

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

Our stories this month range from a new Australian prefabricated lightweight timber ground floor system that it is excellent for sites with sloping blocks, on reactive clays with high seasonal moisture movement, or low lying flood prone areas, to research showing cellulose nanocrystals (that give trees and plants their high strength) and may be used to create a new class of biomaterials with wide-ranging applications, to how best to store pine logs for bio-fuel.

I hope you enjoy reading about these, and other, research stories that are helping build a more robust industry.

Ric Sinclair
Managing Director, FWPA

MAIN NEWS

An economical prefabricated timber ground floor system

This research project, funded by Forest and Wood Products Australia (FWPA), has developed a prefabricated lightweight timber ground floor system that includes prefabricated timber floor panels and the 'stumps,' i.e. the floor support to the footings. The system has a number of benefits over the concrete slab-on ground construction method that dominates new urban developments throughout Australia in that it is excellent for sites with sloping blocks, on reactive clays with high seasonal moisture movement, or low lying flood prone areas. The system also has real benefits for timber producers as it is estimated in Victoria alone that each one per cent in market share the system gains equates to between \$2.5M and \$3.4M in new sales of timber products.

To take the system to market, a new Market Implementation Group has been created, facilitated by the Frame & Truss Manufacturing Association. A key component of the new prefab ground floor initiative is that frame and truss manufacturers supply builders with the whole package: design, fabrication and installation. In essence, the system effectively provides what the concrete slab sector offers builders: the delivery of a working surface, on a specific site, on a specific date for a specific cost in one contract. It also provides additional advantages such as no delays due to concrete curing and greater flexibility in regard to plumbing.

The project is an excellent example of industry engagement and collaboration in the commercialisation of FWPA R&D, leading to a value-added service that will be appreciated by customers.

Project PNA244-1112

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FOREST GROWING

Bushfire smoke deadly for lungs

Breathing in bush fire smoke can damage the lungs in a similar way to smoking-related emphysema, new research from the Woolcock Institute of Medical Research reveals.

Laboratory tests on human lung cells have shown for the first time that smoke from burning wood can scar and inflame the lungs. Those exposed are at risk of developing chronic, degenerative lung disease, say the Sydney scientists who headed the study. The findings, published in the international scientific journal PLOS ONE, raises concerns about the long-term effects of exposure to biomass fuels used for cooking and heating in many developing countries.

Lead author, Woolcock cell biologist Dr Brian Oliver says the discovery also sends a timely warning about exposure to wood smoke in bush fires and hazard reduction burns as Australia's summer kicks off.

"There's a message here that the smoke we inhale from burning biomass smoke can do long-term lasting damage to our lungs," Dr Oliver says. "That makes exposure to wood smoke a potentially important risk factor in the development of chronic lung diseases."

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Image Credit: Woolcock Institute of Medical Research



Research could revolutionise forest industry

University of Canterbury research could revolutionise New Zealand's forest industry by treating radiata pine as an agricultural crop and screening for strength and stability at a young age.

The project, co-funded by FWPA, highlights the advantage of using young trees in that there is no wastage of resources on trees which would otherwise end up in low economic gains because of low value products, UC forestry postgraduate student researcher Monika Sharma says.

"In radiata pine which is 25 years old, 50% of the merchantable wood is core wood, formed in the first 10 growth rings which falls below the threshold stiffness required for structural timber.

"Therefore, it can only be utilised for low value products. The approximate value of low grade timber is \$A220 per cubic metre whereas structural timber price is \$A430 per cubic metre.

Her research has helped develop techniques that can quickly and reliably screen young trees for stiffness and dimensional stability.

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Image Credit: University of Canterbury



PLEASED project working on plant-borgs to act as environmental biosensors

Many claim that talking to plants helps them grow faster. But what if the plants could talk back? That's what the EU-funded PLants Employed As SENSing Devices (PLEASED) project is hoping to achieve by creating plant cyborgs, or "plant-borgs."

While this technology won't allow green thumbs to carry on a conversation with their plants, it will provide feedback on their environment by enabling the plants to act as biosensors.

Like most living organisms, plants produce electrical signals in response to external stimuli. By classifying which electrical signals are produced in response to which stimulus, the PLEASED team says will be possible to use plants as biosensors to measure a variety of chemical and physical parameters, such as pollution, temperature, humidity, sunlight, acid rain, and the presence of chemicals in organic agriculture.

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Image Credit: PLEASED



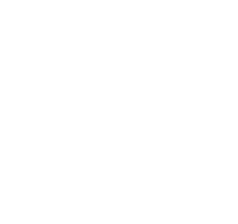
Guidelines for forest road engineering in mountainous terrain

This guide was written for the Food and Agriculture Organization of the United Nations (FAO) to describe recommended practices for forest road engineering in mountainous terrain. It is designed for forest road practitioners who are responsible for road access on steep terrain and provides practices that address concerns for timber production, forage production and grazing, recreation and tourism, water, fisheries, wildlife and biodiversity and cultural heritage.

Recommendations have been compiled with reference to best management practices, sound engineering and a critical evaluation of field experience from case studies. Key areas covered include: strategic planning, access planning, road pavement, drainage, equipment selection, road construction, slope protection and stabilisation and road maintenance practices.

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Image Credit: Food and Agriculture Organization of the United Nations



A new guide for work studies in forestry

A team of specialists from Italy, Austria and Germany have developed a new guide for conducting forest work studies. The guide is a quick how-to manual designed for the field researcher and also contribute to the international harmonisation of work-study methods.

While there is an increasing number of scientists conducting work studies, there is much misunderstanding about time-study methods at both the theoretical and the practical level. Ambiguity arises regarding terminology, units of measure, experimental design, and the statistical treatment of data.

Supported by the European Union through COST Action FP0902, 'A new guide for work studies in forestry' is a common reference guide designed to be simple and concise enough to encourage widespread adoption.

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Image Credit: Chris Ellbeck



Bee sensors take flight to help farmers and foresters

Thousands of honey bees in Australia are being fitted with tiny sensors as part of a world-first research program to monitor the insects and their environment using a technique known as 'swarm sensing'.

The research is being led by CSIRO and aims to improve honey bee pollination and productivity on farms as well as help understand the drivers of bee Colony Collapse Disorder (CCD), a condition decimating honey bee populations worldwide.

Up to 5,000 sensors, measuring 2.5mm x2.5mm are being fitted to the backs of the bees in Hobart, Tasmania, before being released into the wild. It's the first time such large numbers of insects have been used for environmental monitoring. The next stage of the project is to reduce the size of the sensors to only 1mm so they can be attached to smaller insects such as mosquitoes and fruit flies.

This new technology should give us a better understanding our environment and has the potential to help improve productivity in both agriculture and forestry.

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Image Credit: CSIRO



New deforestation monitoring method for tropical regions

Halting deforestation in tropical regions requires verification of forest conditions. The VTT Technical Research Centre of Finland (VTT) has developed a new satellite image based method for accurate assessment of tropical forest cover.

In this three-year project, VTT developed a new method of monitoring tropical forest cover using numerical satellite images. The method permits forest mapping using satellite images with a resolution of ten to thirty metres. The accuracy of the maps is assessed by taking a statistical sample from satellite images with a resolution of better than one metre. Sampling is intended to ensure that the mapping method does not over or underestimate the forested area.

"In late 2014, the Sentinel satellites launched as part of the European Copernicus programme will begin to deliver satellite image data that is highly suitable for forest monitoring," says Tuomas Häme, Research Professor at VTT.

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Image Credit: VTT Technical Research Centre of Finland



MARKETS

New market benchmarking report on pulp sector

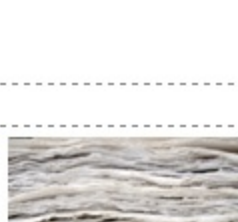
In the pulp sector, major changes have been occurring in the past decade in kraft pulp production and applications.

To assist Canadian pulp manufacturers in competing more effectively in global markets, FPInnovations conducts benchmarking programs every five years to assess the quality of bleached kraft market pulps from major pulp-producing countries worldwide.

Results of the 2013 benchmarking report has already been sent to participating companies and a report on the results of two previous benchmarking programs has now been released to the public. A total of 84 pulps (50 softwood and 34 hardwood) from Eastern and Western Canada, Southeast USA, Scandinavia, Southern Europe, Russia, South America, Australasia, and South Africa were included in these programs.

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Image Credit: PaperAdvantage



NEW PRODUCT INNOVATIONS

Carbon nanotubes used to create a flame-retardant coating for furniture

Your furniture could kill you. According to the US National Fire Protection Association, nearly 20% of home fire deaths between 2006 and 2010 occurred in fires where upholstered furniture was the first item to ignite. It's actually not so much the exterior fabric that burns, as it is the foam beneath it. With that in mind, scientists at the National Institute of Standards and Technology (NIST) have used carbon nanotubes to create a coating for that foam that reduces its flammability by 35%.

The coating was made by inserting a layer of the heat-dissipating nanotubes between layers of polymer, then stacking four of those three-layer sandwiches to form one sheet. Despite the fact that it's made up of a total of 12 layers, that sheet has a thickness of less than one-hundredth the diameter of human hair.

[Click here for report](#)

Image Credit: Kim/NIST



Cellulose nanocrystals possible 'green' wonder material

The same tiny cellulose crystals that give trees and plants their high strength, light weight and resilience, have now been shown to have the stiffness of steel. The nanocrystals might be used to create a new class of biomaterials with wide-ranging applications, such as strengthening construction materials and automotive components.

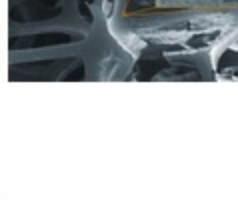
Calculations using precise models based on the atomic structure of cellulose show the crystals have a stiffness of 206 gigapascals, which is comparable to steel, said Pablo Zavattieri, a Purdue University assistant professor of civil engineering.

"This is a material that is showing really amazing properties," he said. "It is abundant, renewable and produced as waste in the paper industry."

The findings represent a milestone in understanding the fundamental mechanical behavior of the cellulose nanocrystals.

[Click here for report](#)

Image Credit: Purdue University



WOOD HARVESTING, TRANSPORT AND LOGISTICS

Research released on effect of storage on pine logs for bio-fuel

New research from University of Canterbury has tested the effect of storage duration and technique on the moisture content of radiata pine biomass logs in New Zealand.

The research saw two trials established in the South Island to represent favourable and unfavourable storage conditions, namely: summer storage in a warm and dry location and winter storage in a cold and relatively wet location. After 24 weeks in summer storage, the moisture content of radiata pine logs decreased from an initial value of 53% to between 33 and 21%.

Due to wet and cold weather conditions, logs stored in winter dried very little over a 17-week period.

The study concluded that the best summer storage technique was the simplest and consisted of stacking small logs without any cover. The larger logs dried the slowest, but splitting accelerated drying significantly. Covering did not help and results indicated that, while covering is useful for preventing rewetting of dry logs, it does not improve drying of wet logs.

[Click here for report](#)

Image Credit: FIEA

