Manure Management Practices

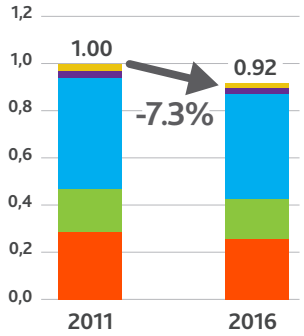
to Mitigate Greenhouse Gases

Manure is an important source of agricultural greenhouse gas (GHG) emissions. Methane (CH_4) is the most important GHG associated with liquid manure management.

Manure methane emissions occur as a net result of microbial production and consumption of methane. 'Wetter' conditions (less oxygen) favour the production of methane, while drier conditions (such as in a crust on manure) result in methane consumption. Management practices to avoid optimal conditions for methane production and/or to provide favourable conditions for methane consumption are helpful in reducing GHG emissions from dairy manure.

LOWERING THE CARBON FOOTPRINT OF CANADIAN MILK PRODUCTION

(kg CO_2 equivalent/kg of milk)



Dairy Farmers of Canada conducted two life cycle assessments to measure the impact of the adoption of best practices on lowering the carbon footprint of milk production and identify areas for continuous improvement. The adoption of best practices helped lower the carbon footprint of milk production by 7.3% in five years.

- Livestock management (48%)
- Feed production (28%)
- Manure management (18%)
- Transport → (6%)
- On-farm energy and infrastructure

Source: Life cycle assessment of milk production update (2018)

INFORMED BY SCIENCE, FARMERS CAN CONTINUE TO ADOPT BEST PRACTICES FOR LIVESTOCK, MANURE AND FEED MANAGEMENT THAT BENEFIT THE ENVIRONMENT.

1 Straw Cover on Liquid Manure

Applying a straw cover on the liquid manure surface has the potential to reduce methane emissions during storage by up to 15%.

The thickness of the cover should be at least 15 cm to achieve this potential reduction as thin straw covers have been found to increase methane emissions.

Reduction by up to 15%

Benefits

- Simple to put into practice and inexpensive
- Adaptable and immediately usable
- Decreases ammonia emissions, reduces odour and hydrogen sulfide production

Drawbacks

- Limited buoyancy time (but can be made more durable with floating supports)

Example of straw covering on liquid manure:

A straw cover reduces methane emissions by creating an environment where there is enough oxygen for microbes to break down the methane that is produced at the bottom of the tank before it rises to the surface and into the atmosphere.

2 Completely Empty Manure Storage Tank

Completely emptying a liquid manure storage tank in the spring eliminates the inoculum (or aged manure) in the tank and reduces the methane emissions from the newly loaded manure in the following months by up to 40%.

The more manure removed, the better: Even emptying the tank to 5% of its total volume of manure will reduce methane emissions.

3 Anaerobic Digestion

In this process,"methane-producing" bacteria use volatile manure solids as "food" to produce methane under enhanced environmental conditions in a digester. This leads to lower methane production during storage of the digestate (the liquid portion of the digested manure) due to lack of "food" for "methane-producing" microbes. The methane produced during anaerobic digestion is captured and used as an energy source in a generator.

Benefits

- Reduces methane emissions from the storage tank component by up to 60%
- Controls odour
- Improves the fertilizer value of the manure
- Produces renewable energy

Drawbacks

- Capital costs associated to installing anaerobic digestion systems are high but the associated GHG benefits are substantial.

4 Solid-Liquid Separation

Separating solids from the liquid manure and composting the solid fraction has the potential to reduce overall methane emissions by about 30%.

Caution has to be exercised because storage of the solid fraction could increase nitrous oxide emissions; however, by supplying sufficient oxygen in manure heaps and implementing good composting practices, emissions can be reduced.

Applying a straw cover, complete emptying of tanks to eliminate inoculum, producing biogas using anaerobic digestion and separating solids can significantly reduce greenhouse gas emissions from dairy farms.

Farm size and the amount of manure produced by the herd will impact the cost-benefit.

Anaerobic digestor with methane trapped under the dome cover.

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