Assessing the Sustainability of the Canadian Beef Industry

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Sustainability Assessment

Farm to fork analysis, key performance indicators and strategy to advance continuous improvement in the Canadian beef sector

Verification Framework

Verification framework to assess the sustainability of individual operations along the beef value chain

Projects

Projects guided by the Sustainability Strategy to strategically advance sustainability within the Canadian beef sector
Sustainability Assessment

There were three main sections to the National Beef Sustainability Assessment

**Environmental Assessment**
Assessed climate change, fossil fuel use, water use and air and land pollution potentials through the E-LCA and biodiversity, carbon soil sequestration, water use and water risk through the land use assessment

**Social Assessment**
Assessed the practices and processes that promote the well being of stakeholders including, workers, local communities as well as animals

**Economic Assessment**
Assessed: long-term profitability, long term cost of production, domestic consumer demand international consumer demand
Thank-You!
A sincere thank-you to everyone who contributed to the success of this project.

<table>
<thead>
<tr>
<th>Steering Committee</th>
<th>Research Teams</th>
<th>Producers &amp; Processors</th>
<th>External Experts</th>
<th>CRSB Stakeholders</th>
</tr>
</thead>
<tbody>
<tr>
<td>The steering committee consisted of CRSB members and observers, industry experts and scientific advisors.</td>
<td>Canfax and Deloitte researchers with expertise spanning across social, environmental and economic sustainability topics.</td>
<td>Surveys were filled out by producers and packers. We estimate this involved the contribution of well over 120 individuals.</td>
<td>8 external reviewers and 8 industry experts contributed their expertise.</td>
<td>CRSB membership and observers contributed to the development of strategy through priority setting and identification of KPIs.</td>
</tr>
<tr>
<td>12</td>
<td>18</td>
<td>120</td>
<td>16</td>
<td>75</td>
</tr>
</tbody>
</table>
Multiple review and consultation processes
Professionals and experts engaged throughout

Multi-stakeholder process
Multiple review and consultation processes
Professionals and experts engaged throughout

Multiple sources of information
Top-down, bottom-up iterative approach
National statistics provided a base with more details from surveys and literature review
Environmental Assessment

E-LCA
- Climate change
- Fossil fuel use
- Water use & pollution potential
- Air pollution
Followed ISO and LEAP guidelines

Land-Use Assessment
- Biodiversity
- Soil carbon sequestration
- Water use and risk
<table>
<thead>
<tr>
<th>Category</th>
<th>Number of Head</th>
</tr>
</thead>
<tbody>
<tr>
<td>Cow-calf</td>
<td>63,291 head</td>
</tr>
<tr>
<td>Backgrounding</td>
<td>26,887 head</td>
</tr>
<tr>
<td>Yearlings</td>
<td>14,703 head</td>
</tr>
<tr>
<td>Finishing</td>
<td>150,084 head</td>
</tr>
<tr>
<td>Replacements</td>
<td>9,056 head</td>
</tr>
</tbody>
</table>

**77 Farms Surveyed with 266,600 head**
Functional Unit

kilogram of live weight
refers to just the farming stage of the life cycle; and

kilogram of packed boneless beef
(delivered and consumed)
includes all stages in the life cycle, from farming to consumption

Environmental life cycle stages

FARMING  TRANSPORTATION between farms and packers  PACKING  SECONDARY PROCESSING  RETAIL  CONSUMPTION
Results  Climate Change

11.4 kg CO₂ eq./kg live weight at farm gate; OR 30.8 kg CO₂ eq./kg of packed boneless beef, which is then delivered and consumed.

- Canada’s emission intensity is less than half of the world average.
- It is estimated that if all livestock producers achieved the production efficiency of the top 10-25% of producers, total emissions could be reduced by 18-30% (FAO, 2013).

What can producers do?
- Optimize diets
- Manure management that reduces N₂O from storage and application
- Improve feed production – avoid N leaching and efficient fossil fuel use
Results Water

631 L of blue water/kg of packed boneless beef OR 235 L/kg LW

What can producers do?
• Support and adopt innovation that improves water use efficiency in irrigation (80%)
• Improve feed yields/productivity and drought resistance that reduce the blue water footprint for feed
• Support innovation that improves water use efficiency within the processing and packing sectors.
# Results Water

Gross blue water footprint Values (Indicative reference points, as not directly comparable)

<table>
<thead>
<tr>
<th></th>
<th>Farm’s gate (liters/kg of live weight)</th>
<th>Packers’ stage (liters/kg hot carcass)</th>
<th>Packer’s gate (liters/kg bone-free meat)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Canada, National Beef sustainability assessment (CRSB, 2016)</td>
<td>235</td>
<td>382</td>
<td>508</td>
</tr>
<tr>
<td>United States (Capper, 2011)</td>
<td>1,100</td>
<td>1,763</td>
<td></td>
</tr>
<tr>
<td>Southern Australia (Ridoutt et al., 2011)</td>
<td>16-1,067</td>
<td></td>
<td></td>
</tr>
<tr>
<td>USA (Rotz et al, 2013)</td>
<td>2,790</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th></th>
<th>Packer’s gate (liters/kg bone-free meat)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Global (Water Footprint Network, 2015)</td>
<td>550</td>
</tr>
<tr>
<td>USA (Water Footprint Network, 2015)</td>
<td>525</td>
</tr>
</tbody>
</table>

An estimated 54,000 hectares of land in BC, AB and SK are irrigated for beef feed. Blue water required for irrigation of feed is estimated at ~276 million cubic meters, accounting for about 16% of total water volumes required for irrigation in Canada.
Results

Water pollution potential

Freshwater eutrophication 5.8 g P eq./kg live weight at farm gate; OR 15.3 g P eq./kg of packed boneless beef, which is then delivered and consumed

Marine eutrophication 75.8 g N eq./kg live weight at farm gate; OR 197.6 g P eq./kg of packed boneless beef, which is then delivered and consumed

RISK is during feed production: Fertilizer
Canada’s 4R Nutrient Stewardship program, which promotes Right Source, Right Rate, Right Time, Right Place
Results Food Waste

Food waste costs Canada’s economy $31-107 billion annually. Carbon pollution from organic material in landfills accounts for about 4% of the national total (Environment Canada) and food waste accounts for more than half of all organic disposed.

The Zero Waste: National Zero Waste Council reports that 47% of food waste occurs with the consumer, 20% at processing, 10% at retail stores, 10% on farm, 9% in restaurants and hotels, 4% during transportation and 1% international catering.
Results Food Waste

Reducing Food Waste by 50% could:

1. Avoid the release of 1.6 Mt CO$_2$ eq per year
2. Save up to 31 billion litres of water

The National Zero Waste Council has recommended a national target of reducing food waste by 50% by 2030.

What can industry do?
- Encourage efforts to reduce food waste at the consumer level
- Promote improved product packaging
- Improve carcass quality and utilization (↓YG3)
Methodology Land Use

Land use was calculated using feed rations, average yields for feed stuffs by province to estimate acreage. Tremendous diversity in rations depending on location, production system, type of animal.

Figure 3-3 Detailed average rations used in this analysis (dry matter intake %)
Results Land Use

It takes between 37 square metres (m²) and 93 m² of land to produce one kg of live weight in Canada. Beef cattle production is currently using approximately one third of agricultural land.

There are 160 million acres of farmland in Canada, 2011 (-4%)

- Natural Pasture 22.7%
- Tame or Seeded Pasture 8.5%
- Cultivated 57.8%
- Other 11.0%

2016 Census of Agriculture: Forage is the largest crop with 14 million acres, 15% of total cropland acres. Hay and alfalfa acres declined 16.6% or 2.8 million acres; while pastureland decreased 4.4% or 2.2 million acres for a combined reduction of 5 million acres. As the largest user of pasture and forage land is the beef cattle industry, consolidation of the herd has meant fewer acres are needed.
The Importance of Sustainable Grazing practices on Native and Unimproved pasturelands

Currently less than 20% (30 million acres) of Canada’s grasslands remain intact. Grasslands are considered an endangered ecosystem.

The key concern for biodiversity is further losses of native prairie grasslands. The disappearance of grasslands has led to an overall loss of 44% of the populations of grassland species since the 1970s, with individual species showing declined of up to 87%.

From 1981 to 2001, Canada’s agricultural land lost 5% of its capacity to sustain biodiversity, mostly as a result of intensification in Eastern Canada. While 31% of farmland is pasture in the West; only 9% of farmland is pasture in the East. The decline came from reduced species richness and suitable habitat for terrestrial wildlife.

Native rangelands and unimproved pasture provide the highest capacity to sustain biodiversity in agricultural areas.

Conservation of grassland species largely depends on sustainable cattle grazing practices.
Biodiversity is a complex issue

Beef production appears to contribute disproportionately to the land footprint; by using almost 3 orders of magnitude more land than other meat production systems. But beef cattle also play a valuable role in maintaining or improving the health of native and time perennial rangeland and thus can improve ecological services and wildlife habitat.

Overview of the pressures (brown) or benefits (green) that livestock have on biodiversity. Adapted from LEAP, 2015
Wildlife Habitat Capacity of Farmland Indicator (WHAFI) developed by AAFC

What is within the beef producer control? You cannot control species abundance, but you can provide a suitable habitat for when they arrive.

Habitat Suitability model – combines species geographical ranges, habitat preferences and environmental data to ID unsuitable habitat within a species range.

587 species of wild terrestrial vertebrates in Canada in four different taxonomic groups (137 mammals, 370 birds, 42 amphibians and 38 reptiles)

Each 30m grid of agricultural land cover was classified for each species as:

- **primary habitat** without this habitat the species cannot use the area
- **secondary habitat** species will use several habitat types for the same purpose
- **tertiary habitat** habitat not required, but species occasionally observed in it
- or **unsuitable habitat**

A habitat capacity matrix was then constructed for each terrestrial vertebrate species known to use agricultural land and adjacent habitats in Canada for one or more specific habitat requirements (breeding, feeding, loafing, cover, staging and wintering).
WHAFI customized for beef industry

The WHAFI has mainly been applied to assess the impact of relative changes in land cover types on the wildlife habitat capacity of agricultural land in Canada at the SLC polygon level. In order to better reflect the impact of beef cattle production at a broader scale, Deloitte customized the WHAFI for agricultural land at the provincial level. The approach followed for the development of the index was as following:

- The average **habitat use values for breeding and feeding (Matrix Combined Values, MCVs)** of each land cover at the SLC polygon level were obtained.
- The average MCV of each land cover in each ecozone was then derived, since there was little variability among these values.
- These average **MCVs represent habitat capacity intensity values (capacity to provide habitat to various species per unit of surface)** calculated through the WHAFI methodology.
Habitat use values highlight the importance of grasslands

Results are conservative as wetlands in pastures are excluded

Matrix combined values (MCV) per land cover and ecozone
Results Biodiversity

Figure 4
Habitat capacity index values for land used for beef cattle production and other agricultural areas.

- 33% or **52.2 Ma**
- 67% or **107.2 Ma**

- 68% or **414**
- 32% or **196**
### Method Carbon Sequestration

**Average Stock of Carbon per land use type**

<table>
<thead>
<tr>
<th>Carbon stock per ha per land use per province</th>
<th>Average</th>
<th>Cropland</th>
<th>Improved</th>
<th>Unimproved</th>
</tr>
</thead>
<tbody>
<tr>
<td>Cropland</td>
<td></td>
<td>75.9</td>
<td>71.2</td>
<td>74.5</td>
</tr>
<tr>
<td>Improved pasture</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Unimproved pasture</td>
<td></td>
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</tbody>
</table>
Results Stock of Carbon (up to 30cm depth)

Approximately 1.5 billion tonnes of carbon are currently stored in the lands used by beef producers thanks to soil carbon sequestration.

Land for beef cattle feed represents about 32% of total Canadian stocks of Carbon - 964 million tonnes in natural land for pasture; and 589 million tonnes in cropland, tame pasture, hay, and other land.
Land management practices, such as reduced tillage, can offset some of the emissions of beef production. When offsets are taken into consideration, the net GHG footprint of beef production is estimated to decrease by 8% to 10.5 kg CO\textsubscript{2} eq./kg live weight.
Social Assessment

- Working Conditions
- Animal Welfare
- Antimicrobials
Results Social Assessment
Areas where industry is performing well

**Health & Safety**
Training and policies in place to ensure health and safety within the workforce

**Animal Care**
Sickness and disease prevention, health assessment, handling practices, housing and feeding, transport

**Working Conditions**
Scope of benefits, overtime, unionization, work load

**Socio-Economic Commitment**
Commitment to sustainability issues (water, biodiversity), local community support, odor reduction, responsible procurement
Results Social Assessment

Four higher risks were identified across the value chain

What can industry do?
- Promote farm safety awareness and best practice implementation
- Support dialogues regarding safety from upstream value chain actors, rights of migrant workers, and adequacy of median income for downstream value chain actors
- Promote diversity, inclusion and transparency within the beef supply chain
## Results: Animal Care

<table>
<thead>
<tr>
<th>Rating Level</th>
<th>Life Cycle Stage</th>
<th>Indicator</th>
</tr>
</thead>
<tbody>
<tr>
<td>Very low risk</td>
<td>Packers</td>
<td>- Animal harvest method</td>
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<tr>
<td></td>
<td></td>
<td>- Animal stunning method</td>
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<td></td>
<td></td>
<td>- Animal welfare audit</td>
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<td></td>
<td></td>
<td>- Technology and Infrastructure to support animal welfare</td>
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<td></td>
<td></td>
<td>- Internal communication of animal welfare regulations</td>
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<tr>
<td></td>
<td></td>
<td>- Transporters’ certification</td>
</tr>
<tr>
<td>Farmers</td>
<td></td>
<td>- Health prevention</td>
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<tr>
<td></td>
<td></td>
<td>- Health assessment</td>
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<tr>
<td></td>
<td></td>
<td>- Housing and feeding</td>
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<td></td>
<td></td>
<td>- Euthanasia method</td>
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<td></td>
<td></td>
<td>- Handling injuries</td>
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<tr>
<td></td>
<td></td>
<td>- Handling training</td>
</tr>
<tr>
<td></td>
<td></td>
<td>- Breeding injuries</td>
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<tr>
<td></td>
<td></td>
<td>- Transport certification</td>
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<tr>
<td></td>
<td></td>
<td>- Calving assistance</td>
</tr>
<tr>
<td>Associations</td>
<td></td>
<td>- Animal welfare promotion</td>
</tr>
<tr>
<td>Low risk</td>
<td>Farmers</td>
<td>- Housing condition</td>
</tr>
<tr>
<td></td>
<td></td>
<td>- Castration</td>
</tr>
<tr>
<td></td>
<td></td>
<td>- Weaning conditions</td>
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<tr>
<td></td>
<td></td>
<td>- Disbudding and dehorning pain control</td>
</tr>
<tr>
<td></td>
<td></td>
<td>- Handling issues</td>
</tr>
<tr>
<td></td>
<td></td>
<td>- Code of Practice awareness and implementation</td>
</tr>
<tr>
<td>Moderate Risk</td>
<td>Farmers</td>
<td>- Branding pain control</td>
</tr>
<tr>
<td>High Risk</td>
<td>None</td>
<td>- None</td>
</tr>
</tbody>
</table>
ECONOMIC SUSTAINABILITY

Is the ability of a system to maintain productivity in the face of a major disturbance, as well as slow shifts in consumer preferences.
Declining Terms of Trade
Commodities tend to experience declining terms of trade. Declining terms of trade is when the price received for outputs declines relative to prices paid for inputs. This happens when productivity improvements result in supply increasing faster than demand, leading to declining deflated commodity prices.

Profitability
The entire beef supply chain (cow-calf, feedlot and packer) is rarely profitable all at the same time.

Cattle Cycle
The Canadian beef industry typically follows a 10-12 year cattle cycle from peak to peak or trough to trough. The cattle cycle is driven by the biological lag from when the producer receives the price signal to expand and when additional beef production is available to the consumer.
Economic Assessment Framework

Four indicators were chosen to benchmark the economic sustainability of the Canadian Beef industry:

- Producer Viability
  - Long Term Profitability
  - Long Term Cost of Production

- Consumer Resilience
  - Domestic Consumer Demand
  - International Consumer Demand
1. Returns meet or exceed cost of capital
2. Fund all current operating expenses and operational capital through internally generated working capital
3. Pay labour/owners, at least to the standard of the average wage
4. Have capacity to re-pay debt principle in a timely manner
5. Maintain a safe level of equity (e.g. 85%)
6. Provide for the independent retirement of the existing owners
7. Be able to survive business succession with the business and the family remaining intact
8. Survive and prosper in the long term without the erosion of environmental capital (over stocking)
Consumer Resilience Results

- Domestic Retail Demand
- International Demand

**Domestic Index 2000=100**

**International Index 2000=100**

**Demand** is a consumer’s willingness to pay for a specific quantity and quality of product.

**Trends** are the result of fundamental changes in technology, society and the economy that play out over years or even generations.

**Fads** are driven by changes in current consumer inclinations; they come and go.
Consumer Resilience Considerations

Long Term Trends
- Population growth
- Growing middle class with disposable income
- Consumer Demographics
  - Ethnic Diversity
  - Age Structure (baby boomers, millennials)

Medium Term Perceptions
- Food Safety
- Beef Quality
- Health Information
- Environmental Impact
- Animal Welfare

Short Term Market Impacts
- Price
- Competing Meat Prices
- Switching between proteins and cuts
Producers contribution to supporting beef demand

Today’s quality driven consumers seem willing to pay more for beef as long as the eating experience justifies the price” Daryl Tatum, Colorado State University

Canadian AAA + Prime as a % of all A Grades

Source: CBGA
Continuous Improvement

Do not expect profitability to continuously improve. But we do need to see producers and marketers adapting to changing market environment and consumer preferences.

**Quality**
- Recognizing and Responding to Trends
- Produce more of what consumers want (attributes) and less of what they don’t want

**Productivity**
- Pounds weaner per cow exposed
  - +1.87 lbs/year (98-13)
- Feed efficiency 10:1 in 1950 to 6:1 in 2010
- Carcass weights up 7 lbs/year
- Fewer cows needed today to produce more pounds of beef

**Marketing**
- Differentiating quality (grid, formula, rail vs. live)
- Traceability of specific attributes
- Price discovery & transparency
- Risk management
- Product development
Thank you!
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