

# Greenhouse Gas Emissions and Alberta's Livestock Industry

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## Greenhouse Gases - Things You Need To Know

### Why are Greenhouse Gas Emissions Important?

Over the last century, modern industry and lifestyles have rapidly increased greenhouse gas (GHG) concentrations in the Earth's atmosphere. The majority of scientists studying this issue believe that these increasing concentrations are contributing to global warming. Rapid global warming could result in such problems as more severe weather events, more forest fires, and damage to water resources.

Canada has committed to reduce the nation's GHG emissions to 6% below 1990 levels by 2008 to 2012. Canada's emissions have continued to grow since 1990, making our target more distant. The national and provincial processes to address Canada's commitment have indicated that all GHG emitters will be expected to do their fair share in reducing emissions. In addition, recent surveys show the majority of consumers in Canada and abroad believe action has to be taken now on GHG emissions.

The livestock industry also has an immediate economic stake in reducing its emissions because these emissions represent a loss of costly feed energy and nutrient inputs.

### Emissions from Alberta's Livestock Industry

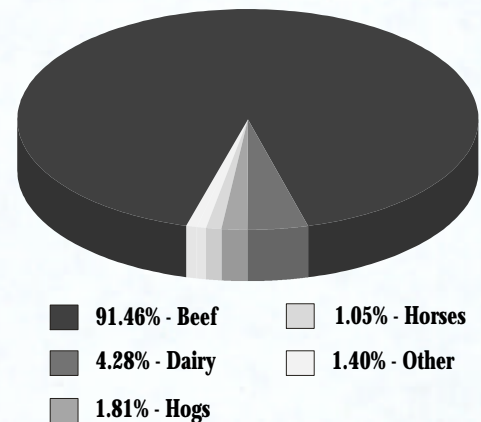
Alberta's livestock industry contributes about 1% of Canada's total GHG emissions. (For information on the contributions of other industries, see *Greenhouse Gas Emissions of the Agriculture and Agri-Food Industry*, another bulletin in this series.)

The main gases emitted by the livestock industry are methane from the animals, and methane and nitrous oxide from manure handling and storage. Methane and nitrous oxide are very potent in terms

of their greenhouse warming effect compared to carbon dioxide, the main GHG emitted by most other industries. Methane is 21 times more potent and nitrous oxide is 310 times more potent than carbon dioxide, per unit of gas.

Figure 1 shows the relative proportions of GHG emissions from the animals and their manures by livestock type in Alberta for 1996. The "Other" category includes sheep and lambs (0.63%), poultry (0.02%) and diversified livestock (0.75%). (Diversified livestock include bison, elk, deer, goat, alpaca, llama, emu, ostrich, rhea and wild boar.)

**Figure 1. Greenhouse Gas Emissions from Alberta's Livestock for 1996, in Carbon Dioxide Equivalents**



**Source: Alberta Agriculture, Food and Rural Development, 1999**

All animals produce methane during digestion. Cattle and other ruminants, however, generate relatively large amounts due to the slow fermentation of feed in the animal's fore-stomach, called the rumen. In 1996, beef cattle accounted for 91% of the GHG emissions from Alberta's livestock sector.



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Manure emits methane when it decomposes under low oxygen conditions, such as poorly aerated stockpiles or lagoons. Nitrous oxide emissions from manure depend on the storage method, application method and rate, manure type and soil conditions.

If the industry's practices remain the same as those used in 1990, annual emissions from Alberta's livestock population are projected to increase by 38% from the 1990 level. The projected increase is due to expected increases in feeder cattle, dairy cattle, hogs, poultry, bison, elk and deer numbers.

### Reducing Emissions from Animals

Many Alberta cattle producers and feeders are already reducing emissions by improving production efficiencies. Increased efficiency lowers emissions because fewer cows are needed to achieve the same number of calves. Due to adoption of improved practices, 9% more calf is now being weaned per cow exposed to breeding, compared to a decade ago.

The most promising future avenues for reducing methane emissions from beef cattle are listed below. With further research and development, these strategies combined could reduce GHG emissions from Alberta's livestock industry to close to the 1990 level by 2008-12.

- **Increasing calf crop percentage**

Greater adoption of practices to improve production efficiency could further increase the calf crop percentage.

- **Feeding higher quality feeds and balanced rations**

This approach creates a hostile environment for the microorganisms that produce methane in the rumen. Some of the options include: high grain diets; ensiled rather than dried forages; and protein and mineral supplements.

- **Feeding ionophores**

Ionophores are common feed additives that reduce methane formation by rumen bacteria. An ionophore rotation may be needed if the bacteria are able to gradually adapt to new ionophores.

- **Feeding lipids**

Plant-derived edible oils, like canola oil, added to cattle feed not only add energy to the diet but also inhibit methane production. However, this approach may not always be economical.

- **Adding bacterial supplements to feed**

Bacterial supplements may be able to convert methane in the rumen to carbon dioxide and may also improve digestion of feed.

### Reducing Emissions from Manures

Options to reduce methane emissions from manure include: applying manure to land more often, rather than stockpiling or storing it in lagoons for long periods; and aerating manure during composting. Options to reduce nitrous oxide emissions include: avoiding excessive manure applications, and optimizing application timing. These practices make the most of the available nitrogen and reduce the risk of nutrients being carried by runoff to water bodies.

### Reducing Emissions from Hay and Pasture Land

Hay and pasture land are generally more effective than annual crops at storing carbon in the soil, and thus have relatively low GHG emissions. For pasture land, the key is to avoid overgrazing. Well managed hay and pasture land also prevent soil erosion and protect water quality.

### Summary

Governments and consumers are expecting all industries, including the livestock industry, to reduce GHG emissions. Increased adoption of existing practices to improve the calf crop percentage could significantly reduce the livestock industry's emissions. As well, promising methods to reduce emissions could be developed through more research. Reducing emissions can improve the industry's production efficiencies, conserve soil and water resources, and contribute to efforts to slow global warming.

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#### Sources

Agriculture and Agri-Food Canada. 1998. The Health of Our Air: Toward sustainable agriculture in Canada. Agriculture and Agri-Food Canada.

Basarab, J.A., Okine, E.K. and Engstrom, D. 2000. Greenhouse Gas Emissions from Livestock in Alberta. Alberta Agriculture, Food and Rural Development.

Basarab, J.A., Okine, E.K. and Engstrom, D. 1999. GHG Emissions from Livestock in Alberta: Past, present and future. Alberta Agriculture, Food and Rural Development.

Environment Canada. 1997. Global Climate Change, "The Science of Climate Change". (<http://www.ec.gc.ca/climate/fact/science.html>).

Okine, E.K. and Basarab, J.A. 1999. Strategies for Reducing Methane Emissions from Ruminants. Alberta Agriculture, Food and Rural Development.

Paul, John. 1999. "Nitrous Oxide Emission Resulting from Animal Manure Management". In Proceedings of the International Workshop on Reducing Nitrous Oxide Emissions from Agroecosystems, March 3-5, 1999. Agriculture and Agri-Food Canada and Alberta Agriculture, Food and Rural Development.

Western Forage Beef Group. 1999. Alberta Cow-Calf Audit, 1997-98. Alberta Agriculture, Food and Rural Development.

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