

FEATURE SECTION

NEW ZEALAND'S PLANTATION FOREST CARBON INVENTORY

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Under the Kyoto Protocol, New Zealand has to report to the United Nations framework convention on climate change (UNFCCC) concerning carbon stock changes in forests and forest soils since 1990. To date New Zealand's plantation forest carbon inventory reports to the UNFCCC have been based on stem volume yield tables and forest areas from the National Exotic Forest Description (NEFD) database. The NEFD stem volume yield tables have been converted to carbon yield tables using the C_Change model. C_Change was developed for the dominant plantation forest species, *Pinus radiata* D. Don. The IPCC (2003) Good Practice Guidance sets out approaches for estimating carbon stocks in relation to the Kyoto Protocol for non-forest land converted to forest land since January 1990 ("Kyoto forests"). The estimates must be unbiased as far as can be determined, and the precision of estimates improved over time. To meet its obligations under the Kyoto Protocol, New Zealand has designed a plot-based method which, coupled with models, will be used to estimate carbon stocks and carbon stock changes in the plantation forest estate. The planted forest carbon inventory is one component of the LUCAS (Land Use & Carbon Analysis System) project which is being led by the Ministry for the Environment to meet New Zealand's Kyoto carbon reporting and accounting obligations.

Unlike the majority of the pre-1990 forest estate, New Zealand's Kyoto forest estate was largely established on grazed pastures which, because of farming practices, are more fertile than typically found in the pre-1990 forest estate. Yield tables and wood density levels based on the pre-1990 forest estate may therefore not necessarily be representative of Kyoto forests. In addition, data on decay rates used in the C_Change model were limited to *P. radiata* in the central North Island of New Zealand, and so work has been carried out to broaden the range of these data. In addition to the carbon cycle, forest influences climate through its effects on the radiation balance and hydrologic cycle; thus, land use effects on water use have also been investigated.

This feature section of five papers is the first of a series of publications that underpin New Zealand's carbon inventory. Papers include a review of methods for determining decay rates, which forms the basis for ongoing decay studies in *P. radiata*;

estimation of wood density from site factors and management factors to convert stem volume to dry matter and carbon; and new shoot and root biomass data for improving root/shoot ratios for *P. radiata*, including a detailed analysis of the suitability of all New Zealand root biomass studies for carbon estimation purposes. In addition, papers document land-use effects on soil carbon fractions and compare water use in pasture, plantation forest, and indigenous forest in New Zealand.

Two other papers will appear in the next issue. These papers will review work undertaken to compare fixed-area plot designs for estimating carbon in forests and revision of a new national volume function for estimating stem volume of *P. radiata* including young stands growing on fertile sites in New Zealand.

IPCC 2003: "Good Practice Guidance for Land Use, Land-use Change, and Forestry".
Institute for Global Environmental Studies (IGES) for the IPCC.