



Canadian Agriculture and Net Zero Aspirations Part 2 – Sources of On-Farm Sector Emissions

A PRIMER ON FERTILIZER AND FARM FUEL CONSUMPTION ACROSS
CANADA

Biological Carbon Canada | April 27, 2022

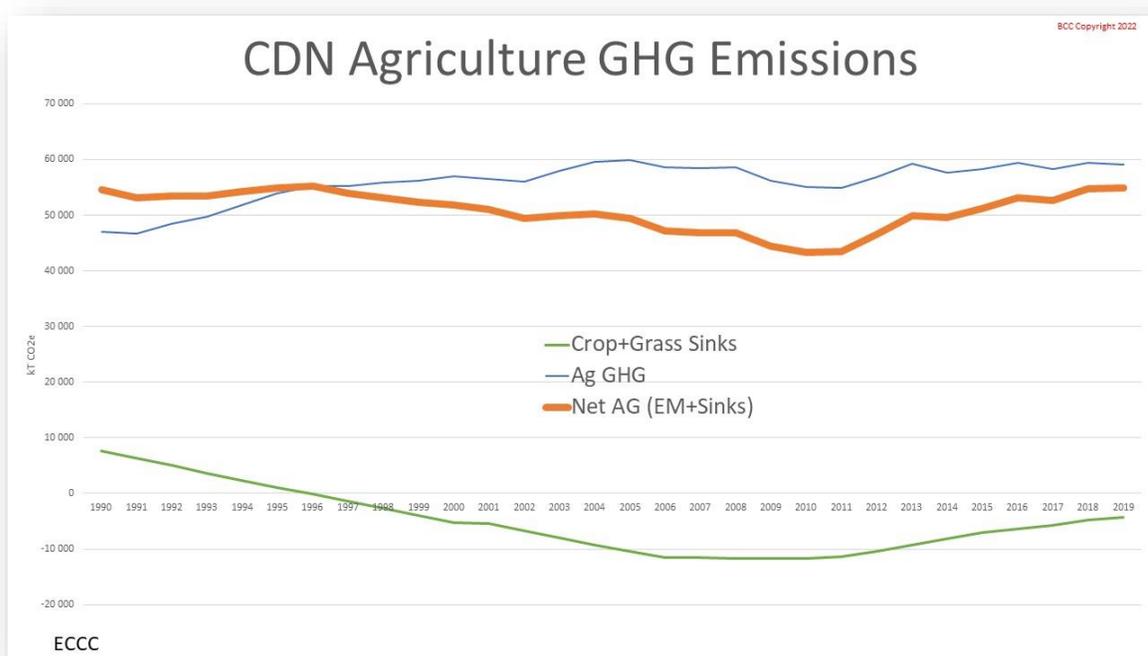
Background

On March 28, 2022, the Government of Canada announced plans to reduce greenhouse gas emissions across the whole economy. Two benchmarks are worth noticing.

- By 2030 the emissions will be below the 2005 levels. The target is at least a 40% reduction from the 2019 levels of greenhouse gas emissions.
- By 2050 the economy will be net-zero.

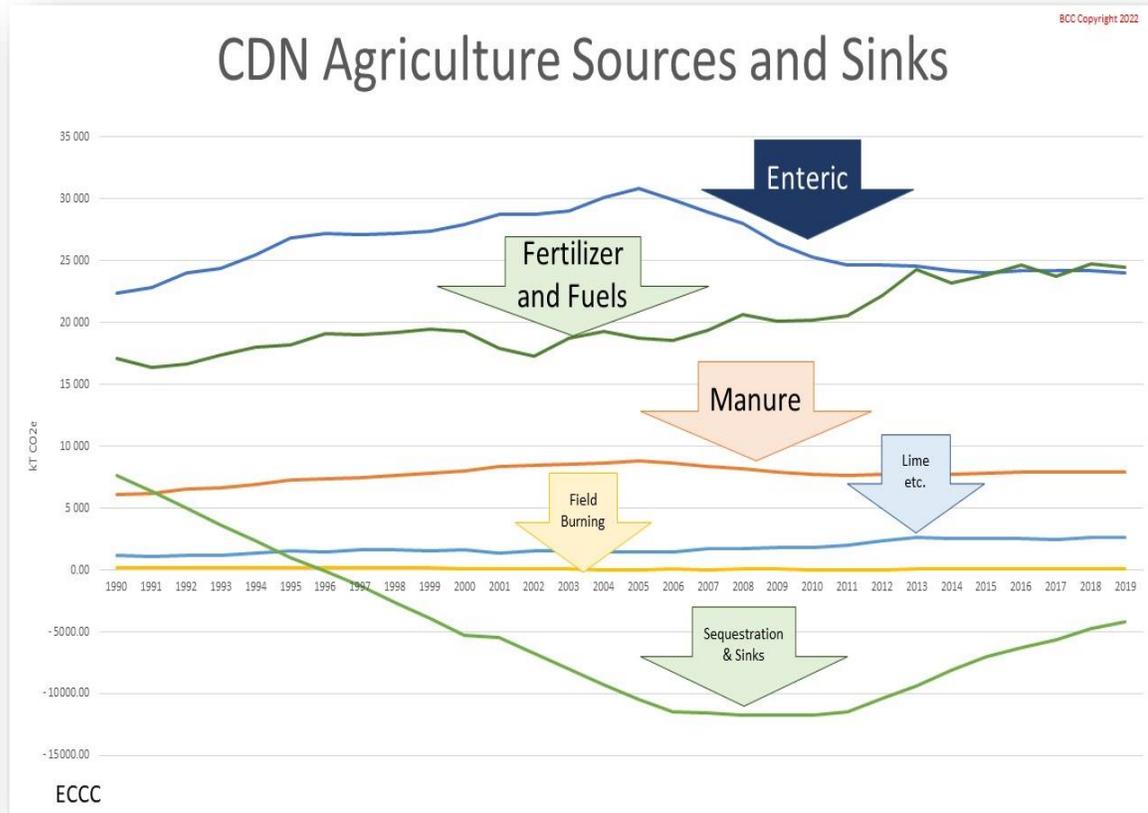
This plan will challenge farms and ranches in Canada. Farms will incur abatement costs to transition to reduced emission buildings, electric vehicles, and farm machines. It will also include new methods and technology to reduce fuel and fertilizer consumption.

Figure 1 – Current State of Ag Emissions (Source ECCC)



The graph above shows gross emissions steady since 2005 with a dip around 2011. However, the emissions and reductions from soil sinks have risen since 2012.

Figure 2 – Breakdown of Main Emission Sources and Sinks On-Farm



The methane from the bovine population follows the cow herd population. Starting about 2000, emissions from farm fuels and fertilizer has continued to rise.

Limitations

This primer has restricted the discussion to fertilizers and fuels.

The farm sector reduction of greenhouse gases has to address two issues; total volume or amount consumed and the emissions factor of each product consumed.

This discussion does not address a partial budget for transition to any viable alternatives.



On-Farm Fuel Consumption

Canada has several background tables outlining fuel consumption. This data rolls up for Canada to build their IPCC report.

The report uses Terajoules. These figures also include the data for 2005.

Figure 3 – Ten Years of Farm Fuel Consumption

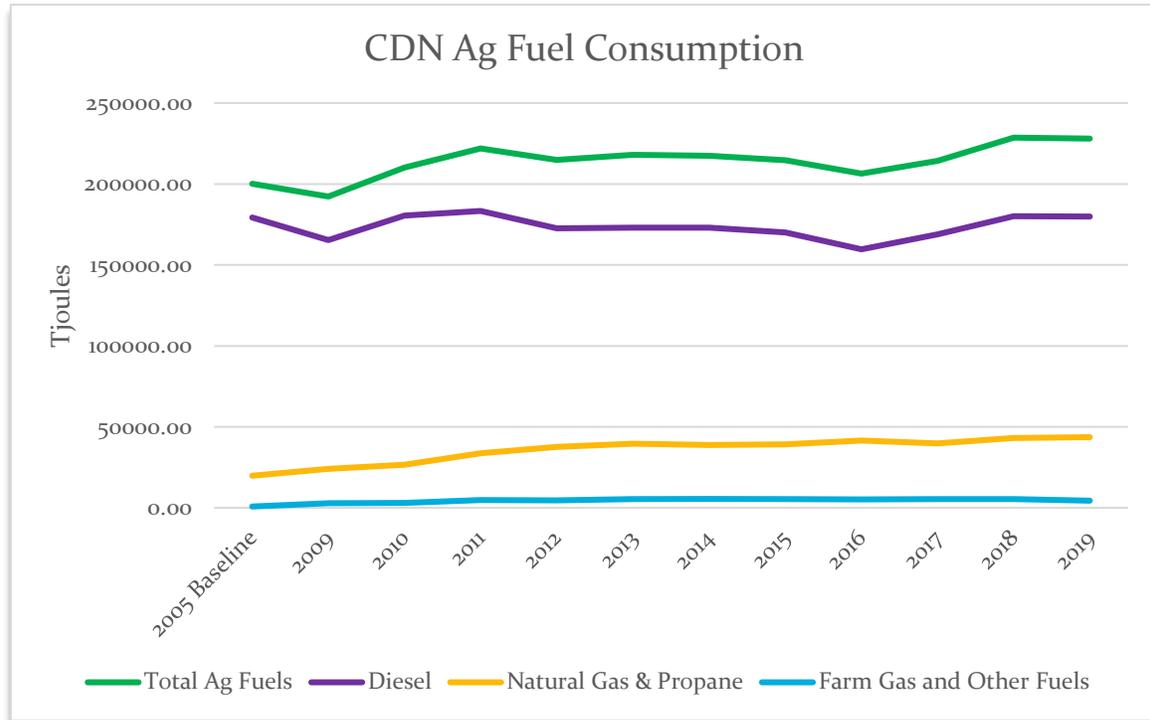


Figure 4 – Last Ten Years Farm Location Fuel Use

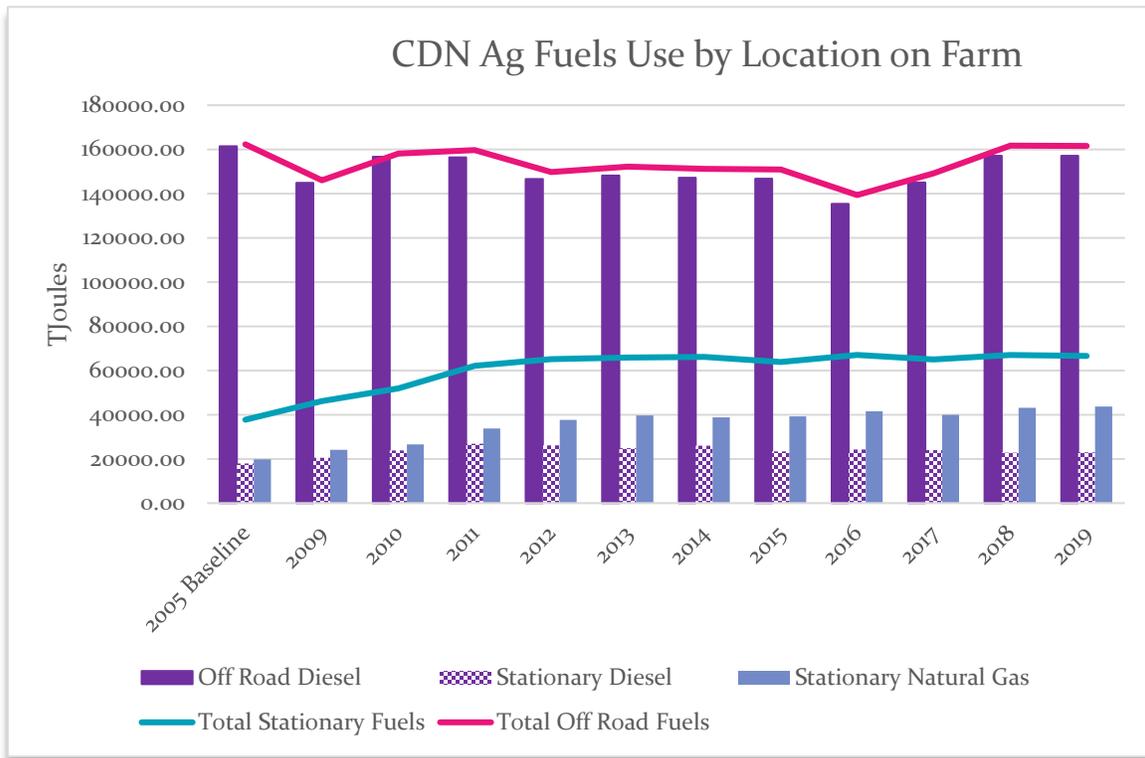
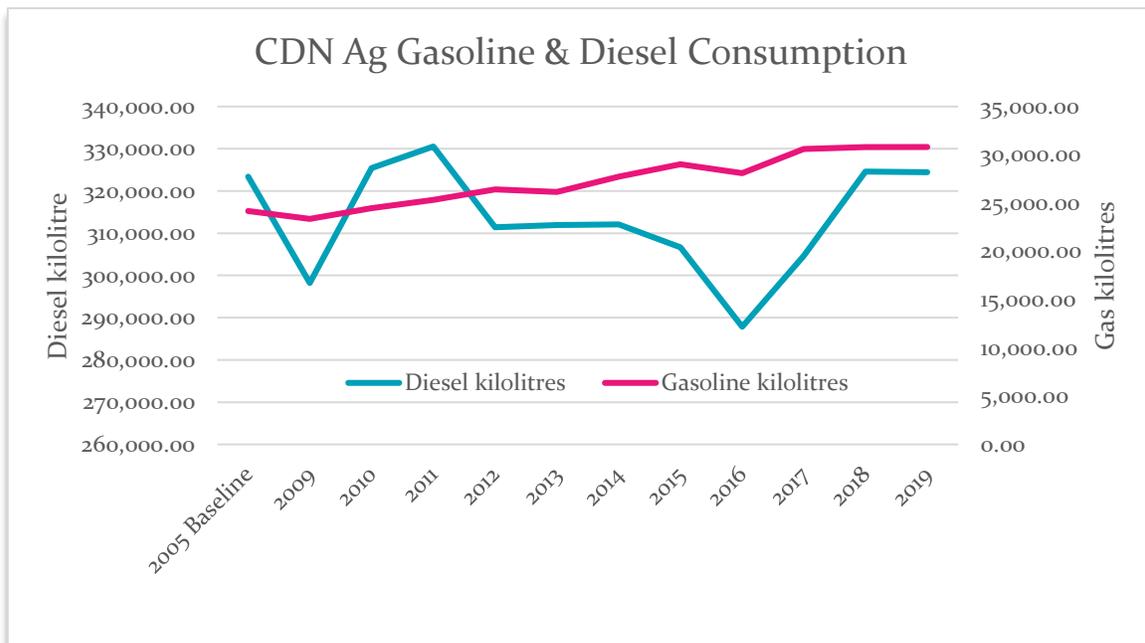


Figure 5 – Litre Consumption on Farm

This figure has the energy converted to litres.



On-Farm Fuel Intensity

A recent announcement by the canola industry targeted on-farm diesel use to drop by 18% per bushel produced.

This reduction target is in contrast to the Government's plan disregards any notion that any sector can use intensity metrics.

The figure below looks at this intensity metric as noted above. There are similar targets for beef and milk. The graphs below substitutes bushels for farm revenue.

Figure – 6 Farm Fuel Consumption and Revenue Achieved

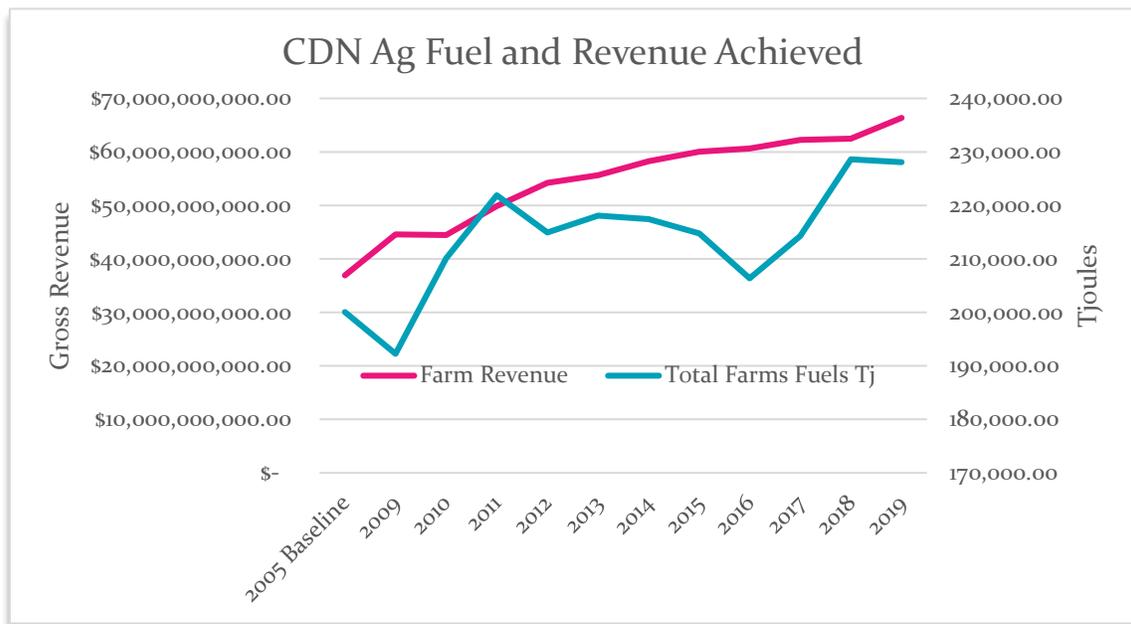
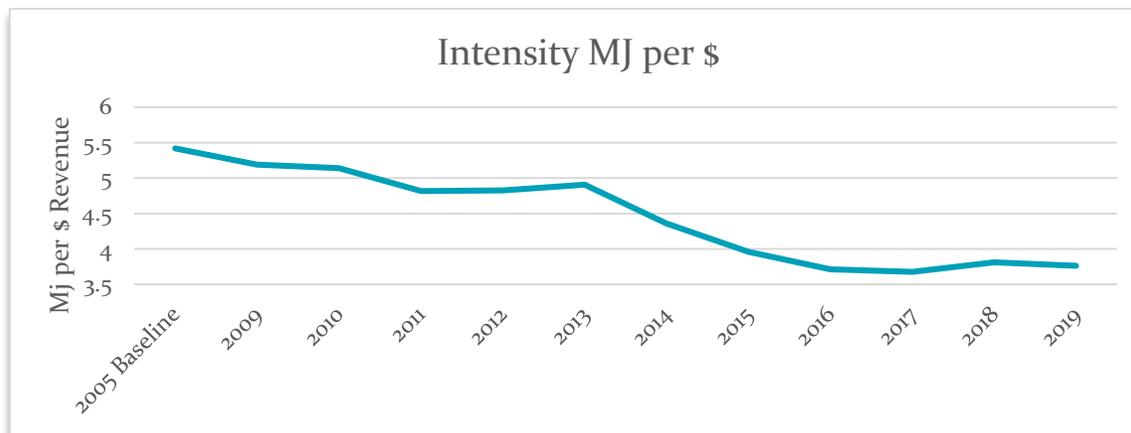


Figure – 7 Intensity Metric of Megajoules Used per Dollar of Revenue



Because the revenue growth is faster than the emissions growth, defending an intensity metric is more acceptable in the agricultural industry.

Policy Considerations

What technology transition is needed to bring absolute on-farm fuel use to at least 2005 levels and below?

- Total Fuel Use
- Stationary Fuel Use
- Off-Road Use

What are management transitions needed to bring absolute fuel use to at least 2005 levels and below?

What substitute is currently or near available to transition to with the same or better joule per GHG emission factor?

Does the farm sector provide sufficient data to inform the policy development process fully?

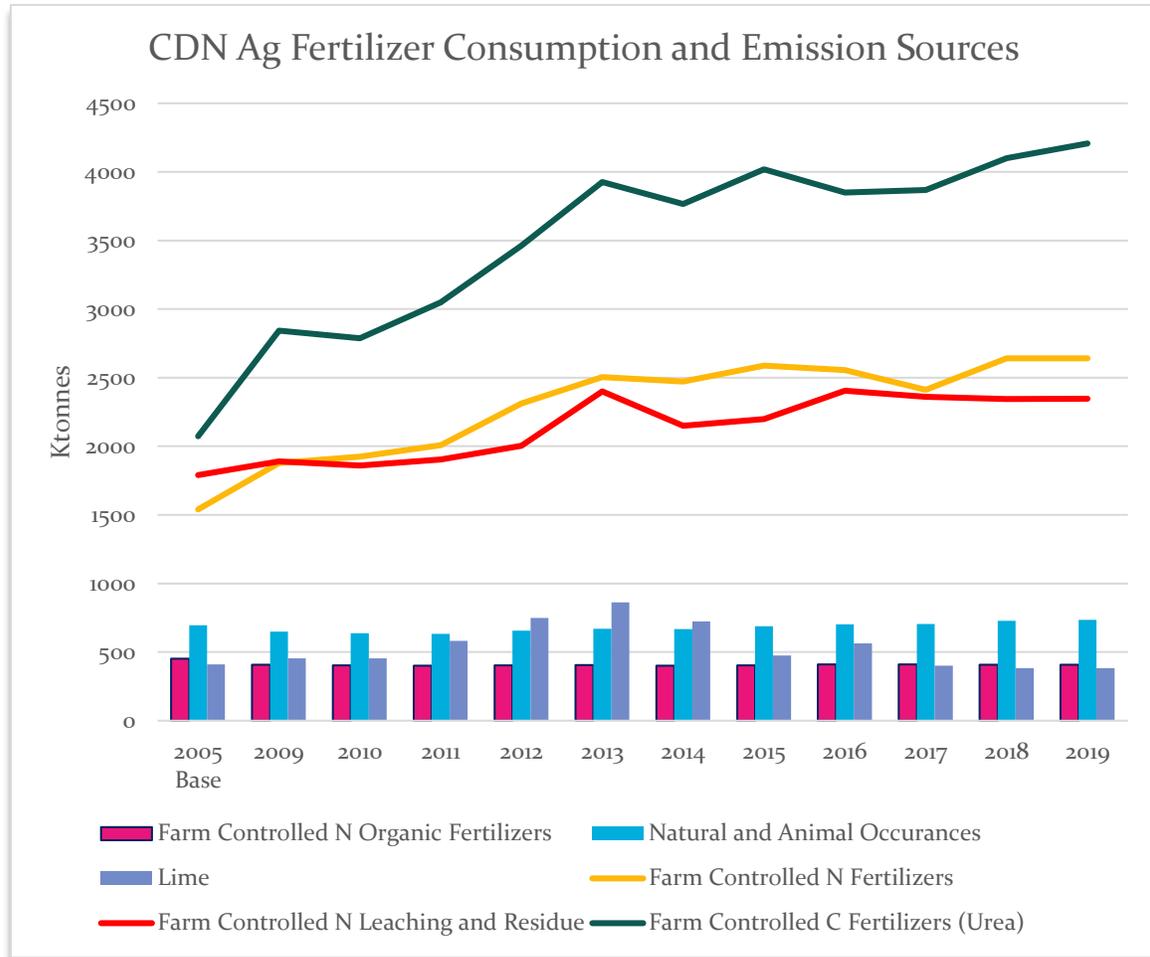


Early Fertilizer Application

Fertilizers, Lime, and Other Emission Sources

Canada has several background tables outlining fertilizer consumption. This data rolls up for Canada to build their IPCC report.

Figure 8 – On-Farm Emission Sources from Fertilizers and Other Sources



The most prominent issues are fertilizers and nutrient leaching.

Figure 9 – N₂O Sources

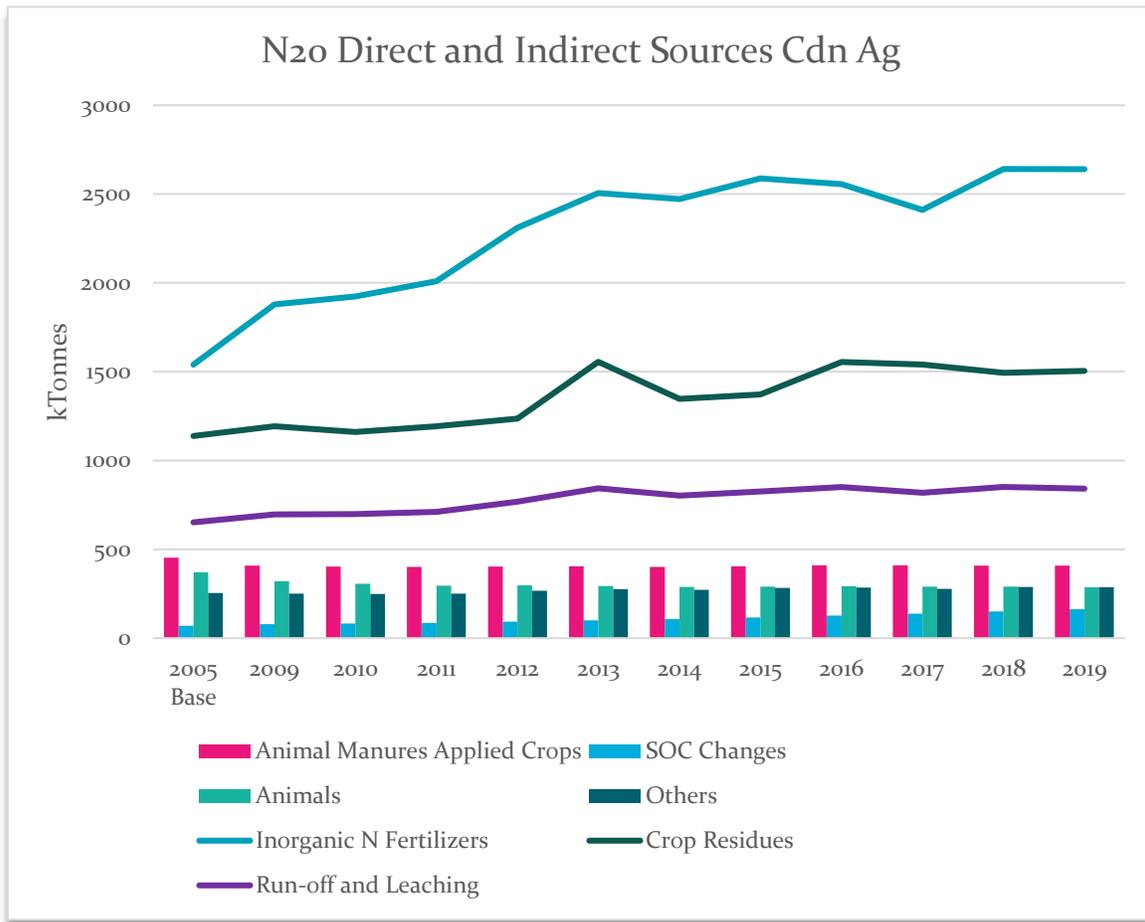
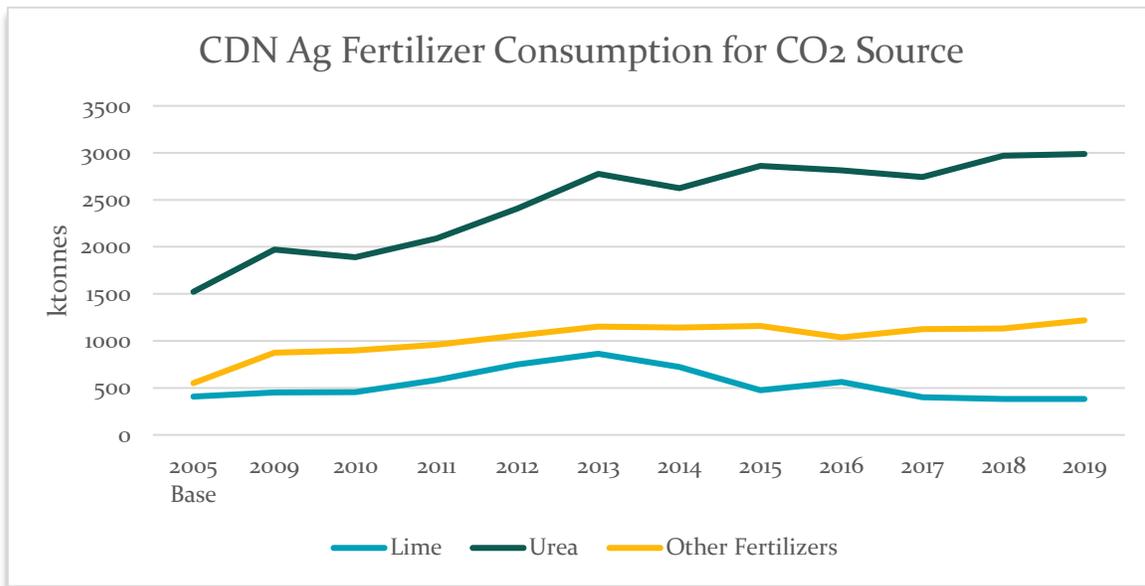


Figure 10 – CO₂ Sources



Policy Considerations

What is the technology needed to bring absolute emissions from on-farm fertilizer use to at least 2005 levels and below?

- Urea Use
- Non-urea Fertilizer Use

What is the management transition needed to bring absolute non-fertilizer emissions to at least 2005 levels and below?

- Leaching
- Crop Residue Emissions

What substitute is currently or near available to transition to with the same or better emission factor?

Does the farm sector provide sufficient data to inform the policy development process fully?

Fertilizer and Fuel Emission Reduction

Early in 2022, Agriculture and Agri-Food Canada published a discussion paper¹. It asked a series of questions about on-farm emission reductions.

The large question is this. Is the reduction approach better at a sector level or at the individual farm level?

As discussed in Part 1 of this paper series, a sector approach will need to accommodate and absorb changes in farmland in production. An on-farm approach is a more static approach until land leaves production.

The Table below quickly outlines some of the issues² to date.

Table 1 – AAFC Questions and Discussion and Policy Implications

AAFC Questions	Fertilizer	Fuels
AAFC Issue 1: Developing a Strategic Approach.		
<i>What are the biggest barriers to the adoption of practices that reduce emissions?</i>	Attitude and overlap with political discourse on emissions and levies applied.	Attitude and overlap with political discourse on emissions and levies applied.
<i>How can these best be overcome?</i>	Coated fertilizers are more costly. Equipment technology can not yet consistently deliver individual boot control. A consistent approach to soil fertility data at the farm level on soil carbon levels.	Poor substitutes. Auto-steer and other GPS-based technology is required across all field implements. Expand Real-Time Kinematic ³ (RTK) Network stations across Canada.

¹ <https://agriculture.canada.ca/en/about-our-department/transparency-and-corporate-reporting/public-opinion-research-and-consultations/share-ideas-fertilizer-emissions-reduction-target/discussion-document-reducing-emissions-arising-application-fertilizer-canadas-agriculture-sector>

² A collection of notes from an AAFC Townhall session and other data sources.

³ RTK is short for real time kinematics. A GPS receiver capable of RTK takes in the normal signals from the Global Navigation Satellite Systems along with a correction stream to achieve 1cm positional accuracy.

What steps can be taken to increase the adoption of practices or the use of new, enhanced efficiency fertilizer products that hold the potential to reduce emissions from fertilizer application?

In addition to existing programs, how can governments best work with industry and producers to mobilize increased adoption of emissions-reducing practices?

What are the appropriate roles for the agriculture sector, governments, and other partners and stakeholders in meeting this target?

As with other public purse transfers, care not to capitalize the cashflow.

Each type of fertilizer targeted for reduction will need a strategy.

Accurate baseline and benchmarks.

Canadian Agriculture needs similar data as collected and published by the USDA, including soil, photo telemetry, and other data collection.

With agriculture being an exempt polluter and only voluntary approaches are planned, **markets are the best approach.**

All funds distributed should be free of strings, traps, and disincentives. An example is the Government wanting ownership of reductions and offset potentials when a farm accepts program cash.

As with other public purse transfers, care not to capitalize the cashflow.

Each type of fuel and location used, targeted for reduction, will need a strategy.

Accurate baseline and benchmarks.

Canadian Agriculture needs accurate volume data collection.

With agriculture being an exempt polluter and only voluntary approaches are planned, **markets are the best approach.**

All funds distributed should be free of strings, traps, and disincentives. An example is the Government wanting ownership of reductions and offset potentials when a farm accepts program cash.

AAFC Issue 2: Data, Reporting, and Measurement

How can important data on the changes in emissions from fertilizer application be more consistently and comprehensively collected, analyzed, and reported?

All data tables used by ECCC need to use coefficients based on each fertilizer applied.

Revise all farm reports to Statistics Canada and revise supplemental data reporting through CRA.

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What would be the most effective way for Government and industry to work in partnership to collect and make public detailed fertilizer use and 4R-related data to understand better areas where there has been a success or opportunities for improvement?

4R is an industry sales program that has GHG benefits. Caution and care when bringing into policy a product promotion.

What considerations need to be taken into account to ensure better and more accurate reporting of farm-level data while minimizing the reporting burden at the individual farm level?

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**AAFC Issue 3:
Innovation and
Transformation
Opportunities**

What is the best way for governments and industry to support the emergence of new and innovative solutions to address climate goals, such as emissions reductions?

Revise and revisit all current investment tax policies.

Significant work is needed on the rules and infrastructure to support a robust carbon market.

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Are there opportunities not listed in this discussion document that you think should be considered as potential pathways for achieving the emissions reduction target for both 2030 and 2050?

Farm emission policy must penetrate provincial boundaries. Policy differentiation across borders does not support sector or industry approaches to reductions.

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Sources of Data:

Statistics Canada

Environment and Climate Change Canada

