3.3 Climate change | Focus on greenhouse gas emissions (GHGs)

The most compelling environmental issue today, climate change, drives much attention to Canada's agri-food system. The system, which encompasses food producers to retailers, is both a climate change contributor and a solutions provider which is itself impacted by climate change. Producers, processors, and retailers are working to reduce agriculture's emissions footprint in collaboration with partners including governments, technology providers, and researchers. For more than a decade, total GHG emissions from Canadian agriculture have been relatively stable at a time when food production has continued to increase. The Index includes 18 metrics related to emissions, which underscore the complex relationship between agriculture, food, and climate change.

Results from the Index: Environment Indicators

Agriculture and food production is a dynamic biological system that requires a comprehensive approach to assessing greenhouse gas emissions. The Index includes the following observations:

- Emissions from Canadian agriculture have remained relatively stable, increasing from 65 to 69 million tonnes of CO_2 equivalent from 2016 to 2020.
- Agriculture also sequesters carbon, mainly through soil organic carbon. However, the amount of carbon sequestered annually in the soil has begun to decrease.
- Life cycle analysis show emissions intensity (GHG emissions per unit of food produced) decreasing across most Canadian agriculture products.
- Emissions data from food processing, transportation and retail are less available and are not included in the overall emissions from agriculture.

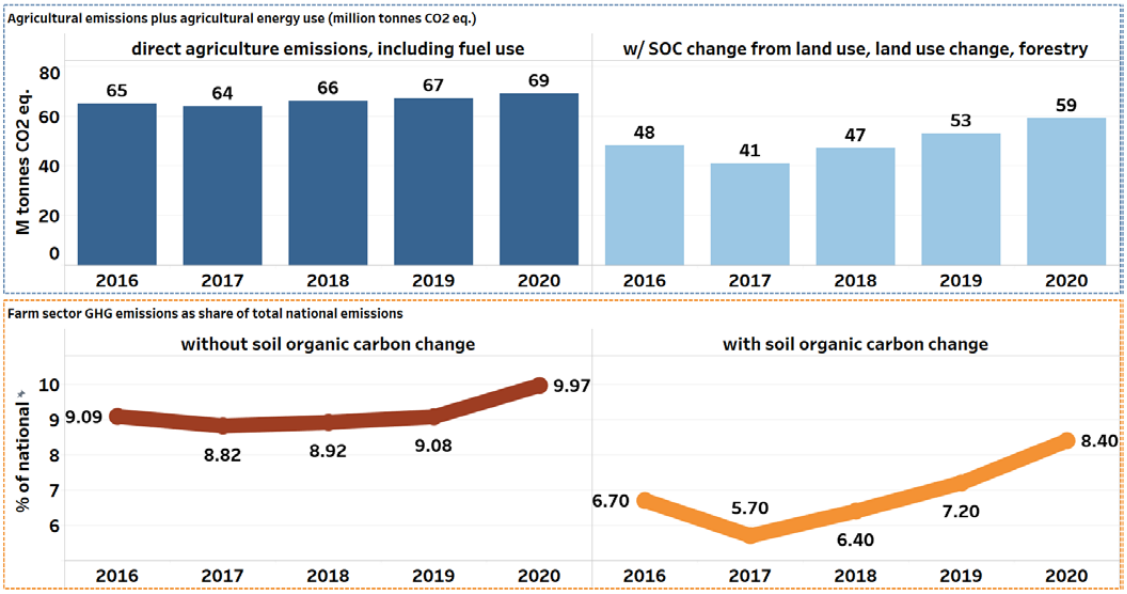

Figure 1: Agricultural emissions with and without soil organic carbon change. Source: National Inventory Report (NIR), Environment & Climate Change Canada. Image produced internally.

Interpreting the results

Reporting emissions

Agriculture emissions can be measured in three ways: i) absolute emissions (emissions emitted by the sector); ii) net emissions (absolute emissions minus the carbon sequestered in the soil; and iii) emissions intensity (net emissions per unit of food produced). Each way of reporting emissions is accurate, but the context for each is different.

1. ABSOLUTE EMISSIONS

From 2016 to 2020, absolute emissions from agriculture increased 6% from 65 to 69 million tonnes of CO_2 equivalent. This effectively represents emissions from primary production, such as methane emissions from livestock, energy use and fertilizer use.

These numbers do not reflect emissions from the rest of the food sector, including food processing, transportation and retail. A complete picture of emissions should include emissions beyond the farm gate, and account for emissions beyond Canada's borders (imported inputs, exported commodities); however, data is limited. This data will be included in the Index when it becomes available.

2. NET EMISSIONS

Net emissions were significantly lower: 48 million tonnes of CO_2 equivalent in 2016, and 59 million tonnes in 2020. Agriculture's net emissions share of total Canadian emissions, as reported in the National Inventory Report, ranged from 6.7% in 2016 to 8.4% in 2020, with a low of 5.7% in 2017.

The amount of carbon sequestered in the soil is more varied, as soil is a biological system and its ability to sequester carbon is influenced by weather and farming practices. The decreasing amount of carbon sequestered in the soil, as measured by carbon accounting models, reflects that soil is becoming saturated with carbon.

3. EMISSIONS INTENSITY

In addition to total emissions, the Index includes emissions intensities metrics for major food products where life cycle analyses (LCAs) are available. LCAs measure emissions intensity (emissions per unit of output food produced throughout its life cycle, that is from the extraction of raw material to downstream stages, until its end of life) and enable insights into environmental impacts for a kilogram of beef or tonne of wheat.

Many emissions intensities have fallen, demonstrating that more food is being produced with fewer emissions. Improving productivity will help continue to drive down emissions intensities. Providing timely access to new technologies and scientific innovations, improving soil health, and tapping into better data will help enable such beneficial changes.

Additional context

The Index reports on existing performance and does not include targets and emission reduction plans developed by actors, including governments, food companies, and producer groups. Moreover, emissions reporting and accounting are changing as new science and data become available. Many global indices and standards (such as SBTi, the Science-Based Targets initiative) are also in place to enable and track the GHG emissions reduction journey, including the global Race to Zero, or net zero emissions by 2050.

Greenhouse gas emissions (GHGs) reductions are one component of a sustainable agri-food system.

The National Index on Agri-Food Performance is a first-of-its-kind Canadian initiative to define and report on a comprehensive and consolidated picture of sustainability from food production to retail.

Complete Index results along with references to global practices are available at **agrifoodindex.ca**. All information in this paper is sourced from the Index (Part 2) unless otherwise stated. This paper is one of seven published together as Part 3 of the Phase 3 Final Report, May 2023.