Net Zero: Implications for Canadian Agriculture

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Smart Prosperity Institute

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About Smart Prosperity Institute

- National research network and policy think tank based at U. of Ottawa.
- Focus on **market-based policies for a stronger, cleaner economy**. Work closely with governments, industry and ENGOs.
- Four key components:
  - World-class **research network**: 150+ scholars across Canada and world
  - **Leaders initiative**: 30 business & civil society CEOs from all sectors, regions
  - **Policy research team**
  - **Communications team**
- Program line on clean growth in agriculture and agri-food, funded by AAFC. Presentation draws from SPI's forthcoming launch report.
- Advisory panel member on Farmers for Climate Solutions Expert Task Force.

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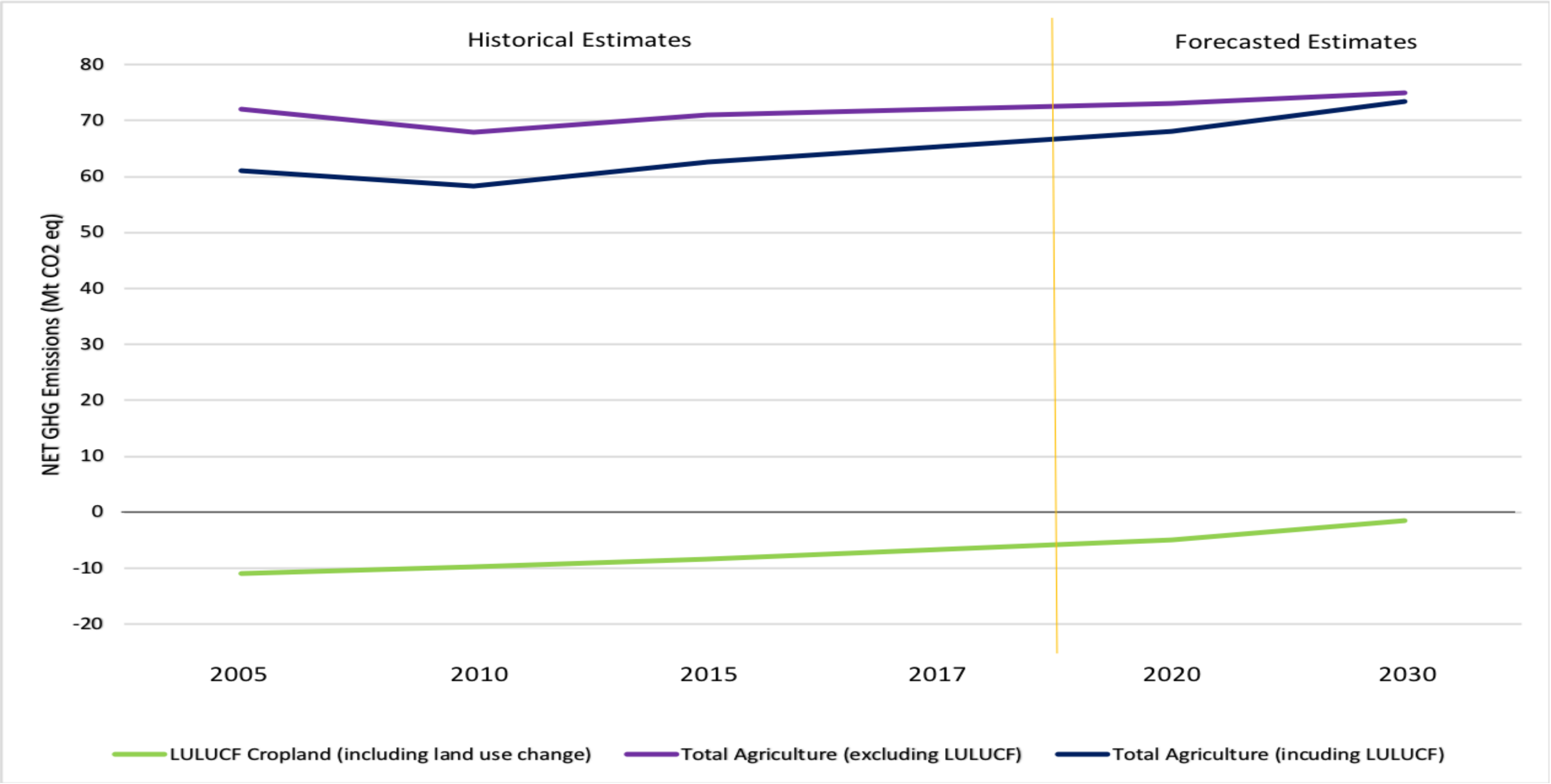
Key messages

- **Biological emissions matter**.
- Need for mitigation **and** sequestration.
- Stimulating broader technological and systems change:
  1. Stronger incentives for research, development and deployment
  2. De-risk promising tech and practices (BMP insurance, etc.)
  3. Enhancing carbon sinks on ag. land (payments, offsets)
  4. Use behavioral insights to promote adoption (producers) and change social norms (consumers)
  5. Leveraging supply chain initiatives (e.g. carbon neutrality/ sustainable sourcing)
  6. Technology-forcing regulations (improved fertilizers, hybrid/electric/renewable energy-powered farm equipment)?
- Need to actively partner with farmers on solutions.

Historical and forecasted emissions, 2005-2030 (ECCC, 2019)



Major challenges and opportunities (ECCC, 2020)

- **Nitrogen fertilizer use** (14 Mt in 2018 = 58% of total emissions from crop production, 19.2% of total ag. emissions).
- **Agricultural soils and other sinks** (8.8 Mt of sequestration in ag. soils in 2018, equivalent to 12.1% of total ag. emissions).
- **Beef and dairy livestock** (27.9 Mt in 2018 = 77.5% of total livestock emissions, 38.2% of total ag. emissions).
- On-farm fuel use (14 Mt in 2018 = 19.2% of total ag. emissions).
- Food loss and waste.

GHG abatement for nitrogen fertilizer

- **Improving timing, source, rate and placement provides major abatement opportunities:**
  - Potential to decrease N_2O emissions in ON corn by 42-57% (Banger *et al.*, 2020)
  - 15% (basic NERP) to 28% (advanced NERP) reduction in emissions per acre from canola, wheat, and barley in AB (Mussell *et al.*, 2015)
  - Slow-release fertilizers with N inhibitor can reduce N_2O emissions substantially (est. 30-40% across studies) (Kanter & Searchinger, 2018)
- **What's needed to get us there:**
  - Measures to de-risk new tech. and practices (BMP insurance, etc.)
  - Behavioral nudges (e.g. frames, defaults, simplification, time preferences)
  - Technology-forcing regulations (e.g. sales or 'blending' targets for controlled/slow release fertilizer, N inhibitors)?

Enhancing sequestration

- LULUCF Cropland (incl. land use change) sequestered 6.6 Mt of CO_2 eq in 2017 (ECCC, 2019).
- Equivalent to 9% of total Canadian ag. sector emissions.
- US Natural Climate Solutions (NCS) from agricultural soils and grasslands (Fargione et al., 2018):
  - 425 Mt/year peak sequestration potential
  - Equivalent to ~65% of US agriculture GHG emissions in 2018 (U.S. EPA undated)
  - 25% of emissions reductions from Ag. NCS are attainable at a cost of CAD 13/tonne; 76% are attainable at CAD 64/tonne
- Ongoing Canadian studies on Ag. NCS.

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Policies for enhancing sequestration

- **Natural Climate Solutions Fund (Department of Finance, 2020)**
  - $98.4 million over ten years to establish a new Natural Climate Solutions for Agriculture Fund (led by AAFC)
  - Up to $631 million over ten years to restore and enhance wetlands, peatlands, grasslands, and agricultural lands (led by ECCC)
  - Up to $3.16 billion over ten years for 2 billion trees program (led by NRCAN). Farmers eligible to participate.
- Emerging federal and provincial carbon offset protocols (massive opportunity for generating co-benefits for biodiversity).
- **Other potential opportunities**
  - Policies for protecting existing natural assets (e.g. reverse auction)
  - Policies for returning marginal cropland to permanent cover?

Abatement opportunities for beef and dairy

- **Improved genomics by selecting cattle for increased feed efficiency:**
  - Unit reduction in feed intake (kg fed/day) associated with a 33.46 tonne reduction in CH_4 (Boaitey et al., 2017)
  - Breeding practices decrease dairy CH_4 emissions by 11-26% (Schenkel et al., 2019)
- **Rotational Grazing**:
  - Canadian Prairie: 229-276 kg CO2 eq/ha/yr sequestration potential (Lynch et al., 2005)
  - Equivalent to 9.1-11% of CH4 emissions produced by one adult cow/year (Qualman, 2019)
  - US Great Plains: 260-1700 kg CO_2 eq/ha/yr (Derner & Schuman, 2007; Liebig et *al.*, 2010)
  - High end: equivalent to 67.5% of CH4 emissions produced by one adult cow/year (Qualman, 2019)

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Abatement opportunities for beef and dairy

- **Opportunities through feed modifications:**
  - Improved hay, 5% GHG intensity reduction in cow-calf production (Beauchemin et al., 2010)
  - 5-10% potential CH_4 emission decrease with corn/small grain silage vs. grass/hay silage (Beauchemin, 2019)
  - Enteric CH_4 emission reduced by fat supplementation (Haque, 2018)
  - 30% CH_4 emission reduction by nitrate and 3-Nitrooxypropanol (3NOP) supplementation (Jayasundra et al., 2016)

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Possible mitigation policies for beef and dairy

- Support for research, development, deployment at scale (genomics).
- Concessional finance (genomics, rotational grazing).
- Field demonstrations (genomics, rotational grazing, improved feeds).
- Cost-share or tax credit (genomics, rotational grazing, feeds).
- GHG offset markets (genomics, rotational grazing, feeds?).

Conclusions (1/2)

- Net zero will require a substantial rethinking of agri-environmental policy and sector growth strategies.
- 'Absolute zero' is not feasible or desirable – need for mitigation **and** sequestration.
- Targeting biological emissions is challenging, but not impossible.
- Current policies (e.g. cost-share) make an important contribution but are not sufficient.

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Conclusions (2/2)

- **Need to stimulate broader technological and systems change:**
  1. Stronger incentives for research, development and deployment (clean innovation)
  2. De-risk promising tech and practices (BMP insurance, etc.)
  3. Enhancing carbon sinks (payments, offsets)
  4. Use behavioral insights to promote adoption (producers) and change social norms (consumers)
  5. Leveraging supply chain initiatives (e.g. carbon neutrality/ sustainable sourcing)
  6. Technology-forcing regulations (improved fertilizers, hybrid/electric/renewable energy-powered farm equipment)?
- Work collaboratively with farmers to find solutions.

Thank you!

Questions? Comments?

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