

# Greenhouse Gas MITIGATION

A Beef Sector Report

Summer 2003

## MANURE MANAGEMENT AND ITS IMPACT ON GREENHOUSE GAS EMISSIONS

*Manure releases greenhouse gases as it decomposes and scientists are evaluating how best to manage the emissions.*

For years, scientists, policy makers and producers have recognized two things about proper manure management - it helps protect the environment and it makes good business sense. Scientists are now working to determine the precise contribution cattle manure management makes to overall greenhouse gas (GHG) emissions.

To recap, GHGs are gases that absorb infrared radiation from the sun and then emit the radiation into the atmosphere. The result is a net trapping of energy that warms the earth's surface. The primary GHGs in the earth's atmosphere are water vapour, carbon dioxide, methane and nitrous oxide.

Proper manure management can help mitigate GHG emissions, but researchers continue to debate and investigate what form of management is best.

### WHY MANURE RELEASES GHGS

GHGs are released by cattle manure, in part because of inefficient feed conversion. For example, digestion in the absence of oxygen creates methane. If feed efficiency is increased, less methane will be produced.

All manure has the potential to release GHGs over time whether the manure is stockpiled or otherwise treated. Researchers are now working to determine how different methods of manure management alter the quantity of gases released by the manure and their rate of release.

Composting has recently garnered significant attention as a method of manure management.

Composting is the biological breakdown of organic material, such as manure, into a more stable organic form. During composting, micro-organisms consume the organic material, releasing a number of by-products, such as heat and carbon dioxide. The result is a recycled product that is rich in carbon, free of pathogens and substantially reduced in terms of mass and volume, due to moisture removal.



*The federal greenhouse gas mitigation program is a multi-sector initiative that provides research demonstration sites and information for Canada's agricultural industry.*

The benefits of composting are well documented. Substantially reduced in volume and mass, the manure is more easily transported to fields. It requires fewer transport trips, saving time, money, as well as wear and tear on vehicles, and it reduces total exhaust emissions from machinery because fewer trips are needed.

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However, the process of composting still results in the release of GHGs, especially carbon dioxide. Proper composting management can go a long way to mitigating these releases, say scientists.

## GHG RELEASES CAN BE MANAGED

Current GHG research is seeking methods to mitigate emissions. In many cases, these are approaches already being used by producers, but new techniques and fine-tuning of existing options will lead to new alternatives. For example:

**Input.** Feeding more nitrogen than the animal needs will result in an increase in the amount of nitrogen released in the manure, which leads to the potential creation of nitrous oxide - the most powerful GHG. Excess nitrogen is also a waste of a valuable nutrient. To reduce nitrogen production, producers need to use feeding regimens that maximize feed efficiency. While it's acknowledged that feed efficiency will help reduce GHGs, the steps aren't as clear. Research is continuing in this area, and includes ongoing studies with various feed additives.

**Manure management.** Land application of raw or composted manure can be tailored to reduce the emission of GHGs and their impact on the environment. Application of more nitrogen than a crop needs via manure will result in excess nitrogen accumulation in soil and will increase the release of nitrogen as nitrous oxide. Application of manure at the wrong time of year, for example in the very early spring, will also increase the release of nitrous oxide, as will applying raw manure during wet conditions. Researchers believe that timing manure application correctly and ensuring proper application amounts will contribute to an overall reduction in GHG emissions from agricultural operations.

## ONGOING RESEARCH

Despite some headway in research that will help producers mitigate GHG emissions from their operations, more research is needed.

One of the biggest challenges is that there has been no detailed study of GHGs throughout the entire manure output system, from the time when manure first appears in a pen through to the finished compost product or through to land application of raw manure. This makes it difficult to quantify emissions.

Another impediment, say researchers, is the lack of standard research methodology protocols, which makes it impossible to definitively say how much GHG is emitted during the composting process. Additionally, it makes it difficult to accurately compare different composting techniques and variations.

To assist producers, the Canadian Cattlemen's Association (CCA) has produced a Greenhouse Gas Calculator in an effort to better understand the GHG emissions that result from Canadian beef cattle operations. This is a computer-based calculator that roughly quantifies the amount of carbon equivalents emitted and/or sequestered from a specific operation. Producers interested in the calculator are welcome to contact CCA.

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The CCA gratefully acknowledges the technical assistance of Canadian researchers in the preparation of this information sheet. Special thanks go to Dr. Xiyang Hao at Agriculture and Agri-Food Canada's Lethbridge Research Centre and Dr. Katherine Buckley at Agriculture and Agri-Food Canada's Brandon Research Centre.

Greenhouse Gas Mitigation Program for Canadian Agriculture  
Programme d'atténuation des gaz à effet de serre pour l'agriculture canadienne

