



National Beef Sustainability Assessment: Economic Assessment

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Acknowledgements

Project Manager

Brenna Grant, Canfax Research Services

Canfax Research Services project team

Jamie Kerr

Huiting Huang

Steering Committee

Brad Downey, Alberta Conservation Association

Kerriane Koehler-Munro, Alberta Agriculture and Irrigation

Reynold Bergen, Beef Cattle Research Council

Marianne Possberg, Saskatchewan Cattlemen's Association

Kim Ominski, University of Manitoba

Tim McAllister, Agriculture and Agri-Food Canada

Christoph Wand, Ontario Ministry of Agriculture, Food and Rural Affairs

Katie Wood, University of Guelph

Dorothy Erickson, Zoetis

Michael Lohuis, Semex

Sean Thompson, Olds College

Kristine Tapley, Ducks Unlimited Canada

Graeme Finn, Foothills Forage and Grazing Association

Kevin Teneycke, Nature Conservancy of Canada

Jenna Sarich, Canadian Cattle Association

Karen Schwartzkopf-Genswein, Agriculture and Agri-Food Canada

External Panel of Experts

Scott Jeffrey, University of Alberta

Derrell Peel, Oklahoma State University

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Note: The National Beef Sustainability Assessment is not intended to compare or rank beef production practices or systems. Rather, its sole intention is to provide a benchmark of the social, economic, and environmental performance of the Canadian beef industry, and should be considered in its entirety.

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Glossary

Alternative Marketing Arrangements (AMA) – prices that are determined by a seller and a buyer that are not publicly available. These marketing arrangements may encompass quality attributes, quantity supplied during a specific time frame, management style, etc. as part of the pricing of the animals.

Branding Program – enrolling cattle (cows, calves, feeders, fed cattle) into a program that incentivizes environmental and social responsibility.

Capital* – the tools, equipment, buildings, and other items that businesses use to produce goods and services.

Cash Market – a process where animals are traded in such a manner that size, quantity, and price are easily available to all relevant and non-relevant stakeholders.

CME – Chicago Mercantile Exchange. The market trading organization that sets the price for all major goods in North America, including fed cattle (live cattle) and feeder cattle.

Complementary Item* – an item that typically is used in combination with the item in question, e.g., beef burgers and ketchup.

Consumption** – spending by households on goods and services.

Cost of Production – the cash costs associated with one unit of production (cow-calf is cost per calf weaned, feedlot is cost per one hundred pound of gain).

Debt-to-Equity Ratio – the degree to which a company is financing its operations with debt rather than its own resources (Fernando, 2022).

Deflated*** – the act of indexing nominal values by removing yearly inflation from the values; also referred to as “real”.

Demand* – the relationship between the price of a good and the quantity demanded of it when all other influences on the buyers’ plan remains the same.

Economies of Scale* – the factors of a firm’s technology that makes average total cost fall as output increases.

Economic Breakeven – the point where short-term, medium-term, and long-term costs are covered through the sale of a good or service.

Expense-to-Receipts Ratio – the average amount incurred in operating expenses for a dollar in gross farm receipts (Statistics Canada, 2023b).

External Benefits*** – a benefit that production or consumption of a product or service has on third parties.

External Costs*** – a cost that production or consumption of a product or service has on third parties.

Financial Breakeven – the point where financial costs equal financial revenue.

Fixed Costs* – costs that are independent of output level.

Inelastic Demand* – a demand with a price elasticity between 0 and 1. The percentage change in quantity demanded is less than the percentage change in price.

Land* – the “gifts of nature” that are used to produce goods or services.

Labour* – the time and effort required to produce a good or service.

Long-term Costs – cash, non-cash (depreciation) costs and opportunity costs (land, labour, and capital).

LPI (Livestock Price Insurance) – a business risk-management program where producers purchase price protection on livestock in the form of an insurance policy; available in British Columbia, Alberta, Saskatchewan and Manitoba.

Marginal Benefit* – the benefit received by consuming one more unit of a good or service.

Marginal Cost* – the opportunity cost resulting from a one unit increase in total production of a good or service.

Market Shock** – a change in the price of supply variables (labour force, productivity, expected future price level, input price changes), or demand variables (interest rates, taxes, income, future profitability, growth rate relative to other countries, exchange rate) that cause the price for an item to change while demand or supply of that item remains the same.

Medium-term Costs – cash and non-cash costs (depreciation on equipment and buildings),

Opportunity Cost* – the highest-valued alternative of a resource (land, labour or capital) that is foregone in the development of a product or service.

Own Price Elasticity* – an economic term to describe the responsiveness of an item in relation to the change in price of that item.

Price Premium – an additional value that is added to the price of an animal at sale time that reflects positive quality attributes desired by the next participant along the supply chain.

Price Taker* – a firm that cannot influence the price of a good or service it produces.

Quantity Demanded* – the amount of a good or service that consumers plan to buy in a given time period at a given price.

Quantity Supplied* – the amount of a good or service that producers plan to sell during a given time period at a given price.

Scarce Resource – a resource that is considered finite or exclusionary in its use, resulting in available quantity that is less than its desired use.

Short-term Costs – “cash” costs; costs that allow the day-to-day operation to function.

Substitute Item* – an item that will be used in place of the item in question: e.g., pork chops instead of T-bone steaks.

Sunk Costs* – a cost that has already been incurred and cannot be recovered, e.g., the past expenditures on a plant that have no resale value.

Supply* – the relationship between the price of a good and the quantity supplied of it when all other influences on producers' planned sales remain the same.

Thinning of Cash Markets – the movement away from trading fed cattle in auction facilities where prices are readily available, and cattle are traded on a live weight basis to private transactions between feedlot operators and packers where cattle are priced on carcass quality and branding program.

Transactions Costs* – the costs that arise from finding someone with whom to do business, agree on a price and determine details of the exchange of a product or service, and of ensuring that the terms of the agreement are fulfilled.

Value-added – an on-farm practice that increases the value of an animal that is not associated with an increase in production.

Variable Costs* – costs that vary as production level changes.

* definitions are either taken directly from or adapted from Parkin & Bade, 2016.

** definitions are either taken directly from or adapted from Hubbard, et al., 2015.

*** definitions are either taken directly from or adapted from Boardman et al., 2018.

Executive Summary

There are three pillars of sustainability—economic, environmental, and social—considered for benchmarking of the Canadian beef industry to assess its long-term viability. All three pillars must work as one for industry sustainability, but for the purposes of analysis, they are separated for simplification. This paper discusses the economic portion of sustainability, while the environmental and social aspects are addressed in a complimentary analysis (Canadian Roundtable for Sustainable Beef, 2016a).

Economic sustainability is defined as the ability of a system to maintain productivity in the face of a major disturbance, as well as shifts in consumer preferences. This definition focuses on the resilience of the industry as a whole and its ability to adapt to changing market conditions. Multiple supply and demand shocks occurring in recent years (i.e., COVID19 disruptions in 2020 and 2021 drought conditions in much of Canada) have challenged the beef supply chain.

The Canadian beef industry has withstood these supply and demand shocks of 2020 and 2021 admirably, showing resilience and the ability to adapt to shifting market conditions. Off-farm income as a proportion of total income continues to increase to support overall profitability of the industry. While there are management-related trade-offs, it is generally thought that reductions in off-farm work may negatively affect the beef industry sustainability.

While margins have been strong for the cow-calf and packing sectors in the past several years, it is the feedlot sector that has expanded. Producers are currently facing high feed costs which require cattle prices to increase for more equitable margins throughout the supply chain. This leverage shift from packer to feedlot is expected to occur in 2023 as the supply of fed cattle in North America tightens. However, profitability is not enough; the beef industry must also compete with alternative protein options domestically and internationally to maintain resources and market share.

The cattle industry is currently facing inflationary pressures with input costs rising faster than output (i.e., consumer) prices. Consumer demand has withstood many pressures in recent years, with both domestic and international demand remaining strong and showing a preference for high quality beef. Cutout values and retail prices are expected to remain at or near current levels.

The Canadian cattle industry contributes \$51.6 billion in production of goods and services, \$21.8 billion to the Canadian GDP and \$11.7 billion in labour income annually (Kulshreshtha & Nagy, 2021; CCA, 2023). As such, the sustainability of the beef industry is imperative for the well-being and livelihoods of thousands of Canadians employed throughout the value chain as well as the millions of Canadian consumers demanding safe, high quality, and nutritious protein options.

The Framework

The framework to evaluate the economic performance of the Canadian Beef Industry utilizes Producer Viability (see Section 3) and Consumer Resilience (see Section 4). Four indicators are used as benchmarks: (1) long-term profitability; (2) long-term per unit cost of production; (3) domestic consumer demand; and (4) international consumer demand.

Since 2014, the global beef industry has been going through a period of adjustment related to higher prices for cattle and inputs. Global supplies of beef are tight as production has lagged demand, largely driven by population growth and the shift to the middle class. Declining terms of trade is when beef and cattle prices lag general inflation and input costs, squeezing producer margins over time, before there are with periods of adjustments. There are two ways to address declining terms of trade: (1) increase demand; and/or (2) decrease cost of production through productivity improvements.

Despite competition from plant-based protein, cultured meat, and other alternatives, international demand for North American sourced beef has remained strong. Maintaining stability in the beef-to-pork and beef-to-poultry price ratios will also ensure beef demand remains strong in the face of inflationary pressures and increases in the cost of living.

The Update

Profits through the supply chain averaged \$667 per head in the 2013-2021 period up over nine-fold from \$71 per head in the 2003-2012 period. Overall, Producer Viability from industry wide profitability seems improved, but there are nuances to consider throughout the value chain and its various players.

The 2021 updated assessment for each benchmark indicators are shown in Table 1. While cow-calf margins are positive, they have declined over the full study period, 2012-2021. In deflated dollars, Canfax Research Services (CRS) estimates that average per cow cost of production (COP) for cow-calf operations rose seven per cent in Alberta and fell five per cent in Ontario between the two five-year time periods, 2012-2016 and 2017-2021, in deflated dollars.

Feedlot margins were negative for both cash and hedgeable options in the two five-year time periods, highlighting the importance of risk management for this sector and explaining why so few cattle are traded on the cash market (see Section 3.2.3 Feedlot Viability – Profit Margins and Table 12). Average total feedlot costs per one hundred pounds of gain increased 10 per cent between 2012-2016 and 2017-2021 in nominal dollars, but only two per cent when deflated. High year-over-year variability is an important consideration in long-term profitability, as in 2021, feedlot costs were 24 per cent higher than 2020, as drought conditions reduced feed supplies in western Canada.

Considering Consumer Resilience, the Domestic Retail Beef Demand Index was at 120 (Index 2000=100) in 2021, up from the low of 94.7 in 2010. The International Demand Index was at 168 in 2021 and has been increasing since the low of 63.6 in 2009 following the global financial crisis Canadian and international consumers continue to have historically strong levels of demand for grain-fed beef despite food price inflation, reduced purchasing power, and competition from alternative protein options.

Table 1. Benchmark Indicators for the Economic Performance of the Canadian Beef Industry

1. Producer Viability		Nominal \$	Deflated (2013=100)	Nominal \$	Deflated (2013=100)
#1	Long-term Profitability	2012-2016		2017-2021	
	Alberta (\$/cow) (550 lb calf)	\$384	\$375	\$269	\$247
	Ontario (\$/cow) (610 lb calf)	\$215	\$208	\$152	\$139
	Alberta Feedlot (cash) (\$/cwt)	-\$2.42	-\$2.38	-\$5.29	-\$4.62
	AB Feedlot hedgeable (\$/cwt)	-\$5.90	-\$5.73	-\$10.78	-\$9.27
#2	Long-term Cost of Production	2012-2016		2017-2021	
	Alberta Cow/Calf (1200 lb cow) (\$/cow)	\$687	\$673	\$794	\$719
	Ontario Cow/Calf (1500 lb cow) (\$/cow)	\$956	\$939	\$986	\$895
	Alberta Feedlot (\$/cwt)	\$104.70	\$102.86	\$115.52	\$104.54
2. Consumer Resilience		Beef Demand			
#3	Domestic Retail Beef Demand Index (2000=100)	112		118	
#4	International Beef Demand Index (2000=100)	118		141	

Producer Viability

There is significant variability in profitability between operations in the beef industry, within and between sectors (i.e., cow-calf, feedlot, packer), and regionally. For example, in this analysis in 2021, 80 per cent of benchmark cow-calf farms were covering short-term cash costs, 61 per cent were covering medium-term costs (i.e., including depreciation), and 13 per cent were covering long-term costs (i.e., including opportunity costs) (Canfax, 2023). In this case, opportunity costs largely represent unpaid labour and owned land. Notably, in 2021, drought in western Canada negatively affected profit margins due to the shortage of homegrown feed, higher input costs for feed production, and extra expense on purchased feed. In contrast,

in 2020, the percentage of farms covering short, medium, and long-term costs were 87, 74, and 28 per cent respectively (Canfax, 2023).

Cow-calf producers in both eastern and western Canada have seen positive profit margins from since 2013, allowing producers the ability to service debt and build equity. Canada's cow herd expanded by 1.2 per cent from 2016 to 2021, attributed to these more favourable financial realities. Ontario producers have successfully reduced costs of production (in deflated terms) over the last decade, while costs for Alberta producers have increased, largely due to higher hay prices related to drought conditions. Long-term trends indicate continually high hay prices in the west, creating incentives for producers to evaluate alternative options for controlling costs. Producers who experience cash flow difficulties are more likely to change enterprises compared to those who do not (Donnelly, 2015). This highlights the importance of strategies to address cash flow challenges, such as building and maintaining equity, which may support producers' long-term participation in the beef sector.

Higher average cattle prices in the past decade have reduced the number of cows needed to support a family. A 200-head cow herd provided a total annual income of \$90,954 in 2020, which is similar to the Canadian median after-tax income for all families of \$92,400 in the same year (Statistics Canada, 2022c). Despite these recent favourable conditions, only 27.1 per cent of cattle ranching and farming businesses were profitable in 2020, compared to the 53.1 per cent of all businesses in the agriculture, forestry, fishing and hunting sectors being profitable in the same year. Both the agricultural industry and the cattle ranching and farming sub-sector saw a reduction in the percentage of profitable businesses compared to the previous 2016 edition of this Economic Assessment. In comparison, 87.6 per cent of business in the professional, scientific, and technical services sectors, 78.9 per cent of businesses in the construction sectors, and 70.2 per cent of businesses in the mining and quarrying and oil and gas sectors were profitable in 2020 (Statistics Canada, 2022c).

According to the 2021 Census of Agriculture, only five per cent of cow-calf farms had 250 or more beef cows, and 61 per cent of farms had fewer than 47 beef cows (Statistics Canada, 2021a). Therefore, off-farm income is generally required for the survival of small-scale operations where the production and sale of cattle alone cannot economically sustain the operation.

Farm succession in the beef industry is an important consideration for sustainability and is highly dependent on profitability as an unprofitable operation is unlikely be passed down to the next generation. During the succession process, the farm operation must be able to support the older generation exiting the industry as well as the new generation entering the industry. Management styles between generations have the potential to create conflict and reduce the probability for successful succession of the farm operation.

Higher and more volatile input markets have resulted in greater financial risk for cattle producers at all stages, requiring careful business planning and risk management to protect equity against market volatility and disaster situations. On a cash basis, feedlot profits have been consistently negative since 2018. Despite this, feedlot capacity has expanded as feedlot managers use innovative marketing and cost control measures to ensure long-term profitability and compensate for short-term losses.

The capital-intensive nature of the packing plant sub-sector presents significant barriers for new entrants. As a result, there have been no major changes in the number of large Canadian processing plants available to Canadian beef producers in the last five years, and the Canadian meat packing industry is moderately concentrated (i.e., using the Herfindahl-Hirschman Index). U.S. packers continue to play an important role in the competition for Canadian-fed cattle. Between 2005 and 2015, approximately 23.5 per cent of Canadian cattle marketed were slaughtered in the U.S.; this decreased to 19.5 per cent between 2016 and 2021.

To better understand the sector sustainability, it is critical to evaluate the sector's performance, competition, risk, and potential for producers in the beef industry. Table 2 outlines a SWOT (Strengths, Weaknesses, Opportunities, Threats) analysis to guide high-level recommendations for planning long-term economic sustainability. The ability of beef producers to compete for land, labour, and capital is a continued challenge due to smaller profit margins compared to other agricultural sectors. Of note however, leverage is expected to shift towards the cow-calf and feedlot producer in 2023 as overall North American cattle supplies continue to contract. Conversely, packers have had several years of very positive margins, that are expected to be squeezed in the coming years. Packing plants are capital intensive and timing investment with the cattle

cycle is key to their long-term success, an important consideration as investment in this area drives long-term cattle demand regionally.

Table 2. Producer Viability SWOT for Canadian Beef Industry Sustainability

<p>Strengths</p> <ul style="list-style-type: none"> • There are profitable production systems out there, it is about expanding the portion of producers with them (i.e., 5 per cent rule). • Risk management tools and value-added programs are supporting producers across the value chain. • Diversity in operational structures stabilizes incomes. 	<p>Weaknesses</p> <ul style="list-style-type: none"> • Significant inflationary pressures with input costs rising faster than output prices. Cattle price adjustments tend to lag, resulting in periods of negative margins. Larger margins in following periods are needed to offset this risk and attract new and younger entrants. • Volatility in input prices requires producers to use cash reserves, equity, unpaid labour, and alternative income sources in periods of drought, flood, etc. • Significant labour shortages are present in rural areas. Skills available do not match skills required.
<p>Opportunities</p> <ul style="list-style-type: none"> • Improved profitability in recent years has provided an opportunity for producers to rebuild equity. • To increase financial awareness of the cost of production, resulting in more accurate forecasts and results for improved strategic planning. • Appreciating land values have allowed producers easier access to capital to cover short-term losses or for expansion. 	<p>Threats</p> <ul style="list-style-type: none"> • Appreciating land prices are pushing producers out of some regions where there is strong competition from urban expansion or for annual crop use. • Access to risk management tools is not available in all provinces and is unequal between commodities. • Investment levels are too high to have farming as a way of life if profits are sporadic and inconsistent.

Recommendations for long-term producer viability

At the farm level, cow-calf producers should include all costs in their cost of production, not only financial costs. Being aware of the effect of depreciation and opportunity costs allow for a comprehensive quantitative analysis of long-term farm viability and improves producer ability to make informed decisions.

From a policy perspective, risk management resources must be available in all regions and policy that improves access to competitively priced inputs are necessary. Related, increased price transparency and information sharing throughout the supply chain is needed.

Continued research, innovation investment, and knowledge and technology transfer for improved adoption of management practices that decrease per unit cost of production are needed. This should include evaluation of the cost-benefit ratio variability by production system for adoption of recommended management practices.

And finally, from a marketing and competitiveness perspective value-added programs should aim to provide revenue premiums, while reducing the reporting burden for participating producers. Improved data accessibility for costs and returns of value-added beef programs should be made available to producers to better inform their decision-making processes.

Consumer Demand

Current strong domestic and international demand for Canadian beef is supporting cattle prices despite numerous protein alternatives available to consumers. Strong international demand represents an opportunity for the Canadian beef industry in the global market. Having market access to a broad diversity of markets, supporting competition for cuts not traditionally consumed in the domestic market, and maximizing utilization of the carcass value will support Canadian producers and encourage expansion. Some of the market access required to take advantage of this increase in international demand has been attained through trade agreements, providing reliable market access and enhanced ability to compete with other grain-fed beef producers. Work on additional agreements for sustained and diversified access will further help beef producers and the broader value chain remain competitive and sustainable.

Beef continues to be a staple product for North American consumers; substitution away from beef and its retail cuts, and toward other meat products does not appear to be widely observed. Additionally, alternative protein products have struggled to gain traction among Canadian consumers after initially showing promise. Importantly, it is the relative price of beef substitutes that is most critical to consumers. If the price of competing meat products rise by a similar proportion, higher retail beef prices will not largely change consumption. For example, it has been observed that during recessions, beef has historically performed well, trading down within the category (i.e., moving away from middle meats and toward ground beef) when historical price relationships of substitutes is maintained.

Historically, global supplies of beef, pork and poultry increased at a steady rate – reflecting population growth and disposable incomes. Since 2015, however, global supplies of beef, pork and poultry have been stagnant. Global beef production has been impacted by weather (i.e., drought), strong land-use competition for grain production and urban expansion, and higher input costs, all challenging producer viability. As a result, we are seeing global demand for protein outstrip the supply, and interest in alternative proteins is expected to persist to help fill some of the gaps. While per capita consumption of beef is down in many parts of the world, the increasing global population is keeping the total demand for Canadian beef high. Higher income levels in Asia and the Pacific regions, and the desire by this segment of the global population to consume high quality proteins such as beef is expected to increase global demand for all beef products.

Consumer attitudes toward how beef is raised and its impacts on the environment are evolving, and as the consumer drives half the equation for the economic performance of the beef industry, it's vital to pay attention to these shifts and adapt accordingly. Consumers indicate they want beef produced in ways that reduce or offset the greenhouse gases emitted by cattle, though actual consumer willingness to pay is observed to be low (Li et al., 2016). Studies suggest that consumers will pay higher prices for beef products that are perceived to have some attribute that can be internalized by the consumer, either health or taste-related (Lim et al., 2018), but are unwilling to pay more for external benefits, such as a reduction in GHGs (Li et al., 2016). In addition, food safety, real or perceived, related the use of hormones, antibiotics, or other growth promotants are generally not viewed favourably by consumers and work is being done in these areas to maintain consumer confidence (BCRCa, 2021).

It is critical to evaluate the competitiveness and risks from a consumer resilience perspective as the second half of the economic sustainability framework. Table 3 outlines a SWOT analysis to guide high-level recommendations for planning long-term consumer resilience for beef consumption.

Table 3. Consumer Resilience SWOT for Canadian Beef Industry Sustainability

<p>Strengths</p> <ul style="list-style-type: none"> • Current strong domestic and international demand for Canadian beef is supporting cattle prices. • International demand has been supported via market access and trade agreements to reduce tariffs. • Producers and industry have responded to consumer signals by producing beef that is higher quality, priced and sized accordingly with information on preparation. • Consumers have confidence in Canada's beef supply chain, even when faced with food safety concerns. 	<p>Weaknesses</p> <ul style="list-style-type: none"> • Continual improvements must occur in market research to ensure the type of product demanded is the product supplied. • Consumer perceptions regarding livestock production and its effect on the larger ecosystem is generally not favourable. • There is a knowledge gap in how beef is produced and perceived animal welfare.
<p>Opportunities</p> <ul style="list-style-type: none"> • Increased international demand for high-quality grain-fed beef as a source of protein and nutrition, stemming from growing populations with larger disposable incomes. • Continued commitments to transparency and continuous improvements will build public trust and allow consumers to eat beef without guilt. E.g., Guardians of the Grasslands • Continued product innovation to meet consumers' shifting preferences for beef products and attributes by promoting branded programs that encompass all aspects of sustainability. 	<p>Threats</p> <ul style="list-style-type: none"> • Consumers worldwide are currently facing erosion of purchasing power that may encourage a shift to more affordable protein choices. • Longer production cycle for beef, means slower response to changes in input costs. Potential for demand erosion, in price spreads.

Recommendations for long-term consumer resilience

Supporting consumer resilience is vital to the long-term economic sustainability of the beef industry. Continued adaption and responsiveness to consumers' shifting preferences for beef products and attributes will be necessary, as will increased investment in product differentiation and development (e.g., additional processing and value-added options) to enhance the competitiveness of beef as a desirable protein option. There have been strong success cases in niche markets where some have gained widespread supply chain support; in these cases, these markets have a greater likelihood of success in areas of research, efficiency gains, and marketing potential. However, most niche markets still have very little data available to analyze profitability potential and continued research is required in this area to better understand the strategies and potentially adapt them to wider industry use.

1. Introduction

Economic sustainability is defined as the ability of a system to maintain productivity in the face of a major disturbance, as well as shifts in consumer preferences. This definition focuses on the resilience of the industry as a whole and its ability to adapt to changing market conditions.

Canadian beef producers operate within a highly competitive and dynamic market. The Canadian beef supply chain is affected by live cattle and beef supplies in the U.S., as well as demand for Canadian beef globally. The Canadian beef industry was affected by multiple supply and demand shocks in 2020, when COVID19 led to lockdowns in Canada and around the world.

Demand Shocks

In March 2020, retail beef demand surged as restaurants were closed and people were told to stay home. The shift to retail as the primary channel for meat purchases created challenges for utilizing the entire carcass for pork and poultry, but less so for beef. Consumers found that food dollars went a lot further at retail compared to foodservice. Government programs increased consumer savings and spending on food at grocery. Over the subsequent two years, as restrictions were lifted and reinstated in various countries, demand at foodservice has been recovering, although in a stilted and careful fashion. The change in the way consumers purchase meat also changed typical seasonal demand patterns for cuts, and subsequently values and volumes available and sold.

Supply Shock

As a highly perishable product it was necessary that the meat supply chain continue moving. The unknown nature of COVID19 required drastic measures to slow the spread of this new disease and packing plant closures in April and May 2020 resulted in reduced capacity utilization. Physical distancing measures required processing plants to reduce the number of employees in the facility at any given time, which also reduced the number of fed cattle that could be processed. The daily reductions in slaughtered cattle created a backlog of market-ready beef cattle in feedlots and depressed live fed cattle prices. After packing plants re-opened with enhanced safety measures, weekly slaughter in the second half of 2020 was comparable with the second half of 2019. Actual slaughter was 94 per cent of capacity during the second half of both 2019 and 2020 and rose to 97 per cent during the second half of 2021.

During this challenging time, aside from the noted months of adjustment, the resiliency of the Canadian beef supply chain was on full display. Producers were able to maintain supply and transport of fed cattle into processing plants, and the processing plants were able to transition from supplying products to both foodservice and retail industries to only retail beef products. As a result, consumers did not experience any shortage of beef as they did for many other grocery necessities.

Despite appearances at the retail level, the temporary closures at the packing plants during a demand surge created a bottleneck, resulting in increased cutout values and subsequently retail prices. When bottlenecks occur in a supply chain, profits flow to that point until it can be addressed through increased capacity, in this case via more labour or more plants. While the backlog of fed cattle depressed live and rail prices, packing plant margins rose to record high levels, and led to concerns around price transmission fully reflecting the market.

2021 Drought

In 2021, moderate to severe drought extended from northwest Ontario to British Columbia (essentially the entire western half of Canada) impacting 76 per cent of the Canadian cattle herd¹. Provincial assistance programs, focused on cow-calf producers, were announced in August and September 2021 with varying coverage and delivery mechanisms. In Alberta and Saskatchewan payments were based on herd inventories on certain dates.

The drought increased feed costs for primary production. This was amplified by supply chain challenges in the first quarter of 2022 when U.S. corn shipments were delayed, and the Russia-Ukraine war created further uncertainty and price volatility.

The last two years have tested the resilience of the beef supply chain and its ability to adapt to multiple shocks and stressors. And yet it has shown the responsiveness of those within the supply chain to quickly adapt to changing market signals and circumstances.

¹ Extrapolated using Statistics Canada Table 32-10-0130-01 January 1, 2021 inventories and Ontario business, agri-food, and farm data profiles – Northern Ontario Summary (Statistics Canada, 2021a)

2. Methodology Framework

Defining Economic Sustainability in an Agricultural Context

Sustainability in its larger context encompasses economic, environmental, and social aspects. While it is recognized that all three aspects of sustainability must work seamlessly in tandem with one another, they are separated for simplification of analysis. This paper discusses the economic portion of sustainability, while the environmental and social portions are addressed in a complimentary analysis (Canadian Roundtable for Sustainable Beef, 2016a).

Regarding the economic component of sustainability, internal benefits must be equal to or greater than internal costs, prior to any introduction of external costs and benefits. In other words, the beef sector must first be financially viable where producers realize a financial profit, as well as reach an economic equilibrium where marginal benefit equals marginal cost (i.e., revenues that cover long-term costs). Economic sustainability is the ability of a system to maintain productivity despite a major disturbance or slow shifts in consumer preferences (Conway, 1985). Such a definition focuses on the resilience of the industry as a whole and the ability to adapt to changing market conditions.

In terms of estimating the probability and impact of major disturbances in the future, the best proxy is the past, and as such we will be relying primarily on historical evidence in this analysis of how the beef industry might respond to occurrences such as disease outbreak, market shocks, weather impacts, and changing consumer preferences.

A History of Declining Terms of Trade

Commodities tend to experience declining terms of trade where the price received for outputs declines relative to prices paid for inputs (OECD, 2022). This can happen when productivity improvements result in supply increasing faster than demand, leading to declining deflated commodity prices. Declining terms of trade can be addressed in two ways. First, by increasing demand for the commodity (see Section 4, Consumer Resilience); this increase in demand must be greater than any increase in supply to result in higher deflated commodity prices. If the domestic market is mature (i.e., saturated), the next step is the global market.

The second option is for individual producers to reduce cost of production to stay ahead of the declining prices. This is also an area within the direct control of the producer. The Canadian Cow-Calf COP Network reported that in 2021, the top third of participating producers had break-evens 23 per cent lower than the bottom two-thirds with a difference of \$564 per cow in medium-term profits (cash and depreciation). Notably, this is from a profit of \$320 per cow for the top-third compared to a loss of \$244/cow for the bottom third (Canfax, 2023) and there is opportunity for cost control and adjusting cost structures within the industry. Factors such as inflation affects both output and input prices and the rate of change can squeeze margins or amplify them. But as price takers, players within the beef supply chain must focus on costs of production within their control and influence.

A Framework

An operation² must remain financially viable to survive; this will be compromised if the resources necessary for production (e.g., land or animals) are impacted. There are many factors that impact the financial health and well-being of the beef industry, including production efficiency, market access, industry investment, technology adoption, risk management, policy, and regulatory costs. Some of these are supported by data and are measurable, while others are not; however, all these factors are eventually captured one way or another through profitability.

The beef industry has operations of various sizes and structures and producers of various ages that are profitable. One type of operation is not better or worse than another and this diversity in the industry provides a measure of sustainability as each operation handles market shocks differently.

In any market, there must be both a buyer and a seller. Profitability in this analysis simply addresses the producer, or supply side, and consumer demand is the ultimate driver for the long-term development of the cattle industry. Therefore, a sustainable cattle industry must evolve with the consumer market and respond to changes in consumer preferences. Failure to respond to consumer preferences leaves an industry without a market and without a market, an industry will eventually cease to exist.

Continuous Improvement

The beef industry is a small-margin business and producers are not expected to be profitable each year. However, long-term margins must increase with general inflation. Cattle production is cyclical, and a full cattle cycle typically lasts for 10-12 years. Different stages of the cycle and the volatility in commodity prices mean that a sustainable business may experience short-term financial loss while remaining profitable in the long run. The intention is to update this sustainability assessment every five years as using annual data would only capture a snapshot of the cattle cycle and not necessarily reflect long-term profitability. The risk of using a five-year period is comparing the bottom of the cattle cycle when things are profitable, to the top of the cattle cycle when prices are signalling liquidation. In many ways the 2016 Economic Assessment captured prices in 2013 right before the rally in 2014-16; this assessment captures prices that are also on the verge of another rally. In an ideal world, an assessment will be conducted for each cattle cycle, though some cycles can last 13-15 years. As shown in Section 3, Producer Viability, the next cycle must be in full swing to be sure the previous cycle is over, for appropriate analysis to be conducted. Timeliness is then an issue and there is no ideal solution regarding best intervals to report on beef industry economic sustainability.

Continuous improvement requires the ability to constantly adapt to the market conditions in which a producer operates. Responding to higher input costs may require not just productivity improvements but changes in marketing practices to ensure the type of product supplied is the product demanded. Failure to respond to changing consumer preferences can result in a shrinking market share, and reduced consumption.

The five percent rule focuses on incremental improvements in productivity, input costs and output prices that altogether, can provide compounding effects. Given the diversity of production systems, each operation may focus on a different area to optimize profits due to differing trade-offs.

2.1. Approach

This assessment is an update from the 2016 National Beef Sustainability Assessment (NBSA) Economic Assessment (Canadian Roundtable for Sustainable Beef, 2016b) where four indicators were chosen to create an economic benchmark for the Canadian cattle industry and are summarized in Table 4.

There are several contributing factors for each indicator. For example, risk management, price transmission, debt-to-asset ratios and off-farm income all must be accounted for when evaluating profitability. The goal, though, is not to improve risk management programs but to improve profitability.

² For this analysis, the terms operation, enterprise, farm, and ranch are used interchangeably.

Table 4. Indicators for the Economic Assessment of the Canadian Cattle Industry

1. Producer Viability	
Indicator #1	Long-term Profitability in Cow-calf and Feedlot Sector
Indicator #2	Long-term Cost of Production for Cow-calf and Feedlot sector
2. Consumer Resilience	
Indicator #3	Retail Beef Demand Index
Indicator #4	International Beef Demand Index

2.2. Future Research

There are several data gaps that are recommended for future research, including:

- GHG contributions of the beef industry: Only recently has research begun on the net GHG contribution of the beef industry by production system. As research is conducted and academic results are compiled, a better understanding of the different strategies that reduce net GHG emissions and provide a positive cost-benefit relationship to producers, or those that require incentives will become clear. Work is underway with the Alberta AgriSystem Living Lab project that should provide greater understanding of the socio-economic implications of adopting different practices through a Marginal Abatement Cost Curve (MACC).
- Family labour and succession planning: Research is lacking on the need for transparency in qualifying the “perks³” (i.e., compensation) related to beef production. There are also gaps on the choice of the younger generation to re-invest their wages to build equity or to manage them separately. These discussions are highly recommended in succession planning⁴.
- Profitability and productivity unit economics: The challenge of comparing profit per acre for beef cattle versus crops is that it is inherently different land productivity⁵, with cropland typically of higher productivity capabilities. Better understanding beef returns per acre through the COP Network and how it relates to productivity will be key future work.
- Risk management programs: These programs have an impact on economic sustainability as well as the viability of the beef industry. However, due to the myriad of programs available, or not (regional or sector specific), analysis of these programs was not completed.

2.3. Critical Review Panel

Derrell Peel (Oklahoma State University) and Dr. Scott Jeffrey (University of Alberta) have provided a third-party review in addition to the CRSB Science Advisory Committee. They have reviewed the document in its entirety for quality and comprehensiveness of the analysis.

³ Perks refers to the reasons, monetary or other, that encourage a new generation of people to join the Canadian beef industry.

⁴ In years past, producers have typically re-invested their wages back into the farm to pay down debt more quickly. In doing so, quality of life may have been reduced. New entrants to the beef industry may be more hesitant to reduce their quality of life. The fact that the younger generation have choices when it comes to managing the wage received (and receiving a wage vs. unpaid wages) is important in discussions of farm succession.

⁵ The only way to perform an “apples to apples” comparison between beef and crop sectors is to measure on a per acre basis, as crop production cannot be measured on a per head basis.

3. Producer Viability

The modern beef cattle cycle is a biological-economic phenomenon (Gracey, 1981). The Canadian cattle cycle has historically followed in line with the US cycle (Gracey et al., 1995). Economic considerations determine whether the herd will expand or contract. Biology determines the speed of the change. The Canadian cattle cycle has historically been a major driver for prices received, and therefore, profits obtained in the beef industry. As the Canadian cattle and cow inventory increases, supplies out pace demand and processing capabilities, and prices fall. At the other end of the cycle, when the cow herd is at its lowest, there is an under supply of beef to the market and prices for calves, feeders, yearlings and fed cattle rise. Each cattle cycle (low price to low price) is assumed to be 10-12 years, though in practice, timelines vary (Anderson, Robb & Mintert, n.d.). In the last decade, the Canadian beef industry has neither contracted nor expanded (Figure 1), rather it has entered what is being referred to as a “Two Stage Cattle Cycle” (CRS, 2021a). Statistics Canada estimates the Canadian cow herd to be the fifth smallest since 1991, with heifers kept for breeding estimated to be the third lowest since 1987 (Statistics Canada, 2022a). From 2019-2021, cattle supplies increased 1.1 per cent to 12.65 million head (Statistics Canada, 2022a), and during the same period, Canada transitioned from being a net feeder exporter into a net feeder importer, with feedlots expanding bunk capacity (CRS, 2021a). This ultimately supported expansion of the feedlot sector even with overall decreases in the Canadian cow herd.

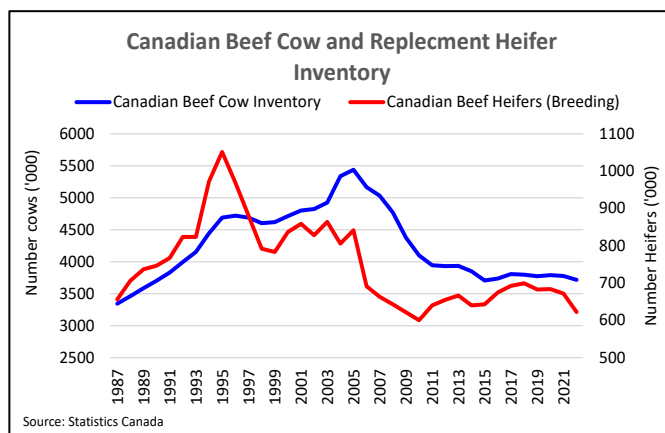


Figure 1: Canadian Beef Cow and Heifer Inventory (July 1)

Producer viability refers to producer’s financial ability and incentive to continue participating as part of the Canadian beef supply chain. Producers get their market signals from several sources including individual auction markets, the CME futures and Canfax (provide voluntary price reporting for cattle by class, week, and province) and input prices.

3.1. Cow-calf Viability

Cow-calf profit margins are difficult to estimate due to the wide variation in production systems and environments where beef is produced. This coast-to-coast variability is highlighted in the Canadian Cow-Calf [COP Network \(Canfax, 2023\)](#). As an example of this variability, in 2021, there were three main scenarios for cow-calf producers due to drought in western Canada (Canfax, 2023):

- Liquidation of herds, which increased short-term revenue, but as some government programs required inventory for payment these producers then faced challenges with cash flow and restocking efforts.
- Purchased feed resulted in increased costs and compensation from government programs occurred for some, but not all producers.
- The use of stockpiled feed and government program payments resulted increased margins.

3.1.1. Cow-Calf Data

The historical cost of production and profit margins analysis is based on the Alberta and Ontario cow-calf profit margins model maintained by Canfax Research Services. This model is based on industry averages from publicly available data in Alberta and Ontario and assumes no participation in risk management programs. While the estimated return is just that, an estimate, the overall trend, and relative magnitude year over year is useful for the purposes of this study.

The cow-calf profit margins model for Alberta and Ontario is based on average costs from weaning to weaning. Therefore, the higher feed costs for the 2021/22 winter feeding season are not accounted for in this economic assessment but will show up in the 2022 calf crop margin. Costs are calculated at market value with homegrown feed at market prices, provincial average pasture rental at \$1 per animal unit per day, and current labour rates. Using market prices, rather than the cost of production, assumes a market value return to land and labour is included in the market price.

Costs included in the Alberta model are hay, barley, supplement, summer grazing, herd depreciation, veterinary services, medications, yardage (fuel, repairs, utilities, taxes, insurance, office expenses, interest, and depreciation), and labour. Costs were estimated for a 1200 lb cow⁶ weaning a 550 lb calf with a 95 per cent reproductive efficiency⁷ and a five per cent death loss. The Ontario model is very similar, using corn fodder in place of barley; while corn silage is the more popular forage choice, the price data are not publicly available and corn fodder is used as a suitable substitute. The Ontario model uses a 1500 lb cow weaning a 610 lb calf. Differences in cow weight and weaned calf weight are reflective of regional differences at the producer-level. The models assume an average Alberta herd size of 250 head and an average Ontario herd size of 75 head. These differences highlight general trends for the sector by region, including historical context given the 25-30 years of data available.

The regional variation in cow-calf margins and international comparisons are sourced from the COP Network. The COP Network adopts the internationally standardised methodology developed by *agri benchmark*, an international network that analyzes “typical” farms, production systems and their profitability (*agri benchmark*, 2023). As of 2022, the COP Network collected production and financial information from 186 cow-calf producers across Canada through online focus groups and generated 46 cow-calf benchmark farms and three dairy-beef benchmark farms. Each benchmark farm is comprised of aggregated data from 3-7 individual farms from the same province and with similar production systems (e.g., winter-feeding practices, calving dates, herd size and retained ownership). These benchmark farms represent different production systems and capture the variation in cost structures that exist, in response to different climatic conditions. For instance, there is a wide variety of winter-feeding practices from traditional confined feeding to year-round grazing and everything in between, generating as many cost estimates. The dataset is available for 2016 to 2021 and provides a snapshot of the economics of benchmark farms and a comparison to farms around the world.

Data Limitations

Economic profit accounts for opportunity costs, which is the foregone opportunity of using any or all those resources in another capacity within the Canadian beef industry⁸. Economic profit is theoretically driven to zero in a competitive market with low barriers to entry or exit. Note that this does not mean zero financial or accounting profit. Financial profit focuses on the performance within a single fiscal year, with long-term investments depreciated over their lifetime. Financial profit provides an intermediate view of the viability of the business. Financial losses from one year may not permanently harm the business, but consecutive years of losses where net income is insufficient to cover living expenses may jeopardize the viability of the operation (Johanns & Hofstrand, 2019) Ideally, economic profit would be used in this analysis. However,

⁶ As a reference point – Western cow warm carcass weights for 2021 averaged 740 lbs. Converted to live weight, assuming 50 per cent dressing rate, it converts to 1,480 lbs. At 60 per cent, the live weight would be 1,336 lbs. Similarly, Ontario cow warm carcass weights were 668 lbs; converts to 1,348 lbs at 50 per cent and 1,113 lbs at 60 per cent.

⁷ Reproductive efficiency = calves weaned per cow wintered.

⁸ Opportunity costs can be financial, natural, or labour resources. The foregone opportunity of using any or all those resources in another capacity to be engaged in the Canadian beef industry.

Table 5 shows that neither the *COP Network* data nor the *Canfax cow-calf return model for Alberta and Ontario* accounts for all requirements of economic profit. Hence, both economic and financial profit datasets are used.

Table 5. Sustainable Profits

Financial Profit	Economic Profit
Generally Accepted Accounting Principles (GAAP) for financial reporting. Accrual adjusted revenue and expenses; interest is the cash and accrual interest paid. Profit measures are pre-income tax and do not include land appreciation.	
Raised feed is valued at cost of production (<i>COP Network</i>).	Raised feed is valued at market value (<i>Canfax Alberta/Ontario Models based on averages</i>).
Breeding stock replacement costs are depreciated using a reasonable lifespan and salvage value.	
Labour and management, if unpaid, is valued at the opportunity cost of what the individual could earn elsewhere (<i>COP Network, all labour is paid in the Canfax Alberta/Ontario Models</i>)	
	Opportunity cost on land (e.g., cash lease minus property tax and maintenance cost covered in a cash lease) (<i>COP Network</i>)
	Opportunity cost on capital (e.g., return expected on the next most profitable return on investment with similar risk) (<i>COP Network</i>)

3.1.2. Cost of Production

Cow-calf inputs increased substantially in 2021, with costs for feed, fuel and labour all rising in the last five years (Table 6). Lethbridge barley prices ranged between \$280-445 per tonne, with the 2021 average price 65 per cent higher than the five-year average. Alberta hay prices ranged between \$131-256 per ton in 2021. The cost for hay was 32 per cent higher than the five-year average. Costs for fuel and labour vary by region, with fuel in Ontario 55 per cent higher and labour 210 per cent higher than Alberta.

Table 6. Fuel and Labour Costs by Region (2021)

	Fuel (\$/100 L)			Labour (\$/cow)		
	2011	2016	2021	2011	2016	2021
Alberta	18.14	16.68	18.39	45.86	52.59	58.36
Ontario	29.46	26.60	28.45	142.24	176.49	180.81

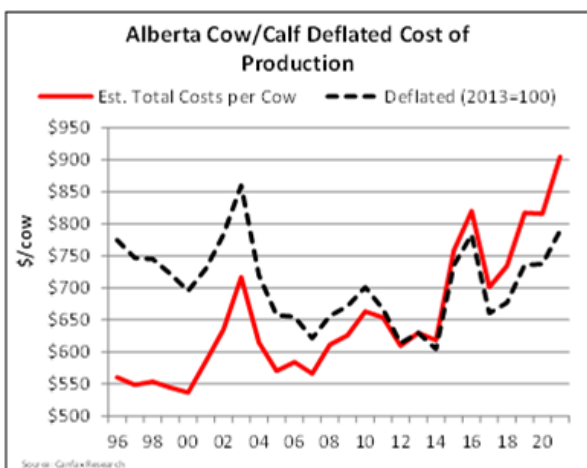


Figure 2. Alberta Cow/calf Cost of Production

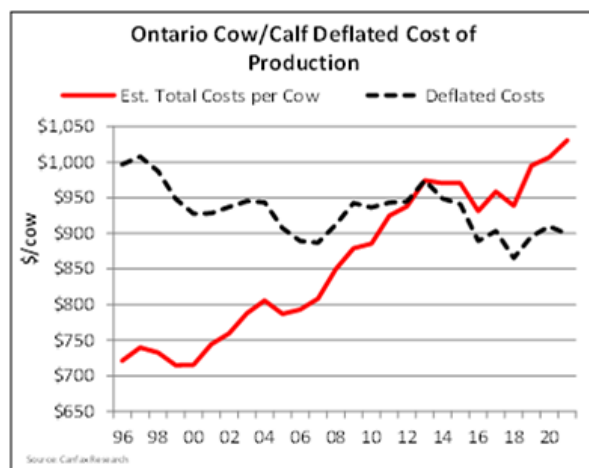


Figure 3. Ontario Cow/calf Cost of Production

Nominal per unit cost of production⁹ has fluctuated depending on the year, but there is an overall increase in per unit cost of production from 2010-2020 in both regions (Figure 2 and Figure 3). The average cost of

⁹ An increase in input levels is assumed to result in an increase cost of production. Deflating costs shows the variation in input costs eliminates the change of the cost of the input due to inflation.

production for a 1200 lb cow in Alberta increased 16 per cent on a nominal basis between the two five-year timeframes for this current analysis; when COP is deflated (2013=100), total costs increased by seven per cent between 2012-2016 and 2017-2021. Total costs in Alberta jumped 19-20 per cent or \$167-202 per cow for the 2022 calf crop (born in 2021) to \$1,072 per 1200 lb cow. This is well up from the five-year average of \$794 per 1200 lb cow. Total costs of production for a 1500 lb cow in Ontario increased three per cent during the same two time periods, as shown in Table 7. Deflated costs declined five per cent in Ontario when comparing five-year averages. High input costs between 2019-2021 greatly increased the nominal cost of production. Deflated cost of production had been declining overall between 1990-2021, though, again, there were increases. Deflated cow-calf cost of production has begun to increase since 2017 in Alberta, while Ontario has seen deflated costs continue to decline.

Table 7. Per Unit Cost of Production, \$/cow

	1990s	2000s	2012-2016	2017-2021
Alberta nominal (1200 lb cow) weaning 550 lb calf	\$503.04	\$604.50	\$687.06	\$794.45
Alberta deflated to 2013 constant dollars ¹⁰	\$713.38	\$704.87	\$673.15	\$719.87
Ontario nominal (1500 lb cow) weaning 610 lb calf	N/A	\$792.90	\$956.73	\$985.76
Ontario deflated to 2013 constant dollars ¹¹	N/A	\$921.88	\$939.42	\$894.60

Regional differences are present for total costs per cow and for breakeven prices. In 2021, a cow weighing 1200 lbs and weaning a 550 lb calf in Alberta had a total cost of \$904. The breakeven price for her calf was \$1.73 per lb. A 1500 lb cow in Ontario weaning a 550 lb calf was \$1031. The breakeven price for her calf was \$1.87 per lb. Western cows had lower breakeven prices, largely attributed to lower labour costs.

As the increase in costs for the 2022 calf crop came entirely from winter feed costs for both regions, longer-term hay prices and forage availability are critical to assessing the competitiveness of the cow-calf sector. Alberta hay prices peaked in May 2022 at \$287 per ton and have started to drop in Fall/Winter 2022 and into early 2023. However, as producers replenish their stockpiled feed supplies, there may be limited supplies for those in dry regions looking to purchase any shortfall. Following the 2002 drought in Alberta, hay prices declined 12 per cent in 2003 and another 30 per cent in 2004, to be back at 2000 levels. Therefore, we can expect hay prices to drop over the next 24 months if production is near average or higher. Drought conditions in the U.S. in 2022 is expected to keep demand for hay strong in 2023 (Livestock Marketing Information Center, 2023). The long-term trend is for increasing hay prices, creating an incentive for producers to evaluate alternative options.

In 2022, Alberta breakeven prices for a 1200 lb cow assuming a 550 lb calf would be \$2.05 per lb and for a 1200 lb cow with a 650 lb calf would be \$1.74 per lb. Breakeven prices in Ontario, assuming a 1500 lb cow are projected to be \$2.04 per lb, weaning a 550 lb calf and \$1.73 per lb weaning a 650 lb calf. Weaning weights are averaged over both steers and heifers for Alberta and Ontario.

3.1.3. Profit Margins

From 2017-2021, average nominal Alberta cow-calf profit margins were \$269 per 1200 lb cow weaning a 550 lb calf (Table 8) and \$305 per 1500 lb cow, weaning a 650 lb calf, with a steady decline since 2017. During the same time frame, a 1500 lb cow in Ontario had an average net profit of \$146 if a 575 lb calf was weaned and \$152 if a 610 lb calf was weaned (Table 8). Significant equity should have been built up on cow-calf operations in both the east and the west regions over the last five years.

¹⁰ Alberta cost of production has been deflated to remove the variability in prices over time. Only the variability in input levels changes. This will be assumed for the tables referencing 'deflated to constant dollars' going forward.

¹¹ Ontario cost of production has been deflated to remove the variability in prices over time. Only the variability in input levels changes. This will be assumed for the tables referencing 'deflated to constant dollars' going forward.

Table 8. Long-term Profit/Loss, \$/cow

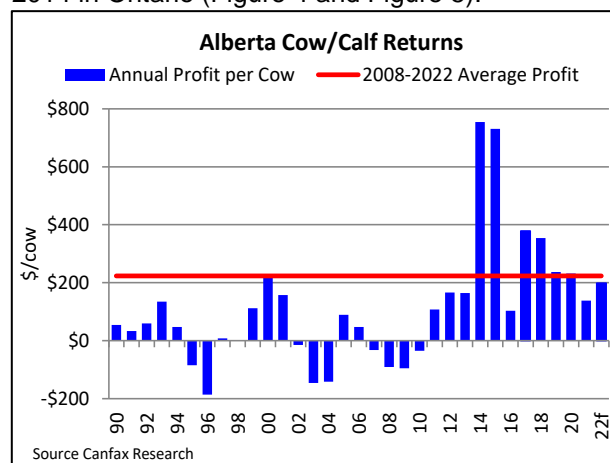
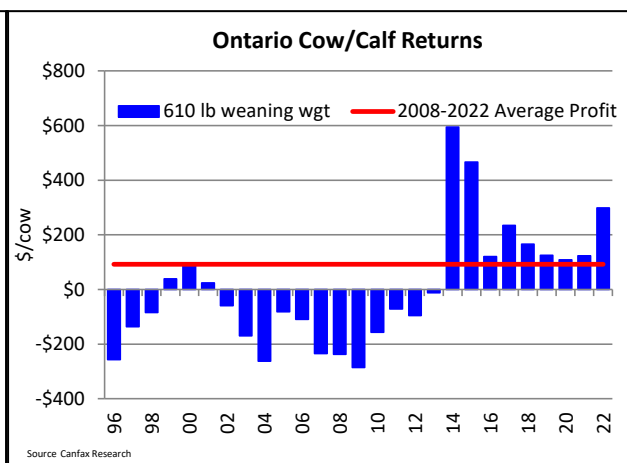
\$/cow	1990s	2000s	2012-2016	2017-2021
Alberta nominal (550 lb calf)	17.83	-0.27	383.73	269.36
Alberta deflated to 2013 dollars	26.82	4.83	375.19	246.60
Ontario nominal (610 lb calf)	N/A	-132.20	214.56	151.56
Ontario deflated to 2013 dollars	N/A	-146.74	207.82	138.54

Revenue realized by Alberta cow-calf producers in the last five years (2017-2021) of \$1,000-1,100 per 1,200 lb cow and \$1,100-1,200 per 1,500 lb cow is steady with the previous five-year average (2012-2016). The model assumes no risk management and calf prices are based on cash sales each fall. Producers using Livestock Price Insurance in the spring of 2022 could have put in a floor price covering cost of production and leaving the upside of the market open (Livestock Price Insurance, 2023).

Ontario cow-calf producer revenue for 2017-2021 was slightly higher than their Western counterparts, in the range of \$1,100-1,200 per 1,500 lb cow. Ontario producers had a higher variation in revenue in the previous five years (2012-2016), at \$800-1,600 per cow. On average, Ontario producers saw a 30 per cent drop in annual per cow profit margins from 2017-2021 compared to 2012-2016. Ontario producers did not have Livestock Price Insurance as a risk management option.

For the past five years, Ontario cow-calf profit margins were \$146 per 1500 lb cow weaning a 575 lb calf and \$152 per 1500 lb cow weaning a 610 lb calf. For 2022, profit margins are projected at \$225 for a 575 lb calf and \$261 for a 610 lb calf.

On average, financial losses have not been seen in the cow-calf sector since 2011 in Alberta and since 2014 in Ontario (Figure 4 and Figure 5).

**Figure 4: Alberta Cow/calf Profit Margins****Figure 5: Ontario Cow/calf Profit Margins**

Producer Viability

The cattle cycle is typically assumed to average ten years between highest profits to highest profits, though rarely is this the case, as it was earlier noted that the cattle cycle can last up to 15 years (Gracey, 1981). This requires a longer timeframe to measure farm profits on beef operations. Canfax Alberta Cow-calf Profit Margins (Figure 4) show a 9-year average profit of \$224 per cow. The long-term average profit from a 250 head cow herd¹² was \$26,413 with paid labour of \$14,370^{13,14} for a return of \$40,783 (nominal, excludes government program payments). This is above Statistics Canada's low-income cut-off of \$27,284 for rural

¹² 84 per cent of cows are in herds with 122 head or less (Statistics Canada, 2021a).

¹³ This assumes all profits go to the family and are not re-invested in the operation.

¹⁴ Labour is paid for services rendered, regardless of who is getting paid (employee, owner, spouse, offspring, etc.). For small operations, family members do not always receive a monetary wage.

areas in 2020 (family of four, Statistics Canada, 2022b). Notably, historically high profits in 2014-2015 in the cow-calf sector were required to shift this long-term average to the level that exceeded the low-income cut-off level. Overall, the latest cattle cycle appears to indicate that an operation of 250 beef cows can support a family of four in Alberta.

The 2021 Census of Agriculture determined that 15 per cent of beef farms reported gross incomes of \$25,000 or less (Statistics Canada, 2021a). Using the Alberta average price for 550 lb calves from August to November¹⁵, a farm grossing \$25,000, would average a herd size of 24 beef cows in 2021. A 200 head cow herd provided a total income¹⁶ of \$90,954 annually in 2020, which is close to the \$92,400 Canadian median after tax income for all families for the same year (Statistics Canada, 2022d). The higher profit margins realized by cow-calf producers has reduced the number of cows required to support a family, though these higher profit margins are not sufficient to fully support the smallest producers. Expansion by the smallest farms has also not occurred in the last five years, despite higher profit margins, as 61 per cent of farms had 47 cows or fewer. This is identical to the 2016 Census of Agriculture (Statistics Canada, 2016). Therefore, for most beef producers, alternative income sources (e.g., other commodities or off-farm jobs) are required.

Variation in Cow-Calf Margins

Data from the COP Network indicates that in 2021, 37 of the 46 benchmark cow-calf farms (80 per cent) were covering short-term costs (i.e., cash costs) (Figure 6); 28 farms (61 per cent) were covering medium-term costs (i.e., including depreciation) (Figure 7); and six farms (13 per cent) were covering long-term costs (i.e., including opportunity costs) (Figure 8) (Canfax, 2023). It is important to keep in mind that in 2021 drought in western Canada negatively affected profit margins due to the shortage of homegrown feed, higher feed costs, and extra expense on purchased feed. For comparison, in 2020, the percentage of farms covering short, medium, and long-term costs was 87 per cent, 74 per cent and 28 per cent, respectively.

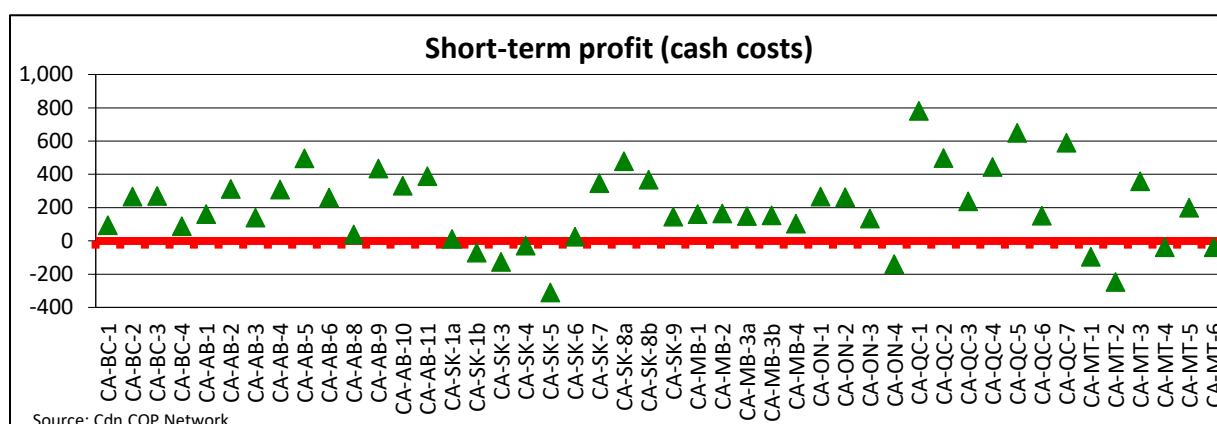


Figure 6: Short-term Profit Margins, Canadian Cow-calf Cost of Production Network

¹⁵ Prices for all weight classes of calves and yearlings are collected continuously by Canfax staff from all auction marts in Alberta to provide a weekly and monthly average of current prices, on a per hundred weight basis. Monthly average prices during the typical "fall run" (i.e., August to November) are used in this analysis.

¹⁶ Income is from from paid labour and profit margin on the cows.

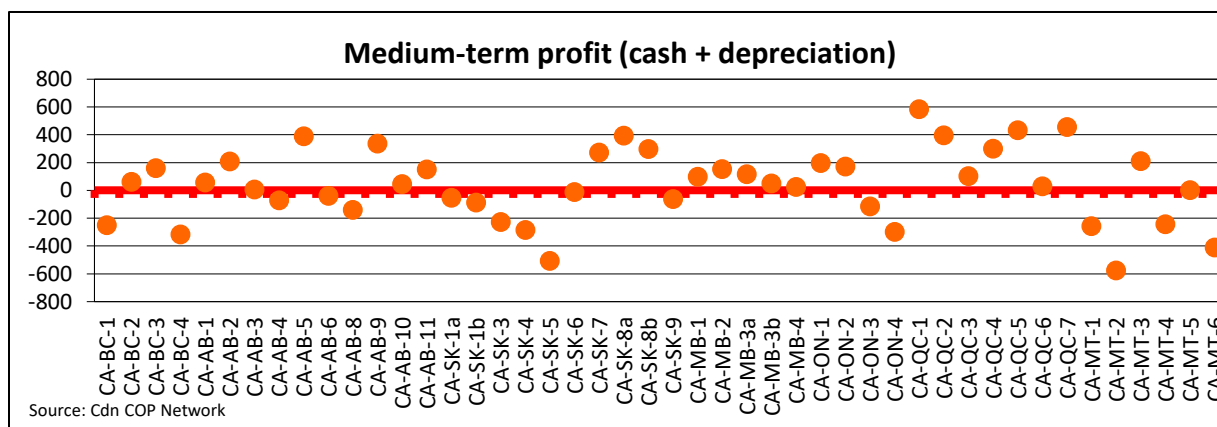


Figure 7: Medium-term Profit Margins, Canadian Cow-calf Cost of Production Network

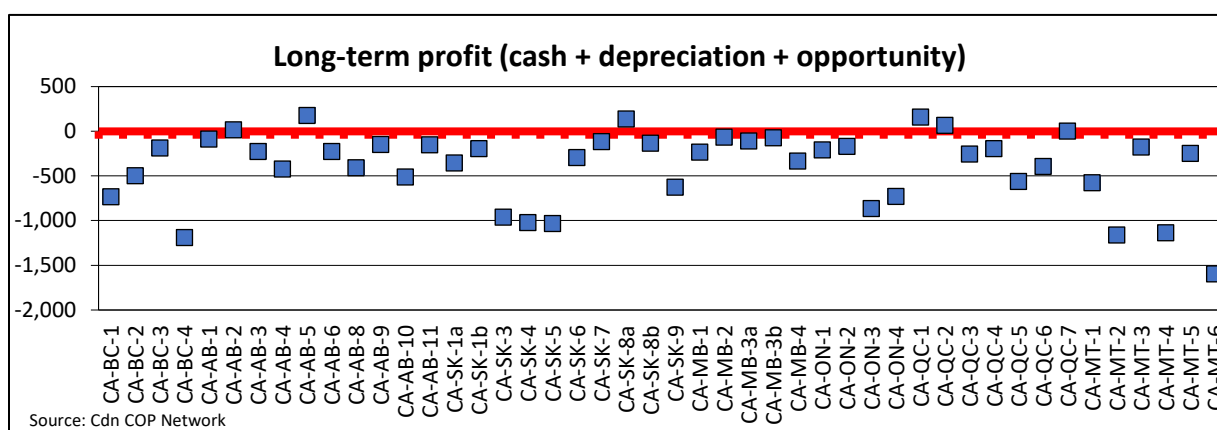


Figure 8. 2021 Long-term Profit Margins, Canadian Cow-calf Cost of Production Network

On average, cash costs accounted for 61 per cent of total production costs, depreciation accounted for 11 per cent and opportunity cost accounted for 28 per cent in 2021. In the context of cow-calf production, opportunity costs are the costs of devoting (unpaid) labour, land¹⁷, and capital to cow-calf production instead of other uses (e.g., an off-farm job, rental value and potential returns from alternative investments).

Unpaid labour can be considered a “flexibility” born out of necessity to increase cash flow in volatile markets and uncertain weather conditions, where owner-operators take only as much as they need to live and reinvest the rest of their “salary” back in the business. This means they may be “paid” less in negative margin years and paid more in profitable years. It is this flexibility that has contributed to the long-term stability of agricultural production. It should be remembered that many cow-calf operations have living expenses covered by the operation (i.e., utilities, fuel for vehicles, etc.). It is very difficult to separate accounting and value these “perks”; however, these are a very real component of the unpaid labour that is covered (Forsythe, 2021). Hence, operators are compensated even if a cheque is not written. The ability to cover unpaid labour, either through off-farm income or diversification of on-farm commodities, is frowned upon by those wishing to quantify costs (i.e., accountants and economists). These practices are potentially not as accepted by younger producers who are more focused on financial profitability rather than the general lifestyle of farming. For this reason, creating transparency in what the “perks” are (i.e., compensation) and being clear that the younger generation has the choice to re-invest their wage to build equity or manage it separately is highly recommended in succession planning.

¹⁷ Land rent is valued using the Alberta Custom Rate Survey – Pastureland Lease and Rental, using 2019 as a base year and averaged across all regions (Government of Alberta, 2020).

Cash flow challenges can also deter the entrance of new producers. Most operations receive revenue only a few times each year (fall sale run for calves, late summer to early fall for crops), and must manage their revenue in a manner that extends to the next production season. While each situation is different, all cash flow challenges can be placed into one of two categories: short-term or long-term, each with their own set of strategies to improve the situation (Gamble, 2018). Farm cash receipts in 2022 are estimated to increase 14.1% over 2021 (Gervais, 2023). Despite the improvement in farm cash receipts, cash flow issues during the low revenue portion of the year can place financial stress on the farm operation. Research from Ireland found several solutions to alleviate cash flow issues, including the use of overdraft, the use of personal savings, reducing living expenses, selling livestock earlier than planned, delay maintenance of equipment and buildings, delay paying bills, and extending merchant credit (Donnelly, 2015). Producers who experience cash flow difficulties are more likely to change enterprises than those who do not (Donnelly, 2015). This highlights the importance of building and maintaining equity, such as savings or assets (i.e., land) that can support producers staying in the beef sector long-term.

Opportunity costs on land is the income foregone by not renting the land out. To be economically sustainable, an operation should generate enough return to justify keeping the land in the current business. Rental rates and land prices tend to move together over time. With average Canadian farmland value increasing 63 per cent from 2011 to 2020, the opportunity cost on land is on the rise (see Section 3.1.6., Debt and Land Value). Cow-calf operations are challenged by the increased competition for land from the crop sector and investment purposes, especially for operations located near large urban areas where urban expansion could raise farmland values beyond the point at which farmers can justify keeping the land for cattle production.

3.1.4. Economies of Scale

Economies of scale are present in the Canadian cow-calf industry, just as economies of scale are present in all other industries. As herd size increases, the fixed costs are spread over more units and costs per head decrease. The COP Network determined that total costs per cow declined from a range of \$1200-1950 per head on farms with less than 100 head to a range of \$700-1300 per head on farms with over 200 head. As herd size doubled, total costs per cow, of which fixed costs are included, decreased by approximately 33-42 per cent (BCRC, 2021b).

Table 9. Viable Herd Size

	1990s	2000s	2011-2015	2016-2020
CDN Median family income	\$39,800	\$60,142	\$76,628	\$87,556
Alberta viable herd size (head)	1,484	12,439	203	363
Ontario viable herd size (head)	N/A	N/A	450	625

Though regional differences within Canada exist, cow-calf producers have seen positive profit margins for the last 8-11 years. Higher profits in 2014 and 2015 allowed the viable herd size to be reduced to 135 cows in Alberta and 153 cows in Ontario for those two years. Increases in the cost of living and a higher standard of living has increased the viable herd size in both regions since. An average viable herd size, that would support a family with no other income source, for the last five years was estimated to be 363 cows in Alberta and 625 cows in Ontario (Table 9).

3.1.5. Off-Farm Income

Figure 9, below, shows some of the dynamics within the beef and grain and oilseeds sectors since 2005. In the last five years the grains¹⁸ and beef sectors saw an increase in off-farm income dependency. In the grains sector, off-farm income as a proportion of total income rose from 45 per cent in 2014 to 58 per cent in 2019 (Statistics Canada, 2022d). Previously, off-farm income dependency for this sector declined from 2005-2013. Likewise, off-farm income in the beef sector, including feedlots, rose from 71 per cent in 2014

¹⁸ Includes grains and oilseeds, here and going forward when text references 'grains'.

to 84 per cent in 2019. This is the highest level of off-farm income dependency recorded for the beef sector within the available data. Off-farm income in 2019 as a proportion of total income is at the same level as during the 2003 Bovine Spongiform Encephalopathy (BSE) crisis.

Total income for the grains sector declined 16 per cent from 2014-2019, while off-farm income only increased eight per cent from 2014-2019. The beef sector saw total income decline by 10 per cent, and off-farm income increase by seven per cent during the same period. Neither sector saw a linear increase in off-farm income.

When comparing off-farm dependency levels between sectors and across timeframes, an interesting observation is made. Between 2005 and 2013, off-farm income as a proportion of total income averaged 49 per cent for the grains sector and 81 per cent for the beef sector, including feedlots. Between 2014 and 2019, off-farm income as a proportion of total income rose to an average of 52 per cent for the grains sector and fell to 77 per cent for the beef sector. Record high prices for all classes of cattle in 2014 and 2015 contributed to this decline in the proportion of off-farm income for beef producers, while depressed cash crop prices in 2015 increased the proportion of off-farm income for the grains sector. When looking at the data year-over-year, both agricultural sectors are seeing a higher proportion of total income from off-farm income.

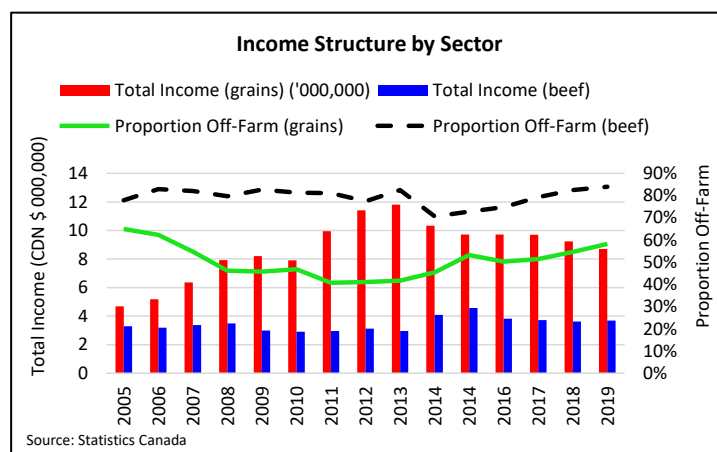


Figure 9. Proportion of Off-Farm Income by Sector

3.1.6. Debt and Land Values

Profits reported in the previous sections are prior to paying interest on debt. Profits are required to pay down long-term loans and to reduce debt load. In some cases, other sources of income or the sale of assets are being used to aid in reducing debt load (see Section 3.1.5, Off-Farm Income section).

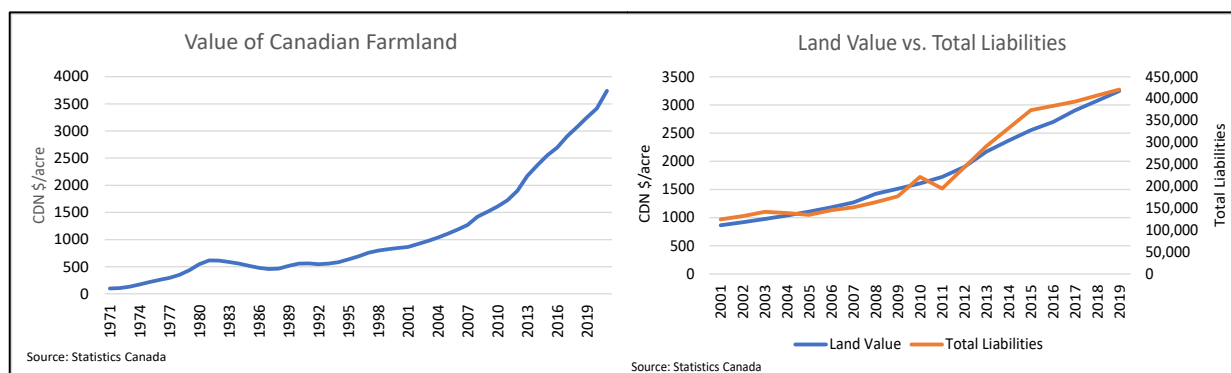


Figure 10: Average Canadian Farmland Value, Statistics Canada

Figure 11: Average Land Value vs. Total Liabilities, Statistics Canada

Average land values were \$1239 per acre from 2001-2010 (Figure 10). Average land values increased 63 per cent to \$2,016 per acre from 2011 to 2020. Though the increase in land value is primarily driven by the cash crop and dairy industries, rather than the beef industry, value is gained by evaluating land prices. Equity derived from either paying down debts or from an increase in land values enables producers to service debts during periods of short-term financial losses. The debt-to-equity ratio has remained constant

at 84-85 per cent from 2009 to 2019, and consistent with 2001 to 2013, when the range was 82-85 per cent (Figure 11). A significant change in a producers' equity level through a decrease in land values would result in the inability to obtain capital for day-to-day operations and force a reduction in herd size. Herd size reductions would further stress farm profitability.

3.1.7. Cow-calf Competitiveness

Producers aim to maximize returns on investment. This means investing in land, labour, and capital to obtain optimal profits. In the last ten years, the cow-calf sector has seen profit margins well above historical averages, while profit margins in the finishing sector have been inconsistent, at best. The 2021 Census of Agriculture verified producer movement into profitable sectors, as 43,834 more cows were counted on Canadian beef farms in 2021 than in 2016 (Statistics Canada, 2021a). Canadian beef producers must also compete with other agricultural commodities for access to scarce resources like land, labour, and capital. Productivity gains in all sub-sectors of the beef industry are necessary for Canada to maintain competitiveness on a global scale, due to Canada's export dependency for beef.

Higher opportunity cost on land also means higher cost of renting land in the future, which could be a barrier for operations that need to expand their herd size to capture economies of scale. Higher land cost means producers will need to focus on increasing profits on a per acre basis. The main issue of comparing profit per acre for beef cattle to crop production is that cropland is typically capable of much higher productivity levels than pasture.

As land value appreciates some older producers may be looking to sell land for their retirement fund. When the prices of farmland, especially those near urban areas, increase beyond what a cow-calf producer can afford, the land is more likely to be sold to developers. Once land is subdivided and developed, the asphalt, buildings and the leftover patchwork of small, undeveloped parcels mean any return to large-scale farming is unlikely. This is seen most in B.C. and eastern Canada where urban sprawl is most pressing (Canfax, 2023). A consideration that are not always accounted for in agricultural vs. urban land valuation is that land development entails a loss of green space and reduces the natural recycling of carbon dioxide (Statistics Canada, 2006).

Other Commodities

The cattle sector continues to see smaller profit margins compared to the crop sector, as field crops are used by the beef sector as inputs. High priced crops used as inputs by the beef sector are not necessarily linked to higher prices at sale time. Thus, beef producers are negatively exposed to higher cash crop prices. According to the Expense to Receipts ratio from Statistics Canada (2023b), the ratio for beef dropped to 90 per cent in 2015, before rising to historical levels of 94 per cent in 2020 (Figure 12). Grain and oilseed producers saw an overall decline in their long-term Expense to Receipts ratio trend, though the ratio rose to 79 per cent in 2015, before dropping to 76 per cent in 2020.

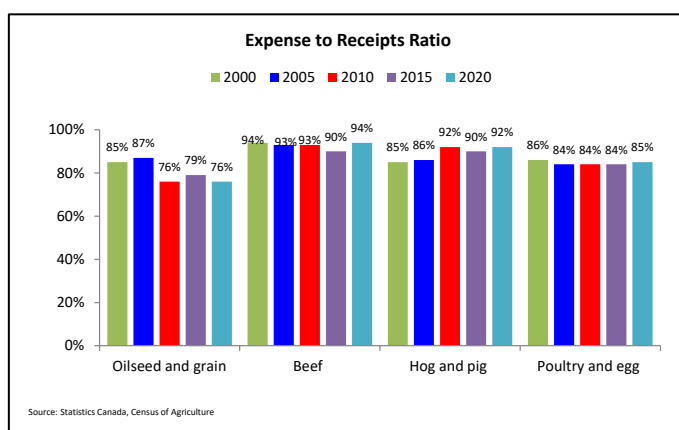


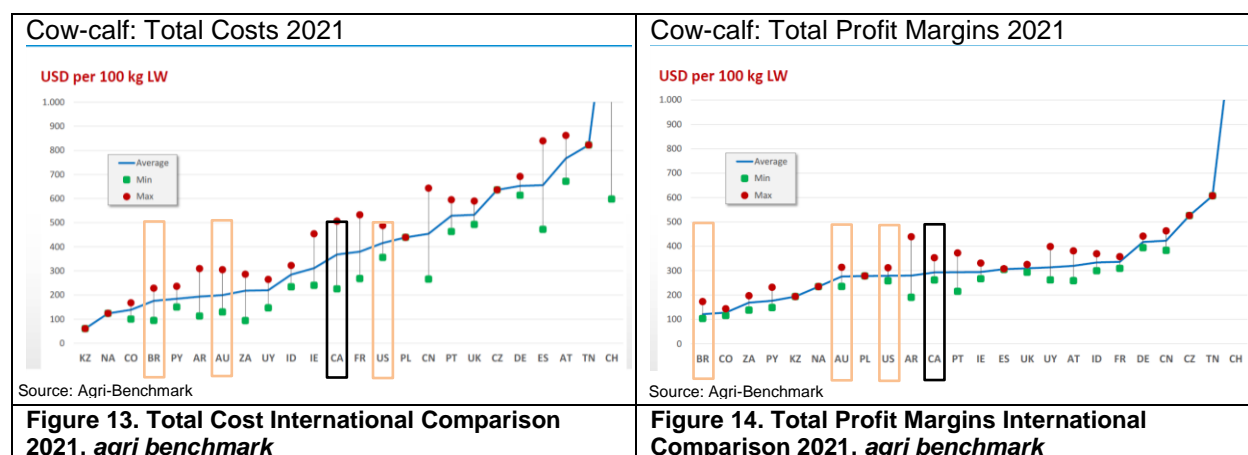
Figure 12. Statistics Canada, Expense to Receipts Ratio

The ability of beef producers to compete for land, labour and capital continues to be a challenge for this sector as smaller profit margins compared to other agricultural sectors continue to hinder beef farmers. Differences in the structure and availability of risk management programs between agricultural sectors also continues to negatively affect the ability of beef producers to compete for scarce land, labour, and capital resources.

International Comparison

International comparison based on the *agri benchmark* data show Canada is in line with other major beef producing countries. The Canadian average cow-calf cost of production based on six selected benchmark farms¹⁹ ranked 12th out of 24 countries²⁰ (Figure 13), while total profit margins ranked 11th out of 24 (Figure 14). Compared to other major beef exporting countries, Canada has similar costs and net margins to the U.S., higher costs compared to Brazil and Australia, and higher net margins compared to Australia, and Brazil. The differences are driven by climate, production systems and inputs (e.g., feed, machinery, building, labour, land). It should be noted that the *agri benchmark* data utilizes the “typical” farm approach and contains only a small sample for each country and may not be entirely representative due to producer self-selection.

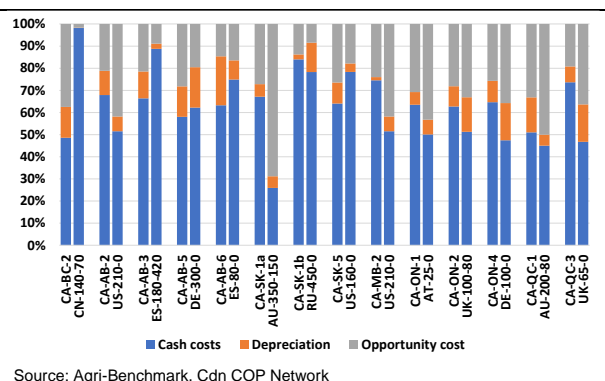
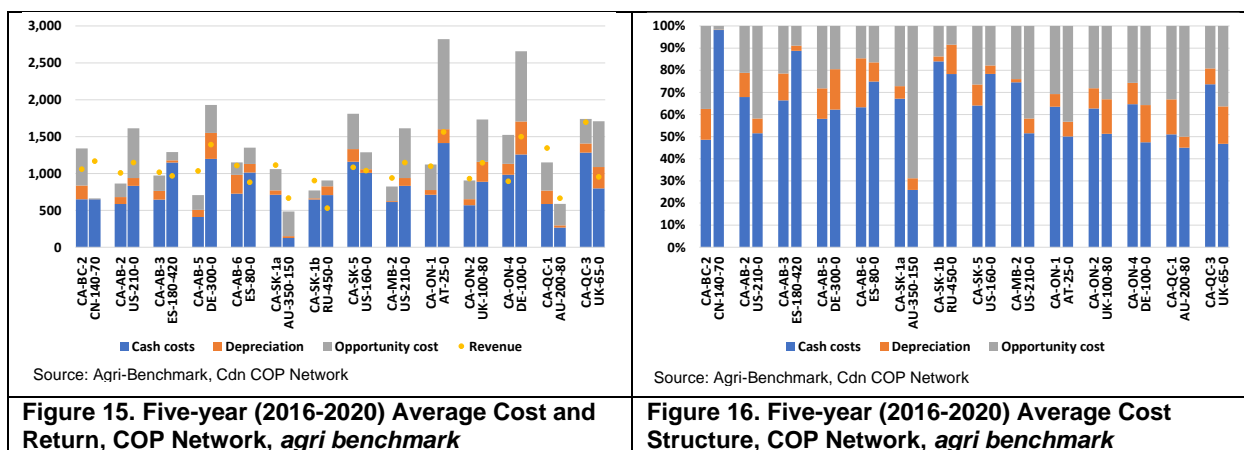
While the international comparison is based on a small sample from each country, it shows that like Canada, only a portion of the benchmark farms in other countries are covering their long-term costs.



Comparisons of the five-year (2016-2020) average cost and profit margins of 14 Canadian benchmark farms and international benchmark farms with similar farm enterprises, herd size, and selected performance metrics are shown in Figure 15 and Figure 16. Like Canada, 10 out of the 14, or 71 per cent of benchmark farms in other countries were covering short-term costs, while about half were covering medium-term costs and about one-fifth were covering long-term costs. Cash costs represent the majority of total production costs for most of the farms, with the exception of benchmark farms in the U.S., Australia, Austria and the U.K. Benchmark farms in these countries appeared to have a larger proportion of opportunity costs, which could be due to differences in unpaid labour hours, wages, and land value. For the benchmark farms in the U.S., land accounts for an average of 54% of total opportunity costs followed by labour (38%) and capital (8%). Similarly in Australia, the major opportunity costs are on land (57%) and labour (32%) while capital accounts for 11%. For the Australia benchmark farm, the major opportunity costs are on labour (80%) followed by land (11%) and capital (9%). In the U.K. benchmark farms show 75% of opportunity costs on labour followed by land (22%) and capital (2%).

¹⁹ Farm selections are limited to cow-calf only operations without a backgrounding enterprise and based on representative of major cattle production region in Canada.

²⁰ Country names: KZ Kazakhstan, NA Namibia, CO Colombia, BR Brazil, PY Paraguay, AR Argentina, ZA South Africa, UY Uruguay, ID Indonesia, IE Ireland, CA Canada, FR France, US United States of America, PL Poland, CN China, PT Portugal, UK United Kingdom, CZ Czechia, DE Germany, ES Spain, AT Austria, TN Tunisia, CH Switzerland.



3.2. Feedlot Viability

3.2.1. Feedlot Data

The data for feedlot profit margins and per unit cost of production is sourced from Alberta, as this province represents 70 per cent of feedlot production. Data are sourced from both *agri benchmark*, as noted in the cow-calf section, and the Canfax monthly TRENDS report for yearling steers. Costs for the analysis include feeder cattle, feed, transportation, vet and medicine, interest, overhead, and death loss.

Long-term margins are available and calculated based on cash and hedgeable price. Hedgeable margins are calculated from the Chicago Mercantile Exchange (CME) live cattle futures, exchange rate, and historical five-year average basis and estimated in the month feeder cattle are placed. This is a proxy for forward contracts and is only available for recent years.

In the 2016 NBSA (Canadian Roundtable for Sustainable Beef, 2016b)²¹, it was assumed that feedlots were relatively homogeneous in cost and profit structures. That assumption is no longer valid, as there are greater variations in feed rations and risk management strategies. Since 2009, an increasing number of feedlot producers are utilizing alternative marketing arrangements (AMAs)²².

AMAs operate under three main structures: forward contracts, formula-based pricing, and negotiated grid pricing specifying weekly volume and price structure. At present, forward contracts are the most common method of marketing fed cattle in western Canada. The move to AMAs by feedlots is an effort to manage price risk (Koontz, 2015). Ward (2017) determined that cash markets for fed cattle provide a fair price representation for fed cattle for only small price differences between marketing methods. However, it is possible that a forward contract price be significantly different compared to the cash market at certain points in the cattle cycle due to the differences when they are negotiated.

In addition, grids provide premiums and discounts to each carcass or load of cattle based on carcass quality, weight, volume of sale, or other attributes. Some types of AMAs are not easily accessible by all producers. The USDA Agricultural Marketing Service (2023) has released a list of premiums and discounts that are applied to each carcass²³ through the weekly Cattle Contracts Library Summary. This pilot program is designed to increase the level of transparency of price discovery and price determination for US feedlots. There are also branded program premiums that can be applied, such as Certified Angus Beef or the VBP+

²¹ The data for the 2016 NBSA Economic Assessment utilized a 2013 baseline year.

²² AMA is defined as any possible alternative to the cash market (Koontz, 2022, Taylor et al., 2007).

²³ Information on the premiums and discounts can be found in the USDA Cattle Contracts Library (USDA, 2023).

program. The price received after premiums and discounts are applied can be the difference between making and losing money on a load of cattle.

Data Limitations

Feedlots also utilize risk management strategies for purchasing inputs, such as feeder cattle and feed, to be profitable. Given the complexity of modelling the various options for risk management, this section is a discussion on what is needed for feedlots to be viable in the current market and does not reflect actual practices.

The use of AMAs for fed cattle procured by processors from North American feedlots continues to be a major marketing strategy, as individual producers can capture more value from each animal or group of animals, especially those with value-added traits. However, due to the private nature between feedlot operators and packing plants when negotiating prices for fed cattle, including for value-added attributes (i.e., AAA or Prime grading) and branded programs, AMAs are excluded from this analysis.

Price Discovery

The method of price discovery has changed in the last decade, as seen in Table 10. Cattle exported to the U.S. from Canada are done so under four main price structures: forward contracts, formula pricing, negotiated, and negotiated grid²⁴. The movement of preferred cattle pricing away from negotiated and negotiated grid, and toward forward contracts and formula pricing reflects the ability of both producers and packers to source higher quality cattle that may also be part of a desired branding program. Canadian cattle sourced by U.S. packers through forward contracting doubled on a percentage basis in the last decade.

Table 10. Canadian Fed Cattle Exported to U.S. Marketing Method 2011-2021 (per cent)

Fed Marketing Method	2011	2016	2021
Forward Contract	46	58	92
Formula	18	29	2
Negotiated	15	7	6
Negotiated Grid	21	6	0
Total	100	100	100

Thinning of cash markets has a potential market distortion effect (CRS, 2018). The issue is that fed cattle markets could be distorted to the benefit of the packer and to the detriment of the producer. Smith (2022) conducted research on behalf of the Canadian Cattle Association, the Alberta Beef Producers and the Alberta Cattle Feeders' Association on price discovery and market transparency for fed cattle procured by Canadian packing plants. Smith (2022) found that AMAs allow for a steady supply of cattle, thereby maximizing slaughter utilization, and reducing fixed costs. Other packer benefits included a reduction in costs associated with sourcing cattle and transactions costs (Peel et al., 2020; Koontz & Lawrence, 2010). Ward (2017) found that price differences between AMAs were minimal, short-term, and varied year-to-year. In fact, Ward (2017) found that the time of price discovery relative to delivery time explained most of the difference in price received between AMAs. Also, of importance to this discussion, Ward et al., (2014) found that the relationship between negotiated and formula prices remained stable, even as fed cattle volumes into packing plants declined. The perceived thinning of the market was resolved with mandatory price reporting by U.S. packing plants (Ward et al., 2014). The mandatory price reporting allowed information to flow to all stakeholders in a timely manner, allowing more informative decision-making.

Price discovery of the base product (live slaughter-ready animals) via cash markets is imperative for producers to measure profitability, as well as to determine if the premiums received for value-added programs is worth the price of joining the program. Without timely price discovery mechanisms, producers will be hesitant to change existing production practices. With an increasing thinness in the number of fed

²⁴ Prices for fed cattle going for slaughter are all based on cash prices. Premiums or discounts for quality are then determined. Basis is also a component of forward contracting and formula cattle.

cattle being sold on the cash market (and reported by Canfax) where feedlot producers source the base price for their slaughter-ready cattle, potential issues arise related to price transparency for these same producers. There are concerns among producers that cash markets are kept artificially low so that packers can benefit through less transparent marketing arrangements (Muth et al., 2008). Muth et al., (2008) found that cattle going through US auction marts provided higher margins compared to direct trade, though a higher price risk was present. Ward (2017) compared cash prices received for fed cattle to AMA derived prices for fed cattle to determine if AMAs provide significantly higher margins compared to the cash market; it was found that there is minimal difference between fed cattle cash markets and AMAs.

3.2.2. Cost of Production

Average yearling steer prices and input costs across time provide an indication of the ratio of each cost as a percentage of the entire cost. The proportion of costs (animal purchase cost, feed cost, overhead, vet feeds and other costs) remained steady between the two time periods: 2012-2016 and 2017-2021 (Table 11). Stabilizing annual costs further highlight the relationship between total costs and the cattle cycle.

Table 11. Feedlot Per Unit Cost of Production, \$/cwt

	1990s	2000s	2012-2016	2017-2021
Feedlot (\$/cwt) nominal	60.36	70.37	104.70	115.52
Feedlot (\$/cwt) deflated to 2013 constant dollars	85.63	81.53	102.86	104.54

Production costs have risen slowly, but steadily since 2006 in both nominal and real terms (Figure 17). Prior to this, nominal production costs were increasing, but real production costs were declining.

In 2016, the cost of a yearling steer comprised 72 per cent of the total cost and the cost of feed comprised 19 per cent, where the cost of a yearling steer was \$1354 and feed costs were \$361, for a total of \$1715 per head. In 2021, the cost of a yearling steer was 69 per cent of the total and feed was 23 per cent, where the cost of a feeder was \$1549, and the cost of feed was \$532, for a total of \$2081 per head (Figure 18 shows the five-year average cost breakdown).

As production costs increase and margins narrow or turn negative, feedlot producers look to other avenues to cover their variable costs. Some of these methods can include alternative feeds like dried distillers' grains, risk management for feeder cattle purchases and feed costs, price insurance, hedging, and diversification into other enterprises such as grain or cattle transportation, cash crops, and more.

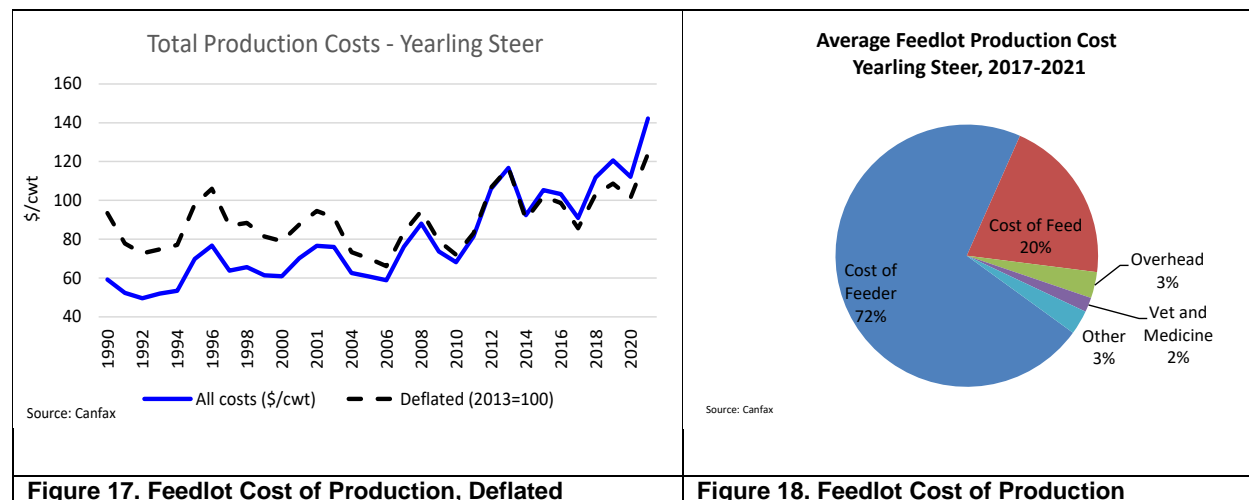


Figure 17. Feedlot Cost of Production, Deflated

Figure 18. Feedlot Cost of Production

Economists typically define risk management in terms of reducing the variation in the net benefits that a new policy is addressing, in comparison to the variation in net benefits from the existing policy. This definition assumes that firms can manage costs and revenues to reduce risk and uncertainty. The Canadian feedlot industry, as a price-taker, lacks the ability to influence the CME futures price, and therefore revenue. As such, risk management in this context is more commonly used to manage down-side risks and costs (feeder price, price of feed, other production practices, etc.), and value-added traits to fed cattle (branding programs, alternative marketing arrangements, etc.)

Boardman et al., 2018; CattleFax, 2022; Canfax Research Services, 2021b

3.2.3. Profit Margins

The last three decades have been characterized by consistently negative margins for the cash market, with only sporadic profits (Table 12). The long-term (1990-2021) margin of a yearling steer provides -\$2.48/cwt. Significant annual losses have been seen in the feedlot sector, especially since 2014. The nominal five-year average shows a net loss of \$5.29/cwt for yearling steers. This indicates that feedlots are unable to cover short-term costs when selling on the cash market. While hedgeable margins (based on the month feeder cattle are placed) provided overall positive margins in the 2000-2010 period, this has not been the case since 2012, indicating that other risk management tools must be utilized for feedlots to be viable. The increased adoption of risk management tools by feedlot operators has also increased the variability in actual feedlot financial performance.

Table 12. Feedlot Long-term Profit/Loss, \$/cwt

\$/cwt	1990s	2000s	2012-2016	2017-2021
Feedlot (cash) nominal	-0.56	-3.95	-2.42	-5.29
Feedlot (deflated cash) (2013=100)	-0.72	-4.71	-2.38	-4.62
Feedlot margin (hedgeable) nominal	N/A	0.69	-5.90	-10.78
Feedlot margin (deflated hedgeable) (2013=100)	N/A	0.66	-5.73	-9.78

Cattle marketed in Canada are predominately sold on a rail (carcass) weight, rather than a live weight basis (CRS, 2014). This shift in market behaviour has rippled through the industry and changed feedlot operators' market signals. The rise in rail pricing has coincided with an increased use of AMAs, as these forms of marketing arrangements benefit both feedlot operators and packing plants. For feedlots, there is consistency in marketing timelines, allowing cattle to be marketed at optimal weights to maximize revenue. Feedlots can also market quality characteristics that may not be prevalent when cattle are sold on a live basis. With rail weight, packers can stipulate quality characteristics and ensure that quality benchmarks are reached. The challenge with rail weight pricing is that these prices are typically not as readily available to producers as are live weights. Despite the challenges of obtaining prices in a timely fashion, there are also benefits to this method of pricing. The most important component of rail pricing is the ability of the packer to grade each carcass for quality attributes and pay accordingly. The annual increases in Prime

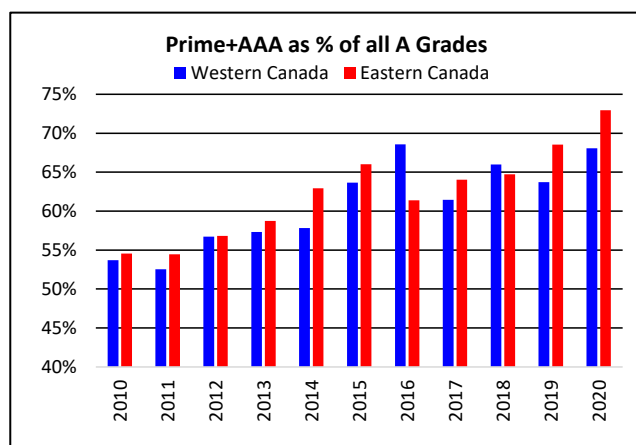


Figure 19: Prime and AAA Quality Carcasses as a Per Cent of All A Grade Carcasses, Regionally

and AAA carcasses is driven by this shift to rail pricing (Figure 19). The bottom line with risk management is that both producers and packers can reduce the variability of the product being traded, in this case, beef, which also happens to be the foundation of risk management (IBM, 2022). At the same time, management of live animal supply has become increasingly important (CRS, 2014).

2021 Profit Margins

High input costs, specifically feed costs are negatively affecting feedlot profit margins²⁵ (Figure 20). Profit margins in 2021 were also impacted by continued disruptions from COVID19 related supply chain and transportation issues. Cross-border travel logistics increased in complexity, reducing the number of truck drivers willing to follow the additional health protocols.

In addition to higher feed costs, producers were faced with packing plant shutdowns in the spring of 2020, resulting in slaughter-ready cattle remaining in feedlots beyond optimal finishing weights, and requiring additional feed. Purchased feed was also more expensive, due to several COVID19 related factors, including truck driver shortages throughout Canada, putting additional pressure on feedlot operators' ability to source feed inputs in a timely fashion.

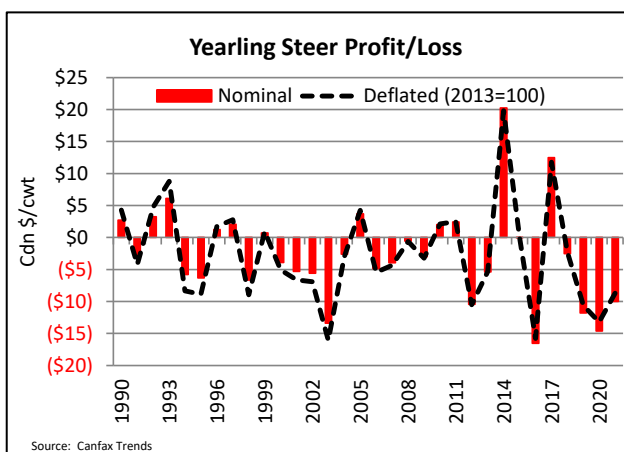


Figure 20. Annual Yearling Profit/Loss Based on Cash Prices, Canfax

3.2.4. Expansion and Concentration

The feedlot sector is highly competitive with very few barriers to entry. The level of investment required can be interpreted as a barrier to entry, though as few as one animal can be finished and marketed. This is confirmed with the Alberta and Saskatchewan Cattle on Feed Demographics Survey that indicates several small (1,000-5,000 head) and seasonal feedlots continue to operate. The participation of producers is dependent on market signals, where profit is the driving factor. Despite long-term losses on a cash basis, there has been expansion in the sector, providing evidence of successful risk management. From 2015 through 2022, Alberta and Saskatchewan bunk capacity²⁶ increased 19 per cent or 271,500 head with an additional 19 feedlots with capacity over 1,000 head (Figure 21). Feedlots that cannot cover cash costs are likely to switch to some other commodity, either cash crops or pivot to a backgrounding feedlot. The other option is to exit the industry.

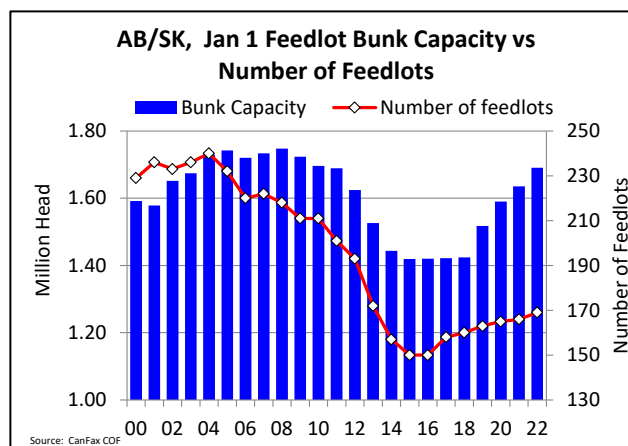


Figure 21. Feedlot Demographics

Economies of scale and consolidation of ownership (of multiple sites) continue to allow larger operations to take advantage of bulk purchases of inputs at reduced prices and allow for some additional positive margin between revenues and expenses. The 2021 Alberta and Saskatchewan Feedlot Demographics report

²⁵ Deflating profit margins removes the change in profits that occur solely from inflation.

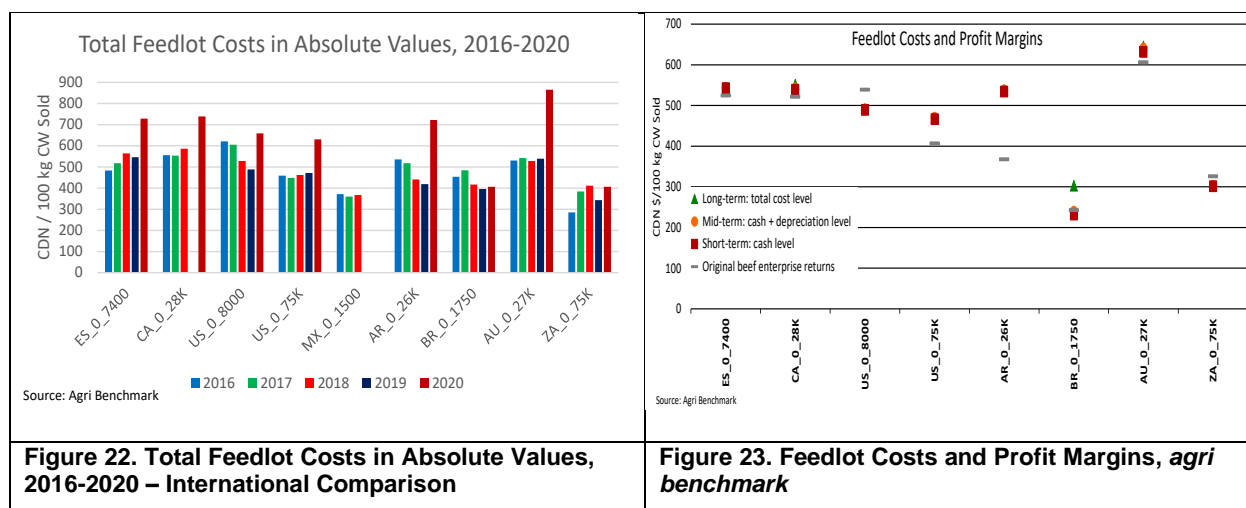
²⁶ Bunk capacity refers to the maximum number of animals that can be housed in the feedlot at any given point in time.

shows that 66.8 per cent of cattle are housed in feedlots that are 10,000 head or bigger, up from 64 per cent in the 2015 Feedlot Demographics Report.

3.2.5. Feedlot Competitiveness

Canadian and U.S. feedlots are similar in management structure but differ vastly in profitability²⁷. Canadian feedlots are faced with higher input prices than American feedlots, including labour and feed. Cattle entering feedlots in Canada are 2-4 per cent lower in weight compared to feeders on American farms, resulting in 4-6 per cent lower average daily gains and subsequently are on feed for up to 17 per cent more days, all contributing to higher feed costs per head. Labour and land costs, which also affect profits are higher in Canada than in the U.S. and prices received for fed cattle are lower.

Overall, Canada has remained competitive internationally in managing total feedlot costs^{28,29}. Canada ranks second only to Brazil in the number of animals per labour unit for the nine farms analyzed, highlighting the efficiency of Canadian feedlots. However, Canada's labour costs are among the highest, with only Spain having higher labour costs. Canada's feed costs are similar to U.S. feedlots feeding 8,000 head annually but are higher than all other countries except Spain. Costs for land, labour and capital continue to be higher in Canada compared to other countries, placing Canada at a comparative disadvantage for these production costs.



Feedlots globally faced the same shocks to production, profitability, and competitiveness as Canadian feedlots, as seen in Figure 22. Higher input costs spiked total feedlot costs for most countries. Some farms that were seeing a reduction in costs (US_0_8000 and AR_0_26K), as well as farms that were able to hold total costs stable in previous years (CA_0_28K, US_0_75K and AU_0_27K) saw a considerable increase in total feedlot costs in 2020. While significant variability exists, Figure 23 shows some of the resiliency of feedlots globally with some operations showing strong profit margins in 2020; even when faced with higher feedlot input costs from a variety of external sources.

²⁷ agri benchmark data for 2020 using feedlot data from CA_0_28K (Canada, 28,000 head per year), US_0_7200 (United States 7,200 head per year) and US_0_75K (United States 75,000 head per year) are used in this comparison.

²⁸ Countries used in the comparison are: Spain, Canada, U.S., Mexico, Argentina, Brazil, Australia, and South Africa (ES_0_7400, CA_0_28K, US_0_8000, US_0_75K, MX_0_1500, AR_0_26K, BR_0_1750, AU_0_27K and ZA_0_75K, respectively in Figure 22).

²⁹ Spain 7,400 head per year; Canada 28,000 head per year; United States 8,000 head per year; United States 75,000 head per year; Mexico 1,500 head per year; Argentina 26,000 head per year; Brazil 1,750 head per year; Australia 27,000 head per year; South Africa 75,000 head per year.

3.3. Packers

The meat packing industry is where beef cattle obtain value-added traits for consumers. The packer processes the animal, making use of as much of the carcass as possible to support profitability. Packers play an important role in transforming live animals into wholesale cuts to be distributed to secondary-processors and the foodservice industry and retail cuts to grocery stores. Labour shortages in Canadian packing plants reached an all-time high in 2021, resulting in limits to cattle slaughter and an increased reliance on beef imports (Stephenson, 2021).

In March 2020, Canadian packers stopped reporting boxed beef prices on a voluntarily basis to industry stakeholders. In the past, this is what allowed Canfax to calculate AAA/AA cutout and primal values. Gross margins have since been estimated using secondary sources, including USDA cutout values. Grier (2022) found that USDA Choice and Select cutout and primal values have historically been highly correlated with Canadian AAA and AA cutout and primal values. Expense levels have been estimated by various analysts and are closely tied to utilization levels. The packing industry has historically been a tight-margin industry with only short timeframes where excess profits are realized.

Utilization rates are an important driver of packer margins. Slaughter utilization from 2012-2016 averaged 80 per cent, this increased in the 2017-2021 period to 89 per cent. After a brief time where slaughter utilization dropped significantly, averaging 57 per cent over a seven-week period in April and May of 2020, slaughter utilization rates recovered and were at 95 per cent utilization consistently through the remainder of 2020 and averaged 94 per cent in 2021.

3.3.1. Packer Margins and Price Spreads

Packer profit margins were within normal ranges in 2016-2018, before moving into a “very profitable” range in 2019 moving further, into “exceptional profitability” in 2020-2021 (Grier, 2022). Grier (2022) determines that several factors contributed to exceptional profits realized by packing plants in 2020 and 2021. On the demand side, beef demand increased substantially, with retail, foodservice and distributors aggressively bidding to procure beef. Export demand was also strengthening, reducing the availability of beef domestically. On the supply side, fed cattle were becoming slaughter-weight-ready at a quickened pace that was threatening hook capacity. Added shutdowns of the Tyson Foods Finney County, KS plant further reduced short-term slaughter capacity while supplies of fed cattle for slaughter remained constant. The shock that COVID19 brought to the supply chain also increased market-ready cattle. Slaughter capacity was reduced short-term, resulting in a longer-term backlog of slaughter-ready fed cattle. These events combined to give packing plants considerable leverage to both prices paid upstream to feedlot producers and prices charged downstream to retailers and restaurants.

Grier (2022) measured retail profit margins in addition to gross packer margins. His research covered 2016-2021 and estimated the change in retail margins before the initial COVID19 outbreak and the resulting lockdown measures, and retail margins during the COVID19 pandemic. He determined that the retailers’ share of the total retail value of a beef cutout declined from approximately eight per cent in 2016 to two per cent in 2021. Grier (2022) also found that the farmer’s share remained relatively constant during that time with a slight decline from 41 per cent in 2016 to 39 per cent in 2021, together indicating an increase in packer share. Patrice (2022) found that price volatility between packers and retailers was largely absorbed by the retailers. Retailers’ profit margins went as low as -20 per cent in June 2020 at the same time as Canadian packer utilization was recovering from its lowest point and COVID19-related operational costs for packers skyrocketed.

Smith (2022) found that AMAs do not allow beef packers to increase beef margins or suppress either live cattle or carcass prices in the U.S. Rather, AMAs benefit large feedlots that can supply a steady volume of cattle, and disadvantage small, seasonal feedlots who do not have the scale to capitalize on these benefits. The discontinuation of boxed beef reporting by Canadian packers has left an unfortunate gap in market information and transparency (Smith, 2022). The use of AMAs reduces per head costs by stabilizing packing plant utilization levels, spreads fixed costs, and reduces costs associated with cattle procurement. The use of AMA also guarantees pick-up times for fed cattle even at times when the packing industry is

chronically over capacity (Smith, 2022). Producers who have an AMA in place generally see more consistency in scheduling fed cattle and lower wait times than those on the cash market.

As determined by Smith (2022) the use of AMAs by packers does not result in increased margins or lower prices for cattle in the U.S. Forward contracts are prevalent in Alberta between feedlot operators and packing plants. Reducing the availability of this type of AMA will reduce or even eliminate an important risk management tool (Smith, 2022).

3.3.2. Regulatory Environment

Several regulatory factors contribute to the differences in profitability for Canadian packers compared to U.S. packers, even without public access to financial records. Sunk costs in addition to those that are considered part of a normal business operation are part of a packer's costs. Specified risk materials (SRMs)³⁰ must still be removed from every animal and disposed of in accordance with CFIA³¹ requirements³² (Government of Canada, 2022). Costs associated with SRM removal and disposal are not publicly available from Canadian packers, but research done by McDougall & Suggitt (2018) provide some indication of the removal cost per kilogram³³ of SRM. It is estimated that Canadian slaughter plants remove 57 kilograms more SRM material per animal than U.S. plants (CCA, 2021) due to differences in regulations. Costs for SRM removal are \$5.37 per head for cattle that are under thirty months of age and \$48.53 per head for cattle that are over thirty months of age. This excludes the extra labour required for SRM removal and disposal, the loss of raw material, and the loss of rendering options (Canada Beef, 2021).

Producing value-added products from dressed beef carcasses requires significant amounts of labour that cannot be accomplished with machines. Higher labour costs in Canada compared to the U.S. diminishes Canadian packer profit margins and makes Canadian products more costly compared to identical products from carcasses processed in the U.S. Hourly rates for U.S. slaughterers, meat and packers, and meat, poultry and fish cutters and trimmers were USD \$14.31-14.38 per hour; or CAD \$17.35-17.43 per hour³⁴ (U.S. Bureau of Labor Statistics, 2021). Hourly rates for employees in meat product manufacturing positions in Canada were \$24.58 per hour (Statistics Canada, 2022e).

3.3.3. Consolidation & Market Power

There have been no major changes in the number of large Canadian processing plants available to eastern Canadian beef producers in the last five years. Alberta continues to have the two largest Canadian packing plants with JBS (Brooks, AB) and Cargill (High River, AB). The two Canadian Cargill plants (High River, AB, and Guelph, ON) combined have a slaughter capacity of 6,400 head per day. In addition, JBS has slaughter capacity estimated at 4,500 head per day. These three packing plants comprised of two ownership groups, slaughter approximately 78 per cent of Canada's market-ready cattle (Canfax, 2023).

The number of Canadian federally inspected cattle slaughter plants has fluctuated over the last decade, from a high of 24 packing plants in 2004/2005 to the current low of 18 in 2020 with the closure of Ryding Regency in 2019 (Agriculture and Agri-Food Canada, 2021). Re-opening of the plant as Tru-Harvest Meats increased the number of packing plants back to 19 in 2021.

³⁰ SRM are defined as materials that may transmit the Bovine Spongiform Encephalopathy (BSE) disease. There is an extensive list of material that must be removed from every animal that is deemed to be over 30 months of age.

³¹ Canadian Food Inspection Agency – the regulatory body responsible for enforcement of safety regulations for both domestic and imported food.

³² A complete explanation of SRM definition, removal and handling requirements is found at Canadian Food Inspection Agency (2022).

³³ Cost is as of 2009. A 2 per cent yearly inflation will be incorporated to determine cost as of 2021.

³⁴ Using a May 2021 exchange rate of \$0.8249 CAD/ 1USD.

Calculating the Herfindahl-Hirschman Index³⁵ (HHI) is the best way to determine the market concentration in the packing industry. An HHI of 10,000 points determines that the entire market is controlled by one packing plant, while an HHI approaching zero indicates perfect competition among the packing industry participants (U.S. Department of Justice, 2018). An HHI between 1,500 and 2,500 points is considered moderately concentrated. Estimates of the HHI for the three large plants mentioned with a fourth, Harmony Meats (Balzac, AB) is 1,514 points. Therefore, the market concentration of the Canadian meat packing industry is moderately concentrated.

Packer concentration levels continue to be of concern. Between Cargill, JBS, and Harmony Meats there is a 95% packer concentration (i.e., 95% of all slaughter occurs in these facilities) in western Canada since 2012 (Smith, 2022). In the east, only one packer, Cargill, accounts for 60-73 per cent of the market share over the last five years (Smith, 2022). A smaller North American herd³⁶, will reduce fed cattle supplies in 2023, which will reduce utilization rates and potentially spur competition between plants for cattle.

U.S. packers continue to play an important role in the competition for Canadian-fed cattle. Between 2005 and 2015, approximately 23.5 per cent of Canadian cattle marketed were slaughtered in the U.S.; this decreased to 19.5 per cent between 2016 and 2021. More cattle were processed in Canada in the latter period as U.S. cattle supplies maxed out packing capacity and pushed cattle to locations with unused capacity.

3.3.4. Packing Capacity & Utilization

The cattle cycle results in fluctuations in packer utilization rates over a 10–12-year period, requiring packers to strategically time their entry into the business.

Federally inspected slaughter capacity for beef in Canada was approximately 66,000 head per week in 2017-2021, up five per cent from the 2012-2016 average (Figure 24). Total weekly plant capacity increased by seven per cent from 2012 when capacity was at its lowest at 62,000 to 66,300 in 2021. Fluctuations in capacity occurred within those years. Harmony Beef opened in 2017 increasing the overall capacity by 3,300 head per week and Ryding Regency closed in 2019 decreasing capacity by 1,500 head per week. The Ryding Regency plant re-opened as Tru-Harvest Meat Packers in 2021 increasing capacity by 1,600 head per week.

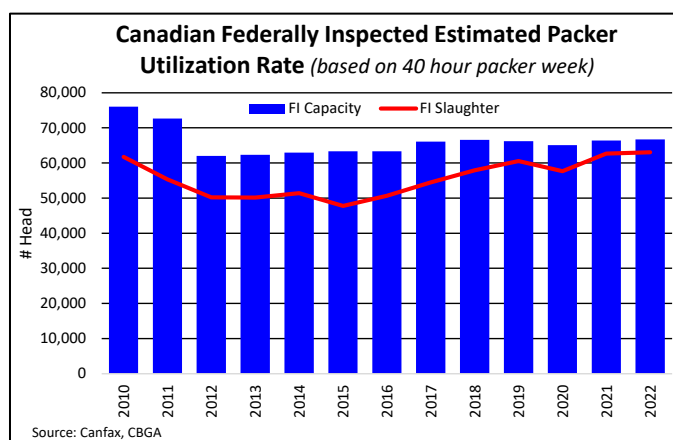


Figure 24. Weekly Packer Utilization Rates, Canfax

The average utilization rate between July 2011 and June 2021 was 84 per cent. Utilization levels averaged 94 per cent in 2021 and have been above 80 per cent since 2017, supporting packer viability.

The shutdown of one or more plants, which occurred in the spring of 2020 due to COVID19, leaves the industry vulnerable to supply chain disruptions, as cattle are backed up and additional shifts are needed to work through the volume (Edmiston, 2020). As North American cattle supplies shrink in coming years packer utilization will once again be determined by individual competitiveness.

³⁵ The HHI is calculated by squaring the market share of each firm competing in the market, then adding the resulting numbers. This analysis uses the four-firm market concentration ratio to determine market power in the packing industry.

³⁶ Canadian data from Statistics Canada Table 32-10-0130-01 (Statistics Canada, 2022a); U.S. data from Statistics Canada, Table 32-10-0140-01 (Statistics Canada, 2023a).

3.3.5. Adding Value

Research suggests that for every worker employed in farm-level production of cattle in Canada, 4.7 workers are employed either directly or indirectly elsewhere in the Canadian economy (Kulshreshtha et al., 2022). From 2018-2020 the Canadian cattle industry has also contributed \$51.6 billion in the production of goods and services, \$21.8 billion to the Canadian GDP, and \$11.7 billion in labour income (Kulshreshtha & Nagy, 2021; CCA, 2023). For every worker employed in the Canadian meat packing industry, another 3.4 workers are employed elsewhere (including direct and indirect employment) (Kulshreshtha & Nagy, 2021). Overall, keeping meat processing plants in Canada continues to greatly benefit the Canadian economy.

The creation of value-added products from Canadian beef is dependent on having available labour. At various times historically labour shortages have resulted in packing plants prioritizing slaughter functions over creating value-added cuts. These value-added cuts have the potential to support international demand. In April 2020, when labour was reduced to 37 per cent due to employee illnesses, getting through the backlog of cattle was the main priority, not value-added cuts. Labour shortages during this challenging time led to a reduced ability to maximize market potential. The uncompetitive labour costs mentioned earlier, may also influence value-added activities.

4. Consumer Resilience

Economic resilience is the industry's ability to cope, recover from and/or minimize economic losses in the face of adverse economic shocks. From a producer's perspective, economic resilience comes from having equity to draw on when facing challenging market conditions (e.g., supply chain disruptions, drought, trade disruption, etc.). This goes back to profitability and risk management, both of which were addressed in the Producer Viability section.

Another key aspect of the industry's economic resilience is the consumer market. Consumer resilience is the ability of consumers to support the Canadian beef supply chain, despite challenges that may occur. These challenges include, but are not limited to price changes, product changes, safety challenges and recalls, and perceptions around animal welfare or animal husbandry issues. Consumption of beef is related to the availability of beef, rather than consumers' willingness-to-pay (CRS, 2015). If consumers are willing to pay more for beef, demand will increase, even if consumption is limited by availability. For this reason, beef consumption is not the best proxy for domestic beef demand.

In contrast, per capita expenditure (price multiplied by quantity) is a good proxy for domestic demand and follows closely with the retail beef demand index (CRS, 2015). Consumer demand is the ultimate driver for the long-term development, and even survival, of the cattle industry. A sustainable cattle industry must evolve with the consumer market and respond to changes in consumer preferences. Demand is impacted by many factors, and it can be difficult to identify the most impactful. Branded programs that highlight certain attributes provide price signals through the supply chain to producers on the value consumers place on these attributes through their willingness to pay a price differential. In this way, production decisions are influenced by consumer decisions.

4.1. Consumer Demand

Figure 25 shows the negative relationship between price and demand. Consumption is simply the amount of a product or service consumed by a person and is dependent on the availability (supply) of that product or service to the marketplace. Willingness-to-pay (expenditure) refers to the how much an individual is prepared to pay for a product or service. Demand represents the quantity of a product or service (Q^*) that is purchased by the population at a given price (P^*). The Law of Demand states that for normal goods, as price increases (moves to P'), the quantity of that product or service decreases to Q' , as normal goods have a negative slope. Changes in quantity demanded refer to the change in the quantity of a product desired by consumers given a change in the price of that product, which results in the movement along the demand (D) line. Change in demand refers to the change in the amount of product desired by consumers given a change in the price of a complementary product, a substitute product, or income level (i.e., a movement from D to D' in Figure 25) (Hubbard, et al., 2015).

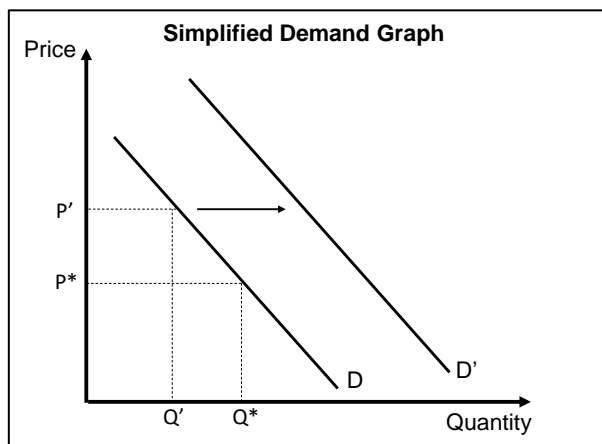


Figure 25753. Generic Consumer Demand for Beef

Demand can be impacted in one of four ways. Firstly, higher beef consumption with high prices indicates that demand is strong. Secondly, low consumption levels at low prices indicates weak demand. Between these two extremes are two more scenarios. Either high prices and lower consumption rates or low prices and high consumption rates. Whether demand has increased or decreased is determined by whether the positive change is more or less than the negative change. Both the Canadian Retail Beef Index and the International Beef Demand Index measure demand for Canadian beef. The Canadian Retail Beef Demand Index measures domestic consumers' willingness-to-pay by measuring per capita consumption and deflated retail prices. The Canadian Retail Beef Demand Index (2000=100) has increased from an average of 112 in 2012-2016 to an average of 118 in 2017-2021. The International Beef Demand Index measures demand for Canadian beef from international markets. The International Beef Demand Index (2000=100), increased from an average of 113 in 2012-2016 to 144 in 2017-2021.

4.1.1. Demand Drivers

Demand drivers can be divided into long-term trends, medium-term perceptions of beef, and short-term market impacts. Long-term trends include a growing global middle class and shifting consumer demographics with more urbanization. Medium-term trends include perceptions around the health and nutrition of red meat, beef quality, and food safety. Shorter-term market impacts include relative protein prices and options.

It is also important to distinguish between food *trends* and food *fads*. Trends are the result of the 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. However, heightened food awareness – around what consumers are eating, who made it, how it was produced and what is in it – has made it more difficult to distinguish between passing fads and longer-term trends.

4.1.2. Long-Term Trends

Long-term trends bring structural change throughout the entire supply chain. Specifically, to the beef industry, these include population growth and changes in demographics, changes in consumer preferences and changes in income levels. The global population is expected to increase to 9.8 billion people by 2050 (United Nations, 2019). Ward and Neumann (2012) estimate that three billion people will join the middle class by 2050, with the majority of them coming from emerging markets. It has also been estimated that 68.4 per cent of the global population will be living in urban centres by 2050 (United Nations, 2018), up from approximately 56% today. During this time, Canada's population is expected to increase over 40 per cent to reach 54.3 million people³⁷. With this increase in population, there may also be changes in consumer preferences that Canadian beef producers should be aware of, and be able to respond to, to remain viable.

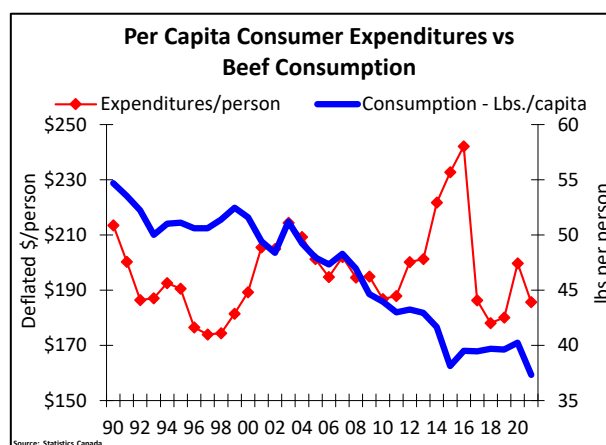


Figure 26. Per Capita Consumer Expenditures vs Beef Consumption

Figure 26 shows how preferences for beef have changed over time with the relationship to the price of beef. As a population ages and shifts its demographics, the demand for beef also changes. While per capita consumption has been declining over the last 30 years, per capita beef expenditure has remained relatively stable, pointing to an overall increase in demand.

An aging population means consumers are more health conscious and are more likely to eat smaller portions of beef and to do so less often. Table 13 summarizes the shift in Canadian demographics in the

³⁷ This estimate uses the slow aging scenario from Statistics Canada Table 17-10-0057-01 (Statistics Canada, 2022f).

last 20 years. Racial, ethnic, and religious diversity also play roles in the demand for beef. Statistics Canada (2022g) estimates that immigrants will represent 25-30 per cent of Canada's population by 2036, with the largest number of immigrants from Asia and Europe. South Asians are projected to be the main visible minority group, followed by Chinese. Members of Muslim, Hindu and Sikh faiths are projected to increase in number by 2036 (Statistics Canada, 2022g).

Table 13. Canadian Population Demographics

	2001	2011	2021
Proportion of Canadians 65+ (Statistics Canada, 2022f)	13%	14%	19%

Labour force demographics also influence meat consumption, as the preparation of meals including meat takes longer than those without. Assuming traditional roles between heterosexual couples, women perform most of the domestic chores. Research conducted by the Pew Research Center estimates that 80 per cent of women in the U.S. are the main meal preparers, validating these assumptions (Schaeffer, 2019). Since 2013, the percentage of women in the labour force in Canada has remained steady at 47 per cent and has remained steady at around 46 per cent in the U.S. (World Bank, 2022). However, Schaeffer, (2019) also determined that at this level of female labour force participation the decrease in demand for beef is not statistically significant.

Income levels also influence demand for beef, as beef is considered a normal, inelastic good. Therefore, the movement of additional consumers into the middle class implies that consumption of beef will increase (Nozaki, 2016). Global meat consumption, including eggs, is expected to increase by 52 per cent from 2013 to 2050 (Roser & Ortiz-Ospina, 2023).

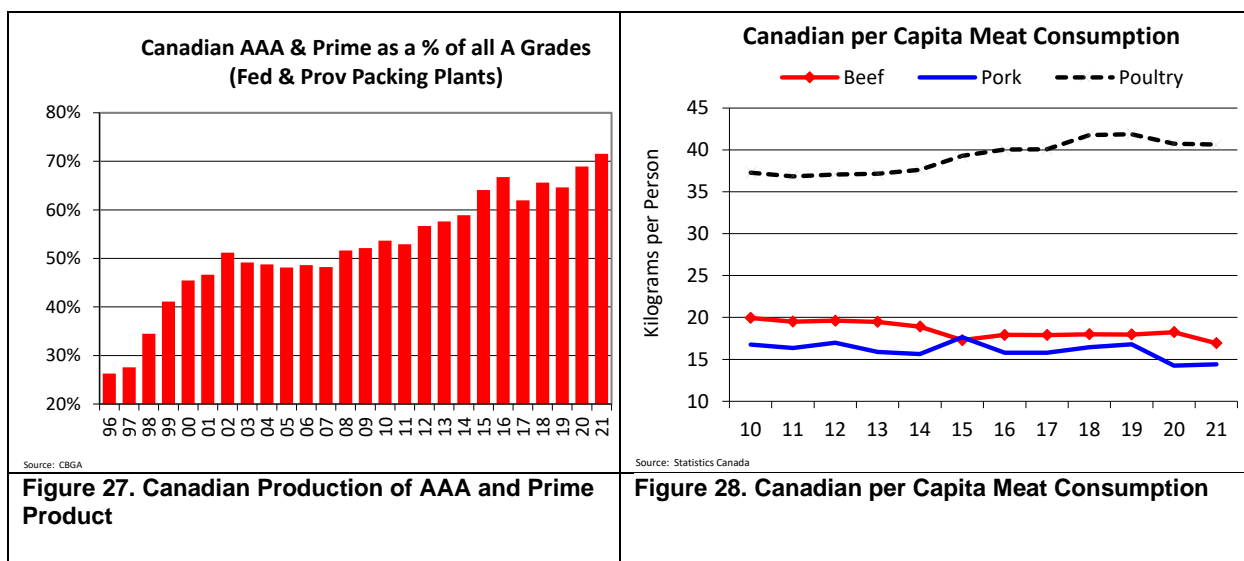
The COVID19 restrictions forced many consumers around the world to learn how to cook. This has the potential to be a strong support of meat consumption in the coming decades. As food prices increase, those skills can support shopping at retail. While it is too soon to tell if these trends are temporary or will have lasting impacts in different markets, it is worth monitoring.

4.1.3. Medium-Term Perceptions

Medium-term perceptions centre around food safety, food quality and the relative health of the product. Consumers are increasingly becoming more educated on where their beef comes from, how it was raised and what it ate. The environmental footprint of beef production is also of concern to environmentally conscious consumers.

Food safety remains one of the biggest influences on beef demand in the medium-term, excluding price (Schroeder et al., 2013). Estimates show that a one per cent increase in the number of beef recalls in Canada results in a 0.037 per cent decrease in Canadian beef demand (Cranfield, 2013). A one per cent increase in the number of recalls of beef in the U.S. results in a 0.023 per cent decrease in U.S. beef demand (Tonsor et al., 2009). Tonsor et al., (2009) also determined that poultry demand increases by 0.2 per cent with a 10 per cent increase in beef recalls, and beef demand decreases by 0.2 per cent. Increases in pork recalls also negatively affect beef demand. Short-term and medium-term disruptions cost the beef industry around CAD \$26.5 million per event (Cranfield, 2013). Historically, food safety concerns have been transient, while consumer confidence appears robust long-term, as these disruptions are not cumulative and tend to not lead to an erosion in supply chain confidence over time.

Food quality also largely influences beef demand. Consumers have become accustomed to high-quality products, with traits that are subjectively desirable. Beef producers have continued to respond to consumers' desire for high-quality carcasses through an increase in the number of animals slaughtered that have graded AAA or above (Figure 27). In 2014, 59 per cent of all carcasses graded AAA or above and by 2021, 72 per cent of carcasses graded AAA or higher. Higher quality carcasses result in higher prices for consumers, but also a higher level of utility or satisfaction. Although higher-priced cuts may reduce per capita consumption (Figure 28), the inelastic nature of beef means that per capita willingness-to-pay (price multiplied by consumption) will increase.



Health and nutrition also influence consumers' demand for beef. An experiment conducted in several European countries attempted to determine the factors that consumers used when determining the health and nutrition benefits of beef (Van Wezemael et al., 2010). The responses provided by participants in this qualitative analysis included all aspects of the supply chain. Included in the responses were perceptions on cooking beef (properly) and sourcing beef (from large vendors) as traits that consumers viewed as healthful. Ready meals and packaged beef were both considered unhealthy. Interestingly, organic beef was considered both 'healthful beef' and 'unhealthful beef' by the participants in the study. In Canada, messaging around saturated fat continues to position beef as 'unhealthy'.

Plant-based proteins, cultured proteins and edible insects have been competing with conventional protein sources for the last number of years. Consumer preferences regarding animal production practices, animal advocacy groups vilifying livestock production, and the ease of which information (true or otherwise) is available have ventured to reduce demand for animal proteins.

Initially, demand for alternative protein sources was driven by ideology with consumers willing to pay a significant premium for plant-based proteins³⁸, but future demand for plant-based proteins will be driven by global population growth, health, or environmental concerns (National Research Council, 2022). Transparency Market Research (2022) estimated the value of the global plant-based protein market at USD \$13.1 billion in 2021 and with projections to rise at a compound annual growth rate of 5.7 per cent to reach USD \$22.7 billion by 2031.

Overall, demand for plant-based proteins is waning. Expansion of market share by plant-based companies has stagnated in North America, as most current cultural preferences lean towards traditional meat products (Paramasivam, 2022). The lack of large-scale consumer interest has resulted in the delay or cancellation of plant-based protein launches at several fast-food chains (Shanker, 2021).

Cultivated and cultured protein is attempting to make an entrance into the Canadian protein market, though regulatory and mass production issues have slowed the scale-up of these products. There is only one cultured protein product known to be sold in one market, in Singapore (Keefe, 2022). Only time will tell whether corporations that are investing in this technology will see the fruits of their labours. Using history as a guide, eventually innovation will reduce costs, and increase production efficiencies and a certain portion of the population will desire cultivated protein products.

Kim, et al., (2019) conducted a review on edible insects, their benefits to the human food chain and cultural biases. Kim et al., (2019) state that many countries in Asia, Oceania, Africa, and Latin America use insects

³⁸ Estimates by Good Food Institute (2021) put plant-based protein premiums at 43 per cent above meat in 2019. Italy has the highest premium for plant-based products at 187 per cent, with the U.K. having the lowest at 32 per cent.

as a major protein source. This research implies that alternative protein products will continue to shock the traditional animal protein market.

Historically, global supplies of beef, pork and poultry increased at a steady rate – reflecting population growth and disposable incomes. But since 2015, global supplies of beef, pork and poultry have been stagnant. As global demand for protein outstrips the supply interest in alternatives is expected to persist.

4.1.4. Shorter Term Market Impacts

Short-term impacts are more easily determined, as these are related to prices, rather than tastes or preferences. Schroeder et al. (2013) found the price of beef was the third largest determinant that consumers consider when purchasing beef. The relative price of substitutes for beef are important from a consumer's perspective, and most consumers consider beef, pork and poultry direct substitutes for each other. Price ratios between competing meats determine the market share for each product. A rise in the price of beef will not largely change consumption, if the price of competing meats rises by a similar proportion (Figure 29).

Pomboza & Mbaga (2007) measured own-price and cross-price demand elasticities for beef, poultry, and pork in Canada. The results from this study were published four years after the confirmation of Canada's first BSE case. The authors determined that own-price elasticity for beef was negative as expected, and that pork and poultry were both positive but inelastic. The results determine that a one per cent increase in the price of beef increases pork consumption by 0.06 per cent and increases poultry consumption by 0.03 per cent.

Following the financial crisis of 2008/2009, consumers substituted less expensive cuts of beef in place of more expensive cuts, rather than substituting for competing meats. During a recession, beef has historically performed well, trading down within the category (i.e., moving away from middle meats and toward ground beef) if historical price relationships with substitutes are maintained.

In more recent years, consumer demand, both domestic and international, has remained strong for Canadian beef products. The market share for beef has not changed dramatically from 2008 and market share is not largely impacted by price increases (Figure 30). As mentioned previously the price ratio between beef and its meat substitutes needs to be consistent for market share to remain steady. The domestic market share for beef has remained close to 40 per cent, even as prices for beef products have steadily risen; this is due to similar price increases in pork and poultry.

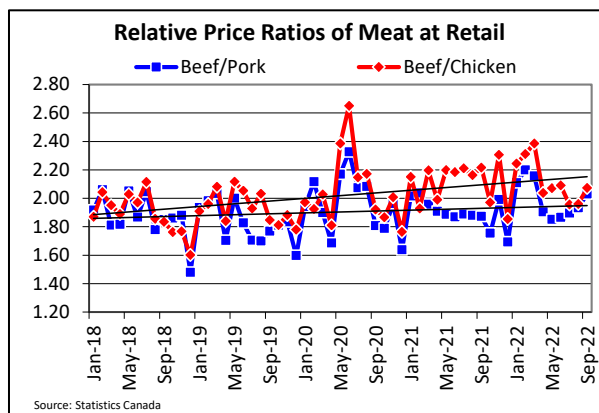


Figure 3666. Canadian Retail Meat Ratios, Statistics Canada

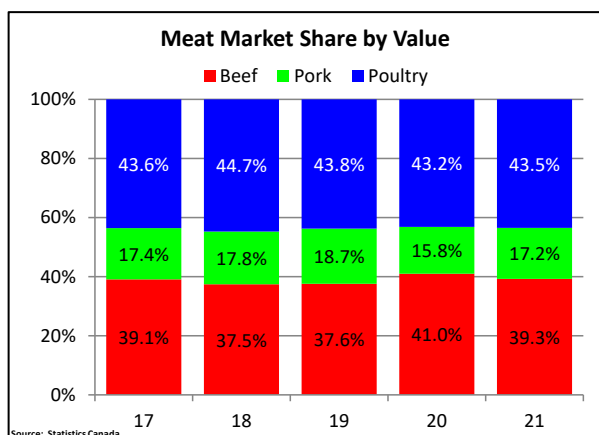


Figure 304395. Canadian Meat Market Share by Value, Statistics Canada

4.2. Domestic Demand

The Canadian Retail Beef Demand Index³⁹ (2000=100) (Table 14) is calculated based on deflated retail beef prices and per capita consumption. Retail beef prices are calculated based on the average prices of five beef cuts⁴⁰, and the price of each beef cut is a weighted average of prices in 26 cities across Canada (Statistics Canada, 2022h). It should be noted that the average retail price does not completely reflect the retail value of the whole carcass in terms of magnitude since it does not account for the differences in carcass weight proportions of these cuts. However, it provides an estimate of year-over-year changes in retail beef prices.

Table 14. Canadian Beef Demand Index

	2001	2011	2013	2021
Canadian Retail Beef Demand Index (2000=100)	107.1	95.4	101.7	120.4

The Canadian Retail Beef Demand Index (2000=100) increased from an average of 112 (2012-2016) to an average of 118 (2017-2021). Retail demand had declined significantly from 1988 to 1997, except for 1994. It ranged between 92 and 111 during 1998-2010, with an average of 101. Since 2010, the most recent data have shown significant increases in the beef demand index, with a high of 124 in 2020. Only slight declines in deflated retail beef prices have been recorded since 2010 (Figure 31). The economic recovery mentioned in the 2016 Economic Assessment drove consumer demand for beef up to a high of 123 in 2016, before dipping to a recent low of 113 in 2018.

The Canadian birth rate has been on an overall downward trend since 2008, indicating that Canadian population growth is increasing through immigration. *The trend in the Canadian Retail Beef Demand Index verifies that consumers continue to show strong resilience to high beef prices.* Domestic consumers are also competing with Canada's beef export markets for high-quality Canadian beef.

Competition from pork and chicken continues to pressure the market share for beef. Deflated retail meat prices (2002=100) determine that all meat groups have trended in the same direction, with beef, pork and poultry all decreasing in value in real terms in 2018, before incrementally increasing year over year. Deflated retail meat prices for beef are twice that of pork and poultry. Beef continues to be a staple product for North American consumers and substitution away from beef and its retail cuts, and toward other meat products does not appear to be widely observed.

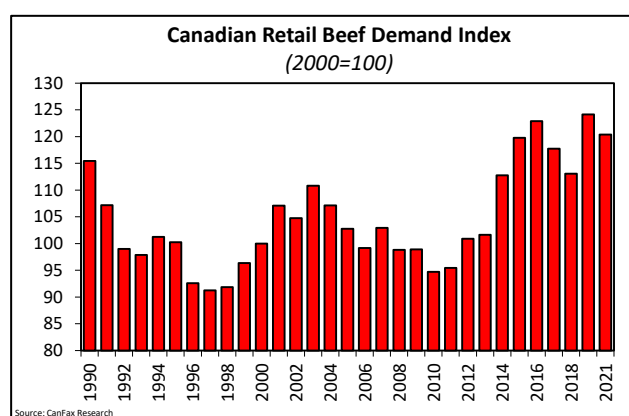


Figure 31. Canadian Retail Beef Demand Index

4.3. International Demand

The International Demand Index (2000=100) for Canadian beef is based on total export volume and average per unit price of exported beef (Table 15). The intention of this indicator is to capture the willingness to pay for Canadian beef by international markets. Whether Canada exports 278,400 tonnes valued at \$1.3 billion in 2013 or 506,600 tonnes valued at \$4.5 billion in 2021, the intention is to maximize the monetary potential of each carcass.

³⁹ Unconditional, uncompensated elasticity; similar to the US index and includes own price elasticity.

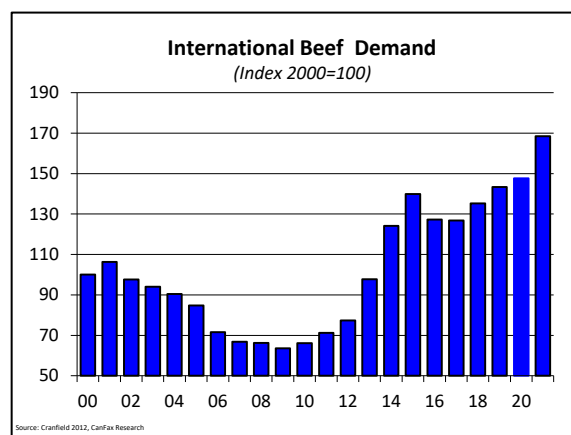
⁴⁰ The Retail Beef cuts reported by Statistics Canada include Striploin cuts, Top Sirloin cuts, Rib cuts, Stewing Beef cuts and Ground Beef.

Table 15. International Beef Demand Index

	2001	2011	2013	2021
International Demand Index (2000=100)	106.3	71.2	97.7	168.4

International demand for Canadian beef was at a low of 67 in 2009 (2000=100) at the height of the U.S. financial crisis. International demand has improved almost every year since then, except for 2016 and 2017. The increase in the number of free trade agreements have strengthened international demand for Canadian beef. Since 2015, Canada has negotiated the Comprehensive and Progressive Agreement for Trans-Pacific Partnership (CPTPP) and several bi-lateral trade agreements, as well as re-negotiated NAFTA (North American Free Trade Agreement), currently called CUSMA (Canada-United States-Mexico Agreement), to reduce transactions costs and more easily facilitate the export of Canadian products to international markets (Business and Industry, 2022).

Global demand for beef continues to be driven by population growth. Per capita consumption of beef is down in many parts of the world, but the increasing global population is keeping the total demand for Canadian beef high (Figure 32). Higher income levels in Asia and the Pacific regions, and the desire by this segment of the global population to consume beef will increase global demand for all beef products (Organization for Economic Cooperation and Development (OECD), 2021). Some of the market access required for Canada to fully take advantage of this increase in international demand has already been attained through trade agreements.

**Figure 32. International Beef Demand**

While global demand for beef is increasing, the global supply of beef has stagnated since 2015. Global beef production has been impacted by weather (drought), strong competition for acres from grains, and higher input costs challenging producer viability.

Canada's contribution to the global beef supply will be dependent on the profitability of the Canadian beef industry, particularly the feedlot and packer sectors and their ability to compete with U.S. counterparts for cattle.

5. Discussion

5.1. Producer Viability

Producer viability refers to the producer's financial ability and incentive to continue producing a product. Profit margins are impacted by reduced income, increased costs, or both. Beef producers, by the necessity of the cattle cycle, have invested long-term in the industry. The cattle industry tends to have small margins with long-term profitability close to breakeven levels. *Thin margins and volatile commodity prices are a threat to producer viability*, as they require producers to use cash reserves, equity, unpaid labour, and alternative income sources in periods of negative margins in the cattle cycle. The severity of the losses determines how much of each are used. Building and maintaining equity is critical for operations to withstand market shocks and periods of negative margins.

Cow-calf producers have seen positive profit margins from 2011-2021, which has enabled cow-calf producers in both eastern and western Canada to service debt, pay down long-term loans and work on improving their equity positions. Canfax estimates that average profit margins between 2011-2021 were \$306 per 1,200 lb cow weaning a 550 lb calf for Alberta producers. Average profit margins for Ontario cow-calf producers during the same time were \$214 per 1,500 lb cow weaning a 610 lb calf.

On average, a 200 head cow herd provided a total annual income⁴¹ of \$90,954 in 2020, which is close to the Canadian median after-tax income of \$92,400 for all families for the same year (source: Statistics Canada, 2022c). Higher prices have reduced the number of cows needed to support a family. The record-high prices received by cow-calf producers have declined since 2015 but have remained positive. According to the 2021 Census of Agriculture, only five per cent of farms had 250 or more beef cows, and 61 per cent of farms had fewer than 47 beef cows (Statistics Canada 2021a). Therefore, further consolidation to larger operations (i.e., to the size that can support a household) or alternative income sources (e.g., other commodities or off-farm jobs for farms with smaller herds) are required for producer viability.

The expansion of the feedlot sector shows that the move to more sophisticated risk management practices has supported long-term profits in this sector, despite rising input costs and periods of profitability challenges in the short-term. However, feedlot margins on the cash market, with no risk management continue to be negative.

A large variation in the beef industry between sub-sectors as well as within sub-sectors is evident. Off-farm income is required for the survival of small-scale operations where the production and sale of cattle alone cannot economically sustain the operation. Though outside the scope of this assessment, it must be recognized that one or both spouses may work off-farm. To compound an already complex situation, the current reality within rural Canada is that skills available do not match skills required, resulting in a higher unemployment rate compared to the national average and significant labour shortages, especially for skilled workers and workers with specialized skill sets (Innovation, Science and Economic Development, 2022).

Greenhouse gas emissions have recently become part of the conversation surrounding the viability and resiliency of primary agriculture. Some research has been completed recently in this area, though significant gaps in knowledge remain. The Government of Alberta has several Emissions Offset System protocols designed to reduce carbon dioxide, methane and nitrous oxide emissions (Government of Alberta, 2022). There are two voluntary programs that are highly relevant to Alberta's beef producers:

1. Reducing Greenhouse Gas Emission from Fed Cattle (Government of Alberta, 2016)

⁴¹ Income is calculated from paid labour and profit margins on the cows.

2. Selection for Low Residual Feed Intake Markers in Beef Cattle (Government of Alberta, 2012).

Both these programs reward producers who reduce GHG's per kilogram of live weight (cow-calf producers) or emissions per kilogram of beef produced (feedlot producers). AAFC performed a preliminary analysis of the financial impacts of carbon pricing on Canada's primary agricultural sector, thus providing a worst-case scenario (Agriculture and Agri-Food Canada, 2020). It should be noted that while continued improvements are necessary, Canadian farmers have already reduced GHG emissions per unit of production through best practices and efficiency gains (Agriculture and Agri-Food Canada, 2020).

A literature review conducted by Lokuge & Anders (2022) lists four policy recommendations for reducing GHG's under the Paris Climate Accord. Lokuge & Anders (2022) determine that participating in carbon-credit systems allow farmers to take advantage of their ability to sequester more carbon than they produce and contribute in a positive manner to carbon reduction incentives and regulations that are being or may be implemented. Policy recommendations include:

1. Design projects at farm-level, ensuring that GHG reductions follow a suitable offset standard,
2. Incentivize farmers via cost-share programs,
3. Endorse farmers for carbon offsetting by emphasizing the co-benefits, and
4. Any future research should consider farmer benefit-risk evaluation.

Future research is still required in this area.

5.1.1. A Non-Agriculture Context

Only 53.1 per cent of businesses in the agriculture, forestry, fishing and hunting sector were profitable in 2020; however, the percentage of profitable businesses in cattle ranching and farming (as a sub-sector) was only 27.9 per cent (Statistics Canada, 2021b). The agricultural industry overall and the cattle ranching and farming sub-sector saw a reduction in the percentage of profitable businesses compared to the 2016 Economic Assessment. In comparison, 87.6 per cent of businesses in the professional, scientific, and technical services sector, 78.9 per cent of businesses in the construction sector, and 70.2 per cent of businesses in the mining and quarrying and oil and gas sectors were profitable in 2020 (Statistics Canada, 2021b).

5.1.2. Risk Management

Beef producers face two major types of risk: prices and weather. Recent examples include a four-week period between April and May of 2020, when packing plants were fully or partially closed, the Alberta fed steer rail price dropped 26 per cent. And, in 2021, Western producers faced extreme drought conditions, reducing the availability of feed for the cow herd.

Higher and more volatile input markets have resulted in greater financial risk for cattle producers, requiring careful business planning and risk management. Risk management is an important tool to protect equity against market volatility and disaster situations. The risk management tools that are currently available to producers tend to benefit those who have specialized in one sub-sector (cow-calf, feeder, cash crops, etc.) more so than producers who diversify. This can hinder sustainable innovations in the case where price insurance doesn't cover 'untested' species or types of rotations. Conversely, operations that are diversified are better able to weather price reductions. Specialization versus diversification and the reasons for each, should also be part of a risk management discussion.

History has shown profit is vulnerable to external factors that depress prices. Government disaster programs played a critical role in the 2021 drought. There are several risk management tools available to producers, including: Livestock Price Insurance (LPI), AMAs (e.g., forward contracting), and federal business risk management programs (e.g., Agri-Stability, Agri-Invest). The use of risk management strategies to address market volatility helps producers manage cash flow, but some of these tools are only available regionally. There is an increased use of risk management tools throughout the supply chain with price insurance available to cow-calf producers and the increasing use of forward contracting by feedlots.

A producer's risk tolerance may vary based on demographic variables like age and gender. Risk tolerance may also vary based on the operation's 'farming style,' or values. For example, an operation that primarily

values their role as a custodian of the land and may have little intention to expand, compared with an operation that values their operation primarily as a modern family business with growth ambitions to support more families. These two operations may have different approaches to risk when it comes to the environment, or to new investments. Indeed, when the Canadian Cow-calf Cost of Production (COP) Network participants were segmented based on their response to the question “why do you farm?”, statistically significant differences emerged between different group’s willingness to take on the risk of new investments.

While profitability is often paramount, producers are not only looking at risk with respect to their bottom line. They have internal drivers that influence their decision-making. The COP Network participants were asked to rate their risk aversion in several categories, including new investment, market fluctuations, policy and regulation change, and personal well-being. Far more producers (67 per cent) were very willing or willing to take risks when it came to new investments than when it came to market fluctuations (49 per cent), policy and regulation change (23 per cent), or personal well-being (35 per cent). These results show that the ‘risk to what’ aspect plays a role in risk management and is mediated by producer’s values.

Diversity in operational structures (e.g., size, production systems, producer age, and use of technology) means that each operation handles market shocks differently, providing a level of stability to production. In addition, the price cycles for cattle and grain tend to be countercyclical, meaning operations that include beef and cash crops are more successful in using diversification to stabilize income. Producers do not know which commodity will be profitable each year. *This provides stability in production but makes it difficult for producers to immediately respond to market signals for a single commodity such as beef – resulting in delayed responses to market signals. This delayed response puts beef at a disadvantage to competing proteins due to the longer biological and production cycle.*

Weather events can be devastating at a local and farm level. Producers must be financially prepared to adapt to these events in the long term. For instance, there are limited options during a drought: reducing livestock numbers or purchasing feed (i.e., leasing forage or increasing supplemental feed). In areas prone to drought, producers can maintain a conservative stocking rate so that destocking is rarely necessary. The cost of this strategy is underutilization of forage, negatively impacting economic viability. The second strategy is variable stocking, where destocking can occur quickly in a drought situation. This has been primarily done with yearling grassers. Yearlings can be sold, thereby conserving forage and preventing the liquidation of the cow herd. Torell et al., (2010) found that a flexible yearling enterprise increased average annual profit margins by 14 per cent with conservative stocking and by up to 66 per cent with flexible grazing.

5.1.3. Competitiveness

Competitiveness constraints throughout the beef supply chain are identical to those described in the 2016 Economic Assessment. Land, labour, and capital are required to remain competitive, yet they are scarce resources. Each of these resources will be used by the highest bidder. In the case of agriculture, the highest bidder is one that has sufficient profit margins to be able to invest in capital investments and labour, one that has adequate risk management programs in place to aid in supporting an expansion, and one that has a timely return to investment. Ruminant production has both advantages and disadvantages. Ruminant biology allows producers to utilize lower quality grasslands and hay stocks, as well as options to use cash crop residues and by-products from other industries. At the same time, cow biology coupled with the length of the average cattle cycle places all sectors of the beef industry at a disadvantage to competing meats as well as to cash crops.

For the Canadian feedlot sector to remain competitive with the U.S. feedlot sector, prices of finished animals must be the same price per pound entering the packing plant. Higher Canadian labour wages, and higher feed costs between 2014 and 2022, placed Canadian feedlot operators at a disadvantage compared to U.S. competitors. The increased use of AMAs has reduced the use of the cash market, which may allow packers to exercise more power and negatively impact price discovery. However, limiting the use of AMAs by feedlots and packers will decrease efficiency, increase costs, and may reduce beef quality (Koontz, 2015).

5.1.4. Productivity Advancements

Cow-Calf Sector

Herd productivity is closely related to herd profitability. This is accomplished through increased conception rates and increased weaning weights as well as decreases in calf death loss and maintaining a 365-day calving interval (BCRC, 2022). Increasing productivity in the cow-calf sector is realized through selective breeding of desirable traits while eliminating undesirable ones. As an example of the productivity advancements possible, Canadian steer carcass weights in 2020 averaged 917 lbs, 39 per cent higher than 1984, when Canfax first began collecting carcass weight data.⁴² There is a 66% correlation between the increase in carcass weights and the increase in carcasses grading AAA and Prime.

Terry et al., (2020) investigated the efficiency of beef cattle by focusing on several factors that are external and internal to the animal including breeding, operational management, genetics, rumen efficiency, the respiratory system and feed. Terry et al., determined that genetic selection based on several criteria, including growth rate and feed conversion rate, are most effective to increase productivity.

Feedlot Sector

The feedlot sector is a high-cost, low-margin sector and any advancements in productivity are advantageous for the entire sector. Carcass weights have been steadily increasing over time, though increases in carcass weights are not observed every year. Increased carcass weights, however, don't guarantee increased productivity. The backlog of slaughter-ready cattle that were unable to be sent to the packing plant in a timely fashion during the initial shuttering of the economy in April 2020, during the first COVID19 outbreak increased the number of cattle that were on feed 120 days or more, and increased carcass weights (Figure 33).

Canada needs a variety of production systems and age at slaughter to spread a predominantly spring calf crop across twelve months of the year to supply consumers. Making improvements in each of these production systems is necessary. A literature review conducted by Terry et al., (2020) showed that calf-fed feeder cattle slaughtered at 420-450 days old at a weight of 1350 lbs (612 kg) and yearling feeder cattle slaughtered at 510-540 days old at 1450 lbs (658 kg) improved efficiency, increased profit, and contributed positively to the environment through reduced greenhouse gas emissions. Several indicators can be used to measure weight gain efficiency and profitability. A 10 per cent improvement in average daily gain resulted in an 18 per cent increase in profit, and a 10 per cent improvement in feed conversion ratio resulted in a 43 per cent increase in profit during a feedlot study (Fox et al., 2001). Slaughtering cattle at optimal weights (1350-1450 lbs) and at a younger age also results in lower greenhouse gas emissions (Terry et al., 2020).

Productivity advancements have also been occurring in the Canadian dairy industry, with the use of beef semen on dairy cows. Dairy producers found that dairy-beef crossbred calves were more desirable for feeding by beef backgrounding operations and feedlots than purebred dairy calves. Using beef genetics in the dairy herd to produce dairy-beef crossbred calves has the potential to improve feed efficiency, improve rate of gain, and reduce days on feed (Sterry & Cauffman, 2023). Carcass quality can also be improved by increasing ribeye size, increase muscling and moderating the frame size, while maintaining the marbling

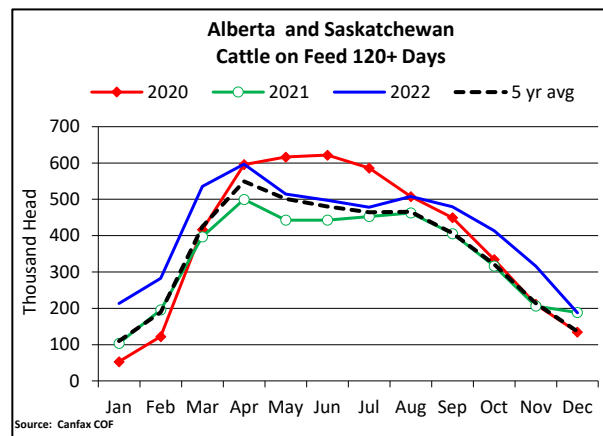


Figure 33: Alberta and Saskatchewan Cattle on Feed 120 Days or More

⁴² Calculated using Statistics Canada data from The Census of Agriculture Table 32-10-0130-01 and Table 32-10-0113-01 (Statistics Canada, 2021a).

ability (Sterry & Cauffman, 2023). A study conducted by Foraker et al. (2022) found that 12th rib fat thickness increased by 0.19cm ($p<0.01$) and ribeye area increased by 4.7 cm² ($p<0.01$) for dairy-beef cross carcasses over straight Holstein carcasses. These dairy-beef crossbred animals potentially increase carcass quality, providing more high-end meat cuts and primals, while reducing the supply of lean meat and trim.

5.1.5. Succession of Farm Operations

The land and capital-intensive nature of the beef industry requires that some alternative form of entry into the sector be in place for the next generation of producers. Farms that depend on “sweat equity” or unpaid labour by one or more children attempting to enter the industry are not sustainable, as the child(ren) performing the manual, unpaid labour may be seen to be purchasing the farm business at less than market value by any child(ren) not involved in the day-to-day operations, and who expect an inheritance. Conversely, if the farm is sold rather than handed down to the person(s) who invested through their sweat equity, full financial reimbursement for that labour may go unrealized. This further disadvantages the younger person(s)’ financially and socially.

Farm succession in the beef industry is dependent on profitability. An unprofitable operation will not be passed down to the next generation. During the succession process, the farm operation must also be able to support the older generation exiting the industry as well as the new generation entering the industry. The 2021 Census of Agriculture determined that 34 per cent of respondents reported having either a written succession plan or a verbal succession plan in place (Statistics Canada, 2021a). With the increasing value of a typical beef farming operation, discussions of fairness between the older generation and the younger generation (those receiving the operation in the succession and those receiving an inheritance later) must be clear and open. Family discussions around what is fair versus what is equal should be included.

Management styles between generations also have the potential to create conflict and reduce the potential for a successful succession of the farm operation. Ron Hanson, farm business succession consultant and professor emeritus at the University of Nebraska outlined nine challenges in farm succession planning (Curley, 2018). They include:

- 1) Determining who counts as family when it comes to decision making.
- 2) Playing favourites among children and how to treat each child fairly, even if not equally.
- 3) Controlling versus mentoring during the transition phase.
- 4) Willingness to share ownership of the enterprise.
- 5) Establishing selling prices for the individual pieces of the operation.
- 6) Communication.
- 7) Addressing disagreements between parents.
- 8) Addressing entitlement attitudes of the child(ren).
- 9) Having a future vision for the farm.

Any discussion of succession planning needs to account for the capital gains tax that accompanies the transfer of assets. There is a limit of CDN\$892,218 in the lifetime capital gains tax exemption (Canada Revenue Agency, 2022). At current land values, the exemption will not cover the costs of transferring the entire farming operation. Options exist to minimize the tax burden on the younger generation, including selling enough assets to cover the tax or to having a life insurance policy in place to offset the tax. Communication with a reputable accountant should also be part of the succession plan (Deloitte, 2015).

A farm owner who did not pay him/herself a regular wage was instead assumed to be paying down debt. With the introduction of a second generation of farm worker who is not in an ownership position, a regular, fair wage should be expected. A farm operation that is re-directing the wage from the new worker who is attempting to become involved in the operation into sweat equity is unprofitable. When the older generation does not receive a regular wage from the farming operation, other decisions surrounding the sale of some assets to support retirement plans need to be considered. Unfortunately, selling assets may negatively affect the viability of the operation under the direction of the new generation.

A typical cow-calf operation has a large land base to transfer. At the same time, they may tend to operate under a less formal business structure. A typical feedlot operation has significant amounts of specialized equipment as well as employees. These operations will operate more rigidly as a business with little unpaid labour. Cow-calf operations that operate as a formal business enterprise rather than an informal business will have addressed the issue of unpaid labour.

5.1.6. Packers

Internal packer profitability data was unavailable for this study. Using Canfax estimates of net packer margins, two trends appear. First, net packer margins averaged \$190 per head from 2017-2019. During 2020 and 2021, however, net packer margins increased four-fold to \$772 per head. Grier (2022) found similar results when he analyzed Ontario packers. His analysis focused on gross margins, rather than net margins, however, he also found a doubling of packer margins from \$408 per head 2017-2019 to \$832 per head 2020-2021.

Utilization rates are a secondary measure of implied profitability. Packers are incentivized to make use of their facilities if the plant remains at or above break-even to cover the fixed costs associated with plant operation in the long-term. However, a plant will operate in the short term where fixed costs are not covered. Average utilization rates at or above 75 per cent with only short timeframes below that critical level imply that a packing plant will continue to operate. Average packer utilization in Canada remains strong, with an average utilization rate of 89 per cent in 2020 and 94 per cent in 2021. The lower utilization rate in 2020 was partially due to reductions in plant staffing related to COVID19 in April and May.

The capital-intensive nature of the packing plant sub-sector presents significant barriers to entry for new entrants. As a result, large-scale new entrants are non-existent. Entry into the packing industry is limited to small-scale packing plants that focus on product differentiation.

5.2. Consumer Resilience

Demand for Canadian beef has remained strong, both domestically and internationally. The higher demand has continued to support prices received for Canadian beef products. Since 2013, international demand has outpaced domestic demand significantly. The trend toward higher beef prices has increased Canada's cow herd by 1.2 per cent from 2016. Market signals from consumers indicate that Canadian production of beef should continue to increase.

High transactions costs such as import and export tariffs prevent the market from reaching an equilibrium. Elimination of these trade restrictions helps to increase international demand for Canadian exports. The ratification of several bilateral and multilateral free trade agreements, as well as the renegotiation of NAFTA, now referred to as CUSMA, has reduced the costs of supplying international markets with high-quality Canadian beef products. International consumers have responded by increasing demand for Canadian beef products every year since 2009, except for 2016 and 2017.

5.2.1. Domestic Demand

To remain a viable industry, Canadian cattle producers must continually evolve their practices to match consumer demands and meet societal expectations. As a result of these market signals, Canadian producers have established several value-added programs, including antibiotic-free, hormone-free, and the Certified Sustainable Beef Framework.

Toronto retail analyst Bruce Winder thinks that e-commerce and online shopping are here to stay (Powell, 2022). Prior to the COVID19 pandemic, e-commerce and online shopping had a presence, though most people still preferred the in-person experience. A study conducted by PayPal found that online spending across Canada increased by \$2 billion per month during the pandemic (Powell, 2022). Prior to the pandemic, 19 per cent of Canadian consumers purchased their weekly groceries online. By the end of the first month, however, 30 per cent of consumers were purchasing groceries through online platforms and

almost 50 per cent of consumers were purchasing their groceries online one year later, in March 2021, for either curbside pickup or delivery (Powell, 2022).

Changing demographics provide challenges to the Canadian beef industry. An aging population with a preference for white meat, and the development of alternative protein sources, both plant and insect, have provided additional competition for consumers' protein dollars at the grocery store. The release of the Revised Food Guide in January 2019 corresponded with a reduction in domestic protein consumption from 2019 to 2020 of 3.4 per cent, though consumption of beef increased 2.9 per cent. The market shock to the beef industry from COVID19 and the closure of all restaurants due to lockdown measures as well as increased exports resulted in a 6.6 per cent decline in domestic disappearance of beef in 2020. Consumption of beef in 2021 fell from the 10-year high and was similar to consumption levels of 2016.

Beef accounted for 39 per cent of the market share by value in 2021, compared to 17 per cent for pork and 43 per cent for poultry. This is identical to the five-year average, indicating substitution between protein products is not occurring on a wide scale among consumers.

Access to social media has made it easier than ever before for Canadian consumers to research issues they feel are important to them. This includes animal health and welfare issues and increased awareness of how food ends up at the grocery store. Developing and maintaining relationships with consumers through social media posts and documentaries such as Guardians of the Grasslands⁴³ provides opportunities for Canadian producers to offset negative publicity (Howard, 2015). Strategies to address any negative publicity may include delay, respond, partner, legal action, and censorship (Thomas et al., 2012).

5.2.2. International Demand

The movement of large proportions of the world population into the middle-class is driving beef demand internationally. The OECD predicts that global beef consumption will increase to 76 million tonnes by 2031, with most of the increase coming from Asia and the Pacific region (OECD, 2021). Reducing trade uncertainty through the implementation of free trade agreements will allow Canadian producers to partially fill these new markets.

To fill these markets, though, Canadian beef needs to be **priced competitively** to beef of similar quality and produced under similar management styles in other countries, there must be **access to timely and reliable shipping** avenues, and Canadian producers need **clear market signals** that producing Canadian beef is profitable.

5.2.3. Supply Chain Dynamics

The beef sector is designed such that one group's output (cow-calf) is another sector's input (backgrounder or feedlot). These supply chain dynamics have the potential to create a competitive atmosphere, as each group is attempting to be profitable and remain competitive with other firms in their sector. The beef supply chain more similarly resembles a series of independent entities rather than a unified group working together to provide a high-quality product. There are, however, some value-added (branded) programs that encourage a collaborative effort throughout the entire supply chain. One initiative that encourages collaboration is the Verified Beef Production Plus program (VBP+), with a focus on sustainable practices. VBP+ is a Certification Body for the Certified Sustainable Beef Framework and can provide certification on behalf of CRSB (CCA, 2022). This program is a voluntary, market-oriented, and producer managed forward-looking program (CCA, 2022). Producers who are enrolled in the program are committed to the stewardship of both the animals and the environment. Certain packers provide a premium paid per animal, with the assumption that all producers who raised the sustainably produced animals will receive a portion of the

⁴³ Guardians of the Grasslands is a short documentary that explores the current state of the Great Plains grasslands and how Canadian ranchers are ensuring its survival. The documentary can be viewed at: <https://guardiansofthegrasslands.ca/>.

premium. This program is part of the Canadian strategy to make beef production economically sustainable and environmentally friendly.

Working in tandem with branding programs are the typical pricing signals provided by packers. Packing plants price cattle, either via negotiated cash or through alternative marketing, based on consumer demand. These price signals inform producers throughout the supply chain of the current demand and quality preference for beef. Producers then can decide whether to participate based on these market signals.

5.2.4. Supplying Niche Markets

Consumers have made clear that they want to know how animals are raised, what they eat and how they are treated by the producer. They are increasingly demanding transparency. Several niche markets exist, each with their own requirements, some with additional auditing mechanisms, some with only informal management styles. Whether beef is organic, raised without antibiotics, grass-fed, Wagyu, grain-fed, Certified Angus, or locally raised, consumers who support such niche markets feel they have a say in how beef is raised, and are willing to pay a premium for the products.

These niche markets are based on product differentiation or value-added traits between the beef produced under these programs and the beef in the grocery store or the restaurant. The goal of the niche market is not to provide beef to the entire population, but to provide a product to a select subset of consumers who value the perceived benefits that come with the niche beef purchase. Consumers who purchase beef produced in one of these niche markets choose to opt in.

Most of the beef produced in Canada is raised under a conventional management system. While value-added programs for the beef industry are available, widespread adoption remains low, with only 1,370 certified Verified Beef Production Plus producers and 1,649,224 total head (CCA, 2022).

Niche markets that change production practices may reduce the economically optimal output level through reduced productivity or increased production costs. Li et al., (2016) found that over 70 per cent of U.S. beef consumers who participated in the study support the use of grazing practices to reduce greenhouse gas emissions. However, as determined by Li et al., (2016), less than 25 per cent of participants were willing to pay for this niche product. Some of those consumers indicated they did not value beef that reduced greenhouse gases more than beef produced under more conventional management styles, and therefore were not willing to pay more for the greenhouse gas reducing beef.

Niche markets only provide a small percentage of retail sales and production in Canada. For example, organic sales increased from the 2016 Economic Assessment, to represent 3.3 per cent of total retail food sales in Canada (Figure 34). This is an increase of 65 per cent from 2011 (Statistics Canada, 2011).

The 2021 Census of Agriculture shows that organic production is increasing in Canada. The number of beef farms reporting organic production increased from 367 farms in 2011 to 916 farms in 2021 with 87 per cent of farms reporting less than 250 head (Figure 35; Statistics Canada, 2021a). The majority of cattle farms (84 per cent) reporting organic production are cow-calf operations. Organic production accounts for 1.3 per cent of Canada's total cattle and beef production. Niche market farms regard their product (grass-fed, certified organic, or raised without antibiotics beef, etc.) as superior to the mainstream and place a price premium on their specific value-added product to recover the added production costs.

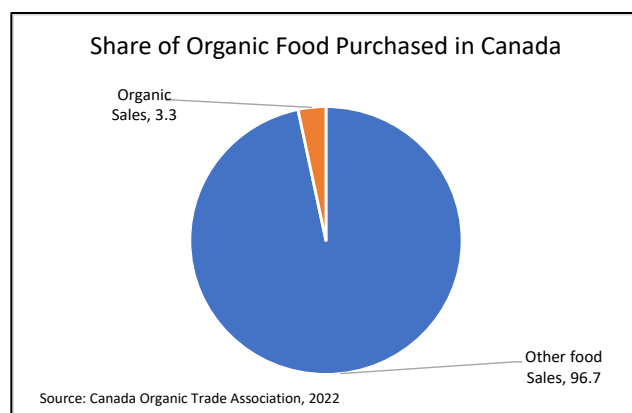


Figure 34: Organic Food Sales in Canada, 2021

Alternative protein products have struggled to gain traction among Canadian consumers after initially showing promise to “shock” the meat production system by encouraging large masses of the general population to move away from animal proteins in favour of alternative protein products. Several fast-food companies, including McDonald’s, have discontinued plant-based protein options and removed them from their menus citing lackluster demand that came in at or under the low end of expectations (CNBC, 2022). According to CNBC, the fast-food chain intends to continue selling the plant-based burger in several European markets. Further indications that the plant-based industry may be considered a “fad” rather than a long-term demand driver came via an announcement from

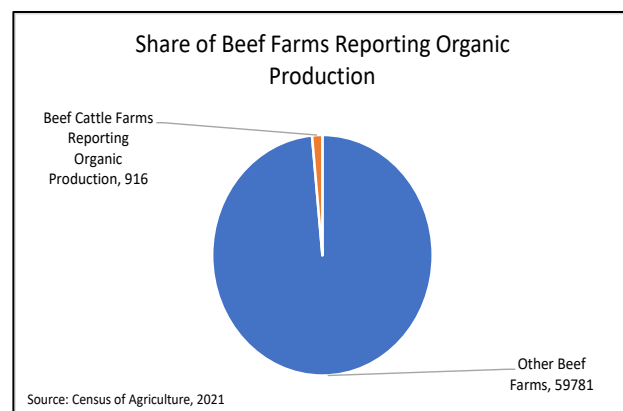


Figure 35: Farm Makeup in Canada, 2021

JBS USA and reported by the Denver Business Journal. In that announcement, JBS said it was closing its Planterra Foods subsidiary as sales of plant-based products fell by double-digit amounts, and that neither the fresh nor the frozen plant-based foods were performing to expectations (Henderson, 2022). Maple Leaf Foods CEO, Michael McCain said that plant-based sales declined 18 per cent in the second quarter, causing the company to rethink its future with plant-based products (Maple Leaf Foods, 2022).

5.2.5. Adopting Environmental Production Practices

Consumer attitudes toward how beef is raised and its impacts on the environment are evolving. Consumers want beef production practices that reduce or offset the carbon dioxide, nitrous oxide, and methane produced by cattle, though consumer willingness to pay is low (Li et al., 2016). In addition, food safety surrounding the use of hormones, antibiotics, or other growth promotants are not viewed favourably by consumers and work is being done in these areas to maintain consumer confidence (BCRC, 2021a).

As mentioned in previous sections, there are costs associated with production practices that incorporate additional attributes, either value-added, sustainable, environmental or some combination of these. The diversity of the beef industry combined with the lack of a centralized marketing system means that increases in production costs will most likely be absorbed to a large degree by producers, rather than passed on through price increases throughout the value chain.

Lim et al., (2018) measured willingness-to-pay (WTP) for quality-differentiated beef steaks (organic, grass-fed, or local) in three locations (grocery store, farmers market, and online) throughout the U.S. It was found that there is a higher WTP for locally raised beef in grocery stores, a higher WTP for all three quality differentiated beef steaks online, and a higher WTP for organic and grass-fed beef steaks at farmers markets.

Zhang (2019) measured consumer WTP for quality differentiated attributes (no production labeling, certified responsible antibiotics use, raised without antibiotics, USDA organic) of ground beef in Delaware before and after reading literature on antibiotic use and microbial resistance. Results indicated a higher WTP for ground beef that was labeled as raised without antibiotics after reading the literature.

Current literature suggests that consumers will pay higher prices for beef products that are perceived to have some attribute that can be internalized by the consumer, either health or taste-related (Lim et al., 2018), but are unwilling to increase WTP for external benefits, such as a reduction in GHG’s (Li et al., 2016).

When price signals are clearly communicated throughout the entire supply chain, producers are more willing to opt-in, provided the price premium is greater than the additional costs of joining the program. The grass-fed beef sub-sector has grown large enough that the three largest packing plants in the U.S. have dedicated efforts to the sourcing, production, and marketing of grass-fed beef (Bauman & Williams, 2021). Bauman

& Williams (2021) state that grass-fed beef that is explicitly labeled as such comprises one per cent (USD \$1 billion) of the total beef market share.

There are limited options for producers or industry analysts to gather information on niche markets in Canada. This provides challenges for the industry to change production practices, and to match changes in consumer preferences. Niche markets that gain widespread supply chain support have a greater likelihood of success in areas of research, efficiency gains, and marketing potential. Most niche markets still have very little data available to analyze profitability potential and continued research is required in this area.

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Appendix

A. Critical Review Panel feedback and responses

The following table summarizes questions and comments raised by reviewers and Canfax Research Services (CRS) responses.

Issue Raised	CRS Response