

Welcome to this month's edition of the FWPA R&D newsletter.

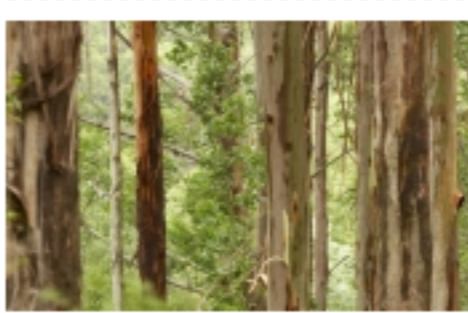
The stories demonstrate the wide range of research work being done both locally and internationally to benefit our industry, and include important studies on predicting the water-use of *Eucalyptus nitens* plantations; the interactions between fungi, fungicides and fertilisers; transparent paper made from cellulose nanofiber, and creating recyclable solar cells from trees.

I hope you enjoy reading about these exciting research projects.

Ric Sinclair  
Managing Director, FWPA

## FOREST GROWING

### Predicting the water-use of *Eucalyptus nitens* plantations in Tasmania



Every plantation needs water to grow, but how much is necessary at each stage of the trees' development? A five year research project, led by Sandra Roberts, a Forest Hydrology Research Officer with Forestry Tasmania, and with funding from Forest and Wood Products Australia (FWPA), has come up with answers.

If plantation managers can model predicted water-use they will be able to assess the impacts of plantation management decisions on wood production, income and water-use.

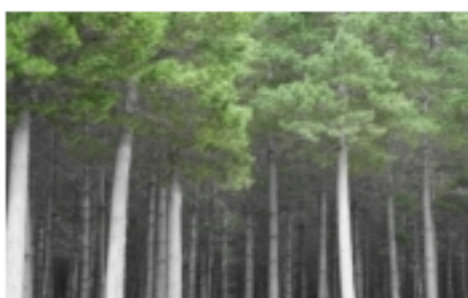
The research gives industry the power to consider water use during the planning process and lets forest managers respond to catchment managers with meaningful predictions on the future availability of water resources,' says Sandra. 'This capacity will be useful in limiting the impacts of plantation management on other water-users, ecosystems or threatened species, while maximising wood production and profits.'

The team measured the water used in six Tasmanian *Eucalyptus nitens* plantations, and improved an existing planning tool (Forest Estate Model) to predict how much water is used by a plantation each year based on the basal area of the plantation and the annual rainfall.

*FWPA Project: Predicting the water-use of Eucalyptus nitens plantations in Tasmania using a Forest Estate Model*  
*FWPA Ref: PNC143-0809*

[Click Here for Report](#)

### Changes in whole-tree water use following pruning



Pruning of live branches is a management option to enhance wood quality in plantation trees. It may also alter whole-tree water use, but little is known about the extent and duration of changes in transpiration.

In this Australian study, sap flow sensors were used to measure transpiration for 14 days prior to, and 75 days following, pruning of four-year old *Eucalyptus pilularis* Sm. and *E. cloeziana* F. Muell. trees. Pruning had no effect on stem growth, sapwood water content or radial pattern of sap velocity in either species. Pruning reduced mean daily water use by 39% in *E. pilularis* and 59% in *E. cloeziana* during the first eight days after pruning.

Results show that pruning of live branches had only a short-term effect on whole-tree transpiration in these sub-tropical eucalypt species.

[Click here for source.](#)

### Degradable plastic creates temporary 'greenhouse'



A novel degradable plastic could dramatically improve the efficiency of native tree revegetation from seed in marginal low rainfall areas, which typically give low germination and establishment. The process is being developed by Greening Australia and Australian manufacturer Integrated Packaging through the CRC for Polymers.

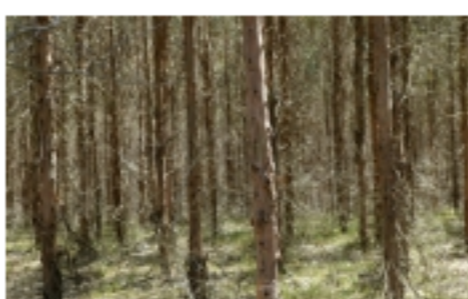
The improved process involves using degrading ultra-thin plastic propagation film. The film is applied mechanically at the time that the seed is planted, and the film is buried at the edges to form a temporary 'greenhouse' to enhance plant growth. The films can be tailored to remain intact for 3-6 months prior to degradation using technology developed by the CRC.

An initial trial of the polymer film conducted with the Birchup Cropping Group and Greening Australia showed its use can dramatically improve practices for re-establishing native woodlands, and so improve carbon capture and storage.

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Image credit: CRC for Polymers

### Vegetation management enhancing productivity

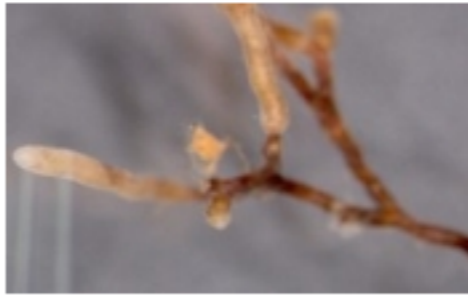


The management of competing vegetation has evolved with forest management over the past half century and is now an integral part of modern forestry practices in many parts of the world. Vegetation management, primarily using herbicides, has proven especially important in the establishment of high-yield forest plantations.

There has been a substantial amount of research quantifying the wood yield gains from the management of competing vegetation over the past few decades. This University of Maine study reviewed results from 60 of the longest-term studies in North America, South Africa, South America, New Zealand and Australia. About three-quarters of the studies reported 30% to 500% increases in wood volume from the most effective vegetation treatments.

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### Fungi, fungicides and fertilisers



Research that may help nursery growers produce faster growing, more robust radiata pine seedlings has been recently published by Scion microbiologists, Simeon Small and Katrin Walbert. Mycorrhizae are critical to the establishment and growth of radiata pine seedlings.

Simeon and Katrin set out to discover what effect variations in fertiliser and fungicide applications (common nursery practices) have on the mycorrhizal associations with radiata pine seedlings.

They found that increased fertiliser and fungicide application rates substantially reduced the relative abundance of *Rhizopogon rubescens* mycorrhizae on the roots and increased the presence of a number of other species. *R. rubescens* is the species most closely linked with nutrient uptake in these seedlings, so it appeared that both fertiliser and fungicide use has a detrimental effect on seedling nutrient uptake.

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Image credit: Scion

## NEW PRODUCT INNOVATIONS

### Recyclable solar cells created using trees



Researchers at Georgia Institute of Technology and Purdue University have developed new solar cells based on natural substances derived from plants, including trees. The organic solar cells have an efficiency of 2.7% – a new high for cells on substrates derived from renewable raw materials – and can be easily recycled.

The research expects to help make sustainable and renewable solar cell technology truly practicable for the first time.

Organic solar cells are typically fabricated on glass or plastic, neither of which is easy to recycle. However, Professor Bernard Kippelen's solar cells are fabricated on cellulose nanocrystal (CNC), which is derived from plants, including trees. 'Our next steps will be to work toward improving the power conversion efficiency over 10%, levels similar to solar cells fabricated on glass or petroleum-based substrates,' said Kippelen.

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Image credit: Gizmag

### Scion to commercialise waste technology



Scion is ready to commercialise their newly developed TERA X™ Hydrothermal Deconstruction technology. This technology reduces the volume of biological solids, such as sewage waste, paper and timber, that go to landfills and produces valuable energy and products.

The technology has the potential to make a major impact on how cities and primary industries deal with organic waste in the future. It's also a source of income from the generation of industrial chemicals that can be used for fertilisers and other biomaterials.

Scion CEO Warren Parker said the commercial scale demonstration plant in Rotorua will put TERA X in the spotlight across the country and overseas. He said it has already attracted the interest of many New Zealand local authorities and it was hoped TERA X could be made available to New Zealand councils on preferential terms.

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Image credit: Scion

### Transparent paper made from cellulose nanofiber



Oji Holdings and Mitsubishi Chemical have announced that they have succeeded in making sheeted transparent paper. This has been achieved by thoroughly thinning down plant-fiber material to enable the world's first mass production of such product.

The two companies will work to put the transparent paper, which can be folded like origami and is expected to be applicable for pocket-size electric newspapers and other devices, into practical use around 2017.

The firms succeeded in producing the paper from "cellulose nanofiber", which was developed by thinning down the plant-fiber pulp for making regular paper to about one-20,000th of a strand of hair. The transparent fiber had been too thin to make sheeted paper, but Oji Holdings and Mitsubishi Chemical have developed a new method of doing so by adding a chemical treatment during the processing.

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Image credit: The Asahi Shimbun

## TIMBER CONSTRUCTION AND DESIGN

### Cross-laminated timber passes fire tests



A new timber-based building material which is revolutionising multi-storey construction, both in Australia and around the world, has stood up well in fire resistance tests.

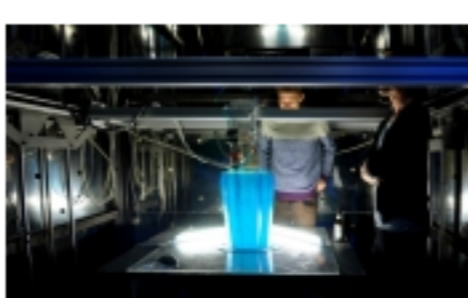
Tests performed in Canada by the National Research Council (NRC) and FireInnovations proved that even without gypsum board protection and under full loading conditions, cross-laminated timber (CLT) achieved fire resistance of close to three hours.

NRC researchers conducted eight full-scale experiments to obtain fire resistance ratings for a number of CLT panels and to obtain data on other factors influencing the performance of CLT in fire. Overall, the tests demonstrated that CLT can achieve significant fire resistance that is close to three hours, with fire resistance improving when more plies and gypsum board protection is used.

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Image credit: Construction Source

### Six-meter tall KamerMaker to 3D print house



Many within the construction industry are excited about the future of 3D printed houses. The latest company to test this new concept is Amsterdam-based DUS Architects, who has announced that it will commence construction of a 3D-printed canal house in the coming months.

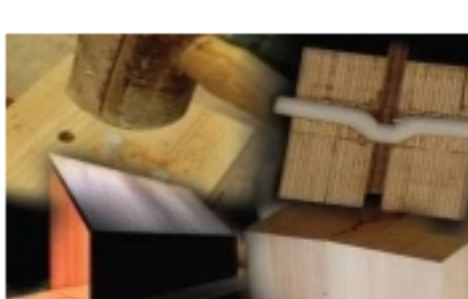
DUS Architects has developed its own 3D printer, the 6m tall KamerMaker, which will print building components on site up to 2.2m by 2.2m by 3.5m in size. The machine can currently print components fabricated from polypropylene, however with further testing, it is hoped the KamerMaker will be able to print objects from recycled plastic in the future.

If the technology is proven successful, 3D printed houses could one day challenge and compete with traditional timber built housing.

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Image credit: Gizmag

### New research on metal-free timber connections



The Timber Research and Development Association (TRADA) has published the results of a research project looking into the development of a metal-free timber connection method applicable for mainstream timber structures and suitable for on-site construction.

The development of new non-ferrous materials, such as fibre reinforced plastics and modified wood products, provides the opportunity to make new forms of non-ferrous timber connections. Unlike traditional carpentry connections, these materials have the potential to allow large glulam sections to be joined using mainstream dowel and slot-in plate techniques.

The research looked at a number of different materials, which were subject to extensive testing and strength analysis. The results will help to shape the future development non-metallic timber connections.

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Image credit: TRADA

## WOOD HARVESTING, TRANSPORT AND LOGISTICS

### Fatigue & inattentiveness behind most truck accidents



Nine out of ten accidents involving trucks are a result of the human factor. This was revealed in a fresh report on traffic safety and road accidents in Europe produced by Volvo Trucks.

The report is based on its own investigations of accidents, as well as data obtained from various national and European authorities. It describes why accidents with trucks occur, their sequence and what can be done to reduce the risk of accidents and their consequences.

'90% of all truck accidents stem entirely or partly from the human factor, for instance when one or more of the drivers of the involved vehicles are distracted or misjudge their speed,' says Carl Johan Almqvist, traffic and product safety director at Volvo Trucks. The report also reveals that drink driving is not one of the major causes of road accidents involving truck drivers.

[Click here for source](#)

Image credit: Volvo Trucks

### Determining cut-to-length harvester productivity



New research has quantified the productivity and fuel consumption of various machines operating in *Pinus radiata*. The University of Sunshine Coast study looked at machine productivity and residual harvesting residues associated with a cut-to-length harvesting system in southern Tasmania.

The cut-to-length method is a preferred method for harvest of pine plantations in Australia. The cut-to-length method studied consisted of a feller-buncher, processor, forwarder, grapple loader and tractor trailers that were producing only pulp logs.

The system was producing 204 pulp logs per hectare and the average tree size was 2.68m<sup>3</sup>. The terrain was relatively flat. The large trees size resulted in good productivity levels, with the feller buncher achieving 122.2m<sup>3</sup> per hour, the processor 84.3m<sup>3</sup> per hour and the loader 100.8m<sup>3</sup> per hour.

[Click here for source](#)