THE UNIVERSITY OF QUEENSLAND
AUSTRALIA

CREATE CHANGE

Sustainable Fuel

Large-scale microalgae cultivation

Producing biofuel from sunshine & water

Schenklab Biofuel

Schenk Lab

The Schenk Lab specialises in Algae Biotechnology and have developed disruptive technologies that enable low-cost, large-scale microalgae cultivation, harvesting and processing. Microalgae are an easy to grow renewable source of fuel, feed and nutrition and can be farmed without competing for arable land or freshwater resources.

Sustainable biofuel production can be achieved by nutrient recycling, with air and water being the only inputs required for biofuel production. This carbon-neutral "solar power plant" produces fuel with CO_2 and water as the only inputs. To ensure high economic return on investment, high value vegan protein will be co-produced. If protein and fuel are co-produced, an ROI of approx. 1 year is expected.

We have a vast portfolio of bioprocessing solutions available to address the unique challenges of aquatic crop growth, along with the expertise to guide our clients through the knowledge transfer in order to achieve optimal crop productivity, sustainability and maximum return on investment.

Aspects of this portfolio include new, low-cost technologies to address infrastructure requirements, microalgae cultivar monitoring and water management.

Microalgae facts

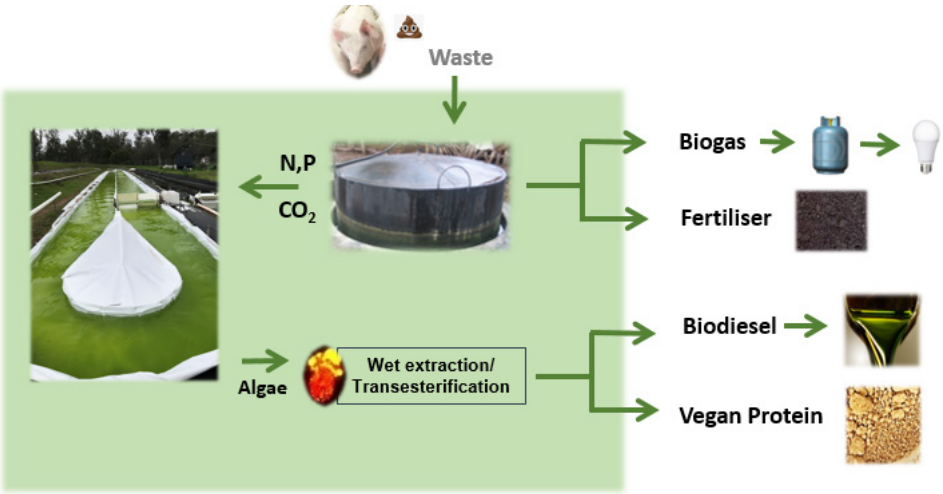
- Biomass can double or triple in 1 day
- Grow on non-arable land
- Use any water source
- All-year-round harvesting (weekly basis)
- 15 000 L of oil for biodiesel per ha per year
- 30 tonnes of protein rich biomass per ha per year
- Can be coupled to wastewater clean-up and anaerobic digestion eg. from piggery
- Nutrient recycling for biogas energy production

Interested Stakeholders

- Unversity of Queensland - Sustainable Gatton campus
- Lockyer Valley Council - Waste reduction & regional jobs
- Military and aviation - Stable, independent fuel supply
- Clean Technology companies - investment
- Early technology adopters - Spearheading sustainability

"At Schenk Lab we are committed to addressing energy security. We aim to pioneer disruptive technologies that will unlock the potential for sustainable long-term energy solutions"

Integration of Algae Farming for Sustainable Biofuel Production



Algae Energy

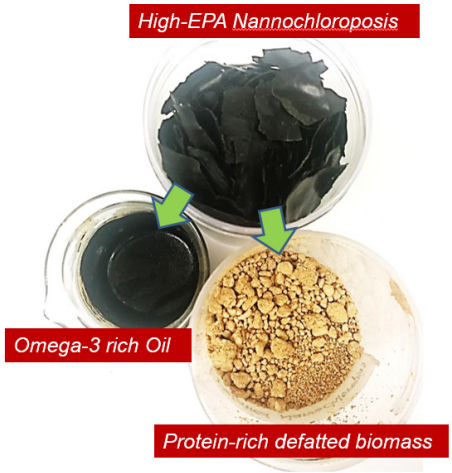
- Sustainable biodiesel with biogas production
- carbon and nutrient recylcing
- optional wastewater clean-up
- Fertiliser by-product

We house a collection of Australian microalgal strains that are highly efficient producers of oil, protein and nutraceuticals and use a special non-GM breeding technique to further improve their performance. For further information on our 250,000 L pilot-scale, low-cost algae demonstration biorefinery at Pinjarra Hills please visit www.algaebiotech.org.

- 15 000 L of oil for biodiesel per ha per year *subject to strain selection
- 30 tonnes of protein rich biomass per ha per year
- biogas will vary subject to system inputs

Cost of Production :

- $2.50 per kg dry weight (whole algae)



Cost Model Microalgae Production (10 ha farm with 8 ha production ponds)

Oil & Protein-rich biomass	CAPEX (total $)	OPEX ($/kg)	Solar OPEX ($/kg)	Wholesale prices 2019
Cultivation	1,015,500	0.11	0.10	
Dewatering (incl. drying)	291,300	0.42	0.40	
Oil extraction	40,000	0.06	0.05	
Labour		0.42	0.42	
Maintenance		0.25	0.25	
Amortisation of CAPEX		0.40	0.43	
Total with amortisation		1.66	1.65	
Oil $/L		**1.45**	**1.45**	
Protein-rich biomass/kg		**1.66**	**1.65**	20
Biodiesel $/L		1.74	1.74	1
Solar (optional)	190,398			
Profit margin/kg				19.34

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