



Growing green-market forests

The last issue of our Biomaterial Futures newsletter focussed on bioenergy and the role that forests could play in meeting New Zealand's future energy needs. In this newsletter we explore the diverse ways that forests can contribute to national resource management issues, by generating non-timber revenue streams for growers.

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There is increasing global awareness of the vital role that forests play in supporting economic growth while, at the same time, meeting the environmental and cultural needs of society. Rapidly emerging international markets provide opportunities for land owners to provide these diverse benefits and to capitalise on them financially - simply by growing trees.

A study on green-market forestry recently completed by Scion, and presented at the NZIF* conference, shows how green-market forestry opportunities are emerging for New Zealand on the back of international developments.

Senior scientist Dr Tim Payn says that markets are developing overseas that allow forest growers to earn payment for

non-timber values such as carbon sequestration, soil conservation, waterway protection, and biodiversity. The Scion report predicts that similar green-market opportunities will soon emerge in New Zealand.

"Markets for non-timber values already exist overseas. This trend can be seen as a precursor to a new type of economics for forestry in New Zealand," Tim says, citing the example of carbon emissions trading.

Although the mechanisms for carbon trading in New Zealand are still unclear, the global market indicates a clear pathway for land owners to trade internationally through legal, but informal systems. The study shows that global trade in carbon emissions is now approaching US\$60 billion, and could hit US\$2 trillion by 2020.

"New Zealand land owners can tap into opportunities for trading carbon on

international markets now if they choose to. But the rapidly evolving nature of these markets means that clear understanding and realistic expectations will be needed for anyone engaged in such trading," Tim warns.

The Scion study predicts that greater certainty will be achieved in New Zealand as new markets develop and as government-led stimuli, such as the Permanent Forest Sink Initiative (PFSI) or the Emissions Trading Scheme (ETS), provide formal mechanisms of payment for non-timber values.

"Such incentives could be used to stimulate new planting and allow New Zealand to meet national goals articulated under various strategies such as the Sustainable Land Management and Climate Change Plan of Action or the Biodiversity Strategy," Tim concludes.

*New Zealand Institute of Forestry - conference Palmerston North 15-18 May, 2008

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Scion scientist shares Nobel Peace Prize honour. Find out about it on Page 3.

PERMANENT FOREST SINKS

- A NEW KIND OF FORESTRY IN NEW ZEALAND?

Over recent years, the Government has developed a number of policies to encourage new forest planting. Policies include the Permanent Forest Sink Initiative (PFSI) and new afforestation programmes under the Emissions Trading Scheme (ETS). Whatever mechanisms are ultimately used, the intention is to encourage reforestation projects that enhance carbon sinks and create new, long-lasting forests in New Zealand.

The PFSI has been designed to give landowners an incentive to plant new forests by enabling them to earn emission units under the Kyoto Protocol for the carbon accumulated. A project completed by Scion evaluated species options for this type of continuous cover forest management in New Zealand.

Scientist, Dr Thomas Paul says that continuous cover forestry is a real paradigm shift for New Zealand forest growers, because even-age clearfelling is not an option. Although permanent forests cannot be clearfelled, they can still be used to produce wood and other products through selective logging at maturity.

Thomas explains that continuous cover forestry under the PSFI scheme requires that the basal area of the canopy species is not reduced to below 80% of that in closed canopy stands on a per hectare basis. Single stem or cohort felling are acceptable alternatives to large scale clearcutting, and will promote the use of high value, shade tolerant tree species in the long term.

“Continuous cover forestry provides an opportunity to develop different silvicultural practices as a means to improve environmental outcomes, while still maintaining some level of production. Many suitable species for such practices are often regarded as high quality timber species and can therefore fetch high prices,” Thomas says.

“The idea of continuous cover forests is not new. Environmentally-sound silvicultural management systems of this kind were developed in Europe in the 19th and 20th century, showing that a sustainable yield can be produced from a ‘permanent’ forest.”

PSFI forests may be made up of any species, but some species will be more suitable than others once selective logging begins. Redwood is a good candidate for an exotic tree species, because it regenerates and survives under low light conditions, and responds when canopy gaps are formed.

A number of native species are also viewed as good candidates for permanent forests, namely kauri, totara and beech. Suitable management regimes for these species have been devised over many years by Scion scientists and a number of excellent publications are now available on this subject, see www.scionresearch.com.



Scion scientist shares Nobel Peace Prize honour

A Scion scientist has shared in a Nobel Peace Prize for his contribution to building knowledge of human-induced global warming. For more than a decade Dr Peter Beets has provided expertise on forestry carbon stocks and land use change to the Intergovernmental Panel on Climate Change (IPCC). This organisation was established by the United Nations in 1988 in response to growing international debate about the risks of anthropogenic climate change.

The 2007 Nobel Prize was awarded to the IPCC jointly with former US Vice-President and climate change activist Al Gore.

The IPCC in turn presented Peter with a certificate honouring his role. The Panel comprises 2,500 scientists and researchers from more than 130 nations, the majority of whom work for the Panel on a voluntary basis.

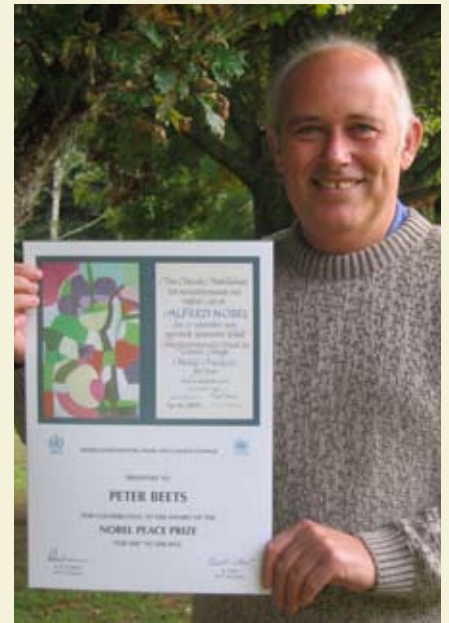
Peter says it is a wonderful gesture for the

IPCC to recognise the people who have been involved in this pivotal work towards the understanding of the human effect of climate change.

“The Panel was established not to conduct research of its own, but to evaluate and assess existing theories and data, much of which is confusing and conflicting. From this analysis we develop ‘good practice’ guidelines for governments and policy makers, providing them with the best tools and techniques for making sound decisions on how to accurately measure and mitigate green house gas sinks and emissions.

“The guidelines have had a major influence on the way the world views, and is responding to, climate change. For example, after the Kyoto Protocol was agreed in 1997, many governments implemented carbon policies based on the available information at the time. We have seen instances where

some of these governments, including New Zealand’s, have now re-evaluated their policies as a result of our findings.”



VALUING FORESTS FOR FUN

Plantation forests provide social benefits in many ways - by generating employment, by enhancing New Zealand's clean green image, and by providing a multitude of recreational opportunities. A study is under way by Scion to assess the economic and social value of Rotorua's Whakarewarewa Forest.

Scion economist, Dr James Turner is using economic methods to understand the value of the forest to those who use it for recreation. He is also using these methods to investigate the potential implications of various forest management regimes on the value of recreation.

“Access to Whakarewarewa Forest for mountain biking and walking has grown into a multi-million dollar industry benefiting the Rotorua community. Our survey shows different aspects of the forest are important influences on how people value the forest for recreation.”

“As many plantation forests are located close to urban centres in New Zealand, their value as recreational resources is increasing. The views of the community may be critical to the successful management of these forests in New Zealand and these need to be better understood,” James says.



WATER MATTERS

Nutrient management

One of the important contributions that forestry can make is in catchment nutrient management. Of all the productive land uses in New Zealand, forestry has the lowest potential for nitrate leaching and contributes the least phosphorous into waterways. For this reason, increasing tree planting on pastoral farms has been identified as an option by local authorities to improve the water quality of Lake Taupo and the Rotorua lakes.

Scion has developed a nutrient balance model that can be used to predict the effects of different planting and forest management scenarios on tree crop nutrient demand and soil nutrient supply, including the rate of change in nitrate leaching when pasture is converted to plantation.

Soil scientist, Dr Peter Clinton says the results of a study in the Rotorua catchment predicted a steady drop in nitrate leaching after conversion from dairy. This reduction levelled out after about 18 years as tree crop demand for nitrogen is balanced by internal retranslocation of nutrients and litter cycling.

"This pattern suggests that although tree planting cannot be viewed as a quick fix, it certainly causes a significant improvement in groundwater quality over time that could be further enhanced by changes to forest management. Assuming that forested areas remain in trees, the nitrate leaching will ultimately drop to low levels, similar to that of indigenous forests," he explains.

The Green Market study completed by Scion suggests that nitrate trading could become an option for landowners in future, in much the same way as carbon trading is developing now.

Managing soil and water run-off

The benefits of forests in reducing on-site erosion and off-site sediment loss have been widely recognised in New Zealand. Several years ago the East Coast Forestry Project began providing incentives for afforestation on erosion-prone land, demonstrating the effectiveness of planted forests to reduce sediment runoff.

A study at Pakuratahi on erodible hill slopes showed a 65% reduction in sediment yields when comparing pasture (21.1T of sediment/km²) with mature pines (7.6T sediment/km²) for a two year period. A reduction in soil runoff is not the only water management benefit achieved by converting land from pasture back into forestry; forests have also been shown to reduce the intensity of floods by up to 50%.

A recently completed Scion study suggests that levels of water run-off in a forest will vary depending on tree species. Scion scientist Dr Michael Watt modelled the effect of the two tree species, *Pinus radiata* and *Cupressus lusitanica* on water balance across a range of sites representing a large environmental gradient of climates and soil types. His analysis showed that *C. lusitanica* uses significantly less water on any given site than *P. radiata*, equating to an average of 22% of total annual rainfall.

"These results suggest that when locating species for erosion control and flood mitigation, *P. radiata* appears to be the better option than *C. lusitanica* because it takes up more water from the soil and therefore results in less run-off," Michael explains.

These results are based on point locations in trial sites, where trees are grown at high densities over short time periods, so further research is necessary to determine if results can be applied to the catchment level for conventional stands.



HOW GREEN WILL YOUR FOREST GROW?

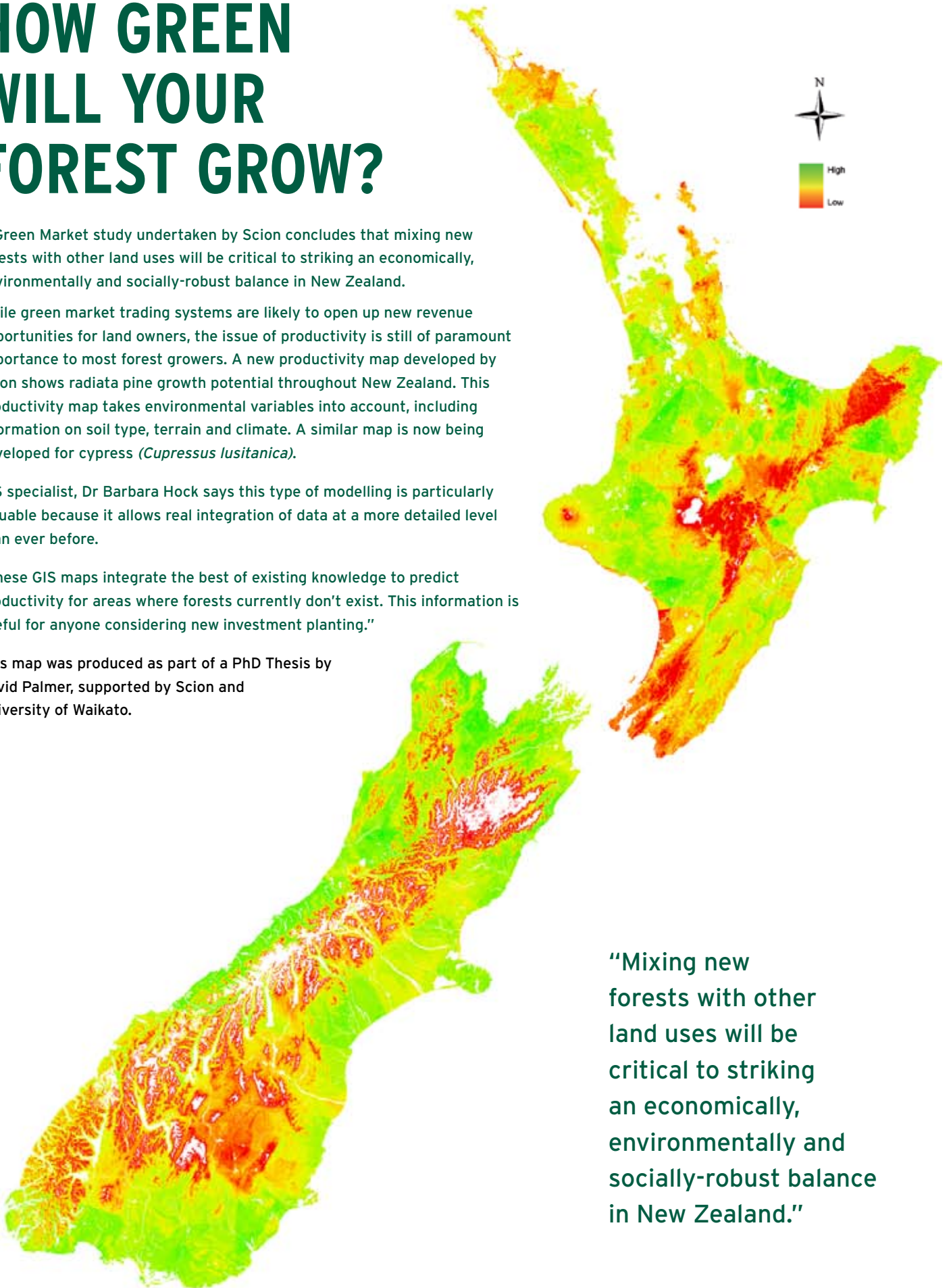
A Green Market study undertaken by Scion concludes that mixing new forests with other land uses will be critical to striking an economically, environmentally and socially-robust balance in New Zealand.

While green market trading systems are likely to open up new revenue opportunities for land owners, the issue of productivity is still of paramount importance to most forest growers. A new productivity map developed by Scion shows radiata pine growth potential throughout New Zealand. This productivity map takes environmental variables into account, including information on soil type, terrain and climate. A similar map is now being developed for cypress (*Cupressus lusitanica*).

GIS specialist, Dr Barbara Hock says this type of modelling is particularly valuable because it allows real integration of data at a more detailed level than ever before.

“These GIS maps integrate the best of existing knowledge to predict productivity for areas where forests currently don’t exist. This information is useful for anyone considering new investment planting.”

This map was produced as part of a PhD Thesis by David Palmer, supported by Scion and University of Waikato.



“Mixing new forests with other land uses will be critical to striking an economically, environmentally and socially-robust balance in New Zealand.”

TAKING GREEN DESIGN UP A PEG

A relationship between Scion and Mulford Engineering Plastics has given rise to one of New Zealand's first eco-friendly bioplastic products for use on a large scale. The Biopeg® is a fastening product for outdoor use that is tough enough to be hit with a hammer and withstand the elements, yet will degrade naturally in the soil.

Mulford's commercialised the Biopeg® product in response to a specific customer need. The Biopeg® uses eco-friendly plastic material developed by Scion, in combination with Clariant. Mulford designer, Barry Pett says the customer needed a product to secure geo-textiles in place in a way that met the needs of their client base for a safe and sustainable solution.

"The peg needs to withstand hammering into place, to resist pull-out forces exerted by winds or heavy rain fall-off, and to degrade benignly

over a timeframe of several years. This means it can be left safely in place after soils are stabilised by new plant growth."

The peg and washer are made from different mixes of natural, renewable and degradable materials that decompose into water, carbon dioxide and humus. Decomposition occurs at different rates for each part, and proceeds naturally through the combined actions of bacteria, fungal organisms and weathering.

Additives in the material are natural minerals and biomass-derived by-products which are selected to be environmentally benign. At least 30% of the product weight consists of natural or bio-based additives sourced in New Zealand.

The Mulford Engineering Plastics Christchurch-based design team came up with a unique product design which utilised a combination of new sustainable, natural and degradable materials. Biopeg® is being marketed worldwide through Maccaferri Ltd, a recognised world leader in soil stabilisation systems.

