

Genetic Variation Patterns Of Shorea Contorta And

The publication was prepared based on information provided by 86 countries, outcomes from regional and subregional consultations and commissioned thematic studies. It includes: •an overview of definitions and concepts related to Forest Genetic Resources (FGR) and a review of their value; •a description of the main drivers of changes; •the presentation of key emerging technologies; •an analysis of the current status of FGR conservation, use and related developments; •recommendations addressing the challenges and needs. By the FAO Commission on Genetic Resources for Food and Agriculture.

The recent development of ideas on biodiversity conservation was already being considered almost three-quarters of a century ago for crop plants and the wild species related to them, by the Russian geneticist N.I. Vavilov. He was undoubtedly the first scientist to understand the importance for humankind of conserving for utilization the genetic diversity of our ancient crop plants and their wild relatives from their centres of diversity. His collections showed various traits of adaptation to environmental extremes and biotypes of crop diseases and pests which were unknown to most plant breeders in the first quarter of the twentieth century. Later, in the 1940s-1960s scientists began to realize that the pool of genetic diversity known to Vavilov and his colleagues was beginning to disappear. Through the replacement of the old, primitive and highly diverse land races by uniform modern varieties created by plant breeders, the crop gene pool was being eroded. The genetic diversity of wild species was equally being threatened by human activities: over-exploitation, habitat destruction or fragmentation, competition resulting from the introduction of alien species or varieties, changes and intensification of land use, environmental pollution and possible climate change.

Forest fragmentation will inevitably continue over the coming years, especially in developing economies. This book provides a cutting edge review of the multi-disciplinary sciences related to studies of global forest fragmentation. It specifically addresses cross-cutting themes from both an ecological and a social sciences perspective. The ultimate goal of Global Forest Fragmentation is to provide a detailed scientific base to support future forest landscape management and planning to meet global environmental and societal needs.

Forest Genetics

Plant Genetic Resources, Inventory, Collection and Conservation

Genetic variation and the reproductive system of *Dipterocarpus* cf. *condorensis* Pierre in Vietnam

Silviculture in the Tropics

The Ecological Consequences of Environmental Heterogeneity

Tropical Forest Canopies: Ecology and Management

Trees that are indispensably supportive to human life pose a formidable challenge to breed them to suit to human needs. From soft drinks to breweries to beverages to oil to tires, the value added products from trees give a spectrum of products to human kind. While attempts to tap these resources through conventional breeding are underway, the quick and elegant way of manipulating the genetic systems at the genome level is an essential chapter of modern science. Books featuring genomics of tree crops are few, and genomics is such a science that changes rapidly. *Genomics of Tree Crops* is an earnest attempt towards compiling genomics of tree crops. Plant genomics has made monumental strides in the last decade providing insights into intra-genomic phenomena such as heterosis, epistasis, pleiotropy and other interactions between loci and alleles within the genome. In contrast, the investigation of the roles and functions of single genes is a primary focus of molecular biology and is a common topic of modern genetic research. A genome is the sum total of all of an individual organism's genes. Thus, genomics is the study of all the genes of a cell, or tissue, at the DNA (genotype), mRNA (transcriptome), or protein (proteome) levels. The complete sequencing of the three billion base pair human genome with 25,000 genes identified and the invention of DNA microarrays ushered in a new era in the science of genomics leading to explosive advancements in oncology diagnostics. This impetus into the genomics era led the way toward advances in plant genomics which started with *Arabidopsis thaliana* and went through an array of crops such as rice, maize, papaya, various cereals and legumes, with pigeon pea added to the list towards the end of 2011. Trees, on the other hand, are the least attended taxa with regard to genomic research. Some of the areas that attracted attention of the scientists are: DNA sequencing, bioinformatics, genomics of flowering, gene flow, spatial structure, local adaptation and assisted migration in trees, transformation of fruit trees, genomics of tropical and temperate fruit trees, genomics of Hevea rubber, genomics of papaya and genomics of palms. *Genomics of Tree Crops* compiles this information with chapters authored by experts on these crops.

The Pasoh Forest Reserve (pasoh FR) has been a leading center for international field research in the Asian tropical forest since the 1970s, when a joint research project was carried out by Japanese, British and Malaysian research teams with the cooperation of the University of Malaya (UM) and the Forest Research Institute (FRI, now the Forest Research Institute Malaysia, FRIM) under the International Biological Program (IBP). The main objective of the project was to provide basic information on the primary productivity of the tropical rain forest, which was thought to be the most productive of the world's ecosystems. After the IBP project, a collaborative program between the University of Malaya and the University of Aberdeen, Scotland, UK, for post-graduate training was carried out at Pasoh. Reproductive biology of some dipterocarp trees featured in many of the findings arrived at through the program, contributing greatly to progress in the population genetics of rain forest trees. Since those research programs, apart of the Pasoh forest and its field research station have been managed by FRIM. In 1984, FRIM started a long-term ecological research program in Pasoh FR with the Smithsonian Tropical Research Institute (STRI) and Harvard University, establishing a 50-ha plot and enumerating and mapping all trees 1 cm or more in diameter at breast height. A census has been conducted every 5 years.

Big-Leaf Mahogany is the most important commercial timber species of the tropics. Current debate concerning whether to protect it as an endangered species has been hampered by the lack of complete, definitive scientific documentation. This book reports on vital research on the ecology of big-leaf

mahogany, including genetic variations, regeneration, natural distribution patterns and the silvicultural and trade implications for the tree.

Population and Phylogenetic Studies on Species of Malaysian Rainforest Trees

Sustainability and Diversity of Forest Ecosystems

Comparative and Evolutionary Genomics of Angiosperm Trees

A Practitioner's Guide to Forest Genetics

40th Symposium of the British Ecological Society

Tropical Forestry Handbook

The rapid decline of the Philippine forests has resulted in highly fragmented tree populations. In response to this, plantation programs boomed during the 80 ' s and early 90 ' s of the last century.

Plantation forests, however, were mostly established with reproductive materials from unknown sources with presumably restricted genetic diversity. In this study, genetic variation patterns at

microsatellite (SSR) and AFLP markers were investigated and compared between planted and natural populations of the ecologically important and critically endangered tropical rainforest tree

species: *Shorea contorta* and *Parashorea malaanonan* (Dipterocarpaceae). The study was important to conserve the remaining genetic diversity within populations of the investigated

dipterocarps. Further, it provided useful data for better planning actions when it comes to reinforcement of existing species populations and re-introduction of the species. In addition, it gave

information for a genetically sound seed collection efforts to support the continuous forest restoration programs in the country.

Basic genetic principles; Genetic processes; Threats to in situ genetic conservation; Domestication and ex situ genetic conservation; Monitoring, socioeconomics and policy.

Pollination is one of the most important processes in plant reproduction. It directly influences reproductive success and fitness and the genetic structure of the plant population. Methods exist

to infer the pattern and distance of pollen dispersal, but direct observation of the movements of individual pollen grains during pollination is not feasible owing to their small size. Single-pollen

genotyping is a novel technique for genotyping a single pollen grain. In this book, the principles, the experimental protocol, and several applications of this method in studies of plant ecology,

reproductive biology, and evolutionary genetics have been described. More specifically, the information is useful for the analysis of linkage disequilibrium, intraspecific genetic variation,

chromosome mapping, and the origins of polyploidy. It is also essential for achieving sustainable and optimal crop yield and is vital to agriculture and forestry. Written by pioneer researchers,

the book provides novel research approaches that are proving useful in a growing number of fields. This volume is intended to encourage new and continued applications of single-pollen

genotyping among many disciplines in the future.

Wood Production, Wood Technology, and Biotechnological Impacts

Challenges in managing forest genetic resources for livelihoods

Biodiversity and Conservation of Woody Plants

Conservation and Utilization of Threatened Medicinal Plants

Chloroplast DNA Variation in Indonesian Dipterocarpaceae

Phylogenetic, Taxonomic, and Population Genetic Aspects

This book provides a solid scientific basis for researchers, practitioners and students interested in the application of genetic principles to tropical forest ecology and management. It presents a concise overview of genetic variation, evolutionary processes and the human impact on forest genetic resources in the tropics. In addition, modern tools to assess genetic diversity patterns and the dynamics of genetic structures are introduced to the non-specialist reader.

Forest canopies not only support high terrestrial biodiversity but also represent a critical interface between the atmosphere and the earth. They provide goods and services to support diverse human communities and offer opportunities to explore sustainable use of these resources for many generations of local livelihoods. Forest canopies are important carbon sequestration units, and in this sense, serve as climate control for the planet. Canopies are important energy production centers for the planet, and serve as the basis for many food chains. The canopy can also act as a hook for education outreach and conservation, inspiring ecotourism through recreation and other sustainable uses such as treetop walks, zip lines, and birding. Despite these critical services provided by forest canopies, almost no dedicated research in the treetops was initiated until as recently as the late 1970s when single rope techniques were developed by mountaineering professionals and adapted for use in the canopy. Subsequently, an array of canopy access tools was designed in the 1980s and early 1990s that have opened up this "eighth continent" for global exploration and discovery. This volume uses the major findings of the 5th international canopy conference as a platform for organization, but it does not mimic the sessions and presentations of the conference itself. Instead, it builds on the important themes that emerged from the conference and solicits articles that represent future priorities and advancements for canopy science in the next decade. Despite the global efforts of hundreds of forest scientists over the past 3 decades, forests are degrading at an accelerated rate and biodiversity is increasingly threatened by human activities. Given these trends - despite the very best efforts of the world's

best scientists - other approaches must be taken. This volume summarizes the issue of "treetops at risk" and assembles a global authorship to examine past accomplishments and future initiatives critical in forest conservation.

This book provides a cross-section of all outstanding experience in all fields of tropical forestry under a drastically changing environment induced by climate change. It sheds light on the existing know-how and presents it in a concise and efficient way for the scientist and professional in charge of planning, implementing and evaluating forest resources. The Tropical Forestry Handbook provides proven and/or promising alternative concepts which can be applied to solve organizational, administrative and technical challenges prevailing in the tropics. Presented are state of the art methods in all fields concerning tropical forestry. Emphasize is given to methods which are adapted to- and which safeguard - environmental conditions.

Proceedings of the Asia Pacific Forest Genetic Resources Programme (APFORGEN) Inception Workshop, Kepong, Kuala Lumpur, Malaysia, 15-18 July, 2003

An Interdisciplinary Approach

Genetics Abstracts

Single-Pollen Genotyping

Ensuring Sustainability and Safety in the Pursuit of Biotechnology's Economic Benefits : Proceedings of the 2nd Indonesian Biotechnology Conference

Plant Genetic Conservation

This edited book deals with plant genetic resources and their status, availability, and ecological niche in natural habitat. Usage and conservation practices followed by communities and their rationale are also discussed in the book. The book explores application of biological tools to conserve plant species and optimization protocols for and elicitation of secondary metabolites and other value addition products. The book is organized into sub-themes covering: (i) Ecological status of plant genetic resources (ii) Traditional ethnobotanical knowledge and conservation practices (iii) Ex-situ conservation practices and bioprospecting Globally, plant genetic resources are deeply rooted in culture and economy. Since the early 1990s, the changing socio-economic situation has increasingly put pressure on plant genetic resources, in some cases leading to a severe loss of diversity. For this reason, most vulnerable areas at risk of genetic erosion have been demarcated and protected by forest laws and regulations. Therefore, this book brings the opinions of leading experts in the area of ecology, conservation biodiversity, ethnobotany, and bioprospecting of plant genetic resources. The book is for use by graduate and undergraduate students and researchers in plant physiology, molecular biology, biochemistry, and agriculture. Additionally, it is extremely useful as a general reference for the conservation of flora and large-scale cultivation.

Medicinal plants are globally valuable sources of herbal products. Plant-based remedies have been used for centuries and have had no alternative in the western medicine while others and their bioactive derivatives are in high demand and have been the central focus of biomedical research. As Medicinal plants move from fringe to mainstream, a greater number of individuals seeking treatments free of side effects, considerable attention has been paid to utilize plant-based products for the prevention and cure of diseases. An unintended consequence of this increased demand, however, is that the existence of many medicinal plants is now threatened, due to their small population size, narrow geographic area, habitat specificity, and destructive mode of harvesting. In addition, climate change, habitat loss and genetic drift have further endangered these unique species. As a result, research has been carried out on medicinal and aromatic plants, there is relatively little information available on their global distribution patterns, conservation and the management of such plants prevailing. This book reviews the current status of threatened medicinal plants in light of increased surge in the demand for herbal medicine. It brings together chapters on wild (non-cultivated) and domestic (cultivated) species having therapeutic values. Thematically, conventional and contemporary approaches to conservation of such threatened medicinal plants with commercial feasibility are presented. The topics of interest include, but not limited to, biotechnology, sustainable development, in situ and ex situ conservation, and the relevance of IPR on threatened medicinal plants. We believe this book is useful to horticulturists, botanists, policy makers, conservationists, NGOs and researchers in the pharmaceutical and the industry sectors.

This book integrates the latest global developments in forestry science and practice and their relevance for the sustainable management of tropical forests. The influence of socio-economic dimensions on the development of silvicultural concepts is another spotlight. Ecology and silvicultural options from all tropical continents, and forest formations from coastal forests and from lowland to mountain forests are covered. Review chapters which guide readers through this complex subject integrate numerous illustrative and quantitative studies by experts from all over the world. On the basis of a cross-sectional evaluation of the case studies presented, the authors put forward possible silvicultural concepts for sustainable forestry in a changing world. The book is addressed to a broad readership from forestry and environmental disciplines.

Genomics of Tree Crops

IPGRI: fgr Research Highlights

Bibliography of Agriculture
Biotechnology in the 21st Century
Global Forest Fragmentation
The in situ approach

Almost half of all life on earth may exist in the world's forest canopies. They may also play a vital role in maintaining the planet's climate, yet they remain largely unexplored owing to difficulties of access. They are renowned for their great diversity and role in forest functioning, yet there are still great gaps in the understanding of this last biological frontier'. This seminal book shows how canopy science is now in a position to answer many of the outstanding questions, among which are some of the most pressing environmental issues society is presently facing. It represents a major summary of the current understanding of canopy ecology, and maps a path forward into a greater understanding of tropical forest ecology and management at a time when the very future of this ecosystem is threatened by humanity's actions.

Reproductive Ecology of Tropical Forest Plants reviews recent developments in the reproductive ecology of tropical forest plants and explores the implications of current findings on forest structure, function, management, and conservation. It examines how insights gained from reproductive ecology can be helpful in the management of tropical forest resources and discusses directions of future research.

Marking the change in focus of tree genomics from single species to comparative approaches, this book covers biological, genomic, and evolutionary aspects of angiosperm trees that provide information and perspectives to support researchers broadening the focus of their research. The diversity of angiosperm trees in morphology, anatomy, physiology and biochemistry has been described and cataloged by various scientific disciplines, but the molecular, genetic, and evolutionary mechanisms underlying this diversity have only recently been explored. Excitingly, advances in genomic and sequencing technologies are ushering a new era of research broadly termed comparative genomics, which simultaneously exploits and describes the evolutionary origins and genetic regulation of traits of interest. Within tree genomics, this research is already underway, as the number of complete genome sequences available for angiosperm trees is increasing at an impressive pace and the number of species for which RNAseq data are available is rapidly expanding. Because they are extensively covered by other literature and are rapidly changing, technical and computational approaches—such as the latest sequencing technologies—are not a main focus of this book. Instead, this comprehensive volume provides a valuable, broader view of tree genomics whose relevance will outlive the particulars of current-day technical approaches. The first section of the book discusses background on the evolution and diversification of angiosperm trees, as well as offers description of the salient features and diversity of the unique physiology and wood anatomy of angiosperm trees. The second section explores the two most advanced model angiosperm tree species (poplars and eucalypts) as well as species that are soon to emerge as new models. The third section describes the structural features and evolutionary histories of angiosperm tree genomes, followed by a fourth section focusing on the genomics of traits of biological, ecological, and economic interest. In summary, this book is a timely and well-referenced foundational resource for the forest tree community looking to embrace comparative approaches for the study of angiosperm trees.

Taxonomy, Ecology, and Silviculture
Ecology of a Lowland Rain Forest in Southeast Asia
Principles and Practice

THE STATE OF THE WORLD ' s FOREST GENETIC RESOURCES

Post-treatment Results of the Landscape Experiment : Held in St. Louis, Missouri, October 17-18, 2000

Tropical Forest Genetics

The last decade has seen countless advances in the measurement and interpretation of the impacts of environmental heterogeneity upon organisms and ecological processes. Progress has been made at a variety of scales of organisation. Following a Symposium on Ecological Consequences of Environmental Heterogeneity, a team of international experts has collaborated to produce this volume. It discusses the effects of environmental heterogeneity; the effects of spatial and temporal heterogeneity on individuals, populations, communities and biodiversity; and the management and conservation implications of environment heterogeneity. This book will prove to be an invaluable reference work not only to advanced students but also established researchers working in the field. This book provides current knowledge about tropical rain forest genetics and its implications for the profitable and sustainable management of forest resources in Southeast Asia. Each chapter covers a major topic in the evolutionary biology of tropical rain forest trees and how management systems interact with these natural dynamics. Authors provide an up-to-date and insightful review of important scientific findings and conclude with practical recommendations for the modern forester in Southeast Asia. Several chapters provide compelling discussions about commonly neglected aspects of tropical forestry, including the impact of historical dynamics of climate change, anthropogenic threats to genetic viability, and the important role of wildlife in maintaining genetic diversity. These discussions will promote a deeper appreciation of not only the economic value of forests, but also their mystery and intangible values. The silvicultural industry in Southeast Asia is a major contributor to the regional economy but the connection between scientific research and the application and development of policy could

be improved upon. This book will help bridge that gap. This book will prove beneficial reading for forestry students, professional forest managers, and policy makers, who do not have technical training in genetics. It is also intended for non-specialists who are involved in the tropical timber industry, from the local forest manager to the international timber purchasing agent.

This book provides complete, comprehensive, and broad subject-based reviews for students, teachers, researchers, policymakers, conservationists, and NGOs interested in the biodiversity and conservation of woody plants. Forests cover approximately 31 percent of the world's total landmass; 93 percent is natural forest and only 7 percent consists of planted trees. Forest decline is progressing at an alarming rate worldwide. In addition to human activities (logging, deforestation, and exploiting forest lands for agriculture and industrial use), a number of other factors – including pests and diseases, drought, soil acidity, radiation, and ozone – are cumulatively contributing to global forest decline. The present situation forces us to focus on forest conservation strategies for the present and future. Gene conservation and maintaining genetic diversity in forest ecosystems are crucial to the preservation of forest genetic resources. This calls for integrated action to implement both the in situ (on site) preservation of forest stands and ex situ (distant from the original site) strategies for the conservation of woody plants' genetic resources. Selected priority areas include: 1) assessing patterns of genetic diversity and threats, 2) understanding the biological processes regulating genetic diversity, 3) assessing the impact of human activities and climate change on genetic diversity, and 5) finding methods for prioritizing species and populations for the conservation of forest trees genetic resources. All chapters were written by leading scientists in their respective fields, which include: woody plant diversity, ecology and evolution; assessment of genetic diversity in forest tree populations; conservation planning under climate change; and in situ and ex situ strategies, including biotechnological approaches, for the conservation of woody plants genetic resources.

Managing the Future of Southeast Asia's Valuable Tropical Rainforests

Proceedings of the Malaysia-United Kingdom Programme Workshop, 21-24 October 1996, Kuala Lumpur, Malaysia

Forest Genetic Resources Conservation and Management

Big-Leaf Mahogany

The Malaysian Forester

General Technical Report NC.

Issues concerning forest genetic diversity; Cases studies from IPGRI's research project; Lessons learned and applicability of reserch outcomes.

Biodiversity is decreasing at the fastest rate in the history of the earth. The sustainable use of ecosystems allowing maintenance of biological diversity is an urgent problem that must be solved.

The work featured in this book presents the results achieved by the RIHN project, together with reports on other international activities and related efforts, as ecologists, forestry scientists, environmental economists, and sociologists share in discussions of the issues.

Genetic variation patterns of Shorea contorta and Parashorea malaanonan (Dipterocarpaceae) in the Philippines

Conservation, Management and Development of Forest Resources

Proceedings of the Second Missouri Ozark Forest Ecosystem Project Symposium

Genetics, Ecology, and Management

Treetops at Risk

Reproductive Ecology of Tropical Forest Plants