BOOK REVIEWS

Agriculture and the Nitrogen Cycle. Assessing the Impacts of Fertilizer Use on Food Production and the Environment. SCOPE Series no. 65

The Scientific Committee on Problems of the Environment (SCOPE) has joined forces with the International Geosphere–Biosphere Programme to develop the International Nitrogen Initiative (INI). The goal of the INI is to develop a sustainable approach to managing N utilization for food and energy while minimizing the release of active N compounds to the environment. This book presents the initial step in the development of INI’s science base and is an updated international assessment of the efficiency and consequences of fertilizer N use.

The book is conveniently broken into several sections that include crosscutting issues, low and high input systems, interactions and scales relating to fertilizer N use and efficiencies, and the challenges that still exist in meeting the worldwide demand for food and fiber while minimizing detrimental effects to the environment. Case studies are presented for different countries and different agricultural systems. For instance, low N input systems in Denmark are shown to have reduced their N surpluses, maintained productivity, and increased overall N use efficiency from 42 to 52% over the last 15 years; a case study from the U.S. Midwest demonstrates how advanced technologies such as calibrated manure application equipment can be utilized to achieve reduced N inputs and maintain productivity.

Thought provoking facts are constantly presented to the reader: for example, “Current data suggest that about 50% of the fertilizer N applied in the world is lost” or the fact that “The use of controlled-release fertilizer has almost doubled in the last 10 years, but still only accounts for only 0.15% of the total fertilizer N used.” The information presented will surely assist in providing the rationale and stimulus for further research to improve the fate of fertilizer N in agricultural systems and to reduce emissions to the environment.

Nitrogen cycling and N use efficiencies are discussed at many scales from experimental plots to global-regional scales. For example, the text has an interesting discussion on how the transfer of agricultural products between the world’s regions results in a redistribution of N. Another chapter, using country and regional examples, discusses how societal priorities and processes have driven N fertilizer accessibility and its use.

In summary, this is not a book on the minutiae of potential N transformation processes that fertilizer N can undergo in agricultural systems. Look elsewhere for that. Rather, it is a book that paints a broader picture and is a synthesis of recent knowledge that all policy makers, researchers, and graduate students involved in, or contemplating, the study of N fertilizer will find compulsory and thought provoking.

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doi:10.2134/jeq2005.0009br

Organic Phosphorus in the Environment

This book is the outcome of the Organic Phosphorus Workshop held during July 2003 in Ascona, Switzerland, that brought together an international group of scientists working on the diverse aspects of organic phosphorus (P) in terrestrial and aquatic environments. Organic P is ubiquitous in the terrestrial and aquatic environments and constitutes a significant proportion of total P, yet the role of organic P in ecosystem functioning is still poorly understood.

Our understanding of reactions and mechanisms regulating inorganic P in environmental process is relatively strong, supported by many decades of research and a voluminous amount of publications. However, despite some recent advances in the understanding of the role of organic P in the environment there has been no comprehensive publication on this vital topic. This book contains comprehensive reviews of organic P characterization and transformations in terrestrial and aquatic environments, and is a timely publication.

The book consists of 17 chapters written by some of the leading international scientists. Each chapter gives a thorough and in-depth analysis of the research undertaken on organic P in terrestrial and aquatic environments and is backed up by clear illustrations and a critical note on the future directions of research. These chapters are organized into three main sections.

Section 1 (three chapters) describes analytical techniques used to characterize organic P in environmental samples. The investigation of organic P in the environment has been hampered by the lack of suitable techniques for detecting diverse ranges of chemical compounds present in soil, water, and sediment samples. The chapters cover the state-of-the-art procedures involving chromatographic separation, nuclear magnetic resonance spectroscopy, and mass spectroscopy to measure organic P, and to isolate, quantify, speciate, and characterize individual organic P compounds at the molecular level in soil and natural waters.

Section 2 (seven chapters) address processes that control organic P behavior in terrestrial and aquatic environments. The chapters in this section cover the role of hydrolytic and photolytic reactions in the abiotic degradation of natural and synthetic organic P compounds; the enzymatic hydrolysis of organic P with reference to classical inorganic and organic compartmental analysis of P compounds in ecosystems; abiotic stabilization in relation to adsorption to soil minerals, complexion reactions, and precipitation with polyvalent cations and incorporation of organic P into humic substances; microbial turnover of organic P in aquatic systems and ecological aspects of phosphatase activity in relation to P utilization by phototrophs; and utilization of organic P by higher plants, in particular the importance of rhizosphere phosphatase activity and its role in hydrolyzing organic P in soil.

Section 3 (seven chapters) integrates the abiotic and biotic transformation processes of organic P at an ecosystem level. The chapters in this section aim to synthesize information on the dynamics of organic P in tropical agroecosystems, with special emphasis on the effects of management practices on soil organic P dynamics; organic P transfer from the terrestrial