Biomass: Applications, Technology, and Production


This book written by one chemical engineer and two environmental engineers, is intended as a technical overview of biomass as an energy resource. The 10 chapters encompass the role of biomass in the energy cycle of the earth, socioeconomic and environmental factors associated with the use of biomass, sources of biomass, methods of energy production from biomass, and biomass production of proposed sea-farming systems. Although the book generally achieves its purpose as an overview, it is not a definitive text on what is known about biomass technology because of imbalances in presentation and the lack of recency in literature coverage.

One notable imbalance is evident after comparisons of the completeness of various technologies for deriving energy from biomass. Comparatively sophisticated, high-capacity boilers and incinerators are featured in the chapter on direct conversion, and grid systems for tethering giant brown kelp on a vast scale are covered in the sea-farming chapter. In contrast, the chapters for producing methane from agricultural residues and animal manures are taken from references up to 24 years old and have the capacity to meet the cooking needs of five families in a developing country. Unfortunately, the notable advances in methane generation made at several Agricultural Experiment Stations have been overlooked.

Most of the 187 references predate 1978, and more than two dozen prominent citations in the text and illustrations are reported of contract research institutes. The chapter on alternate sources of biomass is the weakest, notably in discussions of methods of increasing crop yield. The key reference in that section is an article from a leading business periodical.

The chapter on ethanol and other alcohols was written before the impact of gasohol on the U.S. fuel market, so it is devoid of recent farm- and industrial-scale technology for ethanol production, and of the low-energy processes for separating ethanol from water that are under development.

This book may be useful to instructors and students needing a general text for an upper level undergraduate course in biomass technology. Agricultural scientists will benefit primarily from information on alternate methods of deriving energy from biomass, except for the chapters on methane and ethanol—G. H. HEICHEL, Plant Science Research Unit, U.S. Department of Agriculture, SEA-4R, 1509 Gortner Avenue, St. Paul, MN 55108.

Cadmium in the Environment.

Part 1: Ecological Cycling


In recent years the toxicological significance of cadmium has received much interest, but to date there have been few attempts to evaluate the total ecosystem flow of the metal. This volume attempts to do this by describing the sources, distribution, transformations, and environmental flow of cadmium. The tenor of the volume concerns cadmium in the aquatic environment (approximately 400 pp) with little attention paid to cadmium in the terrestrial environment. This leads to the false concept that little research has occurred in the terrestrial cycle of cadmium.

The amount of repetition has been kept at a minimum despite the number of authors. There has been no attempt to reconcile differing views expressed by the authors. These controversial issues reflect the uncertain nature of present understanding and serve as a mental stimulus.

The first two chapters of the book put into perspective the impact of man on cadmium use and dispersion and lead to the conclusion that man's activity alters the flux of cadmium from passive to active reservoirs. Additionally, a discussion of the impact of cadmium on human health ensues. Chapters 3 and 4 discuss cadmium in the atmosphere and its ultimate deposition. It becomes apparent that point sources (smelters, coal burning power plants, metal processing plants, as well as incinerators) are the major inputs.

Cadmium in the aquatic environment (Chapters 5-13) is the major thrust of the book. These chapters deal with the quantity of cadmium in natural and polluted waters, its chemistry in the system, including partitioning into sediment, the influence of the chemical and physical properties of the sediment on cadmium chemistry, and the impact of cadmium on the biota of the systems. The remaining four chapters discuss cadmium in the terrestrial environment, its impact on plant quality and growth and potential impact on animals which consume the crops.

The multidisciplinary nature of this book makes it of interest to a wide spectrum of readers including environmental scientists, ecologists, biologists, agronomists, limnologists, as well as environmental managers. The book is well organized, illustrated with excellent diagrams, and easily readable. The literature citations at the end of each chapter are up-to-date and thus enhance the value of the book.—JAMES A. RYAN, U.S. Environmental Protection Agency, Cincinnati, OH 45268.


This book is the proceedings of a conference held in Rochester, New York in 1979 under the joint sponsorship of Cornell University and the International Joint Commission. The proceedings include 19 chapters dealing with evaluations of effects of phosphorus inputs on lake eutrophication and methods for the control of those inputs. The focus of the papers is almost entirely on the Great Lakes and, in particular, the lower and most eutrophic lakes—Erie and Ontario. The first five chapters deal with the assessment of point and diffuse sources of phosphorus to the Great Lakes and present strategies and objectives for phosphorus load reductions. While Lake Ontario and Superior are considered in their entirety, eutrophic Saginaw Bay is assessed separately from the rest of Lake Huron, and Erie is divided into Western, Central, and Eastern Basins.

The next five chapters all deal with various approaches to modeling the relationship between phosphorus loads and lake eutrophication. These include the stirred-cell empirical phosphorus budget model of Chapra (Chapter 6), the dynamic phosphorus response models of Thomann and Segna for Lake Ontario (Chapter 7) and Di Toro for Erie (Chapter 8), and the statistical phosphorus loading model of Vollenweider as applied to the Great Lakes (Chapter 9). In Chapter 10, Bierman compares these various modeling approaches and shows the effects each predict for reductions in point and diffuse sources of phosphorus loads.

The important issue of availability to phytoplankton of various sources of phosphorus is discussed in an excellent chapter by Lee, Jones, and Rast which reviews the growing literature on this subject, much of it from Great Lakes Basin studies.

The final eight chapters discuss control strategies for point and diffuse sources of phosphorus including wastewater treatment, stormwater management, and erosion control to reduce phosphorus losses from agricultural land.

This book is a good reference text for scientists, engineers, and managers in the field of water quality and nutrient control. It provides a state-of-the-art discussion of phosphorus/lake eutrophication modeling and phosphorus availability, and illustrates present perspectives on controlling point and diffuse phosphorus loads to the Great Lakes. It should also be applicable to those working on similar problems outside the Great Lakes Basin.—TERRY J. LOGAN, Agronomy Department, The Ohio State University, Columbus, Ohio.