

Greenhouse Gas Emissions



The Environmental Questionnaire (EN2) in the Environment module of proAction® is designed to help farms take note of the positive actions they already take with respect to the environment and will provide an overview of performance on soil health, greenhouse gases, biodiversity, and other topics. This will help identify potential areas that could further benefit your farm and mitigate impacts on the environment.

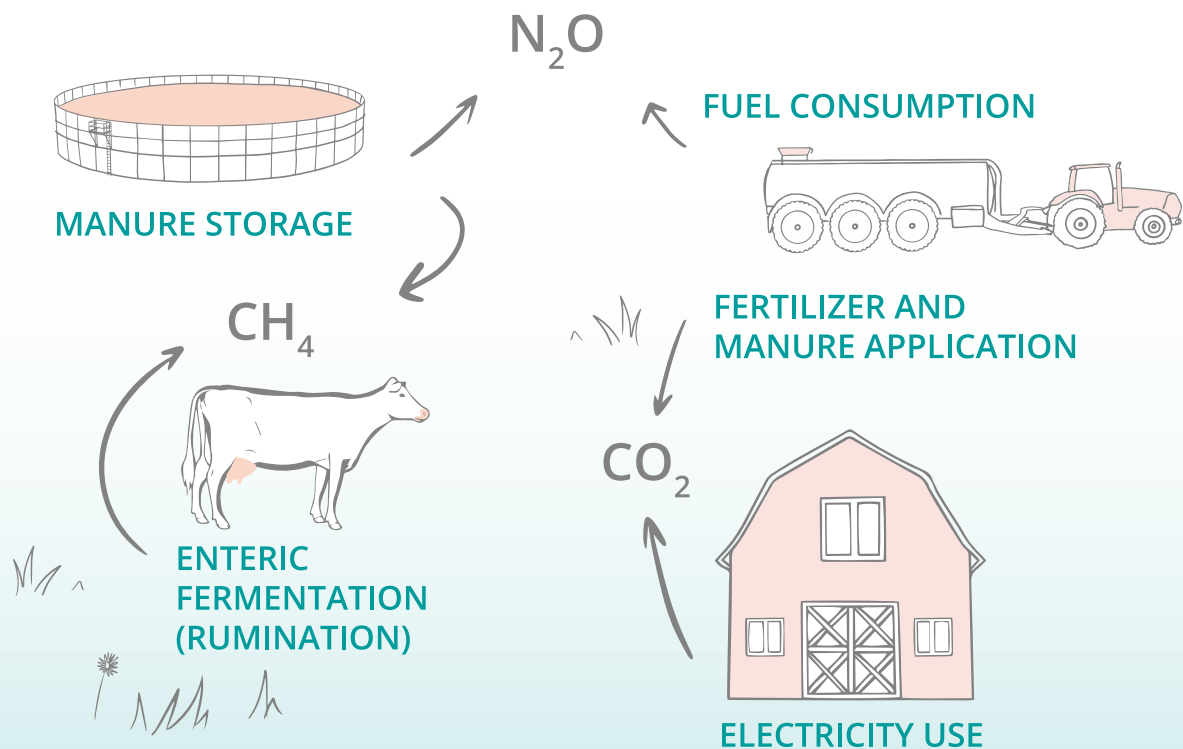
One of the key metrics of environmental performance on farms is greenhouse gas emissions. The questionnaire helps evaluate actions to reduce greenhouse gas emissions and energy use on the farm.

Greenhouse gases (GHGs) are molecules that absorb and emit heat in the atmosphere. The primary GHG emissions on dairy farms are methane (CH_4), nitrous oxide (N_2O), and carbon dioxide (CO_2).

Methane (CH_4) is a by-product of rumination, and cattle release important amounts of this greenhouse gas. It is also emitted from manure storage, particularly from liquid manure systems.

Nitrous oxide (N_2O) is mainly produced during manure storage, mostly from solid manure systems. It is also lost from fields following fertilizer or manure application, especially during freeze-thaw cycles.

Carbon dioxide (CO_2) is produced on-farm through energy use – fuel for farm equipment, electricity use, grain drying, and other applications.



While farms are sources of greenhouse gas emissions, they can also be sinks, as is, certain on-farm activities can capture and store carbon. See the Soil Health fact sheet for more information.



In addition to capturing carbon from the atmosphere, there are many opportunities for farms to reduce the greenhouse gases they produce. These activities bring many benefits alongside reduced environmental impact, including increased productivity, feed efficiency, cost savings, and public trust.

MEASUREMENT

There are many opportunities to participate in research studies or to calculate on-farm emissions with recognized tools. Many academic projects aim to study one or more aspects of farm practice, to help understand factors of greenhouse gas production in order to decrease emissions or improve efficiencies. In addition, other on-farm tools have been developed, including:

- **Dairy Farms +** (dairyfarmsplus.ca) by Dairy Farmers of Canada allows individual farms to calculate their carbon and water footprints, and compare their performance to provincial and national averages
- **Holos** by Agriculture and Agri-Food Canada allows individual farms to estimate greenhouse gas emissions
- **Cool Farm Tool** by Cool Farm Alliances

MITIGATION

Energy management

Reducing energy use is a win-win, as equipment investments often have a net-positive return.

- Energy audits are a tool to help diagnose where energy use is high and which areas could benefit from retrofitting.
- Energy efficient lighting and ventilation can reduce costs, as can equipment such as efficient vacuum pumps, water heaters or the use of plate coolers to reduce the burden on cooling.
- Energy efficiency can also be taken to field practices, where adoption of reduced tillage reduces fuel use. Using “cleaner” fuels is a practice that can also reduce the use of fossil fuels. Some farms have converted some or all farm machinery from diesel to electric; the use of renewable natural gas motors is also emerging.
- Farms can also produce their own energy from renewable sources, with wind and solar installations being increasingly common. Anaerobic digesters have the benefit of reducing methane from manure storage, and producing biogas which can be used to produce electricity, heat or liquid natural gas for use in vehicles.

Livestock management

One of the best ways to reduce on-farm emissions is a practice that many dairy farmers use already: working with a ruminant nutritionist.

- A ruminant nutritionist will advise feeding cattle in a way that improves feed efficiency, so that more milk can be produced from less feed, and animal health can be maintained.
- Nutritionists can also advise how best to incorporate feed additives or fats in the ration that will help to reduce enteric methane.

Manure management

Manure storage is another source of greenhouse gas emissions.

- In the case of liquid manure, fully emptying manure storage removes more of the bacteria that produce methane and that would otherwise inoculate the incoming manure.
- More frequent emptying of manure, at least twice a year, has the same effect and lowers the amount of manure that can act as a source of methane. However, manure application should always be done in accordance with optimal nutrient management practices.
- Other ways to reduce methane produced in manure storage is to cover the storage, or use a technology such as composting, with or without solid-liquid separation, or anaerobic digestion.

Crop management

Various crop management practices can lead to a reduction in greenhouse gas emissions, and an increase in carbon sequestration. These include: spring manure application, reduced tillage, optimizing nitrogen application based on soil testing, and increasing the proportion of perennials in rotation. See the fact sheet on Soil Health for more information on these and other practices.

