



# Global Warming and Agriculture

## Best Management Practices for ILOs

When you are fighting to start a tractor on a frosty January morning, global warming doesn't sound like such a bad thing. Unfortunately it doesn't just mean milder winters, it will probably also mean more of the extreme weather and more of the droughts which have plagued farmers from coast to coast.

Canada's commitment to reduce greenhouse gases (GHGs) means every industry is going to be expected to do their part to reduce emissions. Environment Canada, based on methods developed by the United Nation's Intergovernmental Panel on Climate Change, has determined that agriculture is responsible for 10% of Canada's greenhouse gas emissions. The livestock industry including manure management accounts for 37%, while farm fertilizer applications account for 42% of agricultural and agri-food processing greenhouse gas emissions.

Any strategies or Best Management Practices (BMPs) that are going to effectively reduce the GHGs produced by ILOs have to be practical, as well as economically and environmentally sustainable. While most other industries produce GHGs by burning fossil fuel, Intensive Livestock Operation (ILO) emissions come primarily from natural sources. Methane (CH<sub>4</sub>) and nitrous oxide (N<sub>2</sub>O), the two major GHGs produced by the livestock, are both formed as part of the natural biological breakdown of livestock feed components.

"I'm very comfortable with saying that anything an ILO operation does to improve its efficiency will help with GHGs," says Dr. Karin Wittenberg, Head of the Department of Agriculture at the University of Manitoba. "Things that help with nutrient balance and

odour management will also probably be good for controlling GHG."

### Animal Nutrition

Jack Swainson and family run a small 1500 head capacity feedlot, in conjunction with a grain farming operation near Red Deer, Alberta. They've implemented a variety of practices on their farm to improve productivity and at the same time, reduce GHGs.

"BMPs have to work both ways," Swainson says. "They have to be economically sustainable as well as environmentally sustainable. Feeding animals a well balanced diet is a good example. We work with a good, reliable nutritionist, everything is weighed out in the silage feeder. Our goal is to make sure they are getting a balanced diet. They get what they need to eat and not a whole bunch more. Hit and miss feeding doesn't work very well. It's not good for feed efficiency and it's not good economics."

Improvements to animal nutrition are the simplest and most cost effective BMPs for ILO managers to reduce GHGs. Some good GHG practices, like feed testing, are already well established in dairy, hog and feedlot operations. Feed efficiency is the key. Animal nutritionists can be used to devise diets that avoid both overfeeding and underfeeding proteins, minerals and other essential nutrients.

Improved nutrition also increases profitability and reduces GHGs indirectly through improved animal health and by improving reproduction rates. Since GHGs are measured against units of production, producing a few more weaned calves or weaned pigs from the same herd provides a net per unit emis-

sion reduction.

In some cases enzymes, such as amylase and B-glucanase used in poultry rations, can help animals make better use of nutrients and reduce the amounts that are excreted in manure. Based on what is known about the advantages of improved feed utilization it is logical to assume that enzymes should also reduce GHGs. However since there hasn't been a study done to prove it, the concept remains, as Wittenberg says, an educated guess

### Feed Additives

Ionophores such as lasalocid and monensin can be used to reduce CH<sub>4</sub> emissions. A 1997 study (Kinsman et al) showed that adding 24ppm of monensin to dairy rations decreased CH<sub>4</sub> emissions by 28%. However research is starting to suggest that microbes may be able to adapt to individual ionophores over time. If they are going to be included in a diet, different ones will have to be used in an enhanced rotation.

Adding fats, such as whole sunflower seeds or canola oil, to grain rations has also been shown to reduce methane emissions by 33% in ruminants. Take care when adding fats to rations though since rates higher than 5%–6% will tend to suppress the animals ability to digest fibre.

### Herd Management Options

Phase feeding hogs is a good example of how a herd manager can reduce GHGs and increase profitability at the same time. This, like other diet plan-

ning tools, reduces GHGs by reducing manure output by avoiding overfeeding nutrients. Penning and grouping animals by age, sex and size is another method of tailoring nutrient needs to animal requirements.

Minimizing feed losses during storage, such as spoiled silage also reduces GHGs by limiting the amounts of nutrients lost directly to the environment. Proper management of feed bunks also is a simple, but important way, to reduce the amount of feed wasted.

### Manure Management Systems

The 50% of livestock GHG emissions that come from manure are more problematic. Modifications to storage systems are expensive solutions for moderate emission reductions. Currently managing animal nutrition is the best way to manage manure GHG emissions.

Monitoring dietary protein intake in hog rations is one method that should produce major reductions in GHG emissions by swine. Reducing dietary protein intake by 20% will reduce the N excretion by sows by 20 to 30% which could lead to a significant reduction of the nitrous oxide (N<sub>2</sub>O) and methane emissions when slurry is applied to fields. Methane emissions are greater if pigs are fed barley instead of a corn-based diet. Emissions can be reduced in barley-based diets if the dietary protein content is lowered.

“Manure management is again an area where logic tells us what should be happen but there is very little data available,” Wittenberg says. “We know we can reduce the amount of nitrogen we put into the diet with enzymes and more strategic feeding. This should reduce N<sub>2</sub>O emissions

but we haven't done a lot of the research, it's our best guess and that's it.”

Swainson uses a variety of manure management techniques in his operation. “We are trying not to let it build up in the pens,” Swainson says. “We do, regular pen cleaning and maintenance of the manure pack in the pen. We don't clean our pens completely more than once a year but we try to keep the pads where they are eating, scraped off. It's not only good manure maintenance but also promotes good animal health since they don't have to slop through a bunch of mud to get to their feed bunks everyday.

“The other thing we do is have our pens fairly well sloped for drainage to get the run-off out of the pens. Most pens have access to a drainage ditch in the pens with catch ponds at the end. Feedlots have a major nitrous oxide (N<sub>2</sub>O) flush after every rain so I think the more I can do to get rid of the run-off and keep the cattle from tramping through it and breaking the seal, the better.”

“The jury is still out on which type of manure system is best for GHGs,” Wittenberg says. “We know if we have crusting of some sort we have less movement of GHG into the atmosphere. What we don't know is if little GHG movement in storage means there is more in the field. That work is just being done now.”

Covering manure storage areas or managing pH levels by adding straw to limit N<sub>2</sub>O production can produce major reductions in GHGs. These practices also keep the neighbours much happier by reducing odours. In liquid manure management systems the use of covers can reduce methane (CH<sub>4</sub>) emissions by up to 95% reduction. Switching to bottom loading systems, reducing storage times and keeping pH levels at 4.5 will al-

most completely eliminate CH<sub>4</sub>, CO<sub>2</sub>, and N<sub>2</sub>O losses.

Swainson is trying to incorporate a compost system in his operation. “We have been piling and partially composting our piles. We are not doing a great job on that yet but its something I am hoping to do some work on. It is a big job to turn piles so we are looking at adding some aeration by placing a big perforated pipe beneath the pile.”

Timing manure spreading operations also affects GHG emissions. Eliminating or minimizing fall and winter manure spreading reduces the amount of excess N available in the spring when N<sub>2</sub>O losses are the greatest. There is a large amount of uncertainty over which manure application methods are the best.

#### Sources:

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