

FUTURE FUEL



As fossil fuels fade, biofuels are set to boom as we seek a better future.

ARC CENTRE FOR EXCELLENCE IN INTEGRATIVE LEGUME RESEARCH (CILR)

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Funding source: Australian Research Council linkage grant with BioEnergy Plantation Pty Ltd and Stanwell Corporation, Boeing, Brisbane City Council, Global Change Institute, Queensland Sustainable Aviation Fuel Initiative, UQ

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Meeting the world's ever-growing demand for energy while minimising environmental impact presents quite a challenge - but it's one that UQ researchers relish.

UQ Energy is a research centre set up specifically to investigate alternative energy sources, including solar and geothermal, but it is perhaps biofuel research that's growing the most - literally.

"We are fortunate at UQ to have many gifted scientists, engineers and economists looking at sustainable ways of fuelling our future," says Professor Chris Greig, Director of UQ Energy.

"Incorporating plant science, microbiology, engineering and biotechnology, we are researching alcohol fuel products, green diesel from vegetable oil, micro-algal biofuel systems and biohydrogen production. We must be on the right track because the US Navy was here recently to talk biofuels."

The US Department of Defense has committed to obtaining at least half its energy from non-traditional sources by 2020, and during their visit to Queensland, Navy personnel were particularly keen to investigate the new-generation "drop-in" biofuels that are physically or chemically identical to traditional fossil fuels and suit existing distribution networks and engines.

Many biofuels are created through the manipulation of a range of feed-stocks including microalgae, eucalypts, eSorghum (an arid grass) and the oily seeds of the Pongamia tree.

"Another stand-out is in the area of new nanomaterials, where we convert biomass into valuable chemicals, transport fuels and clean hydrogen," Professor Greig says. "For example, we use microbial fermentation to convert the sucrose from sugarcane into advanced biofuel that can be used in the aviation industry."

The School of Agriculture and Food Sciences is also taking the lead in advanced biofuel research, development and demonstration. Of particular interest is the selection of superior Pongamia genetic material for oil production suitable for creating biodiesel and biojet fuel. Partnerships exist with Australian industry such as Stanwell Corporation, Origin Energy and BioEnergy Plantation Australia.

Says Professor Peter Gresshoff, Director of the ARC Centre of Excellence for Integrative Legume Research (CILR). "We have formed a new collaboration with traditional land owners in far northern Queensland to develop a commercial plantation of Pongamia trees. Pongamia has significant environmental benefits as it requires little nitrogen fertiliser, is both salt and drought tolerant, and can be used to rehabilitate degraded land."

The ability to minimise inputs such as nitrogen, and grow in marginal areas could be a key to success for another sustainable bioenergy crop, sorghum.

Professor Ian Godwin from the School of Agriculture and Food Sciences says, "Our work manipulating sorghum's genes to increase starch and sugar content and biomass will deliver highly adapted hybrids both for Australia and internationally: these will be ideal as a second generation biofuel."

A completely different biofuel source is algae oil, which Associate Professor Peer Schenk and his team are working on in the cultivation of microalgae.

"We have engineered biorefineries where we not only produce biofuels, but also protein-rich animal feedstock and high-value products such as Omega-3 fatty acids. Microalgae are extremely productive as they can be cultivated all year round, do not produce any waste, and yield approximately 10 to 20 times higher than any terrestrial bioenergy crop."

Growing our own fuel sources certainly seems to be the way forward!



Pongamia flowers and buds