

# IUFRO workshop on interactive environmental effects on forest stands

At this workshop 120 participants, representing many of the world's forest ecosystems, visited and discussed aspects of ecology, tree physiology and micrometeorology and hydrology in New Zealand forests. The principal theme of the workshop was the interactive effects of environmental variables on forest stands.

Departing from the traditional format, this was a travelling workshop, and included visits to field sites to promote discussion on research and management activities. The workshop began at Lincoln University, moved across to Franz Josef and the last sector was held at Rotorua. This provided extremely good opportunities for interaction between participants during the field visits and while travelling between destinations, and allowed many research sites to be visited.

At Lincoln, the workshop began by focusing on dryland *Pinus radiata* issues. A visit to the agroforestry research site introduced participants to research investigating the processes of competition between trees and understorey pasture species. This was followed by demonstrations of sophisticated techniques for measuring fluxes of water and carbon dioxide within and above canopies, in relation to a research programme encompassing the role of forest vegetation in global energy, water and carbon cycles. Participants were then shown progress in the long-term research project to investigate the effects of elevated carbon dioxide concentration on forest ecosystems. This project at Christchurch is associated with the International Geosphere-Biosphere Pro-

gramme and involves the use of large open-top chambers for growing trees at ambient and elevated carbon dioxide concentrations. Following these field visits, the second day was devoted to the presentation of papers associated with these issues.

Moving to the second site, the workshop discussed research activities into the ecology of *Nothofagus* and the establishment of introduced species at Craigieburn Forest. At Franz Josef, participants were invited to join a guided walk to discuss forest succession following glaciation or visit Saltwater Forest to be shown research into the ecology of podocarp rainforest. These field visits were interspersed with sessions on interacting environmental factors and constraints on productivity.

At Rotorua, the focus was on research into the management of the plantation estate. Visits to discuss the effects of competition between trees and weed species at the New Zealand Forest Research Institute, and aspects of research into silviculture, genetics and nutrition of *Pinus radiata* at Kaingaroa Forest set the scene for workshop sessions on management, canopy structure, carbon allocation, water use and hydrology. The final session dealt with modelling the response of forest stands to interacting environmental variables.

Impressions emerging from the detail presented at the workshop highlight where substantial progress has been made. For example, advances in technology have led to the capability for measuring the fluxes

of energy, water vapour, carbon dioxide and other trace gases including volatile organic compounds routinely at remote sites. These data are important for defining the limits of the exchange rates of carbon between forest ecosystems and the atmosphere, and will be used to test and validate models of canopy processes and as inputs for global models of climate change scenarios. Considerable progress has been made on the interpretation of processes within forest canopies and the regulation of rates of carbon assimilation and allocation by nutrient distribution. Throughout the workshop the use of models was emphasised strongly and there has been impressive development in their formulation.

The realistic adoption by managers of models based on a rigorous framework of the biophysical processes within canopies is now clearly possible, as was demonstrated during the workshop, especially for issues associated with long-term effects of climate change and hydrology of forest catchments.

The concept of a travelling workshop is not new, but the challenge to organise this for 120 participants was rewarded by the unanimous agreement that the workshop provided excellent opportunity for seeing first-hand a wide range of research activities, forest ecosystems and for discussion.

The workshop was organised within the Canopy Processes (S2.01-12) and Whole Plant Physiology (S2.01-15) Working Groups of IUFRO and hosted by Manaaki Whenua Landcare Research, New Zealand Forest Research Institute and Lincoln University. Additional support was provided by New Zealand Society of Plant Physiologists, Forestry Corporation of New Zealand Ltd, Carter Holt Harvey Forests Ltd, PP Systems Ltd and the International Science Foundation.

A book of abstracts of all the papers and posters presented at the workshop is available and can be purchased from David Whitehead, Landcare Research, P.O. Box 31-011, Christchurch (tel: 0-3-351 7099, fax 0-3-351 7091, email: whitehead@landcare.cri.nz) and the papers will appear in a special issue of *Tree Physiology*, expected to be published in early 1996.

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