formly well written. The figures were of high quality and the editing job was masterful. Whereas many topics were covered in multiple chapters of the text, they were generally discussed from different perspectives, making the information complementary, rather than redundant. The text should be understandable to a broad audience and will be an invaluable resource in graduate courses. My only quibble concerns the rationale for placement of many of the chapters into a given section, which seemed to me rather arbitrary in many cases. Considered overall, I strongly recommend this text as a paradigm of an integrated approach to tackle an important, multidisciplinary topic in crop science.

Steve Rodermel
Dep. of Botany
Iowa State Univ.
Ames, IA 50011
(rodermel@iastate.edu)


Wheat breeding has long been considered as much art as science. This publication is an admirable attempt to complement the art with physiological concepts and methods. Its intended audience is breeders in developing countries, but all wheat scientists will find it a useful compilation of principles and practices.

The 52 authors include wheat scientists at CIMMYT and many national programs around the world. They are all recognized authorities in their subjects. Their contributions are thorough, well written, and nicely illustrated.

The text is divided into three broad areas: General Considerations in Physiological Breeding, Breeding for Adaptation to Environmental Factors, and Breeding for Nutritional and Soil Factors. Each section contains five to eight chapters. The chapters generally begin with a statement of the principles followed by a description of the various procedures.

The section, General Considerations in Physiological Breeding, addresses the need and evaluation for physiological criteria, genetic resources for improving traits, the genetic basis of physiological traits, managing field trials, some modern methods, and the economics of breeding for physiological traits. All of the chapters are highly informative. The chapter on genetic basis, for instance, covers the subject from the structure of DNA to use of molecular markers, and the one on economics contains benefit/cost analyses that should interest all wheat scientists.

Breeding for Adaptation to Environmental Factors properly recognizes that much of the world’s wheat is produced under less-than-ideal conditions. The section contains chapters on breeding for resistance to drought, salinity, cold, heat, waterlogging, and preharvest sprouting as well as ones on selection traits for yield and manipulating plant development for adaptation. All of the chapters list plant characteristics that are associated with resistance to the various stresses as well as methods for measuring them.

Breeding for Nutritional and Soil Factors considers acid soils and Al toxicity; N, P, and Zn efficiency; measuring genetic diversity in roots; and micronutrients. The chapters discuss the importance of the subjects, their genetics, and methods of improving them.

Some attention might have been given to physiological considerations in grain quality. Wheat is mainly a food crop, and the quality of the grain is as much a physiological phenomenon as the yield. Otherwise, the topics are covered admirably well.

Several clear impressions were gained from the book in addition to its practical utility. The progress in understanding the factors that affect growth and productivity of wheat and in methodology for measuring the numerous processes that occur in the plant stands out. These advances indicate that the pace of improvement in wheat yields will increase in the years ahead, particularly in marginal areas. At the same time, however, it is evident that much remains to be learned about the factors that determine productivity of wheat. Productivity of wheat is sink limited, i.e., by processes that occur in the grain. Yet, as an excellent table of selection criteria in the book illustrates, we give most attention to processes in the source (leaves), possibly because all yield components except one have a zero to low correlation with yield potential. Identifying the factors that regulate the number and size of kernels will be essential for moving yields off of the putative plateau and gaining the full benefits of molecular techniques.

Physiology will be even more important for breeding wheat for higher yields in the future than in the past. This book, with its excellent combination of theoretical information and practical application, will be useful for everyone involved in the effort.

Gary Paulsen
Dep. of Agronomy
Kansas State Univ.
Manhattan, KS 66506-5501
(gmpaul@ksu.edu)


This book, as the title states, is an updated and expanded edition of a 1995 book with a similar title and the same editor. The first thing that may strike the reader of the Handbook is the physical size of this volume. Although the second edition is a few pages shorter than the original (973 vs. 1003 pages), the print size was reduced in this revised edition allowing the expanded text to be presented in a similar number of pages. In revising the book, the editor and authors have rearranged the sections, updated almost all chapters, and added chapters on topics not covered in the original edition. The editor states that between 65 to 80% of the material in this edition is new material. In reading the chapters and comparing selected passages between the two editions, this claim maybe a bit of an exaggeration, but rest assured that a great quantity of new material and information was added. In some cases, authors of chapters that occur in both editions have also changed.

One important assessment that must be provided by any book reviewer is the intended use and audience for the book under review. Dr. Pessarakli states in the Preface to the book, “The concepts have been presented to allow both beginning students and specialists of this discipline an opportunity to expand and refine their knowledge.” My training and experience in the broad range of topics covered in this book encompasses the full range of expertise defined by the editor, from beginning students to specialist. In reading chapters dealing with areas where I have little or no knowledge, the presentation of information was too advanced to fully comprehend. Conversely, in areas where I have greater knowledge and