Cropping Practices

to Mitigate Greenhouse Gases

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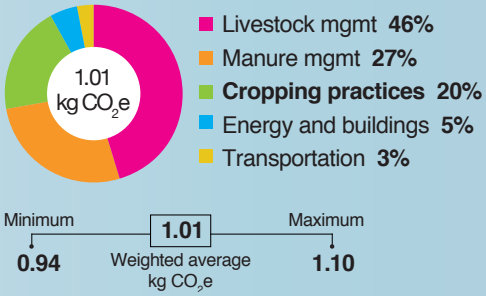
Crop production is a major source of greenhouse gas emission, mostly in the form of nitrous oxide (N_2O) gas emitted from soils.

Nitrogen inputs used in crop production are the major contributors of agricultural N_2O emissions. Production of N_2O in soils mainly occurs due to two microbial processes: nitrification and denitrification, and are regulated by several soil factors.

CONTRIBUTION OF EACH LIFE CYCLE STAGE



*Source: The Environmental and Socioeconomic Life Cycle Assessment of Canadian Milk (2012)

The Dairy Livestock and Crop Systems Project

identified several beneficial soil and crop management practices with large potential to reduce GHG emissions.

1 Spring manure application

Spring manure application is a promising management practice to mitigate GHG emissions.

Compared to fall manure application, spring manure application reduces up to 10% of total N_2O emissions from cropping systems.

Reduction by up to 10%

Fall application of nitrogen increases the likelihood of nitrate leaching and enhanced N_2O loss.

Spreading nitrogen in the spring reduces nitrogen losses through leaching and N_2O production.

? Example of a manure injection system. Nitrogen leaching can result in indirect N_2O emissions due to processes that take place in groundwater or surface water, but which are linked to field practices.

2 Reduced Tillage

Studies conducted in the Prairies reported lower N_2O emissions from no-till plots compared to conventional tillage. No-till also reduses total GHG emissions from western Canadian croplands by increasing the storage of soil carbon.

Example of a reduced tillage field.

Reduced tillage also improves soil quality, promotes biodiversity in and around the soil, reduces soil erosion, and soil compaction.

3 Soil Testing

Optimizing nitrogen application based on soil testing and yield target can reduce N_2O emissions by about 10%.

Yield target helps determine the crop's nitrogen requirement and soil testing gives a better understanding of the nitrogen available for plant growth.

Reduction by up to 10%

Estimating the nitrogen fertilizer requirement using yield target and soil test results helps add the right amount of nitrogen for plant growth and yield expectations.

4 Perennials in Rotation

Increasing the proportion of perennials in rotation resulted in TWO times more carbon sequestration compared to annual cropping with the same nitrogen input.

Though annual crops have higher carbon sequestration rates during the growing seasons, the total sequestered carbon over a year is higher with perennials due to their longer growing season. Compared to annuals, the extensive root mass of perennial crops, particularly in deep soils, helps store more soil organic matter in deeper depths.

Additional Information

Greenhouse gas emissions from soil and cropping systems will vary from year-to-year, but there are clear benefits of soil testing to match crop nutrient needs to inputs; implementing reduced tillage systems; and increasing perennial use in crop rotations; and spring manure application.

Sources

SPRING MANURE APPLICATION

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