

The Ecology Of The Nitrogen Cycle Ebooks Stuffyourhouse

This book contains the papers presented at a Nato Advanced Research Workshop entitled "DENITRIFICATION IN THE N-CYCLE," held in Braunschweig (W-Germany) from 24 to 27 Mai 1983. All expenses were provided by the North Atlantic Treaty Organization. The scientific programme was in the first instance planned by some members of the Eco-Science Panel under the stimulating organization of Dr. Oscar Ravera and the final programme was prepared in co-operation between Ravera and myself. However, even during the meeting important contributions were added. The meeting was hosted by the Microbiological Dept. of F.A.L., which also took care of the organizational aspects. Nitrate is constantly lost from both terrestrial and aquatic ecosystems, causing mixed feelings between ecologists and agriculturists. While bacteriologically very much is known, the ecology of the processes is still poorly understood, nor can it be evaluated what it means as an economic loss for farmers and world food production. Therefore this NATO Advanced Workshop was established to permit a limited number of scientists active in this field to come together for a short while to address the following objectives: 1) To exchange ideas between scientists (bacteriologists and ecologists) and agronomists. 2) To assess the state of the art. 3) To discuss the difficulties of experimentation in the field. 4) To define future research. In order to accomplish these objectives, the workshop was organized in three parts with the following themes: 1) Bacteriological aspects of denitrification

For researchers and graduates with any interest in plant or soil sciences, this fascinating study will be a godsend – it's the complete state of the art with regard to actinorhizal

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symbioses. The self-contained sixth volume of a comprehensive series on nitrogen fixation, it includes chapters that deal with all aspects of this symbiosis between actinorhizal plants and nitrogen-fixing bacteria. It also contains information both about symbionts and their ecological role and use. Other chapters tackle the global distribution of different actinorhizal plants and their microsymbionts and how this impacts the question of co-evolution of the micro- and macrosymbionts as well as comparing the actinorhizal and leguminous symbioses. No other book provides the up-to-date and in-depth coverage of this volume.

This book provides an introductory-level survey of biological nitrogen fixation, covering the role of the process in the global nitrogen cycle as well as its biochemistry, physiology, genetics, ecology, general biology and prospects for its future exploitation.

An integrated approach to understanding and mitigating the problem of excess nitrogen Human activities generate large amounts of excess nitrogen, which has dramatically altered the nitrogen cycle. Reactive forms of nitrogen, especially nitrate and ammonia, are particularly detrimental. Given the magnitude of the problem, there is an urgent need for information on reactive nitrogen and its effective management. Nitrogen Overload: Environmental Degradation, Ramifications, and Economic Costs presents an integrated, multidisciplinary review of alterations to the nitrogen cycle over the past century and the wide-ranging consequences of nitrogen-based pollution, especially to aquatic ecosystems and human health.

Structural chemistry and biochemistry of nitrogenase; Signal perception, transduction and cell cycle genes in nodulation; Plant genes involved in nodulation; Bacterium - plant surface interaction; Molecular microbial ecology; Nitrogen fixation

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systems; Nitrogen fixation in sustainable agriculture; Carbon-nitrogen metabolism in symbiotic systems; Oxygen regulation in nitrogen fixation; Model plants for nitrogen fixation and legume genetics; Coevolution of symbiotic systems. Anthropogenic activity has clearly altered the N cycle contributing (among other factors) to climate change. This book aims to provide new biotechnological approach representing innovative strategies to solve specific problems related to the imbalance originating in the N cycle. Aspects such as new conceptions in agriculture, wastewater treatment, and greenhouse gas emissions are discussed in this book with a multidisciplinary vision. A team of international authors with wide experience have contributed up-to-date reviews, highlighting scientific principles and their environmental importance and integrating different biotechnological processes in environmental technology. Nitrogen is an essential element for plant growth and development and a key agricultural input-but in excess it can lead to a host of problems for human and ecological health. Across the globe, distribution of fertilizer nitrogen is very uneven, with some areas subject to nitrogen pollution and others suffering from reduced soil fertility, diminished crop production, and other consequences of inadequate supply. Agriculture and the Nitrogen Cycle provides a global assessment of the role of nitrogen fertilizer in the nitrogen cycle. The focus of the book is regional, emphasizing the need to maintain food and fiber production while minimizing environmental impacts where fertilizer is abundant, and the need to enhance fertilizer utilization in systems where nitrogen is limited. The book is derived from a workshop held by the Scientific Committee on Problems of the Environment (SCOPE) in Kampala, Uganda, that brought together the world's leading scientists to examine and discuss the nitrogen cycle and related problems. It contains an overview chapter

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that summarizes the group's findings, four chapters on cross-cutting issues, and thirteen background chapters. The book offers a unique synthesis and provides an up-to-date, broad perspective on the issues of nitrogen fertilizer in food production and the interaction of nitrogen and the environment.

Many people learn the rudiments of the nitrogen cycle while at school, but the details of the various processes in the cycle are still not widely understood. Some of them are of great current interest, such as the use of nitrogen fixing crops to feed an increasing world population and the problems of pollution of groundwaters by nitrates. Denitrification (forming nitrogen gas) as a way of getting rid of waste from human and intensively farmed animals. This book describes the general processes of the nitrogen cycle, then gives examples of how the cycle is modified under particular ecological and geographical conditions. These examples are drawn from all the major areas of the world, and the impact of man via agriculture, forestry and fuel combustion is discussed. Numerous references are included. The book provides a background for all those whose specialist interests interact with nitrogen cycling, whether they are involved in research or have responsibility for managing the environment.

The First International Nitrogen Conference provided an opportunity for researchers and decision-makers to exchange information on environmental pollution by nitrogen compounds on three scales: global, continental/regional and local. The main topics were air, ground water and surface water pollution; emission sources, atmospheric chemistry, deposition processes and effects; disturbance of nitrogen cycles, critical loads and levels; assessments, policy development and evaluation; target groups and abatement techniques; and

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new approaches leading to an integrated abatement strategy. The peer-reviewed papers from the Conference presented in this volume will provide readers with a comprehensive review of the transport, deposition and impact on ecosystems of nitrogen.

Nitrogen is an essential element in biological systems, and one that often limits production in both aquatic and terrestrial systems. Due to its requirement in biological macromolecules, its acquisition and cycling have the potential to structure microbial communities, as well as to control productivity on the ecosystem scale. In addition, its versatile redox chemistry is the basis of complex biogeochemical transformations that control the inventory of fixed nitrogen, both in local environments and over geological time. Although many of the pathways in the microbial nitrogen cycle were described more than a century ago, additional fundamental pathways have been discovered only recently. These findings imply that we still have much to learn about the microbial nitrogen cycle, the organisms responsible for it, and their interactions in natural and human environments. Progress in nitrogen cycle research has been facilitated by recent rapid technological advances, especially in genomics and isotopic approaches. In this Research Topic, we reviewed the leading edge of nitrogen cycle research based on these approaches, as well as by exploring microbial processes in modern ecosystems.

Nitrogen is indispensable to all life on Earth. However, humans now dominate the nitrogen cycle, and nitrogen emissions from human activity have real costs: water

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and air pollution, climate change, and detrimental effects on human health, biodiversity, and natural habitats. Too little nitrogen limits ecosystem processes, while too much nitrogen transforms ecosystems profoundly. The California Nitrogen Assessment is the first comprehensive account of nitrogen flows, practices, and policies for California, encompassing all nitrogen flows—not just those associated with agriculture—and their impacts on ecosystem services and human wellbeing. How California handles nitrogen issues will be of interest nationally and internationally, and the goal of the assessment is to link science with action and to produce information that affects both future policy and solutions for addressing nitrogen pollution. This book also provides a model for application of integrated ecosystem assessment methods at regional and state (subnational) levels.

Human activity has dramatically altered the global nitrogen cycle in recent decades. These changes are not evenly distributed around the world; rather, they are greatest in regions of significant industrial and agricultural activity, as the synthesis and use of inorganic fertilizers, cultivation of legumes, burning of fossil fuels, and the simple act of concentrating humans and animals in dense populations all lead to the release of excess, reactive forms of nitrogen into the environment. In part because reactive nitrogen is frequently a limiting nutrient in many terrestrial and aquatic systems, an excess can lead to a variety of adverse effects on both environmental and human health. The North Atlantic Ocean and its contributing watersheds constitute a

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region which has seen perhaps the greatest increase in anthropogenically-derived nitrogen. In May of 1994, the International Scope Nitrogen Project, with funding from the Andrew Mellon Foundation, the United Nations Environment Program, and the World Meteorological Organization, sponsored a workshop held on Block Island, RI, USA, entitled 'Nitrogen Dynamics of the North Atlantic Basin'. More than 50 scientists from 12 different countries convened with a unique set of goals: an integrated and comprehensive estimate of the current nitrogen cycle of the ocean, coastal systems, and contributing watersheds of the North Atlantic region; an analysis of human-induced changes to those cycles; and an assessment of the current and future effects of human-induced changes to nitrogen cycling throughout the globe.

This book highlights the latest discoveries about the nitrogen cycle in the soil. It introduces the concept of nitrogen fixation and covers important aspects of nitrogen in soil and ecology such as its distribution and occurrence, soil microflora and fauna and their role in N-fixation. The importance of plant growth-promoting microbes for a sustainable agriculture, e.g. arbuscular mycorrhizae in N-fixation, is discussed as well as perspectives of metagenomics, microbe-plant signal transduction in N-ecology and related aspects. This book enables the reader to bridge the main gaps in knowledge and carefully presents perspectives on the ecology of biotransformations of nitrogen in soil.

Ecology is characterized by a rapidly growing complexity and diversity of facts, aspects, examples, and

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observations. What is badly needed is the development of common patterns, of rules that, as in other sciences such as physics, can more generally explain the increasing complexity and variability we observe. Tom White, being one of the "seniors" in ecology, makes such an attempt in his book. The pattern he shows and explains with numerous examples from the entire animal kingdom is a universal hunger for nitrogen, a misery that drives the ecology of all organisms. He advocates that the awareness of this fundamental role that the limitation of nitrogen plays in the ecology of all organisms should be as a much part of each ecologist's intellectual equipment as is the awareness of the fact of evolution by means of natural selection. His claim is that not "energy" but "nitrogen" is the most limited "currency" in the animal world for the production and growth of their young. Biological nitrogen fixation has essential role in N cycle in global ecosystem. Several types of nitrogen fixing bacteria are recognized: the free-living bacteria in soil or water; symbiotic bacteria making root nodules in legumes or non-legumes; associative nitrogen fixing bacteria that resides outside the plant roots and provides fixed nitrogen to the plants; endophytic nitrogen fixing bacteria living in the roots, stems and leaves of plants. In this book there are 11 chapters related to biological nitrogen fixation, regulation of legume-rhizobium symbiosis, and agriculture and ecology of biological nitrogen fixation, including new models for autoregulation of nodulation in legumes, endophytic nitrogen fixation in sugarcane or forest trees, etc. Hopefully, this book will contribute to biological, ecological, and agricultural

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sciences.

Discusses a different approach to addressing environmental problems, aimed at a broad interdisciplinary audience.

Carbon and Nitrogen in the Terrestrial Environment is a comprehensive, interdisciplinary description of C and N fluxes between the atmosphere and the terrestrial biosphere; issues related to C and N management in different ecosystems and their implications for the environment and global climate change; and the approaches to mitigate emission of greenhouse gases. Drawing upon the most up-to-date books, journals, bulletins, reports, symposia proceedings and internet sources documenting interrelationships between different aspects of C and N cycling in the terrestrial environment, Carbon and Nitrogen in the Terrestrial Environment fills the gap left by most of the currently available books on C and N cycling. They either deal with a single element of an ecosystem, or are related to one or a few selected aspects like soil organic matter (SOM) and agricultural or forest management, emission of greenhouse gases, global climate change or modeling of SOM dynamics.

The latest volume in the Long-Term Ecological Research series, presenting two decades of research on the sustainability of temperate, row-crop ecosystems in the Midwestern United States. The groundbreaking Encyclopedia of Ecology

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provides an authoritative and comprehensive coverage of the complete field of ecology, from general to applied. It includes over 500 detailed entries, structured to provide the user with complete coverage of the core knowledge, accessed as intuitively as possible, and heavily cross-referenced. Written by an international team of leading experts, this revolutionary encyclopedia will serve as a one-stop-shop to concise, stand-alone articles to be used as a point of entry for undergraduate students, or as a tool for active researchers looking for the latest information in the field. Entries cover a range of topics, including: Behavioral Ecology Ecological Processes Ecological Modeling Ecological Engineering Ecological Indicators Ecological Informatics Ecosystems Ecotoxicology Evolutionary Ecology General Ecology Global Ecology Human Ecology System Ecology The first reference work to cover all aspects of ecology, from basic to applied Over 500 concise, stand-alone articles are written by prominent leaders in the field Article text is supported by full-color photos, drawings, tables, and other visual material Fully indexed and cross referenced with detailed references for further study Writing level is suited to both the expert and non-expert Available electronically on ScienceDirect shortly upon publication Review of the principles and management implications related to nitrogen in the soil-plant-water

system.

Nitrogen (N) is potentially one of the most complex elements on the Earth. It is necessary for all biological activity, but creates negative impacts on water and air quality. There is a balancing act between deficiency and surplus and the forms of N available further complicate our understanding of the dynamics. Biological fixation provides some plants with N supply while others are totally dependent upon N being available in the soil profile for the roots to extract. Nevertheless, the demand for N will increase because the human population with its increasing growth requires more protein and thus more N. Understanding the global N cycle is imperative to meeting current and future nitrogen demands while decreasing environmental impacts. This book discusses availability, production, and recycling of N in air, water, plants, and soils. It features information on N impacts to soil and water quality, management of N in agroecosystems, and techniques to maximize the use efficiency while minimizing the risks of leakage of reactive N into the environment. This volume in the Advances in Soil Science series is specifically devoted to availability, production, and recycling of N with impact on climate change and water quality, and management of N in agroecosystems in the context of maximizing the use efficiency and minimizing the risks of leakage of reactive N (NO_3^- , N_2O) into the environment. ? ?

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Jointly published with INRA, Paris. This book covers all aspects of the transfer of nitrogen from the soil and air to a final resting place in the seed protein of a crop plant. It describes the physiological and molecular mechanisms of ammonium and nitrate transport and assimilation, including symbiotic nitrogen fixation by the Rhizobiacea. Amino acid metabolism and nitrogen traffic during plant growth and development and details of protein biosynthesis in the seeds are also extensively covered. Finally, the effects of the application of nitrogen fertilisers on plant growth, crop yield and the environment are discussed. Written by international experts in their field, *Plant Nitrogen* is essential reading for all plant biochemists, biotechnologists, molecular biologists and physiologists as well as plant breeders, agricultural engineers, agronomists and phytochemists.

This volume quantifies carbon storage in managed forest ecosystems not only in biomass, but also in all soil compartments. It investigates the interaction between the carbon and nitrogen cycles by working along a north-south transect through Europe that starts in northern Sweden, passes through a N-deposition maximum in central Europe and ends in Italy. For the first time biogeochemical processes are linked to biodiversity on a large geographic scale and with special focus on soil organisms. The accompanying CD-ROM provides a complete

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database of all flux, storage and species observations for modellers.

Agriculture transforms the environment. The simplification of agroecosystems structure increases the hazards of leaching, wind and water erosion, and volatilization of chemicals from soil. Soil nitrogen is of interest as a major crop nutrient, but also as a potential environmental pollutant. Knowledge about the behavior of soil nitrogen is desirable in order to optimize plant growth and crop yield and to minimize environmental side effects. This book also gives information about the function of biogeochemical barriers in the form of shelterbelts, which efficiently decrease the concentrations of various forms of nitrogen in ground water.

The Ecology of the Nitrogen Cycle
Cambridge University Press

Nitrogen is one of the most critical elements for all life forms. In agricultural systems it is essential for the production of crops for feed, food, and fiber. The ever-increasing world population requires increasing use of nitrogen in agriculture to supply human needs for dietary protein. Worldwide demand for nitrogen will increase as a direct response to increasing population. Nitrogen in the Environment provides a wholistic perspective and comprehensive treatment of nitrogen. The scope of this book is diverse covering a range of topics and issues related to furthering our understanding of nitrogen in the environment at farm and national levels. Issues of nitrogen from its effects on crops and human nutrition to

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nitrogen in ground water, watersheds, streams, rivers, and coastal marine environments are discussed to provide a broad view of the problem and support scientists, researchers, and engineers in formulating comprehensive solutions. * The only source which presents an international, wholistic perspective of the effects of nitrogen in the environment with worldwide mitigation practices * Provides details on how to improve the quality of the environment by analyzing the development of emerging technologies * Develops strategies to be used by soil scientists, agronomists, hydrologists, and geophysicists for broad scale improvement of nitrogen efficiency

Nitrogen in the Marine Environment provides information pertinent to the many aspects of the nitrogen cycle. This book presents the advances in ocean productivity research, with emphasis on the role of microbes in nitrogen transformations with excursions to higher trophic levels. Organized into 24 chapters, this book begins with an overview of the abundance and distribution of the various forms of nitrogen in a number of estuaries. This text then provides a comparison of the nitrogen cycling of various ecosystems within the marine environment. Other chapters consider chemical distributions and methodology as an aid to those entering the field. This book discusses as well the enzymology of the initial steps of inorganic nitrogen assimilation. The final chapter deals with the philosophy and application of modeling as an investigative method in basic research on nitrogen dynamics in coastal and open-ocean marine environments. This book is a

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valuable resource for plant biochemists, microbiologists, aquatic ecologists, and bacteriologists.

Sustainability has a major part to play in the global challenge of continued development of regions, countries, and continents all around the World and biological nitrogen fixation has a key role in this process. This volume begins with chapters specifically addressing crops of major global importance, such as soybeans, rice, and sugar cane. It continues with a second important focus, agroforestry, and describes the use and promise of both legume trees with their rhizobial symbionts and other nitrogen-fixing trees with their actinorhizal colonization. An over-arching theme of all chapters is the interaction of the plants and trees with microbes and this theme allows other aspects of soil microbiology, such as interactions with arbuscular mycorrhizal fungi and the impact of soil-stress factors on biological nitrogen fixation, to be addressed.

Furthermore, a link to basic science occurs through the inclusion of chapters describing the biogeochemically important nitrogen cycle and its key relationships among nitrogen fixation, nitrification, and denitrification. The volume then provides an up-to-date view of the production of microbial inocula, especially those for legume crops.

Nitrogen in the Environment: Sources, Problems, and Management is the first volume to provide a holistic perspective and comprehensive treatment of nitrogen from field, to ecosystem, to treatment of urban and rural drinking water supplies, while also including a historical overview, human health impacts and policy

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considerations. It provides a worldwide perspective on nitrogen and agriculture. Nitrogen is one of the most critical elements required in agricultural systems for the production of crops for feed, food and fiber. The ever-increasing world population requires increasing use of nitrogen in agriculture to supply human needs for dietary protein. Worldwide demand for nitrogen will increase as a direct response to increasing population. Strategies and perspectives are considered to improve nitrogen-use efficiency. Issues of nitrogen in crop and human nutrition, and transport and transformations along the continuum from farm field to ground water, watersheds, streams, rivers, and coastal marine environments are discussed. Described are aerial transport of nitrogen from livestock and agricultural systems and the potential for deposition and impacts. The current status of nitrogen in the environment in selected terrestrial and coastal environments and crop and forest ecosystems and development of emerging technologies to minimize nitrogen impacts on the environment are addressed. The nitrogen cycle provides a framework for assessing broad scale or even global strategies to improve nitrogen use efficiency. Growing human populations are the driving force that requires increased nitrogen inputs. These increasing inputs into the food-production system directly result in increased livestock and human-excretory nitrogen contribution into the environment. The scope of this book is diverse, covering a range of topics and issues from furthering our understanding of nitrogen in the environment to policy considerations at both farm and national scales.

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This volume on botanical research in tundra represents the culmination of four years of intensive and integrated field research centered at Barrow, Alaska. The volume summarizes the most significant results and interpretations of the primary producer projects conducted in the U.S. IBP Tundra Biome Program (1970-1974). Original data reports are available from the authors and can serve as detailed references for interested tundra researchers. Also, the results of most projects have been published in numerous papers in various journals. The introduction provides a brief overview of other ecosystem components. The main body presents the results in three general sections. The summary chapter is an attempt to integrate ideas and information from the previous papers as well as extant literature. In addition, this chapter focuses attention on processes of primary production which should receive increased emphasis. Although this book will not answer all immediate questions, it hopefully will enhance future understanding of the tundra, particularly as we have studied it in Northern Alaska.

Nitrogen is a key element in ecosystem processes. Aspects of local and global changes in nitrogen in both undisturbed and disturbed conditions are discussed. Environmental changes caused by pollution from nitrogenous compounds and changes in land use are also described. Organisms, plants, animals and microorganisms are all affecting nitrogen supply. Emphasis is placed on natural and anthropogenic transfer of nitrogen between ecosystems and also on the interaction of nitrogen with other bioelements.

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This issue is the final report from the International SCOPE Project on Nitrogen Transport and Transformations: A Regional and Global Analysis. SCOPE (the Scientific Committee on Problems of the Environment, ICSU) authorized the Nitrogen Project as an 8-year effort between 1994 and 2002 because of the need to better understand how humans have altered nitrogen cycling globally and at the scale of large regions. Human activity has more than doubled the rate of formation of reactive nitrogen on the land surface of the earth, and the nitrogen cycle continues to accelerate. The distribution of this reactive nitrogen is not uniform, though, and some regions such as Europe and Asia have seen massive increases in reactive nitrogen, while other regions have seen little change. The SCOPE Nitrogen Project has synthesized detailed information on the nature of the human alteration of the nitrogen cycle through a series of workshops over the past 8 years. These cumulatively have involved over 250 of previous workshops scientists from over 20 different nations. The results have been published in a series of special journal issues and reports that synthesize information on nitrogen in the North Atlantic Ocean and its water sheds (Howarth 1996), nitrogen cycling in Asia (Hong-Chi Lin et al. 1996; Mosier et al.

In *The Story of N*, Hugh S. Gorman analyzes the notion of sustainability from a fresh perspective—the integration of human activities with the biogeochemical cycling of nitrogen—and provides a supportive alternative to studying sustainability through the lens of climate change and the cycling of carbon. It is the first book to examine

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the social processes by which industrial societies learned to bypass a fundamental ecological limit and, later, began addressing the resulting concerns by establishing limits of their own. The book is organized into three parts. Part I, "The Knowledge of Nature," explores the emergence of the nitrogen cycle before humans arrived on the scene and the changes that occurred as stationary agricultural societies took root. Part II, "Learning to Bypass an Ecological Limit," examines the role of science and market capitalism in accelerating the pace of innovation, eventually allowing humans to bypass the activity of nitrogen-fixing bacteria. Part III, "Learning to Establish Human-Defined Limits," covers the twentieth-century response to the nitrogen-related concerns that emerged as more nitrogenous compounds flowed into the environment. A concluding chapter, "The Challenge of Sustainability," places the entire story in the context of constructing an ecological economy in which innovations that contribute to sustainable practices are rewarded.

Presenting the first continental-scale assessment of reactive nitrogen in the environment, this book sets the related environmental problems in context by providing a multidisciplinary introduction to the nitrogen cycle processes. Issues of upscaling from farm plot and city to national and continental scales are addressed in detail with emphasis on opportunities for better management at local to global levels. The five key societal threats posed by reactive nitrogen are assessed, providing a framework for joined-up management of the nitrogen cycle in Europe, including the first cost-benefit analysis

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for different reactive nitrogen forms and future scenarios. Incorporating comprehensive maps, a handy technical synopsis and a summary for policy makers, this landmark volume is an essential reference for academic researchers across a wide range of disciplines, as well as stakeholders and policy makers. It is also a valuable tool in communicating the key environmental issues and future challenges to the wider public.

All organisms require nitrogen to live and grow. The movement of nitrogen between the atmosphere, biosphere, and geosphere in different forms is described by the nitrogen cycle. This book is an activity of the COST 856 Action on Denitrification. It covers all aspects of the N-cycle: chemistry, biology (enzymology, molecular biology), physics, applied aspects (greenhouse effect, N-pollution problems, practices in farming, in waste-water treatment, and more). In this book, leading editors offer the latest research available on denitrification (reduction of nitrates or nitrites commonly by bacteria- as in soil). * Provides details on denitrification and its general role in the environment * Offers latest research in N-Cycle and its reactions * Discusses impacts on various environments: agriculture, wetlands, plants, waste-water treatment and more * The only book available in the field since the last 20 years * Contains 27 chapters written by internationally highly recognized experts in the field * Covers all modern aspects, emphasizes molecular biology and ecology * Written in an easily understandable way

Nitrogen fertilizers are the inescapable necessity to enhance agricultural production and to sustain food

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security. However, their inefficient use accrues from inherent limitations of the crop plants as well as the manner in which N fertilizers are formulated, applied and managed. Excessive accumulation of N in the environment leads to soil acidification, pollution of groundwater and eutrophication of surface water, posing a public health problem as well as ecosystem imbalance. Moreover, the ozone layer depletion and greenhouse effects of NO_x gases have global implications.

Agricultural Nitrogen Use: Environmental Implications provides a comprehensive, interdisciplinary description of problems related to the efficient use of nitrogen in agriculture, in the overall context of the nitrogen cycle, its environmental and human health implications, as well as various approaches to improve N use efficiency. The book is presented in six sections: N Use, Flows and Cycling in Agricultural Systems; N Use Efficiency in Crop Ecosystems; Management Options and Strategies for Enhancing N Use Efficiency; Plant Physiological and Molecular Aspects of Enhancing N Use Efficiency; Role of Legumes and Biofertilizers in Agricultural N Economy; and Environmental and Human Health Implications.

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