

# CULTIVATING RESILIENCE

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Supporting Canada's Agriculture Industry to Achieve Sustainable Growth

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**Scotiabank**<sup>®</sup>

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# Executive Summary: A Commitment to our Clients

It is expected that over the next decade, Canada's population will grow to 50 million people, and the world's population will reach to 9 billion. With this surge in population, Canada's agriculture sector will need to significantly increase production to meet both domestic and international demand. That demand comes at a time of economic uncertainty, considerable supply chain disruption, and with arable land continuing to disappear. The agriculture industry is experiencing increased input costs, changing climate conditions, shifting policies and regulations, new consumer trends, and a structural labour shortage. These factors create complexities for the industry's major business operators.

Scotiabank has been supporting Canadian producers in the agriculture industry for over 190 years, and we understand that our clients know their industry best. Our role is to support our clients in their desired approaches to problems, at the right pace, with the right products and solutions to achieve their goals. We recognize that each agribusiness has a unique set of challenges, opportunities and limitations, including environmental and sustainability challenges.

While the Government of Canada has yet to set emission reduction targets for the agriculture sector, we expect targets will be established soon. In anticipation of this, Scotiabank has committed to several activities to support decarbonization:<sup>1</sup>

- Sharing best practices relating to sustainability with our clients to support emissions reductions on farm operations.
- Promoting awareness and access to government incentives that enable improved energy efficiency and fuel switching.
- Showcasing activities of some of our producers to drive awareness and support for environmentally responsible farming.
- Providing support where needed to producers focused on making investments that improve the sustainability of their operations.

To further support our clients in their sustainability journeys, Scotiabank hosted a series of roundtable discussions in the spring of 2023 with a number of agriculture clients across Canada. The purpose of these discussions was to gain insights into the state of the agriculture industry today, including the challenges these clients face and the role the banking sector may play in confronting these challenges.

This publication summarizes the key insights and takeaways from these discussions and explores new ways to help build resiliency and sustainability at the individual producer level, while supporting the profitable growth of Canada's agriculture industry throughout the fast-changing decade ahead.

# The Agriculture Landscape in Canada

For the purpose of this publication, agriculture is understood as the economic and technological activity used to cultivate soil for the growing of crops and the rearing of livestock, including their preparation and distribution.

Between livestock and crops, and across Canada's vast and diverse geography, there are hundreds of commodity sectors and subsectors that comprise Canada's agriculture industry. Within each of these commodity sectors and subsectors, there are multiple value chains, a range of farm sizes, diverse energy sources, and a variety of geologies.

We recognize the complex reality of the agriculture industry and respect the challenges that come with creating a standard policy environment or measurement system that blankets the entire industry and country. This complexity is part of the fabric that includes industry, consumer groups, and various levels of government. Our aim is to highlight how Scotiabank can help enhance the sustainability, profitability, and resilience of the entire industry – regardless of commodity, geography, size, or position in the value chain.



# Issues Facing Producers Today

The agriculture industry is central to Canada's economic success and critical to the world's food supply. An abundance of land and water resources, as well as strong international trade agreements and leading environmental performance, help make Canada the world's fifth-highest total exporter of agriculture and food commodities, representing roughly \$134.9 billion (or 6.8%) of Canada's GDP.<sup>2</sup> While Canada's agriculture industry is anticipated to experience high revenue growth, the industry is currently facing several headwinds to profitability and competitiveness. As our clients shared with us, however, not all drivers of change are negative; many can also encourage positive outcomes.

## 1. GLOBAL DEMAND IS OUTPACING SUPPLY

The Food and Agriculture Organization predicts that food production will need to increase nearly 60% to keep up with the anticipated global population of roughly 9.3 billion by 2050.<sup>3</sup> As the world's fifth-largest exporter of agricultural products, Canada will be expected to play a large role in the increased food production for both domestic distribution and global exports.

Canada's economy is heavily reliant on the consistent export of agriculture products to its trading partners. In 2021, Canada exported nearly \$82.2 billion in agriculture and food products, with over half going to the United States (Canada's largest agriculture trading partner) and exports to China (Canada's second largest partner) growing over 7% annually.<sup>4</sup>

## 2. CONSUMER AND NUTRITION TRENDS CONTINUE TO EVOLVE

Consumers are increasingly concerned about the carbon footprint, animal welfare, and the origins of their food.<sup>5</sup> Confidence in Canada's food production system and public trust in agriculture producers remain strong. In the past two years, approximately 65% of Canadians have sought information about nutrition and healthy eating, with 42% specifically on food safety.<sup>6</sup>

Despite consumers trending towards healthier, safer, and more transparent food options, affordability and the cost of food remains a top concern for most Canadians. This can result in trade-offs within the food system in balancing affordability and nutrition in the food supply.

We believe these considerations, including increased environmental awareness, support for local producers and local economies, health and nutrition, and food transparency and safety are here to stay.<sup>7</sup> Going forward, we expect the ability to provide products that are safe, responsibly grown, and in a sustainable manner will be of greater importance.

## 3. FEDERAL CLIMATE POLICIES ARE PUTTING UNEXPECTED PRESSURE ON PRODUCERS

Emissions reductions, improving food safety, and mitigating the impacts of climate change are increasingly important issues in Canada. As one of more than 120 countries who have joined the growing coalition committing to achieving net-zero by 2050, the federal government is actively introducing policies (e.g., methane, fertilizer, water) as well as programs (e.g., Sustainable CAP, AgriRecovery, Beneficial Management Practices) in an attempt to protect producers from climate disasters and to address greenhouse gas emissions originating from the agriculture industry.

Our client discussions revealed, however, that some producers feel these regulations, policies, and programs have been introduced in rapid succession, without considering the industry's consistent conservation history and environmental protection that is core to the agriculture industry and mindset. Our clients expressed that increased regulation, inspections, paperwork, and process requirements have led to greater performance pressures, an inconsistent policy and investment environment, and increased distrust of government among agriculture producers.

## 4. RISING INPUT COSTS HAVE BEEN DRAMATICALLY INCREASING

Operating costs in the agriculture sector have risen, including costs associated with inputs (e.g., seeds, pesticides, fertilizer, fuel, etc.), materials, land, livestock, machinery and equipment, labour, and cost of capital.

While input prices typically see steady increases on an annual basis, there has been a dramatic spike in these prices since 2020, especially in the Canadian Prairies. Statistics Canada reports that in 2022 alone, total input prices nationwide rose by 17.4% from the previous year – a stark contrast from the former annual increase of 4.5%<sup>8</sup> – with sharp increases in fertilizer (+80.8%), fuel (+78.5%), livestock-related (+29.8%), and machinery and motor vehicle (+20.4%) costs.<sup>9</sup>

While there is significant variation across segments, on average Canadian producers incur about 83 cents in expenses for every dollar of revenue,<sup>10</sup> impacting their ability to invest in technology and process innovations and hindering their ability to transition towards sustainable growth.

## 5. MANAGING TAX POLICIES IS CUMBERSOME FOR SMALL BUSINESSES

The agriculture sector is subject to federal and provincial taxes, including income, sales and excise, and provincial and municipal property taxes (note: provincial tax rates, exemptions, and deductions on agricultural land vary from province to province). Farm businesses in Canada are subject to industry-specific tax treatment, such as cash accounting rather than the accrual method of accounting for tax reporting, which recognizes revenues and expenses at the time cash is received or paid. This gives producers flexibility on when to report revenues and expenses for tax purposes.<sup>11</sup>

Other special tax provisions include:<sup>12</sup>

- Certain farm losses claimed against all income can be carried forward over 20 years.
- Taxable income is averaged by adding the value of inventory to income.

- Qualifying capital expenditures or issued shares can be deducted.
- Capital gains exemptions/deferrals from inter-generational ownership transfer.
- Capital gains income from the farm transfer over a number of years are averaged.
- Property, fuel, and carbon tax adjustments on farmland and farm buildings.
- Land conservation/preservation tax adjustments and easement agreements.

Although each program is designed for the benefit of agriculture industry players, managing the business tax environment at the farm level has become more time-consuming, as producers balance profitability with the overall increased tax, regulatory, input, and operating cost structure. Some smaller farms with limited resources are struggling to keep up. While many of these initiatives may be helpful to farmers, simplification of tax treatments, incentives and expectations would help to address these resource limitations.

## 6. TECHNOLOGICAL INNOVATION IN AGRICULTURE IS LACKING SIGNIFICANT PRIVATE INVESTMENT

Despite increasing adoption rates for agriculture technologies – with a 28% increase in automated guidance steering systems and 59% increase in geographic information system mapping from 2015 to 2020 – Statistics Canada reports that agriculture remains one of the least digitally intensive sectors.<sup>13</sup>

Although the Canadian agriculture industry has access to more technological innovations than ever before (with over 850 Canadian ag-tech start-ups),<sup>14</sup> the country lags in private investments compared to international peers on a relative basis. Canadian agriculture attracts only 3% of global venture capital and private equity investments<sup>15</sup> while representing approximately 5.5% of global agriculture production exports. One of the key reasons for the low levels of venture investment is the tightening of margins among Canadian producers, which may otherwise be directed to technology adoption and venture-based investments.

## 7. SUCCESSION AND LABOUR SHORTAGES LEAVE THE INDUSTRY'S FUTURE UNCERTAIN

The agriculture industry faces a declining and aging workforce. Currently, 40% of agriculture employers struggle to find workers,<sup>16</sup> and by 2033, it is predicted that roughly 40% of producers will retire and exit the workforce, resulting in a shortage of nearly 123,000 workers.<sup>17</sup> While the Canadian Temporary Foreign Worker Program helps alleviate some of these pressures, it is not enough to sustain the sector.

Labour shortages in agriculture are also a result of the growing trend of younger Canadians leaving rural areas for different career opportunities. In 2021, only 17.8% of Canadians lived in rural areas and this is expected to continue declining.<sup>18</sup> With more young Canadians choosing to seek employment in urban areas, family farms face challenges in succession planning, with studies showing that 66% of Canadian producers do not have a succession plan in place. To address this, it has been recommended that Canada look to attract new immigrants to either start or take over farms to ensure the stability of the agriculture sector.<sup>19</sup>



# Sustainability Challenges Facing the Agriculture Industry in Canada

Sustainability in the agriculture industry requires the balancing of environmental ambition, land and soil conservation, productivity investment, and economic competitiveness. Getting this balance right, while still increasing production to meet local, national, and international demand, is a big challenge for producers.

Without financial stability, there is limited opportunity for technology innovation or managerial capacity to focus on higher order goals. Business sustainability – the protection of the balance sheet and access to key inputs including labour – is the critical enabler to making advances in environmental sustainability and progress towards net-zero emissions.

In this publication, sustainability refers to the responsible balance needed between emissions reduction, biodiversity preservation, technological investment, and business prosperity goals at the farm level and across the agriculture value chains to create the capacity to continue indefinitely within macro cycles.

Canada has joined over 120 other countries and committed to achieving net-zero emissions by 2050, which became legally binding with the passing of the Canadian Net-Zero Emissions Accountability Act.

Canada's financial institutions, along with other members of the Net-Zero Banking Alliance, recognize that they play an important role in addressing climate change, and have committed to achieving net-zero emissions from their operations by 2030 and net-zero financed emissions by 2050.

While agriculture plays a crucial role in reaching net-zero, Canada's emissions reduction requirements, as well as changing consumer trends within the agriculture industry, are presenting a series of sustainability challenges for producers across the country.





# An Overview of the Sources of Emissions

There are seven greenhouse gases (GHGs) typically included when addressing net-zero considerations. These gases include Carbon Dioxide (CO<sub>2</sub>); Methane (CH<sub>4</sub>); Nitrous Oxide (N<sub>2</sub>O); Perfluorocarbons (PFCs); Hydrofluorocarbons (HFCs); Sulphur Hexafluoride (SF<sub>6</sub>) and Nitrogen Trifluoride (NF<sub>3</sub>).<sup>20</sup>

In agriculture, emissions generally come from mechanical and non-mechanical sources:

## MECHANICAL SOURCES

- Purchased electricity: CO<sub>2</sub>, CH<sub>4</sub>, N<sub>2</sub>O
- Mobile machinery (tilling, sowing, harvesting, transportation): CO<sub>2</sub>, CH<sub>4</sub>, N<sub>2</sub>O
- Stationary machinery (milling and irrigation equipment): CO<sub>2</sub>, CH<sub>4</sub>, N<sub>2</sub>O
- Refrigeration and air conditioning Equipment: HFCs and PFCs

## NON-MECHANICAL SOURCES

- Drainage and tillage of soils: CO<sub>2</sub>, CH<sub>4</sub>, N<sub>2</sub>O
- Synthetic fertilizers, livestock waste and crop residues to soils: CO<sub>2</sub>, CH<sub>4</sub>, N<sub>2</sub>O
- Addition of urea and lime to soils: CO<sub>2</sub>
- Enteric fermentation: CH<sub>4</sub>
- Rice cultivation: CH<sub>4</sub>
- Manure management: CH<sub>4</sub> and N<sub>2</sub>O
- Land use change: CO<sub>2</sub>, CH<sub>4</sub>, N<sub>2</sub>O
- Open burning of savannas and crop residues left on fields: CO<sub>2</sub>, CH<sub>4</sub>, N<sub>2</sub>O
- Managed woodlands (tree strips and underbelts): CO<sub>2</sub>
- Composting of organic waste: CO<sub>2</sub>
- Oxidation of horticultural growing media (peat, etc.): CO<sub>2</sub>

Producers understand mechanical emissions sources well, as they typically derive from assets that need to be replaced over time. Incentive programs can encourage early asset retirement and the agriculture community understands that incentive programs focused on mechanical emissions reduction will likely come from the government over time. Producers recognize that there is little benefit to being a first mover in the early retirement of assets or being an early adopter of new technologies without de-risking programs. Slow adoption can be expected until government programs or other incentive programs emerge that motivate investment or make it equitable for all.

Non-mechanical sources of emissions typically come from agricultural processes, rather than assets. Our client discussions revealed that changes in processes tend to be made when there is clear economic return associated with that change, or when the change has been proven to be effective by peers. In the following section, we provide an overview of the barriers identified by our clients in adopting changes in processes.

# Understanding Barriers to the Adoption of Sustainable Practices

## 1. PERSISTENT LACK OF COMMONLY ACCEPTED INDICATORS AND BENCHMARKS

Measuring emissions in agriculture is challenging due to the lack of commonly accepted indicators to assess sustainability levels on farm and explicit sustainability benchmarks set by the federal government. The absence of set net-zero targets for the sector and standardized tools used for measurement further complicates the task. For these reasons, measuring sustainability at the farm level remains an ambiguous task with little incentive to purchase necessary equipment or act.

The challenge of measurement and defining standards in agriculture extends beyond sustainability practices. Canada's carbon credit program also faces challenges that leave producers apprehensive to join this voluntary

program. Canada's Greenhouse Gas (GHG) Offset Credit System (also referred to as the carbon credit program) provides financial incentives for reducing GHG emissions by awarding one offset credit for every tonne of reduced carbon dioxide equivalent.<sup>21</sup> Many producers are hesitant to participate because the value of carbon credits is not standardized and fluctuates based on supply and demand. This makes it difficult for producers to determine the payoff for investing in the required tools and equipment and establishing necessary trading practices and procedures.

Scotiabank recognizes the difficulties associated with measuring emissions and understands the importance of standards and guidelines that will support in the measurement and disclosure of emissions and other environmental indicators across all industries, including agriculture.



## 2. EFFORTS ARE NEEDED TO FINANCE NEW SOLUTIONS

Producers are often hesitant to adopt sustainable solutions due to risk aversion associated with unproven technologies, high upfront investment costs, fluctuating return on investment (ROI), and limited data on cost savings or increased yields. Research shows that productivity is rarely attributable solely to a piece of new equipment or operational process, and the actual cost savings to producers varies based on farm size, cost structure, commodity group, and the type of farm operation.

When they do adopt new solutions, producers commonly seek proven and peer-approved solutions. Approximately 80% of agriculture technologies are purchased off the shelf, with 60% through local distributors.<sup>22</sup> With this uncertainty and non-assurance, producers often wait to invest until technologies and processes are proven, or once programs are in place to de-risk upfront investments.

## 3. THE GOVERNMENT'S URGENCY FOR ACTION

As shared in our client roundtables, many clients' perception is that the government's push for emission reduction practices and policies are not being made with thorough consultation with the sector to manage the potential negative impacts of the change, leading to increased expectations without sufficient support. An example is the voluntary fertilizer reduction target of 30% from 2020 levels set by the federal government.<sup>23</sup>

While the federal government did actively consult with industry on the topic of fertilizer emissions reduction, some producers believe the resulting approach was economically harmful and did not create a meaningful trade-off.

This concern around government process seems to stem from the belief that the government may, at times, establish policy objectives out of a sense of urgency, but which lack a meaningful appreciation of the agriculture sector, are insensitive to existing sustainable farming practices, and ignore other important issues such as food affordability and food security. This perception seems to have contributed to a reluctance in sharing data, where over 50% of producers are willing to share data with universities, with less than 25% willing to share with government.<sup>24</sup>

Similarly, the clients we met with preferred to seek the advice of their peers and agronomists when looking for new and innovative approaches to farming. The peer-to-peer approach has been successful, with research indicating that the number of producers in peer farming groups is growing, and those who have participated for a number of years have a 43% higher operating profit, a 2.2% higher return on assets, and a higher net worth.<sup>25</sup>

## 4. OUTDATED INFRASTRUCTURE A BARRIER TO INNOVATION

Infrastructure deficiencies are a major barrier to technology adoption in agriculture – specifically rural internet, irrigation, and rail. The federal government has made a significant commitment to connecting rural areas with high-speed internet, which our clients hope will address the problem that over 30% of Canadian producers lack sufficient broadband internet needed for cloud-based solutions, precision agriculture technologies, and IoT connectivity. This is particularly interesting considering digital technology adoption rates in Canada's agriculture sector are among the lowest in any industry, with only a slight increase in recent years.<sup>26</sup> These technology solutions are critical in the fields and on machinery, as well as in the business offices to create capacity and security. This challenge is being urgently addressed with continuous announcements of additional rural broadband infrastructure and new satellite options, which are welcomed, appreciating it will take time to make these deployments available across Canada.

A lack of access to irrigation, rail spurs, and natural gas infrastructure also creates economic and environmental inefficiencies at the farm level and throughout the value chain. Regional and cooperative infrastructure projects can enhance productivity and sustainability, however, the effort and time required deter many from leading such activities without incentives to stimulate collaboration and the political will to eliminate red tape.



## 5. LABOUR SHORTAGE A BARRIER TO SCALE

Resource constraints on farms, such as economies of scale and labour shortages, pose barriers to the adoption of sustainable solutions. Small- and medium-sized farms that generate less profit than larger farms are less likely to adopt new solutions – which usually have high initial cost investments – without proven ROI payback models. Most precision agriculture technologies and vendor credit programs are tailored to farms above 500 acres in size and the adoption rate of these technologies on smaller farms declines significantly.<sup>27</sup>

A shortage of skilled and unskilled labour is also a major barrier to technology adoption in the agriculture sector. Over 40% of agriculture employers are unable to find the workers they need, and by 2030, labour shortage is predicted to increase to 123,000 workers.<sup>28</sup> Talent familiar with technology implementation, artificial intelligence, and programming is crowded out by higher paying industries with perpetual training budgets, as ag tech has never been promoted as a profession with high-earning potential. This is a significant barrier to long-term sustainability, succession, technology adoption, and practice innovation in the sector.

Scotiabank Economics published a report [Canadian Workers in Their 50s and 60s: Overlooked and Underutilized](#), relating to Canada's labour market shortage and views the issue as an obstacle to economic growth across a range of sectors.

## 6. DISCONNECT BETWEEN PRODUCERS AND POLICYMAKERS

The final barrier to adoption is what many producers refer to as rugged individualism – the belief that the people closest to the land know best, and government or institutional direction or involvement is not always warranted. Many producers have worked their land for generations, are making incremental progress towards sustainability and resiliency, and have developed circular business models for the long-term health of the land, air, and water.

Our client discussions revealed that emission reduction policies and regulations are perceived by many producers as ill-timed and poorly targeted, at a time when food security and affordability are at its highest risk and Canadian producers are recognized as high performers amongst international competitors.

Amongst the clients we spoke with, it was clear that more needs to be done to support the case for change throughout the agriculture industry and there is a need for transition supports to help facilitate adoption.

The six barriers to adoption outlined above represent the reality at the farm level when considering how to accelerate the adoption of sustainable technologies. As the quest to net-zero is rooted in change management, understanding the barriers to change is critical to success as each of them also presents a range of opportunities.

# Reinforcing our Relationship with our Agriculture Clients

As we look ahead, how can we help increase the rate of adoption of environmentally sustainable solutions across the agriculture industry, while increasing economic prosperity and competitiveness at the individual farm level?

## GUIDING PRINCIPLES

Through our client discussions, Scotiabank identified the following ten guiding principles that should be considered when designing banking supports for agriculture clients to advance the adoption of sustainable solutions while maintaining competitiveness:

### GUIDING PRINCIPLES

1. Always put our clients first by taking a holistic approach and considering sustainability in the broader context of their business.
2. Recognize that programs and solutions need to be localized and scaled based on the size of operations – client solutions must be tailored to the specific business need and objective.
3. Respect and recognize the significance of sustainability advances made to-date in the agriculture sector and appreciate performance relative to global producers.
4. Embrace a responsible and pragmatic approach to sustainability, acknowledging that financial sustainability is required for investment in innovation.
5. Recognize and appreciate that incremental improvements made over time builds culture and mindset towards a perpetual approach to change.
6. Encourage research, data gathering, and information sharing to ensure evidence-based sustainable solutions, policies, and practices are embraced across the industry, starting with our clients.
7. Leverage the Bank's network to bring clients and stakeholders together to share best practices and solutions.
8. Provide support to both low- and high-emitting producers and subsectors, as divestment avoids rather than helps solve industry challenges.
9. Aim to use industry best practices to collect objective data, set targets and measures, and report performance, while recognizing data limitations and evolving standards.
10. Inform policy decision-makers and regulators about the economic and competitiveness impacts of change in the agriculture industry.

These principles represent a solid foundation for future progress and are aligned to how Scotiabank has been supporting agri-businesses in Canada for over 190 years. Through constant listening and understanding at the farm level, Scotiabank has been able to work with producers to anticipate and prepare for challenges in the business and policy environment.





## Closing Thoughts

In the decade ahead, the agriculture industry will need to balance environmental ambition, land and soil conservation, productivity investment, and economic competitiveness. Getting this balance right – while still increasing production to meet local, national, and international demand – will be challenging but essential for Canada to achieve its climate goals and for our agriculture industry to be globally competitive.

We are part of a broader effort across the Canadian financial sector to embrace the challenge and are investing in research, measurement, loan products, and technology pathways to provide guidance to both policy makers and the industry. This collective effort is exactly what is needed to allow early adopters in the industry to take risks, innovate, improve, and invest again. Canadian agriculture leaders have a long history of doing just that – protecting the environment, embracing technology, building resilience, and reinvesting profits for the benefit of the next generations.

Scotiabank remains committed to engaging with industry players, listening and learning, and working with our clients and partners to define where we can best support Canada's agriculture industry in achieving resiliency and sustainable growth. We celebrate advancements through our Sustainability Spotlight series and Climate Change Centre of Excellence. We are committed to maintaining a pragmatic and responsible approach to innovation, and to transitioning and changing as the challenges facing the agriculture industry continue to intensify in the decade to come.

# References

- 1 Scotiabank. (2022). Scotiabank Net-Zero Pathways Report. Scotiabank. [https://www.scotiabank.com/content/dam/scotiabank/corporate/Documents/Scotiabank\\_Net\\_Zero\\_Report\\_2022-EN.pdf](https://www.scotiabank.com/content/dam/scotiabank/corporate/Documents/Scotiabank_Net_Zero_Report_2022-EN.pdf)
- 2 Agriculture and Agri-Food Canada. (2022). Overview of Canada's agriculture and agri-food sector. Government of Canada. <https://agriculture.canada.ca/en/sector/overview>
- 3 The United Nations. (2012). Feeding the World Sustainably. The United Nations. <https://www.un.org/en/chronicle/article/feeding-world-sustainably>
- 4 Agriculture and Agri-Food Canada. (2022). Overview of Canada's agriculture and agri-food sector. Government of Canada. <https://agriculture.canada.ca/en/sector/overview>
- 5 Alonso, Marta E, et al. (2020). Consumers' Concerns and Perceptions of Farm Animal Welfare, Domestic Animal Behavior and Well-Being. MDPI. <https://www.mdpi.com/2076-2615/10/3/385>
- 6 The Canadian Centre for Food Integrity. (2020). Trends in Trust and The Path Forward. The Canadian Centre for Food Integrity. <https://www.foodintegrity.ca/wp-content/uploads/2020/11/ENG2020Summit-Research-HR-new.pdf>
- 7 Reynolds, J. (2016). What is behind the trend of local food? Food Secure Canada. <https://foodsecurecanada.org/resources-news/news-media/buying-local-food-products>
- 8 Statistics Canada. (2022). Growing and raising costs for farmers. Statistics Canada. <https://www.statcan.gc.ca/o1/en/plus/2413-growing-and-raising-costs-farmers>
- 9 Statistics Canada. (2022). Growing and raising costs for farmers. Statistics Canada. <https://www.statcan.gc.ca/o1/en/plus/2413-growing-and-raising-costs-farmers>
- 10 Johnson, E. (2022). Agricultural Law in Canada: Overview. Miller Thomson LLP. <[https://uk.practicallaw.thomsonreuters.com/w-0279006?transitionType=Default&contextData=\(sc.Default\)&firstPage=true](https://uk.practicallaw.thomsonreuters.com/w-0279006?transitionType=Default&contextData=(sc.Default)&firstPage=true)>
- 11 OECD. (2020). Taxation in Agriculture. OECD Publishing. <https://doi.org/10.1787/073bdf99-en>
- 12 OECD. (2020). Taxation in Agriculture. OECD Publishing. <<https://doi.org/10.1787/073bdf99-en>>
- 13 Liu, H., McDonald-Guimond, J. (2021). Measuring digital intensity in the Canadian economy. Statistics Canada. <https://www150.statcan.gc.ca/n1/pub/36-28-0001/2021002/article/00003-eng.htm>
- 14 Tracxn. (2023). AgriTech Startups in Canada. Tracxn. <https://tracxn.com/explore/AgriTech-Startups-in-Canada>
- 15 RBC. (2022). Seven Technologies That Can Drive Canada's Next Green Revolution. RBC. [https://www.rbccm.com/en/insights/story.page?dcr=templatedata/article/insights/data/2022/12/the\\_transformative\\_seven\\_technologies](https://www.rbccm.com/en/insights/story.page?dcr=templatedata/article/insights/data/2022/12/the_transformative_seven_technologies)
- 16 Canadian Federation of Agriculture. (2023). Getting into the Field: Labour Issues in Agriculture. Canadian Federation of Agriculture. <https://www.cfa-fca.ca/getting-into-the-field-labour-issues-in-agriculture>
- 17 Bacque, T. (2022). Re-thinking the future of labour in Canadian agriculture. Farm Credit Canada. <https://www.fcc-fac.ca/en/knowledge/re-thinking-the-future-of-labour-in-canadian-agriculture.html>
- 18 Bresge, A. (2022). Rural population growth concentrated near urban centres, StatCan says. Toronto Star. <https://www.thestar.com/news/canada/2022/02/09/share-of-canadians-in-rural-areas-shrinks-for-ninth-consecutive-census-statcan-says.html>
- 19 Simmons, T. (2023). How Alberta farmers are planning for the future amid concerns around succession plans. CBC News. <https://www.cbc.ca/news/canada/calgary/alberta-farmers-sucession-plans-future-1.6809788#:~:text=>
- 20 National Atmospheric Emissions Inventory. (2022). Overview of Greenhouse Gases. National Atmospheric Emissions Inventory. <https://naei.beis.gov.uk/overview/ghg-overview>
- 21 Environment and Climate Change Canada. (2022). Canada's Greenhouse Gas Offset Credit System. Government of Canada. <https://www.canada.ca/en/environment-climate-change/news/2022/06/canadas-greenhouse-gas-offset-credit-system.html>
- 22 The Information and Communications Technology Council. (2022). Canadian Agri-Food Technology: Sowing the Seeds for Tomorrow. The Information and Communications Technology Council. <https://www.ictc-ctic.ca/wp-content/uploads/2021/11/canadian-agrifood-tech-2021.pdf>
- 23 Agriculture and Agri-Food Canada. (2022). Discussion document: Reducing emissions arising from the application of fertilizer in Canada's agriculture sector. Government of Canada. <https://agriculture.canada.ca/en/department/transparency/public-opinion-research-consultations/share-ideas-fertilizer-emissions-reduction-target/discussion>
- 24 Briere, K. (2018). Farmers favour sharing data with universities. The Western Producer. <https://www.producer.com/news/farmers-favour-sharing-data-with-universities/>
- 25 Hein, T. (2019). The peer-to-peer choice. Country Guide. <https://www.country-guide.ca/guide-business/farmers-are-joining-peer-to-peer-farm-management-and-benchmarking-clubs-heres-why/>
- 26 Liu, H., McDonald-Guimond, J. (2021). Measuring digital intensity in the Canadian economy. Statistics Canada. <https://www150.statcan.gc.ca/n1/pub/36-28-0001/2021002/article/00003-eng.htm>
- 27 The Information and Communications Technology Council. (2022). Canadian Agri-Food Technology: Sowing the Seeds for Tomorrow. The Information and Communications Technology Council. <https://www.ictc-ctic.ca/wp-content/uploads/2021/11/canadian-agrifood-tech-2021.pdf>
- 28 Canadian Federation of Agriculture. (2023). Getting into the Field: Labour Issues in Agriculture. Canadian Federation of Agriculture. <https://www.cfa-fca.ca/getting-into-the-field-labour-issues-in-agriculture/>

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