

Our cows, our air

GREENHOUSE GASES & DAIRY FARMING

QUEBEC PROJECT

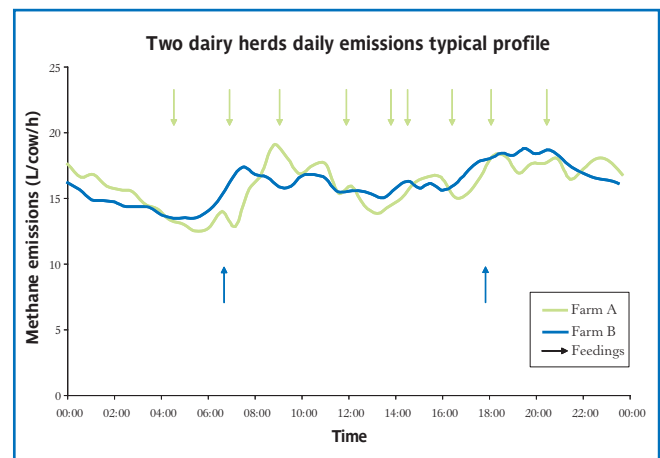
This project, conducted by Agriculture and Agri-Food Canada in Lennoxville, Quebec, compares greenhouse gas emissions from cows and manure on dairy farms with different levels of milk production and different herd management practices. The aim is to identify approaches that limit emissions of greenhouse gases while maintaining a herd's productivity. The project also demonstrates the potential of biofiltration in reducing methane emissions from barns and pits on commercial dairy farms.

The formation of methane by the cow is a loss of energy from the feed, accounting for up to 12% of the food's energy. Given that methane gas is not used by the cow for milk production, it represents a loss of feed energy that could increase food costs.



Air sampling equipment at barn ventilation points

Two different farms were equipped with instrumentation for monitoring purposes. The air entering and leaving the mechanically ventilated barns is sampled and analyzed on a continuous basis to measure the methane produced by the animals inside. Differences between the two farms include cattle breeds, feed and supplements, the number of daily feedings, and manure management. In both instances, emission peaks correlate with animal feeding schedules.



Each cow produces 350 to 650 litres of methane per day. There are several ways of processing these emissions and reducing their concentrations in air evacuated from barns. Cost and environmental impacts are major factors in deciding which technique to use.

Biofiltration appears to be a promising option. This is a natural process of aerobic degradation of air contaminants through bacterial oxidation. Micro-organisms are attached to a filtering material (such as peat, compost or wood chips) in which contaminants are absorbed and oxidized. The microbes “eat” methane particles, converting them to less harmful carbon dioxide and water.



Large-scale experimental biofilter operating on a covered manure storage

A large-scale experimental biofilter was designed and built. It is divided into four compartments, each with a different filtering material. The biofilter was set up on a trailer so that it could be moved to different farms, helping to measure its effectiveness in oxidizing different methane sources. Preliminary results show methane reduction of 80% from concentrations of 0.5% to 2.5%.

In addition to the cattle themselves, manure contributes to greenhouse gas emissions. Some systems for storing manure in liquid form create anaerobic conditions that lead to higher methane production, varying according to temperature. In a cool climate such as in Quebec, volumes of methane produced by manure storage in pits may represent less than 3% of the volumes from ruminal fermentation in dairy herds, thus accounting for only a very small portion of a dairy farm’s greenhouse gas emissions. Covering manure pits can hold back these emissions while also containing odours and nitrogen, and reducing water accumulation in the pits.



Negative air pressure covered manure storage