

# Biogas on your farm

## Biogas – energy from waste

'Biogas' is gas produced during the breakdown of biological matter, which can be used to provide electricity, heat and transport fuel. Biogas can be produced using effluent from farms, crop wastes, sewage, or at landfills.

Biogas contains methane, which is lighter than air so it can easily be separated and stored. Methane has 20 times more greenhouse gas effect than carbon dioxide. The process of burning biogas for electricity generation and/or heat or to power an internal combustion engine converts methane into carbon dioxide, so this significantly reduces total greenhouse gas emissions.

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Systems for extracting and using biogas on farms have been used for decades

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## Biogas on farms

Small-scale biogas schemes can generate electricity or heat for use on the farm, within communities, in business and in homes, and in some cases can also export electricity back into the local network. Farms and businesses which export may be able to sell the electricity to a power retailer, or to another user.

The raw material used to produce biogas is called 'feedstock'. The feedstock (e.g. manure) is collected and held in tanks or ponds, the gas produced is captured, and this is used either as fuel in its own right (to heat buildings or power vehicles), or to drive a generator that provides electricity. Systems for extracting and using biogas on farms have been used for decades in Europe and North America. A biogas system may be as simple as fitting a cover to ponds, or as sophisticated as a fully automated off-the-shelf system using tanks. A well-designed system offers other benefits: odour control, reduced contamination of groundwater and production of biofertiliser.



Ponds used for effluent disposal can provide the raw material for a biogas system. Covers also help to reduce odour.



Tank digester on the Landcorp farm at Eyrewell, North Canterbury.  
Photo courtesy Natural Systems Ltd

The most common method of producing biogas is anaerobic (without air) digestion. Anaerobic ponds are often used to treat effluent and waste water from piggeries, dairy, and other types of farming. Biogas can be collected from ponds by installing covers secured around the perimeter. Capping ponds also helps reduce odour.

## More potential for NZ farms

Biogas has historically not been viable in New Zealand due to low energy prices, relatively small herds and paddock-based farming. However, in the past decade rising energy prices and larger herds have made biogas production in New Zealand far more viable. The trend in colder regions to move stock indoors during winter, also enhances the potential for biogas generation as larger volumes of feedstock can be collected.

Installing a biogas system may also assist farms' effluent disposal. This is because processing manure through a biogas system reduces pathogens, resulting in a digestate output with enhanced value as a fertiliser. The digestate has less odour and fewer environmental issues when applied directly to pasture. It is important to thoroughly investigate the changes required to effluent disposal before embarking on a biogas project. Effluent may need to be held for longer to harvest biogas; however, a well-managed system will make effluent disposal and compliance easier.

## Biogas from dairy effluent – Eyrewell, North Canterbury

A prototype biogas system has been operating for two years on a Landcorp-owned farm at Eyrewell, North Canterbury.

Manure from the farm's 900 cows is collected on a concrete pad outside the milking sheds, and pumped into a tank digester. The gas produced is used to power a generator that provides around a third of the farm's energy requirements. An arrangement with local retailer Genesis Energy means that any excess electricity that is exported, gets subtracted from the farm's overall consumption.

The BioGenCool™ system, designed and installed by Natural Systems Ltd, also instantly cools the milk, which improves its quality and lowers power demand.

Natural Systems director Ian Bywater says the potential for biogas systems on dairy farms is growing fast, especially where farmers increasingly use barns to house cows during winter. This not only boosts productivity by improving cows' welfare, it also enables 100% of manure to be collected for energy generation during months that cows are inside.

There are environmental benefits to the biogas system also. The digestate that comes out of the tank is very low in pathogens compared to raw manure, and is ready for use on paddocks as an effective biofertiliser. This comes on top of the reduction in carbon emissions from using up methane in the biogas.

"Farmers are realising that it's sensible to look at biogas energy generation – both to combat the environmental problems with dairy effluent, and because they're concerned with rising energy costs," says Mr Bywater.

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## Biogas from pig farming – Lepperton, Taranaki

In Taranaki, pig farmer Steve Lepper is installing a biogas system to utilise energy from his 400 breeding sows.

An anaerobic oxidation pond has been re-located next to the piggery, with covers installed to capture methane. This will be used to power a generator, using the resulting electricity to help power the piggery. Energy savings from the project are estimated at around 60%, with the scheme expected to pay for itself in around three to four years.

The pond covers will enable biogas to be stored, and used when the need for electricity is greatest. Mr Lepper says he currently spends approx \$90,000 per year on natural gas and electricity. Much of the power is used for heating, as the farrow-to-finish operation means newborn piglets have to be kept warm. In time he hopes that the biogas system can be used to heat water to replace the heat lamps currently used.

An added benefit of covering the ponds was reducing odour. With homes less than a kilometre from the pig farm, odour was a growing issue that needed to be dealt with.

The scheme is a pilot endorsed by the New Zealand Pork Industry Board. “Every farm is unique and what works here may not apply to everyone – but there is a lot of potential and as we learn more about setting up and running biogas projects it should become easier for others,” says Mr Lepper.



## Assessing your farm for biogas energy

### The technical issues – can it work?

- **Your feedstock resource (primarily effluent but vegetable matter can be used).** You will need to determine the total available volume of feedstock and composition of the organic matter. Consultants can help to analyse its chemical composition.
- **Your heat and/or electricity demand.** It is important to determine whether the biogas will be used directly on site for heat, or used to generate electricity. If you are generating electricity, and potentially exporting excess back into the network, it pays to talk to your electricity lines company early. Systems that meet the safety and technical requirements of the local network company are able to connect to the network to export electricity. There will likely be a charge for the connection.
- **The track record of the company that is supplying, installing and maintaining your system.** Look at what skills the staff have and their understanding of the factors that go into making a biogas system economically viable. What monitoring and maintenance will the supplier offer? You also need to assess the track record of the manufacturer, including how their systems have performed to date, and what guarantees and warranty support they offer.
- **Consents that may be required.** Depending on where your site is, your local and regional councils may have consent requirements for effluent management and the storage of flammable substances. Your system may also require a building consent.



The potential for biogas systems on dairy farms is growing, especially where farmers use barns to house cows.



## Costs and benefits – do the numbers add up?

- **Assessing your power needs.** To determine whether a biogas system may suit your requirements, first understand your power demand. Talk to your electricity retailer and review your power bills. As a first step, try to reduce your consumption through energy efficiency. Review what your electricity cost is now and also how this may change in the future.
- **The installed price of a biogas system and ongoing maintenance costs.** These can vary depending upon a number of factors, including the installation site and the type of system you install. Expect that most biogas systems will be bespoke designed, based on your feedstock volumes and the feedstock's chemical composition.
- **What price you will be paid for exported electricity and what limits there may be on the amount that can be exported.** It is important to remember that generating electricity for your own use is quite different to generating electricity for financial gain. With the former you are offsetting your own consumption so the value of the electricity is the price you pay for it. Generating electricity for profit means competing on the wholesale market where prices are significantly lower as they don't include the costs of transmission or administration. (Be aware that any electricity you generate will usually be considered taxable. You should clarify your potential tax liability and include this in your calculations. Also consider how your business treats depreciation of capital assets.)

### Ideally, a suitable site for biogas generation needs:

- enough concentrated feedstock resource, such as manure
- reasonable access to the site
- a requirement for heat and/or electricity nearby
- resource consent issues to be analysed.

### I'm interested, what do I do next?

If you are interested in generating electricity and heat or running vehicles on biogas on your farm check out the following links:

- The Bioenergy Association of New Zealand has established a Biogas Interest Group for discussion and shared activities – [www.bioenergy.org.nz/biogas.asp](http://www.bioenergy.org.nz/biogas.asp)
- EECA's websites – [www.eeca.govt.nz](http://www.eeca.govt.nz) and [www.energywise.govt.nz](http://www.energywise.govt.nz) provide a wide range of advice on energy efficiency and renewable energy.
- The Ministry of Agriculture and Forestry has more information on farming practices and the Sustainable Farming Fund at [www.maf.govt.nz](http://www.maf.govt.nz)

EECA enables organisations to increase their domestic and international competitiveness by adopting energy efficiency and renewable energy practices.

We work with businesses to identify the opportunities for energy management that are available to them and help them develop energy management action plans to make the most of these opportunities.

Good energy management has many benefits for businesses, including lower costs, increased productivity, reduced greenhouse gas emissions and a positive effect on the brand.

We have a particular interest in:

- encouraging new or under-used technology that can make processes more efficient
- projects that reduce greenhouse gas emissions, and
- developing the wood fuel industry.

 For more information contact The Energy Efficiency and Conservation Authority:

#### EECA HEAD OFFICE:

PO Box 388, Wellington, (04) 470 2200

#### EECA AUCKLAND:

PO Box 37444, Parnell, Auckland, (09) 377 5328

#### EECA CHRISTCHURCH:

PO Box 13983, Christchurch, (03) 353 9280

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