

Making plantations the growth industry

Looking into the crystal ball, I foresee increasing public support for production forestry in coming decades, with a greater emphasis on plantations. With larger areas of native forest protected in reserves, and less land clearing for agriculture, loss of forest habitat should become less of an issue. At the same time, the environmental benefits of growing trees will be increasingly recognised.

Developments around the world and in Australia have set the scene for change. Internationally, a Forests Convention is under consideration and initiatives such as the Montreal Process are developing sustainable management principles for forests. Clearing of natural forest still occurs at an unacceptable rate in many countries and particularly in the tropics – the current global estimate is about 15 million hectares a year – but pressure is building to halt the destruction from uncontrolled exploitation. Some developing countries have already taken decisive action: India has



Chief of CSIRO Forestry and Forest Products, Dr Glen Kile.

banned wood harvesting from native forests and China has imposed a similar ban in the Yangtse River basin.

In Australia, the implementation of management systems based on principles of ecological sustainability is proceeding through the Regional Forest Agreement process, updating of Codes of Forest Practice and other strategies. An encourag-

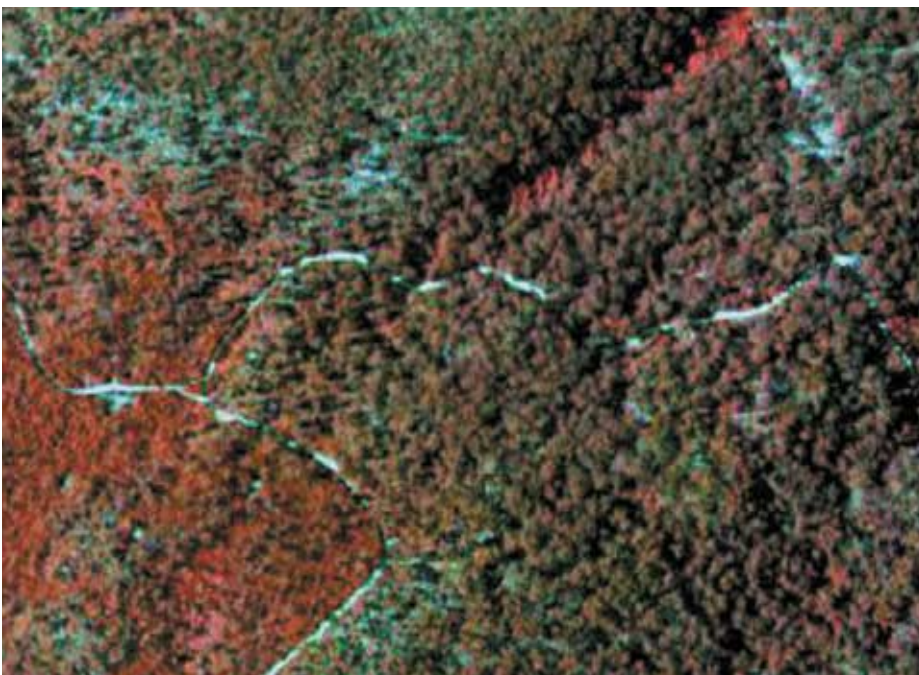
Dr Glen Kile foresees a future in which sustainability grows on trees, thanks to continuing advances in forest and plantation management practices.

ing aspect of all this activity has been requests from the Federal and state governments for extensive scientific input. Interest among policy-makers in obtaining scientific information has been noticeably greater in the 90s than in earlier years, and CSIRO is heavily involved in providing it.

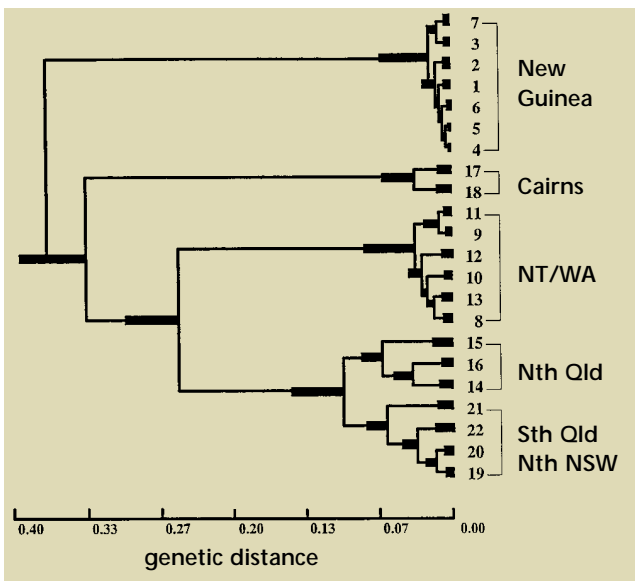
Scientific developments in recent years have helped to make sustainability more than a mere catchword, and ways to monitor it are improving rapidly. Ongoing research will further enhance the ability of forest managers to preserve biodiversity and other environmental values.

For example, developments in remote sensing from satellites and aircraft are making it possible to more accurately measure the extent of forest cover and monitor the health and productivity of the trees and understorey. Even the suitability of areas for different types of wildlife can be assessed. Remote sensing technologies are improving rapidly; the increasing resolution available will raise their value in forest management planning and monitoring.

Biotechnology also has much to offer. Using genetic 'markers', scientists can now measure the genetic diversity within a tree species and its distribution through the tree's natural range. The resulting



Remote sensing technologies, such as the airborne video image from southern New South Wales shown here, are being used to assess forest productivity. In this case the image has been used to provide an indication of vegetation complexity from which predictions can be made of habitat quality for boreal animals.



Above: A river red gum (*Eucalyptus camaldulensis*) plantation at Bai Bang in Vietnam. The trees were grown from a seed source originating in northern Queensland, an area of similar climate conditions.

Left: A representation of the genetic similarity between populations of *Acacia aulacocarpa*. A short path distance is equivalent to a close genetic relationship. Such information assists conservation efforts and tree selection and breeding for plantations.

knowledge is valuable for conservation management, and can aid the selection and breeding of trees for plantations. Researchers are making use of such information in developing strategies for planting spotted gum (*Eucalyptus maculata*) in the Murray-Darling Basin.

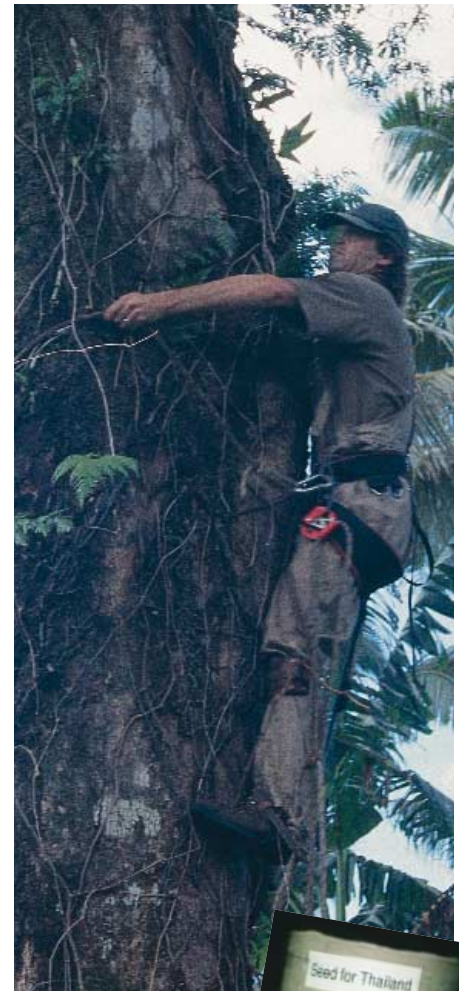
Another important application of genetic markers is in assessing the effects of harvesting and regeneration systems on forest genetic diversity. A recent pioneering study concluded that forest management practices in East Gippsland are unlikely to adversely affect the genetic diversity of silvertop ash (*E. sieberi*).

In native forests, a growing proportion of timber production is likely to come from relatively small areas of managed regrowth. Research has shown that yields can be

increased greatly, and ongoing work will refine management systems for sustainable high productivity.

The trend, though, will be for an ever-increasing proportion of wood production to come from plantations of introduced pines and, increasingly, native species – mainly eucalypts and acacias. Since 1995, tree plantations in Australia have expanded by about 50 000 hectares a year. Research has led to management strategies that will ensure second and subsequent radiata pine rotations are more productive than the first. Lessons from this work are being applied in research aimed at ensuring similar sustainability in eucalypt plantations.

In the tropics, some 80% of plantations consist of eucalypts and other Australian species. Their fast growth is a major



Above: Collecting seed in Western Samoa.

Right: Seed from CSIRO's Australian Tree Seed Centre bound for Thailand. The centre works with developing nations to improve the performance of Australian species in community forests and small landholder plantings.

attraction. CSIRO's Australian Tree Seed Centre supplies quality seed and works with foresters in developing countries to maximise the benefits of our trees in community forests and small land owner plantings. Its work is greatly increasing knowledge of Australia's tree genetic resource, which is important for conservation as well as benefiting Australian and overseas growers.

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Above: Measuring the impact of tree planting on groundwater levels. The benefits of replanting trees to ameliorate dryland salinity is being intensively studied.

Right: In Central Australia, CSIRO research, in cooperation with Aboriginal communities, has demonstrated the potential of acacia plantations as a source of nutritious seed for human consumption and improved amenity around community settlements.



Maggie Long Nakamara.

Growing versatility

I expect the pace of tree planting in Australia to quicken, with plantations serving multiple purposes. Their contribution to wood production – both for sawn timber and fibre products – will expand rapidly. Other contributions will range from helping reduce greenhouse warming to boosting local economies by providing specialised products such as leaf oils as well as wood.

Tree selection and breeding will continue to lift plantation productivity. Large gains have already been achieved with radiata pine and collaborative breeding programs are producing elite lines for eucalypt plantations. Genetic engineering will contribute to tree

improvement in future decades; it will not replace conventional breeding but may speed up the process of producing trees with desirable traits such as improved wood properties or salt tolerance.

On farms, tree plantations will increasingly become a source of income as well as helping control dryland salinity and erosion, providing habitat for wildlife and offering shade and shelter to stock and crops. Cities and towns through much of inland Australia will irrigate plantations with sewage effluent, reducing pollution pressures on rivers and streams. CSIRO research has shown how this can be done safely and effectively, and a comprehensive guide to best practice will be launched in August 1999.

Many effluent-irrigated plantations are likely to operate on short rotations (two to three years), with the resulting biomass providing a substantial energy resource that can substitute for fossil fuels. New gasification technology has facilitated economic electricity production on a scale suited to municipal plantations. In addition, other forest residues will contribute to the production of bioenergy or liquid fuels such as ethanol.

Such fast-growing plantations will be substantial carbon 'sinks', helping reduce the build-up of greenhouse gases in the atmosphere. An exciting new involvement for CSIRO Forestry and Forest Products is the Cooperative Research Centre for Terrestrial Carbon Accounting; one of our goals is to develop accurate means to predict how much carbon individual plantations – irrigated or otherwise – will take up. Reliable predictions will be essential to trading in 'carbon credits', the proposed system whereby sinks such as tree plantations can offset emissions.

Wood is renewable, recyclable and biodegradable. Existing forests provide environmental services valued at about \$16 billion a year. In a world where environmental degradation is the number one problem, the expansion of our forests is part of a sustainable future.

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