

Book review

Nutrient disequilibria in agricultural ecosystems edited by E. M. A. Smaling, O. Oenema, and L.O. Fresco. CABI Publishing, Wallingford, UK. 1999. 336 p. Hardback. ISBN 0-85199-268-4. Price £60.00; US\$110.00.

This book draws together a considerable amount of information on the causes of nutrient imbalances in agroecosystems and examines ways of quantifying and managing nutrient stocks. In addition to soil, plant, and animal sciences, this challenging topic incorporates ecology, economics, and policy development. It will be of interest to everyone concerned about the sustainability of agricultural production systems, the impacts of land management on the environment, and the efficient use of fertilisers, and, as such, is a very timely publication.

The Preface includes a plea to economists to recognise the value of natural resources such as soil, water, and air. The examples listed in the Preface to “illustrate the importance of carbon and nutrient stocks and flows” include some interesting emphases. For example, the loss of nutrients caused by deforestation in the tropics may be “saddening” for soil scientists but, I suggest, it is tragic for the local inhabitants. Similarly, the value of nutrients deposited by flood waters may be small compensation for peasant farmers who lost their homes, stock, and current crops in the flood.

The first six chapters of the book are, in the editors’ terms, conceptual in nature and the next eight report on a series of case studies. The examples used are mainly concerned with managed ecosystems, including those in tropical, temperate, and aquatic environments.

The first chapter (van Noordwijk) briefly reviews the history of soil fertility research from the Rothamsted trials started in the 1840s to the more recent emphasis on modelling. It also contains a useful discussion of the efficiency of nutrient use in agroecosystems. Overall nutrient-use efficiency is separated into application, uptake, utilisation (conversion into plant or animal products), and harvest components. Although not original, these distinctions should help to remove some of the confusion resulting from poorly or undefined

references to nutrient use efficiency common in the literature. Efficiency is influenced by nutrient reactions in the soil, spatial variability in nutrient concentrations, nutrients lost by leaching and volatilisation, nutrients removed in produce, and economic factors. It also depends on identifying and achieving optimum concentrations of plant available nutrients for individual crops (Chapter 2, Janssen). However, Janssen’s assertion that a “perfect agroecosystem” is one in which there are no nutrient deficiencies or excesses and in which plants can absorb all available nutrients ignores the range of soil processes which influences the availability of fertiliser nutrients. The suggestion that a crop which removes all available nutrients can achieve full potential yield is also unrealistic.

Uncertainties in nutrient budgets are discussed in Chapter 4 (Oenema & Heinen). They identify possible sources of error and bias and conclude that the scale of errors in the various components of production systems should be identified and sampling systems developed to minimise them. Bias can be introduced by fraud if budgets are used to implement fertiliser-use policies.

The techniques proposed for improving nutrient management are largely conventional. They include minimising nutrients lost through leaching and erosion, adding nutrients as fertilisers and concentrates for livestock, recycling organic materials, and increasing the efficiency with which nutrients are used. Nutrient management also involves balancing economic and environmental concerns. The book acknowledges that all management strategies have associated risks but does little to suggest how these risks can be quantified and applied.

The discussion of economic policy for maintaining soil fertility (Chapter 6, Kuyven et al.) is largely based on examples from less developed countries. Similarly, many of the case studies in Chapters 7–11 present nutrient balances from various production systems in Africa and Asia. The remaining case studies include nitrogen cycling in Norwegian fisheries (Chapter 11, Bleken), a comparison of nutrient dynamics under a range of organic and conventional farming systems in Switzerland (Chapter 12, Mader et al.), and

