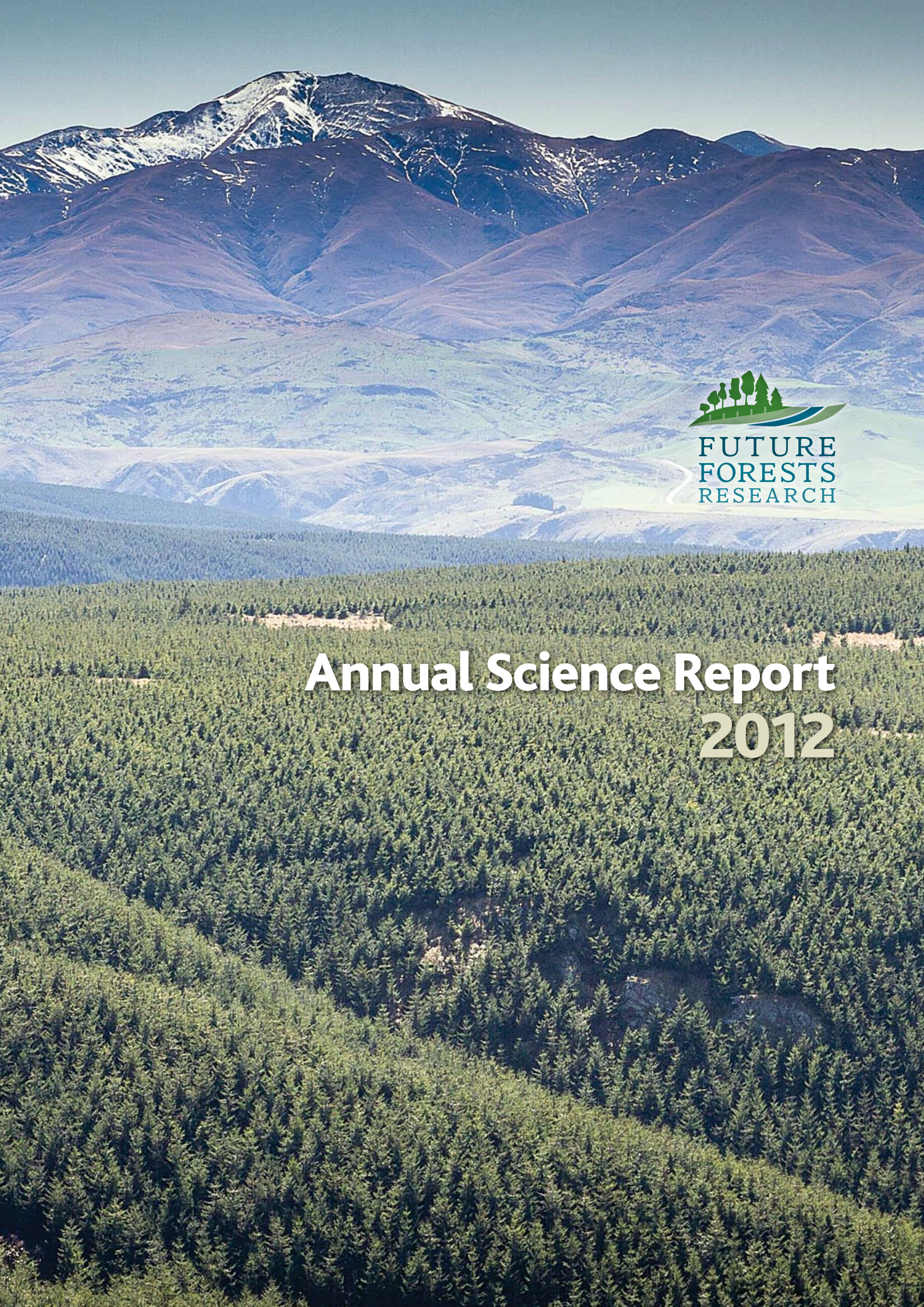
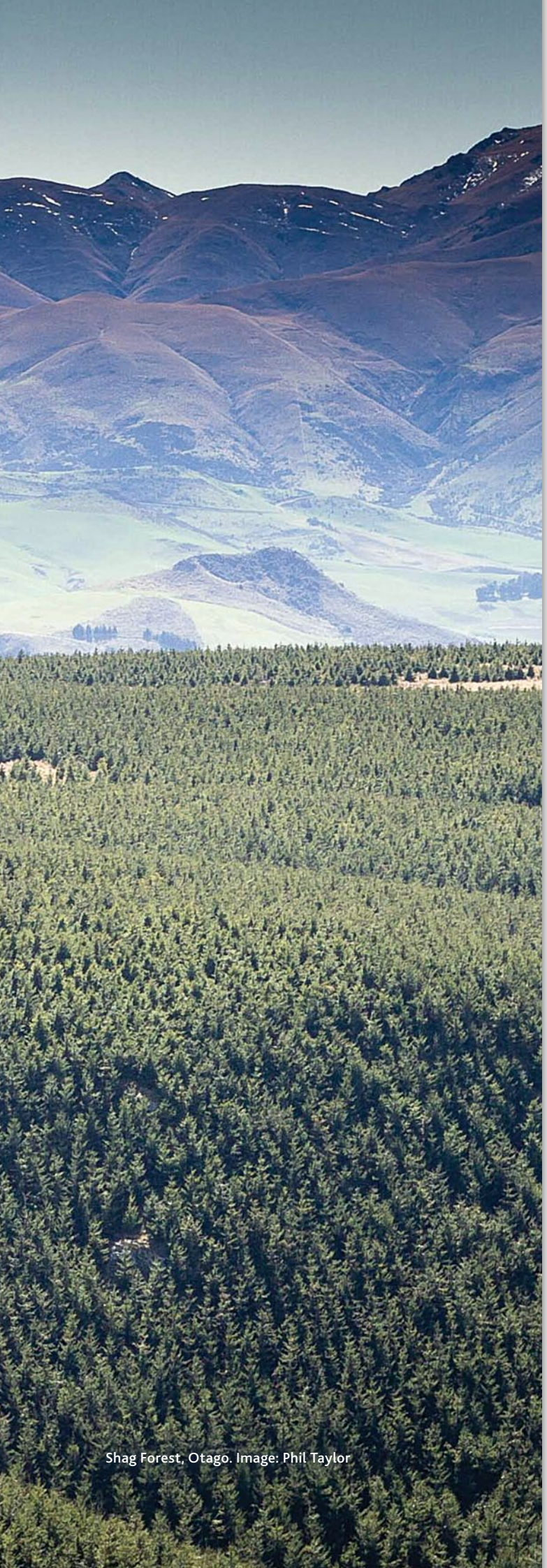


FUTURE FORESTS RESEARCH

Annual Science Report 2012



Shag Forest, Otago. Image: Phil Taylor

Ensuring a pro
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FUTURE FORESTS RESEARCH

SCION
forests · products · innovation

Scion's contribution to producing this report is gratefully acknowledged.

ISSN 1179-4151

sperous future for New Zealand's
st industry through innovative,
search of a world class standard.

Foreword

Phil Taylor, FFR Chair
Managing Director, Blakely Pacific

Since its inception in 2007, Future Forests Research (FFR) has proved highly successful in balancing the research interests of industry, government, and other stakeholders to deliver tangible benefits to the forestry sector.

We are industry-driven, and while our role is to provide leadership and management of research, we do this on behalf of our industry members. As the forest industry gears up for a period of growth, the time has come for us all to lift our game.

The New Zealand forest industry is on the cusp of a period of rapid expansion, with wood flows projected to increase from 24 million to 34 million cubic metres per annum over the next decade. This wood is already in the ground so we need to focus our efforts in adding value to this resource – but not at the expense of future forests and longer-term research horizons.

The role of research is primarily to solve future problems: at the same time funders require us to deliver quantifiable outputs in the short term. Achieving the right balance between applied and 'blue skies' research is always challenging. There is ample evidence from economies around the world that those that actively fund and participate in research outperform those that don't. Our forest industry today is mining the research and development capital that has been created over the past 20 to 30 years and more. It is critical that we replenish this R&D capital with both short-term applied research and long-term research aimed at sustaining our industry's growth through innovation in the years and decades to come.

We applaud the development of both WoodCo's Sector Plan, which sets a targeted growth in industry value from $4 billion to $12 billion by 2022, and New Zealand Forest Owners Association Science and Innovation Plan. FFR's work will continue to be closely aligned with the priorities identified by these organisations, but if the industry's own growth targets are to be met, research funding and capability must be increased to match. Given commitment from industry, FFR and its research providers then have the very clear responsibility of delivering value to investors. This value will come from efficient and targeted R&D using the best research capability available.

To date the bulk of FFR's $7.5 million per annum funding has come from government, but it is clear there will be less government money available in the next funding round. As our dependence on export markets increases, the industry cannot risk losing ground to international competitors, and this begins with a strong research sector. Research in forest management science underpins the whole forestry industry: the industry must step up if research capability is to be maintained and increased. Researchers must listen to what industry wants and respond by delivering outcomes that can be used to add value to their businesses.

In this constrained economic climate, every sector of our industry must strive to be as lean and efficient as possible. It is timely to review the governance of industry structures to ensure that resources are being well-used. FFR fully supports the NZFOA-led initiative to examine how the execution and delivery of forestry research can be improved.

When FFR comes to its stakeholders over the next few months to identify research priorities, the industry must think beyond the current operating climate. It must look ahead to future problems and opportunities facing each part of the sector. In this way, FFR can build a world-class research programme that will deliver results to sustain and grow our world-class industry.

Elements bus shelter. Image: Access Pacific Ltd (NZ Wood Design Awards 2012)

Vision

Ensuring a prosperous future for New Zealand's plantation forest industry through innovative, well focused research of a world class standard.

Purpose

To ensure that good decisions form the foundations of land and forest management in New Zealand. We will achieve this by working with those who make the decisions about growing and harvesting trees to:

- identify research requirements
- contract relevant research
- enhance science capability
- promote the uptake of research outcomes.

Aspirations

Quite simply, to make investors' businesses more profitable. We will do this by:

- creating and delivering meaningful research
- improving sector involvement in defining research directions
- helping to improve the partnership between the sector, research providers and government
- building research capability and science quality
- communicating research outcomes effectively to end users.

FFR Organisation

Russell Dale, Chief Executive

I am pleased to welcome you to the fourth annual science report of FFR. Here we review some of the highlights of recent work across our four major research themes:

- Radiata Management
- Diversified Species
- Environment and Social
- Harvesting and Logistics.

Times are interesting as we enter into the final year of many of our research programmes. Work to prepare next year's funding bid to the Ministry of Business, Innovation and Employment (MBIE) is well underway with Scion, and we will be entering into full consultation with stakeholders in the second half of 2012.

Rewardingly, some of the very real benefits of FFR-funded research are becoming apparent as it is taken up by the forest industry. There are many examples, but some prominent gains include:

- developing and evaluating a range of remote sensing-based tools for forest management
- improving the quality of diverse species planting stock, and delivering new decision-support tools to growers of diverse species
- forecasting erosion risk using remote sensing and spatial technologies
- identifying ways of improving nursery stock quality and early growth
- incorporating national-level productivity and wood quality parameters into industry planning tools.

The enthusiasm with which the harvesting industry has come on board to support research to improve harvesting productivity and worker safety on steep slopes has been gratifying. The advances made by the FFR/Primary Growth Partnership over the past two years have been impressive.

We continue to work hard to deliver research findings effectively to the industry. Our innovative workshop programme is proving popular, and we have further expanded the members' area of the FFR website. We have also spent time working with external agencies to improve their knowledge of the forestry sector by engaging with them and bringing them to the Central North Island to see our industry in action.

Over the next few months we will meet with stakeholders to identify research priorities and build our business case for new projects. We will work closely with all parties, and seek clear signals on priorities within different sectors.

One of the great strengths of FFR is the diversity of our stakeholders. Our members include overseas and NZ-based forest owners, both large and small-scale; contractors; wood processors; government agencies; consultants; regional authorities; education providers; other industry organisations and more. This diversity brings huge value in building relationships, widening members' vision, and increasing understanding between different parts of our industry.

Our diverse membership can also lead to tensions in identifying research priorities. FFR's role is to resolve different views and build a balanced case which we will bring back to members to seek approval and funding commitments.

We have achieved a great deal already, and as each year passes, the cumulative value of FFR's work increases. I would like to acknowledge the contribution of many people in delivering FFR's collective achievements to date. In particular I thank MBIE for their significant funding; also our theme leaders, Scion programme leaders, the many science and industry participants in our technical steering groups, and members who provide input and implement the outcomes from the programmes. Finally the significant in-kind support of forest owners who provide invaluable help with staff time, information and field trials.

Growth rings, Douglas-fir. Image: Phil Taylor

FFR 2011-12

91 members

24 publications in science journals

77 projects

$7.5 million total revenue

517 workshop/ field day attendees

374 members attending research briefings

275 technical presentations

Radiata Management

Increasing the profitability of plantation forestry through improved tree growth, wood quality and end product performance.

Pruned radiata pine. Image: Phil Taylor

Research under FFR's Radiata Management theme ultimately aims to increase the profitability and international competitiveness of New Zealand radiata pine. Our world-leading research work spans the underlying science behind tree growth and wood properties to the development of tools to assist economic and environmental decision making by forest managers.

End product performance is of critical importance to the producers and users of wood products. FFR-funded research seeks to discover how the actions of forest managers impact on end-product quality. Managers can then evaluate different combinations of genetics, site and silvicultural regimes and determine whether the resulting products will meet the performance requirements of end users.

Key wood properties affecting end-product performance, particularly that of solid timber, are wood density, spiral grain, wood chemistry and microfibril angle. Scion researchers have developed new techniques for collecting high-resolution information on these properties. Particular advances have been made in measuring spiral grain, which is a key driver of timber distortion. Researchers have also developed models that describe these properties in three dimensions within the tree stem. These models enable virtual stems to be created with internal wood property 'maps'; the virtual trees can then be sawn into boards and distortion and stiffness of these boards predicted using a product-quality simulation model.

This new approach has been applied to 20 clonal radiata pine trees growing on a relatively uniform site. Early results show that there are marked differences in the distribution of wood properties between trees, which may challenge some of the commonly held views about clonal uniformity of wood properties. Further research to validate these initial findings is underway.

Ultimately the aim is to be able to predict intra-stem and inter-stem variation in wood properties for any combination of genetics, environment and silviculture, and to link this to timber distortion and stiffness, which are key performance criteria for end users.

Wood density is related to timber stiffness and is also closely linked to carbon content. Previously, the effects of site and stocking on radiata pine wood density could be modelled using FFR software, but the impact of genetic improvement on wood density could not.

Scion researchers have now developed models for predicting the effect of genetic gain on wood density using the 'GFPlus' density rating associated with genetically improved planting stock. This advance will increase the forest managers' ability to select for specific traits on certain sites when using genetically improved stock, and manipulate a range of objectives such as growth, wood density, and carbon content. The new model will be delivered to the industry via FFR's Forecaster software.

Building scientific progress into decision support tools for managers continues with the release of version 1.11 of Forecaster, FFR's chief software product. FFR's 60 Radiata Management theme members include the overwhelming majority of New Zealand's major plantation owners, and some 85% of their total stocked plantation forest area is managed by companies using Forecaster.

Forecaster is continually evolving to incorporate the most recent results from FFR-funded research, and in response to user needs. Recent advances include upgrades to three of the main models within the Forecaster suite, enabling better prediction of growth, branch habit, and the carbon content of forests. The accuracy and consistency of some models' operational elements have been improved, and several usability enhancements have been made in response to recent user surveys. New features to support greenfields forest planning have been added covering crop growth and productivity, the role of improved genetics, and a tool for in-depth economic analysis of planting on new sites.

Evaluating remote sensing tools for use in forest management is a very active part of FFR's work and one of the fastest evolving areas of forestry technology. Remotely captured data have a host of applications in forest planning and in management of the standing tree resource.

When used in forest inventory, LiDAR data are interpreted over large areas, but Scion researchers have developed a technique which segments and delineates individual trees. The researchers have focused on the development of ways to accurately and consistently count the number of trees in a stand. The FFR programme has made a significant breakthrough in this area by combining field data with LiDAR-derived tree counts. This research was recently reviewed by an USA forest inventory expert who commented that Scion's research was at the forefront of international efforts in this area.

Individual tree crowns can now be described in three dimensions using a series of LiDAR metrics. When linked with other LiDAR data, these crown metrics have been shown to have the potential to provide a range of tree quantity and quality information, which could then be mapped by forest managers. For example, research has shown that crown metrics can accurately predict parameters which relate closely to wood stiffness. And by using crown metrics to measure gaps in the forest canopy, scientists have also succeeded in quantifying elements of forest biodiversity, such as the abundance and species richness of understory plants.

"The work the FFR radiata theme is doing in the remote sensing area is helping Timberlands Limited to better describe the forests it manages, and at a cheaper cost. With better forest descriptions we are able to provide improved management and higher returns to our clients." Ian Hinton, Technical Manager, Timberlands Ltd

EPIC Centre, Christchurch. Image: Josie Meachen (NZ Wood Design Awards 2012)

Monitoring forest health using remote sensing technology has been also investigated with encouraging results. Under an FFR-funded project, a proof-of-concept study was undertaken by Scion to evaluate whether RapidEye satellite imagery could be used to identify and map the spatial extent of a needle cast disease.

The study investigated whether satellite imagery can be used to identify changes in the canopy colour associated with a needle cast disease. As a proof-of-concept the technology was effective and provides a promising method for detecting needle cast disease. The study showed that 73% of disease-affected areas greater than 500 m² can be detected using 5-metre resolution satellite imagery.

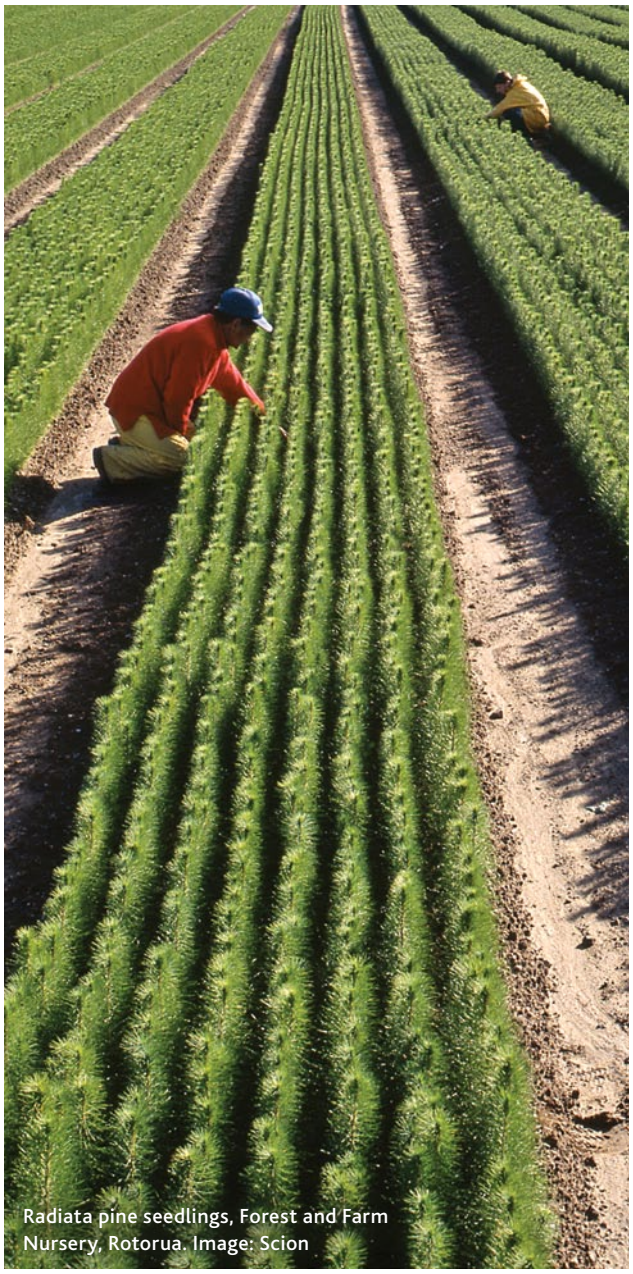
The technique requires some refining before it is ready for uptake by the forest industry, but is one of numerous examples of how FFR is assisting in the development and evaluation of remote sensing tools for forest management.

Delivering robust, healthy planting stock to forest managers is the key role of forest nurseries. FFR-funded work has investigated how nursery management practices affect mycorrhizae (beneficial soil fungi) in nurseries, and how these in turn impact on the potential of seedling stock to thrive when planted out.

The symbiotic relationship between plants and mycorrhizae is essential for seedling survival and growth once the seedlings leave the nursery. Research has shown that the application of fungicides and fertilisers in the nursery may be reducing the number of mycorrhizal relationships formed with seedlings, and altering the diversity of the mycorrhizae forming those relationships. Some mycorrhizae are more important than others in delivering benefits to young trees, and standard nursery practices were shown to be inadvertently selecting against the most beneficial mycorrhizae.

The findings are preliminary, but they have important implications for nurseries, and have been presented to the nursery industry by Scion researchers.

"The Quantitative Silviculture workshop was a huge benefit to our silvicultural forester. This is just the type of technology transfer we need, to enable us to engage with science and researchers." **Philip Elworthy, Forest Services Manager, Rayonier NZ Ltd**



Radiata pine seedlings, Forest and Farm Nursery, Rotorua. Image: Scion

Creating outcomes, not just outputs is the basis on which FFR-funded research is conducted, and ensuring effective technology transfer is a major part of both FFR and Scion's roles. In collaboration with industry stakeholders, more effective ways of embedding research findings into industry practices were examined in a concerted effort to ensure the forest industry gets maximum value from scientific advances. As a result, a series of hands-on workshops focusing on key aspects of forest management have been developed, focusing on the following three priority areas:

I. quantitative silviculture
II. forest productivity
III. resource assessment.

These areas were chosen because they are where gains in science can best be applied in the forest industry with tangible results. The workshops have a clear aim of linking with individual's Continuing Professional Development plans and enabling people to do their jobs better. The first quantitative silviculture workshop was held in Rotorua in June 2012 with further workshops planned in the coming year. Feedback from the first workshop was very positive: participants valued the opportunity to interact with their peers and to be able to ask questions of individual researchers.

Diversified Species

Enhancing the profitability of growing species other than radiata pine through improved selections, end product and site suitability knowledge.

Doon Forest, Otago. Image: Phil Taylor

Diversified species have the potential to capitalise on sites and timber markets not always suited to radiata pine. Increasingly they are of interest for their wood properties, and non-timber values including biodiversity, carbon capture, aesthetics, and recreation. Research is providing increasing certainty around the performance and end uses of a range of diversified species, and hence increasing grower confidence.

Douglas-fir is New Zealand's second-most widely grown species and its timber is much valued in construction. It is often grown on sites too cold and exposed for radiata pine. In an FFR-funded investigation to see how site factors affect wood quality, research by Scion has revealed that wood density and stiffness both increase as sites get warmer. Conversely, as altitude and exposure increase, so wood quality decreases, with marked declines apparent above 800 metres altitude.

The map arising from the research will help New Zealand growers select optimum sites for Douglas-fir to produce high quality construction timber, and to understand the likely quality of their planted resource. This research is of direct benefit to growers of Douglas-fir, and those considering new plantings.

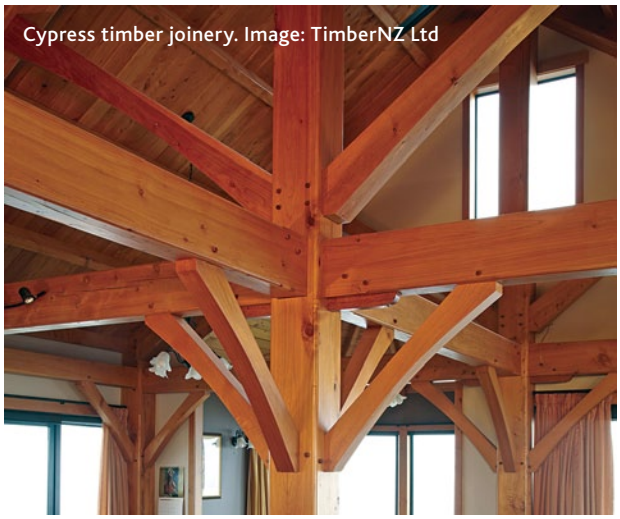
Establishing indigenous plantations tends to be costly: seedlings are relatively expensive and failure rates can be high. Trials to investigate ways of reducing seedling cost and increase early tree survival and growth have been progressively established since 2009 on a site near Lake Taupo and are starting to yield valuable results.

For example, nurseries supply indigenous species mostly as container-grown or root-trainer stock. FFR-funded research by Scion has shown that, if grown on a relatively large scale, bare-rooted stock can be produced at half the cost of containerised stock, and be equally viable in terms of survival and growth.

The trials are also looking at different site preparation and weed control techniques to improve early survival and growth of a range indigenous species. Results include evidence that, on harder hill sites, survival rates of podocarps – species such as rimu, kahikatea, matai and miro – improve if nurse shrub species are used.

"The heart redwood durability study carried out through FFR is very important. It means redwood cultivars can be quickly and easily screened for heartwood durability before trees are propagated and planted in forests. We also now understand how durability changes as trees age and can set silviculture regimes accordingly." Simon Rapley, Managing Director, The New Zealand Redwood Company

Kauri is a species highly valued for many reasons: a new web-based kauri calculator shows the economic viability of growing kauri at plantation scale could be more attractive than previously thought. Scion researchers used data from kauri plantations around the country to model growth on different site-types; the calculator can also evaluate different land values, thinning regimes and rotation lengths. Analyses indicate potential returns are comparable with current commercial species. The kauri calculator joins the suite of diversified species calculators available for growers, which now cover Douglas-fir, cypresses and a widely grown eucalypt, *Eucalyptus fastigata*.


Cypress timber joinery. Image: TimberNZ Ltd

Cypresses are a well-established species, producing timber with a wide range of internal and external end uses. The threat of cypress canker now restricts the choice of cypress species for growers, and canker-resistant genotypes with good growth and wood properties are much needed. Three promising hybrid crosses bred from superior parent stock are being evaluated by Scion. Two of these crosses are similar to the Leylands and Ovens cypress, which are already commercially popular, but a third, a *Cupressus lusitanica x C. guadalupensis* cross, is still relatively untested.

Results are exciting, as growth rates of all hybrids are exceeding that of pure stock from the same mother trees. Cuttings taken from the new hybrids will form the basis of new clonal populations and will be tested further for desired properties. Whether or not these hybrids will be fertile remains to be discovered.

A redwood strategic development report has been produced by a FFR partnership between Scion and industry. The report identifies development priorities in areas of genetics, silviculture, carbon sequestration, and soil conservation over the short and medium term.

The genetics and productivity of much of New Zealand's existing redwood plantings are still largely unknown. A new bench-marking trial has been established to compare a range of redwood genotypes, and this will provide a basis for future genetic improvement work. Identifying genotypes with high heartwood durability as well as good productivity is a key focus. And for the first time, a GIS-based redwood productivity surface has been developed, indicating redwood's growth potential on favourable sites throughout New Zealand.

Short-rotation eucalypts grown for pulp is a niche filled by *Eucalyptus nitens*. Breeders are using a 'rolling front' strategy to continuously improve the productivity, pulp content, and pest resistance of *E.nitens*. Third-generation stock is now available and the fourth will be ready within the next 12-25 months.

Selection strategies have resulted in volume gains of between 7% and 14%. Novel genetic finger-printing techniques are being tested to reconstruct genetic pedigrees, and research to develop a cost-effective way of predicting pulp yield continues.

On many sites *E.nitens* can be decimated by the eucalyptus tortoise beetle, *Paropsis charybdis*. As most pulp is grown under FSC criteria, chemical control options are limited, so the search is also on for insect resistance in breeding populations.

Environment and Social

Developing knowledge and tools to enable integrated resource management and true environmental and economic accounting.

Hanmer Forest. Image: Craig Robertson (courtesy of Rayonier | Matariki Forests)

Forests can provide many benefits to people and the environment, but negative perceptions pose risks to the forest industry, including the threat of ever more stringent compliance conditions. New work seeks to provide tools that will play an important role in managing risks and perceptions.

Water quality in rivers and lakes is considered a key indicator of environmental well-being. The effects of plantation forests on water quality are still not well understood by the general public; as a result the forest industry cannot respond convincingly to criticism or capitalise on what could be good news stories.

In an FFR-funded study, Scion researchers analysed New Zealand's existing water quality monitoring network and concluded that, for a number of practical reasons, it does not provide good forestry-related data; also forestry sites are significantly under represented. Scion is now representing the forest industry as part of a team undertaking a major review of the monitoring network. Changes in water monitoring are needed by the Ministry for the Environment to meet State of the Environment reporting requirements. The review will ultimately determine what will be measured, where, when, and how.

A set of water quality indicators to quantify the impact of plantation forests on water quality has been developed to guide future monitoring. A review of international research on the effects of plantation forests on water quality reinforced many of the positive aspects that are generally known to science but often not the public, as well as identifying a number of gaps in the knowledge; future research must home in on priorities identified by the review.

Shallow landslides are a highly visible and potentially costly environmental problem. They can trigger debris flows and cause damage to the environment and infrastructure. Land managers urgently need tools to help them assess erosion susceptibility and then manage contributory risks on their land.

An FFR partnership between Scion and Landcare Research has evaluated an internet-based American tool, SINMAP, to see how well it predicts erosion risk in New Zealand. The tool has proved very effective, identifying around 80% of erosion sites using historical data from two trial areas in the Hawke's Bay. A statistical modelling approach developed by Scion was even more effective.

Both methods have significant potential and a programme of validation is being considered for further high erosion-risk areas with different soil types. Whichever method is finally carried forward, the techniques have strong promise as a tool for forest planners and managers, assisting both compliance and operational work.

> **"We are very keen to see a science-based soil erosion model that can be endorsed by the forest industry. Such a model is needed to provide a consistent approach when planning for erosion risk nationwide; also to use in decision support to underpin important national planning instruments."**
>
> **Kelvin Meredith, Environmental Manager, Rayonier | Matariki Forests**

Measuring biodiversity in forests, a challenge identified as important by a wide cross-section of forest stakeholders, has never been cheap or easy. Scion researchers have developed a technique using LiDAR which has great potential to become a cost-effective management tool.

The researchers linked LiDAR metrics describing forest structure from 30 forest trial sites with biodiversity data gathered from the same sites to see whether any relationships could be found. The results were encouraging: select LiDAR metrics explained a significant percentage of the variation in plant, bird and invertebrate species richness. Gaps in the forest canopy were found to be the most important determinant of species richness.

It is still early days, but the results have been sufficiently robust to justify a comprehensive validation process. Once fully developed, this technique could give forest managers a tool for biodiversity monitoring over a range of time-scales and situations – for example, in rapid assessment of changes in biodiversity through a forest rotation or for comparisons of biodiversity across different land uses. The technique could greatly reduce field monitoring costs especially if its outputs become acceptable as part of FSC biodiversity reporting requirements.

Forest Investment Finder (FIF) is a new strategic planning tool developed by Scion with FFR funding, which has been welcomed by national authorities. The tool is being developed to guide strategic land-use decisions and to compare future private and public benefits from forests.

At present, FIF models future radiata pine timber and carbon regimes on different site-types nationwide. It provides an indication of both economic viability at the private commercial level and also the level of public benefits conferred. In terms of public benefits, the future economic value of soil conservation by forests on certain sites, and the value of provision of biodiversity, have so far been modelled. The FIF can be used at national, regional or even estate scale.

If developed further, the FIF framework could explore many other private and public benefits of both existing and yet-to-be-planted forests. Examples include climate change impacts on forest productivity, the economics of diversified species to achieve various objectives on marginal land, or the total economic value to society of environmental benefits and employment from existing or future forest estates.

Harvesting and logistics

Enabling the New Zealand forest industry to realise substantial gains in productivity and cost reduction through improved harvesting technologies.

The ClimbMax beta prototype. Images: Trinder Engineers Ltd

Increasing harvesting productivity and worker safety are the focus of research under the Harvesting and Logistics theme. Expanding mechanisation on forest slopes is the way forward, and big gains are already being achieved in this FFR/government collaboration through the Primary Growth Partnership. The value of potential benefits from this work could reach $100 million by 2018 through cost savings, reduced accidents, energy savings and machinery sales.

The ClimbMax steep slope feller buncher rolled out of the workshop and into the forest this year, and is an example of a major step change achieved for the harvesting industry. The 42-tonne machine was built by Trinder Engineers Ltd, of Nelson, and is already working above expectations on slopes over 30 degrees. Early field tests indicated that, using the ClimbMax, hauler productivity had the potential to increase by up to 40% over a manual felling and breaking out system, thanks mainly to accumulation of loads of stems for the hauler (bunching).

The current ClimbMax is the 'beta' prototype constructed by Trinder Engineers; the second ClimbMax steep slope machine is now being built. This one should be close to the commercial model. FFR research into market potential indicated demand for up to 30 steep slope machines over the next five to ten years. FFR will continue to evaluate the performance of further innovations as the machines develop.

An advanced hauler vision system developed for FFR by Scion and Trinder Engineers is being welcomed by hauler operators. The project, now at the prototype stage, involves options for four cameras positioned on the hauler grapple, the hauler tower, the tail hold (mobile back anchor) or looking across the cutover. Wireless technology relays high-resolution video of the break-out area, and grapple, back to the hauler operator. Sophisticated software that allows the hauler operator to adjust the cameras has been developed, for example enabling digital pan, tilt and zoom functions, and brightness adjustment.

Operational issues such as improving wireless reception and camera battery charging have been addressed in field trials, and the system is ready for commercialisation. A feasibility study indicated the potential for the system to improve hauler grapple and carriage positioning times and improve overall hauler productivity. Feedback from hauler operators who have trialled the grapple camera and the cutover camera has been very positive.

The grapple restraint developed for FFR by Scion last year has been released to the industry. The simple, low-cost device reduces grapple swing, and gives the operator much more control when picking up stems.

The design is easy for contractors to put together themselves and the components cost only about $1500. Trials have shown that the device speeds up the grapple load time by three to four seconds per cycle which improves overall productivity by an average of 4.5%. Scion researchers believe the grapple restraint will pay for itself in as little as four or five weeks.

Unmanned teleoperated machines are ultimately the future of cable logging, with operators remotely controlling machines in a safe and comfortable environment away from the hazards and high work load of today's steep slope harvesting.

FFR has put a team of engineers from Scion and the University of Canterbury's mechatronics programme together to incorporate teleoperation into forest harvesting. The use of robotics is well-established in other heavy industries such as mining, but forestry has been slow to adopt this technology. Initial work will focus around remotely controlling an excavator arm as a lab-based development platform, before extending to a full-sized excavator in the field.

The advanced hauler vision system already developed will be adapted to feed video images to screens in the 'cab', and the operator will 'drive' the machine solely using this information. Direct or haptic feedback to the operator, such as sound and vibration, can also be relayed to make operation feel more realistic. Apart from eliminating all the safety hazards of operating machines on steep slopes, the operator will incur far less fatigue, and should work more productively than sitting in the machine on steep and difficult terrain.

The third annual FFR benchmarking survey of costs and productivity has been completed by the University of Canterbury. The survey collects data on all the important factors driving harvesting cost and productivity.

Results then relate these factors to logging productivity and logging cost for ground-based and cable yarding operations. The database now holds 528 separate harvest areas. Fifty five per cent of the harvest areas surveyed were ground-based operations, and 47% were cable operations – this accurately represents the national harvesting picture. More forestry companies have been providing data for this survey each year, and the data are available to participating FFR members to benchmark their own operations against. In this way the database is becoming a valuable resource for FFR members to evaluate their operations and target areas for future improvements.

"We are all looking forward to the second harvester going out in August and thank FFR for their assistance to date."

Kerry Hill, Managing Director, Trinder Engineers Ltd

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FUTURE FORESTS RESEARCH

Herbert Forest, Otago. Image: Phil Taylor


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