

Welcome to our April edition of the R&D Works newsletter.

Our stories this month include research which has created a new form of insulation entirely from wood, and another which has developed technology for making wood composite panels using industrial wastes, natural fibre and polymers. Other research is looking at a new initiative to produce advanced high value wood biomass-based fuels; ways to fingerprint trees to stop illegal logging; a disposable folding paper microscope to help fight malaria in developing nations; and a FWPA-supported PhD thesis on ways to optimize life cycle costs and life cycle environmental impacts in building materials used in Australian residential house designs.

I hope you enjoy reading these articles and others in this newsletter.

Rio Sinclair
Managing Director
FWPA

MAIN NEWS

Using timber to build homes better

Use of Material in Residential House Design: An Optimisation Approach Balancing Life Cycle Cost & Life Cycle Environmental Impact

PhD thesis by Hamidul Islam

Understanding which building materials have the least environmental impact when used in a standard house design over the life of the home means developers, architects and builders can be confident they are making the best economic decisions for owners well into the future. This research project used the design of a recently built three bedroom, double storey townhouse unit in Brisbane as a case study. Using operational energy (AccuRate) and life cycle assessment computer modeling software (SimaPro) different building materials were tested to identify the design that produced the lowest greenhouse gas emissions, solid waste, life cycle costs and cumulative energy demand.

While there was no single 'best' design that minimised all environmental impact factors at the same time, the best overall outcome was achieved by a dwelling with insulated weatherboard walls, an insulated skillion flat roof and a timber/tiled floor. This design is estimated to have a total cost of \$209,000, while the next best design had a cost of \$207,000 but with a lower energy efficiency rating.

The findings show great savings can be made in terms of environmental impact, with a small investment in construction costs yielding equal savings in operation and maintenance costs. When incremental design improvements for wall, roof and floor assemblages are combined into one house design, there are remarkable reductions in life cycle assessment impacts and life cycle costs of up to 43 per cent when compared to the case study dwelling.

Project number: PGD103-0809



FOREST GROWING

World forests may hold 20% more carbon

The world's forests could hold 20% more carbon than previously thought, according to a recent UK study. If correct, that extra 125 billion tonnes of carbon could lead to an increase in the number of forest-based carbon credits set to be offered in carbon markets around the world.

Scientists from the University of Edinburgh said they have developed a new 3D system to measure forests' carbon content that is more detailed and accurate than current methods.

For the study, the group analysed a specific forested area in Costa Rica and compared resulting data with previous calculations of carbon stocks. The system used by the Edinburgh scientists is based on 3D data extracted from airborne laser scanning.

"Satellite data cannot provide information on the vertical dimension of the forest, such as canopy height and layering, which are crucial to accurate measurement of the carbon," said team leader Iain Woodhouse.

Satellite-collected data from existing studies found the area in Costa Rica contained between 14.4 and 16.3 million tonnes of carbon, while the new method estimated the same area to hold 19.8 million tonnes.

[Click here for source](#)

Image Credit: Wiki Commons



Are hybrid pines the super trees of the future?

Hybrid pines are promising to play an increasingly important role in commercial forestry, particularly for the cold, dry southern regions of New Zealand.

Field trials of *Pinus radiata* x *P. attenuata* hybrids established by Scion and forest tree seed company Proseed in the late 1990s, show the now mid-rotation hybrids to be tolerant of cold and dry conditions, and to have good resistance to snow.

"Based on these results we have been promoting hybrids to South Island forest growers and making seed commercially available for the past five years," says Shaf van Ballekom, Proseed Chief Executive. "These hybrids show superior performance with good resistance to cold and drought compared with the individual species. Companies have already begun planting them particularly in snow prone areas."

"The hybrids are ideal for the south and may provide a solution for land owners in high country areas where the declining viability of extensive livestock farming has spurred an interest in afforestation."

[Click here for source](#)

Image Credit: Scion



Australian soil carbon map sets a baseline for future

A new CSIRO developed map of Australia's stored soil carbon provides an important benchmark against which Australia can track future changes in soil carbon storage or carbon sequestration.

The 2010 soil organic carbon map for Australia provides the most detailed and accurate representation of soil organic carbon stocks nationwide. The map includes an estimate of soil carbon stock and an estimate of the uncertainty for approximately two billion football-field-sized blocks (90m by 90m) across Australia.

"This map is the first effective nationwide baseline of organic carbon levels in the top 30cm of soil, which comes with estimates of uncertainty," according to lead researcher, Dr Raphael Viscarra Rossel.

"The map provides a reliable benchmark for Australia to monitor the influence that changes in land cover, climate, land management and greenhouse gas offset activities have on soil carbon stocks, and associated carbon dioxide removal from the atmosphere," Dr Viscarra Rossel said.

[Click here for source](#)

Image Credit: CSIRO



Global study busts myths about forests and livelihoods

Forests play a crucial role in sustaining people's incomes — but to what extent? Until now, development actions related to forests and livelihoods have been based on incomplete or fragmented data. In many cases, forestry has been combined with agriculture in national income statistics — or not counted at all.

Now, in the most comprehensive study on the links between the environment and livelihoods to date, researchers have challenged conventional wisdom about the importance of environmental income, the roles of men and women in forest-product use, and the function of forests as safety nets.

The global study is the product of the Poverty and Environment Network, a collaborative effort led by the Center for International Forestry Research.

Sven Wunder, lead editor of the publication, said, "Our results indicate that, even some 10,000 years after the start of the agricultural revolution, rural people in developing countries still depend strongly on foraging from nature for their livelihoods."

[Click here for source](#)

Image Credit: Free Big Pictures



NEW PRODUCT INNOVATIONS

Wood foam could provide an insulation hit

An effective new form of insulation created entirely from wood has been created by researchers at the Fraunhofer Institute for Wood Research in Germany. The new insulation — which is essentially foamed wood — could serve as a petrochemical-free, environmentally friendly alternative to insulations currently in widespread-use, according to the researchers.

"Our wood foam can be used in exactly the same way as conventional plastic spray foams, but is an entirely natural product made from sustainable raw materials," says Professor Volker Thole of the WVKI.

This new wood foam can be produced via a rather simple process. All that you have to do is grind wood up into a very fine consistency (till the tiny wood particles become a slimy mass), and then add gas to expand it into a frothy foam that is then force-hardened.

The researchers are currently continuing their work by experimenting with different types of wood and developing a suitable processes for mass-producing wood foams on an industrial scale.

[Click here for source](#)

Image Credit: Fraunhofer WVKI



New wood composite developed

Researchers in India have developed a new technology for making wood composite panels using industrial wastes, natural fibre and polymer. This wood composite can be used in variety of applications like partitions, ceilings, flooring, doors, ventilators, instant houses and furniture.

Dr Asokan Pappu from the Advanced Materials and Processes Research Institute in Bhopal said, "This technology has been developed in view of the National Forest Policy of MOEF, Government of India for development of wood substitute for building applications."

During the process, processed industrial wastes, such as fly ash (industrial waste in dust form), red mud, marble waste and polymer were mixed and reinforced with natural fibre.

After testing, the wood composite performed six times better than teak wood, in quality as well as in strength.

[Click here for source](#)

Image Credit:



New initiative to produce advanced biomass based fuels

Three global leaders in the bio-fuel sector, Fortum, UPM and Valmet, have joined forces to develop a new, winning technology to produce advanced high value lignocellulosic fuels, such as transportation fuels or higher value bio liquids. The idea is to develop catalytic pyrolysis technology for upgrading bio-oil and commercialise the solution.

This five-year project will develop pyrolysis technology enabling improvement of bio-oil quality compatible for further refining to transportation fuels or intermediate products.

Petri Kukkonen, vice president of UPM Biofuels said, "Our aim is to become a significant advanced bio-fuel producer. In accordance with our strategy, we will start production in Lappeenranta with crude tall oil residue as a raw material, and simultaneously we are looking for ways of producing bio-fuels out of solid wood biomass. Catalytic pyrolysis is one of the promising options we are looking into."

This project will help utilities and the forest industry sector in making investment decisions for entering advanced biofuel production.

[Click here for source](#)

Image Credit: Fortum



Australia's first carbon neutral bricks

Bricks made using sawdust have become the first of their kind in Australia to be recognised as carbon neutral, the organisation behind the products says.

In its latest announcement, building materials manufacturer Brickworks says bricks, manufactured at its Longford plant near Launceston, have become the first ever to be recognised by the Australian Government's Department of the Environment as being carbon neutral under the National Carbon Offset Standard.

The company says the certification is largely the result of using of sawdust rather than fossil fuel for kiln firing at the plant — reducing the 8,607 tonnes of carbon dioxide the plant would have otherwise emitted each year in producing the same capacity using fossil fuels to just 215 tonnes (about the same as twelve Australian households). They then achieved the remainder of the carbon neutral certification by purchasing carbon offsets.

The company said its carbon offset required to achieve the carbon neutral status are purchased largely via a contribution to the local Forests Alive program in Tasmania.

[Click here for source](#)

Image Credit: Sourceable



WOOD HARVESTING, TRANSPORT AND LOGISTICS

Tree swinging robot may revolutionise forestry

A remote controlled tree 'swinging' robot modelled on stick insects and spider monkeys may revolutionise the way forests are managed and harvested.

The two-armed forest locomotion robot, nicknamed 'Stick Insect' because of its deliberate movements, can be manoeuvred from tree to tree without touching the ground, using a joystick control. The device has been developed by Scion in partnership with the University of Canterbury, Future Forests Research and the Ministry for Primary Industries under a Primary Growth Partnership Programme to improve worker safety in steep, rugged terrain.

"I've been working on the concept of a tree-to-tree machine for over 10 years, and this funding has enabled the project to progress," says developer Dr Richard Parker, Senior Scientist at Scion. "The 'Stick Insect', is a mobility platform. We have been trialling the device to better understand its operating capabilities and are now working to incorporate gadgets to perform tasks, such as sensors for measuring tree diameter, and custom-built saws for felling."

Further research will look at developing a whole family of tree-to-tree robots which can perform a wide range of productive tasks throughout the forest.

[Click here for source](#)

Image Credit: Scion



OTHER INFORMATION

Technology boost in the battle of the birds

In hopeful news for birdlife, NZ developed automatic rat traps have totally eliminated predator rat populations during large-scale Department of Conservation (DOC) trials in native New Zealand bush.

Results from large-scale DOC trial sites confirm that the patented automatic trap technology developed by local company Goodnature has successfully reduced rat populations to undetectable levels. Monitoring at the two large scale trial sites by DOC field personnel indicate that rat populations in these areas had been completely eliminated.

The unprecedented rat detection results contrasted with monitoring results on the adjacent comparison sites which showed that rat populations outside the automatic trap trial area continued to thrive.

Powered by a small compressed CO2 canister, the commercially successful Goodnature traps automatically reset themselves after striking a pest and can kill up to 24 rats before the canister needs to be replaced.

"These rat kill results are very promising. It is a significant step towards having a better and more effective trapping option for predator control in New Zealand." DOC deputy director general Kevin O'Connor commented.

[Click here for source](#)

Image Credit: Forestry Expo

Fingerprinting trees to stop illegal logging

The University of Adelaide will help step up the fight against illegal logging with a new two-year, DNA-fingerprinting project in Indonesia.

The Adelaide-led project will develop DNA markers for important Indonesian timber species, allowing trees to be tracked from forest through to final product. "Tropical rainforests play such an important role in Indonesian economic development and the global ecosystem," says Professor Andrew Lowe, project leader and Director of the University's Australian Centre for Evolutionary Biology and Biodiversity. "But, at the current rate of deforestation, the sustainability of these resources is under serious threat."

The researchers will develop a species identification and timber-tracking system for important Indonesian timber species from the red and light red meranti group of trees — which make up more than half of the wood trade in the region. Using DNA-fingerprints, a tree-by-tree approach will control the 'chain of custody' in cooperation with the forestry agency and timber companies in Indonesia.

[Click here for source](#)

Image Credit:

Folding paper microscope could reduce deaths from malaria

According to the World Health Organization, there were approximately 207 million cases of malaria worldwide in 2012, 627,000 of which proved fatal. Unfortunately, the disease most often occurs in developing nations, where diagnostic equipment may not be available. Manu Prakash, an assistant professor of bioengineering at the Stanford School of Medicine, hopes to change that ... using his disposable folding paper microscope.

Known as the Foldscope, the device can be assembled on site by the user in just a few minutes, from flat-packed components. It's made almost entirely of cardstock paper, with the exception of its poppy seed-sized spherical lens. The lenses are in fact actually a type of abrasive grit, used to round off the rough edges of metal parts.

The Foldscope can magnify samples up to 2,000 times and can simply be incinerated (along with the biological sample in it) after one use.

[Click here for source](#)

Image Credit: Gizmag

