

Defining breeding and deployment regions for radiata pine in southern Australia

Authors

[Authors and affiliations](#)

Gregory Dutkowski Miloš Ivković  Washington J. Gapare T. A. McRae

Article

First Online: 18 August 2016

DOI: 10.1007/s11056-016-9544-6

Cite this article as:

Dutkowski, G., Ivković, M., Gapare, W.J. et al. New

Forests (2016) 47: 783. doi:10.1007/s11056-016-9544-6

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Views

Abstract

Productivity of forest tree plantations can be maximised by matching genetically improved planting stock to environments where it performs best. Radiata pine (*Pinus radiata* D. Don) breeding and deployment of genetically improved stock in Australia are currently based on the National Plantation Inventory (NPI) regions. These regions are not based on environmental drivers and biological patterns of genotype by environment interaction ($G \times E$), so they may not deliver optimal genetic gains across plantation areas in Australia. This study used diameter at breast height data from trial sites with common parents to estimate site–site and age–age additive genetic correlations, and compile them into a database. A custom-built script in R was developed, which models the correlation estimates by minimising the weighted error sum of squares from the model to the estimates. First, parameters for the Lambeth's age–age correlation model were derived to adjust for differences in age between sites. Second, estimates of average site–site additive genetic correlations between and within NPI regions were compared with currently assumed values. Third, to identify new breeding and deployment regions, sites were sequentially divided into groups based on critical values of climate and soil variables. Sites were first split into two clusters based on mean daily minimum temperature of wettest quarter, at a threshold of 9.0 °C, and then within the cool cluster, based on rainfall in March, at a threshold of 68 mm. Variances among breeding values were compared for different site classifications as a measure of potential genetic gain. The results from this study are currently being used to redefine the breeding and deployment regions for radiata pine grown in Australia.

Keywords

Radiata pine Genetic correlations Genotype by environment interaction Breeding Climate variables Soil variables

Electronic supplementary material

The online version of this article (doi:[10.1007/s11056-016-9544-6](https://doi.org/10.1007/s11056-016-9544-6)) contains supplementary material, which is available to authorized users.