

# Analysis of Nutrient Depletion in a Radiata Pine Plantation (PRC202-1011)

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## Abstract

*A trial in an 11-year-old stand of radiata pine (Pinus radiata D. Don) was used to analyse the effects of accelerated loss of nutrients from the site on forest productivity and nutrient status. Raking of litter was undertaken over 14 years prior to thinning, then for two years after thinning at which time the trial was destroyed in a wind storm. The experimental design was a factorial of three main treatments: (i) removal (raking) versus nil removal of the forest floor, (ii) replacement or non replacement of nutrients to adjust for imbalances between nutrients in litter and those in the tree stem, and (iii) complete replacement (or not) of all nutrients removed in the litter. Additionally, a small trial was incorporated to address physical aspects of litter removal by comparing raking with 'raking and a cover of woven plastic mesh'. Raking and nutrient additions were carried out approximately every six months.*

*Over the study period, the raking treatment removed about 75 Mg ha<sup>-1</sup> of organic material with contained nutrients (559 kg ha<sup>-1</sup> of N, 68 kg ha<sup>-1</sup> of P, 323 kg ha<sup>-1</sup> of Ca, 91 kg ha<sup>-1</sup> of Mg, 243 kg ha<sup>-1</sup> of K, 0.9 kg ha<sup>-1</sup> of B) and this related to about 4 normal sawlog harvests or one total tree harvest. Up to the time of thinning, raking reduced basal area increment by 25% while raking together with replacement of nutrients reduced this by about 12%. Nutrient additions to unraked plots led to increases of up to 14% in basal area increment. The raking treatment reduced foliage nitrogen and this was correlated with reduced growth while other nutrients such as boron and sulphur were reduced but not to a degree to affect growth or health. The results were used to assess the effects on soil nutrient status and growth of different harvesting regimes (wood only, wood plus bark, total tree). The balance of inputs and outputs of nitrogen was also compared with initial soil nutrient contents and was related to relative growth rates but the changes due to harvesting wood only are probably difficult to detect at an operational level.*

***A published scientific journal paper resulting from the project is available via the following citation:***

***John Turner and Marcia J Lambert (2011) Analysis of Nutrient Depletion in a Radiata Pine Plantation. Forest Ecology and Management Vol 262 PP. 1327-1336.***