Assessing the Sustainability of the Canadian Beef Industry

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Sustainability Assessment

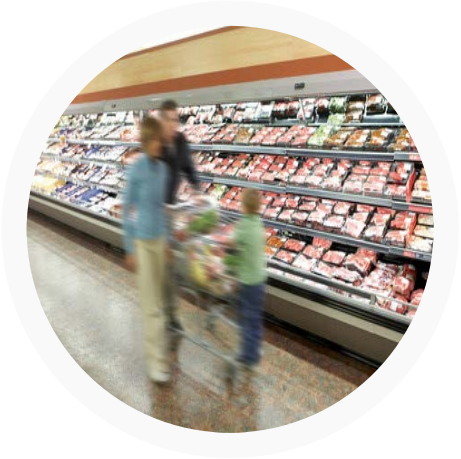
There were three main sections to the National Beef Sustainability Assessment

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

Process

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

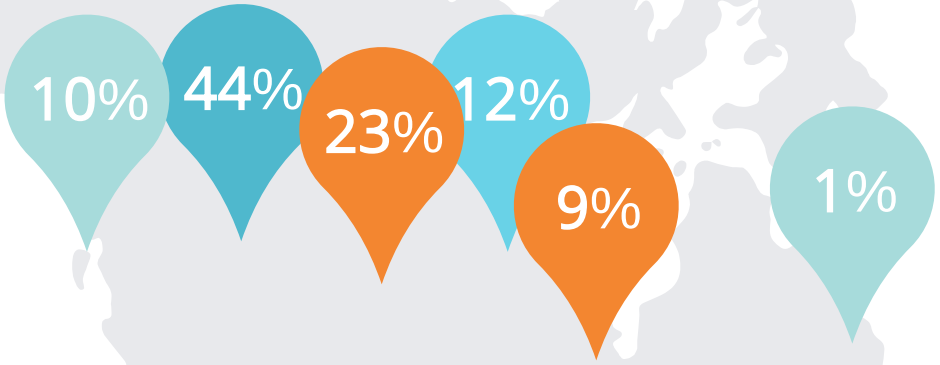
Followed ISO and LEAP guidelines

Land-Use Assessment

- Biodiversity
- Soil carbon sequestration
- Water use and risk

77 Farms Surveyed with 266,600 head

Cow-calf	63,291 head
Backgrounding	26,887 head
Yearlings	14,703 head
Finishing	150,084 head
Replacements	9,056 head



Functional Unit

kilogram of live weight

refers to just the **farming stage** of the life cycle; and

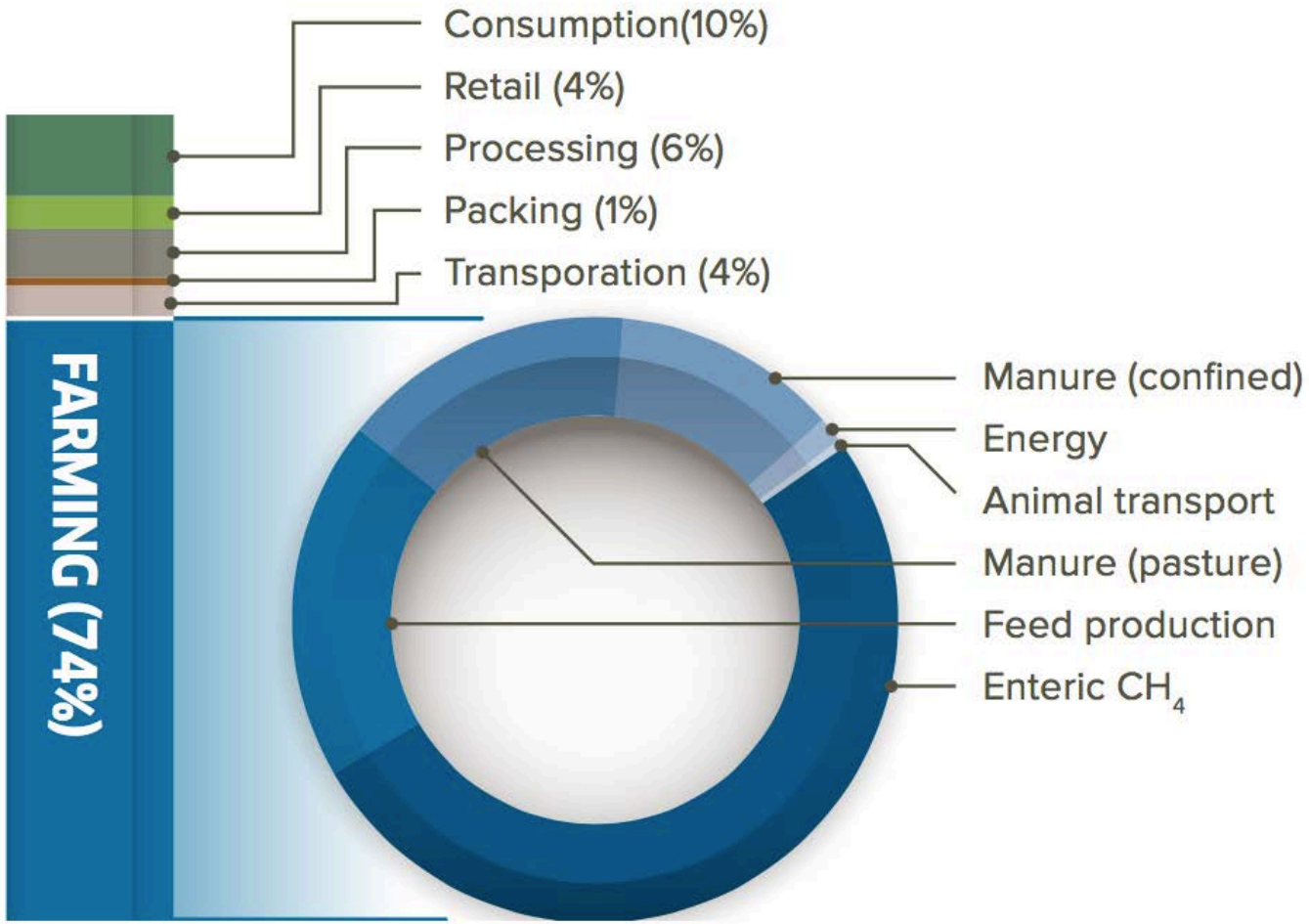
kilogram of packed boneless beef (delivered and consumed)

includes all stages in the life cycle, from **farming to consumption**

Environmental life cycle stages

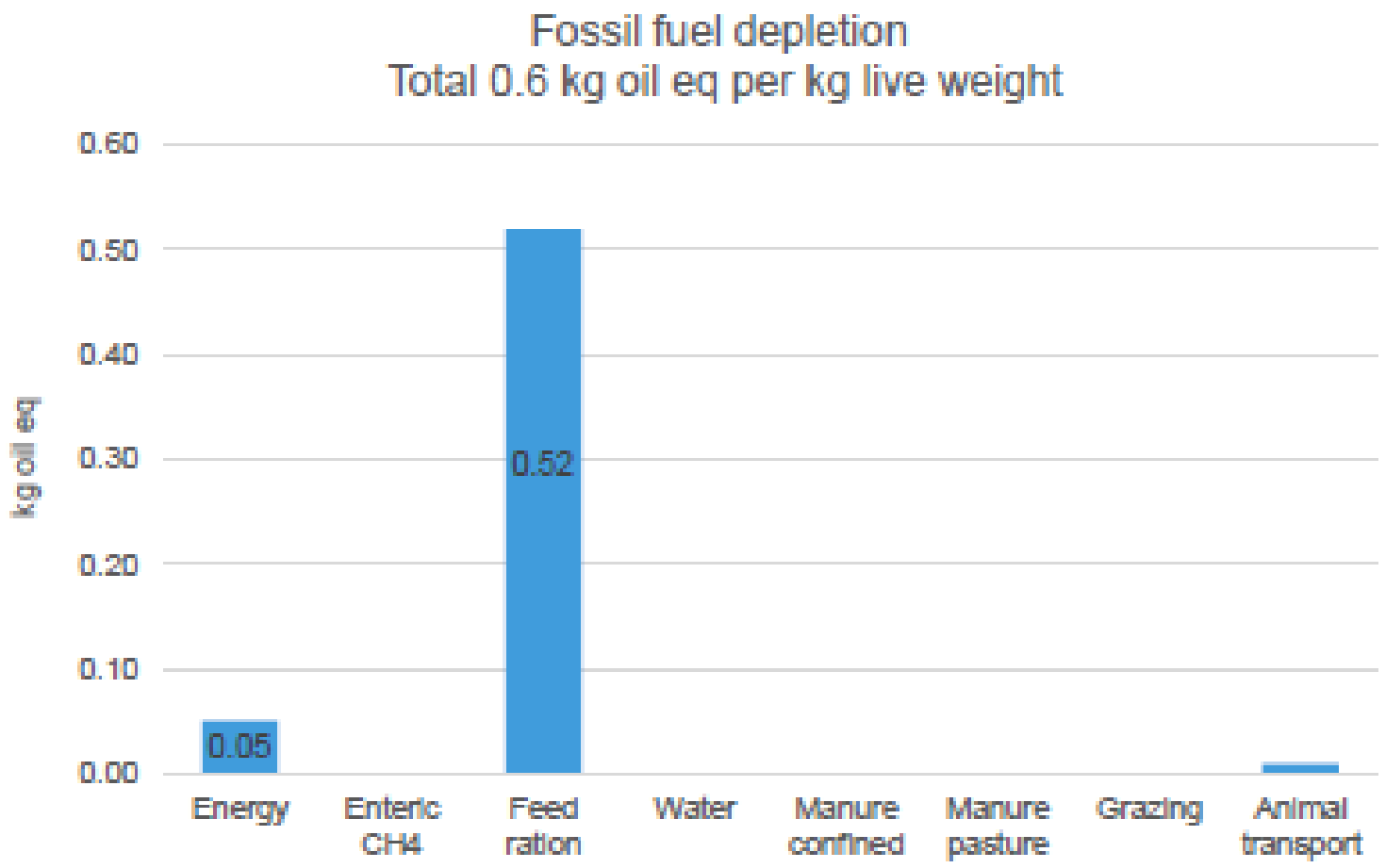
Results Climate Change

11.4 kg $C0_2$ eq./kg live weight at farm gate; OR **30.8** kg CO_2 eq./kg of packed boneless beef, which is then delivered and consumed



Results Fossil fuel depletion

0.6 kg oil eq./kg live weight at farm gate; OR **2.0** kg oil eq./kg of packed boneless beef, which is then delivered and consumed



Results Water

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

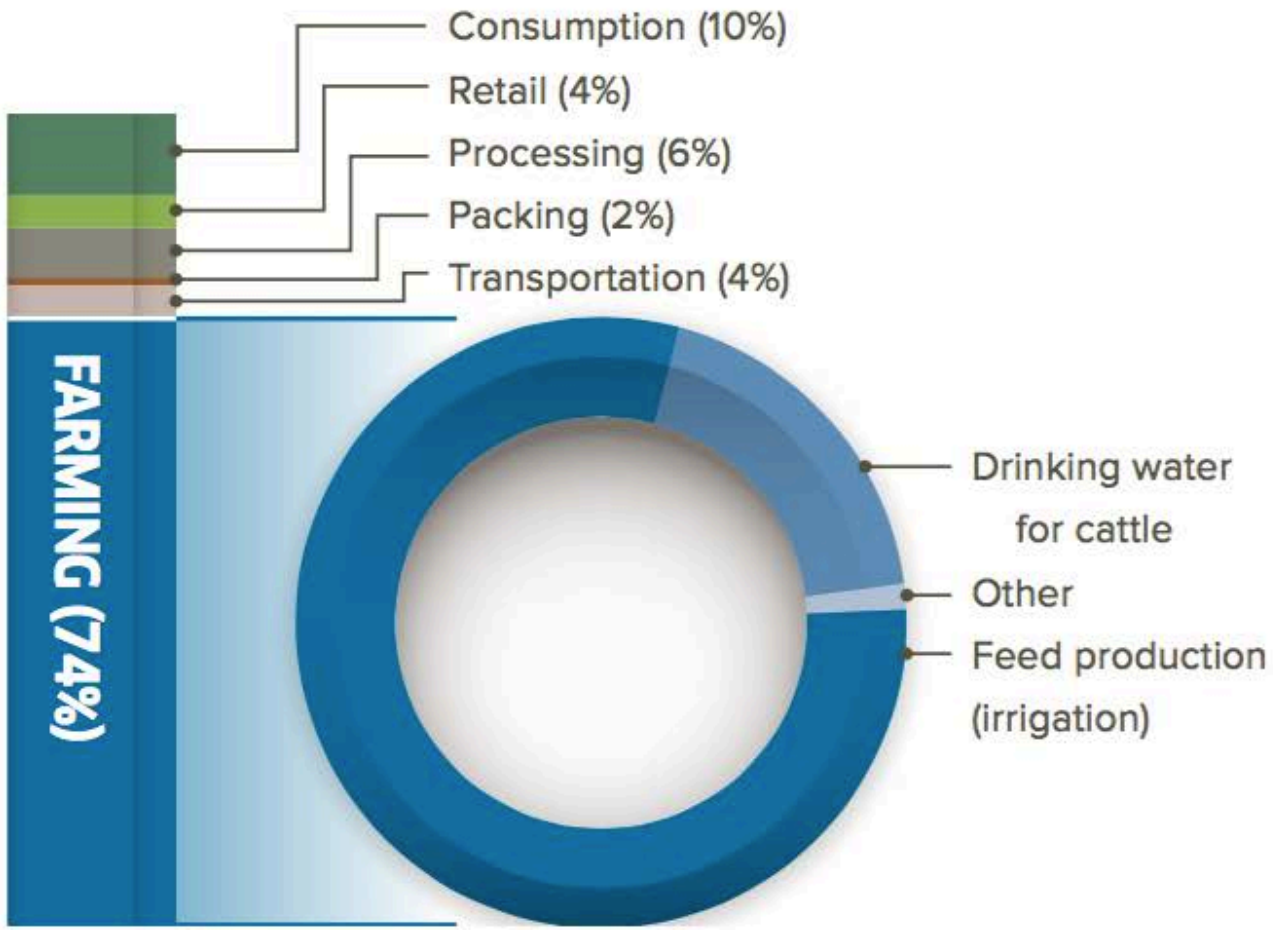


Figure 5

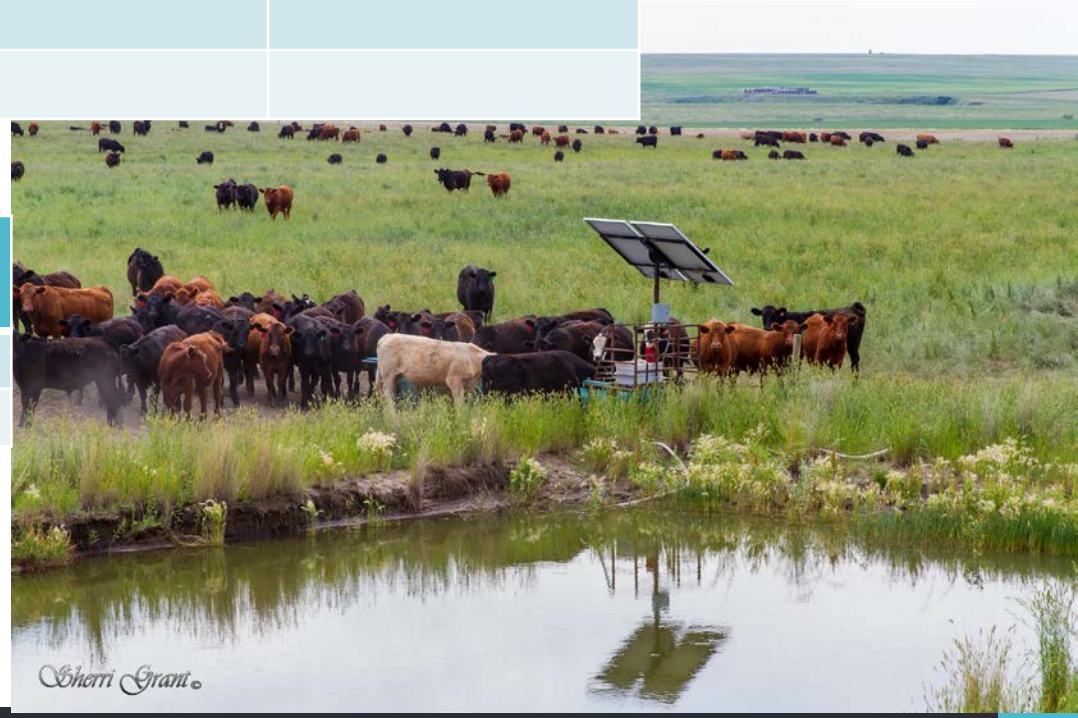
Contributions of different life cycle stages to the Canadian beef industry's blue water footprint (Total: 631 litres of blue water/ kg of packed boneless beef [delivered and consumed]). (Note: individual items may not add to the total due to rounding).

Results Water

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

	Farm's gate (liters/kg of live weight)	Packers' stage (liters/kg hot carcass)	Packer's gate (liters/kg bone-free meat)
Canada, National Beef Sustainability Assessment (CRSB, 2016)	235	382	508
United States (Capper, 2011)	1,100	1,763	
Southern Australia (Ridoutt et al., 2011)	16-1,067		
USA (Rotz et al, 2013)	2,790		

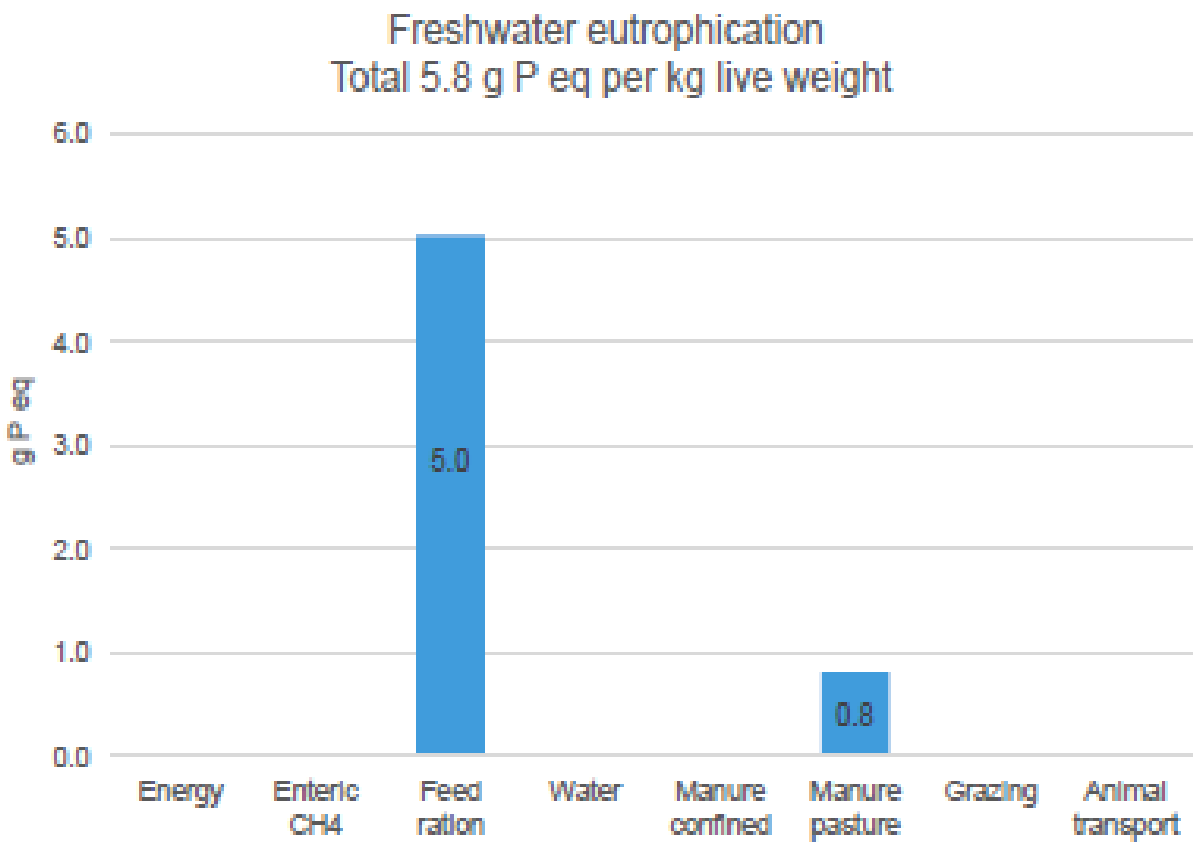
Net Blue Water Footprint values *(not comparable to CRSB study)*	Packer's gate (liters/kg bone-free meat)
Global (Water Footprint Network, 2015)	550
USA (Water Footprint Network, 2015)	525

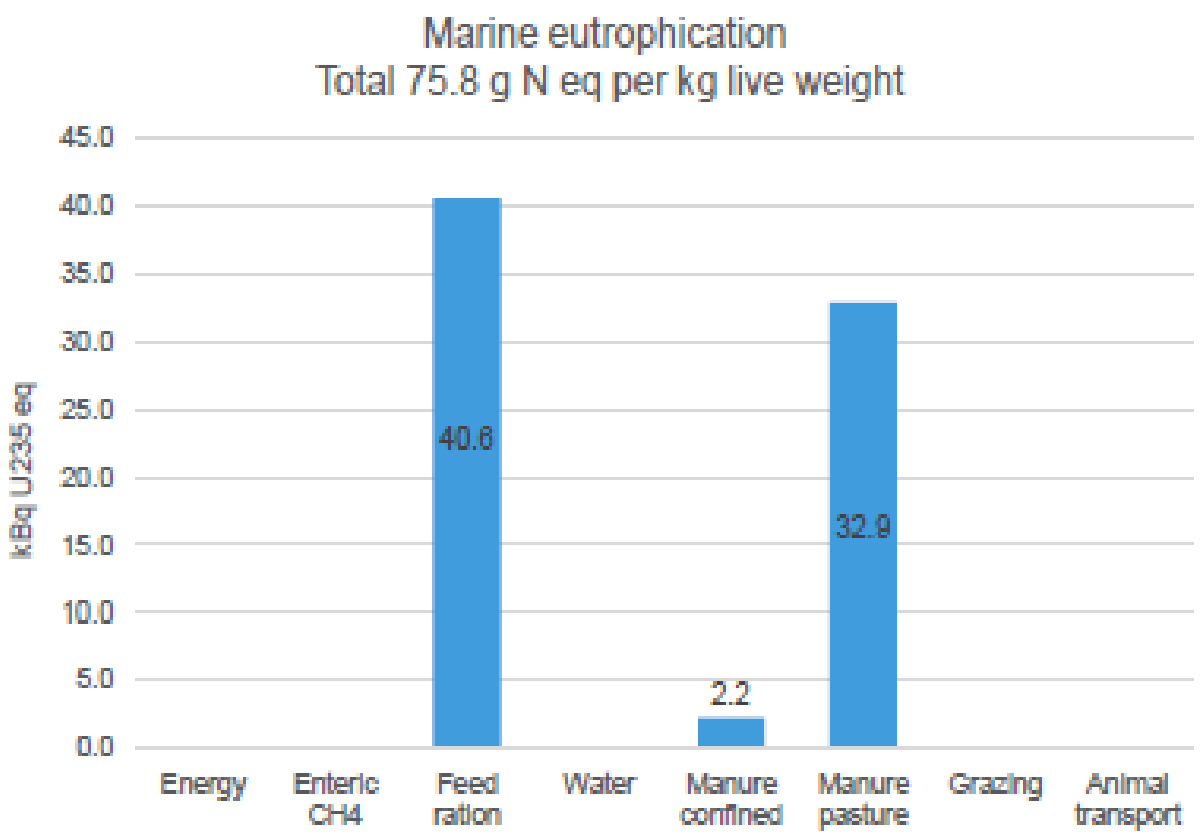


Results Water pollution potential

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





Results Food Waste

Meat waste occurring during secondary processing, retail and consumption (Note: individual items may not add to the total due to rounding).

19%

Meat waste

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

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

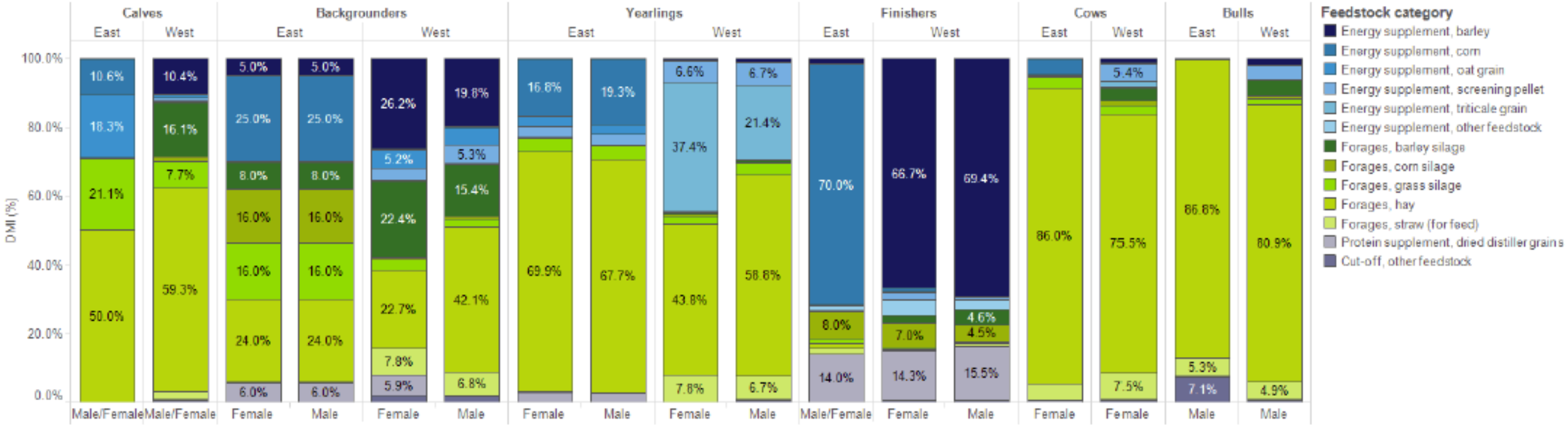


Figure 3-3 Detailed average rations used in this analysis (dry matter intake %)

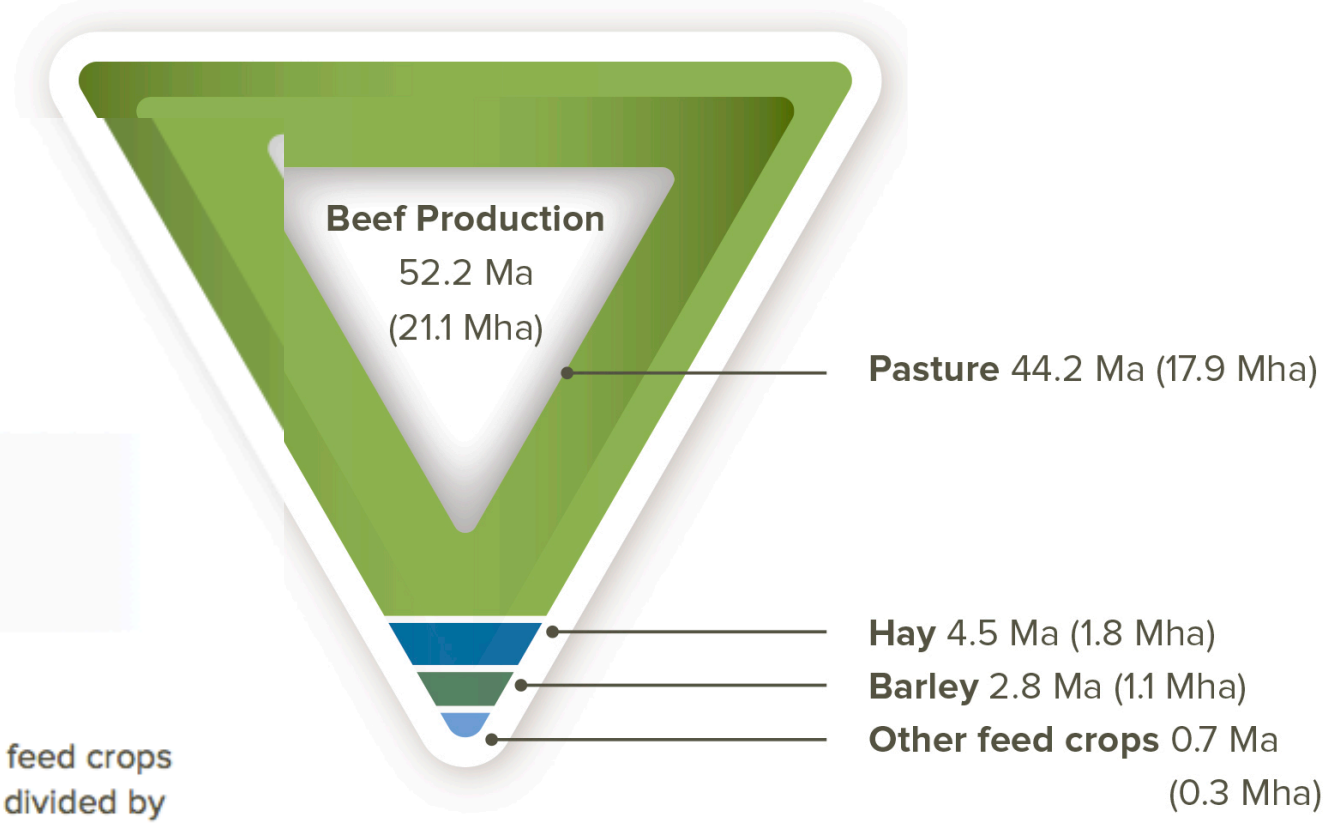
Results Land Use

It takes between 37 square metres (m2) and 93 m2 of land to produce one kg of live weight in Canada

Figure 3

Land used for beef production in Canada

Ma	Million acres
Mha	Million hectares



[3] Calculation based on area needed to produce feed crops for cattle, excluding natural land from pasture, divided by total available land in crops and summerfallow land in Canada.

The Importance of Sustainable Grazing practices on Native and Unimproved pasturelands

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.

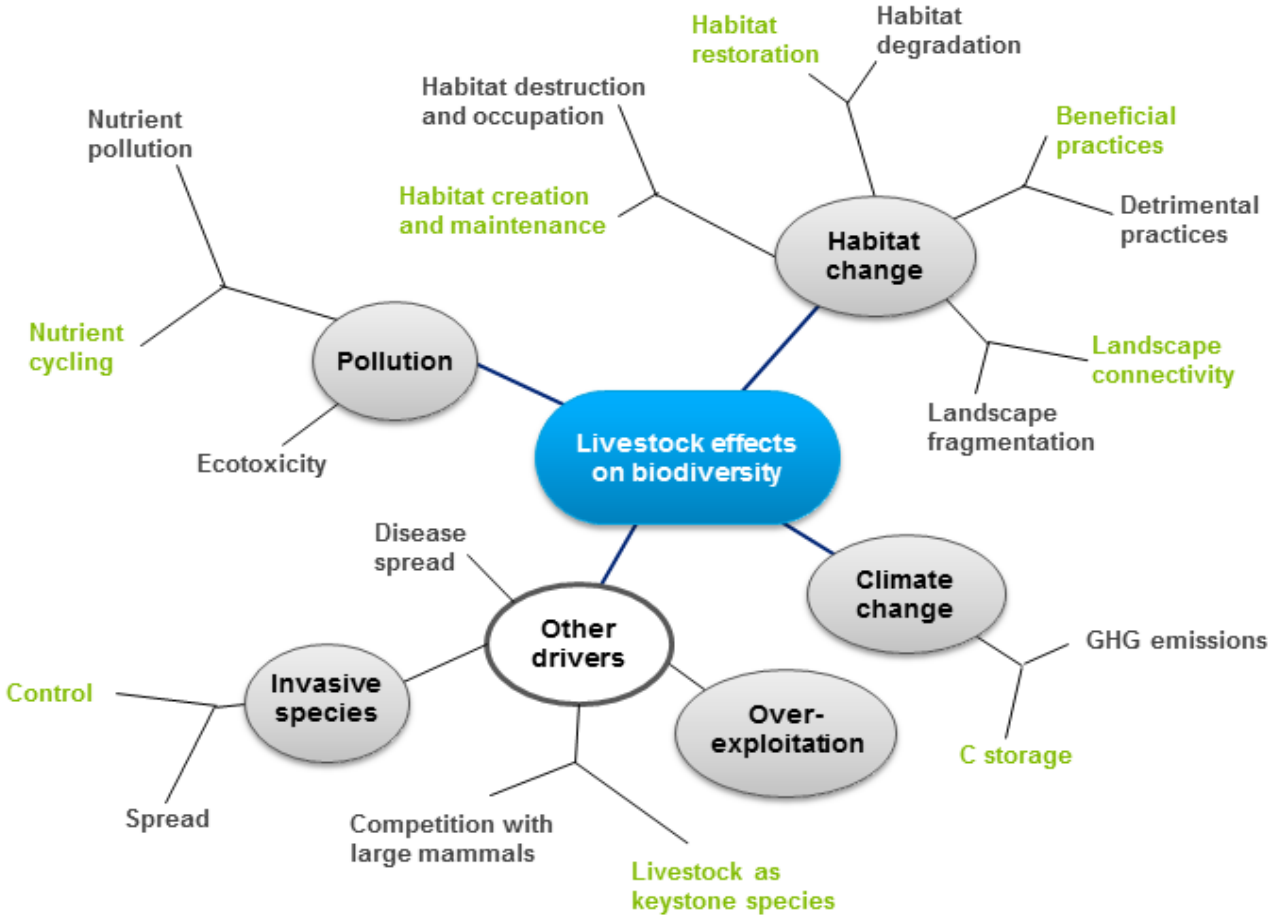
The main concern for biodiversity is not conversion of forest and wetlands (which has slowed in recent years), but losses of native prairie grasslands

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

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%.

Conservation of grassland species largely depends on sustainable cattle grazing practices.

Biodiversity is a complex issue



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

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).

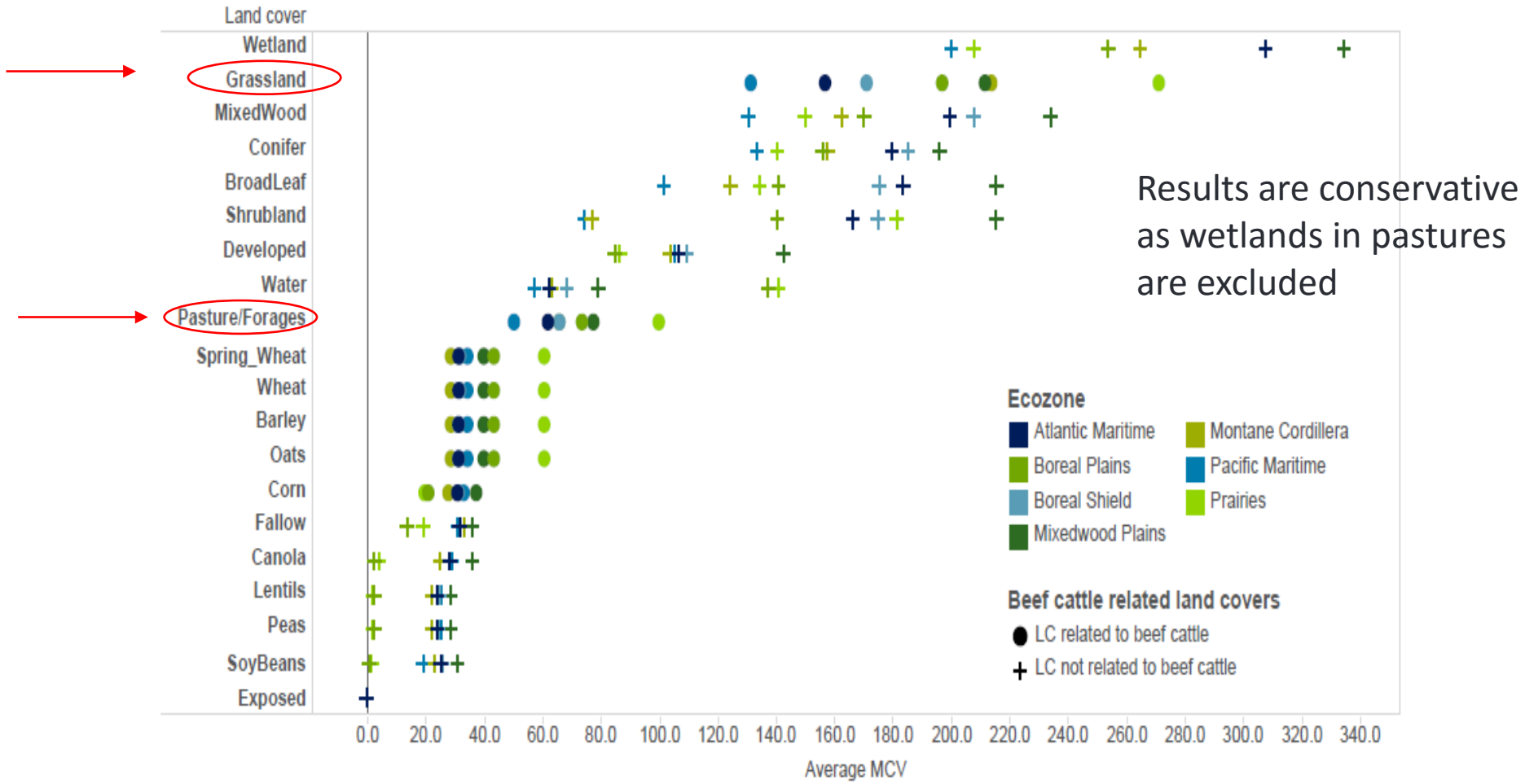
WHAFI customized for beef industry

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

Canada’s boreal forest

The largest contiguous forest ecosystem on earth, covering a quarter of Canada’s land area.

Over 40% of boreal forests are under industrial forest management; while the remaining are typically in the North and both less productivity and less biodiversity rich.

Threats to the boreal forest include: habitat loss, conversion of forest types, alteration of forest stands; age-class distribution and structural diversity and increased isolation of old forest fragments, leading to varying impacts on biodiversity.

While generally not suited to agriculture, **livestock operations** are found on the **Southern edges** where it meets the prairie grasslands and about **5 million ha** are **cultivated** for crops (primarily in Alberta and Saskatchewan).

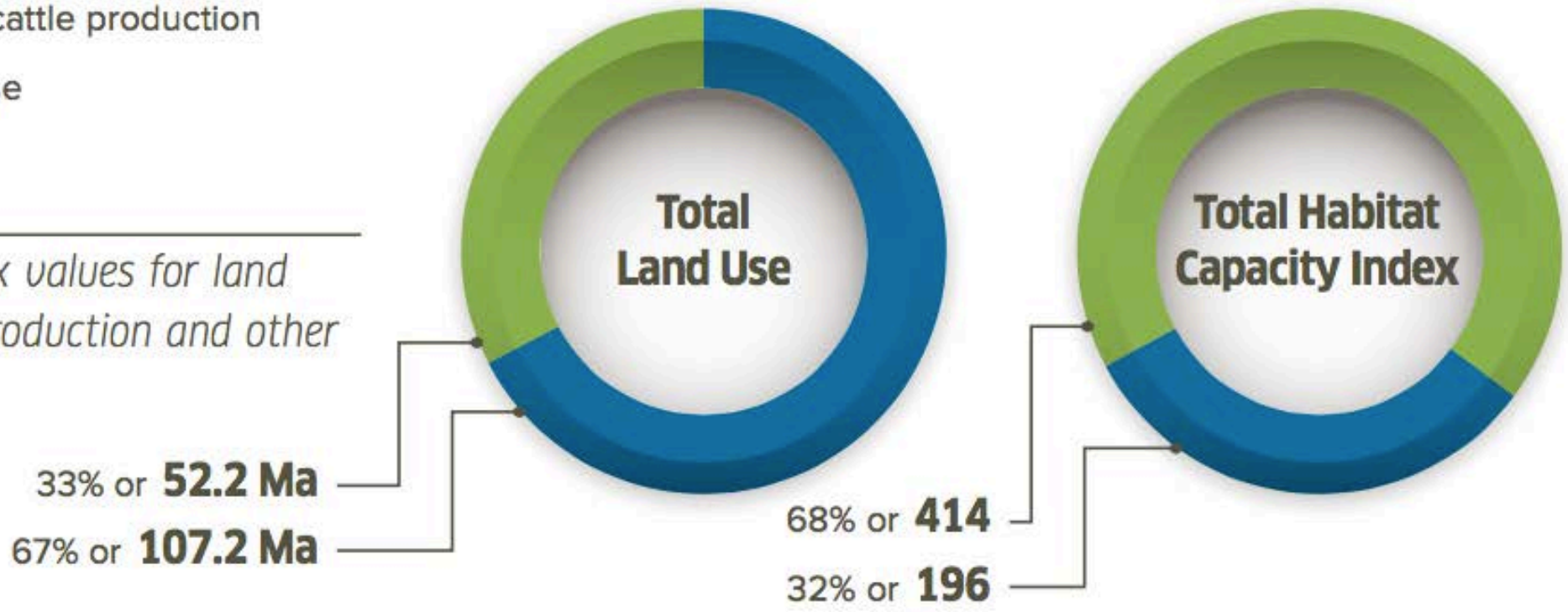
Results Biodiversity

Land used for beef cattle production

Other agricultural use

Figure 4

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



Method Carbon Sequestration

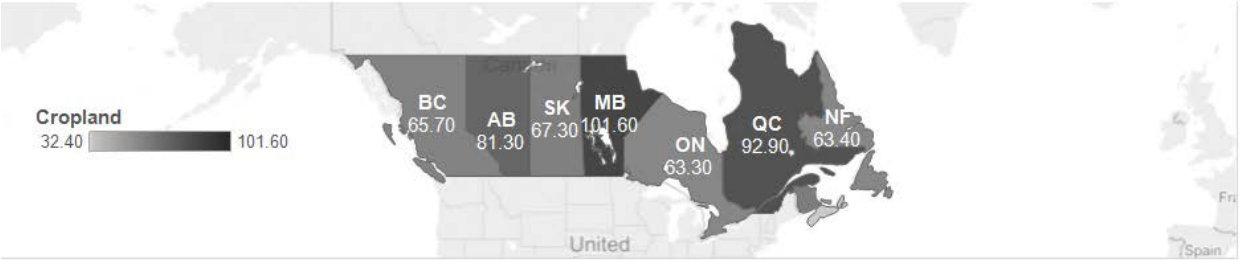
Average Stock of Carbon per land use type

Carbon stock per ha per land use per province

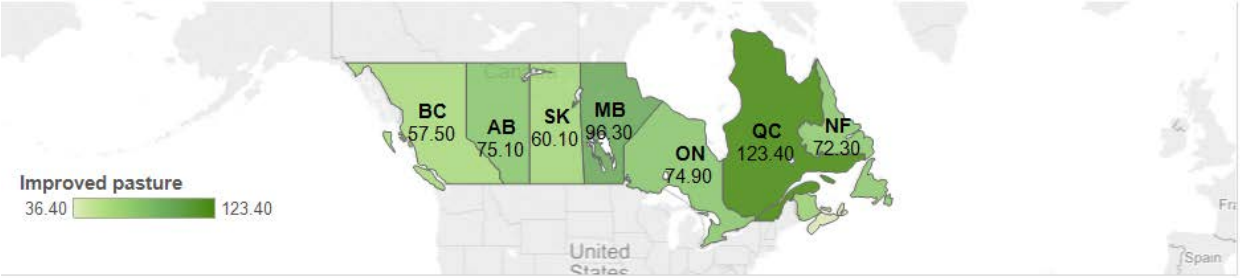
Average

	Cropland	Improved	Unimproved
Average	75.9	71.2	74.5

Cropland

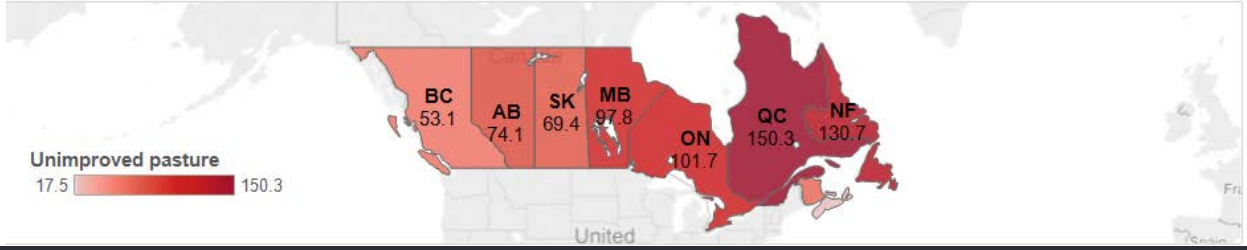


Improved pasture



Value

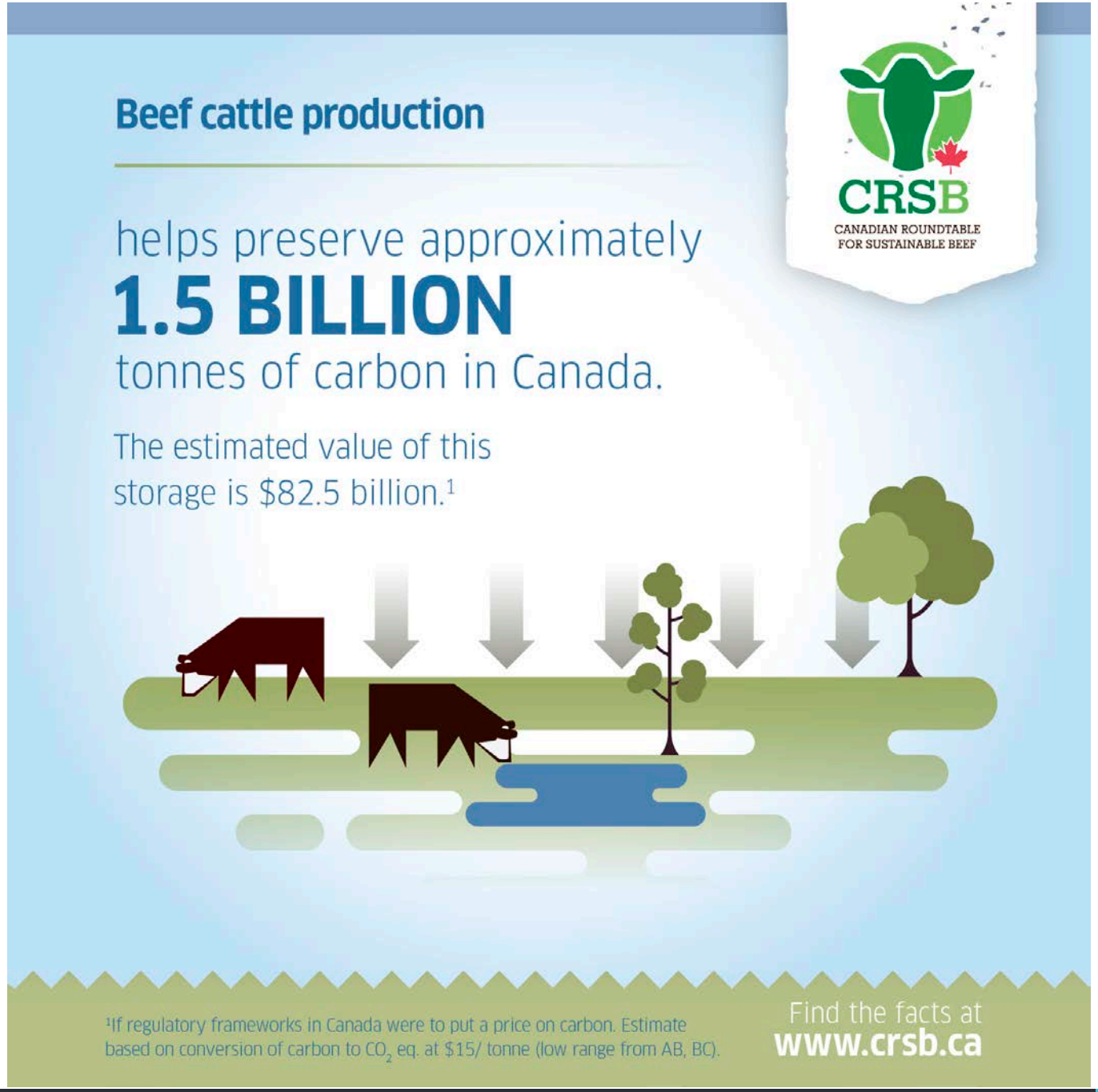
Unimproved pasture



Results Stock of Carbon (up to 30cm depth)

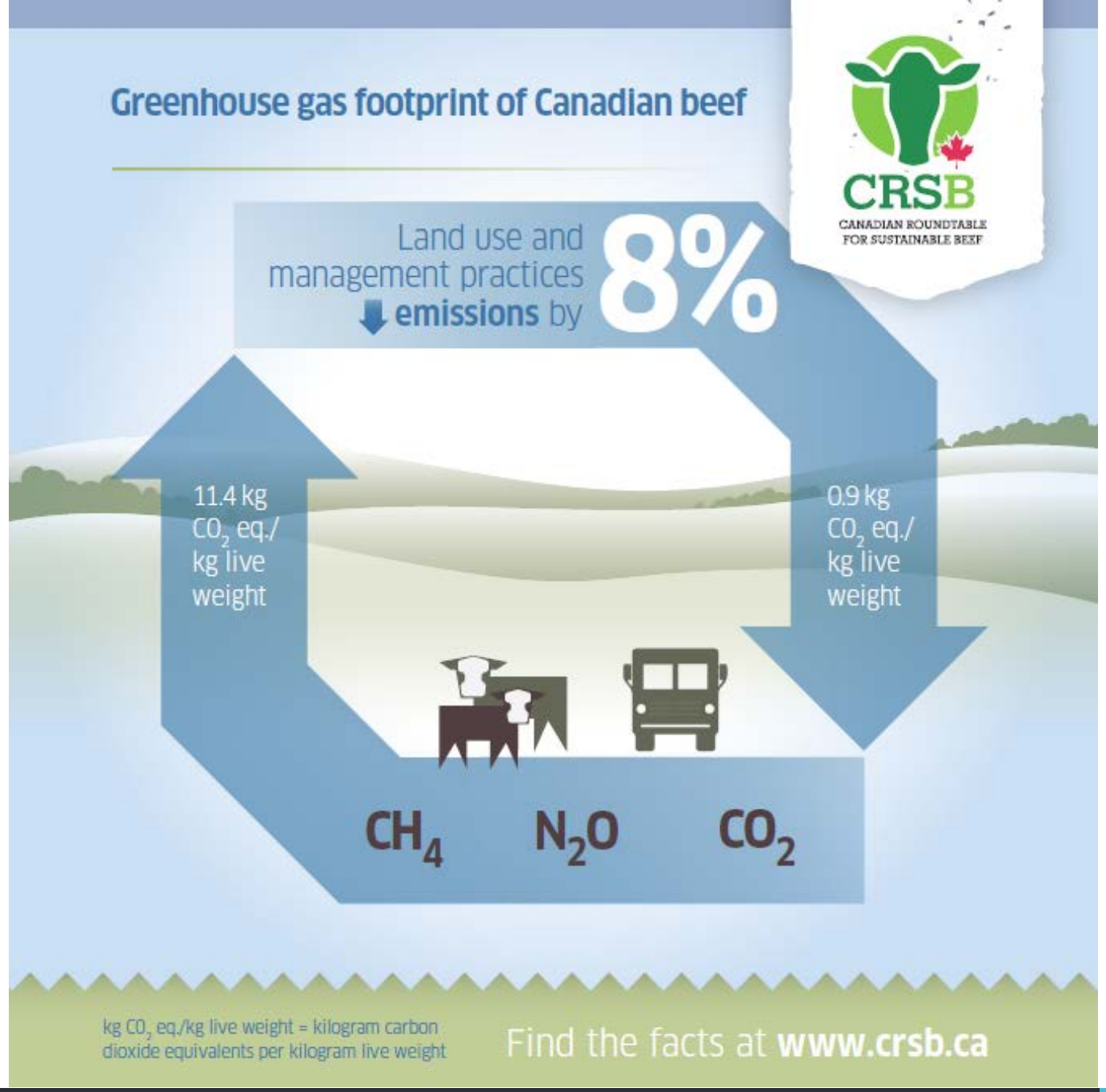
Approximately 1.5 billion tonnes of carbon are currently stored in the lands used by beef producers thanks to soil carbon sequestration.

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.



Results Carbon Sequestration

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_2 eq./kg live weight.



Social Assessment

- Working Conditions
- Animal Welfare
- Antimicrobials

Social Assessment

Methods

Colour	Risk scale level	Definition
	High	High risk of negative social impact
	Moderate	Moderate risk of negative social impact
	Low	Low risk of negative social impact
	Very Low	Very low risk of negative social impact

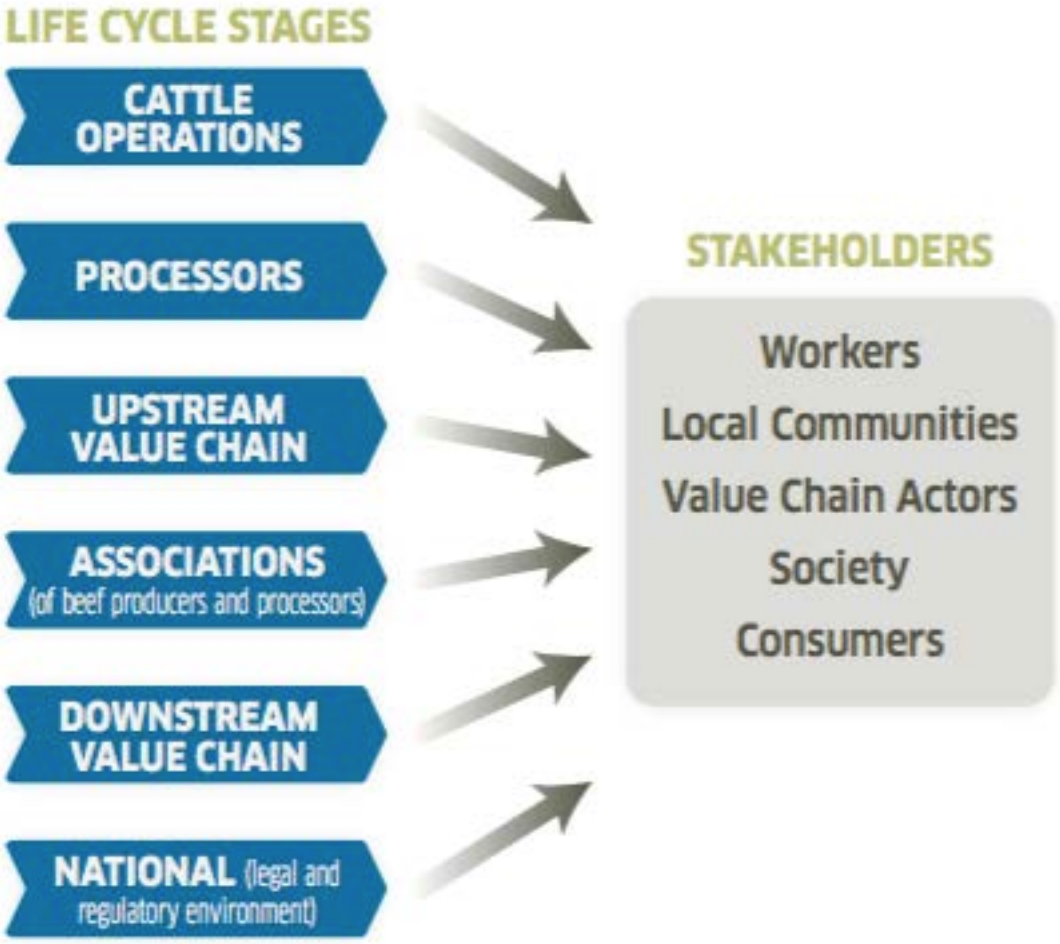
Survey

The S-LCA utilized 76 farm surveys to identify hotspots

Desk Top Assessment

Survey results were further analyzed with a desk top assessment and regulatory review

Assessment Stages



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

National
Rights of foreign workers

Distribution
Median income

Suppliers
Rate of fatal and non-fatal injuries

Cattle operations
Work load

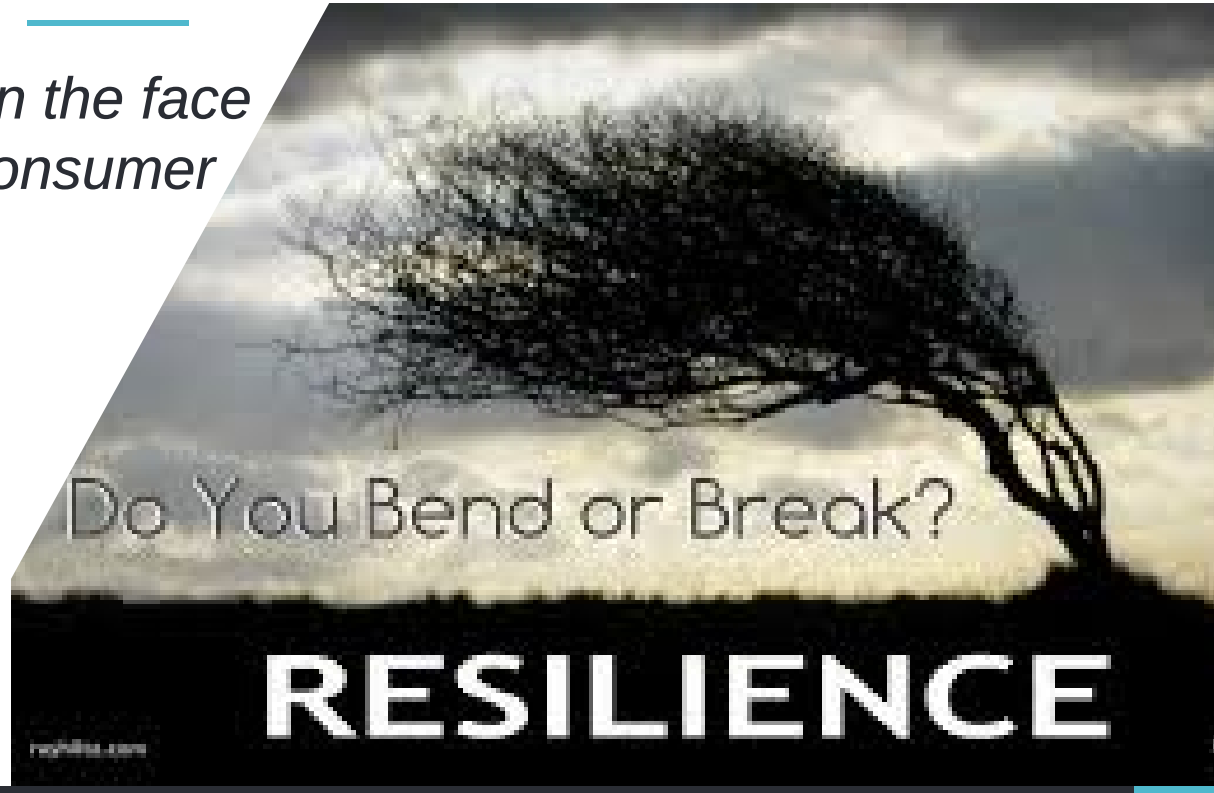
Results Animal Care

Rating level for the animal health and welfare indicators examined in the S-LCA

Rating Level	Life Cycle Stage	Indicator
Very low risk	Packers	• Animal harvest method • Animal stunning method • Animal welfare audit • Technology and infrastructure to support animal welfar • Internal communication of animal welfare regulations • Transporters' certification
	Farmers	• Health prevention • Health assessment • Housing and feeding • Euthanasia method • Handling injuries • Handling training • Breeding injuries • Transport certification • Calving assistance
	Associations	• Animal welfare promotion
Low risk	Farmers	• Housing condition • Castration • Weaning conditions • Disbudding and dehorning pain control • Handling issues • Code of Practice awareness and implementation
Moderate Risk	Farmers	• Branding pain control
High Risk	None	• None

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



Profitability Considerations

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		Consumer Resilience	
Long Term Profitability	Long Term Cost of Production	Domestic Consumer Demand	International Consumer Demand

Data Sets Used for Producer Viability Analysis

Agri Benchmark

Agri benchmark is a global, non-profit network that provides a consistent methodology to compare production systems, cost of production and profitability around the world

Canfax

As the *agri benchmark* data are only available to 2006, the historical analysis is based on models and data sets maintained by Canfax

The Canfax monthly cattle TRENDS report supplied the data for the feedlot analysis.

Results Producer Viability

Producer viability refers to producer's financial ability and incentive to continue producing a product

Cow –Calf Profit Margins: Data from *agri benchmark's* typical farms in 2013, show cow/calf enterprises are covering short-term (i.e., cash costs) and medium-term (i.e., including depreciation) costs. Three of the four typical farms are also covering long-term costs (i.e., including opportunity costs). In this case, opportunity costs largely represent unpaid labour.

Feedlot: Data from *agri benchmark's* typical farm in 2013 indicate feedlot enterprises were unable to cover even short-term (cash) costs when selling on the cash market

Results Producer Viability

Long term cost of production, 2013 baseline (deflated)

- Cow/calf $120/cwt, or $264/ckg
- Feedlot $106/cwt, or $235/ckg

Long Term profitability, 2013 baseline (deflated)

- Cow/calf $93/cow
- Feedlot -$0.09/cwt (cash), or -$0.20/ckg

There is great diversity in the beef sector with a wide range between the high cost and low cost producers. There is no single right way. You can be profitable with high cash cost, due to the environment one lives in, with corresponding high productivity resulting in low per unit cost of production. Also you may focus on reducing cash costs if you are in a low productivity environment.

There are times in the cattle cycle when margins are negative. Producers need access to risk management tools to navigate those years.

Results Producer Viability

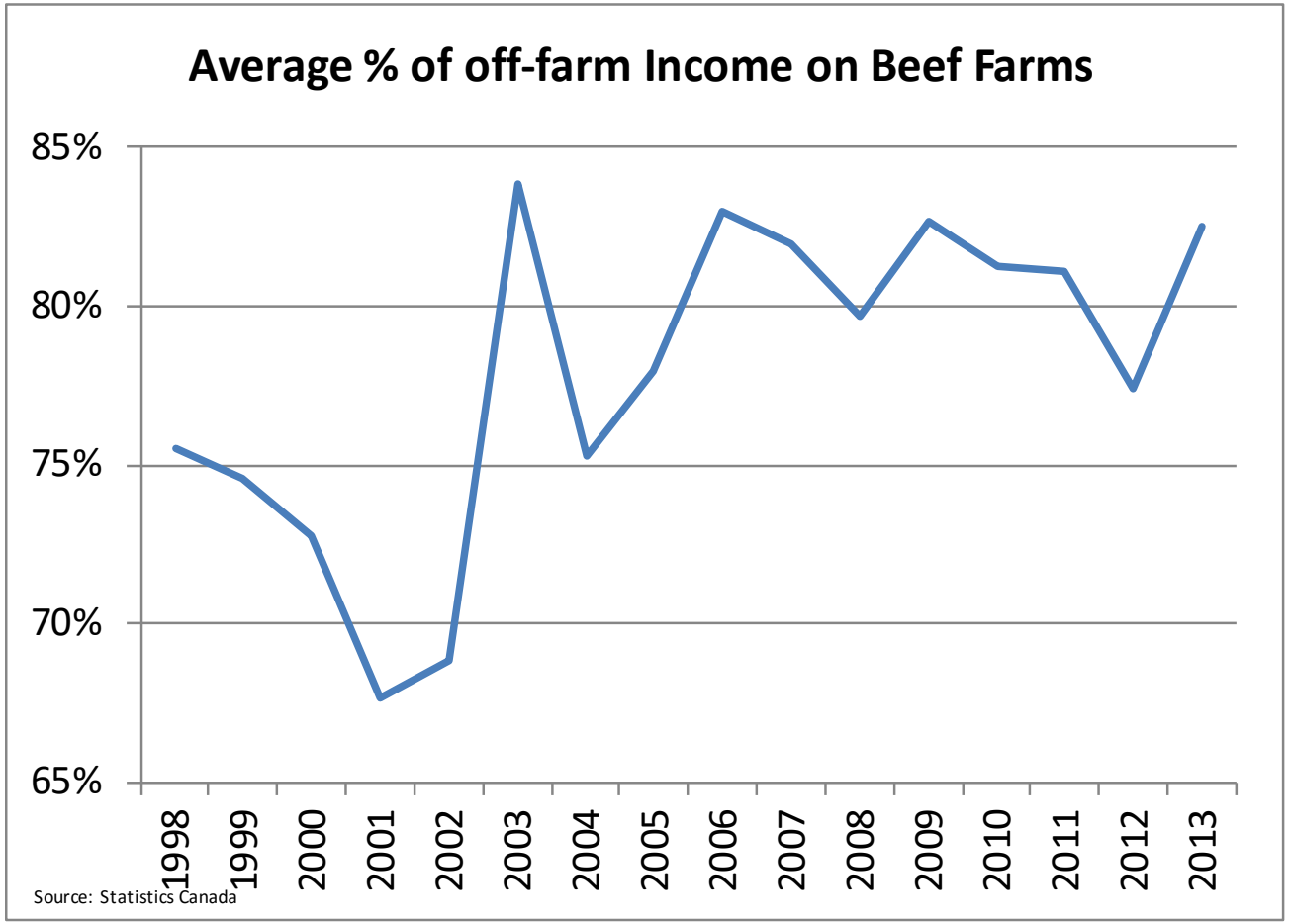
Long term (1990-2014) average **margins** from a **200 head cow** herd of $9,650 with **paid labour** of $7,909 provides a total annual income of $17,559.

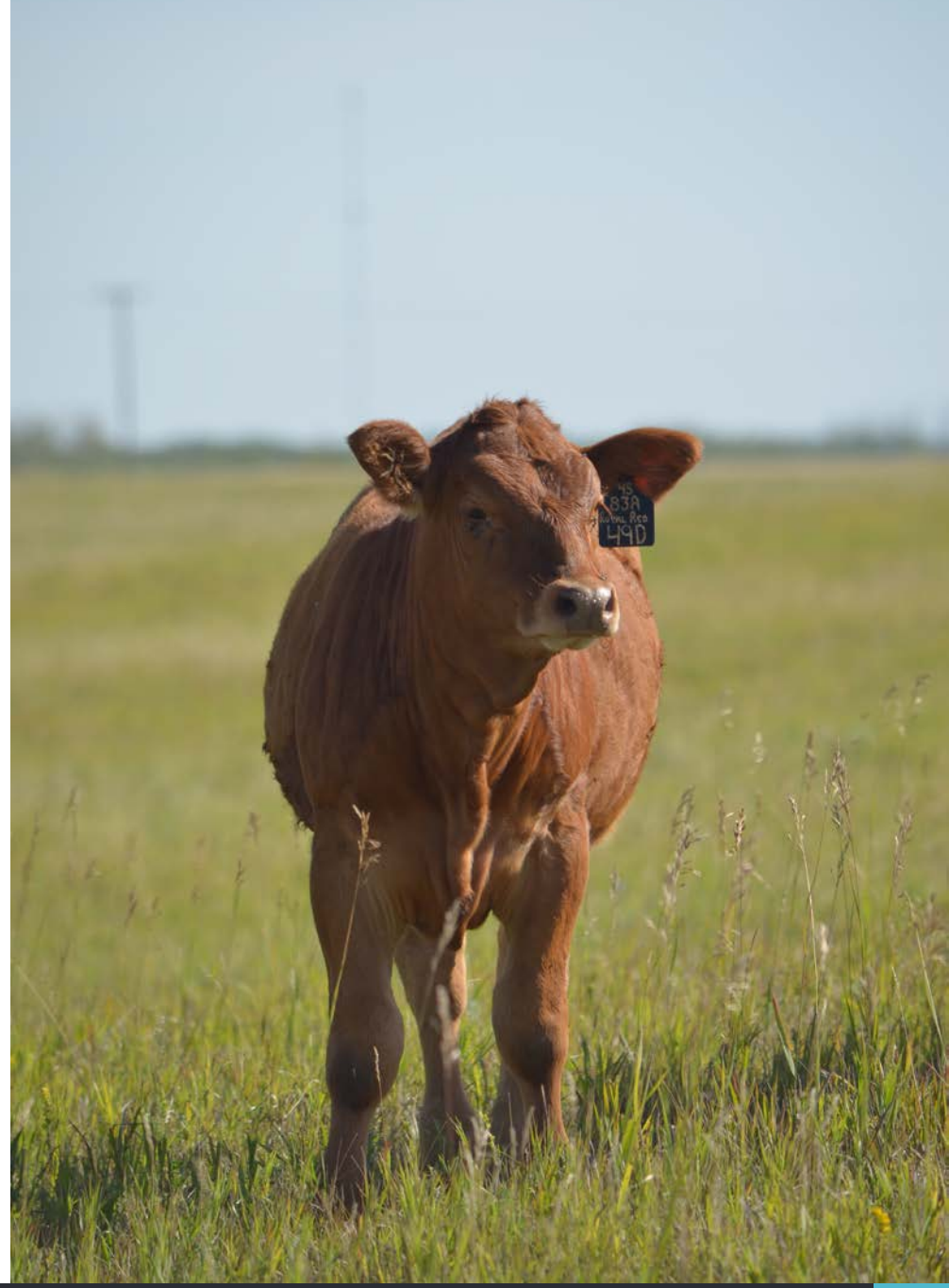
Most of these operations are mixed with income from other commodities and therefore do not expect the beef enterprise to provide their entire income.

Using the most recent 10-year average (2005-2014), which includes record large profits, results in a total annual income of $27,468 (including paid labour).

Results Producer Viability

Beef farm operations rely on off-farm income



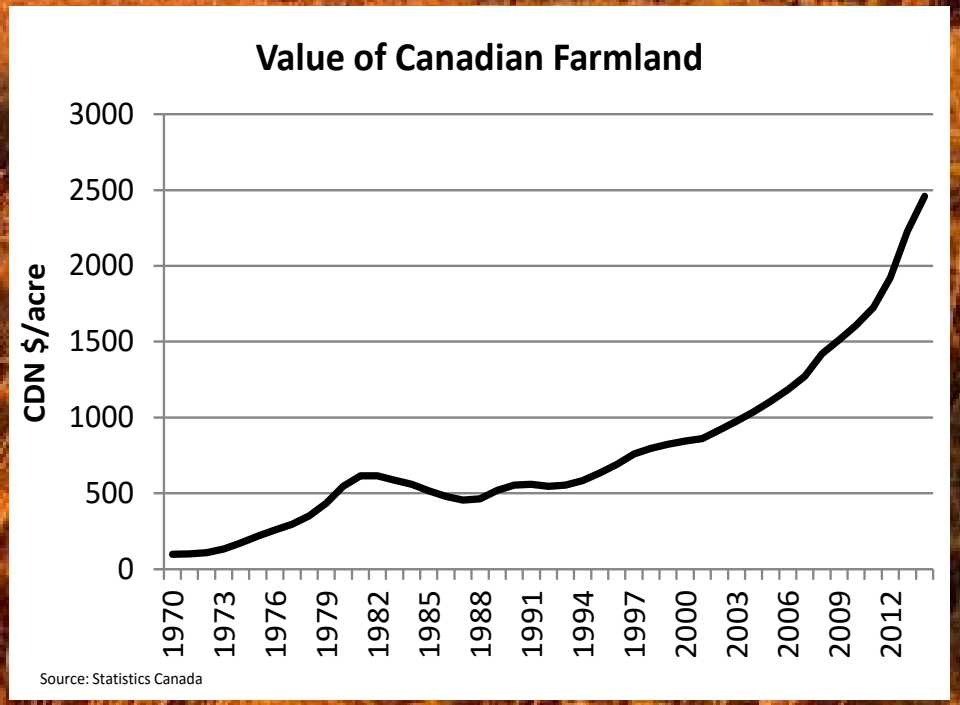


Results Producer Viability

Equity as a percentage of total assets has been **steady around 82-85% from 2001 to 2013** which reflects the increase in liabilities taken on as land values have increased.

If land prices decline like they did between 1981 and 1988 (-25%), then equity levels would fall, creating financial pressure on operations.

This pressure would come from the **need to reduce debt** principle and as the same time impair the capacity of the operation to **raise working capital**.



Consumer Resilience

Results

- **Domestic Retail Demand**
- **International Demand**

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.

104

Domestic Index 2000=100

82

International Index 2000=100

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

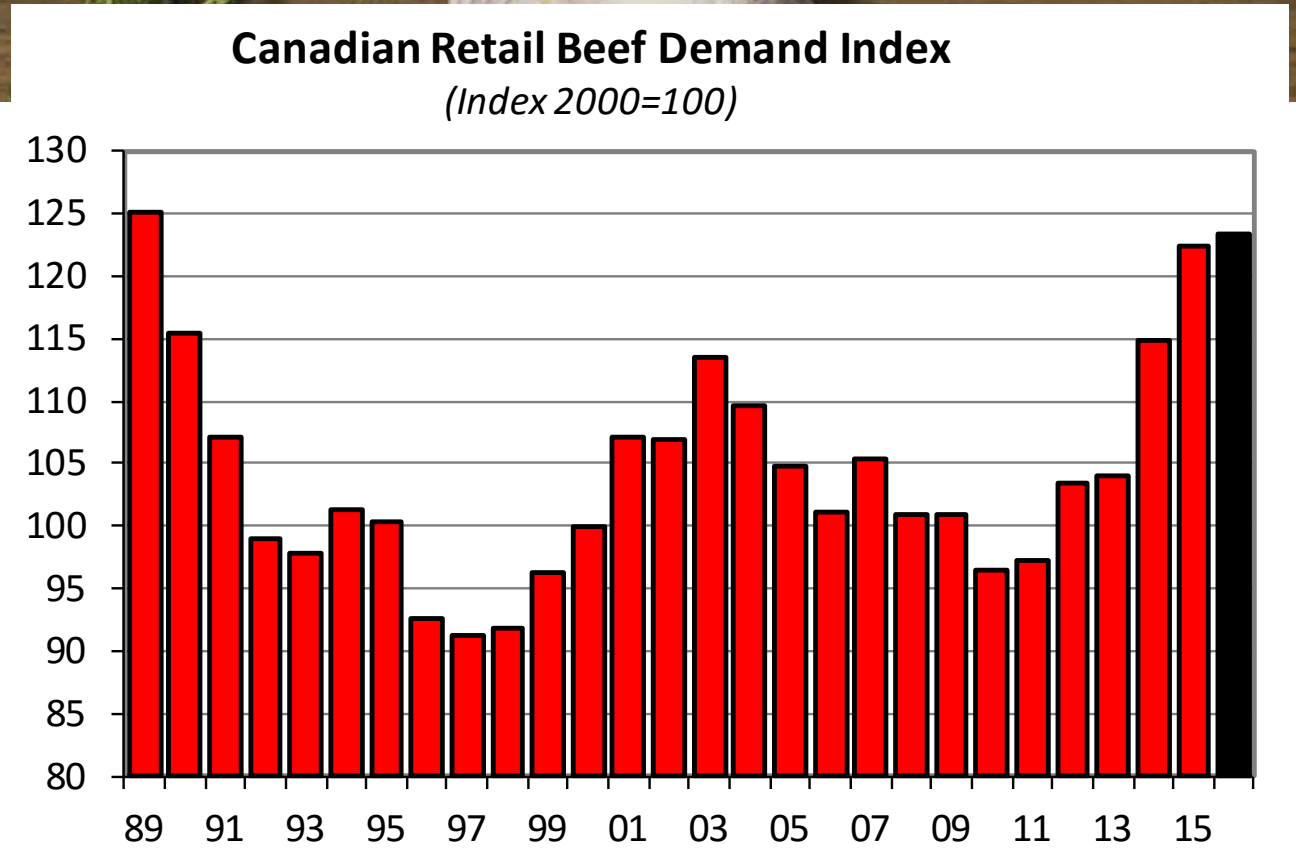
Short Term Market Impacts

Price

Competing Meat Prices

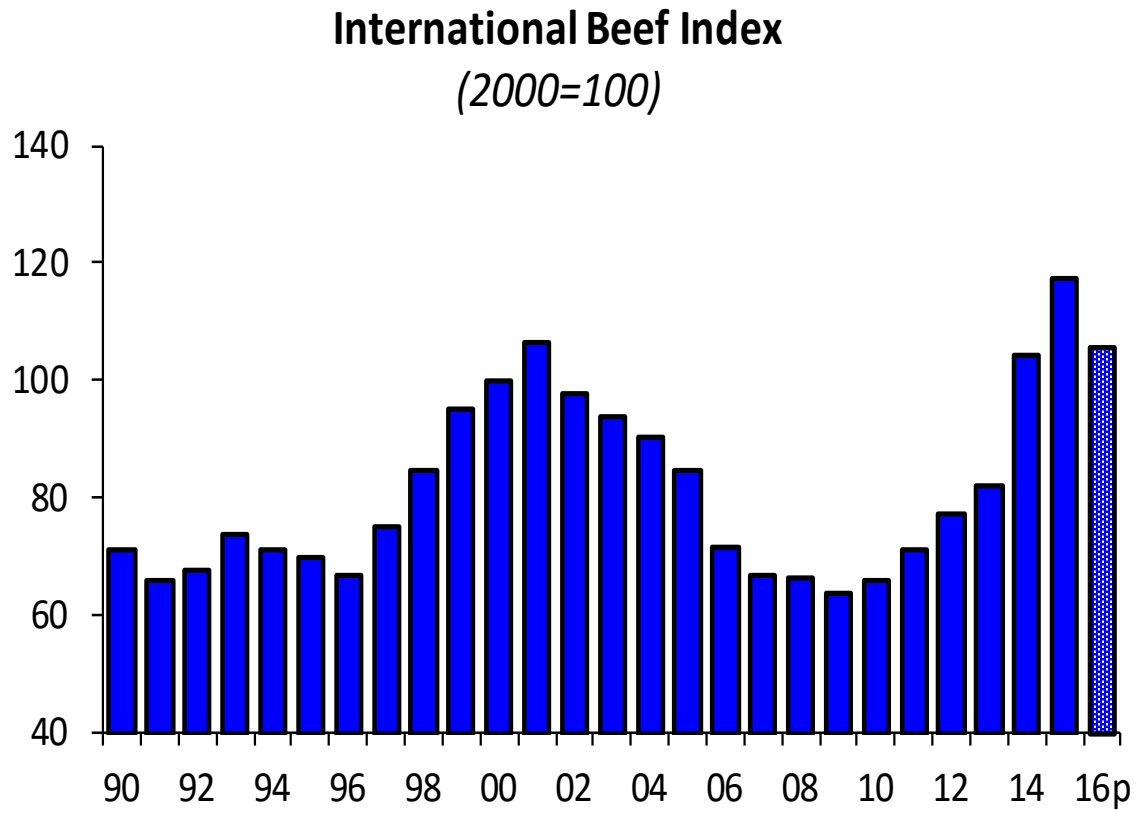
Switching between proteins and cuts

Demand Index Domestic Retail



Source: CanFax Research

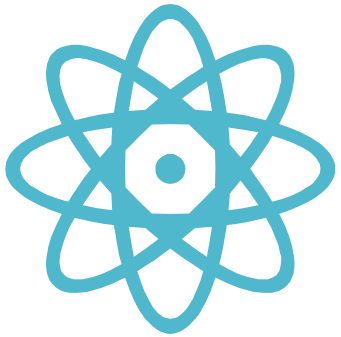
Demand Index International



Source: Cranfield 2012, CanFax Research Services

Continuous Improvement

Producer Viability & Consumer Resilence



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 +1.87lbs/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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