



## BIOENERGY FROM FORESTS

Biomass arising from planted forests represents one of New Zealand's largest renewable resources. As long as a tree is planted for every one that is cut down, woody biomass offers an abundant source of low-carbon energy.

### BIOFUELS FROM WOOD

In New Zealand, plantation forests offer a significant opportunity for large scale production of biofuels to replace fossil fuels. The technology to convert New Zealand grown softwoods and hardwoods to transport fuels is rapidly progressing towards commercialisation - driven by significant global research investment.

A pre-treatment process for radiata pine developed by Scion improves the enzymatic conversion of softwood into sugars. These sugars can be used as feedstocks for the production of biofuels such as bioethanol, biobutanol and hydrocarbons.

The development of Scion's pre-treatment process has focussed on overcoming the economic barriers associated with biofuel production from lignocellulosic (woody) biomass. The programme addresses three key technical needs:

- Minimising energy and chemical inputs for thermomechanical pre-treatment.
- Maximising the yields and purity of fermentable wood sugars.

- Maintaining the functional value of "native" lignin for co-product and energy production opportunities.

The ongoing focus of the programme is to maintain high levels of recovery while further reducing the cost of the process. This research is part of an international research effort to develop cost-effective ways of converting lignocellulosic biomass into biofuels.





## HEAT ENERGY & COGENERATION

Woody biomass from forest harvesting and wood processing by-products are already used to create energy in New Zealand. Most of this energy comes in the form of heat via combustion. Nationally around 3.3 million tonnes of wood processing residue is used annually as bioenergy fuel (27-30 PJ primary energy).

Sawmills commonly burn wood residues to provide heat for timber drying. Pulp mills burn black liquor (a lignin-based by-product of the pulping process) in boilers to generate heat and recover chemicals.

The use of sawdust and shavings to make wood fuel pellets is expanding. These pellets can be used in boiler instead of coal for domestic and commercial heating.

Scion has a research programme aimed at improving and creating new opportunities for generating heat from radiata pine residues.

**Wood provides an important bioenergy resource for producing heat, electricity and, potentially, fuel for transportation.**

### Climate change will affect planted forests in New Zealand

Over the next two or three forestry rotations, NIWA projects the following likely climate trends in New Zealand:

- Warmer by 2.0°C (mid-range projection)
- Wetter in the west and drier in the east
- More extreme weather events

Some of these changes will create opportunities. Others will require higher levels of risk management.

## BIOENERGY OPTIONS FOR NZ

Scion has published a series of reports on Bioenergy Options for New Zealand, highlighting the vital role planted forests can play in New Zealand's future energy needs. The study has demonstrated that New Zealand could potentially meet all of its transport fuel needs from planted forests.

Scion has produced a scenario that shows how New Zealand could gain a long-term, sustainable alternative to imported transport fuels by establishing 1.8 million hectares of energy forest. This would mean doubling the size of the current planted forest estate, using land that is marginal for agriculture.

A range of residual and biomass feedstocks (e.g. algae, canola etc) offer New Zealand niche opportunities (cumulatively less than 10% of demand). However, only forest trees planted on New Zealand's least productive agricultural hill country represents a scalable option that does not significantly impact food or feed production.

The complete set of Bioenergy Options reports are available from the Scion website:

**[www.scionresearch.com/bioenergy](http://www.scionresearch.com/bioenergy)**