Plant Genomics And Our Food Supply An Introduction

Recent major advances in the field of comparative genomics and cytogenomics of plants, particularly associated with the completion of ambitious genome projects, have uncovered astonishing facets of the architecture and evolutionary history of plant genomes. The aim of this book was to review these recent developments as well as their implications in our understanding of the mechanisms which drive plant diversity. New insights into the evolution of gene functions, gene families and genome size are presented, with particular emphasis on the evolutionary impact of polyploidization and transposable elements. Knowledge on the structure and evolution of plant sex chromosomes, centromeres and microRNAs is reviewed and updated. Taken together, the contributions by internationally recognized experts present a panoramic overview of the structural features and evolutionary dynamics of plant genomes.This volume of Genome Dynamics will provide researchers, teachers and students in the fields of biology and agronomy with a valuable source of current knowledge on plant genomes.

More Food: Road to Survival is a comprehensive analysis of agricultural improvements which can be achieved through scientific methods. This reference book gives information about strategies for increasing plant productivity, comparisons of agricultural models, the role of epigenetic events on crop production, yield enhancing physiological events (photosynthesis, germination, seedling emergence, seed properties, etc.), tools enabling efficient exploration of genetic variability, domestication of new species, the detection or induction of drought resistance and apomixes and plant breeding enhancement (through molecularly assisted breeding, genetic engineering, genome editing and next generation sequencing). The book concludes with a case study for the improvement of small grain cereals. Readers will gain an understanding of the biotechnological tools and concepts central to sustainable agriculture More Food: Road to Survival is, therefore, an ideal reference for agriculture students and researchers as well as professionals involved sustainability studies.

Sequencing of the model plant genomes such as those of A. thaliana and rice has revolutionized our understanding of plant biology but it has yet to translate into the improvement of major crop species such as maize, wheat, or barley. Moreover, the comparative genomic studies in cereals that have been performed in the past decade have revealed the limits of conservation between rice and the other cereal genomes. This has necessitated the development of genomic resources and programs for maize, sorghum, wheat, and barley to serve as the foundation for future genome sequencing and the acceleration of genomic based improvement of these critically important crops. Cereals constitute over 50% of total crop production worldwide (http://www.fao.org/) and cereal seeds are one of the most important renewable resources for food, feed, and industrial raw materials. Crop species of the Triticeae tribe that comprise wheat, barley, and rye are essential components of human and domestic animal nutrition. With 17% of all crop area, wheat is the staple food for 40% of the world's population, while barley ranks fifth in the world production. Their domestication in the Fertile Crescent 10,000 years ago ushered in the beginning of agriculture and signified an important breakthrough in the advancement of civilization. Rye is second after wheat among grains most commonly used in the production of bread and is also very important for mixed animal feeds. It can be cultivated in poor soils and climates that are generally not suitable for other cereals. Extensive genetics and cytogenetics studies performed in the Triticeae species over the last 50 years have led to the characterization of their chromosomal composition and origins and have supported intensive work to create new genetic resources. Cytogenetic studies in wheat have allowed the identification and characterization of the different homoeologous genomes and have demonstrated the utility of studying wheat genome evolution as a model for the analysis of polyploidization, a major force in the evolution of the eukaryotic genomes. Barley with its diploid genome shows high collinearity with the other Triticeae genomes and therefore serves as a good template for supporting genomic analyses in the wheat and rye genomes. The knowledge gained from genetic studies in the Triticeae has also been used to produce Triticale, the first human made hybrid crop that results from a cross between wheat and rye and combines the nutrition quality and productivity of wheat with the ruggedness of rye. Despite the economic importance of the Triticeae species and the need for accelerated crop improvement based on genomics studies, the size (1.7 Gb for the bread wheat genome, i.e., 5x the human genome and 40 times the rice genome), high repeat content (>80%), and complexity (polyploidy in wheat) of their genomes often have been considered too challenging for efficient molecular analysis and genetic improvement in these species. Consequently, Triticeae genomics has lagged behind the genomic advances of other cereal crops for many years. Recently, however, the situation has changed dramatically and robust genomic programs can be established in the Triticeae as a result of the convergence of several technology developments that have led to new, more efficient scientific capabilities and resources such as whole-genome and chromosome-specific BAC libraries, extensive EST collections, transformation systems, wild germplasm and mutant collections, as well as DNA chips. Currently, the Triticeae genomics "toolbox" is comprised of: - 9 publicly available BAC libraries from diploid (5), tetraploid (1) and hexaploid (3) wheat; 3 publicly available BAC libraries from barley and one BAC library from rye; - 3 wheat chromosome specific BAC libraries; - DNA chips including commercially available first generation chips from AFFYMETRIX containing 55'000 wheat and 22,000 barley genes; - A large number of wheat and barley genetic maps that are saturated by a significant number of markers; - The largest plant EST collection with 870'000 wheat ESTs, 440'000 barley ESTs and about 10'000 rye ESTs; - Established protocols for stable transformation by biolistic and agrobacterium as well as a transient expression system using VIGS in wheat and barley; and - Large collections of well characterized cultivated and wild genetic resources. International consortia, such as the International Triticeae Mapping Initiative (ITMI), have advanced synergies in the Triticeae genetics community in the development of additional mapping populations and markers that have led to a dramatic improvement in the resolution of the genetic maps and the amount of molecular markers in the three species resulting in the accelerated utilization of molecular markers in selection programs. Together, with the development of the genomic resources, the isolation of the first genes of agronomic interest by map-based cloning has been enabled and has proven the feasibility of forging the link between genotype and phenotype in the Triticeae species. Moreover, the first analyses of BAC sequences from wheat and barley have allowed preliminary characterizations of their genome organization and composition as well as the first inter- and intra-specific comparative genomic studies. These later have revealed important evolutionary mechanisms (e.g. unequal crossing over, illegitimate recombination) that have shaped the wheat and barley genomes during their evolution. These breakthroughs have demonstrated the feasibility of developing efficient genomic studies in the Triticeae and have led to the recent establishment of the International Wheat Genome Sequencing Consortium (IWGSC) (http//:www.wheatgenome.org) and the International Barley Sequencing Consortium (www.isbc.org) that aim to sequence, respectively, the hexaploid wheat and barley genomes to accelerate gene discovery and crop improvement in the next decade. Large projects aiming at the establishment of the physical maps as well as a better characterization of their composition and organization through large scale random sequencing projects have been initiated already. Concurrently, a number of projects have been launched to develop high throughput functional genomics in wheat and barley. Transcriptomics, proteomics, and metabolomics analyses of traits of agronomic importance, such as quality, disease resistance, drought, and salt tolerance, are underway in both species. Combined with the development of physical maps, efficient gene isolation will be enabled and improved sequencing technologies and reduced sequencing costs will permit ultimately genome sequencing and access to the entire wheat and barley gene regulatory elements repertoire. Because rye is closely related to wheat and barley in Triticeae evolution, the latest developments in wheat and barley genomics will be of great use for developing rye genomics and for providing tools for rye improvement. Finally, a new model for temperate grasses has emerged in the past year with the development of the genetics and genomics (including a 8x whole genome shotgun sequencing project) of Brachypodium, a member of the Poeae family that is more closely related to the Triticeae than rice and can provide valuable information for supporting Triticeae genomics in the near future. These recent breakthroughs have yet to be reviewed in a single source of literature and current handbooks on wheat, barley, or rye are dedicated mainly to progress in genetics. In "Genetics and Genomics of the Triticeae", we will aim to comprehensively review the recent progress in the development of structural and functional genomics tools in the Triticeae species and review the understanding of wheat, barley, and rye biology that has resulted from these new resources as well as to illuminate how this new found knowledge can be applied for the improvement of these essential species. The book will be the seventh volume in the ambitious series of books, Plant Genetics and Genomics (Richard A. Jorgensen, series editor) that will attempt to bring the field up-to-date on the genetics and genomics of important crop plants and genetic models. It is our hope that the publication will be a useful and timely tool for researchers and students alike working with the Triticeae.

"This book can be used in a junior or senior level course, including masters students in plant biotechnology or plant genetics, as well as in special topics classes for both undergraduate and graduate students"--Provided by publisher.

Applied Plant Genomics and Biotechnology

From Plant Genomics to Plant Biotechnology

Meeting the Challenge of Food Security

Plant Genomics and Climate Change

Genomics of Plant Genetic Resources

Plant Genomes

This volume aims to provide a timely view of the state-of-the-art in systems biology. The editors take the opportunity to define systems biology as they and the contributing authors see it, and this will lay the groundwork for future studies. The volume is well-suited to both students and researchers interested in the methods of systems biology. Although the focus is on plant systems biology, the proposed material could be suitably applied to any organism.

Plant genomics aims to sequence, characterize, and study the genetic compositions, structures, organizations, functions, and interactions/networks of an entire plant genome. Its development and advances are tightly interconnected with proteomics, metabolomics, metagenomics, transgenomics, genomic selection, bioinformatics, epigenomics, phenomics, system biology, modern instrumentation, and robotics sciences. Plant genomics has significantly advanced over the past three decades in the land of inexpensive, high-throughput sequencing technologies and fully sequenced over 100 plant genomes. These advances have broad implications in every aspect of plant biology and breeding, powered with novel genomic selection and manipulation tools while generating many grand challenges and tasks ahead. This Plant genomics provides some updated discussions on current advances, challenges, and future perspectives of plant genome studies and applications.

Maize is one of the world□s highest value crops, with a multibillion dollar annual contribution to agriculture. The great adaptability and high yields available for maize as a food, feed and forage crop have led to its current production on over 140 million hectares worldwide, with acreage continuing to grow at the expense of other crops. In terms of tons of cereal grain produced worldwide, maize has been number one for many years. Moreover, maize is expanding its contribution to non-food uses, including as a major source of ethanol as a fuel additive or fuel alternative in the US. In addition, maize has been at the center of the transgenic plant controversy, serving as the first food crop with released transgenic varieties. By 2008, maize will have its genome sequence released, providing the sequence of the first average-size plant genome (the four plant genomes that are now sequenced come from unusually tiny genomes) and of the most complex genome sequenced from any organism. Among plant science researchers, maize has the second largest and most productive research community, trailing only the Arabidopsis community in scale and significance. At the applied research and commercial improvement levels, maize has no peers in agriculture, and consists of thousands of contributors worthwhile. A comprehensive book on the biology of maize has not been published. The "Handbook of Maize: the Genetics and Genomics" center on the past, present and future of maize as a model for plant science research and crop improvement. The books include brief, focused chapters from the foremost maize experts and feature a succinct collection of informative images representing the maize germplasm collection.

Plant nutrients are the vital elements essential for plant growth and survival, with key roles in adapting to challenging environments. Each nutrient, whether required in relatively large (macronutrients) or minute concentrations (micronutrients) plays a unique role in plant life cycle. Both the insufficient and surplus concentrations of these nutrients may render negative impacts on plant growth and development and therefore their homeostasis is considered critical for optimal plant growth and yield. Plant Nutrition and Food Security in the Era of Climate Change comprehensively reviews all critical plant nutrients. Chapters include topics such as: biological roles, uptake and transport of vital nutrients in plants; an in-depth review of the roles of potassium, calcium, magnesium and trace element; molecular breeding approaches for enhanced plant nutrients; and exploring the rhizosphere microbiome for enhance nutrient availability. Written by leading experts in the field of plant biology, this is an essential read for researchers and scientists interested in plant science, agronomy, food security and environmental science. A comprehensive review of all the important plant nutrients Discusses plant homeostasis under natural and changing environments Introduces novel approaches and state-of-the-art tool for enhancing the levels of targeted nutrients within plant tissues

Stress Signaling in Plants: Genomics and Proteomics Perspective

Genetics and Genomics

Plant Biotechnology

Volume 1. Managing, sequencing and mining genetic resources

Appraisal of the Proposed 1992 Budget for Food and Agricultural Sciences

(NAS Colloquium) Protecting Our Food Supply

Assists policymakers in evaluating the appropriate scientific methods for detecting unintended changes in food and assessing the potential for adverse health effects from genetically modified products. In this book, the committee recommended that greater scrutiny should be given to foods containing new compounds or unusual amounts of naturally occurring substances, regardless of the method used to create them. The book offers a framework to guide federal agencies in selecting the route of safety assessment. It identifies and recommends several pre- and post-market approaches to guide the assessment of unintended compositional changes that could result from genetically modified foods and research avenues to fill the knowledge gaps.

Soybean genomics is of great interest as one of the most economically important crops and a major food source. This book covers recent advances in soybean genome research, including classical, RFLP, SSR, and SNP markers; genomic and cDNA libraries; functional genomics platforms; genetic and physical maps; and gene expression profiles. The book is for researchers and students in plant genetics and genomics, plant biology and pathology, agronomy, and food sciences.

This two-volume set takes an in-depth look at stress signaling in plants from a uniquely genomic and proteomic perspective and offers a comprehensive treatise that covers all of the signaling pathways and mechanisms that have been researched so far. Currently, plant diseases, extreme weather caused by climate change, drought and an increase in metals in soil are amongst the major limiting factors of crop production worldwide. They devastate not only the food supply but also the economy of a nation. With global food scarcity in mind, there is an urgent need to develop crop plants with increased stress tolerance so as to meet the global food demands and to preserve the quality of our planet. In order to do this, it is necessary to understand how plants react and adapt to stress from the genomic and proteomic perspective. Plants adapt to stress conditions by activating cascades of molecular mechanisms, which result in alterations in gene expression and synthesis of protective proteins. From the perception of the stimulus to the transduction of the signal, followed by an appropriate cellular response, the plants employ a complex network of primary and secondary messenger molecules. Cells exercise a large number of noticeably distinct signaling pathways to regulate their activity. In order to contend with different environmental adversities, plants have developed a series of mechanisms at the physiological, cellular and molecular levels that respond to stress. Each chapter in this volume provides an in-depth explanation of what we currently know of a particular aspect of stress signaling and where we are heading. Together with the highly successful first volume, Stress Signaling in Plants: Genomics and Proteomics Perspective, Volume 2 covers an important aspect of plant biology for both students and seasoned researchers.

This book explores the impact of climate change on agriculture and our future ability to produce the crops which are the foundation of the human diet. Specifically, individual chapters explore the potential for genomics assisted breeding of improved crops with greater yield and tolerance to the stresses associated with predicted climate change scenarios. Given the clear and unmet challenge to mitigate climate changing events, this book will be of wide interest from plant breeders and environmental scientists, government bodies through to a more general audience who are interested in the likely impact of climate change on agriculture.

Safety Assessment and Control

Genetically Engineered Crops

Genetics and Genomics of Soybean

Plant Genome Editing - Policies and Governance

Genetically Modified Food Sources

Governing Agrobiodiversity

Our lives and well being intimately depend on the exploitation of the plant genetic resources available to our breeding programs. Therefore, more extensive exploration and effective exploitation of plant genetic resources are essential prerequisites for the release of improved cultivars. Accordingly, the remarkable progress in genomics approaches and more recently in sequencing and bioinformatics offers unprecedented opportunities for mining germplasm collections, mapping and cloning loci of interest, identifying novel alleles and deploying them for breeding purposes. This book collects 48 highly interdisciplinary articles describing how genomics improves our capacity to characterize and harness natural and artificially induced variation in order to boost crop productivity and provide consumers with high-quality food. This book will be an invaluable reference for all those interested in managing, mining and harnessing the genetic richness of plant genetic resources.

This book reviews modern strategies in the breeding of vegetables in the era of global warming. Agriculture is facing numerous challenges in the 21st century, as it has to address food, nutritional, energy and environmental security. Future vegetable varieties must be adaptive to the varying scenarios of climate change, produce higher yields of high- quality food and feed and have multiple uses. To achieve these goals, it is imperative to employ modern tools of molecular breeding, genetic engineering and genomics for 'precise' plant breeding to produce 'designed' vegetable varieties adaptive to climate change. This book is of interest to scientists working in the fields of plant genetics, genomics, breeding, biotechnology, and in the disciplines of agronomy and horticulture.

This new volume provides a better understanding of molecular plant breeding in order to boost the quality of agriculture produce, to increase crop yields and to provide nutritious food for everyone by 2050. Scientists believe the challenge can be met by implementing new and improved techniques of quantitative trait inheritance in plant breeding. Integrating genomics and molecular biology into appropriate tools and methodologies can help to create genetically engineered plants, such as by using biotic and abiotic stress tolerance, molecular markers, '-omics' technology, and genome editing.

The recent development of computation and automation has led to quick advances in the theory and practice of recursive methods for stabilization, identification and control of complex stochastic models (guiding a rocket or a plane, organizing multi-access broadcast channels, self-learning of neural networks ...). This book provides a wide-angle view of those methods: stochastic approximation, linear and non-linear models, controlled Markov chains, estimation and adaptive control, learning ... Mathematicians familiar with the basics of Probability and Statistics will find here a self-contained account of many approaches to those theories, some of them classical, some of them leading up to current and future research. Each chapter can form the core material for lectures on stochastic processes. Engineers having to control complex systems will find here algorithms with good performances and reasonably easy computation.

Genetic Engineering of Plants

Applied Uses of Ancient DNA

Principles, Techniques, and Applications

Plant Nutrition and Food Security in the Era of Climate Change

Plant Genetics and Developing Countries

Genetically Modified Food Sources reports detailed results of studies on the medical and biological safety of 14 species of genetically modified plant-derived organisms (GMOs). The authors focus on issues in GMO production and world output, specifically the basic legislative regulations of modern biotechnology in the Russian Federation. Also covered are international approaches to the medical and biological assessment of safety and control of the food produced from genetically modified organisms. A special chapter is devoted to the problem of informational coverage of novel biological technologies. Previously available only in a 2007 Russian-language edition published by the Russian Academy of Medical Sciences, this English translation has been completely revised and updated to include the latest developments in regulations and human and animal safety assessment practices. The book is addressed to a wide community of specialists working in the fields of food science, plant genetics, and food safety as well as medicine and biology. Students and postgraduates focusing on the problems of modern biotechnology and biological safety will find it a valuable guide to these topics. Specific assessments of 14 species of genetically modified plant-derived organisms used for food supply Addresses the safety assessment requirements to ensure consumer health International coverage provides comparative insights into regulation development and application Advances in understanding plant biology, novel genetic resources, genome modification, and omics technologies create new solutions for food security and novel biomaterials production under changing environmental conditions. The evolution of plant breeding is a classic example of how improved biological understanding has been adapted to provide more effective methods of meeting the demands of a changing world. Plant biotechnology offers significant improvements in virtually every area of crop production and utilization, with potential benefits to farmers, the food industry, consumers and the environment. Recent progress in plant genomics has allowed us to discover and isolate important genes and to analyze functions that regulate yields and tolerance to environmental stress. New gene and germplasm candidates that are expected to lead to improved crop yields and other plant traits under stress have to pass long development phases based on trial and error using large-scale field evaluation. So, quantitative, objective, and automated screening methods combined with decision-making algorithms are likely to have many advantages, enabling rapid screening of the most promising crop lines at an early stage followed by final mandatory field experiments. Thus, with the objective to find new technologies, ecologically or environmentally safer, for the control of plant diseases, mainly in organic growth, alternative methods for the control of phytopathogens has been development.Plant Biotechnology sheds light on current biotechnological research to develop modern technology for producing biologicals and also increasing plant immunity in present environmental conditions. It is intended to provide comprehensive information of novel molecular tools, screening technologies, and economic evaluation should become the main goal of the plant biotechnological revolution in agriculture. The book dwells on aspects of genome editing which will enable researchers to produce transgenic plants in a more convenient and safer way to genetic modification of stem cells holding significant therapeutic promise to treat complications of diabetes and obesity.It is hoped that this book will serve as a seed for further investigations and novel innovations in the area of plant biotechnology.

"The book . . . is, in fact, a short text on the many practical problems . . . associated with translating the explosion in basic biotechnological research into the next Green Revolution," explains Economic Botany. The book is "a concise and accurate narrative, that also manages to be interesting and personal . . . a splendid little book." Biotechnology states, "Because of the clarity with which it is written, this thin volume makes a major contribution to improving public understanding of genetic engineering's potential for enlarging the world's food supply . . . and can be profitably read by practically anyone interested in application of molecular biology to improvement of productivity in agriculture."

This book describes the history of tobacco genomics, from its "discovery" by Europeans to next-generation omics approaches in plant science. The authors primarily focus on the allotetraploid common tobacco plant (N. tabacum); however, separate chapters are dedicated to closely related Nicotiana species, such as N. benthamiana and N. attenuata, for which substantial progress in omics data analysis has been already achieved. While genetic maps, transcriptomes, and physical maps of BAC libraries have significantly enhanced our understanding of the tobacco plant, the genome of tobacco and related Nicotiana species has opened a new era in modern tobacco research. This book addresses current and future industrial and research applications as well as central challenges in tobacco science, including diseases, low variability of cultivars, the genome's large size, polyploidy, and gene duplication.

The Tobacco Plant Genome

Volume 2. Crop productivity, food security and nutritional quality

Cumulated Index Medicus

Genomic Designing of Climate-Smart Fruit Crops

Genomic Designing of Climate-Smart Vegetable Crops

Organic Farming, Genetics, and the Future of Food

Handbook of Maize: Its Biology centers on the past, present and future of maize as a model for plant science research and crop improvement. The book includes brief, focused chapters from the foremost maize experts and features a succinct collection of informative images representing the maize germplasm collection.

This edited book provides a comprehensive overview of modern strategies in fruit crop breeding in the era of climate change and global warming. It demonstrates how advances in plant molecular and genomics-assisted breeding can be utilized to produce improved fruit crops with climate-smart traits. Agriculture is facing a number of challenges in the 21st century, as it has to address food, nutritional, energy and environmental security. Future fruit varieties must be adaptive to the varying scenarios of climate change, produce higher yields of high-quality food, feed, and fuel and have multiple uses. To achieve these goals, it is imperative to employ modern tools of molecular breeding, genetic engineering and genomics for 'precise' plant breeding to produce 'designed' fruit crop varieties. This book is of interest to scientists working in the fields of plant genetics, genomics, breeding, biotechnology, and in the disciplines of agronomy and horticulture.

Plant GenomicsBoD – Books on Demand

This book presents the genetics and genomics of Jatropha, which is used for biofuel, and shows how plant genomics can be used to improve plant breeding. The utilization of plant biofuels is a promising solution to global issues such as the depletion of fossil fuels and resources and climate change. Jatropha curcas L. (jatropha) is a species of shrub belonging to the Euphorbiaceae family. Native to Mesoamerica, it is now grown widely in tropical and subtropical areas in America, Africa and Asia. The seed oil of Jatropha is a suitable source for biodiesel or bio jet fuel, and since it is not edible and can grow in semi-arid lands unsuitable for the cultivation of food crops, its production does not compete with that of food to inflate its price. The characteristics of this promising biofuel plant, however, have not been fully exploited in terms of breeding, mainly because of the lack of information on its genetics and genomics. The structure of the whole genome of Jatropha is analyzed, providing insights into on the plant's genetic system and accelerating the molecular breeding process.

Sources, Effects, and Management

Agricultural Research Opportunities and Policy Concerns

Plant Genomics

Handbook of Maize

The Value of Plant Genome Initiatives

Experiences and Prospects

Applied plant genomics and biotechnology reviews the recent advancements in the post-genomic era, discussing how different varieties respond to abiotic and biotic stresses, investigating epigenetic modifications and epigenetic memory through analysis of DNA methylation states, applicative uses of RNA silencing and RNA interference in plant physiology and in experimental transgenics, and plants modified to produce high-value pharmaceutical proteins. The book provides an overview of research advances in application of RNA silencing and RNA interference, through Virus-based transient gene expression systems, Virus induced gene complementation (VIGC), Virus induced gene silencing (Sir VIGS, Mr VIGS) Virus-based microRNA silencing (VbMS) and Virus-based RNA mobility assays (VRMA); RNA based vaccines and expression of virus proteins or RNA, and virus-like particles in plants, the potential of virus vaccines and therapeutics, and exploring plants as factories for useful products and pharmaceuticals are topics wholly deepened. The book reviews and discuss Plant Functional Genomic studies discussing the technologies supporting the genetic improvement of plants and the production of plant varieties more resistant to biotic and abiotic stresses. Several important crops are analysed providing a glimpse on the most up-to-date methods and topics of investigation. The book presents a review on current state of GMO, the cisgenesis-derived plants and novel plant products devoid of transgene elements, discuss their regulation and the production of desired traits such as resistance to viruses and disease also in fruit trees and wood trees with long vegetative periods. Several chapters cover aspects of plant physiology related to plant improvement: cytokinin metabolism and hormone signaling pathways are discussed in barley; PARP-domain proteins involved in Stress-Induced Morphogenetic Response, regulation of NAD signaling and ROS dependent synthesis of anthocyanins. Apple allergen isoforms and the various content in different varieties are discussed and approaches to reduce their presence. Euphorbiaceae, castor bean, cassava and Jathropa are discussed at genomic structure, their diseases and viruses, and methods of transformation. Rice genomics and agricultural traits are discussed, and biotechnology for engineering and improve rice varieties. Mango topics are presented with an overview of molecular methods for variety differentiation, and aspects of fruit improvement by traditional and biotechnology methods. Oilseed rape is presented, discussing the genetic diversity, quality traits, genetic maps, genomic selection and comparative genomics for improvement of varieties. Tomato studies are presented, with an overview on the knowledge of the regulatory networks involved in flowering, methods applied to study the tomato genome-wide DNA methylation, its regulation by small RNAs, microRNA-dependent control of transcription factors expression, the development and ripening processes in tomato, genomic studies and fruit modelling to establish fleshy fruit traits of interest; the gene reprogramming during fruit ripening, and the ethylene dependent and independent DNA methylation changes. provides an overview on the ongoing projects and activities in the field of applied biotechnology includes examples of different crops and applications to be exploited reviews and discusses Plant Functional Genomic studies and the future developments in the field explores the new technologies supporting the genetic improvement of plants

With the appearance of methods for the sequencing of genomes and less expensive next generation sequencing methods, we face rapid advancements of the -omics technologies and plant biology studies: reverse and forward genetics, functional genomics, transcriptomics, proteomics, metabolomics, the movement at distance of effectors and structural biology. From plant genomics to plant biotechnology reviews the recent advancements in the post-genomic era, discussing how different varieties respond to abiotic and biotic stresses, understanding the epigenetic control and epigenetic memory, the roles of non-coding RNAs, applicative uses of RNA silencing and RNA interference in plant physiology and in experimental transgenics and plants modified to specific aims. In the forthcoming years these advancements will support the production of plant varieties better suited to resist biotic and abiotic stresses, for food and non-food applications. This book covers these issues, showing how such technologies are influencing the plant field in sectors such as the selection of plant varieties and plant breeding, selection of optimum agronomic traits, stress-resistant varieties, improvement of plant fitness, improving crop yield, and non-food applications in the knowledge based bio-economy. Discusses a broad range of applications: the examples originate from a variety of sectors (including in field studies, breeding, RNA regulation, pharmaceuticals and biotech) and a variety of scientific areas (such as bioinformatics, -omics sciences, epigenetics, and the agro-industry)Provides a unique perspective on work normally performed 'behind closed doors'. As such, it presents an opportunity for those within the field to learn from each other, and for those on the 'outside' to see how different groups have approached key problemsHighlights the criteria used to compare and assess different approaches to solving problems. Shows the thinking process, practical limitations and any other considerations, aiding in the understanding of a deeper approach

Hazardous and Trace Materials in Soil and Plants: Sources, Effects and Management explores the latest advancements in reducing, avoiding and eliminating soil contaminants that challenge the health and safety of agricultural plants. With a focus on minimizing the production of those hazardous substances, controlling their distribution and ensuring safe utilization, the book explores each contributing area and provides insights toward improved, sustainable and secure production. This is an excellent reference resource on both current research and future directions from laboratory research to field applications. The combined impacts of climate change and industrialization have led to increased and diversified threats to the health of the soil in which our food crops are grown, as well as in the plants themselves. This dual-hazard scenario is increasingly recognized as a threat to not just the environment, but to global food security as agricultural soils contaminated with pollutants alter plant metabolism, thus resulting in reduced crop quality and production quantity. Addresses the challenges of mitigating toxic substances in plants, including agricultural crops Presents current status and future prospects for managing biotic and abiotic environmental stress factors through plant stress tolerance mechanisms Includes chapters that address both biotic and abiotic stresses, agricultural and environmental science, toxicology, biotechnology, nanotechnology, and molecular studies Integrates insights and developments between environmental and plant science

A challenge of our generation is the creation of an efficient system providing sustainable food and fuel from the land whilst also preserving biodiversity and ecosystems. We must feed a human population that is expected to grow to more than nine billion by mid-century. Agricultural biotechnology is one tool that holds potential promise to alleviate hunger and poverty. However, there are complex and interrelated scientific, social, political and ethical questions regarding the widespread use of biotechnology in the food supply. This edited volume discusses diverse perspectives on sustainable food production systems in terms of challenges, opportunities, success stories, barriers and risks associated with agricultural and food biotechnology. The effects of biotechnology on the environment, ethical and moral issues, potential changes to government policies and economics, and social implications are summarised. This book will interest students, professionals and researchers from the areas of bioengineering, agriculture and ecosystem science to economics and political science.

Plant Systems Biology

More Food: Road to Survival

Approaches to Assessing Unintended Health Effects

Plant Biotechnology and Genetics

Safety of Genetically Engineered Foods

Tomorrow's Table

Plant genetic diversity is crucial to the breeding of food crops and is therefore a central precondition for food security. Diverse genetic resources provide the genetic traits required to deal with crop pests and diseases, as well as changing climate conditions. Plant genetic diversity is also essential for traditional small-scale farming, and is therefore an indispensable factor in the fight against poverty. However, the diversity of domesticated plant varieties is disappearing at an alarming rate while interest in the commercial use of genetic resources has increased in line with bio-technologies, followed by demands for intellectual property rights. This important book contributes to our understanding of how international regimes affect the management of plant genetic resources for food and agriculture in developing countries. It identifies entry points to shape a better governance of agrobiodiversity and provides the first comprehensive analysis of how the international agreements pertaining to crop genetic resources affect the management of these vital resources for food security and poverty eradication in developing countries.

By the year 2050, Earth's population will double. If we continue with current farming practices, vast amounts of wilderness will be lost, millions of birds and billions of insects will die, and the public will lose billions of dollars as a consequence of environmental degradation. Clearly, there must be a better way to meet the need for increased food production. Written as part memoir, part instruction, and part contemplation, Tomorrow's Table argues that a judicious blend of two important strands of agriculture--genetic engineering and organic farming--is key to helping feed the world's growing population in an ecologically balanced manner. Pamela Ronald, a geneticist, and her husband, Raoul Adamchak, an organic farmer, take the reader inside their lives for roughly a year, allowing us to look over their shoulders so that we can see what geneticists and organic farmers actually do. The reader sees the problems that farmers face, trying to provide larger yields without resorting to expensive or environmentally hazardous chemicals, a problem that will loom larger and larger as the century progresses. They learn how organic farmers and geneticists address these problems. This book is for consumers, farmers, and policy decision makers who want to make food choices and policy that will support ecologically responsible farming practices. It is also for anyone who wants accurate information about organic farming, genetic engineering, and their potential impacts on human health and the environment.

Genetically engineered (GE) crops were first introduced commercially in the 1990s. After two decades of production, some groups and individuals remain critical of the technology based on their concerns about possible adverse effects on human health, the environment, and ethical considerations. At the same time, others are concerned that the technology is not reaching its potential to improve human health and the environment because of stringent regulations and reduced public funding to develop products offering more benefits to society. While the debate about these and other questions related to the genetic engineering techniques of the first 20 years goes on, emerging genetic-engineering technologies are adding new complexities to the conversation. Genetically Engineered Crops builds on previous related Academies reports published between 1987 and 2010 by undertaking a retrospective examination of the purported positive and adverse effects of GE crops and to anticipate what emerging genetic-engineering technologies hold for the future. This report indicates where there are uncertainties about the economic, agronomic, health, safety, or other impacts of GE crops and food, and makes recommendations to fill gaps in safety assessments, increase regulatory clarity, and improve innovations in and access to GE technology.

This book collates the basic and advanced concepts of plant biotechnology and genomics along with the future trends. It discusses the combination of conventional breeding techniques with genomic tools and approaches leading to a new genomics-based plant breeding technology supporting crop plants that respond better to biotic and abiotic stress, and pathogen attacks. Plant genomics play an important role in developing more efficient plant cultivars which are essential for the neo green revolution needed to feed the world's rapidly growing population. Plant genomic data is being utilized in genetic engineering to ensure that better and resilient varieties of crops are available ensuring food security. This book is of immense interest to teachers, researchers, crop scientists, capacity builders, and policy makers. Also, the book serves as additional reading material for undergraduate and graduate students of agriculture, biotechnology, genomics, soil science, and environmental sciences. National and International agricultural scientists and policy makers will also find this to be a useful read.

Advanced Molecular Plant Breeding

Plant Genomics for Sustainable Agriculture

Genetics and Genomics of the Triticeae

The Role of Biotechnology in a Sustainable Food Supply

Handbook of Maize: Its Biology

Random Iterative Models

1. The book is designed for preparation of civil services exams 2. It is divided into 4 papers and segmented into topics. 3. Last 5 Years solved papers are given to understand the changing paper. 4. Chapterwise Questions are provided from 2020 to 1997 for practice. 5. Solved Papers 2020-2017 are given for practice. Candidates, who are appearing in IAS Main Exams, are always in need of comprehensive and accurate study material which could actually serve the purpose for the smart and cumulative understanding of the subject. General Studies is a very dynamic topic which requires in depth analysis and vast knowledge. With the current edition of "IAS Mains General Studies Chapterwise Solved Papers 2020-1997" candidates are guided with the authentic source of information following the current paper pattern. The book is divided into 4 Parts providing complete practice of each paper. Every chapter is loaded with good number of questions from 1997 to 2020 along with detailed solutions. Solved Papers (2020-2017) are provided to get the better insight of the question papers and its pattern. TOC Solved Paper 2020-2017 (Paper - I, II, III, IV), Paper I – Indian Heritage and Culture, History and Geography of the World and Society, Paper II – Governance, Constitution, Polity, Social Justice and International Relations, Paper III – Technology, Economic Development, Biodiversity, Environment, Security and Disaster Management, Paper IV – Ethics, Integrity and Aptitude.

Two worlds that in academia remain largely separated are brought together in this book in a unique way; the world of food safety law and the world of the right to food. Key features include: (1) an up to date reflection of the status quo on food law related research written by those who are at the forefront of research in the functional field of food law; (2) a collection of contributions from all continents of the world; and (3) covering human rights, international law, European law and non-European law dimensions. This book is written as a Liber Amicorum in honour of Professor Bernd van der Meulen, who was the Chair of Law and Governance at Wageningen University (2001-2018), and established food law as an academic discipline in the Netherlands. In 29 contributions the functional field of food law is discussed. The contributors are researchers and academics from around the globe, and are above all friends who have worked with Bernd during his time at Wageningen University. In this book, they share their latest insights, research and thoughts on this fascinating and highly relevant field.

The Jatropha Genome

IAS Mains Chapterwise Solved Papers General Studies

Reconciling the market and human rights

Report to the President and Congress

Hazardous and Trace Materials in Soil and Plants

The functional field of food law