

Preface

Photosynthesis is the “reaction of life.” Through photosynthesis, plants convert the sun’s energy into a form that humans and other living creatures can use. To do this, they use carbon dioxide and produce oxygen. Photosynthesis is the original source of all important fuels, including oil, coal, wood, and natural gas. It is also the source of all foods, because all animals depend on plants at some point in the food chain. To work the magic that is photosynthesis, plants need a medium for their roots. Most often this is the soil, so to teach the science of using plants for human needs, an understanding of the soil is necessary.

As an author, my goal was to create a book that is useful and easy to use for both teaching and learning. To achieve this, a detailed outline guided the development of the book and the order of the chapters in the book. For each chapter, the outline became the chapter headings. Because these headings are in bold type and because the outline for each chapter is detailed, the book is easy to read and information can be found quickly.

Each chapter of the book features learning objectives, key terms (defined in the glossary), tables, charts, illustrations, and color photographs to aid the learning and teaching process. Learning objectives at the beginning of each chapter highlight the important concepts. The review questions at the end of each chapter are tied to the learning objectives to assess if the objectives were covered.

To further guide the learner and organize the 28 chapters, the book is divided into four major parts: (1) Introduction to Plants, (2) Fundamentals of Soil Science, (3) Fundamentals of Plant Growth and Propagation, and (4) Crops—Applied Plant and Soil Science.

The four chapters in Part 1 set the stage for learning plant science by covering the organization of the plant kingdom, the origins of cultivated plants, and the general structure and anatomy of cultivated plants. The anatomy of plants is discussed in the hierarchy of biochemicals, cells, tissue, and organs.

Six chapters in Part 2 provide a solid understanding of soils and other media for growing plants. These chapters cover soil materials and formation, land use and classification, soil fertility and management, soilless plant production, irrigation, and soils as related to organic farming.

Nine chapters in Part 3 include temperature, light, photosynthesis, and respiration and their role in plant growth and development. Chapters on plant growth at the cellular level and vegetative growth logically follow. Next, cultivated plants would be of little use to humans if they could not be propagated on a large scale; thus, the chapter on propagation details sexual and asexual propagation methods. Growing plants for human use also requires that plant pests be recognized and controlled. Finally, no text today would be complete without a chapter on genetic engineering and biotechnology.

Chapters 20 through 28 in Part 4 can be considered the practical application of Chapters 1 through 19 of the book. These eight chapters describe the production of major agronomic crops, grains, forage grasses, oil seeds, legumes, vegetables, small fruits, fruits, nuts, flowers, and sod.

Lastly, those who find learning about and using plants and soils enjoyable will want to be employed in the industry. Chapter 28 of the book provides ideas on necessary skills, education, and career paths in plant and soil science.

Every book on effective teaching and learning can be captured in an old Chinese proverb that says, "I hear, I forget; I see, I remember; I do, I understand." At the end of each chapter in this book, additional resources are listed and a "Knowledge Applied" section contains student activities. These sections are designed to get the students "doing" so that they begin "understanding" plant and soil science.

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Any photos in the text without a courtesy line were taken by Marilyn or by me.

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