
Preface

I obtained my M.S. degree in Soil Science in 1976, and I had been a teacher in the Department of Botany, University of Chittagong, Bangladesh, for 25 years since 1977. I taught undergraduate and graduate students of Botany the origin and development of soils, properties of soils, growth and distribution of plants in relation to properties of soils, soil fertility and productivity management, and soil conservation. I also gave lectures on different aspects of ecology, particularly edaphic factor of vegetation development and distribution, and agronomy, especially soil and crop management for sustainable yield. For sometime in the 1990s, I worked off and on as a guest faculty in the Institute of Forestry and Environmental Sciences, where I lectured on forest soils and forest soil management to the undergraduate students of forestry. Meanwhile, I obtained my Ph.D. in 1996 on the growth of teak (*Tectona grandis*) in relation to soil properties in the southeastern hilly areas of Bangladesh. I joined the Department of Soil Science in 2000 as the founding chair and have been working there as a professor since. Versatile as my academic experiences have been, I could see the connections of soil science with other relevant branches of knowledge and felt the necessity of integrating them in one volume.

During my studentship and teaching life, I had the opportunity to study some good books on soil science. I enjoyed much the works of H. O. Buckman and N. C. Brady (*The Nature and Properties of Soils*, 10th edn.); N. C. Brady and R.R. Weil (*The Nature and Properties of Soils*, 14th edn.); L. M. Turk and H. D. Foth (*Fundamentals of Soil Science*); M. J. Singer and D. N. Munns (*Soils: An Introduction*); M. E. Sumner (*Handbook of Soil Science*); R.L. Donahue, R. W. Miller, and J. C. Shikluna (*Soils: An Introduction to Soils and Plant Growth*); E. A. Fitzpatrick (*An Introduction to Soil Science*); C. A. Black (*Soil Plant Relationships*); E. J. Russel (*Soil Conditions and Plant Growth*); J. S. Joffe (*Pedology*); H. Jenny (*Factors of Soil Formation*); R. J. Schaetzl and S. Anderson (*Soils Genesis and Geomorphology*); R.E. Grim (*Clay Mineralogy*); F. E. Bear (*Chemistry of the Soil*); H.L.Bohn, B. L. McNeal, and G. A. O'Connor (*Soil Chemistry*); G. Sposito (*The Chemistry of Soils*); D. L. Sparks (*Environmental Soil Chemistry*); K. H. Tan (*Principles of Soil Chemistry*); USDA (*Soil Survey Manual, Soil Taxonomy*); USDA Salinity Laboratory Staff (*Diagnosis and Improvement of Saline and Alkali Soils*); L. D. Baver (*Soil Physics*); D. Hillel (*Introduction to Soil Physics*); M.B. Kirkham (*Principles of Soil and Plant Water Relations*); P. J. Kramer (*Plant and Soil Water Relationships: A Modern Synthesis*); H. Marschner (*Mineral Nutrition of Higher Plants*); H. D. Chapman (*Diagnostic Criteria for Plants and Soils*); M. M. Kononova (*Soil Organic Matter*); H. H. Benett (*Soil Conservation*); S. L. Tisdale, W. L. Nelson, and J. D. Beaton (*Soil Fertility and Fertilizers*); K. Kilham (*Soil Ecology*); R. P. C. Morgan (*Soil Erosion and Conservation*); N. van Breemen and P. Buurman (*Soil Formation*); A. Martin (*Introduction to Soil Microbiology*); F. J. Stevenson (*Cycles of Soil: Carbon, Nitrogen, Phosphorus, Sulfur, Micronutrients*); N. Juma (*The Pedosphere and Its Dynamics*); R. F. Fisher and D. Binkley (*Ecology and Management of Forest Soils*); K. A. Armson (*Forest Soils: Properties and Processes*), J. B. Jones, Jr. (*Agronomic Handbook*), and so on. These authors have stimulated my interest in learning soil science and delivering my acquired knowledge to my students in a systematic way. I have keenly noticed the responses of my students, whom I have seen to have hard times with information extraction and interpretation of texts, which led me to conclude that despite the availability of plenty of good texts, there is still scope of new books with novel styles of

presentation, updated information, and new interpretations. The present work is an attempt toward this.

Chapters 1, 2, 3, and 4 of this book emphasize soil as a natural dynamic body, its origin and development, and its systematic study for a better understanding of its properties and management. Chapter 1 deals with the concepts of soil—soil as it occurs in nature, its makeup, and ecosystem functions. Chapter 2 gives an account of the elemental, mineralogical, and petrological composition of the lithosphere and weathering of rocks and minerals including biogeochemical weathering and its products. Chapter 3 is a brief account of soil-forming factors and processes. Chapter 4 contains modern soil classification systems. Chapters 5, 6, 7, 8, and 9 describe physical, chemical, and biological properties of soils in relation to plant growth. Chapter 6 deals with soil water—water as a component of soil, its hydrological properties, moisture constants and potentials, water movement through soil and plant, water stress, and waterlogging. Irrigation and drainage methods have also been treated in considerable detail. Chapter 9 deals with biological properties of soils with a good account on soil fauna, which is not generally stressed in basic soil science books despite its significant role in determining soil characteristics. Chapter 10 addresses plant nutrients and soil fertility management. Physiological functions of nutrients in plants, behavior, and availability of nutrients in soil, plant nutrient requirements, nutrient interactions in plants and soils, soil fertility evaluation, organic and inorganic fertilizers, and methods of fertilizer application have been discussed with sufficient details. Problem soils and their management have been treated in Chap. 11. Chapter 12 reviews soil resources and soil degradation. Recent data and literature have been consulted to incorporate most recent developments in the field. This book has accommodated one chapter for wetland soils (Chap. 13) and another for forest soils (Chap. 14) unlike most fundamental soil science books. In spite of the fact that forests occupy almost one-third land area of the world and forest soils have tremendous ecological roles, they are not generally included in discussions of common basic soil science texts, which, in my view, is a major exclusion. Therefore, I have attempted to give a comprehensive yet concise account of forest soils. Chapter 15 emphasizes soil study in a changing climate, an issue that has attracted much attention in recent decades.

This book is intended for undergraduate and graduate students of soil science, and agricultural, biological, and environmental sciences, who study soil as a natural resource. Professionals, including agronomists, horticulturists, gardeners, geologists, geographers, ecologists, biologists, microbiologists, and silviculturists, may find something of their interest as well.

In this text, soil processes and properties have been explained with adequate examples, tables, and figures. In order to make matters comprehensive, necessary generalization and simplification were done, though bearing the danger of oversimplification of soil as a complex entity in mind. Students, I have noticed often, get overwhelmed by throngs of information without being able to have a complete understanding of the central concept. This is why I inserted meaningful messages in section headings so that even before going over a particular section, one might get the gist right away.



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