



Centre for Land and Water



Winter Lectures 2011

Eight informative lunchtime lectures in the
Green Shed: Fridays at 12 noon

Lecture 1

**Rural New Zealand Biofuels
the future could arrive any time:**

Rocky Renquist



Winter Lectures 2011

REGISTRATIONS REQUIRED

Phone: 06 650-4532 or Email greenshed@claw.net.nz

Small charge to cover expenses: \$25 inc GST per lecture
(\$150 inc GST for a Series Registration*)

You will receive a light lunch (if you register on time), a lecture and an invitation to stay and discuss the topic in more depth should you wish.

ACKNOWLEDGEMENTS:

The Centre for Land and Water thanks the Winter Lecturers who have generously given their time:



*Berry
Beekeeping*



NOTES:

- * We may cancel or vary presentations if speakers become unavailable or if registrations fail to meet minimum numbers.
- * If a speaker becomes unavailable, we may arrange a suitable replacement to cover the same or a similar topic.
- * Holders of a Series registration will be refunded for any cancelled lectures at \$20 inc GST per cancellation, up to \$150 inc GST total.

Biomass conversion technologies

Oilseed crops to biodiesel

bioethanol

» from sugary/starchy plant parts

» from cellulosic material

gasification (for power + syngas);

pyrolysis to bio-oil

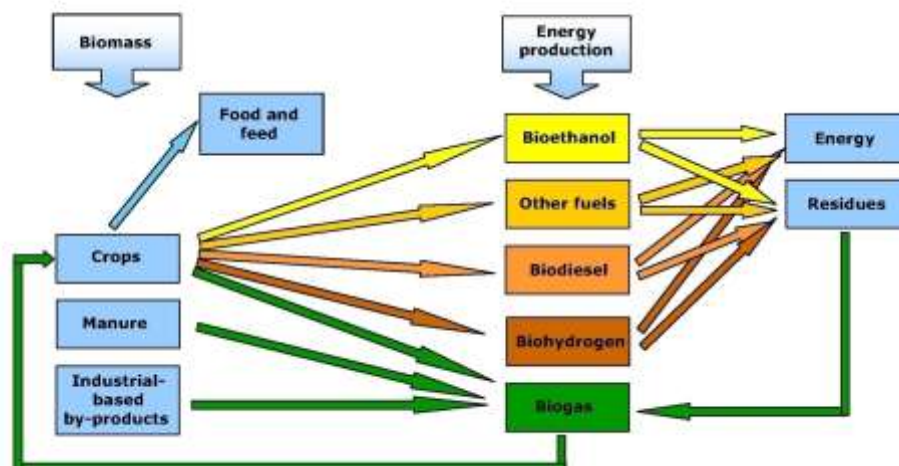
biogas/biomethane



from Amon, et.al. 2007

Fuel-oriented fully-integrated biorefinery system

University of Natural Resources and Applied Life Sciences, Vienna



The New Zealand Institute for Plant & Food Research Limited

Plant & Food RESEARCH
NATURAL RESOURCES & APPLIED LIFE SCIENCES

My gasification feedstock research

Some crops are only for high dry mass:

- *Miscanthus x giganteus* (MxG)
- Eucalyptus leaves and small branches

Others are also good to supply AD digesters

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Miscanthus

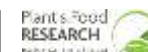
photo courtesy University of Illinois



Higher DM than lucerne in Europe and the American Midwest.

The MISCANMOD model calculated the DM would be 29t/ha in a trial in Waikato by year 3 and thereafter.

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Biomass to Biofuel Conversion Technologies



Most biofuel research has been on liquid fuels, such as cellulosic ethanol or biodiesel.

Why choose biogas?

The AD conversion technology yields 3-4 times more vehicle fuel (km travel/ha of biomass) than from using the biomass for liquid fuels.

The energy to produce N fertiliser is also best avoided by using AD, the conversion most amenable to returning available nutrients to the crop land in the digestate.

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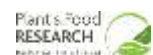


Arable land affected by moisture stress



Sites vulnerable to moderate water stress are defined as those with annual soil moisture deficit > 50mm

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Feedstocks for anaerobic digestion



Types of AD feedstocks include:

- livestock manure;
- wastes from food and other processors;
- crop residues; and
- Purpose grown crops.

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Selection criteria for biomass crops



- Ability to produce moderate to high DM in marginal conditions and with minimal tillage (perennials).
- Very high DM yield in years when rainfall is adequate. Can be annual crops with a high N requirement (annuals/perennials).
- General traits:
 - high biogas yield per kg DM;
 - minimal pest control requirements;
 - easy to establish and harvest;
 - able to be stored or ensiled; and
 - don't make viable seed

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Crops screened for CLN system



<u>Common name</u>	<u>Species</u>
Maize	<i>Zea mays</i>
Sorghum	<i>Sorghum bicolor</i>
Pearl millet	<i>Pennisetum glaucum</i>
Forage sunflower	<i>Helianthus annuus</i>
Jerusalem artichoke	<i>Helianthus tuberosus</i>
(Lucerne)	<i>Medicago sativa</i>

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Elements of the CLN supply concept



- Crops with moderately high DM yield on marginal land: the screening trial confirmed good options for NZ.
- A biomass crop 'rotation' that is integrated by means of a shared biogas digester rather than as a crop sequence in a single planting site.
- Crops need no bought-in N fertiliser: recycled from digester to field and new N fixed by the use of lucerne and crimson clover.
- Two rotation types: annual sorghum + crimson clover, perennials in long rotation or merely adjacent (Jerusalem artichoke + lucerne).

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Data for a 'virtual' test of CLN supply

The 2011 trial measured the elements of a 'virtual' CLN system using sorghum as the annual crop and Jerusalem artichoke for the 'all-perennial' virtual system.

Crops were fertilized with purchased AD digestate (from CSI in Hastings). We are measuring the methane yield of ensiled samples in a number of laboratory-scale digesters in Vienna.

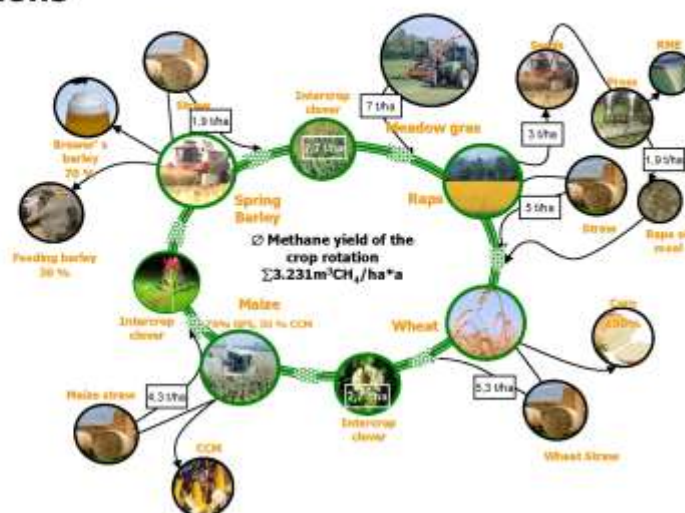
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Extend CLN to crop land?

Biogas production from integrated biorefinery complexes and sustainable crop rotations

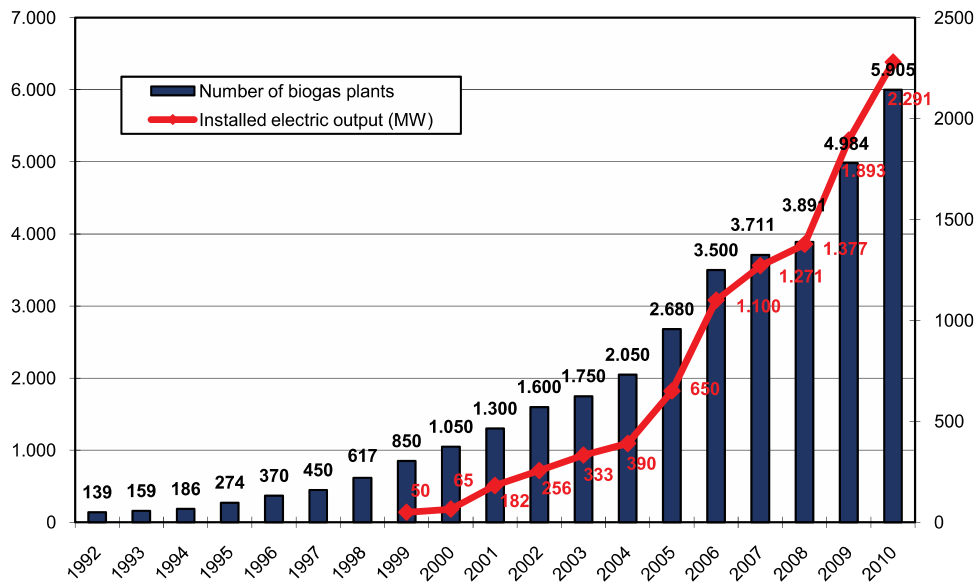
University of Natural Resources and Applied Life Sciences, Vienna



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Development of the number of biogas plants and the total installed electric output in megawatt [MW] (as of 06/2011)



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Centre for Land and Water

WELCOME

Welcome to the Centre for Land and Water, a venue supporting sustainable agriculture through training, research and consultancy.

The Centre provides professional offices, meeting and seminar facilities and land for research and training.

We currently have rental offices available. Terms by agreement - phone, fax, copy and print facilities available on-site.

The Green Shed seminar venue is available for training, meetings or for general event hire. Contact us: Phone: 06 650-4532 or Email greenshed@claw.net.nz

The Centre is located on a 4 ha site with easy access and plentiful parking. Entry is from Ruahapia Road, accessed from Karamu Road (SH2) at Waipatu or Pakowhai Road at Chesterhope. It is 4 km (8 minutes) from the Hastings CBD, 17 km (20 minutes) from Napier CBD and 18 km (20 minutes) from Hawke's Bay Airport.

COMING SOON

CLAW Short Seminars:

Communications: Preparing a media release

Communications: Writing popular articles

Communications: Writing technical reports and manuals

Communications: Preparing and delivering public presentations

Irrigation: System calibration theory and practice

Irrigation: How much water do I really need?

CLAW Short Courses

NZQA Certified Irrigation Evaluator



Centre for Land and Water

- 1. Rural New Zealand Biofuels - the future could arrive any time:** **July 8th**
Speaker: Rocky Renquist, Plant and Food Research
Rocky is a crop research scientist. Bio-energy can replace ¼ of all energy use by 2050 and reduce the footprint of ag products. Having identified better conversion technologies, Rocky has worked on crops and crop residues to supply fuel plants. His focus is on bio-energy for rural New Zealand.
- 2. Ground Water Resources – beginners guide to hydrology:** **July 15th**
Speaker: Tony Davoren, HydroServices
Tony is a hydrologist with extensive experience in irrigation, soil water, surface and groundwater water resources. He will explain key hydrology concepts so you can make sense of well tests and groundwater science. What does an aquifer report tell me? How do we know if current take levels are sustainable?
- 3. Bees - what's happening in the hive:** **July 22nd**
Speaker: Peter Berry, Berry Beekeeping
Fresh from the National Beekeepers Association Conference, Peter will update us on the latest developments. He is a conservationist, tramper, hunter, fisherman, farm forester, muso and playwright. He is also passionate about bees, with lifelong beekeeping experience.
- 4. Managing and making sense of data:** **July 29th**
Speaker: Mark Rodgers, "Datatamer"/ Hilltop Software
Mark is a data management specialist and developer of Datatamer software which is used by regional councils and irrigation schemes. He will explain how data from water meters, river monitoring, soil moisture and other sensors can be captured, cleaned, stored and made available. What is this data for and how can it help me?
- 5. Employment Matters - getting it right:** **August 5th**
Speaker: Gill Riley, Grow Human Resources
Gill is an HR specialist with experience in management and operational HR across many sectors. She presents a common sense approach to people issues, good employment structures, and ways to de-escalate issues. Her focus is excellence and optimal results through integration of all business operations.
- 6. Lean Production - taking the waste out of what we do:** **August 12th**
Speaker: Glenn Manahi, SBF
Glenn is the director of SBF, a company facilitating businesses into "lean" ways of thinking and doing. Lean is about doing more with less: less time, inventory, space and money; getting the process right the first time. Glenn promises a fun interactive session looking at systems - what works and what doesn't.
- 7. Social Media - business in the online era for Rural Communities:** **August 19th**
Speaker: Matthew Miller, Mogul
Matt has a wealth of experience in digital marketing and web development. He will enlighten us on social media including Facebook and Twitter – what role do they have in keeping rural communities connected with each other, their markets and the rest of the world.
- 8. Interpreting leaf and petiole test results:** **August 26th**
Speakers: Mike White, Analytical Research Laboratories and Andre Lubbe, Ravensdown
Mike and Andre will co-present this session on testing plant material and turning results into fertiliser recommendations. They will use grapes as a case study to explain what your tests tell you about your crop. Mike and Andre are happy to answer questions about other crops that have particular interest to attendees.