The Physiology Of Crop Yield

This book is a compilation of recent global measures to conserve bio-resources and manage biotic and abiotic stresses. It highlights emerging issues related to agriculture, abiotic and biotic stress factors, ethnic knowledge, climate change and global warming, as well as natural resources and their sustainable management. It also focuses on the consolidated efforts of scientists and academics engaged in addressing a number of issues related to resource management and combating stresses in order to protect the Earth. Crop production and productivity have been significantly improved, however, there have been no corresponding practical advances in sustainable agriculture. This book offers a wide range of affordable approaches to managing bio-resources with a focus on sustainability. Lastly, it describes research highlights and future areas of research.

Completely updated and revised, this bestselling book continues to explain the growth and developmental processes involved in the formation of vegetables. Since the publication of the successful first edition significant discoveries, particularly in the area of molecular biology, have deepened and broadened our knowledge and understanding of these processes. This new edition brings the
topic up-to-date and is presented over two sections: the first provides general knowledge on germination, transplanting, flowering, the effects of stress and modelling, whilst the second section details the physiology of specific crops or crop groups.

Global demand for wheat, rice, corn, and other essential grains is expected to steadily rise over the next twenty years. Meeting this demand by increasing production through increased land use is not very likely; and while better crop management may make a marginal difference, most agriculture experts agree that this anticipated deficit must be made up through increased crop yields. The first resource of its kind, Physiology and Biotechnology Integration for Plant Breeding assembles current research in crop plant physiology, plant biotechnology, and plant breeding that is aimed toward improving crop plants genetically while supporting a productive agriculture ecosystem. Highly comprehensive, this reference provides access to the most innovative perspectives in crop physiology – with a special emphasis on molecular approaches – aimed at the formulation of those crop cultivars that offer the greatest potential to increase crop yields in stress environments. Surveys the current state of the field, as well as modern options and avenues for plant breeders and biotechnologists interested in augmenting crop yield and stability.
With the contributions of plant scientists from all corners of the globe who are actively involved in meeting this important challenge, Physiology and Biotechnology Integration for Plant Breeding provides readers with the background information needed to understand this cutting-edge work, as well as detailed information on present and potential applications. While the first half of the book establishes and fully explains the link between crop physiology and molecular biology, the second part explores the application of biotechnology in the effective delivery of the high yield and environmentally stable crop plants needed to avert the very real possibility of worldwide hunger.

This book includes twenty-one comprehensive chapters addressing various soil and crop management issues, including modern techniques in enhancing crop production in the era of climate change. There are a few case studies and experimental evidence about these production systems in specific locations. Particular focus is provided on the state-of-the-art of biotechnology, nanotechnology, and precision agriculture, as well as many other recent approaches in ensuring sustainable crop production. This book is useful for undergraduate and graduate students, teachers, and researchers, particularly in the fields of crop science, soil science, and agronomy.

From climate change to farming systems to genetic modification of organisms,
Crop Physiology, Second Edition provides a practical tool for understanding the relationships and challenges of successful cropping. With a focus on genetic improvement and agronomy, this book addresses the challenges of environmentally sound production of bulk and quality food, fodder, fiber, and energy which are of ongoing international concern. The second edition of Crop Physiology continues to provide a unique analysis of these topics while reflecting important changes and advances in the relevant science and implementation systems. Contemporary agriculture confronts the challenge of increasing demand in terms of quantitative and qualitative production targets. These targets have to be achieved against the background of soil and water scarcity, worldwide and regional shifts in the patterns of land use driven by both climate change and the need to develop crop-based sources of energy, and the environmental and social aspects of agricultural sustainability. Provides a view of crop physiology as an active source of methods, theories, ideas, and tools for application in genetic improvement and agronomy Written by leading scientists from around the world Combines environment-specific cropping systems and general principles of crop science to appeal to advanced students, and scientists in agriculture-related disciplines, from molecular sciences to natural resources management Water stress and heat stress are considered to be two primary factors that limit
crop production in many parts of the world. Global warming appears to be increasing the water requirements of plants. Understanding the impact of water deficit on plant physiological processes and efficient water management are of great concern in maintaining food production to meet ever increasing world food demand. The book addresses various climatic soil and plant factors that contribute to the water use efficiency in plants subjected to water stress. It covers all issues related to soil, plant and climatic factors that contribute to the crop responses to water stress. The book advances the knowledge in improving and sustaining crop yields in ever increasing unpredictable climatic fluctuations. This book uses crop simulation models for response of crops to limited water under various management and climatic conditions. This book summarizes recent research on the physiology of yield of all the world's major field crops. The authors focus on the development of crop yield, the physiology underlying this process and the interactions between this physiology and the environment in which the crops develop. The need for the integration of the knowledge available for each of these crops has never been greater. In view of the increasing demand for food supplies of the world's growing population, the development and improvement of crop yield will play a crucial role in the future. Soybean is the most important oilseed and livestock feed crop in the world.
These dual uses are attributed to the crop's high protein content (nearly 40% of seed weight) and oil content (approximately 20%); characteristics that are not rivaled by any other agronomic crop. Across the 10-year period from 2001 to 2010, world soybean production increased from 168 to 258 million metric tons (54% increase). Against the backdrop of soybean's striking ascendancy is increased research interest in the crop throughout the world. Information in this book presents a comprehensive view of research efforts in genetics, plant physiology, agronomy, agricultural economics, and nitrogen relationships that will benefit soybean stakeholders and scientists throughout the world. We hope you enjoy the book.

The Physiology of Crop Yield
Wiley-Blackwell

In this major 1993 work, Lloyd Evans provides an integrated view of the domestication, adaptation and improvement of crop plants, bringing together genetic diversity, plant breeding, physiology and aspects of agronomy. Considerations of yield and maximum yield provide continuity throughout the book. Food, feed, fibre, fuel and pharmaceutical crops are all discussed. Cereals, grain legumes and root crops, both temperate and tropical, provide many of the examples, but pasture plants, oilseeds, leafy crops, fruit trees and others are also considered. After the introductory chapter, the increasing significance of crop yields to the world's food supply is highlighted. The next three
chapters consider changes to crop plants over the last ten thousand years, including domestication, adaptation and improvement. Aimed at research workers and advanced students in crop physiology and ecology, agronomy and plant breeding, this book also reaches conclusions of relevance to those concerned with developmental policy, agricultural research and management, environmental quality, resource depletion and human history.

Potato Physiology provides perspective and knowledge on the biological behavior and potentials of the potato plant. Organized into 15 chapters, this book focuses on tuber development physiology, biochemistry, and anatomy. This text also covers topics on physiological and biochemical aspects of photosynthesis, photoassimilate partitioning, respiration, tuberization, as well as carbohydrate and protein metabolisms. It elucidates potato's rest period, the stage when growth is inhibited as a result of endogenous causes, and the tubers' disorders, environmental responses, frost hardiness, and tissue culture. This text provides a worldwide perspective and is organized and presented to be useful to graduate students, teachers, and potato investigators.

Respiration is a large and important component of the carbon economy of crops. There are already several good books dealing with the biochemistry and physiology of plant respiration, but there are none I know of that are devoted to the relationship between respiration and crop productivity, although this relationship is more and more frequently being studied with both experiment and simulation. Crop physiology books do cover
respiration, of course, but the treatment is limited. The purpose of the present book is to fill this void in the literature. The approach taken here is to use the popular two-component functional model whereby respiration is divided between growth and maintenance components. After thoroughly reviewing the literature, I came to the conclusion that at present this is the most useful means of considering respiration as a quantitative component of a crop's carbon economy. This functional distinction is used as the framework for describing respiration and assessing its role in crop productivity. Discussions and critiques of the biochemistry and physiology of respiration serve primarily as a means of more fully understanding and describing the functional approach to studying crop respiration. It is assumed that the reader of this book is familiar with the fundamentals of plant physiology and biochemistry. The research worker in crop physiology should find this an up-to-date summary of crop respiration and the functional model of respiration. This book is not, however, a simple review of existing data.

Organization and conduct of plant stress research to increase agricultural productivity.

Disease tolerance: reducing the impact of disease-induced stress on crop yields.

Thigmomorphogenesis: the effect of mechanical perturbation on the growth of plants, with special reference to anatomical changes, the role of ethylene, and interaction with other environmental stresses. Differential aluminum tolerance in crop plants.

Comparative responses of field grown crops to phosphate concentrations in soil.
With contributions from over 70 international experts, this reference provides comprehensive coverage of plant physiological stages and processes under both normal and stressful conditions. It emphasizes environmental factors, climatic changes, developmental stages, and growth regulators as well as linking plant and crop physiology to the production of food, feed, and medicinal compounds. Offering over 300 useful tables, equations, drawings, photographs, and micrographs, the book covers cellular and molecular aspects of plant and crop physiology, plant and crop physiological responses to heavy metal concentration and agrichemicals, computer modeling in plant physiology, and more.

Key features:
- Describes the effects and responses of the macro and micro levels of crops under the different components of climate change
- Reports on the adaptation and resilience of food production systems within the changing climate
- Covers how plants cope with the changing climate including physiological, biochemical, phenotype, and ecosystem responses
- Provides an in-depth discussion on the importance of agricultural education connected to climate change
- Presenting an overview of agroecology within the framework of climate change, this book looks at the impact of our changing climate on crop production and agroecosystems, reporting on how plants will cope with these changes, and how we can mitigate these negative impacts to ensure food production for the growing population. It explores the ways that farmers can confront the challenges of climate change, with contributed chapters from around the world.
demonstrating the different challenges associated with differing climates. Examples are provided of the approaches being taken right now to expand the ecological, physiological, morphological, and productive potential of a range of crop types. Giving readers a greater understanding of the mechanisms of plant resilience to climate change, this book provides new insights into improving the productivity of an individual crop species as well as bringing resistance and resiliency to the entire agroecosystem. It offers a strong foundation for changing research and education programs so that they build the resilience that will be needed for the uncertain climate future ahead.

D.A. Cooke and R.K. Scott Sugar beet is one of just two crops (the other being sugar cane) which constitute the only important sources of sucrose - a product with sweetening and preserving properties that make it a major component of, or additive to, a vast range of foods, beverages and pharmaceuticals. Sugar, as sucrose is almost invariably called, has been a valued component of the human diet for thousands of years. For the great majority of that time the only source of pure sucrose was the sugar-cane plant, varieties of which are all species or hybrids within the genus Saccharum. The sugar-cane crop was, and is, restricted to tropical and subtropical regions, and until the eighteenth century the sugar produced from it was available in Europe only to the privileged few. However, the expansion of cane production, particularly in the Caribbean area, in the late seventeenth and the eighteenth centuries, and the new sugar-beet crop in Europe in the nineteenth century, meant that sugar became available to an increasing proportion of the world's population.
This volume explores specific approaches that have shown to result in crop yield increases. Research on the physiological understanding of these methods has led to the development of practical applications of plant breeding approaches to genetically improve crops to achieve higher yields. Authoritative entries from crop scientists shed new light on two water-conservation traits: one that is based on an initiation of the decrease in transpiration earlier in the soil drying cycle, and the second that is based on a sensitivity of transpiration rate under high atmospheric vapor pressure deficit that results in partial stomatal closure. Both these approaches involve partial stomatal closure under well-defined situations to decrease the rate of soil water loss. Readers will be able to analyze the circumstances under which a benefit is achieved as a result of the water-limitation trait; and key discussion points in the case studies presented will help answer questions such as what species, which environments, how often will yield be benefited for various crop species? Contributions also review the genetic variation for these two traits within each crop species and the physiological basis for the expression of these traits.

Model studies focus experimental investigations to improve our understanding and performance of systems. Concentrating on crop modelling, this book provides an introduction to the concepts of crop development, growth, and yield, with step-by-step outlines to each topic, suggested exercises and simple equations. A valuable text for students and researchers of crop development alike, this book is written in five parts that allow the reader to develop a solid foundation and coverage of production models including water- and nitrogen-limited systems.

Ecophysiology of Pesticides: Interface between Pesticide Chemistry and Plant Physiology is
the first comprehensive overview of the physical impact of this increasingly complex environmental challenge. Designed to offer state-of-the-art knowledge, the book covers pesticide usage and its consequences on the ecophysiology of plants. It includes the challenge of policymaking in pesticide consumption and a risk analysis of conventional and modern approaches on standard usage. In addition, it summarizes research reports pertaining to the physio-ecological effects of pesticides, discusses the environmental risks associated with the over-utilization of pesticides, and covers pesticide usage on the micro-flora and rhizosphere. This book is a valuable reference for plant ecologists, plant biochemists and chemists who want to study pesticide consumption and its biochemical and physiological evaluation effects on plants. It will also be of immense help to university and college teachers and students of environmental biotechnology, environmental botany and plant ecophysiology. Contains comprehensive coverage of topics on pesticides, environmental ecology and strategies for pesticide control. Presents all data available on the intensification of pesticide stress on non-target organisms. Includes an appendix of products containing active ingredients. Effect of High Temperature on Crop Productivity and Metabolism of Macro Molecules presents a comprehensive overview on the direct effect of temperatures defined as "high", a definition which increasingly includes a great number of geographic regions. As temperature impacts the number of base growth days, it is necessary to adapt plant selection, strategize planting times, and understand the expected impact of adaptive steps to ensure maximum plant health and crop yield. Global warming, climate change and change in environmental conditions have become common phrases in nearly every scientific seminar, symposium and meeting, thus these changes in climatic patterns constrain normal growth and reproduction cycles. This book
reviews the effect of high temperature on agricultural crop production and the effect of high
temperature stress on the metabolic aspects of macro molecules, including carbohydrates,
proteins, fats, secondary metabolites, and plant growth hormones. Focuses on the effects of
high temperature on agriculture and the metabolism of important macro-molecules Discusses
strategies for improving heat tolerance, thus educating plant and molecular breeders in their
attempts to improve efficiencies and crop production Provides information that can be applied
today and in future research
The Biology of Crop Productivity attempts to reassess and restate what is known about the
biology underlying crop productivity. The prime question which this volume attempts to address
is, "What is known about the biology of crop productivity from a range of diverse biological
disciplines, and what needs to be known?" Is it possible to formulate the important biological
questions, can we begin to discern the biological mechanisms and limitations which underlie
crop production? This volume is certainly not an all-inclusive survey. It attempts to supplement
and explicate material presented in other volumes. The volume is organized into five broad
areas: the first deals with various interactions of plants and their environments; the second
deals with the interactions of plants with other organisms; the third treats some aspects of the
internal organization of plants; the fourth examines genetic manipulations utilizing plant
materials; and the fifth outlines a perspective for future research efforts. This volume is
intended primarily for persons interested or actively engaged in research in the agricultural
plant sciences.
Crop physiology is one of the foundationds of the improvement of crops and cropping systems,
whether the aim is to increase yield or improve the efficiency of use of resources. Great strides
forward have been made in the understanding of the functioning of crop plants in the field over
the last decade, and this book is unique in reviewing and analysing these advances at a level
which can be assimilated by degree students. The emphasis is on north–temperate cropping,
although examples are drawn from elsewhere, and the authors have used a combination of
findings from the laboratory and the field. Other features include an introduction to crop
simulation and consideration of the interactions between plant disease and crop physiology.
Overall the book provides a clear explanation of difficult concepts, bearing in mind the
complexity of crop/environment/management relationships.
This book has been prepared for those seeking a better understanding of the functioning of
crop plants, particularly the processes that lead to the generation of products valued by
human beings. The contributors, who are among the world's foremost experts on the important
crops upon which humanity depends for food or fibre, address the relevant processes for their
specific crop. Currently, the world population is continuing to increase. It is projected to plateau
around the middle of the next century, and while there is considerable controversy regarding
the population level when this plateau is achieved, most estimates are in the area of 10 000
000 000. At present, there are about 800000000 people in the world who do not have secure
access to food. Over the last 50 years various aspects of agricultural research have been
combined to increase the output of world crops approximately 2.5-fold. Given the need to feed
the increasing population, and to provide better access, it is predicted that during the next 50
years the agricultural research community must repeat this achievement.
The knowledge of plant responses to various abiotic stresses is crucial to understand their
underlying mechanisms as well as the methods to develop new varieties of crops, which are
better suited to the environment they are grown in. Environmental Stress Physiology of Plants and Crop Productivity provides readers a timely update on the knowledge about plant responses to a variety of stresses such as salinity, temperature, drought, oxidative stress and mineral deficiencies. Chapters focus on biochemical mechanisms identified in plants crucial to adapting to specific abiotic stressors along with the methods of improving plant tolerance. The book also sheds light on plant secondary metabolites such as phenylpropanoids and plant growth regulators in ameliorating the stressful conditions in plants. Additional chapters present an overview of applications of genomics, proteomics and metabolomics (including CRISPR/CAS techniques) to develop abiotic stress tolerant crops. The editors have also provided detailed references for extended reading to support the information in the book. Environmental Stress Physiology of Plants and Crop Productivity is an informative reference for scholars and researchers working in the field of botany, agriculture, crop science and physiology, soil science, and environmental sciences.

This book presents a simple, straightforward discussion of the principles and processes involved in the production of grain yield by agronomic crops, and how these processes underlie and influence management decisions. The focus is on grain crops, principally maize and soybean, although the general principles apply equally well to cereals, grain legumes and oil crops. Intended for researchers in crop science, agronomy and plant science, and crop production practitioners, this book will enable readers to make better, more informed management decisions; decisions that will help maintain a well-fed world in the future. This new edition of an established title examines the determination of grain crop yield from a unique perspective, by concentrating on the influence of the seed itself. As the food supply for
an expanding world population is based on grain crops harvested for their seeds, understanding the process of seed growth and its regulation is crucial to our efforts to increase production and meet the needs of that population. Yield of grain crops is determined by their assimilatory processes such as photosynthesis and the biosynthetic processes in the seed, which are partly regulated within the seed itself. Substantially updated with new research and further developments of the practical applications of the concepts explored, this book is essential reading for those concerned with seed science and crop yield, including agronomists, crop physiologists, plant breeders, and extension workers. It is also a valuable source of information for lecturers and graduate students of agronomy and plant physiology.

Crops and world food supply, crop evolution, and the origins of crop physiology; maize; sugar cane; rice; wheat; soybean; pea; potato; sugar beet; cotton; The physiological basis of crop yield.

When humankind began to save seed to plant for the next season, they did so hoping to secure a food supply for the future. With that came the inevitable question: Will it be enough? Scientists today are still asking that question. Our dependence on domesticated cultivated varieties has never been greater, even as increasing populations strain our resource base. This book provides a fascinating snapshot-in-time account of the productivity status of all major U.S. field crops. Each crop has a different story to tell. Plant breeding, biotechnology, and agronomy have shaped these stories. It is imperative that we learn from them to ensure continued productivity. The solution is long-term stewardship and the most effective use of our critical resources—water, soil, genetic resources, and human intellect.

This single volume explores the theoretical and the practical aspects of crop physiological
processes around the world. The marked decrease over the past century in the land available for crop production has brought about mounting pressure to increase crop yields, especially in developing nations. Physiology of Crop Production provides cutting-edge research and data for complete coverage of the physiology of crop production, all in one source, right at your fingertips. This valuable reference gives the extensive in-depth information soil and crop professionals need to maximize crop productivity anywhere the world. Leading soil and plant scientists and researchers clearly explain theory, practical applications, and the latest advances in the field. Crop physiology is a vital science needed to understand crop growth and development to facilitate increases of plant yield. Physiology of Crop Production presents a wide range of information and references from varying regions of the world to make the book as complete and broadly focused as possible. Discussion in each chapter is supported by experimental data to make this book a superb resource that will be used again and again. Chapter topics include plant and root architecture, growth and yield components, photosynthesis, source-sink relationship, water use efficiency, crop yield relative to water stress, and active and passive ion transport. Several figures and tables accompany the extensive referencing to provide a detailed, in-depth look at every facet of crop production. Physiology of Crop Production explores management strategies for: ideal plant architecture maximizing root systems ideal yield components maximizing photosynthesis maximizing source-sink relationship sequestration of carbon dioxide reducing the effects of drought improving N, P, K, Ca, Mg, and S nutrition improving micronutrient uptake. Physiology of Crop Production is an essential desktop resource for plant physiologists, soil and crop scientists, breeders, agronomists, agronomy administrators in agro-industry, educators, and upper-level
undergraduate and graduate students. Plant physiology is now considered as an essential ingredient for improving crop productivity, a continuing necessity with today’s ever-increasing world population. This new volume provides an understanding of the physiological basis of the various plant processes and their underlying mechanisms under fluctuating environments, which is of great importance for sustainable crop production. Further advances in cellular and molecular biology hold promise to modify physiological processes, thereby improving the quality and quantity of major food crops and ensuring stability in yield of the produce even under severe abiotic stress. This book covers the latest information on the physiological basis of plant productivity, including abiotic stress adaptation and management, plant nutrition, climate change and plant productivity, transgenic and functional genomics, and plant growth regulators and their applications. The chapters in this volume tackle some of these key issues of sustainable plant production and evolve future strategies in overcoming challenges faced by the agricultural sector as a whole. The topics covered in this book presents important from research reputed scientists. This volume is a rich source of information in one place. It will be a useful resource for researchers and extension workers involved in plant physiology and related disciplines. Key features: Provide the latest information on developments in plant physiology Covers abiotic and biotic stress on economically important crop species Presents a detailed collection of biotechnological approaches in plant physiology Covers plant growth regulators, secondary metabolites, germination, crop growth and development of different crop species Provides research from experts at internationally renowned institutes This second edition of a text-book focused on crop physiology, reflects the many changes and
expanded efforts have been made to facilitate the agronomist and the crop physiologist to integrate information, synthesize new levels of knowledge, and develop systems for problem solving. The emphasis is on two major purposes: to develop an understanding of the important principles underlying the practices used in the culture of crop plants and to develop the ability to apply these principles in production strategies.

First published in 1989, Physiology of Crop Yield was the first student textbook to digest and assimilate the many advances in crop physiology, within a framework of resource capture and use. Retaining the central core of the first edition, this long-awaited second edition draws on recent developments in areas such as phenology, canopy dynamics and crop modelling, and the concepts of sustainable crop production. A broad perspective is developed, from the gene through the plant and crop to the ecosystem, covering: Advances in molecular biology relating to crop science Limitation of crop yield by the supply of water or nitrogen Global climate change and its impact on crop modelling Physiological aspects of crop quality A wider range of species, with emphasis on wheat, maize and soybean This book will be a valuable tool for advanced undergraduate and postgraduate students of agricultural science, plant science, applied ecology and environmental science. It will be an essential addition to all libraries in universities and relevant research establishments.

Crop Physiology: Case Histories of Major Crops updates the physiology of broad-acre crops with a focus on the genetic, environmental and management drivers of
development, capture and efficiency in the use of radiation, water and nutrients, the formation of yield and aspects of quality. These physiological processes are presented in a double context of challenges and solutions. The challenges to increase plant-based food, fodder, fiber and energy against the backdrop of population increase, climate change, dietary choices and declining public funding for research and development in agriculture are unprecedented and urgent. The proximal technological solutions to these challenges are genetic improvement and agronomy. Hence, the premise of the book is that crop physiology is most valuable when it engages meaningfully with breeding and agronomy. With contributions from 92 leading scientists from around the world, each chapter deals with a crop: maize, rice, wheat, barley, sorghum and oat; quinoa; soybean, field pea, chickpea, peanut, common bean, lentil, lupin and faba bean; sunflower and canola; potato, cassava, sugar beet and sugarcane; and cotton. A crop-based approach to crop physiology in a G x E x M context Captures the perspectives of global experts on 22 crops Systems analysis of natural resources and crop production. Engineering for higher yields. Productivity and the morphology of crop stands: patterns with leaves. Physiological significance of internal water relations to crop yield. Light interception and radiative exchange in crop stands. Gaseous exchange in crop stands. Mechanisms of translocation of plant metabolites. Metabolic sinks. Interrelationships among photosynthesis, respiration, and movement of carbon in developing crops. Mechanisms
of carbon fixation and associated physiological responses. Physiological responses to nitrogen in plants. Plant morphology and stand geometry in relation to nitrogen. Development, differentiation, and yield. Cultural manipulation for higher yields. Environmental manipulation for higher yields. Germ plasm manipulation of the future. This book discusses general concept and management issues of deficient irrigation practices, covering a wide range of field crops including cotton, maize, soybean, wheat, sugarcane, and the like, based on five years of field research implemented in fourteen different countries, in Latin America, Africa, Europe and Asia. Additionally, guidelines are given for experimental methodology and data analysis for evaluating crop yield response to deficient irrigation. Experimental data, discussions and cited references will be an asset not only to field irrigation engineers but also to research scientists including soil and irrigation scientists and agronomists, for whom the book would be an invaluable reference source.

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