Advances In Wheat Genetics From Genome To Field Proceedings Of The 12th International Wheat Genetics Symposium

Is your knowledge about this important grain crop up to date? This comprehensive two-volume resource reviews the latest advances in scientific and technical knowledge for durum wheat breeding. With a scope of coverage that includes genetics and molecular biology, plant and crop physiology, and breeding strategies and methodology, Durum Wheat Breeding: Current Approaches and Future Strategies is designed to aid students, educators, and practitioners alike. More than 200 figures and tables make important information and concepts easy to access and understand. Though not primarily designed as a textbook, Durum Wheat Breeding is valuable supplementary reading for postgraduate courses on plant breeding, genetics and molecular biology as applied to agricultural crops, crop physiology, and other related subjects. Part One: World Distribution and the Role of Durum Wheat Breeding covers: the evolution and taxonomy of wheat uses of durum wheat—present and future breeding for improved yield Part Two: Genetics and Molecular Aspects examines: genetic diversity in durum wheat elite germplasm collecting and managing genetic resources wheat cytogenetics the impact of genetic manipulation upon grain composition and quality resistance to abiotic stresses, diseases, and pests the genetic bases of grain quality Part Three: Physiological Bases of Durum Wheat Improvement addresses: advances in yield through genetic improvement ideotypes for sustainable farming the physiological basis of yield potential in durum wheat adaptive mechanisms for water stress functional determinants of grain quality Part Four: Breeding Strategy and Methodology focuses on: increasing yield potential and stability selection tools that can strengthen physiological traits that improve yield selection strategies for winter- and facultative durum wheat and for biotic stress resistance breeding methods and strategies designed to improve the quality of durum wheat the value of wide crosses the doubled-haploid technique the management of genotype x environment interactions proper design and analysis of field experiments Part Five: Applied and Strategic Research in Different Durum Breeding Programs examines some of the most important breeding/improvement programs worldwide, with case examples from Italy, Spain, Romania, Canada, Morocco, the United States, Turkey, and India, as well as the CIMMYT’s international durum wheat breeding program. From the authors: “Durum wheat breeding has been quite successful during the last half-century or so in most regions in which it is a traditional crop. This success, like that of other major crops, has been brought about by the traditional breeding approach of trial and error together with the ’eye’ of the breeder in the selection process. There is a growing consensus, however, that future breeding may be far more efficient if it takes into account not only the newest

developments in knowledge for breeding strategies and methodologies, but also advances in scientific areas that may assist breeding to reach its objectives—mainly genetics/molecular biology and plant/crop physiology. It is our hope that this volume will be a valuable resource to current and future generations of wheat growers, breeders, and scientists."

Cytogenetics plays an important role in understanding the chromosomal and genetic architecture of plant species. Plant Cytogenetics, Third Edition follows the tradition of its predecessors presenting theoretical and practical aspects of plant cytogenetics. Chapters describe correct handling of plant chromosomes, methods in plant cytogenetics, cell division, reproduction methods, chromosome nomenclature, karyotype analysis, chromosomal aberrations, genome analysis, transgenic crops, and cytogenetics in plant breeding. This new edition begins with a brief introduction on the historical aspect of cytogenetics and flows directly into handling of plant chromosomes by classical and modern cytological techniques, classical Mendelian Genetics, brief description of cell division, and chromosome identification by karyotype analysis. The comprehension of cytogenetics is incomplete without information on the role of aneuploidy in associating a gene on a particular chromosome, and the book covers these methodologies as a primary topic. Covering classical to modern cytogenetics, the book presents to the reader the crucial role of cytogenetics in improving crops.

With near-comprehensive coverage of new advances in crop breeding for drought and salinity stress tolerance, this timely work seeks to integrate the most recent findings about key biological determinants of plant stress tolerance with modern crop improvement strategies. This volume is unique because is provides exceptionally wide coverage of current knowledge and expertise being applied in drought and salt tolerance research.

The 4th International Conference on Selenium in the Environment and Human Health was held 18-21 October 2015 in SPaulo, Brazil. This conference provided an effective scientific communication platform for researchers in different disciplines worldwide to elucidate and better understand those complex roles of Se as both essential nutrient and enviro

Volume 54 contains seven reviews covering key contemporary topics in the crop and soil sciences. The connections between agricultural practice and environmental impact are addressed in chapters on subsurface microbial ecology, herbicide-resistant field crops, and nitrification inhibitors. Also among this collection are reviews on the microbial reduction of iron, manganese, and other metals; acid tolerance of wheat; lentil breeding and production; and the use of apomixis in cultivar development. With this latest volume, Advances in Agronomy continues to be recognized as a prolific and first-rate reference by the scientific community. In 1993 Advances in Agronomy increased its publication frequency to three volumes per year, and will continue this trend as our breadth of agronomic inquiry and knowledge continues to grow. Impact of agriculture on subsurface microbial ecology Herbicide-resistant crops Microbial reduction of iron, manganese, and other metals Nitrification inhibitors Apomixis in cultivar development

The papers included in this Special Issue address a variety of important aspects of plant biodiversity and genetic resources, including definitions, descriptions, and illustrations of different components and their value for food and nutrition security, breeding, and environmental services. Furthermore, comprehensive information is provided regarding conservation approaches and techniques for plant genetic resources, policy aspects, and results of biological, genetic, morphological, economic, social, and breeding-related research activities. The complexity and vulnerability of (plant) biodiversity and its inherent genetic resources, as an integral part of the contextual ecosystem and the human web of life, are clearly demonstrated in this Special Issue, and for several encountered problems and constraints, possible approaches or solutions are presented to overcome these.

Advances in Genetics

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 proceedings is a collection of 46 selected papers that were presented at the 12th International Wheat Genetics Symposium (IWGS). Since the launch of the wheat genome sequencing project in 2005, the arrival of draft genome sequences has marked a new era in wheat genetics and genomics, catalyzing rapid advancement in the field. This book provides a comprehensive review of the forefront of wheat research, across various important topics such as germplasm and genetic diversity, cytogenetics and allopolyploid evolution, genome sequencing, structural and functional genomics, gene function and molecular biology, biotic stress, abiotic stress, grain quality, and classical and molecular breeding. Following an introduction, 9 parts of the book are dedicated to each of these topics. A final, 11th part entitled “Toward Sustainable Wheat Production” contains 7 excellent papers that were presented in the 12th IWGS Special Session supported by the OECD. With rapid population growth and radical climate changes, the world faces a global food crisis and is in need of another Green Revolution to boost yields of wheat and other widely grown staple crops. Although this book focuses on wheat, many of the newly developed techniques and results presented here can be applied to other plant species with large and complex genomes. As such, this volume is highly recommended for all students and researchers in wheat sciences and related plant sciences and for those who are interested in stable food production and food security.

Investigations on seed proteins have been intensively carried out during the past two decades. This is valid with regard to both their chemical composition as well as their nutritive value. The development of new biochemical and physical methods has resulted in obtaining deep insights into the structures of seed proteins and their mutual interactions. Intensive exchange of information between the scientists participating in national and international research programmes has given strong impulses for intensifying the research in this field. For the quantitative and quali tative investigations of seed proteins, not only some model plants were used; on the contrary, they were carried out on a large number of different crops important for different regions of the earth. In this way, a level of knowledge has been reached which could not be expected in this diversity within such a short period. This holds not only true for biochemical but also for physiological characters of the species of the limiting amino acids studied. With regard to nutritional aspects, the problem was of special interest, but also seed proteins acting as antinutritional factors were analysed in detail. Based on the knowledge of seed protein structures, it was possible to perform investigations on the genetic basis of their synthesis. This was done under two different aspects: The basic knowledge on the genes involved should be widened; moreover, it should be tried to improve the seed proteins quantitatively and qualitatively under the influence of mutant genes.

Allohexaploid bread wheat and diploid barley are two of the most cultivated crops in the world. This book reports novel research and reviews concerning the use of modern technologies to understand the molecular bases for wheat and barley improvement. The contributions published in this book illustrate research advances in wheat and barley knowledge using modern molecular techniques. These molecular approaches cover genomic, transcriptomic, proteomic, and phenomic levels, together with new tools for gene identification and the development of novel molecular markers. Overall, the contributions for this book lead to a further understanding of regulatory systems in order to improve wheat and barley performance.

This book presents an overview of the state-of-the-art in barley genome analysis, covering all aspects of sequencing the genome and translating this important information into new knowledge in basic and applied crop plant biology and new tools for research and crop improvement. Unlimited access to a high-quality reference sequence is removing one of the major constraints in basic and applied research. This book summarizes the advanced knowledge of the composition of the barley genome, its genes and the much larger non-coding part of the genome, and how this information facilitates studying the specific characteristics of barley. One of the oldest domesticated crops, barley is the small grain cereal species that is best adapted to the highest altitudes and latitudes, and it exhibits the greatest tolerance to most abiotic stresses. With comprehensive access to the genome sequence, barley's importance as a genetic model in comparative studies on crop species like wheat, rye, oats and even rice is likely to increase.

ADVANCES IN GENETICS VOLUME 2.

The field of genetics is rapidly evolving and new medical breakthroughs are occurring as a result of advances in knowledge of genetics. This series continually publishes important reviews of the broadest interest to geneticists and their colleagues in affiliated disciplines. The field of genetics is rapidly evolving and new medical breakthroughs are occurring as a result of advances in knowledge of genetics. This series continually publishes important reviews of the broadest interest to geneticists and their colleagues in affiliated disciplines.

What is the Mediterranean? The perception of the Mediterranean leans equally on the nature, culture, history, lifestyle, and landscape. To approach the question of identity, it seems that we have to give importance to all of these. There is no Mediterranean identity, but Mediterranean identities. Mediterranean is not about the homogeneity and uniformity, but about the unity that comes from diversities, contacts, and interconnections. The book tends to embrace the environment, society, and culture of the Mediterranean in their multiple and unique interconnections over the millennia, contributing to the better understanding of the essential human-environmental interrelations. The choice of 17 chapters of the book, written by a number of prominent scholars, clearly shows the necessity of the interdisciplinary approach to the Mediterranean identity issues. The book stresses the most serious concerns of the Mediterranean today - threats to biodiversity, risks, and hazards - mostly the increasing wildfires and finally depletion of traditional Mediterranean practices and landscapes, as constituent parts of the Mediterranean heritage.

Cultivation of grain crops has been rightly recognized as one of the main drivers in shaping human civilizations. Considering their key role in fulfilling a major portion of the global food needs, grain crops are the most widely grown crops around the world. Unfortunately, like many other agronomic crops, grain crops are quite vulnerable to climate change and this has posed multifaceted threats to agricultural sustainability. To add to the menace, the deteriorating quantity and quality of both land and water as primary factors of production are further aggravating the scenario. Confronting such challenges demands innovative adaptation strategies through intensification of grain crop production that can ensure grain self-sufficiency worldwide.

Wheat: Science and Trade is an up-to-date, comprehensive reference work designed to expand the current body of

knowledge on this staple crop, incorporating new information made available by genetic advances, improvements in the understanding of wheat's biology, and changes in the wheat trade industry. Covering phylogeny and ontogeny, manipulation of the environment and optimal management, genetic improvement, and utilization and commercialization, the book focuses on the most economically significant diseases and impacts

The basic concept of this book is to examine the use of innovative methods augmenting traditional plant breeding towards the development of new crop varieties under different environmental conditions to achieve sustainable food production. This book consists of two volumes: Volume 1 subtitled Breeding, Biotechnology and Molecular Tools and Volume 2 subtitled Agronomic, Abiotic and Biotic Stress Traits. This is Volume 1 which consists of 21 chapters covering domestication and germplasm utilization, conventional breeding techniques and the role of biotechnology. In addition to various biotechnological applications in plant breeding, it includes functional genomics, mutations and methods of detection, and molecular markers. In vitro techniques and their applications in plant breeding are discussed with an emphasis on embryo rescue, somatic cell hybridization and somaclonal variation. Other chapters cover haploid breeding, transgenics, cryogenics and bioinformatics.

The World population will reach 9 billion by 2050, with the majority of this growth occurring in developing countries. On the other hand, one in nine of the World's population suffers from chronic hunger, the vast majority of which live in developing countries. We therefore need to find new and sustainable solutions to feed this increasing population and alleviate the predicted negative impact of global changes on crop production. This e-Book deals with new strategies to improve food security and livelihoods in rural communities, reduce vulnerability, increase resilience and mitigate lthe impact of climate change and land degradation on agriculture. This collection of 18 articles addresses the major abiotic factors limiting crop production worldwide, how to characterize and exploit the available plant biodiversity to increase production and sustainability in agrosystems, and the use of beneficial microbes to improve production and reduce the use of fertilizers and pesticides.

The Wheat Improvement, Management, and Utilization book covers some of the most recent research areas that touch on enhancement of wheat productivity. It is obvious that wheat is one of the major staple crops grown globally. This crop has widely been researched on considering that, for instance, it is afflicted by various abiotic and biotic stresses that limit its growth and productivity. Today?s goal of wheat improvement consistently is to develop varieties that are high yielding with good processing and technological qualities, well adapted and tolerant to prevailing biotic and abiotic stresses. Therefore, this is a valuable reference book on wheat improvement, agronomy, and end-use qualities, particularly for those who work in research organizations and higher academic institutions. Moreover, it provides an invaluable resource

for readers interested in a quick review of trending topics in wheat.

Advances in Agronomy, Volume 155, the newest release in this valuable serial, continues to be recognized as a leading reference and first-rate source for the latest research in agronomy. Each volume contains an eclectic group of reviews by leading scientists throughout the world. As always, the subjects covered are rich, varied and exemplary of the abundant subject matter addressed by this long-running serial. Includes numerous, timely, state-of-the-art reviews on the latest advancements in agronomy Features distinguished, well recognized authors from around the world Builds upon this venerable and iconic review series Covers the extensive variety and breadth of subject matter in the crop and soil sciences

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A comprehensive overview of various aspects of photosynthesis and its regulation is presented by this book. An international group of scientists offer historical background, recent data and new techniques and speculations on future research in such areas as: regulation of metabolism in chloroplasts and leaf cells; partitioning of carbon products; chloroplast genetics and molecular biology; photosynthetic electron transport; regulation of photosynthetic efficiency; C4-photosynthesis; ribulose bisphosphate carboxylase; photorespiration and photosynthesis; dark respiration; photosynthesis; and crop yield.

This collection reviews key advances in cereals breeding. It looks at advances in exploiting genetic diversity, the use of doubled haploids and hybrid breeding. The books also reviews developments in phenotyping, the use of genetic markers and techniques such as genomic selection.

Two major challenges to continued global food security are the ever increasing demand for food products, and the unprecedented abiotic stresses that crops face due to climate change.Wild relatives of domesticated crops serve as a reservoir of genetic material, with the potential to be used to develop new, improved varieties of crops. Crop Wild

Relative and Climate Change integrates crop evolution, breeding technologies and biotechnologies, improved practices and sustainable approaches while exploring the role wild relatives could play in increasing agricultural output. Crop Wild Relative and Climate Change begins with overviews of the impacts of climate change on growing environments and the challenges that agricultural production face in coming years and decades. Chapters then explore crop evolution and the potential for crop wild relatives to contribute novel genetic resources to the breeding of more resilient and productive crops. Breeding technologies and biotechnological advances that are being used to incorporate key genetic traits of wild relatives into crop varieties are also covered. There is also a valuable discussion on the importance of conserving genetic resources to ensure continued successful crop production. A timely resource, Crop Wild Relative and Climate Change will be an invaluable resource for the crop science community for years to come.

Advances in Wheat Genetics: From Genome to FieldProceedings of the 12th International Wheat Genetics SymposiumSpringer

The field of genetics is rapidly evolving and new medical breakthroughs are occuring as a result of advances in knowledge of genetics. This series continually publishes imporatnt reviews of the broadest interest to geneticists and their colleagues in affiliated disciplines.

World population is growing at an alarming rate and may exceed 9.7 billion by 2050, whereas agricultural productivity has been negatively affected due to yield limiting factors such as biotic and abiotic stresses as a result of global climate change. Wheat is a staple crop for ~20% of the world population and its yield needs be augmented correspondingly in order to satisfy the demands of our increasing world population. “Green revolution”, the introduction of semi-dwarf, high yielding wheat varieties along with improved agronomic management practices, gave rise to a substantial increase in wheat production and self-sufficiency in developing countries that include Mexico, India and other south Asian countries. Since the late 1980’s, however, wheat yield is at a standoff with little fluctuation. The current trend is thus insufficient to meet the demands of an increasing world population. Therefore, while conventional breeding has had a great impact on wheat yield, with climate change becoming a reality, newer molecular breeding and management tools are needed to meet the goal of improving wheat yield for the future. With the advance in our understanding of the wheat genome and more importantly, the role of environmental interactions on productivity, the idea of genomic selection has been proposed to select for multi-genic quantitative traits early in the breeding cycle. Accordingly genomic selection may remodel wheat breeding with gain that is predicted to be 3 to 5 times that of crossbreeding. Phenomics (high-throughput phenotyping) is another fairly recent advancement using contemporary sensors for wheat germplasm screening and as a selection tool. Lastly, CRISPR/Cas9 ribonucleoprotein mediated genome editing technology has been successfully utilized for efficient

and specific genome editing of hexaploid bread wheat. In summary, there has been exciting progresses in the development of non-GM wheat plants resistant to biotic and abiotic stress and/or wheat with improved nutritional quality. We believe it is important to highlight these novel research accomplishments for a broader audience, with the hope that our readers will ultimately adopt these powerful technologies for crops improvement in order to meet the demands of an expanding world population.

Over the last few decades, the prevalence of studies about plant growth has dramatically grown in most regions of the world. Many aspects have been investigated related to this phenomenon. If we can gain understanding of how plants grow, then we may be able to manipulate it to reduce both chemical fertilizer use and its environmental impact without decreasing the yield. This book provides information about the use of bio-agents, plant health, plant pathogen, property of melanin, and the influence of rootstock and root growth. We hope this information will be useful for all the people who work with this hot topic.

Plant breeding has played a significant role in the development of human civilizations. Conventional plant breeding has significantly improved crop yield by genetically manipulating agronomically important traits. However, it has often been criticized for ignoring indigenous germplasm, failing to address the needs of the marginal and the poor farmers, and emphasizing selection for broad instead of local adaptation. Participatory plant breeding (PPB) is the process by which the producers and other stakeholders are actively involved in a plant-breeding programme, with opportunities to make decisions throughout. The Working Group on Participatory Plant Breeding (PPBwg) was established in 1996 under the framework of the Consultative Group on International Agricultural Research (CGIAR). Research in PPB can promote informed participation and trust in research among consumers and producers, and in recent years, PPB has had a significant impact on food production by quickly and cost-effectively producing improved crop varieties. At the same time, there has been significant research in the area. PPB offers significant advantages that are particularly relevant to developing countries where large investments in plant breeding have not led to increased production, especially in the marginal environments. In addition to the economic benefits, participatory research has a number of psychological, moral, and ethical benefits, which are the consequence of a progressive empowerment of the farming communities. PPB can empower groups such as women or less well-off farmers that are traditionally left out of the development process. This book explores the potential of PPB in the coming decades. The topic is more relevant since international breeding efforts for major crops are aimed at decentralizing local breeding methods to better incorporate the perspective of end users into the varietal development process. The first book incorporating the upcoming research on this novel breeding approach, it reviews the important tools and applications of PPB in an easy-to-read, succinct format, with illustrations to clarify these complex topics. It provides readers with a basic idea of participatory plant breeding as well as advances in the field and insights into the future to facilitate the successful integration of farmers into breeding programmes. This book is a valuable reference resource for agriculturists, agricultural advisers, policy makers, NGOs, post-doctoral students and scientists in agriculture, horticulture, forestry and botany.

Comprehensive Foodomics offers a definitive collection of over 150 articles that provide researchers with innovative answers to crucial questions relating to food quality, safety and its vital and complex links to our health. Topics covered include transcriptomics, proteomics, metabolomics, genomics, green foodomics, epigenetics and noncoding RNA, food safety, food bioactivity and health, food quality and traceability, data treatment and systems biology. Logically structured into 10 focused sections, each article is authored by world leading scientists who cover the whole breadth of Omics and related technologies, including the latest advances and applications. By bringing all this information together in an easily navigable reference, food scientists and nutritionists in both academia and industry will find it the perfect, modern day compendium for frequent reference. List of sections and Section Editors: Genomics - Olivia McAuliffe, Dept of Food Biosciences, Moorepark, Fermoy, Co. Cork, Ireland Epigenetics & Noncoding RNA - Juan Cui, Department of Computer Science & Engineering, University of Nebraska-Lincoln, Lincoln, NE Transcriptomics - Robert Henry, Queensland Alliance for Agriculture and Food Innovation, The University of Queensland, St Lucia, Australia Proteomics - Jens Brockmeyer, Institute of Biochemistry and Technical Biochemistry, University Stuttgart, Germany Metabolomics - Philippe Schmitt-Kopplin, Research Unit Analytical BioGeoChemistry, Neuherberg, Germany Omics data treatment, System Biology and Foodomics - Carlos Leon Canseco, Visiting Professor, Biomedical Engineering, Universidad Carlos III de Madrid Green Foodomics - Elena Ibanez, Foodomics Lab, CIAL, CSIC, Madrid, Spain Food safety and Foodomics - Djuro Josi?, Professor Medicine (Research) Warren Alpert Medical School, Brown University, Providence, RI, USA & Sandra Kraljevi? Paveli?, University of Rijeka, Department of Biotechnology, Rijeka, Croatia Food Quality, Traceability and Foodomics - Daniel Cozzolino, Centre for Nutrition and Food Sciences, The University of Queensland, Queensland, Australia Food Bioactivity, Health and Foodomics - Miguel Herrero, Department of Bioactivity and Food Analysis, Foodomics Lab, CIAL, CSIC, Madrid, Spain Brings all relevant foodomics information together in one place, offering readers a ‘one-stop,’ comprehensive resource for access to a wealth of information Includes articles written by academics and practitioners from various fields and regions Provides an ideal resource for students, researchers and professionals who need to find relevant information quickly and easily Includes content from high quality authors from across the globe