Dairy Farming Forward to Net Zero 2050

Korb Whale, Clovermead Farms Inc.
June 1, 2022
The Evolution of Clovermead Farms

A Brief History
A Brief History

- Immigrated to Canada from Wiltshire County in England in 1845
- Claimed a forested 100 acre parcel of land adjacent to our current operation
The Long Walk....

- 120 km each way, twice every year, on foot!!
• Mixed farming
• 100 acre parcels
• Horses for field work
• Shipped some milk to local cheese factory
• Shipped cream on the train

The ORIGINAL Whale Farm in 1850
Grandfather’s farm in 1955
New state-of-the-art slatted floor dairy barn
New Tower silos

- Complete with a double 4 herringbone milking parlour
# Green House Gas Emissions at Clovermead Farms

<table>
<thead>
<tr>
<th></th>
<th>1850</th>
<th>1950</th>
<th>1975</th>
<th>2013</th>
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</thead>
<tbody>
<tr>
<td>Cows</td>
<td>10</td>
<td>28</td>
<td>65</td>
<td>150</td>
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<tr>
<td>Litres/cow</td>
<td>15</td>
<td>21</td>
<td>25</td>
<td>32</td>
</tr>
<tr>
<td>1000kg CO2</td>
<td>274</td>
<td>1073</td>
<td>2373</td>
<td>7008</td>
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</tbody>
</table>
Clovermead Farms over time

- **Cows**
- **Total Milk Tons**
- **Total Acres**
- **Total GHG's Tons**

Legend:
- 1850
- 1950
- 1975
- 2013
GHG Statistics for the Dairy Industry

- Globally, the livestock industry accounts for 18% of the anthropogenic GHG’s
- 4% is attributed to the dairy industry
- 0.7kg – 7.5kg of CO2 equivalent/ kg of FPCM
- Main sources of GHG’s on dairy farms are cows and manure storage
- The most important GHG’s are NO2, CH4, and CO2
- 1kg of NO2 is equivalent to 310kg CO2
- 1kg CH4 is equivalent to 21kg CO2
Milk Transport as a key process driver:
Ø Minimize Transportation Carbon-Wastes to fuels
Key Focus: “Greening” of Milk Products by reducing environmental footprint of Value Chain Activities
Why a sustainability strategy?

- Increasing demand from consumers
- Ambitious net-zero targets being set by Government of Canada, agri-food supply chains, national dairy organizations (GDP Pathways to Net Zero Initiative)
- Direction from farmers that this is a priority
Sustainability Working Group

- DFC 2021 Strategic Objective
  - The mandate of the Sustainability Working Group from its inception has been to support the development of a national environmental target for consideration by the DFC Board that is credible and meaningful to consumers

- Steps taken
  - Knowledge building
  - Materiality Assessment
  - Environmental target setting
Identifying priority areas

- **Materiality Assessment (June-Aug. 2021, by ISOS Group):** Analysis to identify priority areas for the industry, using:
  - International sustainability frameworks
  - DFC research, Life Cycle Assessment, and other publications
  - Previous consumer and stakeholder surveys

- **New Consumer Survey (Sept. 2021, by Nanos Research):** Survey of 1,000 Canadians to confirm priority areas for consumers
Priority matrix

Importance to industry (Materiality Assessment)

Importance to consumers (Consumer Survey)

GHG emissions

- Biodiversity
- Waste
- Soil health and land use
- Water use and quality
- Energy use and efficiency
- Air quality

Manure/nutrient management (not assessed with consumers)

85% of Canadians say it is “important” or “somewhat important” that Canada’s dairy farms meet the target of net zero emissions by 2050 (up from 71% in Oct. 2020)
Setting targets

- Review materiality assessment
- Consumer feedback review
- Scan BMPs and mitigation pathways
- Farmer workshops
- Assessment of BMPs
- Environmental targets
Proposed targets

Net-Zero by 2050
- Greenhouse Gas Emissions

Regenerative agriculture targets
- Soil and land
- Water
- Biodiversity
- Waste
- Energy
GHG Targets – Public-Sector

- **Ambitious** Net-Zero Targets being set by:
  - Public-sector: Canada, Guelph, Vancouver, Hamilton, Toronto, Halifax, Newfoundland and Labrador, Quebec, Prince Edward Island (2040), Nova Scotia and British Columbia
  
- Government of Canada: Net Zero by 2050
  - Canadian Net-Zero Emissions Accountability Act
  - 2030 target: 40-45% below 2005 levels (increased from 30% reduction – exceeding expectations)
  - $165.7M Agricultural Clean Technology Program
  - $4B Natural Climate Solutions Fund: $185M – Agricultural Climate Solutions; $631M – Nature Smart Climate Solutions; $3.19B for 2 Billion Trees Commitment
GHG Targets – Private-Sector

- **Ambitious** Net-Zero Targets being set by:
  - Private-sector: especially major corporations in agri-food supply chains, e.g. McDonalds, Walmart, Nestle, Mars
  - Corporate Drivers: Science-Based Targets Initiative
    - New Corporate Net-Zero Standard – covers all value chain emissions
    - Net-zero by 2050 with interim targets (e.g. 2030) – means 90-95% decarbonisation for most corporates by 2050 (~50% by 2030)
Quantifying Emission Reductions

Example:

Diet Improvement
Reduction of 0.08 tCO₂ eq / t milk
Improve adoption by 5%
Market Pathways
Reduction of 38,000 tCO₂ eq

Total Milk Production
10.3 million t FPCM / year
Total Emissions across sector 9.7 million tCO₂ eq / year
* Based on 2016 LCA
Net Zero Scenario Estimate

<table>
<thead>
<tr>
<th>Best Management Practices</th>
<th>Percent Adoption</th>
<th>Emissions Reduction [tCO2e/yr]</th>
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<tbody>
<tr>
<td>Herd genetics</td>
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<tr>
<td>Herd Optimization (high yielding selection)</td>
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<td>Production change (tie stall to free stall)</td>
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<tr>
<td>Dietary improvements and substitutes - Ambitious</td>
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<tr>
<td>Grazing isolating cows</td>
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<tr>
<td>Improving feed efficiency</td>
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<td>Feed supplements</td>
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<tr>
<td>Methane inhibitors</td>
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<td>Methane inhibitors - Ambitious</td>
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<tr>
<td>Anaerobic Digestion</td>
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<td>Anaerobic Digestion - Ambitious</td>
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<td>Manure solidification</td>
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<td>Manure incorporation</td>
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<td>Manure separation</td>
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<td>Manure separation &amp; composting solids</td>
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<td>Dealing or covering manure storage pits</td>
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<tr>
<td>Conversion to pastureland</td>
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<td>Cover Cropping</td>
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<td>No Till</td>
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<tr>
<td>Optimized rotation</td>
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<tr>
<td>Conversion from Ammonia to urea fertilizer</td>
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<td>Fats reduction</td>
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<td>Use of enhanced efficiency fertilizers</td>
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<tr>
<td>Use of enhanced efficiency fertilizers - Ambitious</td>
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<tr>
<td>Energy Efficiency</td>
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<tr>
<td>Plastic burning avoidance</td>
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<tr>
<td>Preserving and restoring natural systems</td>
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<td>Renewable Energy</td>
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Target Timeframe
- 2030-2050
- Up to 2030

0  20  40  60  80  100
0  500,000  1,000,000
Reaching Net Zero

• There may be a portion of emissions (residuals) that cannot be eliminated within the sector:
  • Feed production, energy use, enteric methane

• Some of these may be offset by removals, such as from:
  • Pasture management: Science is developing
  • Tree-planting
  • Avoided conversion of existing natural sinks

• The rest may need to be ‘offset’:
  • Through the purchase of carbon offsets in carbon markets
  • Through emission reductions elsewhere in the value chain
Farms implementing key practices
Regenerative agriculture - Qualitative targets

- Based on priority areas for industry and consumers, and which support GHG reduction target

- Difficult to quantify so will focus on adoption of BMPs – targets will be based on current rates of implementation and adoption needed to reach GHG reduction target

- Will recognize current practices farmers are implementing and encourage increased adoption of beneficial practices
Identified Priority Categories

Soil and land
(e.g., minimum tillage, riparian zones, cover crops, crop rotation)

Energy
(e.g., renewable energy, energy efficiency)

Water
(e.g., irrigation, for animals, for cleaning)

Waste
(e.g., plastics)

Biodiversity
(e.g., wetland restoration, wildlife habitat)
Pathways to improve regenerative agriculture: Net-Zero Key Performance Indicators

<table>
<thead>
<tr>
<th>Pathway</th>
<th>BMP</th>
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<tr>
<td><strong>Herd management</strong></td>
<td>- Herd genetics</td>
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<td>- Herd health optimization</td>
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<td><strong>Feed management</strong></td>
<td>- Improving feed efficiency</td>
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<td></td>
<td>- Improving forage diet quality</td>
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<td></td>
<td>- Animal dietary changes</td>
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<td>- Rotational grazing</td>
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<td><strong>Manure management</strong></td>
<td>- Optimized manure collection</td>
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<td>- Reduction in manure storage duration</td>
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<td></td>
<td>- Manure separation and composting</td>
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<td></td>
<td>- Sealing or covering manure storage</td>
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<td></td>
<td>- Optimized manure application</td>
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<tr>
<td><strong>Crop management</strong></td>
<td>- Cover cropping</td>
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<td></td>
<td>- Minimizing tillage</td>
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<tr>
<td></td>
<td>- Optimized crop rotation</td>
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<td></td>
<td>- Conversion to perennials</td>
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<tr>
<td><strong>Fertilizer management</strong></td>
<td>- Nitrogen use efficiency</td>
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<tr>
<td></td>
<td>- Optimized application of fertilizers</td>
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<td></td>
<td>- Rate reduction</td>
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<tr>
<td></td>
<td>- Use of enhanced efficiency fertilizers</td>
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<td>- Conversion from ammonia to urea fertilizer</td>
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<td><strong>Energy management</strong></td>
<td>- Energy efficiency</td>
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<td></td>
<td>- Anaerobic digestion</td>
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<td></td>
<td>- Solar, wind and other renewable energy</td>
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<tr>
<td><strong>Land management</strong></td>
<td>- Plastic management</td>
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<td></td>
<td>- Enhancing natural systems</td>
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**Net-Zero by 2050**
- LCA: Carbon Footprint per litre of milk
- National Inventory Report: GHG emissions

**Regenerative Agriculture**
- Includes soil, land, and water

**Biodiversity**
- LCA: Biodiversity Assessment
- Env. Questionnaire: % adoption

**Energy**
- LCA: contribution to Carbon Footprint
- Env. Questionnaire: % adoption

**Plastic Waste**
- Env. Questionnaire: % adoption
Where do we go from here?
Where do we go from here?

- Adopt a national tool to measure Actual GHG on farm
- Opportunities for collaboration with processors, government and NGOs to fund training, implementation, and pilot projects
- Farmer Advisory Group
- Establish a national farmer friendly data system in order to aggregate the data from our efforts, to share the data with our partners and governments and to encourage investment in agriculture
Key Players

**Dairy Farmers of Canada**
Lead strategy by developing initiatives to support progress on farm with partners across the industry.

**Provincial Dairy Organizations**
Provide input and support the strategic direction through the Sustainability Working Group, and on communications through IMWG.

**Environmental NGO and Corporate Partners**
Provide programming and/or funding to support initiatives. Corporate partners rely on the data we collect to reach their own environmental goals and communicate with consumers.

**Consumers**
Expect to see progress in order to feel confident about consuming dairy.

**Farmers**
Provide input through the Farmer Sustainability Advisory Group and implement practices on their farm.

**Government**
Develop regulatory frameworks and make funding available to facilitate on-farm initiatives.
By Reducing our Environmental Footprint, As Farmers we:

- Reduce our input costs
- Reuse our waste streams
- Diversify our revenue stream
- Provide our customers with a sustainably produced food
- Encourage the next generation to farm
How can industry partners help?

- Provide accurate data to verify on-farm practices
- Encourage research that helps find solutions to achieve our net zero target
- Use on farm resources to encourage BMP uptake and Knowledge Transfer
- Develop tools to simplify data collection and accuracy for farmers
- Encourage genetic selection to decrease GHG’s per kg of milk produced
- Help develop a complete and accurate model of actual impact of animal agriculture on the environment that is cognisant of the CH4 cycle, biodiversity, nutrients and soil health and water quality
We can do this....

..and you can help!