

# Sustainable management of *Pinus radiata* plantations



**Cover photos:**

Left: High pruning of radiata pine, New Zealand (P. Wilks)

Centre: A combination of radiata pine plantations, other introduced trees, native areas and farming create attractive landscapes in New Zealand; the farming is on the better soils (D. Mead)

Right: Recreation in a mature radiata pine plantation near Nelson, New Zealand (D. Mead)

# Sustainable management of *Pinus radiata* plantations

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by  
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## Foreword

Growing societal demand for forest products and services require an increase in efforts to establish new forests. Where appropriate, intensively managed forest plantations can supply local and global markets with wood while contributing significantly to rural and industrial development. One of the most successful forest plantation species is *Pinus radiata* – radiata pine.

FAO recognizes the need to back up any significant tree-planting with a deep understanding of all aspects of the species being planted. In 1960, FAO published a major review of radiata pine, written by C.W. Scott, which presented the state of knowledge at that time. After more than 50 years, FAO is pleased to present a comprehensive update of knowledge on radiata pine. While this new publication, by Dr Donald Mead, covers many aspects of the species – its discovery and domestication, site requirements, limitations, wood properties and end-uses, and its social and environmental roles – its focus is on the principles and practices of growing radiata pine sustainably. It also looks ahead to emerging challenges facing plantation forest management, such as the effects of climate change, new diseases and other threats, and how to manage plantation forests to meet changing product needs and societal demands. Thus, this book is relevant and helpful for growers of other tree species, and should also provide valuable insights to forestry students and a wide range of other people interested in forestry.

Globally, there are just over 4 million ha of radiata pine plantations, mainly in Australia, Chile, New Zealand and Spain, making this species the most widely planted introduced conifer. As a plantation species, radiata pine has been a spectacular success, becoming the basis of strong wood-using industries in those countries and producing about 60 million cubic metres of wood per year. Even so, radiata pine provides only slightly more than four percent of the output of all planted forests.

Dr Mead, a New Zealander, has been involved in forestry research and teaching about radiata pine for more than 50 years. He wanted FAO to publish this review of radiata pine management as a means to ensuring its wide dissemination. For FAO, this publication is a way of educating professionals and others on the importance of long-term sustainable plantation forest management based on a profound knowledge of the biology, silviculture and use of a species. I congratulate Dr Mead for this outstanding contribution to global knowledge on plantation forest management and recommend the work to the global forestry community.



Eduardo Rojas-Briales  
Assistant Director-General  
FAO Forestry Department

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## Dedication

This book is dedicated to Dr Gonzalo Paredes Veloso, who died at Valdivia, Chile, in October 2012. Gonzalo was a forest engineer who did his PhD in forest economics at Corvallis, Oregon, United States of America, from 1984 to 1986. He was Dean of the Faculty of Forestry and Natural Resources, Universidad Austral de Chile in Valdivia, for two periods of his career, and for a time he was the Vice Chancellor of Finance and Administrative Support. He was a major leader in the development of the Chilean radiata pine simulator and actively supported forestry research in Chile. Between 1997 and 2000 he was director of Instituto Forestal, the Chilean government forest research organization.

Gonzalo, an academic leader and a critical thinker, was a strong supporter of this book project. He was a dedicated family man and a good friend to many, including the author.

# Acronyms and abbreviations

|                 |   |
|-----------------|---|
| B               | boron   |
| BA              | basal area  |
| C               | carbon  |
| Ca              | calcium   |
| CAI             | current annual increment  |
| CO <sup>2</sup> | carbon dioxide  |
| CSIRO           | Commonwealth Scientific and Industrial Research Organisation<br>(Australia) |
| Cu              | copper  |
| D               | diameter  |
| dbh             | diameter at breast height   |
| DCF             | discounted cash flow  |
| DDC             | diameter of the defect core in the centre of a pruned log                   |
| DOO             | diameter over occlusion   |
| DOS             | maximum stem diameter over branch stubs after pruning                       |
| DRIS            | Diagnosis and Recommendation Integrated System                              |
| FAO             | Food and Agriculture Organization of the United Nations                     |
| Fe              | iron  |
| FRI             | Forest Research Institute (New Zealand), now Scion                          |
| FSC             | Forest Stewardship Council  |
| G               | genetic gain  |
| H               | tree height   |
| H <sup>2</sup>  | broad-sense heritability  |
| INFOR           | Instituto Forestal (Chile)  |
| IRR             | internal rate of return   |
| LAI             | leaf area index   |
| LEV             | land expectation value  |
| LiDAR           | light detection and ranging   |
| LSW             | log sweep   |
| MAI             | mean annual increment since establishment                                   |
| Mg              | magnesium   |
| Mn              | manganese   |
| MoE             | modulus of elasticity   |
| N               | nitrogen  |
| n               | stocking  |
| NPW             | net present worth   |
| P               | phosphorus  |
| PEFC            | Programme for the Endorsement of Forest Certification                       |
| PMAI            | periodic mean annual increment  |
| RD              | relative density  |
| REDD+           | reducing emissions from deforestation and forest degradation                |
| S               | sulphur   |
| SI              | site index  |
| V               | variance  |
| Zn              | zinc  |