil degradation has a negative impact on food security by reducing the cultivated land areas, while at the same time the world population is predicted to increase to 9.2 billion in 2050. Soil degradation adversely affects soil function and productivity and degraded soils now amount to 6 billion ha worldwide. The major factors are salinization, erosion, depletion of nutrients due to exhaustive agricultural practices and contamination with toxic metal ions and agrochemicals, which reduces the activity of soil microbe. In addition, poor soil management also decreases fertility. As such, measures are required to restore the soil health and productivity: organic matter, beneficial microorganisms and nutrient dynamics can all improve the physical, chemical and biological properties of soil. Understanding the role of soil health restoration and management in sustainability and nutritional security calls for a holistic approach to assess soil functions and examine the contributions of a particular management system within a defined timescale. Further, best management practices in cropping systems are important in ensuring sustainability and food and nutritional security without compromising the soil quality and productivity potential. Rational soil management practices must allow environmentally and economically sustainable yields and restoration of soil health.

The *Global Industrial Complex: Systems of Domination*, is a groundbreaking collection of essays by leading scholars from wide scholarly and activist backgrounds who examine the entangled array of contemporary industrial complexes—what the editors refer to as "the power complex"—that was first analyzed by C. Wright Mills in his 1956 classic work, *The Power Elite*.

Earthworms, which belong to the order Oligochaeta, comprise roughly 3,000 species grouped into five families. Earthworms have been called 'ecosystem engineers'; much like human engineers, they change the structure of their environments. Earthworms are very versatile and are found in nearly all terrestrial ecosystems. They play an important role in forest and agricultural ecosystems. This *Soil Biology* volume describes the various facets of earthworms, such as their role in soil improvement, soil structure, and the biocontrol of soil-borne plant fungal diseases. Reviews discuss earthworms' innate immune system, molecular markers to address various issues of earthworm ecology, earthworm population dynamics, and the influences of organic farming systems and tillage. Further topics include the characteristics of vermicompost, relationships between soil earthworms and enzymes, the role of spermathecae, copulatory behavior, and adjustment of the donated sperm volume.

The main aim of this book is to bridge the gap between aerobic and anaerobic waste treatments by concentrating on studies of earthworms. In particular, vermicomposting is being discussed as well as its properties and applications. Other subjects touch on the treatment of palm oil mill effluents, the various importance of earthworms, its scope and future aspects of earthworm research, and the impact of waste management practices on human health.

Earthworm Vermicompost A Sustainable Alternative to Chemical Fertilizers for Organic Farming Nova Novinka

Over the period of last two decades, there has been significant resurgence in solid-state fermentation due to the numerous benefits it offers, especially in the engineering and environmental aspects. SSF has shown much promise in the

development of several bioprocesses and products. This resurgence gained further momentum during the last 5-6 years with the developments in fundamental and applied aspects. A good deal of information has been generated in published literature and patented information. Several commercial ventures have come up based on SSF in different parts of the world. The contents are organized into four parts: Part 1 deals with the General and Fundamentals aspects of SSF; Part 2 deals with the production of bulk chemicals and products such as enzymes, organic acids, spores and mushrooms in SSF; Part 3 is on the use of SSF for specialty chemicals such as gibberellic acid, antibiotics and other pharmaceutically valuable secondary metabolites, pigments, and aroma compounds; Part 4 deals with the use of SSF miscellaneous application such as SSF for food and feed applications, agro-industrial residues as substrates in SSF and the production of silage and vermicompost.

This new volume looks at the evolution and challenges of sustainable agriculture, a field that is growing in use and popularity, discussing some of the important ideas, practices, and policies that are essential to an effective sustainable agriculture strategy. The book features 25 chapters written by experts in crop improvement, natural resource management, crop protection, social sciences, and product development. The volume provides a good understanding of the use of sustainable agriculture and the sustainable management of agri-horticultural crops, focusing on eco-friendly approaches, such as the utilization of waste materials. Topics include ecofriendly plant protection measures, climate change and natural resource management, tools to mitigate the effect of extreme weather events, agrochemical research and regulation, soil carbon sequestration, water and nutrient management in agricultural systems, and more. Key features:

- Discusses sustainable agriculture within the framework of recent challenges in agriculture
- Looks at the development and diversification of crops and cultural practices to enhance biological and economic stability
- Discusses innovative nanotechnologies in research and production technologies
- Highlights the development of new varieties in agri-horticultural crops
- Discusses use of recent technologies for soil–plant–microbe–environment interactions.

In *Soil Not Oil*, Vandana Shiva explains that a world beyond dependence on fossil fuels and globalization is both possible and necessary. Condemning industrial agriculture as a recipe for ecological and economic disaster, Shiva champions the small, independent farm: their greater productivity, their greater potential for social justice as they put more resources into the hands of the poor, and the biodiversity that is inherent to the traditional farming practiced in small-scale agriculture. What we need most in a time of changing climates and millions who are hungry, she argues, is sustainable, biologically diverse farms that are more resistant to disease, drought, and flood. “The solution to climate change,” she observes, “and the solution to poverty are the same.” *Soil Not Oil* proposes a solution based on self-organization, sustainability, and community rather than corporate power and profits.

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This volume provides an abundance of valuable information on emerging eco-friendly technology and its potential role in combating climate change via agroforestry. The volume begins by describing the recent understanding of the scenario of climate change and its issues and challenges and provides an in-depth analysis of the potential of agroforestry toward climate change mitigation and adaptation. Chapters address a wide range of techniques and methods for mitigating the negative aspects of climate change through agroforestry, such as vermicomposting, carbon sequestration, horticulture techniques, nutrient sequestration and soil sustainability, conservation of medicinal plant resources, silvipastoral systems, phytoremediation techniques, and more. The book also looks at livelihood security and the role of agroforestry. Key features: Provides updated information and recent developments in the field of climate change and agroforestry Looks at a variety of eco-friendly methods being employed to help mitigate climate change through agroforestry Provides recommendations and suggestions to build harmony between agroforestry and climate change Discusses new insights on the role of agroforestry toward combating climate change as well as maintaining the sustainability of ecosystems

Our Earth is considered as a natural system which organizes and controls itself. However, the present scale of anthropogenic activity is unprecedented in the history of mankind compelling the intelligentsia to ponder over the scientific causes of the problems, processes and sustainable and pragmatic solutions. The current rate of resource use and consumption pattern are depleting the planet's finite resources and damaging life-supporting ecosystems. A large number of toxic substances are increasingly found in air, water, soil, and flora and fauna. We are in the midst of a period of increasing interconnected and complex global challenges that seek action across temporal and spatial scales, diverse sectors, and concerted efforts from global citizens. The environment on account of human's action has been experiencing imbalances and ecological catastrophe. Environmental issues like global climate change, biodiversity loss, the rapid depletion of natural resources, degradation of global commons, stratospheric ozone depletion have been restricting the safe operating space and transgressing the planetary boundaries endangering the existence of human societies. The global environmental problems if not scientifically managed may end up in the civilizational collapse. Nevertheless, the underlying commonality among these environmental issues is interrelatedness, complexity, and difficulty in identifying and implementing solutions. The global environmental challenges can be managed by adopting sustainable green technologies which dovetails the principles of environmental sustainability with social and ecological sustainability. Green growth is construed as a new development paradigm that sustains economic growth while at the same time ensuring environmental sustainability. Contaminants and Clean Technologies provides valuable information on environmental contaminants such as industrial pollutants, micropollutants, pesticides, endocrine disruptors, pharmaceuticals, toxins, and hormones. It

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focuses on the various types of environmental contaminants discharged from various sources; their toxicological effects in environments, humans, animals, and plants; and their removal methods. It also covers, comprehensively, information on the contaminants released by various industries and agricultural practices, which cause severe threats to the environment. Features of the book: Elucidates systematic information on various types of environmental contaminants, and their fate and consequences Discusses contaminants such as endocrine disruptors, pharmaceutical waste, and personal care products Provides an overview of physicochemical and biological treatment technologies for sustainable development Details recent research finding in the area of environmental contaminants and their future challenges

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 application in plant growth promotion, soil fertility, microbial biomass and diversity, and environmental sustainability through bioremediation, biodegradation, and biosorption processes Features: Discusses microbes and their applications for sustainable agriculture and environmental protection in agro-environmental circumstances Presents innovative and eco-friendly approaches for the remediation of contaminated soil and wastewater Focuses on green technologies and sustainability Includes chapters on sustainable agriculture development through increasing soil fertility, physico-chemical properties and soil microbial biomass in nutrient-deprived soils Defines the role of microbial bio formulation-based consortia in the productivity improvement of agricultural crops It will be an invaluable addition to the bookshelves of researchers and graduate students in agriculture and environmental engineering, soil science; microbiology, sustainable agriculture, and ecosystems. Dr. Chhatarpal Singh is presently the President of Agro Environmental Development Society (AEDS), Majhra Ghat, Rampur, Uttar Pradesh, India. Dr. Tiwari is currently working in the field of methanotrophs ecology (methane oxidizing bacteria), which is sole entity responsible for the oxidation of potent greenhouse gas CH₄. Dr. Jay Shankar Singh is presently working as a faculty member in the Department of Environmental Microbiology at Babasaheb Bhimrao Ambedkar University in Lucknow, India. Dr. Ajar Nath Yadav is currently serving as an assistant professor in the Department of Biotechnology, Akal College of Agriculture, Eternal University, Baru Sahib, Himachal Pradesh, India.

Agriculture is the main occupation in India and about 75% of its population depends directly or indirectly on agriculture for their livelihood. It is the dominant

sector that contributes 18% of the gross domestic product. Thus, agriculture is the foundation of the Indian economy. The maximum share of Indian exports is also from the agriculture sector. As the population of the country is increasing tremendously, approximately at the rate of 19 million every year over the existing population of more than 1 billion (approximately 1.18 billion), the food grain production must necessarily be increased. This can be done by increasing crop production to match the population growth rate of 2.2% per annum, which is expected to stabilize at 1.53 billion around 2050. There is no doubt that the Green Revolution in India during the late 1960s brought self-sufficiency in food grain production, mainly through the increase in rice and wheat crop yields – the two main crops of the country which play an important role from food security point of view. However, the excessive use of fertilizers and pesticides, and the neglect of organic manures for these crops, has resulted in the deterioration of physical, chemical and biological health of the rice and wheat-growing soils. Owing to the deterioration of the health of these soils, the productivity of the rice–wheat cropping system has now either got reduced or in some places has become constant for the last decade.

Microbes are the most abundant organisms in the biosphere and regulate many critical elemental and biogeochemical phenomena. Because microbes are the key players in the carbon cycle and in related biological reactions, microbial ecology is a vital research area for understanding the contribution of the biosphere in global warming and the response of the natural environment to climate variations. The beneficial uses of microbes have enabled constructive and cost-effective responses that have not been possible through physical or chemical methods. This new volume reviews the multifaceted interactions among microbes, ecosystems, and their pivotal role in maintaining a more balanced environment, in order to help facilitate living organisms coexisting with the natural environment. With extensive references, tables, and illustrations, this book provides valuable information on microbial utilization for environmental sustainability and provides fascinating insights into microbial diversity. Key features include: Looks at enhancing plant production through growth-promoting arbuscular mycorrhizae, endophytic bacteria, and microbiome networks Considers microbial degradation and environmental management of e-wastes and azo dyes Explores soil-plant microbe interactions in metal-contaminated soils Examines radiation-resistant thermophiles for engineered bioremediation Describes potential indigenous/effective microbes for wastewater treatment processes Presents research on earthworms and microbes for organic farming

Rural development technologies are critically important for the country to improve the quality of life in villages. In this context, held a National Workshop on “Technologies for Sustainable Rural Development: Having Potential of Socio-Economic Upliftment (TSRD–2014)” to frame a road map for the future which will lead to the development of rural areas and improve the socio-economic condition of rural masses through the intervention of Science and Technology.

Organic crop production is the science and art of growing field crops, fruits, vegetables, and flowers by adopting the essential principles of organic agriculture in soil building and conservation, pest management, and heirloom variety conservation. This book

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provides detailed insights into organic farming in agriculture, biological efficacy in the management of plant diseases, organic nutrient management, socio-economic dimensions of adoption of conservation practices, nonchemical weed control, plant growth promoting fungi for phytostimulation, nanotechnological approaches, and finally vermicomposting. The book primarily focuses on research and development based organic agriculture and horticulture production technologies, and has attempted to abridge information on organic crop production of the major food grain crops. The book also contains comprehensive information on the various related dimensions of organic crop production.

This title includes a number of Open Access chapters. Changing land-use practices and the role of soil biological diversity has been a major focus of soil science research over the past couple of decades—a trend that is likely to continue. The information presented in this book points to a holistic approach to soil management. The first part looks at the land use effects on soil carbon storage, and considers a range of factors including carbon sequestration in soils. The second part of the book presents research investigating the interactions between soil properties, plant species, and the soil biota.

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