



Key questions about biogas

If you're considering agricultural biogas production, you likely have a number of questions. This factsheet will help you better understand how to get started with biogas for your farm and point you in the right direction for additional questions you may have.



Financial

How do I finance my biogas facility?

Financial institutions generally want to support farm customers in their renewable energy investments. Obtaining financing should not be a hurdle if a farm has a strong financial position and presents the business case and long-term revenue stream for the biogas system.

When securing financing, be sure to shop around. Different lenders have varying comfort levels with on-farm biogas plants. Some lenders, such as Farm Credit Canada, offer specific financing for environmental solutions that can help you make environmental upgrades to your operation and switch to renewable energy resources.

How profitable is a biogas plant?

There are multiple ways to calculate the profitability of an on-farm biogas plant. Not unlike a new barn or more quota, the payback period (number of years to recover your investment) is a common way to pencil out profitability.

Generally speaking, and because on-farm biogas plants operate for at least twenty years, a payback period of eight years or less should be a good investment. A simple payback period calculation is based on investment cost, operating costs and projected revenue through energy sales and tipping fees. A more complete profitability assessment takes into account important additional variables, such as cost savings on farm inputs (e.g., bedding, commercial fertilizer, building heating), interest on loans, depreciation, insurance and taxation.

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Regulatory

What do I need to know about permitting and regulatory approval?

Government permits and approvals required for biogas systems vary from province to province.

In British Columbia, for example, farms must seek approvals from the Agricultural Land Commission, the Ministry of Environment (MoE) and the municipal government. The B.C. MoE requires three permits for biogas systems: effluent, air and solids. In Ontario, approvals for on-farm biogas systems are typically issued by the Ministry of Agriculture and Rural Affairs. Each province also regulates how much non-agricultural feedstock a farm can accept. The total amount is 49% and 50% in B.C. and Ontario, respectively.

How long does it take to acquire the necessary permits and who can help with this process?

The timeline to acquire the necessary permits varies by province and the number of agencies/government departments involved in the approval process. Typically, several regulations are administered by different departments within the provincial jurisdiction, and regulators are not always familiar with on-farm biogas systems. The length of time to obtain all of the approvals can take as long as 18 months to more than three years. Tap into a technology vendor for assistance in working through this process.

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Operational

How can I ensure optimum anaerobic digester (AD) operation?

Optimum AD operation is a function of system design. Key considerations include frequent and manageable feeding of inputs, even and consistent digester heating to maintain temperatures, easy maintenance of mixers, and sufficient insulation to protect from climate and elements.

As with most mechanical systems, regular monitoring and maintenance can reduce facility downtime. In the case of biogas systems, this may require additional technical support with specialized expertise and accessing replacement parts from outside of Canada.

Many parameters work together to affect the efficiency and productivity of the digester.



Having an appreciation for microbiological systems is also key for overall digester health and achieving optimal biogas production. Many parameters work together to influence the health and, in turn, affect the efficiency and productivity of the digester. The most important digester health parameters include a balanced feedstock mixture, monitoring process control (temperature, carbon:nitrogen ratios, pH) and the use of biological and chemical additives when necessary. These are critical to preventing issues like digester foaming or biological system crashes.

How much time is required to operate an AD?

As in farming, operating an AD system can vary day to day depending on the preventative maintenance and measures you put in place. The size, level of automation and the complexity of the system determines the number of hours required to operate the system. This can range from one part-time operator for several hours each day to full-time operators. Technology vendors can provide an accurate labour assessment for each system.

Where can I access a reliable supply of high-quality feedstock?

There are several ways to procure off-farm materials. One is to work with a company in the resource recovery industry that will contract with you to deliver specific consistent feedstock supplies. Another method is to contract directly with neighbouring farms, or with food processors in your area. Important characteristics to keep in mind of feedstock include availability, consistency, free of contaminants, good methane yield, and the ability to generate a tipping fee.

A reliable supply of high-quality feedstock is the cornerstone of a successful biogas system.

What do I do with an end-product such as digestate?

Ideally, digestate is spread on farmland surrounding a biogas plant (typically within a few kilometres), as this is often the most cost-effective way to deal with it. However, in cases where the nutrients in digestate are greater than the nutrient needs of your farm, nutrient extraction technology may be required to help you move some of your digestate elsewhere. Larger fibre in digestate can be dried and used for livestock bedding. Dry matter product can also be exported off your farm and marketed as fertilizer pellets.



Offtake and interconnection

What are my offtake options?

Biogas can be converted directly into heat and power in a combined heat and power (CHP) system. Currently, the majority of agricultural biogas operations generate electricity for sale to a provincial electricity utility. A small portion of the electricity and some of the heat may be used directly on farms.

Renewable natural gas (RNG) is poised to bring the next wave of opportunity for biogas producers. Biogas can be upgraded into pipeline-quality RNG by removing carbon dioxide and various impurities for injection into natural gas pipelines.

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How do I connect to the grid?

Grid connection, whether to electricity or a natural gas pipeline, will vary depending on the distance of your farm to the grid, and the capacity and constraints on the grid.

If your farm doesn't have three-phase power or a natural gas pipeline close by (i.e., under one kilometre for three-phase power and three kilometres for a gas pipeline), it can be challenging to sell your renewable electricity or RNG. While it is possible to compress renewable natural gas and deliver it by truck, this increases complexity, adds cost, and could negatively impact the profitability of your biogas plant.

Can I supply my farm's own energy requirements?

Yes, you can use the biogas you produce for on-farm heat and electricity generation, thereby reducing your operational costs. In many cases, however, heat production is greater than on-farm demand, so not all of this energy is used (especially in summer months).

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Can I collaborate with other farms?

Yes, biogas co-operatives are an option for some farms. Co-operatives share input materials, such as manure, crops and silage, or have anaerobic digesters on each participating farm. They then pipe the biogas to a common facility that upgrades the biogas to RNG and injects it into the natural gas pipeline. Location, however, is still a critical factor; farms would need to be within approximately five kilometres of the upgrading facility.

How safe is a biogas facility?

The safety of your biogas facility depends on you. Every project should develop a safety plan with the help of industry experts. Handling natural gas and electricity requires training and both need to be done responsibly. For example, farm staff working on digesters should receive specific training related to hydrogen sulfide, which is a poisonous gas often contained in digesters. In Ontario, the Technical Standards and Safety Authority provides oversight for gaseous fuel safety. B.C. producers should consult with Technical Safety BC about biogas flare requirements, inspections and approvals.

Training on confined space entry and managing high-voltage electrical systems will also help ensure your biogas facility is a safe place to work. Having emergency preparedness procedures in place and seeking advice from local emergency management services is recommended as well.

How does biogas improve my farm's environmental footprint?

Biogas production can help you enhance your farm's environmental stewardship by transforming methane from manure into energy. Capturing and using methane through anaerobic digestion can significantly reduce greenhouse gas (GHG) emissions from manure systems, mitigating the impacts of climate change. Besides biogas, the plant produces nutrient-rich digestate that boosts crop production, which feeds livestock and creates a sustainable loop of food, waste and energy. In addition to nutrient recovery and management, the farm benefits from odour reduction and destruction of weed seed and pathogens.

Capturing methane through AD can significantly reduce GHG emissions, mitigating the impacts of climate change.



Other, continued

What is the nutrient content of digestate?

Digestate contains almost all of the nitrogen, phosphorus and potassium of the input feedstock and is considered a good fertilizer due to its nutrient consistency and availability. It also has a lower carbon-to-nitrogen ratio than dairy manure (i.e., better short-term nitrogen-fertilization effect), fewer weed seeds and significantly reduced odour. Finally, due to having less fibre than manure, digestate is easier to mix, pump and spread.

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Sources

The sources used to develop this fact sheet provide many more answers:

Canadian Biogas Association:

Canadian Anaerobic Digestion Guideline

Current Status and Future Potential of Biogas Production from Canada's Agriculture and Agri-Food Sector

Farm to Fuel – Developers' Guide to Biomethane

B.C. Ministry of Agriculture, Food and Fisheries:

On-Farm Biogas

Development Handbook



The Canadian Biogas Association is the source to connect you with information and expertise to get your farm started with biogas.



Canadian Biogas Association

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