National Index on Agri-Food Performance

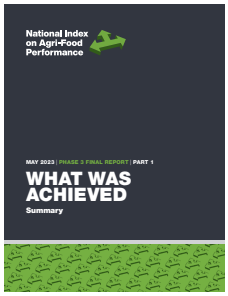
MAY 2023 | PHASE 3 FINAL REPORT | PART 2

INDEX PILOT

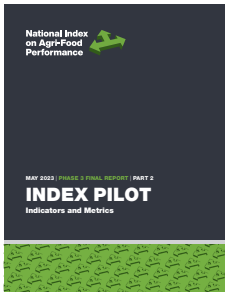
Indicators and Metrics

National Index on Agri-Food Performance

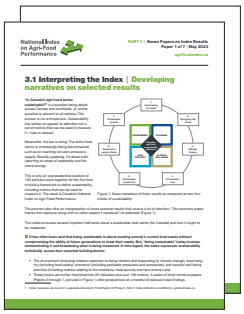
The Phase 3 final report includes four parts:



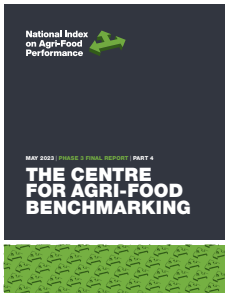
Part 1 | *What was Achieved: Summary*



Part 2 | *Index Pilot: Indicators and Metrics*



Part 3 | *Seven Papers on Index Results*



Part 4 | *The Centre for Agri-Food Benchmarking*

Published May 2023

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Introduction

People want greater assurances that agriculture and food is sustainable. In response, an unprecedented coalition of 130 private-public partners (see Appendix 1) have defined for the first time how Canada's agri-food sustainability ought to be measured – as expressed by the 20 indicators and metrics of the National Index on Agri-Food Performance pilot.[1]

The coalition-designed Index broadly reflects global and national food goals as well as environment, social and governance (ESG) factors being driven by the capital markets. While the pilot faces data and scope limitations, this final report Part 2 presents the sector's overall performance across four blocks of sustainability (see Figure 1) and areas needing progress, including on social, health and environmental outcomes. Being a more sustainable food producer also includes measuring economic outcomes; after all, only viable producers and companies can advance sustainability objectives over time.

The coalition-designed Index broadly reflects global and national food goals.

Such leadership and transparency are needed to build greater consumer trust and confidence in the food brand. The Index also intends to become an essential tool in the domestic and global marketplace to support high-level sustainability claims – which is increasingly important to compete and meet market requirements. As well, by aligning around sustainability and its measures, the Index could be a means to inform policy and strategy, and research and innovation priorities. As such, several narratives are separately published (Part 3 of this report) to reflect selected perspectives of Index results.

While this Index does not score or rank the sector's performance, the Index's intent is to become a more robust benchmark. Better data over time will mark relative change across the indicators on a consolidated basis. The Index also intends to be a reference roadmap for sector players. It can be adopted or used by individual organizations, sub-sectors or governments as needed to improve sustainability reporting based on this common understanding of sustainability.

The partners have developed a plan to improve the Index going forward to ensure its utility and relevance. A new Centre for Agri-Food Benchmarking is proposed. Part 4 of this final report elaborates on the Centre's mission, governance and mandate and the role partners are expected to play. The need to support this Centre is compelling. To meet rising expectations of sustainability disclosures, the next phase of work is dedicated to launching the Centre and evolving the Index.

1 See the complete package of final report documents. Part 1 offers a summary of what was achieved in the pilot phase. Part 2 (this paper) details the indicators and metrics. Part 3 includes several short papers interpreting Index results. Part 4 details the operation of the Centre for Agri-Food Benchmarking.

A. About the Index pilot

This report (Part 2) introduces the approach taken to develop the Index pilot and, further below, includes the complete set of the Index indicators and metrics (see Figure 1).

Intent of pilot

The pilot – *Index 1.0* – presents for the first time a detailed and high-level picture of agri-food sector sustainability. It includes an initial inventory of data for the indicators. By testing the approach, considering how to address data limitations and present the measures, the pilot frames the sector's sustainability. The ultimate intent is to evolve the Index and improve upon it.

For more on the pilot's intent, see Paper 2: *Designing the Index*, in *Seven Papers on Index Results*, Part 3 of this final report, separately published.

Relevance

The Index broadly aligns with key national and global food goals and investor driven environmental, social, governance (ESG) factors. Plus, the metrics reflect Canada's agriculture, food production (including fisheries and aquaculture) and food supply context.

Purpose

A comprehensive national picture is unavailable of the broad impacts, positive and negative, of the agri-food sector's performance across four blocks of sustainability: environment, food integrity, economic and societal well-being. The Index now presents this picture from food production to retail on a consolidated basis. By taking such a holistic approach to reporting on sustainability, the Index intends to inspire and increase voluntary reporting across these, thereby improving further alignment. Demonstrating the current state of sustainability – which reflects producers' and companies' efforts to continuously improve – and showing the progress being made to more sustainable is a shared objective of the coalition.

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Pilot limitations

The pilot does not yet allow for relative performance across the indicators to be assessed. Over time, with better data and time series in hand, the Index is intended to serve as a sector-wide benchmark. Publishing *Index 2.0* and beyond will allow progress and shortcomings to be tracked in a more fulsome way.

Out of scope

The Index does not score individual producers, food companies or jurisdictions. It is not prescriptive (i.e., stating how they should be more sustainable). The Index does not rank Canada's comparative performance domestically or against other countries. The Index is not meant to be a consumer-facing *label* nor assess the sustainability of individual commodities or products presented to the consumer. It does not measure consumer diet choices or consumption trends.

Deriving value (desired outcomes)

By presenting the sector's sustainability credentials and areas of progress, the work of the Index could be used generally to enhance sector competitiveness at home and abroad, build greater consumer trust, and inform policy and strategy, and innovation and research

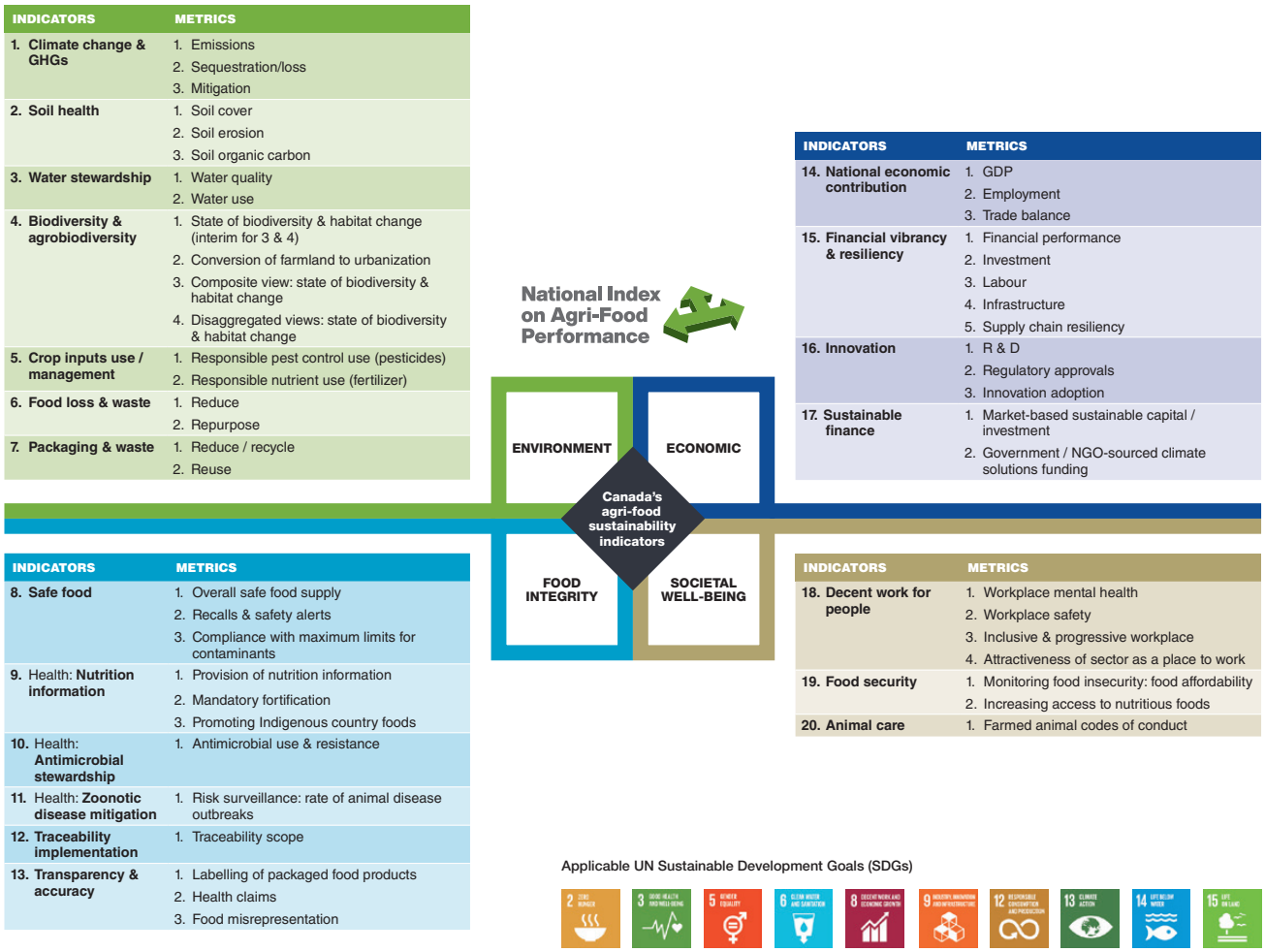

Figure 1: Twenty indicators of the National Index on Agri-Food Performance pilot

Part 1 of this final report elaborates on the considerable opportunity for sector and food system players alike to leverage the Index.

priorities. As well, as ESG reporting requirements for companies and their ingredient supply chains becomes mandatory,[2] the Index offers a common high-level reporting framework to ready the sector for this major development. Part 1 of this final report elaborates on the considerable opportunity for sector and food system players alike to leverage the Index. Aggregated data on sustainability performance is increasingly needed to meet societal and marketplace requirements.

2 *ISSB outlines actions required to deliver global baseline of sustainability disclosures*, International Sustainability Standards Board, May 2022

B. Developing the Indicators and metrics

Since 2020 the coalition has undertaken a process to develop the Index, highlighted below.

Planning the approach

In 2020-2021, the partners explored the need for an Index, developed a set of operating principles, and outlined a plan to proceed.[3] A key outcome was deciding on the four blocks of sustainability which still frame the Index.

Framing the measures

In 2021-2022, the partners detailed what should be measured. With considerable partner input, the Index defined 20 indicators and over 130 metrics spanning the four blocks of sustainability.[4]

Preparing the pilot

In 2022-2023, the partners refined the Index format and choice of metrics somewhat. Data was sourced for as many metrics as possible and expanded commentaries were included for each indicator. The following outlines several key decisions and approaches taken to complete the pilot work. The indicators and metrics, themselves, are found in section D, ahead.

- **Sourcing data:** The pilot was devoted to sourcing suitable data. The main source was the government of Canada, although academic and industry sources were also used.

- **Quality of measures:** Since the project started, the intent has been to use outcomes-based data to report on the state of sustainability and to mark progress. However, some practice-based data is relied upon to provide a proxy of change where insufficient outcome-based data exists.[5]

- **Data baselines:** The metrics are sourced from the most recent available data. A five-period time series has been provided where possible. Many of the data sets include annual observations from the most recent five years available, most commonly 2017 to 2020. However, some data sets are only available occasionally, or have only one or two observations. Each of the metrics tables provide the observation dates as well as the date of the report from which the data is extracted.

- **Data limitations:** It is the intent of the Index to provide a complete sector-wide picture of sustainability. However, there is uneven data availability across all parts of

With considerable partner input, the Index defined 20 indicators and over 130 metrics spanning the four blocks of sustainability.

3 See *Benchmarking Canada's Agri-Food Sustainability Leadership, A Roadmap*, January 2021; see also, *The Business Case for Establishing the National Index on Agri-Food Performance*, June 2021: agrifoodindex.ca

4 *Index Indicators, Poised to Showcase Canada's Agriculture and Food Sustainability Credentials*, Phase 2C Final Report, Part 2, May 2022, agrifoodindex.ca

5 Outcomes-based data measures actual impacts whereas practice-based data often focuses on survey-results or can measure the existence of activities, policies or regulations which are a foundation for or indicative of change.

GLOBAL INPUT (PHASES 1–3)

Other global organizations were included in some general briefings, not listed.
The coalition submitted its views to the Food System Summit 2021 and to some Canadian stakeholders involved in this.

Figure 2: Global engagement & Canadian academic reviews

While the Index speaks to Canada's agri-food context, the partners want to ensure the Index's global relevance.

the supply chain, and for all sustainability metrics selected. These data gaps have been noted in the indicator reports.

- **Presentation of metric results:** In addition to written descriptions of the indicators, the pilot metrics include tables of data findings, measurement types and time-periods throughout where appropriate. In future iterations of the Index, and with additional data in hand, "visually friendly" graphics will likely be used to supplement these data tables.

- **More and better data:** Tapping into new and better data is needed to improve the Index, including more disaggregated views by province or region and sub-sector. Indeed, seizing the need for priority sustainability data is a key outcome of this work. Part 4 of this final report elaborates upon a new process to collect suitable data in the future.

- **Seek advice:** While the Index speaks to Canada's agri-food context, the partners want to ensure the Index's global relevance. In previous phases, global organizations and Canadian academia were invited to be part of dialogues and/or formal reviews of the draft Index (see such outreach, Figure 2). Reference to these players does not imply endorsement of this work however their input helped to improve the quality of the Index.[6]

  Importantly, the Index development process was driven by Canadian thought leaders (the partners and other invited experts). This bottom-up approach was instrumental to align the partners and design an Index to suit Canada's agri-food context.

6 For more on the external reviews undertaken in phase 2C, see *Highlights of Projects, Poised to Showcase Canada's Agriculture and Food Sustainability Credentials*, Phase 2C Final Report, Part 3, May 2022

Moreover, to deepen the Index's global relevance, the pilot phase undertook an assessment of several global benchmarking schemes and standards, addressed in section D.

- **Governance:** From the outset in 2020, a governance process has enabled partner involvement and participatory decision-making.[7] In 2023, the partners decided on the governance structure for the proposed *Centre for Agri-Food Benchmarking* to manage the Index going forward (see Part 4 of this final report).

- **Interpreting Index results:** While considerable Index content is now available, the partners developed interpretations only for some results. Seven separately published short papers have been produced. (See Part 3 of this final report, *Seven Papers on Index Results*.)

- **Sources/methodologies:** A detailed compilation of all sources and methodologies used to report on or calculate Index metrics is currently being prepared. It will be published separately following the release of this report.

Longer-term sightline

How this Index evolves – based on partner and stakeholder input – will become increasingly important. The need to demonstrate sustainability will persist for the sector as will meeting global climate, environmental and other goals from 2030 to 2050 and rising ESG requirements.

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7 In 2021, a proposed governance model was first developed for a future centre to manage the anticipated Index in *The Business Case for Establishing the National Index on Agri-Food Performance*, June 2021. In 2022, a more holistic governance framework was developed with the assistance of an external consultant as reported in *Synthesis of Results, Phase 2C Final Report*, Part 1, May 2022. Both reports are available at agrifoodindex.ca

C. The global context

The Canadian Index is designed to be nationally applicable but globally relevant.

The pilot assessed how the Index's indicators and metrics align with six leading global sustainability standards and indices (see Appendix 2 for an elaboration of the analysis).[8] The Canadian Index is designed to be nationally applicable but globally relevant.

Differences between the global initiatives and the Index do not necessarily imply being better or worse. In some cases, global measures exceed Canada's, and vice versa. The differences can be explained by the topics being measured, their methodologies, types of data used, and, significantly, the intent behind the choice of measurement.

Table 1 summarizes these considerations at a high level; that is, where Canada's Index generally aligns with or differs from the selected standards and indices. As a global food exporter, being aware of such global practices is important and can be taken into consideration as the Index evolves in the future.

8 The global context analysis was developed by Groupe AGÉCO, a Canadian research consultancy firm.

Table 1: Global benchmarking and standards: similarities and differences with Canada's Index

SIMILARITIES		
	Topics	There is a broad similarity of addressed sustainability topics (i.e., chosen indicators and themes).
	Methodology	Some Index's indicators and metrics are informed by or refer to global methodologies (e.g., IPCC Guidelines on National Greenhouse Gas Inventories, ISO 14 040-44) and are cross-referenced to global frameworks (e.g., SDGs, Codex Alimentarius).
	Data	In-keeping with best practices in sustainability reporting, the Index leverages trusted data sources that are clearly referenced and readily available for users to review.
	Intent	Similar to the selected global standards and indices, the Index's overall objective is to mark progress on sustainability goals in a robust and balanced way.
DIFFERENCES		
	Topics	Some global sustainability topics are not included or fully addressed in the Index. These include climate- and water-related risks, as well as certain labour legislation governing workers with respect to globally material issues (e.g., child labour, work hours). On the other hand, there are areas where the Index exceeds what is being considered by global schemes (e.g., including mental health, Indigenous agriculture).
	Methodology	Canada's Index emphasizes measuring "outcomes", although reports on some practices, whereas global schemes rely more on practice-based information, including risk assessments, to assess performance.
	Data	The Index's indicators and metrics are informed by domestic data sources to capture the geographic and agriculture realities and nuances that Canada faces as opposed to using global metrics and data sources to inform performance.
	Intent	Canada's Index is not designed to rank the sector or prescribe how individual producers or food companies should be more sustainable. Global standards are prescriptive and global indices do score and benchmark performance across jurisdictions.

The Index's overall objective is to mark progress on sustainability goals in a robust and balanced way.

D. The Index pilot: four blocks of sustainability and 20 indicators

ENVIRONMENT

1. Climate change & GHGs
2. Soil health
3. Water stewardship
4. Biodiversity & agrobiodiversity
5. Crop inputs use / management
6. Food loss & waste
7. Packaging & waste

FOOD INTEGRITY

8. Safe food
9. Health: **Nutrition information**
10. Health: **Antimicrobial stewardship**
11. Health: **Zoonotic disease mitigation**
12. Traceability implementation
13. Transparency & accuracy

ECONOMIC

14. National economic contribution
15. Financial vibrancy & resiliency
16. Innovation
17. Sustainable finance

SOCIETAL WELL-BEING

18. Decent work for people
19. Food security
20. Animal care

1. ENVIRONMENT INDICATORS

Indicator 1 | Climate change & greenhouse gases (GHGs)

INTRODUCTION

With the global focus on climate change, tracking the food system's contribution to national greenhouse gases (GHGs) and its role in reducing these is a significant gauge of environmental performance. The UN campaign *Race to Zero* (involving some 120 countries, including Canada, and thousands of companies and others) is a global effort to speed up adoption of net-zero carbon commitments. Canada has set a target to reduce its GHG emissions by 40-45% by 2030 (baseline 2005) and achieve net-zero emissions by 2050. Canada is also a signatory of the *Global Methane Pledge* to reduce global methane emissions by almost one third by 2030. Specific to agriculture, Canada has set a goal to reduce nitrous oxide emissions from fertilizer use by 30% below 2020 levels through 2030.

This indicator presents available data to show how the country's agri-food sector contributes to Canada's climate change commitments and GHG reductions targets, consistent with the Paris Agreement. Reporting on GHG emissions and impacts requires presenting three broad measures to reveal what is being emitted, the context for those emissions and how they are or can be offset. At a general level, this approach shapes how this indicator is presented, as outlined:

- **Absolute GHG emissions:** These metrics report on the total volume of emissions and are the numbers upon which national emission reduction targets are based.
- **Intensity GHGs emissions:** These metrics reports GHG emissions as a relationship to a unit of production throughout its life cycle and are used in individual product lifecycle analyses.
- **Sequestration:** This concept speaks to the amount of carbon that is extracted from the atmosphere and stored in agricultural soils. The incremental storing of carbon in the soil is known as a carbon sink.
- **Soil Carbon Change:** This is an indicator of the degree to which soil sequesters carbon or releases carbon. Farm management practices, such as implementing conservation tillage sequesters carbon, while converting grassland to crop land will release carbon. In Canada, emissions measurements which reflect soil organic carbon change will be lower as, in aggregate, Canadian agricultural soils sequester more carbon than they release.

By considering emissions, sequestration, and mitigation (the latter is about practices to reduce emissions and improve sequestration), this indicator presents a holistic and balanced picture of climate change impacts by measuring GHG emissions (the outputs or "liabilities") and carbon sequestration in soil (the inputs or "assets"). A systems-view of GHGs management also considers a supply-chain wide view, although current data is limited.

Key differences and similarities with global sustainability standards and indices

The Index leverages results measured according to an established methodology and also reports results using absolute measures and different ratios. In addition, the Index accounts for mitigation efforts. That said, differences exist between the Index and the selected global indices and standards. For example, carbon sequestration is accounted for, but not all of the possible reduction or mitigation measures at the industry level. The Index does not measure the extent to which the sector is on track to meet a net-zero target as such data are not available or limited to those entities that have made public pledges to meet this target.

As the Index is focused on sector-wide emissions, only a limited number of indirect emissions are included, consistent with Canada's National Inventory Report (NIR). However, the selected global indices and standards are directed at individual companies, which specify the inclusion of indirect emissions (called Scope 3 under the Greenhouse Gas Protocol). See Appendix at the bottom of this report for additional information of global indices and standards, and explanation of Scope 1, 2 and 3 emissions.

RESULTS

1.1 EMISSIONS

Canada reports annually to the United Nations Framework Convention on Climate Change (UNFCCC), according to a prescribed methodology. This report, the *National Inventory Report on Greenhouse Gases Sources and Sinks in Canada – Framework Convention on Climate Change* (referred to in the text as NIR), is the source of many of the Index metrics on GHG emissions.

While not all details are published, the input tables provide additional data. Other sources to supplement the NIR have been used and are noted where appropriate.

For production level metrics, two emission numbers for agriculture (farms) have been provided: one with soil organic carbon sequestration/release included in the total, and one without soil organic carbon change included. The NIR reports agriculture emissions without soil organic carbon change, so these metrics will provide Index users with direct comparisons to the NIR report for Canada and other nations. However, as much of the discussion on agriculture GHG emissions at the farm level also includes reference to carbon sequestration, the provision of metrics net of soil carbon change offers Index users these metrics as well.

In summary, Agriculture and Agri-Food Canada (AAFC) states that: "Canada's total agricultural GHG emissions have stayed relatively stable since 2005, while the sector's contribution to Canada's gross domestic product (GDP) has increased over the same time period; in other words, the emission intensity has been declining."[1]

1 Sustainable Agriculture Strategy: Discussion Document, AAFC, 2023

1.1.1 Agriculture farm production GHG emissions: total

Description	Source	Result: Million tonnes of carbon dioxide equivalent ($MtCO_2e$)	
Direct agriculture emissions, including fuel use. Direct net emissions: agriculture emissions, including fuel use, plus soil organic carbon change from cropland (LULUCF, Land use, land-use change and forestry)	National Inventory Report (NIR), Environment and Climate Change Canada (ECCC)	Direct agriculture emissions, including fuel use: 2020: 69 2019: 67 2018: 66 2017: 64 2016: 65	Direct net emissions (adjusted for soil carbon change): 2020: 59 2019: 53 2018: 47 2017: 41 2016: 48

1.1.2 Processing sector GHG emissions: total

Description	Source	Result: Thousand tonnes of CO_2e ($ktCO_2e$)
Total direct emissions from feed, food, beverage and tobacco processing	Physical flow account for GHG emissions, Table: 38-10-0097-01, Statistics Canada	2019: 6,011 2018: 5,941 2017: 6,267 2016: 6,000 2015: 6,011

1.1.3 Agriculture farm production GHG emissions as a percentage of total Canadian emissions

Description	Source	Result: Percent, excluding soil organic carbon change	Result: Percent, including soil organic carbon change
Farm sector direct GHG emissions, including fuel use, as a percent of national total GHG emissions.	National Inventory Report (NIR), Environment and Climate Change Canada (ECCC)	2020: 9.97% 2019: 9.08% 2018: 8.92% 2017: 8.82% 2016: 9.09%	2020: 8.4% 2019: 7.2% 2018: 6.4% 2017: 5.7% 2016: 6.7%

1.1.4 Agriculture farm production emissions by type of GHG

GHG emissions are usually expressed in Carbon Dioxide (CO_2) equivalents. In addition to CO_2, the other major GHGs emitted through agriculture activities are methane (CH_4) and nitrous oxide (N_2O). The conversion factor to CO_2 for the purpose of GHG emission calculations is based on the estimated Global Warming Potential over 100 years (GWP-100), with N_2O conversion factor at 298 and CH_4 at 25 from Canada's National Inventory Report 2022.[2]

Description	Source	Result: CO_2 equivalents
Direct agriculture GHG emissions converted to CO_2 equivalents.	National Inventory Report, May 2022 (2021 calculations), ECCC	CO_2: 2.65 million tonnes N_2O: 24.75 million tonnes CH_4: 27.60 million tonnes

2 The NIR uses GWP-100 values from the IPCC's fourth assessment report of the as required by the UNFCCC (IPCC, 2012).

1.1.5 GHG emissions as measured by intensity

Emission intensity is the amount of emissions per selected unit, such as weight or volume. The metrics selected are those developed by industry associations, using Intergovernmental Panel on Climate Change (IPCC) and other accepted methodologies as part of a Life Cycle Analysis (LCA). Detailed methodologies for each species and crops can be found in an accompanying methodology report, separately published. Caution should be used for comparisons between livestock species, and between livestock and crops, as timing and "boundaries" (what is included in the analysis) differ.

Description	Source	Result: Per unit of production	
Chicken, live weight	Chicken Farmers of Canada, 2018	2.4 kg CO_2 eq./ kg of chicken	
Beef, live weight	Canadian Roundtable for Sustainable Beef, 2013	11.4 kg CO_2e/kg live weight of beef	
Milk, fat- and protein-corrected milk (FPCM)	Dairy Farmers of Canada, 2018	0.92 kg CO_2 eq./kg of milk	
Field crops, farm production A. Inclusive of soil organic carbon sequestration/release B. Excluding soil organic carbon sequestration/release	Canadian Roundtable for Sustainable Crops Year 2022, using 2018-2019 data Year 2017, using 2014-2016 data Includes upstream emissions from fertilizer manufacturing, seeds, and pesticides and fuel use.	Kg. CO_2e/tonne A. Inclusive of soil organic carbon change	Kg. CO_2e/tonne B. Excluding soil organic carbon change
Canola		2022: 138 2017: 482	2022: 383 2017: 615
Wheat, excluding durum		2022: 104 2017: 232	2022: 363 2017: 347
Lentils		2022: - 69 2017: - 108	2022: 190 2017: 220

1.2 SEQUESTRATION

The amount of carbon sequestered in the soil is an estimate of how much CO_2 is removed from the atmosphere and added, or sequestered, in the soil. For agriculture, this process is a natural function of growing plants and can be enhanced or degraded as a result of agricultural practices. Improving soil's sequestration capacity – an important function to mitigate climate change – is enabled by the use of conservation tillage (notably in Western Canada) and perennial crops, among other practices. As a result of widespread adoption of such beneficial practices over time, agriculture soils in Canada, as a whole, are net sequesters, that is, they store more carbon than they release. The amount of annual soil carbon sequestered due to changes in practices will decline over time as the soil reaches it maximum carbon storage potential.

1.2.1 Carbon sequestration from managed agricultural land

Description	Source	Result: Million tonnes of CO_2 sequestered
Net amount of organic carbon sequestered on managed agriculture land each year. Annual cropland and perennial (such as hay) cropland	LULUCF (Land use, land use change and forestry) Sector Net GHG Flux Estimates, National Inventory Report, May 2022 ECCC	2020: 9.6 2019: 14.0 2018: 19.0 2017: 23.0 2016: 17.0

1.3 MITIGATION

Adopting beneficial management practices and technologies can reduce GHG emissions. Although many mitigation measures can be taken, the Index aims to source data for outcomes, and not practices. As an interim measure to accessing additional outcome data, the selected metric relates to renewable fuel.

Increasing renewable energy use throughout the sector can further help deliver environmental and economic benefits. Renewable energy for this purpose includes biofuels and other renewable energy sources, such as energy derived through solar, wind, hydroelectricity and anerobic digestion. A preferred option for reporting would be to use the ratio of fossil to renewable energy use on a consolidated basis and by sub-sector: agriculture, transport, processing, and retail. Options can be explored to access this type of data in the future, but in the meantime, the percentage of fuel produced in Canada from renewable sources can serve as an indication of the change in availability over time.

1.3.1 Renewable fuel availability

Description	Source	Result: Million cubic metres
Production of renewable fuels from cereal grains, vegetable oils and other renewable fuel plant feedstocks	Renewable fuel plant statistics, supply and disposition, monthly Table: 25-10-0082-01, Statistics Canada	2022: 2.048 2021: 2.058 2020: 2.065

GAPS AND OBSERVATIONS

The following GHG emission metrics were considered but are not included in this indicator report:

- **Overall agri-food sector emissions and percent of total Canadian emissions:** These metrics are not able to be calculated at this time; farm level and feed/food processing were used as proxies.

- **Absolute contributors (animal agriculture, crop agriculture, aquaculture):** Animal and crop agriculture calculations are provided in the National Inventory Report (NIR). However, these calculations have not been used as they are not reflective of livestock and crop operations given that perennial forages and crops for silage are included in the crop sector numbers, although they are used exclusively for livestock feed. This could overestimate the GHG emissions for crops and underestimate emissions for livestock (if excluding soil organic carbon change). Conversely, these metrics underestimate the GHG emissions for crops and underestimate emissions for livestock when considering soil organic climate change as all but native pasture sequestration would be included in crops. There is no data for total emissions from the aquaculture sector.

- **Nitrogen use efficiency:** A calculation for nitrogen use efficiency is not available, and although one could be calculated, there are various methodological approaches. This metric was intended to show effectiveness of added fertilizer use, but measurement on fertilizer use has been selected and reported elsewhere (see indicator 5 on Inputs).

- **Adaptation to climate change** is not explicitly accounted for in the Index. While the topic is a material one from a sustainability standpoint, the selected global standards and indices refer to adaptation by attempting to measure management practices (either from organizations or through programs and/or policies implemented by governments). Given the Index's focus on outcome-based measures, measuring such practices is deemed out of scope.

Appendix | GLOBAL CONTEXT

The following section considers how Canada's choice of Index indicators and metrics align with a selection six leading global sustainability standards and indices.[3] While not intended to be comprehensive, the review highlights key differences and similarities as context for Canada's approach.

Many individual companies are using the Greenhouse Gas Protocol to report their total GHG emissions. The Science-Based Targets Initiative (SBTi) helps companies set emission reduction targets and to track progress toward reduction goals. The Greenhouse Gas Protocol has defined three scopes for GHG emissions. Scope 1 emissions are those from company operations, such as the running of the processing plant; Scope 2 emissions are from purchased electricity or steam acquired energy for heating or cooling; and Scope 3 emissions involve upstream and downstream indirect emissions from such items as purchased goods and services, transportation and distribution. For many food processing and food service companies, most of their scope 3 emissions are from the production of their purchased agriculture inputs. (See Figure on types of emissions.)

SBTi is used to set emission reduction targets primarily for direct scope 1 and 2 emissions. The SBTi Forest Land and Agriculture guidance (FLAG) methodology is used to set emission reductions for scope 3 emissions.

Overview of how this topic is typically addressed in the selected global standards:

- Organization-facing standards typically focus on direct (Scope 1) and indirect (Scopes 2 and 3) GHG emissions, as well as on the efforts made to reduce emissions intensity.
- The standards quantify GHG emissions in keeping with global calculation methods (e.g., IPCC Guidelines on National Greenhouse Gas Inventories, GHG Protocol, ISO 14064-1 and 2) and results are reported in tons of CO_2 equivalent. Organizations are expected to disclose the gases included in the calculation, the base year, the emission factors considered, the consolidation approach and the standards, methodologies, assumptions and/or tools used. When reporting ratios, the denominator is to be clearly outlined.
- Carbon sequestration can be accounted for as part of reduction projects, according to established methodologies (e.g., GRI 305-5 Reduction of GHG Emissions).
- While the Canadian Index is not marking progress at this point to specific targets, the canvassed standards refer to target-setting. They make the point that GHG reduction targets should be set according to established standards (e.g., SBTi). Certain reporting platforms dedicated to climate change and GHG emissions (such as CDP, the Carbon Disclosure Project or TCFD, the Taskforce on Climate-related Financial Disclosures) provide more specific guidance as to what information should be disclosed by organizations with respect to how they mitigate and reduce their GHG emissions. These platforms also pay close attention to how organizations manage climate-related risks.

Overview of how this topic is typically addressed in the selected global indices:

- Global indices typically use national GHG emissions measured at the country level according to the IPCC quantification methodology.
- Results can be reported according to key emission sources (e.g., animal emissions, fertilizer emissions), per gases (e.g., CO_2, CH_4), by using different ratios (e.g., per capita, per acreage) or by tracking changes over

3 The three selected standards are the Global Reporting Initiative (GRI), with a particular focus on chapter 13 on Agriculture, Aquaculture and Fishing, the benchmarking methodology developed by the World Benchmarking Alliance (WBA), and the Sustainability Assessment of Food and Agriculture systems (SAFA) from the FAO. Together, these three standards cover an extensive list of topics related to agri-food sustainability based on which organizations can assess and/or report their performance. The three indices are the Environmental Performance Index (EPI) from the Yale Center for Environmental Law & Policy, the Sustainability Food Index (SFI) from *The Economist*, and the United Nations' Sustainable Development Report (SDR).

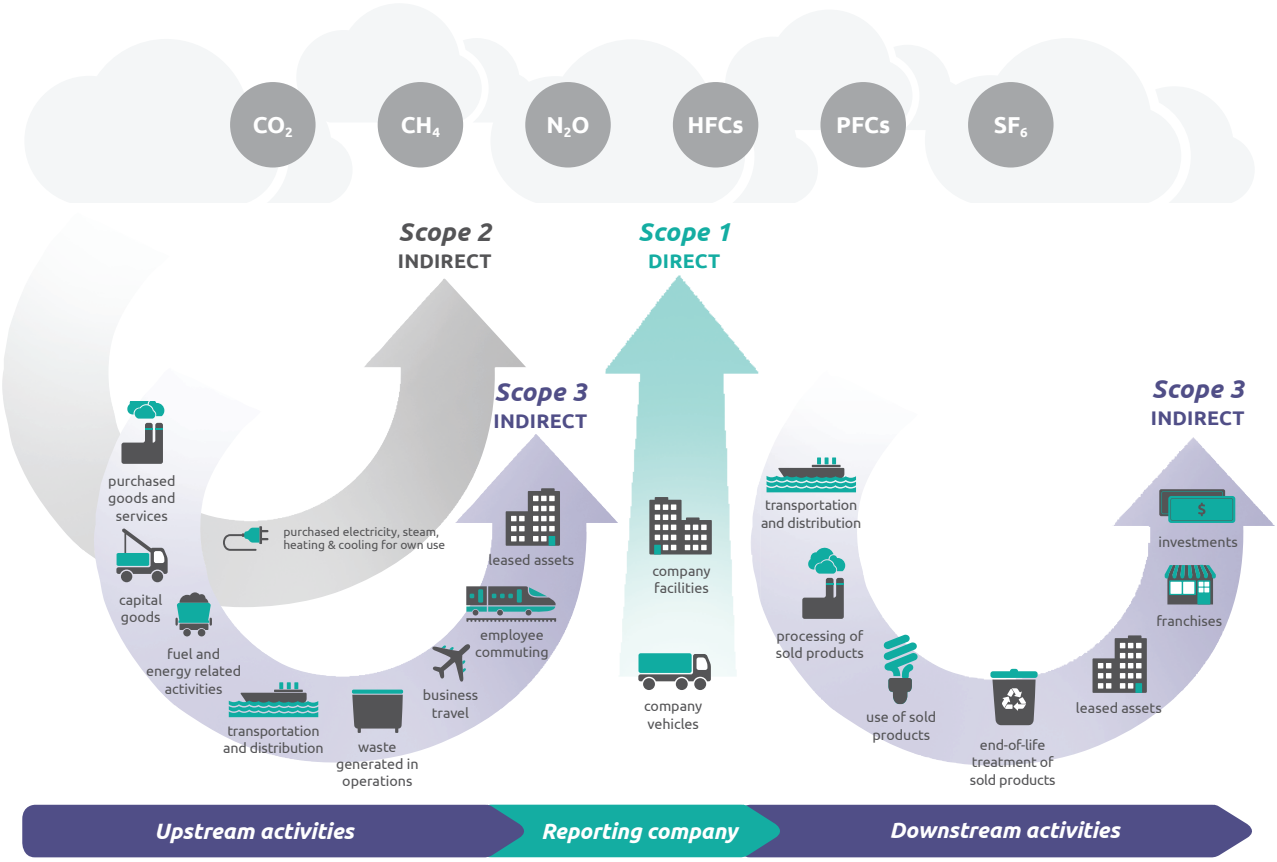

Figure: Overview of GHG Protocol scopes and emissions across the value chain

Source: WRI/WBCSD. (2011). Corporate Value Chain (Scope 3) Accounting and Reporting Standard Supplement to the GHG Protocol Corporate Accounting and Reporting Standard. https://ghgprotocol.org/sites/default/files/standards/Corporate-Value-Chain-Accounting-Reporing-Standard_041613_2.pdf

time. Consequently, results can be reported using different units (e.g., 0-100 evaluation scale, CO_2 equivalent) making comparability a challenge.

- Measuring emissions related to land use change or soil organic carbon is also be tracked by these indices.
- Beyond emissions measures, the indices also address government practices to respond to climate change. For instance, they can document the existence of national programs or policies designed to address vulnerability to climate change and adaptation and mitigation measures.

Indicator 2 | Soil health

INTRODUCTION

Soil health is vital to improve productivity and resilience as well as to increase carbon sequestration.

Improving soil health reduces greenhouse gases (GHGs) and improves soil productivity, key outcomes of *climate-smart* agriculture. Maintaining good soil health is a recognized priority and work is underway to better understand its regional variations, progress, and vulnerabilities.[1] While the role soil plays in sequestering carbon is addressed in the GHG emissions report, this indicator emphasizes broader measures that can determine soil health.

Soils vary considerably and change over time from climate, management practices, and local soil properties. The concept of soil health covers a diversity of considerations that goes beyond the scope of the identified indicators and include, for instance, soil biota which is a critical component of healthy soil. There is an absence of one definition or metric of soil health that measures all aspects of soil health. Proxies of soil health are therefore used: soil carbon, soil erosion risk and soil carbon content.

Key differences and similarities with global sustainability standards and indices

The review of six leading global sustainability standards and indices shows that the Index's indicators and metrics align in different ways. In particular, this includes metrics for soil organic carbon. Soil erosion is also prevalent in global standards. However, differences also exist. For instance, global standards that include measures of soil organic carbon also include soil organic matter and carbon stock more broadly. Soil organic carbon in the Index is expressed as a change over time, whereas global standards and indices attempt to quantify this metric. Certain standards also include soil chemical quality, physical structure, and biological quality which the Index does not. The Index considers erosion based as a risk index, whereas other standards quantify (or attempt to) the amount of soil eroded over time.

RESULTS

2.1 SOIL COVER

Soils can be protected from wind and water erosion, organic matter depletion, and fertility loss degradation when covered by vegetation, crop residue, or snow.

2.1.1 Soil cover

Description	Source	Result: Days per year, average for Canada
The Soil Cover Indicator summarizes the effective number of days in a year that agricultural soil is covered by vegetation, crop residue or snow.	Agri-environmental Indicators, Agriculture and Agri-Food Canada (AAFC)	2016: 284.7 1981: 261.7

1 Soil Health Report Card, Soil Conservation Society of Canada: https://soilcc.ca/programs/sccc-soil-health-report-card/

2.2 SOIL EROSION

Soils can be eroded by water and wind which impacts their health and the health of the surrounding ecosystem. While there is no measurement of soil erosion, AAFC's Soil Erosion Risk Indicator assesses these soil erosion risks and provides a perspective on soil health. As AAFC notes that while there are pockets of risk, the overall "risk of soil erosion has been decreasing on agricultural lands in Canada since 1981. In 2016, the majority of farmland (76%) in Canada was at very low risk from soil erosion."[2] This outcome is significantly attributed to producers' efforts to improve land management practices, including widespread adoption of conservation tillage, use of protective vegetation and fall-seeded, perennial and cover crops.

2.2.1 Risk of soil erosion

Description	Source	Result: Index out of 100
The Soil Erosion Risk Indicator shows performance state and trends over time, based on weighting the percentage of agricultural land in each indicator class, such that the index ranges from 0 (all land in the most undesirable category) to 100 (all land in the most desirable category).	Agri-environmental Indicators, Agriculture and Agri-Food Canada (AAFC)	2016: 90 2011: 91 2006: 89 2001: 83 1996: 79

2.3 SOIL ORGANIC CARBON

Organic carbon is an important component of soil health, contributing to the capacity of the soil to hold water, cycle nutrients, and provide habitat for the microbes in the soil. Its optimum level depends on local climate, soil texture and desired soil function. Agriculture and Agri-Food Canada calculates a Soil Organic Carbon Change indicator which measures the rate of change in carbon levels in agricultural soils. This indicator shows the rate of soil organic carbon change and whether it is increasing or decreasing.

2.3.1 Soil Organic Matter Indicator

Description	Source	Result: Index out of 100
The Soil Organic Matter Indicator shows soil organic matter trends over time, based on an index range from 0 (all land in the most undesirable category) to 100 (all land in the most desirable category). An index value that is increasing over time suggests improving environmental performance, while a decreasing index value suggests deteriorating environmental performance over time.	Agri-environmental Indicators, Agriculture and Agri-Food Canada	2016: 72 2011: 77 2006: 78 2001: 74 1996: 62

[This indicator is linked to indicators on GHGs' emissions, crops inputs, and water stewardship]

Applicable U.N. Sustainable Development Goal (SDG): 2.4

2 https://agriculture.canada.ca/en/agriculture-and-environment/soil-and-land/soil-erosion-indicator

Appendix | GLOBAL CONTEXT

The following section considers how Canada's choice of Index indicators and metrics align with a selection six leading global sustainability standards and indices.[3] While not intended to be comprehensive, the review highlights key differences and similarities as context for Canada's approach.

Overview of how this topic is typically addressed in the selected global standards:

- There is a high degree of variability between standards on the definition of soil health. However, standards typically align conceptually around the ideas that minimal erosion, high productivity, and the ability to sequester carbon are indicators of good soil health. They tend to focus on practice-based commitments or goals organizations can make to improve such soil health drivers.

Overview of how this topic is typically addressed in the selected global indices:

- Indicators are typically calculated at the country level and are largely dependent on which metrics are the most widely available.
- Soil organic carbon is quantified but is often couched within wider metrics such as carbon stock and soil organic matter.[4]
- Soil erosion is typically expressed as a rate or an estimate of the actual quantity of soil eroded per year.
- Soil health can also be expressed in terms of productivity including net primary productivity and the proportion of agricultural land in use.
- Soil cover is included in one standard as an indicator related to soil degradation.

3 The three selected standards are the Global Reporting Initiative (GRI), with a particular focus on chapter 13 on Agriculture, Aquaculture and Fishing, the benchmarking methodology developed by the World Benchmarking Alliance (WBA), and the Sustainability Assessment of Food and Agriculture systems (SAFA) from the FAO. Together, these three standards cover an extensive list of topics related to agri-food sustainability based on which organizations can assess and/or report their performance. The three indices are the Environmental Performance Index (EPI) from the Yale Center for Environmental Law & Policy, the Sustainability Food Index (SFI) from *The Economist*, and the United Nations' Sustainable Development Report (SDR).

4 For instance, building on the FAO Global Soil Organic Carbon (GSOC) Map (http://54.229.242.119/GSOCmap/), the Food Sustainability Index tracks the metric Soil Organic Carbon (SOC) stocks (in t C ha-1), which is measured 20 years into the future, in current agricultural lands under different soil management scenarios that vary in the degree of carbon inputs to the soil, at 0-30 depth and 1 x 1 km spatial resolution.

Indicator 3 | Water stewardship

INTRODUCTION

With climate change "intensifying the water cycle,"[1] countries worldwide are confronting a host of water issues that can disrupt and threaten food production and food security.

Canada is generally known for its abundance and quality of freshwater.[2] However, scrutiny of water stewardship is increasing[3] and some companies and jurisdictions are setting targets to improve water quality of watersheds, reduce pollutants and improve water use efficiencies.

Canada's agri-food sector is facing greater localized impacts and uncertainty, such as from more intense rainfall and flooding to increasing frequency of droughts and reductions in seasonal snow cover.

Water quality and use are regional and local in nature and require finer-level spatial detail by province and by watershed (such as from watershed modelling) to be the most meaningful. However, national-level measuring can provide insightful indicators.

Key differences and similarities with global sustainability standards and indices

The Index includes metrics on major water-related topics, specifically measurements of quantity and quality. It also takes into consideration water withdrawal. Key differences are that global standards and indices typically express water quantity through a broader range of metrics than only water used by irrigation (e.g., water withdrawal, water discharge, water consumption). Some specific indices (e.g., WWF's Water Filter Risk, WRI's Aqueduct Water Risk Atlas) also consider water-related risks more specifically.

RESULTS

3.1 WATER QUALITY

It is important to discern the role and contribution of Canada's agri-food system to water use and quality challenges. Enhanced national water quality reporting in agricultural landscapes would improve understanding of such water challenges and their impacts, including the effect of mitigation efforts to minimize impacts.

There is extensive monitoring of freshwater quality in Canada to ensure safe drinking water. Similarly, food manufacturing establishments are required to ensure that water used in the processing of food meets safety standards for human consumption. There are therefore many site-specific results available that measure quality of water prior to its use.

1 *Climate change widespread, rapid, and intensifying – IPCC*, August 9, 2021

2 Canada had the 2nd-best water-quality ranking among selected industrialized countries. https://www.canada.ca/en/environment-climate-change/services/environmental-indicators/freshwater-quality-global-context.html

3 CDP tracks corporate water risk disclosures for investors. It measures company actions to improve water stewardship both directly in firm operations and indirectly through their supply chains. CDP Global Water Report, 2020: https://cdn.cdp.net/cdp-production/cms/reports/documents/000/005/577/original/CDP_Water_analysis_report_2020.pdf?1617987510

The focus within this index, however, is the impact of the agri-food system on water quality, notably relating to watersheds. The Government of Canada has implemented a water quality monitoring program covering all watersheds at 173 river sites across Canada. Most of these sites have multiple influences: agriculture, mining, forestry and human activity. However, water quality of 31 of these sites are influenced solely by agricultural activity.

There are also significant water quality improvement initiatives and monitoring in both streams and lakes in areas of Canada where there are identified water quality issues, in part impacted by agricultural activity, notably the Great Lakes, Lake Winnipeg and the St. Lawrence River. For purposes of this pilot, such metrics have not been included.

3.1.1 Fresh water quality

Description	Source	Result: Percent
A. Water quality at each of the 173 river sites is considered excellent when parameters in a river almost always meet their guidelines, and poor when parameters usually do not meet their guidelines.	Water quality in Canadian rivers, Environment and Climate Change Canada (ECCC) 2017 to 2019	Excellent or good: 41% Fair: 42% Marginal:16% Poor: 2%
B. Water quality at 31 river sites that can be attributed solely to agriculture use.		Excellent or good: 52% Fair: 42% Marginal: 6% Poor: 0%

Health Canada's Pest Management Regulatory Agency (PMRA), in collaboration with Environment and Climate Change Canada (ECCC) and Agriculture and Agri-Food Canada (AAFC), began a two-year pilot water monitoring program for pesticide residues in the spring of 2022. The results provided are preliminary at time of publication.

3.1.2 Monitoring water for pesticide residue

Definition	Source	Result: Water samples
Water samples were collected from 89 surface water sites including rivers, streams, wetlands and lakes across Canada. Sites with historical data showing detections of pesticides in water or sites located in regions of known intensive pesticide use were selected. The water samples were analyzed for the presence of 185 pesticides currently registered for use in Canada.	Pilot water monitoring program, Pest Management Regulatory Agency, Health Canada	Preliminary results only – more samples are being analyzed 66 currently used pesticides have been detected across 211 samples No concerns for human health as the concentrations are below PMRA's Human Health Reference Values For aquatic invertebrates, 3 insecticides of the 185 pesticides were detected in a limited number of samples at concentrations higher than the PMRA's long-term (chronic) ALRV for these three pesticides. For aquatic plants and algae, seven herbicides of the 185 pesticides were detected in a limited number of samples at concentrations equivalent to or slightly higher than the PMRA's ALRV for these seven pesticides.

3.2 WATER USE

Canadian agriculture is largely *green water* dependent (reliant on rainfall/snow). Agriculture is the 5th largest user of water in Canada but consumes some 80% of water it diverted, as opposed to returning it to the source, unlike most other big water users, such as for hydroelectric generation.[4] Included in that diversion would be water used by the crop and recirculated as ground water.

Note that in metric 3.2.1, "water use" is also termed "water withdrawals" as referenced in the Global Context.

3.2.1 Water use, crop production

Definition	Source	Result: Million cubic metres
The amount of water used for irrigating crops, total for Canada.	Water Use Survey, Statistics Canada 2021	2020: 1.78 2018: 2.95 2016: 2.05 2014: 1.68 2012: 1.69

3.2.2 Water use, livestock production

Definition	Source	Result: Million cubic metres
Animal production.	Physical flow account for water use Table: 38-10-0250-01, Statistics Canada, 2022	2019: 1.23 2017: 1.53 2015: 1.41 2013: 0.91

3.2.3 Water use, processing

Definition	Source	Result: Billion cubic metres
Volume of fresh and saltwater intake for food manufacturing, beverage and tobacco manufacturing.	Volume of water intake for the manufacturing industries for Canada, Table: 38-10-0040-01 Statistics Canada Annually, latest reported 2017	2017: 48.9 2016: 38.3 2015: 39.1 2014: 39.4 2013: 46.8

The Canadian Food Inspection Agency monitors water use in food processing for safety, such as for microbiological or chemical hazards.[5] Matters relating to food safety are addressed in the Food Integrity Indicators.

GAPS AND OBSERVATIONS

- **Water stress:** The Index does not currently include water stress, which is defined as areas where water withdrawal exceeds water replenishment. The latest water stress analysis is for 2012 by Environment and Climate Change Canada but is not included as it is not sufficiently recent.

4 https://www.canada.ca/en/environment-climate-change/services/environmental-indicators/water-withdrawal-consumption-sector.html
5 https://inspection.canada.ca/preventive-controls/preventive-control-plans/water-for-use-in-the-preparation-of-food/eng/1511377944601/1511377945080

- **Water use in greenhouses:** Metrics could be developed to describe trends in greenhouse water withdrawals, recirculation systems, and filter/recycling. An additional option is to measure the crop output to the amount of water used over time to track the sustainability of water use on a product intensity basis (whether greenhouse, irrigated cropland, or dryland).

Appendix | GLOBAL CONTEXT

The following section considers how Canada's choice of Index indicators and metrics align with a selection six leading global sustainability standards and indices.[6] While not intended to be comprehensive, the review highlights key differences and similarities as context for Canada's approach.

Overview of how this topic is typically addressed in the selected global standards:

- Global standards emphasize measuring water withdrawals in various segments of the supply chain, but typically also break this calculation down into ground and surface water withdrawals, as well as expressing water use in terms of consumption and discharge (i.e., withdrawal – discharge = consumption).
- Standards typically emphasize target setting and the implementation of water conservation practices, as well as the assessment of water usage in water-stressed areas.
- Standards address water quality in terms of the quality of discharge/wastewater.

Overview of how this topic is typically addressed in the selected global indices:

- Water use is expressed in a variety of ways including water use efficiency, freshwater withdrawal as a proportion of total available freshwater, water footprints per tonne of crop produced, land area under irrigation, and risk indices for water stress.
- The focus of water quality is often tied to the availability of safe water for drinking.
- Agriculture is indirectly implicated in indicators that focus on reducing pollution and water contamination globally.
- Global indices typically include a metric of whether there are policies in place to improve water quality and/or implement sustainable water management strategies.
- Other water-specific indices, namely Aqueduct Water Risk Atlas (from the WRI) and the Water Risk Filter (from WWF), account specifically for water stress and water scarcity, using different metrics and providing results at country and regional levels.

6 The three selected standards are the Global Reporting Initiative (GRI), with a particular focus on chapter 13 on Agriculture, Aquaculture and Fishing, the benchmarking methodology developed by the World Benchmarking Alliance (WBA), and the Sustainability Assessment of Food and Agriculture systems (SAFA) from the FAO. Together, these three standards cover an extensive list of topics related to agri-food sustainability based on which organizations can assess and/or report their performance. The three indices are the Environmental Performance Index (EPI) from the Yale Center for Environmental Law & Policy, the Sustainability Food Index (SFI) from *The Economist*, and the United Nations' Sustainable Development Report (SDR).

Indicator 4 | Biodiversity & agrobiodiversity

INTRODUCTION

The long-term well-being and resiliency of productive landscapes (and seascapes) for food production are connected to ecosystem and habitat health. As emphasized by the Kunming-Montreal Global Biodiversity Framework to which Canada abides, biodiversity is fundamental to human well-being, a healthy planet, and economic prosperity. To achieve its vision that "by 2050, biodiversity is valued, conserved, restored and wisely used, maintaining ecosystem services, sustaining a healthy planet and delivering benefits essential for all people", the Framework proposes four long-term goals and has set 23 action-oriented global targets for urgent action over the decade to 2030.[1]

Given the breadth of biodiversity, lack of a complete inventory of species, and Canada's diversity of agricultural regions, it would be too ambitious to fully measure biodiversity. Measuring habitat change is the most relevant proxy to do so.

It is acknowledged that data improvements could better equip stakeholders to monitor and respond to biodiversity change on agricultural land and seascapes. Stakeholders, including industry, conservation associations and government are committed to working together to explore options for data improvements. As finer-level data becomes available, additional habitat metrics known to be correlated with biodiversity could be considered, such as: hedgerows, shrubland, native plant biodiversity (relevant to agricultural buffer zones), field margins (fencerow, grassy margins), as well as native grasslands inventory.

The status of species at risk as defined under Canada's *Species at Risk Act* is not proposed as an indicator because factors affecting such species extend well-beyond the farm landscape.[2]

Key differences and similarities with global sustainability standards and indices

The Index aligns with global standards and indices with respect to monitoring changes to habitats and biodiversity supporting lands. Global standards often include absolute metrics on the quantity of different habitat types, as does the Index. And global standards typically include metrics on the conversion of land. Key differences are that global indices of biodiversity do not consider solely agricultural land, but rather the full extent of biodiversity at the country level, therefore making comparisons to the Index challenging. Also, global indices and standards typically include a greater emphasis on indicators related to species (e.g., species at risk, genetic diversity and number of commodities). Marine environments present the greatest difference from the Index in that standards and indices focus more heavily on protected areas and the coverage of marine landscapes by conservation policies as a proxy for biodiversity conservation.

RESULTS

4.1 STATE OF BIODIVERSITY AND HABITAT CHANGE

A. THE WILDLIFE HABITAT CAPACITY ON FARMLAND INDEX (WHCFI)

This existing metric, one of Agriculture and Agri-Food Canada's (AAFC) Agri-Environmental Indicators, measures habitat availability for terrestrial vertebrates within agricultural landscapes.[3] It is currently used to meet public

1 Kunming-Montreal Global Biodiversity Framework. https://www.cbd.int/doc/decisions/cop-15/cop-15-dec-04-en.pdf

2 A conclusion made in *Biodiversity, A contributing paper of the Benchmarking Canada's Agri-Food Sustainability Leadership Project* (January 2021) and reaffirmed by National Index Partners in further work in 2022.

3 https://www.canada.ca/en/environment-climate-change/services/environmental-indicators/wildlife-habitat.html

reporting requirements under the Canadian Environmental Protection Act and the Department of the Environment Act. WHCFI's strength is in creating a spatial trend of habitat associations among hundreds of wildlife species on farmland across Canada. However, it is currently limited to vertebrate species (and does not include invertebrates and pollinators). Building on the WHCFI, more inclusive measures are proposed by providing a composite view of habitat change.

The approach emphasizes habitat quantity for reproduction purposes. It is a good overall proxy for wildlife biodiversity because all species respond to habitat. Specific habitats important to a large variety of species on the agricultural landscape occur primarily on the non-cropped landscape, including forest patches and hedgerows (see list under habitat types). Thousands of species of Canadian wildlife use these habitats for breeding, foraging, and migration. Better understanding conversion trends on these habitats may identify ways to improve biodiversity outcomes, such as enabling more "connected habitats" (e.g., riparian areas). This could become more important as sustainable agricultural intensification increases in certain regions.

4.1.1 Wildlife Habitat Capacity on Farms (reproduction)

Description	Source	Result: Average score out of 100
Habitat capacity is measured as the ability of the landscape to support breeding for wild terrestrial vertebrates. The WHCFI weighs the area of agricultural land use classes within each of Canada's soil landscape units by the suitability of each land use class for wildlife species potentially occurring in each soil landscape unit. The index ranges from 0 habitat capacity to 100 where a score of 100 would mean all land is highly suitable for all potentially occurring species. In addition to the average index value, available data can be used to track the change in percent area of the agricultural landscape where wildlife habitat capacity is maintained, increasing or declining. An index value that is increasing over time suggests improving environmental performance, while a decreasing index value suggests deteriorating environmental performance over time.	Wildlife Habitat Capacity on Farmland Indicator (WHCFI), Agriculture and Agri-Food Canada (AAFC), 2023	2015: 34.27 2010: 34.65 2005: 35.19 2000: 35.48 • 0.08%/year rate of decline (2000 to 2015) **Change in habitat capacity 2000 to 2015: % agricultural land** • Stable/ slight change/ maintained: 74.71% • Declined: 24.72 • Increased: 0.57

B. WILD CAPTURE FISHERIES

Fisheries and Oceans Canada regulates Canada's commercial fisheries to ensure the country's fish resources remain sustainable. The focus is on ocean fisheries given that 97% of the commercial fishery is ocean based.[4] Unfortunately, like many jurisdictions, past management decades ago fell short, and some fish stocks collapsed. Canada's fisheries management is much improved from previous decades including by incorporating the global Precautionary Approach in its modern, robust regulatory regime.[5] Maintaining and rebuilding healthy stocks is a joint responsibility of industry and government. By 2027, Canada aims to have all key fish stocks harvested at or below an approved removal reference or other approved level.

4 DFO's Fisheries Facts 2021:https://www.google.com/url?sa=t&source=web&rct=j&url=http://waves-vagues.dfo-mpo.gc.ca/Library/41039634.pdf%3F&ved=2ahUKEwjD5-eprcj2AhVUCM0KHUGVBkQQFnoECAQQAQ&usg=AOvVaw0GrJvsFdKBqj84UkGuaXv3

5 A Fishery Decision-Making Framework Incorporating the Precautionary Approach, DFO: https://www.dfo-mpo.gc.ca/reports-rapports/regs/sff-cpd/precaution-back-fiche-eng.htm

4.1.2 Harvest level of key fish stocks

Description	Source	Result: Percent of species at or below removal reference level or other approved levels
Harvest limits for wild fish and other marine animals are set to protect the addressed stocks for the future. Percent of species at or below removal reference level or other approved levels: The removal reference is defined as the maximum acceptable removal rate, or level, for the stock based on an analytical assessment of historical stock productivity data. When removal references are not available, other approved levels are established. Metric is in percent of species at or below removal reference level or other approved levels.	Sustainability Survey for Fisheries, 2022, Fisheries and Oceans Canada	2020: 98% 2019: 98% 2018: 96% 2017: 96% 2016: 96%

4.2 FARMLAND LOSS TO URBANIZATION

A. PRIME FARMLAND LOSS

The loss of prime agricultural land due to urbanization and industrial expansion raises questions about long term-food security given that less than 7% of Canada's land base is farmed.[6] As well, the farmland under the most urbanization pressure is in eastern Canada and on the west coast, both areas of which have a higher soil/climate capacity to produce fruits and vegetables.

4.2.1 Loss of farmland

Description	Source	Result: Area
Cropland converted to Settlements (cropland includes tame pasture). "Settlements" include all built-up land: urban, rural residential, land devoted to industrial and recreational use; roads, rights-of-way and other transportation infrastructure; and resource exploration, extraction and distribution (mining, oil and gas). ECCC reports that, on average, during the 2000–2010 period, 11 kilohectares (kha) of cropland were converted annually to Settlements. The 2020 NIR figure is the result of ECCC using a constant conversion rate after 2010.	National Inventory Report (NIR), 2022, Environment and Climate Change Canada	2020: 11,480 hectares

4.3 COMPOSITE VIEW: STATE OF BIODIVERSITY AND HABITAT CHANGE

Conversion of habitat to alternative uses can have a negative impact on the wildlife dependant on that habitat for breeding and food. This proposed measure is intended to present an overall view of land-use and habitat change relevant to agriculture production. It could include the primary and secondary habitat associations of the WHCFI indicator for component habitats that are most important to biodiversity (i.e., forest, native grasslands, wetlands, riparian habitat, and marginal land). The metric would represent overall losses and gains – a "biodiversity ledger" – by representing conversion of grassland to crops (loss), conversion of marginal land from crop to perennial forage

6 Overview of Canada's agriculture and agri-food sector, Agriculture and Agri-Food Canada

(gain), forest conversion to crops (loss) or afforestation (gain). At this point, measuring landscape heterogeneity is not included in the suggested composite metric.

Currently, conversion of forests, grasslands and wetlands on a field-sized scale is calculated. However, it is recognized that a more accurate calculation could be obtained if areas smaller than field-size were to be included. As well, losses and gains of riparian areas and marginal land are not currently measured. Ongoing work by Agriculture and Agri-Food Canada to refine the WHCFI, such as including invertebrate species, fine-scale habitats (e.g., small wetlands), and difficult to decipher habitats (e.g., native grassland and smaller parcels), could ultimately be incorporated into this proposed broader metric.

4.3.1 Changes in landscapes within agricultural land

Description	Source	Result: Percent change 2000 to 2015	
Cropland: Annual Cropland, Perennial Cropland, and Fruits and Berries. Grassland: Managed Grassland and Unimproved Pasture, Forest and wetland: Woodland, wooded wetland, wetland.	The National and Provincial proportion of land cover types in the Canadian agricultural extent in 2015 (State) and the percent change from 2000-2015, Agriculture and Agri-Food Canada Unpublished data, 2023	Cropland	• Annual cropland: +4.2% • Perennial cropland: -3.6% • Fruit and berry: +50.0%
		Grassland	• Managed grassland: -8.8% • Unimproved pasture: -11.1%
		Forest and wetland	• Woodland: -5.3% • Wooded wetland: -1.1% • Wetland: -0.6%
		Result: change in thousands of hectares 2000-2015	
		Cropland	• Annual cropland: + 1,766.7 • Perennial cropland: - 824.6 • Fruit and berry: + 46.0
		Grassland	• Managed grassland: - 778.8 • Unimproved pasture: - 343.2
		Forest and wetland	• Woodland: - 2,995.7 • Wooded wetland: - 100.5 • Wetland: - 45.8

GAPS AND OBSERVATIONS

Disaggregated views: state of biodiversity and habitat change

Proposed metrics on the state of biodiversity for specific habitats and species and on a regional basis would provide greater insights on progress and responses, such as identifying programs/incentives that can be directed to the habitat types that have the highest relative losses. This metric will track the trend in acres of each habitat type by the Soil Landscapes Polygons of Canada.[7] As finer-scale data becomes available, this metric will incorporate habitats that are not currently measured, such as marginal land.

A. HABITAT TYPES

1. **Forests**: Currently, the overall rate of deforestation in Canada is low, at less than half of 1% since 1990 and this rate has been declining. The intent of this metric is to focus on agricultural activities on forests.

2. **Riparian:** This is a rich source of transitional habitat between water and land not currently captured by the WHCFI. Regional data sets could be used to indicate trend in this habitat.

7 https://sis.agr.gc.ca/cansis/nsdb/slc/index.html

3. **Native grasslands:** Native grasslands are used extensively for livestock production in the Prairies. There is significant compatibility between livestock production and maintenance of important habitat for biodiversity. Native grasslands are very important to biodiversity in Canada but regional datasets vary in their suitability for determining status and trends. Models are being developed by AAFC, the Saskatchewan government and others to identify the unique spectral signature of native grasslands using earth observation data. Once these models are available, the maps may be incorporated into this indicator to report on trends in native grasslands.

4. **Tame grasslands:** This habitat is important to wildlife. Currently, there is a lack of data to distinguish between tame and native grasslands.

5. **Wetlands:** Wetlands are a key source of habitat for many species. The current WHCFI does not capture the small sized wetlands (<1 acre). Regional data sets that do so could be used to track regional wetlands, especially in the Prairie pothole region.

6. **Marginal land:** Land that is economically marginal for agricultural production represents a significant opportunity for restoration of wildlife habitat.

B. SPECIES

1. **Farmland birds:** Selecting native species populations that are sensitive to agricultural production is relevant.[8] For example, farmland birds are a good choice because they mirror the influence of factors that shape biodiversity at a landscape scale. There is also a significant body of knowledge on bird habitat and population trends.

2. **Beneficial insects:** Some of the crops grown in Canada directly rely on insect pollination such as most of our fruits and vegetables and forage crops such as clover and alfalfa. Other crops that are self-fertile, such as soy and canola, experience greater yields in the presence of insect pollinators. This indicator focuses on wild pollinators, of which Canada has thousands of species, including wild bees, butterflies, and beetles. (It does not include the packaged bee business that relies mainly on non-native or managed species.) Pollinator habitat trends could be used as a proxy rather than measuring population trends. (Agriculture and Agri-Food Canada is planning to revisit insect habitat availability metrics).

3. **Agrobiodiversity:** Agrobiodiversity is the variety of domesticated cultivars of crops and breeds of livestock. Tracking agrobiodiversity is gaining greater global interest[9] as it offers a means to monitor heterogeneity trends in ecosystems and the connection with natural landscapes and species.[10]

[Soil biodiversity is relevant to the indicators on soil health and water stewardship.]

Applicable U.N. Sustainable Development Goal (SDG): 2.4.1, Life on land: 15.1, 15.3, 15.5, 15.9; Life below water: 14.1, 14.2, 14.4

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8 Note, a farmland bird index exists for the EU; http://appsso.eurostat.ec.europa.eu/nui/show.do?dataset=env_bio2&lang=en

9 A new global index is measuring agrobiodiversity by Bioversity International, part of CGIAR, the Consortium of International Agricultural Research Centers: https://www.bioversityinternational.org/abd-index/

10 Refer to: https://ingeniumcanada.org/channel/articles/food-for-the-future-how-canadas-seed-bank-is-protecting-crop-plants-for-tomorrow and https://www144.statcan.gc.ca/sdg-odd/goal-objectif02-eng.htm. Bioversity International notes: "Landscape heterogeneity helps to maintain species diversity and thus conservation of wild crop relatives, pollinators and natural pest and disease controls which directly or indirectly support the maintenance of agrobiodiversity." The Agrobiodiversity Index: Methodology Report v.1.0. Bioversity International, Rome, Italy, 2018, page 26.

Appendix | GLOBAL CONTEXT

The following section considers how Canada's choice of Index indicators and metrics align with a selection six leading global sustainability standards and indices.[11] While not intended to be comprehensive, the review highlights key differences and similarities as context for Canada's approach.

Overview of how this topic is typically addressed in the selected global standards:

- Global standards emphasize on conservation and rehabilitation of land and species. This includes identifying areas of highest risks and targets and efforts to assess impacts.
- Identify key species (including species at risk) and monitor diversity and abundance, including ensuring a diversity of commodity species (both genetic diversity and the total number of commodity species) .
- Standards consider conversion of land through loss of soil and biological productivity.
- One standard specifically focuses on high-risk commodities with respect to deforestation/conversion-free operations.

Overview of how this topic is typically addressed in the selected global indices:

- Global indices use a combination of absolute measures of habitat, but more frequently express habitat types as a proportion of a larger area, often as an index.
- Global indices rarely express biodiversity and habitat availability with respect to agricultural land, and rather provide an overview at the country level. For example, several standards include measures on proportions of habitats and biomes that are within protected areas.
- With respect to marine habitats, global standards do include measures of biologically sustainable fish stocks, but include more indicators related to the development and implementation of policy as well as protected marine areas.
- Global indices include metrics on the diversity of crops grown within a country, including through the saving of seeds.
- Global indices also include metrics on species at risk globally.

11 The three selected standards are the Global Reporting Initiative (GRI), with a particular focus on chapter 13 on Agriculture, Aquaculture and Fishing, the benchmarking methodology developed by the World Benchmarking Alliance (WBA), and the Sustainability Assessment of Food and Agriculture systems (SAFA) from the FAO. Together, these three standards cover an extensive list of topics related to agri-food sustainability based on which organizations can assess and/or report their performance. The three indices are the Environmental Performance Index (EPI) from the Yale Center for Environmental Law & Policy, the Sustainability Food Index (SFI) from *The Economist*, and the United Nations' Sustainable Development Report (SDR).

Indicator 5 | Crop inputs use / management

INTRODUCTION

The essential global challenge is how to produce more food with less environmental impact. How producers manage two inputs (pest control and nutrient products) is part of how best to achieve this outcome.[1] On the one hand, some governments are seeking absolute reductions in use and prohibitions on certain products.[2] On the other, there is a global effort to take a ground up approach to improve producer use and management of inputs.[3] The Convention on Biodiversity meeting in Montreal in December 2022 resulted in an agreement of parties, including Canada, for reducing pollution risk to levels that are not harmful to biodiversity, including reducing excess nutrients lost to the environment by at least half including through more efficient nutrient cycling and use; reducing the overall risk from pesticides and highly hazardous chemicals by at least half including through integrated pest management, based on science, taking into account food security and livelihoods; and also preventing, reducing, and working towards eliminating plastic pollution, (known as target 7).[4] Canada has set a goal to reduce nitrous oxide emissions from fertilizer use by 30% below 2020 levels through 2030.

Canada has developed initiatives, such as environmental farm plans and cost-shared funding, to support beneficial management and continuous improvement practices. However, there is a discernable lack of good data on crop inputs to adequately demonstrate outcomes to meet rising customer, societal and regulator expectations. New "priority" metrics are required to respond.

Key differences and similarities with global sustainability standards and indices

In most global standards and indices, pesticide and nutrient management is cross-cutting with training, water quality, climate change (emissions), biodiversity, and health & safety. There is also typically a focus on the implementation of responsible management practices. Key differences are that global standards identify and ban specific high-risk products. Also, global standards and indices rarely attempt to quantify the extent of good practice management. Global indices that do quantify input use typically measure use relative to efficiency or area of land, even though one index (EPI) does attempt to quantify risk in a similar way to the Index.

RESULTS

5.1 RESPONSIBLE PEST CONTROL PRODUCT USE

Canada does not currently measure pesticide use intensity (i.e., per hectare of cropland) nor does it have the data available to provide suitable insight on environmental impacts beyond some limited water monitoring.[5] Largely

1 See, for example: https://www.euractiv.com/section/agriculture-food/news/commission-not-afraid-of-global-coalition-against-eus-food-policy/

2 The EU Farm to Fork strategy aims to reduce by 50% the use and risk of chemical pesticides and reduce fertilizer use by at least 20% by 2030. https://ec.europa.eu/food/farm2fork_en. Quebec is looking to reduce the sales of synthetic pesticides by 500,000 kg and achieve a 15% reduction in application of nitrogenous fertilizers on cropped lands while also embracing organic production by doubling the number of its hectares by 2025 and increasing the share of eco-certified aquatic products by volume by 2025: Politique Bioalimentaire, 2018-2025: https://cdn-contenu.quebec.ca/cdn-contenu/adm/min/agriculture-pecheries-alimentation/publications-adm/dossier/politique-bioalimentaire/PO_politiquebioalimentaire-planaction_MAPAQ.pdf?1583250620. http://www.budget.finances.gouv.qc.ca/budget/2018-2019/fr/documents/ChangementsClimatiques_1819.pdf.

3 See, for example, http://www.nutrientchallenge.org

4 Kunming-Montreal Global Biodiversity Framework. https://www.cbd.int/doc/decisions/cop-15/cop-15-dec-04-en.pdf

5 Statistics Canada's Farm Management Survey (FMS) has information on pesticides, including by type of pest use (fungicide, insecti-

speaking, sales-based data is being collected to extrapolate environmental risk, but this is not outcome-based as impacts are not measured.

Demonstrating responsible pest management practices (or integrated pest management (IPM) is about controlling pests "with no adverse effects on human health, while optimizing crop yield, crop quality, and environmental protection and minimizing effects on biodiversity."[6] In short, developing the optimum IPM outcome-based metric is required to meet producer needs and public expectations.

The EU has developed their own indicator to estimate the trends in risk or hazard posed by chemical use.[7] Its Harmonized Risk Indicator focuses on product hazard defined using volumes applied times a hazard factor (defined by their regulatory approvals system) but does not include mitigation efforts.

Given that existing indicators are either hazard or practice-based and that neither accurately captures risk, scientific validation and creation of a new indicator is proposed to track and monitor risks more accurately and to demonstrate continuous improvement in risk reduction. With the December 2022 adoption of the Kunming Montreal Global Biodiversity Framework and the commitment to reducing the risk of pollution from all sources (Target 7), it is proposed that a new indicator be adopted from the resulting Monitoring Framework that governments will be implementing. This will ensure alignment across both public and private sector efforts, reduce duplication and ensure global alignment, enhancing the relevance of the Index. If successfully developed, this indicator could form part of a suite of measures, such as label safety instructions, water monitoring, worker safe-handling practices, and proper pesticide container disposal.

Link to other indicators

This sub-indicator is to be read in conjunction with identified iindicators addressed elsewhere in this Index to provide a holistic view of crop protection:

- **Safe product compliance:** refer to maximum residue limits (MRL) and label adherence in Food Integrity indicators.
- **Water impacts from crop protection products:** refer to water in these Environment Indicators.
- **Pesticide container and obsolete stock management:** refer to packaging waste in these Environment Indicators.
- **Safe-handling crop management products:** refer to Societal Well-Being Indicators for workplace safety (which would include poisonings and other pesticide-related safe-handling incidences).

5.2 RESPONSIBLE NUTRIENT USE

Producers deploy a variety of beneficial management practices (BMPs) to limit the environmental impacts of commercial fertilizers, manure and other nutrient sources. Regulatory and self-regulatory mechanisms which support this activity vary across jurisdictions and agricultural landscapes. This has also resulted in considerable practice-based data being available.

Self-regulatory initiatives include 4R Nutrient Stewardship Program, an industry standard. It is about applying nutrients from the right source at the right rate, right time, and right place. Industry is increasingly monitoring and

cides, herbicides, biopesticides).

6 *Field to Market: The Alliance for Sustainable Agriculture. 2020. Trends in Pest Management in U.S. Agriculture: Identifying Barriers to Progress and Solutions Through Collective Action*: https://fieldtomarket.org/media/2020/02/Field-to-Market-Trends-In-Pest-Management-Report-Feb-2020_WEB.pdf. en/

7 EU: https://ec.europa.eu/food/plants/pesticides/sustainable-use-pesticides/harmonised-risk-indicators_en

reporting the adoption of 4R practices.[8] This is also a relevant metric given the targets being set by the sector and government to deploy 4R. Many farmers have adopted environmental farm plans (EFPs) which include nutrient management practices. In some provinces, regulations require a Nutrient Management Plans (NMPs) for handling nutrient applications. Varying across jurisdictions, they essentially aim to assess crops/field nutrient needs and the nutrient content of available sources (i.e., manure, biosolids or commercial fertilizers); NMP are generally consistent with the 4R principles.

Though the impacts of responsible nutrient management have been well documented in research across North America (see endnotes in links section, below), the impact of each BMP is site specific and can vary depending on the climate, farming system, soil type, and can change from year to year. Research is being conducted to quantify the impact of specific practices on GHG emissions.[9] Until such comprehensive outcome-based metrics are available, this indicator tracks 4R practices as an interim measure.

5.2.1 Adoption of 4R Nutrient Stewardship practices

Description	Source	Result: Percent of crop land
Fertilizer Canada undertakes an extensive annual survey of nutrient management practices on major crops in varying parts of the country. From this survey, they have estimated the percentage of total cropland farmed using 4R Nutrient Stewardship principles.	Fertilizer Use Survey, Fertilizer Canada 2021	2021: 58% 2020: 45%

Links to other indicators

- **GHG emissions:** Responsible nutrient management practices help to reduce greenhouse gas emissions associated with crop production.[10]
- **Soil health:** Applying nutrients responsibly increases crop yields and contribution of carbon to the soil, and ensures adequate nitrogen to stabilize soil carbon, both allowing for more carbon sequestration in the soil.[11]
- **Water stewardship:** BMPs reduce nutrient losses to water ways.[12]
- **Biodiversity:** Optimum fertilizer use enables crop production and biodiversity.[13]

Applicable U.N. Sustainable Development Goal (SDG): 2.4, 14.1

8 Fertilizer Canada: https://fertilizercanada.ca/our-focus/stewardship/4r-designation/. Refer also to Statistics Canada's Farm Management Survey (FMS) which has information on quantities and areas receiving fertilizers, manure application and containment and other types of inputs (e.g., boron, sulfur).

9 A Review of the Recent Scientific Literature Documenting the Impact of 4R Management on N_2O Emissions Relevant to a Canadian Context, Dr. David Burton. https://fertilizercanada.ca/wp-content/uploads/2018/08/NERP-Science-Review-Paper-.pdf

10 Supporting references include: Drever, C., R., Cook-Patton, S., C., Akhter, F., Badiou, P., H., et al. 2021. Natural Climate Solutions for Canada. Sci Adv. 7:23. doi: 10.1126/sciadv.abd6034. https://www.science.org/doi/10.1126/sciadv.abd6034#T2

11 Reference example: Christopher, S.F., and R. Lal. 2007. Nitrogen management affects carbon sequestration in North American cropland soils. CRIT REV PLANT SCI 26(1): 45–64.

12 Reference example: Vollmer-Sanders, C., A. Allman, D. Busdeker, L.B. Moody, and W.G. Stanley. 2016. Building partnerships to scale up conservation: 4R Nutrient Stewardship Certification Program in the Lake Erie watershed. J. Great Lakes Res. 42(6): 1395–1402. doi: https://doi.org/10.1016/j.jglr.2016.09.004.

13 Reference example: *Achieving Nature-Positive Plant Nutrition: Fertilizers and Biodiversity*, The Scientific Panel on Responsible Plant Nutrition: https://www.sprpn.org/post/achieving-nature-positive-plant-nutrition-fertilizers-and-biodiversity#:~:text=Achieving%20Nature%2DPositive%20Plant%20Nutrition%3A%20Fertilizers%20and%20Biodiversity,-Mineral%20nutrition%20of&text=Optimally%20managing%20nutrient%20inputs%20for,land%2Dscape%20and%20global%20scales.

Appendix | GLOBAL CONTEXT

The following section considers how Canada's choice of Index indicators and metrics align with a selection six leading global sustainability standards and indices.[14] While not intended to be comprehensive, the review highlights key differences and similarities as context for Canada's approach.

Overview of how this topic is typically addressed in the selected global standards:

- Standards focus on the implementation of responsible and sustainable use of crop inputs, as well as commitments to reducing the overall use and reliance on inputs.
- Standards also emphasize mitigation practices such as implementing buffer strips.
- Reporting is focused on disclosing the extent of use and hazardousness of particular pesticides.

Overview of how this topic is typically addressed in the selected global indices:

- Global indices consider the use of fertilizers and pesticides in terms of both the management practices used and attempts to quantify the extent of use.
- Various metrics are used to express input use including nitrogen use efficiency, amount of fertilizer and pesticide per area of land.

14 The three selected standards are the Global Reporting Initiative (GRI), with a particular focus on chapter 13 on Agriculture, Aquaculture and Fishing, the benchmarking methodology developed by the World Benchmarking Alliance (WBA), and the Sustainability Assessment of Food and Agriculture systems (SAFA) from the FAO. Together, these three standards cover an extensive list of topics related to agri-food sustainability based on which organizations can assess and/or report their performance. The three indices are the Environmental Performance Index (EPI) from the Yale Center for Environmental Law & Policy, the Sustainability Food Index (SFI) from *The Economist*, and the United Nations' Sustainable Development Report (SDR).

Indicator 6 | Food loss & waste

INTRODUCTION

Reducing food loss and waste (FLW) can catalyze positive change, from boosting efficiencies and reducing costs across food supply chains, to lowering GHG emissions and fostering innovative food products and approaches that create new economic opportunities and improve access to food in society. In order to reduce the global footprint of consumption by 2030, the Kunming-Montreal Global Biodiversity Framework aims at halving global food waste.[1]

It has been estimated that 58% of all food produced in Canada is lost or wasted, with 32% of all food loss and waste (FLW) in Canada potentially avoidable.[2] Typical for advanced economies, the leading source of avoidable FLW in Canada is primary processing and further manufacturing at 43% of this total. While 21% of food waste occurs at the household level,[3] this Index focuses on supply chain actions. Canada's national target is to halve food waste by 2030 and leading food retailers have pledged to reduce FLW by 50% by 2025.[4]

The global Food Loss and Waste Protocol provides guidance for quantifying and reporting on FLW and for encouraging reduction strategies.[5] Although there are estimates of FLW for Canada as reported below, there is no standardized, finer-grained methodology to assess FLW (such as by weight, by GHG emission or by economic cost).[6] Consistent and more detailed data will be beneficial to obtain an accurate picture of the situation and tracking on-going progress.

As this Index is focused on agri-food sector performance, this indicator does not include consumer food waste practices.

Key differences and similarities with global sustainability standards and indices

The Index is comparable to global standards and indices in how it differentiates food loss and food waste, defining each in similar terms. It also includes metrics for government programs on this issue. As for the differences, the Index situates metrics for food loss and waste in the context of a goal statement (reduce and repurpose). It does not provide a methodological description or a comparatively detailed breakdown of background processes (i.e., to the steps necessary for reporting against a metric) as that found in other indices. Lastly, the Index does not report on food waste in metric tons, but as a percentage of avoidable waste in order to facilitate reporting on an aggregate number of both loss and waste, which is itself also a major difference from other standards and indices.

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1 Kunming-Montreal Global Biodiversity Framework. https://www.cbd.int/doc/decisions/cop-15/cop-15-dec-04-en.pdf

2 *Avoidable Crisis of Food Waste Report*, Second Harvest and Value Chain Management International Inc.: https://vcm-international.com/january-17-2018-ground-breaking-report-the-avoidable-crisis-of-food-waste-released-today/; Food loss or waste is estimated to be worth $49 billion annually, representing over a third of the nation's agri-food GDP contribution. *Circular Food Solutions in Canada: A Coast to Coast Landscape Scan*, October 2021, Smart Prosperity Institute, University of Ottawa.

3 *Background Materials for Circular Economy Sectoral Roadmaps*; Agri-Food, Smart Prosperity Institute, University of Ottawa, Feb. 2021; referencing data from Second Harvest and Value Chain Management International: https://institute.smartprosperity.ca/sites/default/files/BestPractices_Agri-food.pdf

4 National Zero Waste Council: http://www.nzwc.ca/focus-areas/food/issue/Pages/default.aspx. The World Benchmarking Alliance is ranking the world's top 30 food and beverage companies on this metric: https://www.worldbenchmarkingalliance.org/seven-systems-transformations/

5 Food Loss and Waste Accounting and Reporting Standard: https://www.flwprotocol.org

6 Reducing Food Loss and Waste in Canada, Workshop Summary, Environment and Climate Change Canada; June 2019, pp 7, 9: https://www.canada.ca/content/dam/eccc/food-loss-and-waste/FLW%20Workshop%20Summary%20Report%20ENG%20-%20FINAL.pdf.

RESULTS

6.1 REDUCE

The following metrics provide insight into avoidable food loss and waste within the agri-food system. The focus is on avoidable loss, rather than total loss, as total loss would include removal of weeds and seeds from harvested grain, for example. Regarding avoidable waste, uses of food for human consumption include selling misshaped vegetables, creating new food processing opportunities or diverting foods to food charities.[7] Repurposing inedible food can create new value, such as for animal feed, upcycling products from processing food waste, diverting rotten or inedible food for composting and for biofuel production.

6.1.1 Avoidable food loss and waste

Description	Source	Result: Million tonnes
A. Estimated total avoidable food loss and waste in growing/producing, processing and manufacturing food in Canada.	The Avoidable Crisis of Food Waste: Technical Report, Value Chain Management International, 2019	5.48
B. Estimated total avoidable food in the distribution and retailing of food in Canada (includes food produced in Canada and imported).		1.86

6.2 REPURPOSE

While this index aims to measure outcomes, data on reduction of food loss and waste over time is limited (such as measuring the volume of food "reused"). As such, this metric reports on the foundation being laid to engage stakeholders. Coordinated policy responses could facilitate industry action to track food reuse volumes across jurisdictions. This metric tracks the number of such policy interventions across Canada and use of food products or co-products not suitable for human consumption.

6.2.1 Government programs to encourage food waste reduction

Description	Source	Result: Funding
Program to provide funds through a competitive application-based process. Stream A/B: business model solutions that can prevent or divert food waste at any point from farm to plate. Streams C/D: technological solutions to food waste.	Food Waste Reduction Challenge, Agriculture and Agri-Food Canada Announced November 2020	$20 million available funding

Note for 6.2.2: Wheat and canola are grown for their value to the human food market. However, if the quality of the wheat is not suitable for milling for flour, it is diverted to livestock feed. Canola seed contains 44% oil, which is extracted and utilized by the culinary industry. The leftover seed contents are processed into meal. Canola

7 There is a recognized priority of actions to address food waste and loss; see the National Zero Waste Council: http://www.nzwc.ca/focus-areas/food/issue/Pages/default.aspx

meal is not suitable for food, but can be used for livestock feed. The use of these by-products for animal feed are provided as proxies for repurposing.

6.2.2 Use of by-products for animal feed

Description	Source	Result: Amount
A. Amount of wheat that is not marketable for milling and is used for animal feed.	Fundamentals of the Commercial Feed Industry in Canada, Animal Nutrition Association of Canada, 2021	30% of available wheat produced in Canada
B. Amount of canola meal used for animal feed.	Crushing statistics of major oilseeds, Canada and United States, Statistics Canada	Million tonnes of canola meal produced: 2022: 5.22 2021: 5.70 2020: 5.79 2019: 5.38 2018: 5.17

GAPS AND OBSERVATIONS

The Index does not include metrics for food waste at the consumer level, as some of the standards and indices do. However, measuring consumer impacts is out of scope for the Index.

As a measure of investment in upcycling, a metric was proposed for government programs to incent incremental research into and implementation of practices to accelerate activity on loss and waste reduction. One program has been cited, but there are other government research activities that could lead to a reduction in food loss and waster, such as using by-products for food and/or animal feed, that may be funded through general research support programs.

Appendix | GLOBAL CONTEXT

The following section considers how Canada's choice of Index indicators and metrics align with a selection six leading global sustainability standards and indices.[8] While not intended to be comprehensive, the review highlights key differences and similarities as context for Canada's approach.

Overview of how this topic is typically addressed in the selected global standards:

- Organization-facing standards generally define food loss and waste in similar terms, where food loss refers to a percentage of food lost from the post-harvest up to but not including the retail stages in the value chain, and food waste is a measure in metric tons of food wasted from the retail up to and including the end-consumer stages of the value chain. GRI situates food loss and waste in the context of food security.
- Standards demonstrate some variability with respect to the granularity of reporting expectations, with the

8 The three selected standards are the Global Reporting Initiative (GRI), with a particular focus on chapter 13 on Agriculture, Aquaculture and Fishing, the benchmarking methodology developed by the World Benchmarking Alliance (WBA), and the Sustainability Assessment of Food and Agriculture systems (SAFA) from the FAO. Together, these three standards cover an extensive list of topics related to agri-food sustainability based on which organizations can assess and/or report their performance. The three indices are the Environmental Performance Index (EPI) from the Yale Center for Environmental Law & Policy, the Sustainability Food Index (SFI) from *The Economist*, and the United Nations' Sustainable Development Report (SDR).

least rigorous requiring only the disclosure of an organization's commitment to reducing food loss and waste, and the most rigorous requiring quantitative disclosure as well as transparency into the methodological effectiveness. The type of food products is not generally identified.

Overview of how this topic is typically addressed in the selected global indices:

- Country-level indices (FSI, SDGs) define and measure food loss and waste in accordance with standards, i.e., food loss as a percentage of food lost from post-harvest up to but not including the retail stages, and food waste as a volumetric measurement in metric tons of food wasted from retail up to and including end-use.
- Indices differ from standards by reporting on loss and wastage of particular food commodities and, in the case of FSI, the number and quality of policies and strategies to avert food loss and waste.

Indicator 7 | Packaging & waste

INTRODUCTION

Reducing packaging and plastic achieves multiple environmental and productivity benefits; plus, innovative packaging can enhance food safety and quality.

Canada's national target is zero plastic waste by 2030.[1] The approach echoes the Kunming-Montreal Global Biodiversity Framework's targets that seek to prevent, reduce, and work towards eliminating plastic pollution, as well as to substantially reduce waste generation.[2]

Only 14-18% of global plastic waste is being recycled.[3] In Canada some 15% is recycled.[4] An industry-driven coalition – the Canada Plastics Pact – has set goals to reduce plastic by 2025 across the economy, including 100% of plastic packaging being designed to be reusable, recyclable, or compostable by 2025.[5] Embracing such *circular economy* objectives can spur innovation. For instance, food processors and retailers are introducing less-impact packaging and bioplastics that are functional, maintain food quality and safety, and can reduce environmental impacts.[6] At the production level, improving plastic waste management can improve on-farm sustainability. Once appropriate data is available, this indicator expresses how the Canadian agri-food sector is doing its part to fulfill such commitments.

Key differences and similarities with global sustainability standards and indices

The Index and the selected global indices and standards share common priorities: reducing, reusing and recycling waste. The Index also emphasizes the need for sustainable packaging and circularity. Single-use plastic is a priority issue for the Index as well as for the selected standards and indices. However, differences exist. For instance, the Index focuses on agricultural, processing, and retail plastics and packaging which is not well addressed in other indices and standards. Also the Index emphasizes packaging versus other types of plastic-based products. In comparison, while plastic waste is an issue for most other indices and standards, not all address packaging specifically or even plastic waste more broadly in the form of an indicator. Lastly, the Index emphasizes compostable packaging as opposed to other non-plastic materials which may be used.

RESULTS

7.1 REDUCE/RECYCLE

A. PRODUCTION

Data is available to track recovery and recycling of on-farm plastics. Of the nearly 62,000 tonnes of packaging and plastics, such as pesticide and fertilizer containers, plastic wrap, grain bags, twine, generated annually on Canadian farms, approximately 6,000 tonnes (about 10%) of this is diverted through a variety of Extended

1 Government of Canada: https://www.canada.ca/en/environment-climate-change/services/managing-reducing-waste/reduce-plastic-waste/canada-action.html
2 Kunming-Montreal Global Biodiversity Framework. https://www.cbd.int/doc/decisions/cop-15/cop-15-dec-04-en.pdf
3 EIU: https://ocean.economist.com/rethinking-plastics/breathing-life-into-plastic-waste/
4 Over 85% of products are thrown away to landfill: https://roadmap.plasticspact.ca
5 See *Roadmap to 2025* for the complete list of targets, Canada Plastics Pact: https://plasticspact.ca
6 See company and other goals reviewed for this project: *A Report on Agri-Food Sustainability Targets*, October 2020: www.agrifoodindex.ca

Producer Responsibility programs operated by Cleanfarms.[7] (This number also includes collection and safe disposal of unwanted pesticide and obsolete livestock and equine medications.) The remaining plastics are managed by reuse, on-farm disposal, and landfill disposal. The following metric provides information on one of the most prevalent types and sizes of containers collected for recycling. Additional data for other types of containers is available from Cleanfarms.

7.1.1 Pesticide and fertilizer container recycling

Description	Source	Result: Number of containers
Number of pesticide and fertilizer jugs (23 litres and under) collected for recycling.	Cleanfarms Annual Report, 2021	2021: 6.2 million 2020: 5.5 million

B. PROCESSING/RETAIL

Preferred metrics for measuring recycling performance at the processing and retail level were identified as (1) Mass of single use plastic packaging used (2) Percent of products on shelves with certified compostable packaging and (3) Percent of packaging from recycled materials.

Data is being collected on a consolidated basis by the Canada Plastics Pact (CPP) for the Industrial, Commercial and Institutional (IC&I) sector, although this is not representative of all industry. Aligning data collection methodologies and definitions would enable recycling actions and reporting.[8]

For instance, measuring the mass of single use plastic packaging is being considered by the CPP. Some plastic materials are highly recyclable (e.g., PET, or polyethylene terephthalate, bottles); others are not (e.g., multi material multilaminate flexible plastic). Another challenge is measuring the percentage of on-shelf products with certified compostable packaging given the lack of a standard for this. Also, compostable packaging does not necessarily get accepted for collection and composting. Industry discussions to resolve this matter are unfolding and may result in identifying a new related metric. Finally, a metric could report on the percentage of packaging from recycled materials. This is currently not marked on packaging and is a matter being considered by CPP for certain material types.

Given the lack of data specific to processing/retail, the following metrics has been provided to show trends in plastic disposal over time.

7.1.2 Plastic recycling

Description	Source	Result: Tonnes
Waste material diverted, plastics.	Pilot physical flow account for plastic material, by product category; Table: 38-10-0138-01, Statistics Canada	Residential sources of diverted materials: 2020: 239,874 2018: 250,323 Non-residential sources of diverted materials: 2020: 128,469 2018: 104,236

7 *Agricultural Plastic Characterization and Management on Canadian Farms*, Cleanfarms: https://cleanfarms.ca/agricultural-plastic-characterization-and-management-on-canadian-farms/ Cleanfarms is developing a strategy for *Building a Zero-Plastic Waste Strategy for Agriculture*: https://cleanfarms.ca

8 *Roadmap to 2025*, Canada Plastics Pact: https://plasticspact.ca

7.2 REUSE

A. PRODUCTION

There is some agriculture-related reuse potential, such as using refillable containers for the same crop protection products and reusable bins for the delivery of seed. However, this will likely be a limited option for crop protection products, given safety challenges of reusing containers, and regulations designed to protect both the applicator and the consumer. At this stage, production-level reporting focuses on recycling, given the level of detail available.

B. PROCESSING/RETAIL

There is a lack of data now available in the marketplace given the infancy of reuse of packaging volumes. Consequently, this proposed metrics has not been included at this stage.

Applicable U.N. Sustainable Development Goal (SDG): 12.3, 12.4, 12.6

GAPS AND OBSERVATIONS

- **Prevalence of Extended Producer Responsibility (EPR) legislation:** EPR legislation is the enabling factor for permanent, sustainably funded collection and recycling programs for on-farm plastics and packaging. EPR is legislated provincially, by packaging/product, so the programs available to farmers are inconsistent across the country. Experience has shown that the ability to collect and recycle on-farm practices is highly correlated with results. For example, in Saskatchewan there has been an EPR regulation on grain bags since 2018, and as a result, approximately 66% of the grain bags that are used in Saskatchewan each year are collected. However, in Canada about 10% of the total plastic waste generated on-farm is collected for recycling because programs for collection and recycling are not available in every province. In the future, a metric to develop and include could involve Extended Producer Responsibility (EPR) legislation and the percentage of total agriculture plastics/packaging products covered under such programs.

Appendix | GLOBAL CONTEXT

The following section considers how Canada's choice of Index indicators and metrics align with a selection six leading global sustainability standards and indices.[9] While not intended to be comprehensive, the review highlights key differences and similarities as context for Canada's approach.

Overview of how this topic is typically addressed in the selected global standards:

- Global standards vary in both the focus and granularity of reporting and disclosure. Some encourage methodologies for measuring the volumes of waste generated, diverted, and/or disposed of in metric tons. Others call for the setting of targets and engagement efforts along the value chain to mitigate externalities.
- There is little consistency across standards in the types of waste to be measured, and in the boundaries within which it should be measured. Some delineate between hazardous and non-hazardous wastes and others focus on plastic in particular, but indirectly so by emphasizing disclosure of target-setting and strategic efforts toward circularity rather than measurement.

9 The three selected standards are the Global Reporting Initiative (GRI), with a particular focus on chapter 13 on Agriculture, Aquaculture and Fishing, the benchmarking methodology developed by the World Benchmarking Alliance (WBA), and the Sustainability Assessment of Food and Agriculture systems (SAFA) from the FAO. Together, these three standards cover an extensive list of topics related to agri-food sustainability based on which organizations can assess and/or report their performance. The three indices are the Environmental Performance Index (EPI) from the Yale Center for Environmental Law & Policy, the Sustainability Food Index (SFI) from *The Economist*, and the United Nations' Sustainable Development Report (SDR).

Overview of how this topic is typically addressed in the selected global indices:

- Global indices prioritize ocean and marine plastic debris, its measurement, and its reduction.
- Recycling is also priority for global indices.

2. FOOD INTEGRITY INDICATORS

Indicator 8 | Safe food

INTRODUCTION

Mitigating food safety risks is essential to protect the health and safety of consumers as well as to foster a positive national food reputation. This indicator portrays Canada's food safety record and the extensive oversight devoted to ensuring a safe food supply. Importantly, as a proxy for this, 98.4% of tested foods are deemed to be safe and accurately represented (see 8.1.1). Still, food safety remains front of mind for consumers. Consumer research in 2020 reveals that 61% of Canadians express worry about the safety of food in restaurants and 52% about the safety of the food in grocery stores. In 2022, research noted that 44% of Canadians have concerns with imported foods, down from 2021.[1] Canada's robust approach to food safety is about having an effective system in place to prevent and minimize food borne illnesses, respond when an incident is identified and, overall, to protect the food supply.

Health Canada, the Public Health Agency of Canada (PHAC), and the Canadian Food Inspection Agency (CFIA) are the internationally recognized competent authorities responsible to ensure the safety of the country's food supply and food-related consumer health matters. Ensuring food safety is also highly dependent on the compliance and voluntary actions undertaken by food producers, processors, and retailers, among others. Municipal and provincial governments also play a role in ensuring a safe food supply, through the inspection of provincial/municipal regulated establishments and including being part of Canada's sentinel site monitoring network.[2]

Key differences and similarities with global sustainability standards and indices

Food safety topics are largely consistent, namely, limiting/reducing exposure of the public to unsafe contaminants, reducing the use of medications in livestock, measuring the number of recalls, and measuring non-compliances with maximum residue limits and other sources of contamination. Canada and other countries conform to the Codex Alimentarius as foundational guidance for food safety. Regarding differences, certain indices focus on reporting on specific contaminants, i.e., lead.

1 Canadian Centre for Food Integrity, 2020, *Public Trust Research*: https://www.foodintegrity.ca/wp-content/uploads/2020/11/ENG2020Summit-Research-HR-new.pdf; and 2022 report. Note, this more recent report did not probe on consumer safety concerns in restaurants/grocery stores.

2 Sentinel sites: https://www.canada.ca/en/public-health/services/surveillance/foodnet-canada.html

Global standards place particular emphasis on preventative policies in place to ensure safety and avoiding cross-contamination. In the Index, this is addressed in the "Percentage of food businesses that comply with federal rules" as registered establishments are required to put in place systems that identify and prevent hazards.

RESULTS

8.1 OVERALL SAFETY OF CANADA'S FOOD SYSTEM

A. PERCENTAGE OF TESTED IMPORTED AND DOMESTIC FOOD PRODUCTS IN COMPLIANCE WITH FEDERAL REGULATIONS

One key metric informs the public whether food in the Canadian marketplace is safe and accurately represented. The Product Content Compliance Indicator (PCCI) assesses foods tested by the Canadian Food Inspection Agency (CFIA) in a year and how they meet Canadian standards (for a variety of hazards, including microbial, chemical and/or physical contamination). This is expressed as a percentage of routine sampling and testing of foods in Canadian marketplace (total annual inspections). For 2021-22, this overall food safety indicator indicated that 98.6% of tested foods were safe and accurately represented.

8.1.1 Food safety compliance

Description	Source	Result: Percent
Percentage of tested foods that were deemed to be safe and accurately represented in food production facilities across Canada.	Departmental Results Report 2021-22, Canadian Food Inspection Agency	2021-22: 98.6% 2020-21: 98.4%

B. PERCENTAGE OF FOOD BUSINESSES THAT COMPLY WITH FEDERAL RULES

The implementation of Canada's robust food safety regulations is monitored through compliance management. This metric measures the ability of industry to follow food safety and consumer protection rules and when issues arise, that they are corrected in a timely fashion.

8.1.2 Compliance rates of food processing establishments

Description	Source	Result: Percent
A. Percentage of federally registered food businesses that comply with federal rules. B. Percentage of federally registered food establishments that have addressed compliance issues upon follow-up or were brought into compliance.	Departmental Results Report, 2020-21, 2021-22, Canadian Food Inspection Agency	A. 2020-21: 98% 2019-20: 97% 2018-19: 98% B. 2021-22: 78%

C. INSPECTIONS

The effectiveness of the food inspection system is a key means to ensure accountability. This indicator includes several metrics that report on the extent to which food safety inspections are undertaken by the CFIA.

8.1.3 Number of inspections annually

Description	Source	Result: Number of inspections
Number of inspections in federally registered establishments.	Departmental Results Report, 2020-21, Canadian Food Inspection Agency	2020-21: 1.1 million inspections

8.1.4 Number of inspectors

Description	Source	Result: Number of inspectors
Number of inspectors employed by CFIA. These also include inspections for other parts of CFIA's mandate such as animal disease.	Departmental Results Report, 2020-21, Canadian Food Inspection Agency	6,000+

8.2 RECALLS

The number and speed of food recalls is evidence of a food safety system that is working well. No country can guarantee zero risk but the speed, transparency and effectiveness of the response to incidents is vital to protect consumers from contaminated food. CFIA denotes the three types of overall recalls: microbial (biological), allergen (chemical) and foreign matter (physical). Recalls are assessed in terms of three classes from the highest risk (class I) to lowest (class III).[3] Most of the recalls relate to allergen alerts. The selected metric ("percentage of public warnings for high-risk food recalls that are issued within 24 hours of a recall decision") is the recall indicator that the CFIA currently reports on every year in its Departmental Results Report which is available to the public.

8.2.1 Speed of high-risk recalls

Description	Source	Result: Percent of recalls
Number of high-risk recalls within 24 hours.	Departmental Results Report, 2020-21, Canadian Food Inspection Agency	2020-21: 100 2019-20: 89.8 2018-19: 96.9

8.3 COMPLIANCE WITH MAXIMUM LIMITS FOR CONTAMINANTS

The Government of Canada establishes science-based maximum limits of residues of chemicals (MRLs) to protect against contaminants in Canada's food supply. A Maximum Residue Limit is a level of residue that could safely remain in a food product that has been treated with a veterinary drug/pesticide. This residue is considered to pose no adverse health effects if ingested daily by humans over a lifetime.

3 *How do we decide to recall a food product*, CFIA: https://inspection.canada.ca/food-safety-for-consumers/canada-s-food-safety-system/how-we-decide-to-recall-a-food-product/eng/1332206599275/1332207914673

Maximum limits can be set for a variety of substances, such as pesticides, natural toxins, veterinary drugs, and other adulterating substances, etc.[4] Health Canada and the CFIA are responsible for assessing and monitoring food safety and rely on surveillance data to help identify potential contamination issues and, when warranted, appropriate risk management responses are applied.[5] The National Chemical Residue Monitoring Program (NCRMP) is an annual CFIA regulatory surveillance program which verifies compliance in foods to Canadian standards and guidelines for chemical residues and contaminants. The National Chemical Residue Monitoring Annual Reports provide information on testing and results. During the years 2018-19, nearly 120,000 tests for residues of veterinary drugs, pesticides, metals, and contaminants were performed on approximately 16,000 monitoring samples.

A. PESTICIDES AND VETERINARY DRUGS

MRLs apply to both Canadian and imported food.[6] Health Canada notes that "the MRLs for each pesticide-crop combination are set at levels well below the amount that could pose a health concern."[7] Therefore, trace amounts of pesticides or veterinary drugs in food or instances of non-compliance does not necessarily mean there is an unacceptable health risk to consumers or a dietary exposure concern. If residues are found, they are usually at such low levels that they do not pose a safety concern.[8] Additionally, non-compliance can occur for a variety of reasons such as missing or misaligned MRLs with the importing country and/or product.

B. OTHER CONTAMINANTS

Data from the CFIA's National Chemical Residue Monitoring Program verifies compliance of foods to Canadian standards and guidelines for other chemical residues and contaminants.

8.3.1 Compliance rate of MRL's for pesticides: fresh fruits and vegetables

Description	Source	Result: Percent in compliance
Compliance rates for fresh fruit and vegetables, with domestic and imported produce tested.	2018/19 Annual Report: National Chemical Residue Monitoring, Canadian Food Inspection Agency	2018-19: Domestic: 98.5 2018-19: Imported: 95.3

8.3.2 Compliance rate of MRL's for veterinary drugs: meat

Description	Source	Result: Percent in compliance
Compliance rates for meat produced in Canada.	2018/19 Annual Report: National Chemical Residue Monitoring, Canadian Food Inspection Agency	2018-19: 97.7

4 https://www.canada.ca/en/health-canada/services/food-nutrition/food-safety/chemical-contaminants/maximum-levels-chemical-contaminants-foods.html; https://www.canada.ca/en/health-canada/services/drugs-health-products/veterinary-drugs/maximum-residue-limits-mrls.html

5 https://www.canada.ca/en/health-canada/services/food-nutrition/food-safety/chemical-contaminants/maximum-levels-chemical-contaminants-foods.html

6 Health Canada's List of MRLs for Veterinary Drugs in Foods sets out the level of residue that could safely remain in the tissue or food product derived from a food-producing animal that has been treated with a veterinary drug. https://www.canada.ca/en/health-canada/services/drugs-health-products/veterinary-drugs/maximum-residue-limits-mrls/list-maximum-residue-limits-mrls-veterinary-drugs-foods.html

7 https://www.canada.ca/en/health-canada/services/consumer-product-safety/pesticides-pest-management/public/protecting-your-health-environment/pesticides-food/maximum-residue-limits-pesticides.html; PMRA: https://publications.gc.ca/collections/Collection/H113-2-5-1999E.pdf

8 *Health Canada's Maximum Levels for Chemical Contaminants in Foods*: https://www.canada.ca/en/health-canada/services/food-nutrition/food-safety/chemical-contaminants/maximum-levels-chemical-contaminants-foods.html#a1

8.3.3 Compliance rate for other chemicals

Description	Source	Result: Percent in compliance
Compliance rates for chemicals other than pesticides or veterinary drugs.	2018/19 Annual Report: National Chemical Residue Monitoring, Canadian Food Inspection Agency	2018-19: 96.7

GAPS AND OBSERVATIONS

- **Risk management:** The Safe Food for Canadians Regulations require preventative control plans (PCPs) to be implemented in food processing establishments.[9] This may include adoption of Hazard Analysis Critical Control Points (HACCP) assessments.[10] While PCPs are required to license and operate a food business and industry PCP compliance is monitored, CFIA does not yet report on PCPs.

- **Food treatments, novel foods, food processing aids, and food additives:** These food developments are regulated to ensure safety in humans, animals and the environment. Treatments include high pressure processing and irradiated foods. The criteria to assess novel foods such as GMOs (genetically modified organisms) are detailed in the *Guidelines for the Safety Assessment of Novel Foods*.[11] In that document, Health Canada notes that: "The application of genetic modification through either traditional breeding or genetic engineering is not considered to increase or decrease the inherent risk associated with consuming the organism as a food." Before these foods can be marketed, they must meet rigorous standards to demonstrate safety.[12]

- **Production methods:** Organic, grass-fed, pasture-raised, free-run, sustainable, and other similar production claims, marketed to consumers are not specifically health or safety related and are, therefore, not tracked by this indicator.

Appendix | GLOBAL CONTEXT

The following section considers how Canada's choice of Index indicators and metrics align with a selection six leading global sustainability standards and indices.[13] While not intended to be comprehensive, the review highlights key differences and similarities as context for Canada's approach.

Overview of how this topic is typically addressed in the selected global standards:

- Standards typically assess food safety based on organizations' preventative measures and policies. This includes compliance with recognized safety standards, targets to reduce reliance on antibiotics and other

9 For food that is imported, exported and traded inter-provincially. https://inspection.canada.ca/DAM/DAM-aboutcfia-sujetacia/STAGING/text-texte/regs_safe_food_regulations_handbook_business_1531429195095_eng.pdf

10 HACCP is a globally recognized food safety risk management method that is deployed to hazards that pose food contamination risks in food processing and food services sectors. https://inspection.canada.ca/preventive-controls/preventive-control-plans/the-food-safety-enhancement-program/eng/1525869691902/1525869759693#a65

11 https://www.canada.ca/en/health-canada/services/food-nutrition/legislation-guidelines/guidance-documents/guidelines-safety-assessment-novel-foods-derived-plants-microorganisms/guidelines-safety-assessment-novel-foods-2006.html

12 https://www.canada.ca/en/health-canada/services/food-nutrition/genetically-modified-foods-other-novel-foods.html#a3

13 The three selected standards are the Global Reporting Initiative (GRI), with a particular focus on chapter 13 on Agriculture, Aquaculture and Fishing, the benchmarking methodology developed by the World Benchmarking Alliance (WBA), and the Sustainability Assessment of Food and Agriculture systems (SAFA) from the FAO. Together, these three standards cover an extensive list of topics related to agri-food sustainability based on which organizations can assess and/or report their performance. The three indices are the Environmental Performance Index (EPI) from the Yale Center for Environmental Law & Policy, the Sustainability Food Index (SFI) from *The Economist*, and the United Nations' Sustainable Development Report (SDR).

medications, and policies to identify and address other health and safety concerns.
- Standards also express food safety as the number of recalls reported by an organization within a given timeframe, and/or the number of non-compliances reported against the company for food contamination by exceeding pesticide residue level thresholds and any other biological or chemical contamination.

Overview of how this topic is typically addressed in the selected global indices:

- There is minimal coverage of food safety topics through the selected global indices. Those that do exist are unique to each of the reviewed indices, and include the prevalence of lead exposure, ensuring access to safe food (though no indicator specifically addresses this), and ratings of overall animal welfare by country
- However, *The Economist* has recently published its 2022 Global Food Security Index, which includes a series of metrics under the indicator "Quality and Safety". With respect to food safety specifically, the Global Food Security Index refers to the presence of relevant food safety legislation, of food safety mechanisms, to access of safe/clean drinking water and to the ability to store food safely as a way to measure country-level performance.

Indicator 9 | Nutrition information

INTRODUCTION

Enabling consumers to make healthy food choices and improve population diets is a societal priority.

In Canada, regulations stipulate how processed foods must meet minimum standards of nutritional transparency and healthiness.[1] Packaged foods are required to display a nutrition facts table which informs consumers about the energy value and content of fat, carbohydrates, protein, vitamins and minerals in a standard serving size to allow people to understand nutrition values and compare between products. Labels must also include a list of ingredients in descending order of their proportion by weight and a list of priority allergens present. Considerable efforts are undertaken across the private and public sectors and jurisdictions to promote healthy diets and food choices. This indicator is primarily concerned with the national approach taken to promote good disclosure practices.

For Indigenous Peoples, the links between nutrition and health are becoming better understood. The high rate of Indigenous diabetes has been linked to a diet which has moved away from traditional foods in favour of processed foods imported into Indigenous communities. Part of this trend is the result of western policies and the de-valuing of the traditional economy in favour of efforts to build wage economies in Indigenous communities.[2]

Key differences and similarities with global sustainability standards and indices

Nutrition is addressed by all evaluated standards and indices, except for EPI. FSI and SAFA acknowledge the religious, cultural, and social importance of traditional foods. UN Sustainable Development Goal (SDG) 2 emphasizes nutritional risks for vulnerable groups, which aligns with the focus of the Index on Indigenous country foods and health implications.

None of the evaluated indices or standards identify national food guides as an indicator except for the Global Food Security Index 2022 and FSI. None of the evaluated indices or standards identify the percentage of food supply requiring a mandatory nutrition table as an indicator nor mandatory fortification as an indicator. Responsible marketing of nutrition information (such as health claims) was identified by only one other evaluated framework (WBA).

RESULTS

9.1 PROVISION OF NUTRITION INFORMATION

- **9.1.1 Nutrition Facts Table:** This metric reports on the amount of food products required to provide a nutrition table on the label.[3] In addition, a front-of-package nutrition symbol is mandatory for prepackaged foods that meet or exceed set levels for sodium, sugars or saturated fat, with some specified exceptions. (Must be implemented before 2026.)
- **9.1.2 National Food Guide:** This metric reports on the presence of such a national guide and its frequency of update.[4]

1 Food and Drugs Regulation, Part B: https://laws-lois.justice.gc.ca/eng/regulations/c.r.c.,_c._870/index.html
2 Commentary from Indigenous Works, a project partner
3 Nutrition Facts Table: https://www.canada.ca/en/health-canada/services/understanding-food-labels/nutrition-facts-tables.html
4 National Food Guide: https://food-guide.canada.ca/en/

9.1.1 Nutrition facts

Description	Source	Result: Mandatory labels
Amount of food in Canada that requires a mandatory nutritional label.[5]	Nutrition labelling, Canadian Food Inspection Agency	All food sold at retail except fresh meat, poultry and seafood and food prepared in-store

9.1.2 Existence of a National Food Guide

Description	Source	Result: Updates of guides
The presence of such a national guide and its frequency of update.	Canada's Food Guide, Health Canada	Updated: 2019 Previous updates: 2007, 1992, 1982

9.2 MANDATORY FORTIFICATION

Mandatory fortification can have several purposes. One purpose is to assist in consumer access to certain vitamins or minerals, such as the requirement to add vitamin D to milk, and iodine to salt. Another purpose would be to ensure substitutes have a comparable nutritional profile to the original product, such as fortification of margarine and simulated meat products. A third purpose would be to ensure food products are fit for purpose, such as meal replacements and infant formulas.

9.2.1 Mandatory food fortification

Description	Source	Result: Fortified foods
Fortification is a process by which vitamins, mineral nutrients and amino acids are added to foods to provide consumers with sufficient but not excessive amounts of certain nutrients in their diet.	Food and Drug Act and Regulations, 2022, Health Canada	• Milk • Prepared breakfast cereals • Fruit-flavoured drinks • Fruit juices except for orange • Flour (white) • Salt • Margarine • Simulated meat products • Products simulating whole eggs • Infant formulas • Meal replacements and nutritional supplements • Food represented for a very low-energy diet

GAPS AND OBSERVATIONS

At the heart of the goals for Indigenous self-determination, nation-building, and sovereignty is the premise that Indigenous People want to attain a quality of life and prosperity in alignment with their own cultural outlooks and values. This holistic thinking is shaped and interpreted by Indigenous philosophies about the environment, the land, and inter-relationships and this can vary among communities.

- **Promoting Indigenous country foods:** The nutritional needs of Indigenous communities need to respect the true imputed value and use of "country foods". The Assembly of First Nations, in their 2017 report on

5 Information required can be sourced at: https://inspection.canada.ca/food-labels/labelling/industry/nutrition-labelling/nutrition-facts-table/eng/1389198568400/1389198597278?chap=1

the safety of traditional foods,[6] describes country foods as: "First Nations traditional foods, also referred to as country foods, mainly consisted of animal and plant species that were harvested from the natural environment. They include foods such as wild meats, fish species, bird species, plants species, and berries." Facilitating the consumption of traditional food is a key principle of food sovereignty. This metric would need to be developed to report on such promotion and communication in Indigenous communities. Ultimately, the ideal metric would be to report on the extent by which Indigenous communities are successful in replacing manufactured or processed foods from the marketplace (which can be described by Indigenous stakeholders as "imported" food) in relation to community-grown or harvested foods.

[The Societal Well-Being Indicators address access to nutritious food, food security and related matters.]

Applicable U.N. Sustainable Development Goal (SDG): Not specifically addressed; related to deliver on SDG 2

Appendix | GLOBAL CONTEXT

The following section considers how Canada's choice of Index indicators and metrics align with a selection six leading global sustainability standards and indices.[7] While not intended to be comprehensive, the review highlights key differences and similarities as context for Canada's approach.

Overview of how this topic is typically addressed in the selected global standards:

- Global standards generally address the disclosure of nutrition information based on compliance with national regulations, although there are variations in how nutrition is addressed. For example, GRI requires reporting on the percentage of food products under recognized food safety standards (e.g., having a Global Food Safety Initiative recognized food safety certification). WBA focuses on reducing food insecurity through increasing availability of nutritious foods by expanding food production and variety, and improving nutritional quality. SAFA measures organizational performance based on whether the total volume of production meets certain quality standards which include nutritional content. SAFA also acknowledges the value of traditional food and agriculture among Indigenous groups as a measure of food sovereignty.

Overview of how this topic is typically addressed in the selected global indices:

- Global indices also address the prevalence of malnutrition and, in the case of FSI and the Global Food Security Index 2022, whether countries have plans, policies, and/or strategies to monitor, maintain, or improve nutrition.

6 *Traditional Foods: Are they Safe for First Nations Consumption?* Assembly of First Nations Environmental Stewardship Unit, March 2007.

7 The three selected standards are the Global Reporting Initiative (GRI), with a particular focus on chapter 13 on Agriculture, Aquaculture and Fishing, the benchmarking methodology developed by the World Benchmarking Alliance (WBA), and the Sustainability Assessment of Food and Agriculture systems (SAFA) from the FAO. Together, these three standards cover an extensive list of topics related to agri-food sustainability based on which organizations can assess and/or report their performance. The three indices are the Environmental Performance Index (EPI) from the Yale Center for Environmental Law & Policy, the Sustainability Food Index (SFI) from *The Economist*, and the United Nations' Sustainable Development Report (SDR).

Indicator 10 | Antimicrobial stewardship

INTRODUCTION

Antimicrobials are essential for managing bacterial infections and safeguarding health and welfare in both human and animal medicine. However, antimicrobial resistance is regarded by the World Health Organization as one of the top 10 threats to global health.[1] The Public Health Agency of Canada (PHAC) reports that antimicrobial resistance (AMR) is "worsening" in society at large as serious human infections caused by microbial organisms become more frequent.[2] A global multi-sector *One Health* approach aims to reduce antimicrobials use, including from players involved in terrestrial and aquatic animal, human and plant health.

Like many countries, the Canadian farm animal sector is responsible for consuming nearly 80% of the volume of active antimicrobial ingredients.[3] In Canada, 95% of animal health product manufacturers report on antimicrobial sales for use in animal agriculture, voluntarily provided by the Canadian Animal Health Institute (CAHI).[4] Canadian consumer views about antibiotic use have improved significantly since 2016. Still, some 32% of consumers remain "very concerned" (2021).[5] This indicator reflects the efforts being taken to steward and track the use of antimicrobials in the sector.

Key differences and similarities with global sustainability standards and indices

The Index considers the amount of antimicrobial used as well as the risk of resistance, similar to global standards. However, the Index does not differentiate between the prophylactic and treatment uses, per type of antimicrobial, which is addressed by the canvassed global standards.

RESULTS

10.1 ANTIMICROBIAL USE

A comprehensive approach is being undertaken in Canada to prolong the effectiveness of antimicrobials and limit the development of antimicrobial resistance, including:

- Medically important veterinary antimicrobials (MIAs) can only be obtained within the confines of a valid veterinary-client-patient relationship (VCPR).
- Over-the-counter sales and obtaining MIAs in the absence of a valid VCPR are illegal. Individuals cannot import MIAs or medicated feed containing MIAs into Canada for personal use.
- A drug establishment license, compliance with good manufacturing practices and annual reporting of all antimicrobial sales to Health Canada is required before active pharmaceutical ingredients can be imported, manufactured, formulated and/or distributed.

1 WHO Fact Sheet: *Antimicrobial resistance*, 13 October 2020: https://www.who.int/news-room/fact-sheets/detail/antimicrobial-resistance

2 *2020 Canadian Antimicrobial Resistance Surveillance System Report*, Public Health Agency of Canada: https://www.canada.ca/content/dam/hc-sc/documents/services/drugs-health-products/canadian-antimicrobial-resistance-surveillance-system-2020-report/CARSS-2020-report-2020-eng.pdf

3 *Canadian Antimicrobial Resistance Surveillance System – Update 2020*; https://www.canada.ca/en/public-health/services/publications/drugs-health-products/canadian-antimicrobial-resistance-surveillance-system-2020-report.html

4 *Canadian Antimicrobial Resistance Surveillance System – Update 2020.*

5 Canadian Centre for Food Integrity, 2021, *Public Trust Research*.

- The Public Health Agency of Canada and Health Canada designed and developed the online reporting tool, the Veterinary Antimicrobial Sales Reporting (VASR) system.[6]
- The use of MIAs to promote growth or feed efficiency of livestock is prohibited in Canada (2018).
- The Canadian Global Food Animal Residue Avoidance Database (CgFARAD)[7] provides Canadian veterinarians with information to avoid the risk of residues in meat, milk or eggs when it is deemed that extra-label antimicrobial use is medically appropriate.

Currently, antimicrobial sales data is the primary source of information for antimicrobial use.

10.1.1 Amount of antimicrobials sold for animal use in Canada

Description	Source	Result: Amount sold, thousand kilograms
Antimicrobials sold for animal used in Canada (farmed and domestic animals).	Canadian Antimicrobial Resistance Surveillance System Report, 2021, Public Health Agency of Canada	2019: 975 2018: 1,083 2017: 934 2016: 1,051 2015: 1,187

10.1.2 Use of antimicrobials by selected farmed animal species

Description	Source	Result: Milligrams per population correction unit
Quantity of medically important antimicrobials sold for use in animals by animal species. (Adjusted for population and weights: milligrams per population correction unit mg/ PCUCA) This metrics adjusts for change in number and weights of animals so provides a more consistent metric over time and for international comparisons.	Canadian Antimicrobial Resistance Surveillance System Report, 2021, Public Health Agency of Canada	Pigs: 2020: 292.55 2019: 277.48 2018: 353.84 Cattle: 2020: 81.49 2019: 72.73 2018: 67.07 Poultry: 2020: 176.98 2019: 175.19 2018: 196.71
Quantity of medically important antibiotics sold for use: aggregate amount, as population correction unit not available		Aquaculture: Total thousand kgs. sold 2019: 12,507 2018: 17,595

10.2. ANTIMICROBIAL RESISTANCE

- **10.2.1 National antimicrobial resistance surveillance:** Antimicrobial resistance is proportional to the amount of antimicrobial use and can occur from use for both humans and animals. Canada has a plan to address antimicrobial resistance through changes in both human and animal health management. The Public Health Agency of Canada's Canadian Antimicrobial Resistance Surveillance System (CARSS) and

6 https://www.canada.ca/en/public-health/services/antibiotic-antimicrobial-resistance/animals/veterinary-antimicrobial-sales-reporting.html
7 https://cgfarad.usask.ca/index.php

Canadian Integrated Program for Antimicrobial Resistance Surveillance (CIPARS). CIPARS reports annually on antimicrobial resistance for select bacteria from humans, animals (cattle, pigs, chickens, and turkeys) and retail meat across Canada. This information supports the creation of evidence-based policies to control antimicrobial resistance in hospital, community, and agricultural settings.[8]

10.2.1 Antimicrobial resistance

Description	Source	Result: Trend
Trend in antimicrobials resistance. PHAC uses the following assessment descriptions: • "Getting better" • "Getting worse" • "Stable"	Canadian Antimicrobial Resistance Surveillance System Report 2021, Public Health Agency of Canada (PHAC)	• Methicillin-resistant Staphylococcus aureus (MRSA) bloodstream infections *2015-19: Getting worse* • Vancomycin-resistant Enterococcus (VRE) bloodstream infections *2015-19: Getting worse* • Carbapenemase-producing Enterobacterales (CPE) infections and colonization *2015-19: Getting worse* • Clostridioides difficile infections (CDI) *2015-19: Getting better* • Neisseria gonorhoeae (GC) infections *2015-19: Getting better* • Drug-resistant Mycobacterium tuberculosis (TB) infections *2015-19: Stable* • Invasive Streptococcus pneumoniae diseases (IPD) 2014-18: Getting worse • Invasive Streptococcus pyogenes (group A Streptococcus) infections *2014-18: Stable*

GAPS AND OBSERVATIONS

Additional information is available on the purpose of antimicrobial use (disease prevention, disease treatment, growth promotion), using a sample approach, as reported in: Indication for AMU in broiler chickens, grower finisher pigs and turkeys collected through sentinel farm surveillance conducted in 2019.[9] existing antimicrobial use surveillance data for dairy and feedlot beef cattle can be sourced as well. As these time series are further developed, these metrics could be included in this Index.

Applicable U.N. Sustainable Development Goal (SDG): 3.9d

8 https://www.canada.ca/en/public-health/services/surveillance/canadian-integrated-program-antimicrobial-resistance-surveillance-cipars/cipars-reports.html

9 Figure 25: *Antimicrobials use by animal species (adjusted by population and weight), Canada, 2015-2019*.

Appendix | GLOBAL CONTEXT

The following section considers how Canada's choice of Index indicators and metrics align with a selection six leading global sustainability standards and indices.[10] While not intended to be comprehensive, the review highlights key differences and similarities as context for Canada's approach.

Overview of how this topic is typically addressed in the selected global standards:

- The topic of antimicrobial stewardship is accounted for differently among the selected standards. For instance, GRI addresses the topic under the umbrella of food safety and considers antimicrobials as a potential food contaminant, alongside pesticides residues. Whereas WBA considers antimicrobials and growth-promoting substances as potential environmental and human health concerns.
- Antimicrobial stewardship is typically addressed by standards from a "practice-based" standpoint. That is, WBA focuses on the existence and implementation of policies and/or protocols to address the use of antimicrobials to avoid antimicrobial resistance (WBA) while GRI considers this issue from a food safety perspective. In both cases, specific references are made to the prophylactic use of antibiotics and medically important antimicrobials.

Overview of how this topic is typically addressed in the selected global indices:

- The theme of antimicrobial stewardship is not addressed by any of the three selected indices.
- Only one global index (which ranks countries, including Canada) identified the issue of antimicrobial stewardship – the AMR Preparedness Index. This Index accounts for different criteria, including the existence of a national strategy, efforts to increase awareness and training as well as the presence of sufficient infrastructure to curb AMR. However, its focus is on the use of antimicrobial for human health and not for agriculture.

10 The three selected standards are the Global Reporting Initiative (GRI), with a particular focus on chapter 13 on Agriculture, Aquaculture and Fishing, the benchmarking methodology developed by the World Benchmarking Alliance (WBA), and the Sustainability Assessment of Food and Agriculture systems (SAFA) from the FAO. Together, these three standards cover an extensive list of topics related to agri-food sustainability based on which organizations can assess and/or report their performance. The three indices are the Environmental Performance Index (EPI) from the Yale Center for Environmental Law & Policy, the Sustainability Food Index (SFI) from *The Economist*, and the United Nations' Sustainable Development Report (SDR).

Indicator 11 | Zoonotic disease mitigation

INTRODUCTION

Animal diseases transmitted to humans can come from a diversity of animal sources and can cause a variety of mild, serious or deadly illnesses. Identifying and tracking zoonotic diseases relevant to animal agriculture is a major part of keeping the food system, people and farm animals safe.

The growing risk of zoonotic diseases globally has heightened the need for embracing the *One Health* approach, taking an integrated or systems approach to manage the links between the health of people, animals, and the environment. Habitat loss (notably in tropical forests and from the wildlife trade) is cited for facilitating human infectious diseases, including infectious H_1N_1, SARS and Ebola. Today, some 75% of the known emerging infectious diseases in humans worldwide are zoonotic-related.[1]

The Canadian Food Inspection Agency's (CFIA) zoonotic tracking system takes an all-hazards approach to focus on risks posed by existing, emerging or re-emerging animal health events.[2] The Public Health Agency of Canada's (PHAC) Centre for Food-borne, Environmental and Zoonotic Infectious Diseases[3] assesses the links and risk between human health, contaminated food or water or through contact with infected animals or the environment. As well, Canada is among the first countries to implement a regulated national identification system for farmed animals, a program that enables animal disease investigations and responses to natural emergencies.[4] This indicator is not about tracking food-borne illnesses in humans (a part of food safety, above) but emphasizes the importance of risk surveillance in response to zoonotic disease risks.

Key differences and similarities with global sustainability standards and indices

The Index goes beyond global practices by considering the zoonotic disease risk mitigation measures within its scope. The selected global standards and indices do not treat zoonotic disease as a standalone metric but address the topic as part of overall animal health and welfare.

RESULTS

11.1 RISK SURVEILLANCE

To protect human and animal health, the CFIA conducts inspections and has monitoring and testing programs in place to prevent and control the spread of diseases to the livestock and poultry sectors. In 2022, the CFIA will be introducing a new high-level indicator on the rate of animal disease outbreaks of zoonotic concern.[5] Prior to the publication of 2022 results, the number of animal diseases that have entered Canada has been used as a proxy.

1 UNEP: https://www.unenvironment.org/news-and-stories/story/coronaviruses-are-they-here-stay; https://www.ncbi.nlm.nih.gov/pmc/articles/PMC7919776/

2 Canadian Food Inspection Agency: https://inspection.canada.ca/animal-health/terrestrial-animals/diseases/decision-analysis-tool/eng/1623936151828/1623936322009

3 PHAC: https://www.canada.ca/en/public-health/services/infectious-diseases/centre-food-borne-environmental-zoonotic-infectious-diseases.html

4 https://inspection.canada.ca/animal-health/terrestrial-animals/traceability/eng/1300461751002/1300461804752

5 CFIA: the rate of confirmed animal disease outbreaks per 100 investigations conducted by the CFIA to limit the impact of animal health diseases within Canada, by year. Note that its scope is animal health diseases to which the CFIA responds (i.e., not limited to only zoonotic diseases), and that the measurement pertains to the number of outbreaks compared to number of investigations done by CFIA each year (showing a rate of number of outbreaks for every 100 investigations).

11.1.1 Number of cases of animal disease that affect human and/or animal health that have entered into Canada

Description	Source	Result: Number of cases per year
Number of cases of animal disease that affect human and/or animal health that have entered into Canada.	Departmental Results Report 2020-21, Canadian Food Inspection Agency	2020-21 fiscal year (April to March): 0 cases

[Animal care is addressed by Societal Well-Being Indicators.]

Applicable U.N. Sustainable Development Goal (SDG): 2.1

Appendix | GLOBAL CONTEXT

The following section considers how Canada's choice of Index indicators and metrics align with a selection six leading global sustainability standards and indices.[6] While not intended to be comprehensive, the review highlights key differences and similarities as context for Canada's approach.

Overview of how this topic is typically addressed in the selected global standards:

- The GRI is the only standard (out of the three that were selected) that explicitly refers to the topic of zoonotic diseases, and does so in relation to the topic of animal health and welfare. Specifically, the standard considers that the "conditions animals live in have considerable implications for preventing zoonotic disease and the risks of antimicrobial resistance". No particular requirement or indicator is referenced on how to manage this specific issue at the organization level.

Overview of how this topic is typically addressed in the selected global indices:

- Similar to the GRI, the Food Sustainability Index (FSI) refers to the issue of zoonotic disease with respect to animal health and welfare. Specifically, it uses the indicator of "livestock density" as both a predictor of zoonotic disease and an output measure for animal welfare.

6 The three selected standards are the Global Reporting Initiative (GRI), with a particular focus on chapter 13 on Agriculture, Aquaculture and Fishing, the benchmarking methodology developed by the World Benchmarking Alliance (WBA), and the Sustainability Assessment of Food and Agriculture systems (SAFA) from the FAO. Together, these three standards cover an extensive list of topics related to agri-food sustainability based on which organizations can assess and/or report their performance. The three indices are the Environmental Performance Index (EPI) from the Yale Center for Environmental Law & Policy, the Sustainability Food Index (SFI) from *The Economist*, and the United Nations' Sustainable Development Report (SDR).

Indicator 12 | Traceability implementation

INTRODUCTION

Effective traceability from farm to retail/food service, and then through communication with the end-use consumer, is part of an effective food safety program.

Tracing the source and destination of food is often described as taking "one step back" and "one step forward" to help reduce the time needed to respond to an incident and remove unsafe food from the marketplace. While traceability does not make food safer, traceability enables more timely investigation and recall when warranted. This is vital to help build consumer confidence and enable market access. Traceability is required under the *Safe Foods for Canadians Regulations*.[1]

Key differences and similarities with global sustainability standards and indices

Legislation and standards are the highest tier for measuring traceability; moving towards 100% implementation of traceability systems is ideal. Compared to the canvassed global standards and indices, the Index is able to draw from national statistics on licensing and federal regulation.

RESULTS

12.1 TRACEABILITY SCOPE

The following metrics focus on the role traceability plays in food supply chains to help ensure food safety, assisting in rapid traceback when food safety incidents occur.

Traceability also has wider applications. It is used to make product claims on quality attributes relating to method of production, product grading, provenance, environmental sustainability, and ethical and social responsibility of sourced ingredients as well as to mitigate against food fraud. Such marketplace applications are not tracked by this indicator theme.

12.1.1 Sector coverage of traceability requirements

Description	Source	Result: Functions covered
The traceability requirements in the *Safe Food for Canadians Regulations* are based on the international standard established by Codex Alimentarius. Regulations require the tracking of food forward to the immediate customer and back to the immediate supplier. Retailers do not require tracking food to their end-use customers, or consumers.	Regulatory Requirements: Traceability, Canadian Food Inspection Agency (CFIA)	The importing, exporting, producing, manufacturing, distributing, storing, and selling of all food in interprovincial and/or international trade.

1 https://inspection.canada.ca/food-safety-for-industry/traceability/traceability/eng/1522294721005/1522294781171

12.1.2 Number of CFIA registered establishments requiring traceability
Traceability compliance data is not reported on, per se, but is an implicit part of the licensing approval process under the regulator's auspices.

Description	Source	Result: Number of licensed establishments
Number of establishments licensed under the *Safe Food for Canadian Regulations*, as of December 2022	Safe Food for Canadians License Registry, CFIA	18,810

SDG: Not specifically addressed; related to SDG 12

Appendix | GLOBAL CONTEXT

The following section considers how Canada's choice of Index indicators and metrics align with a selection six leading global sustainability standards and indices.[2] While not intended to be comprehensive, the review highlights key differences and similarities as context for Canada's approach.

Overview of how this topic is typically addressed in the selected global standards:

- Standards do reference legislation with regard to food safety, but this is in the interest of food safety compliance (see Safe Food, Indicator 8) rather than for regulating the use of traceability systems.
- However, several standards do specify that a traceability system should be in place and users should report compliance with international traceability standards. One standard also states that organizations should describe how they are working towards 100% certified traceable supply chains.

Overview of how this topic is typically addressed in the selected global indices:

- No global index canvassed refers to traceability systems explicitly.

2 The three selected standards are the Global Reporting Initiative (GRI), with a particular focus on chapter 13 on Agriculture, Aquaculture and Fishing, the benchmarking methodology developed by the World Benchmarking Alliance (WBA), and the Sustainability Assessment of Food and Agriculture systems (SAFA) from the FAO. Together, these three standards cover an extensive list of topics related to agri-food sustainability based on which organizations can assess and/or report their performance. The three indices are the Environmental Performance Index (EPI) from the Yale Center for Environmental Law & Policy, the Sustainability Food Index (SFI) from *The Economist*, and the United Nations' Sustainable Development Report (SDR).

Indicator 13 | Transparency & accuracy

INTRODUCTION

Transparency is key to build trust. Giving consumers confidence about the food they buy requires assurances about what stands behind the claims being made about the food.

While the selected metrics can have health and food safety implications, improving transparency with the aid of proper labelling, is about meeting consumer expectations as well as protecting the integrity of the food system and the Canada food brand.[1]

Key differences and similarities with global sustainability standards and indices

There are few similarities between international standards and indices with the Index on the issue of transparency and labelling. The Food and Agriculture Organization's (FAO) Sustainability Assessment of Food and Agriculture systems (SAFA) focuses on internal audits on variance from labelling requirements and the World Benchmarking Alliance (WBA) addresses responsible marketing. The Index appears to be the only one to track transparency in this way, with others focusing primarily on jurisdictional compliance.

RESULTS

13.1 LABELLING OF PACKAGED FOOD PRODUCTS

Overall, Canada's approach to food labelling is about having an effective system in place to prevent and minimize misrepresentation of food products. Other labelling matters are also important to consumers, such as disclosing the nutritional content of foods. All food sold in Canada, whether domestic or imported, must meet Canadian food safety requirements, standards and must be labelled in a manner that is not false, misleading, or deceptive.

13.1.1 Product content compliance

Description	Source	Result: Percent
Percentage of tested foods in food production facilities across Canada that were deemed to be safe and accurately represented.	Departmental Results Reports, 2020-21, 2021-22, Canadian Food Inspection Agency	2021-22: 98.6% 2020-21: 98.4%

13.2. HEALTH CLAIMS

A food health claim is any representation on labelling or advertising that states, suggests or implies that a relationship exists between consumption of a food or an ingredient and a person's health. Health Canada has established a rigorous process to assess health claims, which considers scientific evidence and, once approved, enables claims to be used in labelling and advertising. Currently approved claims include fruit and vegetable consumption and the reduced risk of heart disease and oat products and blood cholesterol lowering. CFIA does not track nor

1 See, for example, the Minister's statement on food fraud and maintaining Canada's world-class reputation, *Government of Canada takes action on fish fraud*, Press Release, March 24, 2021: https://www.canada.ca/en/food-inspection-agency/news/2021/03/government-of-canada-takes-action-on-fish-fraud.html

report on the number of health label violations, per se, but the "Percentage of tested foods in food production facilities across Canada that were deemed to be safe and accurately represented" would capture accuracy misrepresentations with food, including inappropriate use of health claims.

13.2.1 Number of health claims approved

Description	Source	Result: Approved claims
Number of health claims approved, as of December 2022	Substantiation of Health Claims, Health Canada	Approved: 16 Not accepted: 3

13.3. MISREPRESENTATION

The intentional and economically motivated misrepresentation or adulteration of an ingredient, food or beverage, (often described as "food fraud") can be major events and have far-reaching impact with food safety, economic, societal, and/or reputational implications. For example, food fraud has the potential to damage "Brand Canada" in domestic and global markets.[2] [3] Currently, CFIA reports that food fraud is most often reported for olive oil, honey, dry spices, fish, fruit juices and organic food products.

The CFIA conducts enhanced surveillance of domestic and imported foods through risk-based, targeted sampling and testing to determine if a food commodity is accurately represented. The CFIA conducts enhanced surveillance activities to address risks associated with certain foods and uses these results to inform its future targeted surveillance activities to help tackle food fraud and protect Canadians. For most recent data available (2020-2021), the CFIA flagged 74 cases of non-compliance with labelling laws, a relatively low number which has remained steady over the past five years.[4]

13.3.1 Prevalence of food misrepresented

Description	Source	Result: Percent deemed satisfactory 2021-22
Percentage of samples that are deemed acceptable, that were tested for authenticity, adulteration or substitution. This includes domestic and imported foods.	Food Fraud Annual Report 2020-2021, Canadian Food Inspection Agency	• Honey: 88.5% satisfactory • Fish: 91.2% satisfactory • Olive oil: 87.8% satisfactory • Other expensive oils: 66.2% satisfactory • Spices: 92.9% satisfactory

Applicable U.N. Sustainable Development Goal (SDG): Not specifically addressed

2 *Food Fraud in Canada, Understanding the Risks and Opportunities for Leadership*, Arrell Food Institute, University of Guelph: https://arrellfoodinstitute.ca/wp-content/uploads/2021/05/UG_Arrell-Foods_09_Food-Fraud_Final-2.pdf; pages 3, 13, 41, 42. This report suggests that better traceability could mitigate the incidence of food fraud.

3 https://inspection.canada.ca/food-label-requirements/labelling/consumers/food-fraud/eng/1548444446366/1548444516192

4 Arrell Food Institute: https://arrellfoodinstitute.ca/wp-content/uploads/2021/05/UG_Arrell-Foods_09_Food-Fraud_Final-2.pdf, page 6

Appendix | GLOBAL CONTEXT

The following section considers how Canada's choice of Index indicators and metrics align with a selection six leading global sustainability standards and indices.[5] While not intended to be comprehensive, the review highlights key differences and similarities as context for Canada's approach.

Overview of how this topic is typically addressed in the selected global standards:

- Transparency is important to each global standard, especially regarding traceability and labelling. Specially, GRI addresses transparency and accuracy under the topic of supply chain traceability, where it primarily focuses on procurement and fishing; it includes recommendations for the disclosure of efforts toward certification to ensure traceability. (Note, Canada's Index addresses traceability in Indicator 12 within Food Integrity.)
- WBA's indicator for labelling and transparency requires compliance with jurisdictional labelling regulations but does not track violations. The standard also emphasizes responsible marketing. Transparency is described as an underlying principle of the WBA standard.
- SAFA's transparency indicator is qualitative, focusing on whether an enterprise has a transparency policy and can demonstrate how it is used, makes information easy to access, and can explain how stakeholder needs for information are assessed and met. SAFA includes tracking compliance with labelling regulations by auditing against jurisdictional requirements, and by including labelling codes and variance from these in enterprise documentation.

Overview of how this topic is typically addressed in the selected global indices:

- Transparency is not well addressed by global indices in terms of specific indicators designed around this theme. (The areas where transparency is raised is not about sustainability, per se, but relates to encouraging transparent institutions and on the use of public policy practices and tools. This relates to SDG 16.6.)

5 The three selected standards are the Global Reporting Initiative (GRI), with a particular focus on chapter 13 on Agriculture, Aquaculture and Fishing, the benchmarking methodology developed by the World Benchmarking Alliance (WBA), and the Sustainability Assessment of Food and Agriculture systems (SAFA) from the FAO. Together, these three standards cover an extensive list of topics related to agri-food sustainability based on which organizations can assess and/or report their performance. The three indices are the Environmental Performance Index (EPI) from the Yale Center for Environmental Law & Policy, the Sustainability Food Index (SFI) from *The Economist*, and the United Nations' Sustainable Development Report (SDR).

3. ECONOMIC INDICATORS

Indicator 14 | National economic contribution

INTRODUCTION

A profitable and successful sector – as represented by a host of economic measures – is key to being more sustainable and improving positive outcomes.

Establishing the relative size and performance of the agriculture and food sector to the economy as a whole provides context for understanding the sector's economic contribution to national prosperity. As per the metrics provided below, Canada's agri-food sector, from production to retail, is one of the country's largest employers, employing 1 in 9 jobs. Twenty percent, or 1 in 5 people that work in manufacturing, do so in food and beverage processing. More people work in food and beverage processing, for instance, than employed in the country's automotive sector. By being the 5th largest agricultural exporter and 11th largest exporter of manufactured food and beverage products, the following metrics demonstrates the overall importance of the sector in terms of its contribution to the Canadian economy.

Key differences and similarities with global sustainability standards and indices

The contribution played by agriculture and food sectors to national economies is addressed by the global standards and indices alike. Global standards and indices typically do so not as a standalone indicator, but in terms of how business activities enable economic opportunities (e.g., for local communities and support suppliers) or in relation to other metrics (e.g., GHG emissions, research and development expenditures) to contextualise results. Trade-related information is not typically considered.

RESULTS

14.1 GROSS DOMESTIC PRODUCTION (GDP)

GDP is a recognized measure of economic production and how fast the economy and sub-sectors are growing. It is also a basis to compare performance against other industries.[1] "Gross" includes capital consumption costs, that is the costs associated with the depreciation of capital assets, such as buildings, machinery and equipment.[2]

1 Bank of Canada: https://www.bankofcanada.ca/core-functions/monetary-policy/measuring-economic-growth/
2 Statistics Canada: https://www23.statcan.gc.ca/imdb/p2SV.pl?Function=getSurvey&SDDS=1301

14.1.1 Gross Domestic Production (GDP)

Description	Source	Results: Millions $
Total agri-food sector; sum of the following: • Primary agriculture • Food and beverage processing • Food wholesaling • Food retailing • Food service and restaurants	Gross domestic product (GDP) at basic prices, by industry, Statistics Canada	2021: 120,048 2020: 119,661 2019: 128,474 2018: 124,469 2017: 123,993
Primary agriculture: Crop and animal production.		2021: 31,359 2020: 35,089 2019: 34,083 2018: 32,309 2017: 32,648
Food and beverage processing: Food manufacturing plus beverage and tobacco product manufacturing.		2021: 34,864 2020: 33,015 2019: 33,340 2018: 32,761 2017: 32,825
Food wholesaling: Food, beverage and tobacco wholesaler-distributors.		2021:11,977 2020: 11,811 2019: 11,370 2018:10,635 2017:10,238
Food retailing: Food and beverage stores.		2021: 19,607 2020: 19,948 2019: 19,283 2018: 18,839 2017: 18,534
Food service and restaurants: Food services and drinking places.		2021: 22,241 2020: 19,798 2019: 30,398 2018: 29,925 2017: 29,748
Description	**Source**	**Results: Percentage**
Percentage of total Canadian GDP attributable to agri-food sector: Primary agriculture, processing, wholesaling, retail and food service.	Gross domestic product (GDP) at basic prices, by industry, Statistics Canada	2021: 6.06% 2020: 6.34% 2019: 6.46% 2018: 6.38% 2017: 6.54%
Food and beverage processing as a percentage of all manufacturing.		2021: 10.4% 2020: 11.1% 2019: 9.7% 2018: 9.5% 2017: 9.6%

14.2 EMPLOYMENT

The following metrics measure the relative importance of agri-food as a major employer. (Note: matters relating to workers' well-being are addressed in Societal Well-Being Indicators)

14.2.1 Employment

Description	Source	Result: Thousands of employees
Primary agriculture: Crop and animal production.	Labour force characteristics by industry, annual, Statistics Canada	2021: 257,300 2020: 258,500 2019: 279,700 2018: 294,000 2017: 284,000
Food and beverage processing, total of: Food manufacturing plus beverage and tobacco product manufacturing.	Employment by industry, monthly, unadjusted for seasonality, Statistics Canada	June 2022: 321,122 2021: 310,875 2020: 288,415 2019: 308,021
Food wholesaling: Food, beverage and tobacco wholesaler-distributors.		June 2022: 163,770 2021: 156,734 2020: 148,420 2019: 161,446
Food retailing: Food and beverage stores.		June 2022: 536,424 2021: 547,764 2020: 498,782 2019: 521,798
Food service and restaurants: Food services and drinking places.		June 2022: 1,107,902 2021: 872,351 2020: 649,804 2019: 1,162,566
Food Processing as a percent of all manufacturing sector.		June 2022: 20.3% 2021: 20.2% 2020: 20.2% 2019: 19.1%
Food retail as a percent of all retail sector.		June 2022: 26.4% 2021: 28.1% 2020: 29.1% 2019: 25.9%
By Indigenous identity, employment in agriculture, natural resources and utilities.	Employment by geography, Indigenous group and industry, Statistics Canada	Thousands: 2022: 45.9 2021: 40.7 2020: 36.1 2019: 38.5 2018: 33.7

14.3 TRADE BALANCE

The following metrics emphasize exports because of Canada's leading export status. In 2018, Canada's net exports of all foods were 22% of its production (in tonnes), compared to 9% in the United States and a global average of -17% (most countries are net importers).[3] Given the identified importance of growing Canada's value-added sector and improving this rank, the state and trend of food processing's trade balance is profiled.[4] In the recent past, this sector experienced consecutive years of trade deficits.

14.3.1 Trade balance

Description	Source	Result: Millions $
Total Canada agri-food sector exports ($), total of: • NAICS 111 - Crop production • NAICS 112 - Animal production and aquaculture • NAICS 311 - Food manufacturing • NAICS 312 - Beverage and tobacco product manufacturing	Trade Data On-Line, Statistics Canada	2021: 81,036 2020: 73,196 2019: 65,964 2018: 65,530 2017: 63,765
Total exports relative to all Canadian exports, percent.		2021: 12.83% 2020: 14.00% 2019: 11.74% 2018: 11.21% 2017: 11.67%
Canadian agri-food exports relative to global trade, percent. Total Canada agri-food exports in US $, divided by total world agri-food exports in US$.	World agri-food exports: UN 2021 International Trade Statistics Yearbook Volume II Trade by Product U.S/ Canada exchange rates: Monthly average foreign exchange rates in Canadian dollars, Bank of Canada	2021: 4.2% 2020: 4.0% 2019: 3.7% 2018: 3.7% 2017: 3.8%
Trade balance overall of all agri-food: • NAICS 111 - Crop production • NAICS 112 - Animal production and aquaculture • NAICS 311 - Food manufacturing • NAICS 312 - Beverage and tobacco product manufacturing	Trade Data On-Line, Statistics Canada	Net exports: Millions $ 2021: 27,544 2020: 22,383 2019: 15,687 2018: 16,877 2017: 16,653
Trade balance, processing sector Food manufacturing plus beverage and tobacco product manufacturing.		Net exports: Millions $ 2021: 9,417 2020: 6,935 2019: 2,776 2018: 1,359 2017: 926

Applicable U.N. Sustainable Development Goal (SDG): 2.4, 9.2

3 *The National Index on Agri-Food Performance for Sustainability and its Value for Policy-making*, Report to this project, Canadian Agri-Food Policy Institute, 2022.

4 Refer to the Barton report and the ISED Economic Growth Tables Report, Agri-Food: *Unleashing the growth potential of key sectors*, Advisory Council on Economic Growth, February 2017, and *Positioning Canada's agriculture and agri-food sectors for long-term growth*, February 2018.

GAPS AND OBSERVATIONS

About food imports: As a trade-dependent and open economy and northern latitude country, food imports are important to consumers, processors, and retailers. As such, this Index does not imply that food imports are a negative outcome nor track "import replacement".

Appendix | GLOBAL CONTEXT

The following section considers how Canada's choice of Index indicators and metrics align with a selection six leading global sustainability standards and indices.[5] While not intended to be comprehensive, the review highlights key differences and similarities as context for Canada's approach.

Overview of how this topic is typically addressed in the selected global standards:

- The nature and importance of the economic contribution of organizations are accounted for in the selected standards. Notably, it is about how organizations enable economic opportunities for local communities and support suppliers – topics that are, in part, addressed by Indicator 15, Financial Vibrancy and Resiliency; for example, the WBA considers how organizations account for supporting producers to build resilience, increase productivity and access to markets.
- Total number of employees (including per type of jobs) are background data using for reporting on other indicators (e.g., % of employees covered by bargaining agreements).
- Given the focus on the organizations' impacts and management practices, global standards do not report on data pertaining to trade. However, relationships with business partners are taken into account by SAFA and GRI.

Overview of how this topic is typically addressed in the selected global indices:

- Contribution to GDP is considered in the three sustainability indices, but mainly used as background data to inform other metrics. For instance, the EPI reports GHG emissions intensity growth rate per unit of GDP over a 10-year period. The FSI also uses nominal GDP data to report on different indicators (e.g., government R&D expenditures as a % of GDP). The SDG reports this information relative to the US growth performance.
- Similarly, employment is typically expressed as ratios (e.g., employment to population ratio; share of employment in agriculture) among other performance indicators.
- Trade-related information is not taken into account in the selected indices.

5 The three selected standards are the Global Reporting Initiative (GRI), with a particular focus on chapter 13 on Agriculture, Aquaculture and Fishing, the benchmarking methodology developed by the World Benchmarking Alliance (WBA), and the Sustainability Assessment of Food and Agriculture systems (SAFA) from the FAO. Together, these three standards cover an extensive list of topics related to agri-food sustainability based on which organizations can assess and/or report their performance. The three indices are the Environmental Performance Index (EPI) from the Yale Center for Environmental Law & Policy, the Sustainability Food Index (SFI) from *The Economist*, and the United Nations' Sustainable Development Report (SDR).

Indicator 15 | Financial vibrancy & resiliency

INTRODUCTION

Economic sustainability is about farm and firm profitability and the conditions required to ensure resiliency.

Enabling economic growth depends on many factors, including availability of labour, and adequate infrastructure, broadband, and investment.[1] As well, many macro-economic factors influence financial viability, such as the general business environment, monetary policy, and taxation. The metrics below are measures of how farms and other agri-businesses perform overall.

While global food systems demonstrated their "remarkable" resiliency during COVID-19,[2] the pandemic accentuated global supply chain issues. Supply chain disruptions can occur for many reasons for every economic sector, testing business resiliency and impacting competitiveness. Canada's agri-food sector faces its share of domestic and international supply chain vulnerabilities. Proxies are required to track and respond to these highly complex challenges.

Key differences and similarities with global sustainability standards and indices

Supply chain risk management and investment in assets which enhance resilience are important to most standards and indices addressing this topic, although they differ on the degree of granularity and scope of coverage on these matters. Certain standards and indices also consider a host of non-economic factors as indicative of resilience. Some matters are addressed by Canada's Index elsewhere, notably with regard to managing climate and environmental risks. Other matters are not considered by this Index, such as reporting on product quality and promoting a living wage.[3]

The Index is relatively rigorous in its assessment of vibrancy and resilience and covers matters not addressed by others. As such, the Index aligns with global frameworks' broad coverage of tracking of financial vibrancy and resiliency, especially regarding financial performance and supply chain resilience. The Index also highlights the importance of specific proxy measures of infrastructure to support economic opportunities.

1 See sections on "What we need to overcome" and "What we need to become" in ISED Economic Growth Tables Report, Agri-Food, February 2018: https://www.ic.gc.ca/eic/site/098.nsf/eng/00022.html

2 *OECD Policy Response to Coronavirus (COVID-19): Food Supply Chains and COVID-19: Impacts and Policy Lessons*, 2 June 2020: https://www.oecd.org/coronavirus/policy-responses/food-supply-chains-and-covid-19-impacts-and-policy-lessons-71b57aea/

3 These latter themes were deemed to be out-of-scope to the Index; quality is a vague term not defined as limited to sustainability, and a living wage is about general social and economic policy, not about agri-food policy

RESULTS

15.1 FINANCIAL PERFORMANCE

While individual business-owners can rely on a vast number of metrics to monitor or report on their respective financial performance,[4] this indicator selects several proxies for such measurements.

15.1.1 Farm income

Description	Source	Result: Millions $
A. Net farm income; includes all farms reporting more than $10,000 annual farm cash income, five-year average.	Net farm income, Table: 32-10-0052-01, Statistics Canada	2017/2021: 16,208 2016/2020: 14,546 2015/2019: 13,907 2014/2018: 14,025 2013/2017: 14,002
B. Farm receipts adjusted for government payments. Total farm cash receipts minus total direct payments.	Farm Cash Receipts, Table: 32-10-0045-01, Statistics Canada	2021: 77,246 2020: 68,686 2019: 63,241 2018: 60,465 2017: 62,255
C. Debt to asset ratio.	Balance sheet of the agricultural sector as at December 31st, Table: 32-10-0056-01, Statistics Canada	2021: .162 2020: .167 2019: .167 2018: .162 2017: .155

15.1.2 Agri-food processing return on investment

Description	Source	Result: Return on equity
A. Food and soft drink and ice manufacturing.	Financial and taxation statistics for enterprises, by industry type, Statistics Canada	2019: 9.0% 2018: 8.8% 2017: 12.6% 2016: 14.0% 2015: 10.2%
B. Alcohol beverage, tobacco and cannabis product manufacturing.		2019: 4.3% 2018: 9.5% 2017: 8.6% 2016: 7.3% 2015: 13.7%

4 See, for instance, the report from Canadian Roundtable for Sustainable Crops: *The Sustainability Report for Financial Viability.*

15.2 INVESTMENT

Investing in machinery, technology and equipment is regarded as a sector-wide leading indicator of competitiveness.[5] (See also Indicator 17, Sustainable Finance for investment relating to "sustainable finance".) Measuring productivity growth in terms of multi-factor productivity is a strong indicator of technological progress. This metric is determined by a variety of inputs (such as labour, capital, supplies, land) and how it deploys a combination of innovation and investments in R&D, new technologies, new processes, management practices and new marketing methods.[6]

15.2.1 Food processing plant capacity utilization

Description	Source	Result: Percent plant capacity utilization	
Utilization of plant capacity. April has been selected as a proxy for annual data.	Historical (real-time) releases manufacturing capacity utilization rates, Table 16-10-0015-01, Statistics Canada	Food manufacturing	2022: 79.6% 2021: 78.9% 2020: 73.4% 2019: 79.3% 2018: 81.1%
		Beverage and tobacco manufacturing	2022: 76.5% 2021: 74.2% 2020: 71.3% 2019: 73.6% 2018: 76.8%

15.2.2 Farm investment in machinery & equipment

Description	Source	Result: Average per farm $
Net investment: Total capital investments minus total capital sales.	Farm financial survey, capital investment and capital sales of farms, average per farm, Table 32-10-0104-01, Statistics Canada	2019: 90,951 2017: 92,694 2015: 102,200 2013: 88,303 2011: 74,646

15.2.3 Food processing investment in machinery & equipment

Description	Source	Result: Millions $	
For food and soft drink and ice manufacturing. Sum of quarterly total capital expenditures for selected year, divided by average of total assets for selected year.	Quarterly balance sheet, income statement and selected, financial ratios, Table 33-10-0225-01, Statistics Canada	Food and soft drink and ice manufacturing	2022: 5,936 (Jan. to Sept.) 2021: 6,813 2020: 7,368
		Alcohol beverage, tobacco and cannabis product manufacturing	2022: 286 (Jan. to Sept.) 2021: 189 2020: 1,207

5 Canada's Economic Strategy Tables: Agri-Food: Food manufacturing investment in machinery and equipment as a percentage of sales is trending downward, from 2.3% in 1998 to 1.2% in 2016

6 *Canadian Agri-Food Processing Competitiveness, Quality Growth and Global Opportunities: A Snapshot of Current Trends- Key Findings*, March 2020 CAPI: https://capi-icpa.ca/wp-content/uploads/2020/02/2020-03-09-CAPI-Food-Processing-Key-Findings-Paper.pdf

15.3 LABOUR

Meeting the labour needs of the Canadian economy and the agri-food sector is vital to operate and compete. This indicator addresses a key issue, the labour gap, the difference between supply and demand of the work-force. The labour gap can be measured a number of ways, but the available data is the job vacancy rate as reported by Statistics Canada.

15.3.1 Job vacancies

Description	Source	Result: Percent vacancy rate Q2: 2018-2022 (2020 data not available)	
Job vacancy rate as calculated quarterly by Statistics Canada. Q2 selected as proxy for annual data.	Job vacancies, payroll employees, job vacancy rate, and average offered hourly wage by industry sector, quarterly, unadjusted for seasonality, Table: 14-10-0326-01, Statistics Canada	All industries	2022: 5.9%
		Crop production	2022: 8.3% 2021: 8.8% 2019: 9.8% 2018: 9.4%
		Animal production and aquaculture	2022: 4.8% 2021: 4.2% 2019: 3.7% 2018: 3.4%
		Food manufacturing	2022: 6.1% 2021: 5.2% 2019: 3.9% 2018: 4.1%
		Beverage and tobacco manufacturing	2022: 7.2% 2021: 6.7% 2019: 4.7% 2018: 4.7%
		Food and beverage stores	2022: 4.7% 2021: 4.1% 2019: 2.8% 2018: 2.7%

15.4 INFRASTRUCTURE

A. BROADBAND CONNECTIONS

The Canadian Radio-television and Telecommunications Commission (CRTC) reports that 91.4% of Canada has broadband coverage but only 62% of rural households and 43% First Nation reserve areas. This differential and lack of connectivity is a major issue. The infrastructure needed to enable broadband adoption (as well as gas-line connections to facilitate biogas development) is important to support farmers and businesses and to foster new innovative opportunities.

Statistics Canada conducted a survey in the third quarter of 2020, asking businesses to identify business or organization obstacles they had faced over the previous three months.[7] Across all industries, 3.1% identified broadband as an obstacle, but within agriculture, forestry, fishing and hunting businesses, 12.6% identified broadband.

7 Business or organization obstacles over the last three months, by business characteristics, third quarter of 2020, Frequency: Occasional Table: 33-10-0273-01.

15.4.1 Broadband connection

Description	Source	Result: Percent of households
Broadband coverage across Canada.	Current trends – Highspeed broadband, Canadian Radio-Television and Telecommunications Commission (CRTC)	Total Canada: 91.4% Rural: 62.0% First Nations reserve areas: 43.3%

B. RAIL PERFORMANCE REPORT

The Economic Table Report for Agri-Food proposed that Canada should rank in the top 10 among OECD countries in the infrastructure category of the World Bank's Logistics Performance Index by 2025, up from 17th in 2018.[8] Infrastructure is vital to maintain smooth-running supply chains and access markets. All modes of transportation (i.e., air, rail, road, ship, and related infrastructure, such as ports) are vital to the sector; this Index selects rail as one proxy for performance.

15.4.2 Performance of rail system

Description	Source	Result: Number of rail cars (April of each year)
Rail performance in Canada, number of cars unloaded at Western ports – Grain Monitoring Program.	Transportation system utilization and performance, Table: 23-10-0270-01, Transport Canada	2022: 16,842 2021: 42,495 2020: 48,625 2019: 33,866 2018: 32,505

C. CONTROLLED GROWING ENVIRONMENTS

The growth of greenhouses and urban farming infrastructure is an indicator of the interest in producing more fresh food locally and the investments being made in this space. Currently, only greenhouse area data is available, although there are other types of controlled environments, such as mushroom facilities.

15.4.3 Greenhouse area

Description	Source	Result: Square metres
The amount of commercial greenhouse in Canada.	Estimates of greenhouse total area and months of operation, Statistics Canada	2021: 30,177,406 2020: 28,384,491 2019: 25,717,320 2018: 25,720,235 2017: 25,342,825

8 https://www.ic.gc.ca/eic/site/098.nsf/eng/00022.html

15.5 SUPPLY CHAIN RESILIENCY

Several agri-food segments are particularly vulnerable to international supply disruptions.[9] Vulnerability can impact both international and domestic sales. For the latter, primary production and food manufacturing segments can be reliant on international suppliers for their inputs of goods and services sourced from abroad. Flagging such issues can help frame food system dialogues on ways to address vulnerability and enhance resiliency.

This metric reports on international supply and demand vulnerabilities for Canada, including its agri-food sector. Research work using Statistics Canada data identifies provides two indices, measuring industries sensitive to upstream supply shocks from goods and services sourced abroad and downstream impacts from industry's dependence on global markets' demand for their products and services.

15.5.1 Supply Chain Vulnerability Index

Description	Source	Result: 100 = most vulnerable; 0 = not vulnerable
Supply vulnerability score: The index score is the average of five components: reliance on intermediate inputs, imports of intermediate inputs, indirect imports, geographic concentration of imports, and the number of imported products on the "Imports of Limited Supply List".	Vulnerability of Canadian industries to disruptions in global supply chains, Global Affairs Canada, 2020	• Crop production (except cannabis, greenhouse, nursery and floriculture production): 55 • Meat product manufacturing: 63 • Seafood product preparation and packaging: 58 • Breweries: 47 • Wineries and distilleries: 48 • Pesticide, fertilizer and other agricultural chemical manufacturing: 53
International demand vulnerability index: The index score is the average of three components: reliance on exports, geographic concentration of exports, and reliance on indirect exports.		• Crop production (except cannabis, greenhouse, nursery and floriculture production): 29 • Meat product manufacturing: 18 • Seafood product preparation and packaging: 53 • Breweries: 36 • Wineries and distilleries: 40 • Pesticide, fertilizer and other agricultural chemical manufacturing: 48

Applicable U.N. Sustainable Development Goal (SDG): 2.3, 2.4, 9.4

9 *Vulnerability of Canadian industries to disruptions in global supply chains*, June 2020, Statistics Canada: https://www.international.gc.ca/trade-commerce/economist-economiste/analysis-analyse/supply-chain-vulnerability.aspx?lang=eng

Appendix | GLOBAL CONTEXT

The following section considers how Canada's choice of Index indicators and metrics align with a selection six leading global sustainability standards and indices.[10] While not intended to be comprehensive, the review highlights key differences and similarities as context for Canada's approach.

Overview of how this topic is typically addressed in the selected global standards:

- All three selected standards consider on-farm productivity and resilience as key themes, although they differ on the degree of granularity and scope of coverage on these matters.
- SAFA is the most detailed and inclusive of metrics for economic resilience, containing indicators that the Index addresses but under several other themes. Specifically, SAFA considers economic resiliency relating to business investment, vulnerability, product quality and information, as well as contribution to the local economy.
- WBA focuses only on living wage and productivity at the farm level.
- GRI prioritizes disclosing economic and social impacts rather than performance. GRI uses the term 'resilience' to capture to how organizations adjust to current and anticipated climate change-related risks, as well as how they contribute to the ability of societies and economies to withstand impacts from climate change.

Overview of how this topic is typically addressed in the selected global indices:

- EPI does not address this topic, and the primary difference between FSI and the SDGs is also related to granularity and scope.
- FSI treats financial/economic indicators under the theme of sustainable agriculture and includes metrics for subsidies, reliance on imports, diversification, R&D, gross production values per land area, access to financial resources and protection for land users, insurance, investment, and debt risk.
- SDGs prioritize productivity and incomes, especially for vulnerable groups, and emphasize infrastructure investment for greater sustainability and resource use efficiency.

10 The three selected standards are the Global Reporting Initiative (GRI), with a particular focus on chapter 13 on Agriculture, Aquaculture and Fishing, the benchmarking methodology developed by the World Benchmarking Alliance (WBA), and the Sustainability Assessment of Food and Agriculture systems (SAFA) from the FAO. Together, these three standards cover an extensive list of topics related to agri-food sustainability based on which organizations can assess and/or report their performance. The three indices are the Environmental Performance Index (EPI) from the Yale Center for Environmental Law & Policy, the Sustainability Food Index (SFI) from *The Economist*, and the United Nations' Sustainable Development Report (SDR).

Indicator 16 | Innovation

INTRODUCTION

Innovation is vital to drive future sustainable economic growth, competitiveness and longer-term financial viability of farms and companies.

Innovation is described as one of several "levers of change" required to deliver on all 17 of the UN Sustainable Development Goals. The UN Food Systems Summit characterized innovation as including "data and digital, scientific and technological, national and regional innovation ecosystems, as well as societal and institutional innovation models, including traditional and Indigenous knowledge."[1] However, innovation cannot be easily measured. Three proxies are selected for measuring innovation across the agri-food sector: spending on research and development (R&D), speed of regulatory approvals, and adoption of new processes and advanced technologies.

Key differences and similarities with global sustainability standards and indices

Measuring innovation among global standards and indices largely focuses on investment in research and development (R&D), an approach shared with the Index. However, standards focus on the activities that support innovation rather than tracking innovation expenditures. Both global schemes and the Index look to proxies of innovation (such as tracking supportive processes) given the lack of measurable outcomes-based results. The Index uniquely includes innovation from the perspective of Indigenous engagement.

Regulatory processes are only considered by EPI and the Global Innovation Index (GII) and this is based on assessing perceptions of efficiency and efficacy. In comparison, the Index makes an effort to measure regulatory enabling actions.

RESULTS

16.1 RESEARCH AND DEVELOPMENT (R&D)

The federal government has a goal to increase overall Canadian business expenditures in research and development to $30 billion by 2025, up from some $17 billion in 2017.[2] Documenting the total amount of agri-food innovation spending spans many government programs.

A second metric provides information on industry R&D. Academic research broadens the perspective although scientific advancement (and citations) does not necessarily translate into new businesses or products. However, scientific research is a bedrock activity for enabling future innovation and contributing to more sustainable outcomes.

1 *Levers of Change*, UN Food Systems Summit: https://www.un.org/en/food-systems-summit/levers-of-change
2 ISED: *Indicators and targets: Growing business investment in research and development*

16.1.1 Government of Canada expenditures for research and development for agriculture

Description	Source	Result: Millions $
Agriculture knowledge and innovation systems expenditures as submitted to the Organization for Economic Cooperation and Development (OECD) for the calculation of producer support.	Agriculture policy monitoring and evaluation, OECD 2022	2021: $856.35 2020: $868.99 2019: $799.49 2018: $812.7 2017: $829.66

16.1.2 Industry investment in agri-food research and development

Description	Source	Result: Millions $
Total of agriculture, food processing and beverage and tobacco manufacturing.	Business enterprise in-house research and development expenditures, Statistics Canada	2020: $358 2019: $338 2018: $321 2017: $292

16.1.3 Agri-food research activity

Description	Source	Result: Number of academic papers
Published agriculture and food academic papers.	An Overview of the Canadian Agriculture Innovation System, Agriculture Innovation Council, 2017	2014: 6,878
Percent of published veterinary and agricultural science articles that originated in Canada.	Computed by Science-Metrix using the Scopus database (Elsevier)	2014: 3.06%

16.2 REGULATORY APPROVALS

Canada's regulatory system is widely held up as a significant contributor of consumer and marketplace confidence in the food system. Provided that food safety and society's well-being is not compromised, a responsive regulatory environment is also important to do business and attract investment. Administrative burden and speed of approvals are often identified as limiting factors to the adoption of innovation.

ADMINISTRATIVE BURDEN

The federal government's Administrative Burden Baseline establishes metrics of federal regulations and associated forms that impose administrative burden on business.[3] Agri-food businesses are subject to regulations from various departments and agencies, but the following metrics have been selected as these are unique to agri-food businesses.

3 https://www.canada.ca/en/government/system/laws/developing-improving-federal-regulations/requirements-developing-managing-reviewing-regulations/administrative-burden-baseline.html

16.2.1 Administrative burden

Regulatory requirements that are assessed by the Government of Canada to impose regulatory burden on businesses

Description	Source	Result: Number of regulatory requirements
A federal government-wide initiative seeks to identify the total number of requirements in federal regulations and associated forms that impose an administrative burden on business. The following metrics include: • CFIA-related regulations for all types of agri-food businesses only. • Health Canada-related Pest Control Products Act regulations.	Administrative Burden Baseline: Update 2022, Canadian Food Inspection Agency	2022: 5,508 2014: 10,989
	Pest Control Products Act, Health Canada	2022: 802 2021: 802 2020: 802 2019: 802

16.2.2 Speed of approvals: Crop protection products

Description	Source	Result: Completed within established service standards or negotiated timelines
The PMRA's review performance on submissions completed (i.e., registered, rejected, withdrawn, granted, or approved) during the reporting period. Results are provided by category of submissions. Metrics for two categories are provided but results for additional categories are also calculated.[4]	Service Standards for Categories A-L Authorizations under the Pest Control Products Regulations, Health Canada Reporting date: fiscal year 2020-21	Category A: applications to register an active new ingredient or major new use for a registered pesticide: 39% (20/51) Category B: applications to amend a product label or change the product chemistry: 83% (267/322)

16.3 INNOVATION ADOPTION

Investment and research and development (R&D) and other financial health indicators (e.g., profit margin) are habitually used to monitor the economic health of the sector and in lieu of trying to measure innovation. This indicator relies on available and recurring survey data to portray the uptake of innovation in the agriculture sector. Inadequate data exists from other parts of the sector for use in this Index.

4 Full details on categories can be found at: https://www.canada.ca/en/health-canada/corporate/about-health-canada/legislation-guidelines/acts-regulations/service-standards-high-volume-regulatory-authorizations/2021-2022/categories-authorizations-pest-control-products-regulations.html

A. PRODUCTION AGRICULTURE INNOVATION

Available survey findings include insights on improved farm production and management practices; some perspectives are available on advanced technologies as per below.

16.3.1 Farm adoption of innovation

Description	Source	Result: Percent
Percentage of farmers using computer technology to enhance and improve production in the previous year.	Farm Management Survey, Statistics Canada	2021: 40% 2017: 37%
Percentage of field crop farmers using GPS and guidance systems in the previous year.		2021: 84% 2017: 84%
Percentage of farmers who have adopted new business practices in the previous year.		2021: 12% 2017: 10%
Percentage of farmers who have adopted new marketing practices in the previous year.		2021: 14% 2017: 11%

B. SUPPORTING INDIGENOUS ENTREPRENEURSHIP AND BUSINESSES

Institutions dedicated to support Indigenous agriculture and food activity could enable Indigenous entrepreneurs to tap into traditional knowledge, skills and practices in communities, an important means to recognize traditional (vs. wage economy) outcomes and result in more Indigenous communities adopting agriculture/food economic strategies. These metrics also includes marking progress on the growth of Indigenous clean energy projects. Metrics presented cover all types of clean energy/businesses, as data is not available specifically for agri-food.

16.3.2 Indigenous involvement in renewable energy

Description	Source	Result: Number of projects
Indigenous renewable energy projects in operation or final stages of planning or construction.	Indigenous Clean Energy, 2023	Nearly 200 medium to large renewable energy projects with Indigenous involvement are now in operation or in the final stages of planning or construction. It is estimated that 1,700 – 2,100 micro or small renewable energy systems are now in place with Indigenous leadership/ partnerships

16.3.3 Capital funding for Indigenous businesses

Description	Source	Result: Loans
The National Aboriginal Capital Corporations Association, a network of over 50 Aboriginal Financial Institutions (AFIs), provides loans to businesses owned First Nations, Métis, and Inuit people (includes all types of businesses; i.e., not specific to agri-food).	National Aboriginal Capital Corporations Association	1985 to 2022: 50,000 loans representing some $3 billion

GAPS AND OBSERVATIONS

- **Speed of approvals:** Speed of decision-making and regulatory burden are frequently identified issues. Two proxies were selected to address this matter: the speed to approve food additives assessed by Health Canada and, timely science-based regulatory approvals of crop protection products. Data on approval timing for food additives is not available.

- **Farmer investment in research:** Data for farm industry association investment in research has not been compiled. However, a data set could be constructed from information from national industry associations to demonstrate aggregate farmer investment in research.

- **Supporting Indigenous entrepreneurship and businesses:** In addition to accessing metrics specific to assist Indigenous investment specifically in agri-food businesses, it would also be beneficial to identify First Nations, Métis, and Inuit specific projects underway under the capital pool, and the penetration rate of First Nations businesses vs. non-Indigenous businesses who gain access to the capital pool.

- **Future innovation metrics:** Given the importance of advanced technology-adoption to a sustainable and economically successful food system, the following offers what could be used to inform future metrics development.

    - **Digital tool adoption:** Access to digital tools (if internet access permits) can boost productivity (i.e., use of precision agriculture) and increase new revenue streams.[5]
    - **Genetics-innovation:** Selective breeding, genetics technologies and genome editing can improve food safety, crop yields, respond to new pests, address antimicrobial resistance in farm animals,[6] and improve climate change resilience.[7] Such technologies also create new value-added opportunities, such as improving the nutritional quality of foods (e.g., through biofortification).[8]
    - **Clean technology adoption:** The adoption of clean/green technologies across the agri-food sector can improve productivity and reduce greenhouse gas (GHG) emissions.[9] The use of on-farm bioenergy (biogas) and biorefinery adoption, for instance, demonstrates how “waste” can become a source of new value.

- **Number of Indigenous communities with agri-food strategies:** Information on development of agri-food strategies could inform Indigenous adoption of innovation in the agri-food sector.

Applicable U.N. Sustainable Development Goal (SDG): 2.4, 2.5/2.A, 9.4, 9.5, 9.5/9.A

5 The Economic Table Report for Agri-Food proposes that Canada should Canada should double private-sector R&D expenditures and achieve 100% broadband coverage with 100 Mbps download and 50 Mbps upload speeds by 2025.

6 *Scientific achievements in agriculture*; AAFC: https://agriculture.canada.ca/en/news-agriculture-and-agri-food-canada/scientific-achievements-agriculture

7 IPCC, 2019. *Climate Change and Land*: https://www.ipcc.ch/srccl/chapter/chapter-5/, table 5.1

8 https://www.topcropmanager.com/biofortification-of-pulses-could-make-canada-a-preferred-supplier-19905/

9 See *A Healthy Environment and a Healthy Economy, Environment and Climate Change Canada*, 2020: https://www.canada.ca/content/dam/eccc/documents/pdf/climate-change/climate-plan/healthy_environment_healthy_economy_plan.pdf

Appendix | GLOBAL CONTEXT

The following section considers how Canada's choice of Index indicators and metrics align with a selection six leading global sustainability standards and indices.[10] While not intended to be comprehensive, the review highlights key differences and similarities as context for Canada's approach.

Overview of how this topic is typically addressed in the selected global standards:

- Standards do address innovation in multiple ways however research and development is often couched within other topics including: optimization of fertilizers, increasing availability and affordability of healthy foods, and investment in production efficiency.
- Investment is similarly framed within broader categories such as product diversification, improving performance across all areas of ESG (environmental, social and governance factors), and supporting community development.
- Standards measure the presence of business activities that support innovation rather than outcomes.

Overview of how this topic is typically addressed in the selected global indices:

- Indices all utilize GDP as one metric associated with innovation, but they do so differently, such as tracking expenditure on R&D as a percentage of GDP (FSI & UNSDGs), correlating GDP with environmental indicators such as air quality and heavy metals (EPI), and a presenting a ratio of the total agricultural expenditure by the government divided by the contribution of agriculture to GDP (UNSDGs).
- Only EPI includes a metric related to regulatory processes; however, this expresses the perception of regulatory efficacy and efficiency based on survey data from public and private organizations and individuals.
- Other metrics included in various indices include: number of researchers per million inhabitants, carbon emissions per unit of updated technologies and processes, and the presence/absence of subsidies and public supports for agricultural innovation, including institutions, financing, and training.
- The Global Innovation Index (GII) tracks the current state of innovation globally and ranks the innovative performance of 132 countries using a large set of metrics. However, it is not specific to the agrifood industry.

10 The three selected standards are the Global Reporting Initiative (GRI), with a particular focus on chapter 13 on Agriculture, Aquaculture and Fishing, the benchmarking methodology developed by the World Benchmarking Alliance (WBA), and the Sustainability Assessment of Food and Agriculture systems (SAFA) from the FAO. Together, these three standards cover an extensive list of topics related to agri-food sustainability based on which organizations can assess and/or report their performance. The three indices are the Environmental Performance Index (EPI) from the Yale Center for Environmental Law & Policy, the Sustainability Food Index (SFI) from *The Economist*, and the United Nations' Sustainable Development Report (SDR).

Indicator 17 | Sustainable finance

INTRODUCTION

Mobilizing capital is widely seen as a catalyst to help meet global sustainability goals, minimize risks, mitigate climate change and create new economic opportunities.[1] This indicator focuses on private and public and NGO sources of capital available to the agri-food sector. This is not about assessing financial institutions' credit or capital allocation decisions; the indicator focuses to what extent such sustainable capital is available for and taken up by the agri-food sector.

Key differences and similarities with global sustainability standards and indices

Global standards focus on environmental, social and governance (ESG) factor analyses of businesses and other commercial organizations and the practices they are undertaking to reduce climate and other commercial risks and create responsible growth opportunities. Encouraging such reporting is important for investors and share-holders to make more informed investment decisions. Canada's Index does not assess individual company ESG performance but it does take a broader view of capital availability by considering sustainable finance. It intends to measure the level of dedicated investment and public funding available for use in this country to help the transition to a low-carbon and more sustainable economy.

RESULTS

17.1. MARKET-BASED SUSTAINABLE CAPITAL/INVESTMENT

This proposed metric is intended to provide a measurement of the availability and use of market-based or non-governmental institutional sources of capital that is targeted to investment in agri-food businesses (including farms) that are undertaking measures to enhance their environmental sustainability. Other sources could include conservation and philanthropic organizations and large agri-business companies.

To provide an accurate measurement over time, methodology would need to be defined and sources of data secured. Therefore, a metric is not available at this time.

17.2 GOVERNMENT "CLIMATE SOLUTIONS" FUNDING

Public sources of capital include governments and Crown Agencies, at both federal and provincial levels and can be a significant incentive for transition to a greener economy. Given governments' commitment to sustainable development, many programs support actions by farmers and companies to transition to a greener economy, as well as to develop resilience to climate change impacts. For example, the 2018-2023 Canadian Agriculture Policy framework, provided funding through provincial and territorial governments to adopt new sustainable practices. This metric provides one example of federal funding targeted to farmers to adopt best management practices the store carbon and reduce GHGs.

1 https://www.canada.ca/en/environment-climate-change/services/climate-change/expert-panel-sustainable-finance.html

17.2.1 Government of Canada funding

Description	Source	Result: Million $
Total amount of funding available for farmers and other agri-businesses to adopt climate-smart practices: by year announced.	Departmental announcements, Agriculture and Agri-Food Canada	2020: $200 million, Agricultural Climate Solutions – On-Farm Climate Action Fund

GAPS AND OBSERVATIONS

- **Carbon markets:** Currently, Canada does not have a national carbon market. Carbon markets here and abroad are evolving and could become a key tool to enable sustainable capital flows. Accessing such markets also depends on having proper measurements in hand, such as agriculture-related carbon protocols to assign value for such a market activity; these, too, are under-development. This Index does not, therefore, include metrics on carbon market activity.

- **Border carbon adjustments (BCAs):** BCAs are being proposed by some global jurisdictions to purportedly level the competitive position of domestic companies incurring carbon costs with foreign businesses that do not face equivalent carbon costs. This is an evolving policy landscape and potential metric for future consideration.

- **Environmental, social, governance factors (ESG):** ESG is being increasingly used by investors and capital providers (and even consumers) to assess corporate risks and opportunities. Many businesses are reporting on ESG, including in their supply chains.[2] ESG reporting is evolving rapidly, and currently there are a vast array of ESG metrics in use, measures are not standardized, and ESG-adoption remains uneven. However, there is a global effort is currently underway to standardize ESG reporting and mandate corporate reporting in 2024. This includes mandated climate risk disclosures for Canadian financial institutions. As well, ESG-backed financial instruments (e.g., green bonds) are nascent as is extending financing terms generally based on improved performance on greenhouse gas emissions, protecting biodiversity and other ESG outcomes. As such, a specifically labelled ESG metric is not proposed at this time, although ESG factors have influenced this Index.

Applicable U.N. Sustainable Development Goal (SDG): 8.2, 8.4

2 *An enhanced assessment of risks impacting the food and agriculture sector*, World Business Council on Sustainable Development: https://docs.wbcsd.org/2020/01/WBCSD_An_enhanced_assessment_of_risks_impacting_the_Food_and_agriculture_sector.pdf

Appendix | GLOBAL CONTEXT

The following section considers how Canada's choice of Index indicators and metrics align with a selection six leading global sustainability standards and indices.[3] While not intended to be comprehensive, the review highlights key differences and similarities as context for Canada's approach.

Overview of how this topic is typically addressed in the selected global standards:

- None of the selected standards refer to sustainable finance accessed by a business. Rather, reporting standards are primarily used by investors to inform their ESG assessments of individual companies. However, SAFA and GRI do consider the role of investment for the long-term profitability of a business.
- Many standards exist to assess business practices from a sustainable finance perspective. For instance, SASB Standards are designed to guide the disclosure of financially material sustainability information by companies to their investors. Similarly, the Task Force on Climate-Related Financial Disclosures (TCFD) is designed to improve and increase reporting of climate-related financial information. However, these tools adopt a practice-based approach to account for if, and how, businesses are managing climate and other risks.

Overview of how this topic is typically addressed in the selected global indices:

- FSI is the only index amongst those selected that specifically looks at the opportunities for investing in sustainable agriculture. It considers whether countries have a plan, strategy or policy in place to promote private investment in that area.
- The Global Map of Environmental & Social Risk in Agro-commodity Production (GMAP) provides an evidence-based assessment to inform investors about the various social and environmental risks associated with different agri-food commodities at the country level.

3 The three selected standards are the Global Reporting Initiative (GRI), with a particular focus on chapter 13 on Agriculture, Aquaculture and Fishing, the benchmarking methodology developed by the World Benchmarking Alliance (WBA), and the Sustainability Assessment of Food and Agriculture systems (SAFA) from the FAO. Together, these three standards cover an extensive list of topics related to agri-food sustainability based on which organizations can assess and/or report their performance. The three indices are the Environmental Performance Index (EPI) from the Yale Center for Environmental Law & Policy, the Sustainability Food Index (SFI) from *The Economist*, and the United Nations' Sustainable Development Report (SDR).

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4. SOCIETAL WELL-BEING INDICATORS

Indicator 18 | Decent work for people

INTRODUCTION

This indicator focuses on the decency of work in the agri-food sector. It includes proxies for the calibre and inclusiveness of employment opportunities across the agri-food sector and a variety of working conditions and health and safety-related issues, such as mental health, access to health services and preventing injuries and death.[1] This indicator also acknowledges that such outcomes can depend on the overall well-being and supportive infrastructure of rural and urban communities, alike, which is driven by many factors beyond the role and control of the agri-food sector.

Canada's established labour laws detail the rights and responsibilities of workers and employers, including those employed by farmers, in food processing and at the food service retail level. This legislation includes Occupational Health and Safety requirements, guaranteed freedom of association and the right to collective bargaining, employment of youth, labour standards and pay, among others. Labour legislation governing workers in Canada is not specifically addressed in the Index.

Linkages to other indicators include the following: the financial and economic contribution that the sector makes to Canada's economy is addressed in the Economic Indicators, as well as broadband connectivity. In addition, a clean environment is vital for health and well-being and environmental measures are addressed by the Environment Indicators.

Key differences and similarities with global sustainability standards and indices

The inclusion of health and safety are consistent across standards, indices, and the Index. Standards cover relatively more social topics than the Index (including on labour standards and human rights, which are for the most part not specifically addressed by the Index), whereas indices cover relatively fewer social topics. There are topics that the Index uniquely includes that are less prevalent in other standards and indices, such as mental health indicators and training programs for the agricultural sector. Additionally, while standards and indices include requirements on reporting diversity, the Index explicitly identifies representation of Indigenous individuals in the workforce.

1 https://www.casa-acsa.ca/en/canadian-agricultural-safety-association/

RESULTS

18.1 WORKPLACE MENTAL HEALTH

Sector workers and farmer/fisher/business owners face a host of stresses and mental health issues, including from work unpredictability, workload, and financial pressures. Initiatives are underway to address this situation, including a government project to develop more data on farmer and rural mental health.[2] The following metric provides results from a producer self-assessment regarding stress. It can be considered as one proxy for mental health given the relationship between stress and mental well-being.

18.1.1 Stress rating of farmers

Description	Source	Result: Percent of farmers surveyed
A survey asked participants to indicate their stress ratings based on factors that are common stressors to the agriculture industry. A scorecard was created to categorize participants into one of three stress level profiles (out of a possible 24 score): • High-range stress: 17-24 • Mid-range stress: 9-16 • Low-range stress: 0-8	Farm Credit Canada Vision Panel Survey (2019) as reported in: *Healthy Minds, Healthy Farms, Exploring the Connection between Mental Health and Farm Business Management, Final Report*, May 2020, Farm Management Canada	High-range stress: 14% Mid-range stress: 64% Low-range stress: 24%

18.2 WORKPLACE SAFETY

Reducing injuries and fatalities is a priority across the agri-food sector. Occupational health and safety data has been improving in recent decades. Better outcomes are likely attributable to safer best practices adoption, injury prevention promotion and improved emergency planning.[3]

18.2.1 Workplace safety incidents

Description	Source	Result: Farm related fatalities annually
Workplace fatalities.	Canadian Agricultural Injury Reporting, Canadian Agricultural Safety Association	2012: 60 2011: 75 2010: 91 2009: 86 2008: 82

2 See, for example: Ontario Ministry of Agriculture, Food and Rural Affairs: *Governments Supporting Mental Health for Farming and Rural Communities Initiatives to Ensure Mental Health Supports for Rural and Agricultural Communities Unique Needs*, News Release, August 12, 2021; https://news.ontario.ca/en/release/1000718/governments-supporting-mental-health-for-farming-and-rural-communities?utm_source=newsroom&utm_medium=email&utm_campaign=%2Fen%2Frelease%2F1001197%2Fgovernments-protecting-the-mental-health-of-ontario-farmers&utm_term=public

3 See more on this matter from the Canadian Agriculture Safety Association: https://www.casa-acsa.ca/en/cair/

18.3 INCLUSIVE AND PROGRESSIVE WORKPLACE

Ensuring that under-represented population segments can participate in and contribute to the success of the sector is important. Measurement of equitable treatment can be reflected in many ways and several proxies are identified. For instance, women face issues of wage parity differentials, barriers and equal leadership opportunities.[4] Including more women and other underrepresented groups on association boards reflects a global and Canadian trend to improve corporate good governance practices.[5] Communities at large benefit from an inclusive and vibrant food system.

Measuring progress on inclusivity and progressiveness is challenging; in many cases data is unavailable. For instance, employment data is incomplete, not collected or not disaggregated for people of BIPOC (Black, Indigenous and People of Colour) and LGBTQ+ (which includes people of all genders and sexualities) identities.

18.3.1 Fairly treating Temporary Foreign Workers

Description	Source	Result: Non-compliance
Compliance rate of employers with temporary foreign worker employer obligations; includes all employers.	Employers who have been found non-compliant, Immigration, Refugee and Citizenship Canada	612 employers from June 2016 to December 2022

18.3.2 Representation of women in senior positions

Description	Source	Result: Percent
Percentage of farm operator reporting as female.	Census of Agriculture, Statistics Canada	2021: 30.4 2016: 28.7 2011: 27.4 2006: 28.0 2001: 26.3

4 Ontario Federation of Agriculture, OFA Viewpoint (2021): https://ofa.on.ca/wp-content/uploads/2021/03/Women-in-Ag-Statistics-Messaging.pdf

5 A significant majority (nearly 72%) of S&P/TSX 60 companies have set targets to boost representation of women directors. *2021 Diversity Disclosure Practices – Diversity and leadership at Canadian public companies*, Osler: https://www.osler.com/en/resources/governance/2021/report-2021-diversity-disclosure-practices-diversity-and-leadership-at-canadian-public-companies

18.3.3 Representation of women on association boards

Description	Source	Result: Percent
Women on sector association boards – farm/supply chain organizations. Percentage of women on boards of directors of canvassed associations, compared to total board members (as a proxy measure): • Canadian Canola Growers Association • Canadian Federation of Agriculture • Canada Pork Council • Canadian Cattle Association • Cereals Canada • Chicken Farmers of Canada • Dairy Farmers of Canada • Egg Farmers of Canada • Fruit and Vegetable Growers of Canada • Grain Growers of Canada • Pulse Canada	Web sites of various associations, February 2023	10.2%

18.3.4 Indigenous employment in sector

Description	Source	Result: Thousands
A. By Indigenous identity, employment in agriculture, natural resources and utilities.	Employment by geography, Indigenous group and industry, Statistics Canada	2022: 45.9 2021: 40.7 2020: 36.1 2019: 38.5 2018: 33.7
B. Percentage of paid positions in food and beverage manufacturers that are First Nations, Inuit or Métis individuals.	*Labour Market Information Survey, 2020*, Food Processing Skills Canada	2%

18.3.5 Gender wage parity

Description	Source	Result: Wages as a percent female vs. male; as of April	
Female wages as a percentage of male wages: • Average hourly wage • Average weekly wage Selected for April of each year.	Average usual hours and wages by selected characteristics, monthly, unadjusted for seasonality, Statistics Canada	Average hourly wage: 2022: 87.9 2021: 88.1 2020: 89.0 2019: 88.0 2018: 86.8	Average weekly wage: 2022: 78.4 2021: 79.2 2020: 80.1 2019: 79.5 2018: 76.9

18.4 ATTRACTIVENESS OF SECTOR AS A PLACE TO WORK

Availability of labour is the food and beverage manufacturing sector's top challenge as it relates to the most significant business impact.[6] Selected metrics are proxies for how the agri-food sector exposes young people to

6 Availability of labour represents "an extreme or somewhat of a challenge" for 61% of food and beverage manufacturers in Canada and the leading concern among a host of issues. *Labour Market Information Survey, 2020*, Food Processing Skills Canada, page 16.

consider agriculture and the food industry/food services as places to work. As well, metrics represent how the sector attracts, retains, and treats people who work in the sector or how employers and business owners enable people to pursue fulfilling careers and work experiences. While the availability of post-secondary education can be an issue for certain geographies across the country, this metric identifies enrollment as a leading metric. Wages paid are also an indicator of attractiveness. The provided metrics are for food manufacturing, as a proxy, although data is also available for other levels of the supply chain.

INSTITUTIONAL EDUCATION AND TRAINING

A diversity of institutions across the country offer a broad variety of programs to educate, train, mentor and offer apprenticeships.[7] Tracking type, availability and enrollment signals the extent to which the processing and food retail and food services sectors can meet the needs of the marketplace and cater to the career aspirations of Canadians. On-the-job training and continuous learning are an important part of enabling opportunities for people and supporting decent work; however, this is difficult to accurately measure and not included here.

18.4.1 Exposing young students to agriculture

Description	Source	Result: Website views
Agriculture in the classroom engagement annually.	Annual reports, Agriculture in the Classroom Canada	2020-21: 89,082 2018-19: 40,024

18.4.2 Engaging youth and young farmers

Description	Source	Result: Members and demographic breakdowns		
4-H participation.	Annual reports, 4-H Canada	2021-22	16,082 members	39.2% female, 58.4% male 89.1% farm/rural, 10.9% urban
		2020-21	16,985 members	56.0% female, 43.6% male 87.6% farm/rural, 12.4% urban
		2019-20	23,431 members	58.3% female, 39.5% male 84.0% farm/rural, 16.0% urban
		2018-19	24,079 members	60.1% female, 39.7% male 83.0% farm/rural, 17.0% urban
		2017-18	24,728 members	60.3% female, 39.7% male 83.0% farm/rural, 17.0% urban

18.4.3 Institutional education and training

Description	Source	Result: Enrolments
Agriculture, agriculture operations and related sciences. Statistics Canada data set includes food science, but not veterinary medicine.	Post secondary enrolments, by detailed field of study and International Standard Classification of Education, Statistics Canada	2020/21: 12,108 2019/20: 12,351 2018/19: 12,291 2017/18: 12,003 2016/17: 11,445

7 Some 27% of colleges and other institutes offer programs for the culinary arts; 17% of institutions, including universities, offer food sciences and technology programs, including bio-processing; and, baking/pastry and nutrition programs are available at some 11% and 13% of institutions, respectively. *At the Crossroads to Greatness: Key Insights and Labour Market Research About Canada's Food and Beverage Processing Industry*, Food Processing Skills Canada, 2021, page 130.

18.4.4 Wages paid – food manufacturing

Description	Source	Result - $ current
Average wages paid, weekly for food manufacturing employees, including overtime.	Average weekly earnings by industry, annual, Statistics Canada	2021: 951.30 2020: 978.82 2019: 911.36 2018: 858.08 2017: 863.40

GAPS AND OBSERVATIONS

- **Workplace safety metrics:** Occupational health and safety is governed in Canada by both the federal government and provincial governments, with the Government of Canada having jurisdiction only over federally regulated industries. Both farms and processing facilities fall mainly within the jurisdiction of provinces and there is no aggregated data currently available for either farm level or food/feed/bioproducts manufacturing facilities.

- **Underrepresented groups:** The following two metrics could provide information as to the inclusiveness of the agri-food sector: women in senior management positions/owners within processing /food retail sectors and underrepresented groups on sector association boards. These metrics would need to be developed.

- **Mental health metrics:** Overall, health metrics are challenging to obtain. Mental health metrics for self-employed farmers (as most farmers are) are challenging to obtain.

Applicable U.N. Sustainable Development Goal (SDG): 5.5, 8.5, 8.8

Appendix | GLOBAL CONTEXT

The following section considers how Canada's choice of Index indicators and metrics align with a selection six leading global sustainability standards and indices.[8] While not intended to be comprehensive, the review highlights key differences and similarities as context for Canada's approach.

Overview of how this topic is typically addressed in the selected global standards:

- Standards include a wide range of social topics that affect decent work including child labour; forced/bonded labour; fair wages; grievance mechanisms; living/minimum wage; hours worked; collective bargaining; freedom of association; land rights; Free, Prior and Informed Consent; impacts to local communities; preventing discrimination; fair and transparent payment policies.
- Standards place a heavy emphasis on ensuring that there are strong policies and procedures in place to identify, disclose, and mitigate social-related risks.
- With respect to mental health, only one standard (SAFA) outlines that enterprises should have policies in place to ensure worker, producer, and their families have "the right to quality of life", that to "live free from oppression, in peace, security and mental and physical health."

8 The three selected standards are the Global Reporting Initiative (GRI), with a particular focus on chapter 13 on Agriculture, Aquaculture and Fishing, the benchmarking methodology developed by the World Benchmarking Alliance (WBA), and the Sustainability Assessment of Food and Agriculture systems (SAFA) from the FAO. Together, these three standards cover an extensive list of topics related to agri-food sustainability based on which organizations can assess and/or report their performance. The three indices are the Environmental Performance Index (EPI) from the Yale Center for Environmental Law & Policy, the Sustainability Food Index (SFI) from *The Economist*, and the United Nations' Sustainable Development Report (SDR).

- Standards encourage local Indigenous communities to be considered in terms of assessing the impact of business activities and ensuring Indigenous rights are respected.
- Workplace health and safety is typically assessed as the number and rate of accidents, illness, and fatalities. Standards also identify potential health and safety risks to workers including vulnerable workers, implementing health and safety management systems, and providing training/promotion of worker health and safety as well as access to medical care.
- Diversity is considered with respect to gender, age, race, ethnicity, and other potential factors such as sexual orientation or disability. Companies should disclose their employment rates (percentage of workforce) based on diversity metrics. Companies should set targets for improvement. WBA recommends a minimum target of 30% women on their highest governance body as a target, and GRI requires a disclosure of the ratio of salaries and remuneration between women and men. SAFA urges companies to measure any discriminatory practices facing women within their respective organizations but does not specify how this should be measured. It also requires support for vulnerable groups.

Overview of how this topic is typically addressed in the selected global indices:

- The indices reviewed cover relatively fewer social indicators than global standards. For example, EPI only covers environmental topics and does not include social factors.
- Social topics covered by indices are relatively consistent, notably about working conditions, diversity, and rights (e.g., to land ownership). However, the indices differ on the metrics they use to represent these topics. One index (FSI) considers metrics such as the percentage of female agricultural landowners in a country, the average age of farmers, and the percentage of youth in farming. Conversely, the UNSDGs cover the same topics using metrics including the proportion of women in managerial positions, unemployment rates by sex, age, and disability, and the number of workplace injuries per 100,000 workers by sex and migrant status.
- A range of other topics are presented by indices including, mental health (represented by suicide mortality rate), wages, freedom of association and collective bargaining, and protection of smallholder farmers' land ownership.

Indicator 19 | Food security

INTRODUCTION

A sustainable food system is about ensuring food security.[1] Improving food security involves social, health, education and economic policy and includes working with Indigenous Peoples and responding to the needs of vulnerable populations. Enabling reliable supply and access to safe and nutritious food is directly relevant to the agri-food sector's role.

While a significant majority of Canada's population has access to and a broad choice of safe, quality, and nutritious foods, the country does face food insecurity challenges. Food insecurity is worse for northern and remote communities and Indigenous Peoples are particularly vulnerable.[2] One in nine Canadians are food insecure.[3] Addressing this is very complex. It involves a breadth of social, health, education, consumer protection and economic policies across various levels of government and it has implications for agriculture and food sector policy.

The terms *household food insecurity* and *food security* are often used interchangeably but refer to different concepts, as described below.

- **Food insecurity:** The commonly reported statistic of the population prevalence of food insecurity is a measure of economic access. Health Canada and Statistics Canada define food insecurity as inadequate or insecure access to food due to financial constraints, otherwise known as income-related household food insecurity. Although the implementation of economic and social policy is beyond the purview of the agri-food sector, food insecurity is reported to acknowledge the importance of this matter to Canadian individuals and families, who are ultimately customers and consumers of food produced and sold here. Sector research underscores this connection. The number one and four issues, respectively, for Canadians are the cost of food (69%) and keeping healthy food affordable (56%)[4], with the related concern of inflation ranking second.

- **Food security:** The United Nations' Food and Agriculture Organization's (FAO's) food security definition is when "all people, at all times, have physical and economic access to sufficient, safe and nutritious food to meet their dietary needs and food preferences for an active and healthy life." This FAO definition includes four aspects: *stability* of the food system; supply-side *availability*; physical, social and economic *accessibility*; and the information and infrastructure to *utilize* food. The FAO recently added the *sustainability* of the food system and the capacity of individuals and groups to meaningfully participate in food system governance as food security pillars.[5]

1 *Sustainable food systems: Concept and framework*, FAO: https://www.fao.org/3/ca2079en/CA2079EN.pdf

2 *Food Counts: A pan-Canadian sustainable food systems report card*; *FLEdGE (Food: Locally Embedded, Globally Engaged)*, Centre for Sustainable Food Systems, Wilfred Laurier University, May 2017: https://fledgeresearch.ca; see archive; indicator 12; referencing Statistics Canada's Household Food Survey Module. First Nations, Métis and Inuit peoples are experiencing greater food insecurity than the population as a whole.

3 Table 13-10-0835-01: Food insecurity by selected demographic characteristics, Statistics Canada, 2021; https://www150.statcan.gc.ca/t1/tbl1/en/tv.action?pid=1310083501

4 Canadian Centre for Food Integrity, 2022, *Public Trust Research*.

5 Statistics Canada's Household Food Survey Module does not measure these aspects of food security.

- **Sustainable food:** It is acknowledged that there is a global dialogue about what is a "healthy and sustainable diet."[6] This Index as a whole is intended to portray the overall sustainability of the Canadian agri-food sector, and its progress to make improvements, including this indicator's proxies of food security. This Index does not prescribe or track specific diets nor distinguish between the proteins.[7]

- **Consumption:** Relatedly, a host of issues are determined to be beyond the purview of the sector's control and are not deemed to be in scope for this Index, such as food bank use, food consumption volumes of different foods, nutrient deficiencies in the Canadian diet, and so on. These important matters are more relevant to social, health and incomes safety net policy considerations.

Key differences and similarities with global sustainability standards and indices

The Index is mostly in alignment with FSI's indicator for a healthy and sustainable diet and with the evaluated standards and indices in terms of the emphasis on vulnerable groups. The Index does have a greater focus on food sovereignty and Indigenous well-being than most other evaluated standards and indices and a clearer breakdown of affected demographics. The Index also includes tracking the incomes of temporary foreign workers which can be seen as a measure of access to food.

RESULTS

19.1 FOOD INSECURITY

A. FOOD PRICE CHANGES

Affordability affects people and populations differently. The consumer price index reports on changes in food prices.

19.1.1 Food price changes

Description	Source	Result: Index value compared to 2002 at 100
Calculated consumer price index for food purchased from stores and restaurants, weighted by types of purchases.	Consumer Price Index for food, Statistics Canada	2022: 169.0 2021: 155.4 2020: 154.0 2019: 149.0 2018: 144.8

6 In some jurisdictions there is an effort to track the sales of plant-based proteins as a proxy for encouraging healthy/sustainable diets The UK Farm Foundation tracks the sale of plant-based proteins, for instance, and describes this metric as a "new sales-based reporting requirement". UK Farm Foundation: *Exploring the practicalities of benchmarking food industries in different countries and contexts, Discussion Paper.*

7 The vision statement for the Economic Table Report for Agri-Food expressed the importance of "proteins" generally: "By 2025, Canada will be one of the top five competitors in the agri-food sector, recognized as the most trusted, competitive and reliable supplier of safe, sustainable, high-quality agri-food products and an innovator in value-added products to feed the dynamic global consumer. We will have a leading digital and technology-based supply chain and stand out as the world's favoured protein provider." https://www.ic.gc.ca/eic/site/098.nsf/eng/00022.html

B. FOOD INSECURE HOUSEHOLDS

The United Nations SDG 2.1 seeks to end hunger and ensure food access by all people year-round, particularly poor and vulnerable people. Statistics Canada marks progress on this priority by assessing the prevalence of moderate or severe household food insecurity, including by gender, age, First Nations, Métis, Inuit identity and visible minorities.[8]

19.1.2 Food insecurity

Description	Source	Result: Percent of population	
Percentage of population that are moderately or severely food insecure.	Food insecurity by age group and sex, Statistics Canada	Total:	2020: 11.2 2018: 10.8 2017: 11.6
		By gender:	2020: M: 10.8 F: 11.5 2019: M: 10.6 F: 11.0 2018: M: 11.7 F: 11.6
		By age: children (under 18)	2020: 13.6 2019: 13.3 2018: 14.1
		By age: Seniors (65 and over)	2020: 5.7 2019: 5.1 2018: 5.0
	Health indicators, by Aboriginal identity, four-year period estimates, Statistics Canada	First Nations, Métis and Inuit total:	2007 to 2014: 7.1
	Health indicators by groups designated as visible minorities and selected demographic characteristics, 2019-2020, Statistics Canada	Visible minorities:	2020: 9.9 2019: 9.3

19.2 INCREASING ACCESS

A. NUTRITION NORTH CANADA

From a geographic perspective, Canadians who live in remote locations, particularly in northern Canada, have a much higher cost of food, because of transportation costs from the food source to the northern consumer. Nutrition North Canada is a federal subsidy program to enables access to food in Canada's North by providing assistance to lower the costs to northern residents. Assessments are undertaken to improve access to perishable nutritious food, its affordability (based on price trends of a Northern Food Basket) and assesses whether there is compliance to ensure the full subsidy is being passed on to the consumer.[9]

19.2.1 Support for food access in northern Canada

Description	Source	Result: Million $
Expenditures on the Nutrition North Program.	Departmental Plans and Results for Crown-Indigenous Relations and Northern Affairs Canada 2020-21, Food Insecurity in Northern Canada: An Overview, Library of Parliament	2020-21: 152.9 2018-19: 86.5 2017-18: 78.8 2016-17: 75.3

8 The Government of Canada reports food insecurity prevalence using the Household Food Insecurity Survey Module (HFSSM).
9 https://www.nutritionnorthcanada.gc.ca/eng/1415647255632/1415647437113

B. FOOD STRATEGIES

Given the inter-connectedness of food security issues (e.g., spanning many policy areas including, social, health, education and economic), a general indicator of Canada's response is to track the availability of "food strategies" across federal, provincial, municipal, First Nations, Métis and Inuit jurisdictions. These strategies can include improving access to nutritious foods and encouraging healthy eating habits, among many consumer-facing objectives.

Tracking the prevalence of food strategies by jurisdictions could be a proxy for assessing the degree to which holistic – or whole of government – approaches are being embraced to advance and remain current with changing food security priorities. This data series could updated and expanded to include federal, provincial and First Nations, Métis and Inuit governments.

19.2.2 Government food strategies

Description	Source	Result: Number
Number of local and regional municipalities are working to improve the food system, using a mix of municipal policies, programs and civil-society interventions.	*Municipal food policy entrepreneurs: A preliminary analysis of how Canadian cities and regional districts are involved in food system change, 2013*, Toronto Food Policy Council, Vancouver Food Policy Council and the Canadian Agri-Food Policy Institute	2013: 64

GAPS AND OBSERVATIONS

INDIGENOUS WELL-BEING

At the heart of the goals for Indigenous self-determination, nation-building, and sovereignty is the premise that Indigenous People want to attain a quality of life and prosperity in alignment with their own cultural outlooks and values. This holistic thinking is shaped and interpreted by Indigenous philosophies about the environment, the land, and inter-relationships and this can vary among communities. The identified proposed metrics are foundational to enable Indigenous People to better measure their relative performance in the sector and enable their progress to improve well-being. However, adequate data does not exist to measure these priorities.

- **Food sovereignty or food security strategies:** Number of communities or regions that have developed or adopted food sovereignty and food security strategies. Such measurements could be used to track unique Indigenous participation in the performance of the sector.

- **Traditional connection with food:** Number of communities that are conducting archival, heritage, and other kinds of research about their past and historic connections with agriculture and food to rebuild those cultural connections with traditional foods and as a foundation to their incorporation into future agri-food economies.

[Note, the Environment Indicators report on the environmental sustainability of the food system and the Economic Indicators addresses how the sector is investing in new technologies and infrastructure that improves dependable supply.]

Applicable U.N. Sustainable Development Goal (SDG): 2.1

Appendix | GLOBAL CONTEXT

The following section considers how Canada's choice of Index indicators and metrics align with a selection six leading global sustainability standards and indices.[10] While not intended to be comprehensive, the review highlights key differences and similarities as context for Canada's approach.

Overview of how this topic is typically addressed in the selected global standards:

- Global standards address food security in different ways, but all emphasize improving access to healthy food. Addressing this matter involves broader policy and societal responses thus reflecting the complexity of this indicator.
    - GRI includes the importance of partnerships to address food security.
    - Both GRI and WBA link food loss and waste to food security and improving health outcomes (note, food loss and waste is addressed in Canada's Environment Indicators).
    - WBA presents targets to improve food and nutrition security. WBA links improving food outcomes for vulnerable groups to the importance of R&D, investment, and other strategies.
    - SAFA does not have an indicator for food security but speaks to the importance of agrobiodiversity to improve food security (e.g., encouraging locally adapted varieties and breeds). This also enables food sovereignty (e.g., tracking locally produced food using heirloom varieties, encouraging seed saving, and ensuring market access and expanding consumers' freedom to choose).

Overview of how this topic is typically addressed in the selected global indices:

- Global indices similarly address drivers of change to improve food security for vulnerable groups and notably on metrics elating to health and well-being.
- SDG 2 is about achieving "zero hunger" globally and focuses on malnutrition and undernutrition, as well as other health and well-being indicators.
- FSI does not directly address food security. It focuses on a host of largely social, health and economic policy determinants, such as food loss and waste, diet composition, affordability, health metrics, over-nourishment, life expectancy, micronutrient deficiency, and prevalence of malnourishment.

10 The three selected standards are the Global Reporting Initiative (GRI), with a particular focus on chapter 13 on Agriculture, Aquaculture and Fishing, the benchmarking methodology developed by the World Benchmarking Alliance (WBA), and the Sustainability Assessment of Food and Agriculture systems (SAFA) from the FAO. Together, these three standards cover an extensive list of topics related to agri-food sustainability based on which organizations can assess and/or report their performance. The three indices are the Environmental Performance Index (EPI) from the Yale Center for Environmental Law & Policy, the Sustainability Food Index (SFI) from *The Economist*, and the United Nations' Sustainable Development Report (SDR).

Indicator 20 | Animal care

INTRODUCTION

Ensuring humane care of farmed animals and management and leading husbandry practices is a shared social responsibility of producers, transporters, processors, and others involved in the food system. The World Organization for Animal Health (WOAH), of which Canada is a member, seeks "A world where the welfare of animals is respected, promoted and advanced, in ways that complement the pursuit of animal health, human well-being, socio-economic development and environmental sustainability."[1] The WOAH sets global standards for animal and farmed fish welfare. Animal care is also embraced as part of a holistic or *One Health* approach to managing the food system.[2] This indicator presents the Canadian agri-food sector's approach through the development of farmed animal responsible care codes.

Key differences and similarities with global sustainability standards and indices

The review of six leading global sustainability standards and indices shows that the Index is aligned with global practices by tracking the existence and enforcement of codes of practices to ensure animal care across sectors and value chains. A key difference is that the Index does not report on output-based metrics, such as the degree of farm animal coverage or livestock density (units per agricultural land area). That is, global standards typically track the percentage of farm animals that is covered by animal care requirements, whereas one global index considers livestock density as an animal welfare performance metric.

RESULTS

20.1 FARM ANIMAL CODES OF PRACTICE

Cruelty to animals, including farmed animals, is prohibited under the *Criminal Code of Canada*. As well, the Canadian Food Inspection Agency (CFIA) regulates the humane treatment of animals in federal abattoirs, and humane transport of animals into, within, and leaving Canada. To complement these legislative instruments, Canada's National Farm Animal Care Council (NFACC) was formed as a voluntary organization with a membership representative of livestock farm associations, livestock supply chain members, animal welfare organizations and veterinary associations as well as governments and research institutions. NFACC has overseen the development and maintenance of 14 codes of practice for farm animal care, covering major and minor farm animal species in the country. They have also developed a code for transportation, although the majority of farmed animal movement is governed under CFIA regulations.

These codes are based on the most current animal care science and are developed and regularly updated by stakeholders, including participation with animal care advocates, veterinarians, scientists, governments and industry. The code review process emphasizes a science-informed and consensus-based approach. The codes include many types of practices, such as density per unit space, housing systems, pain management, feed and water, and other aspects of animal care.

1 Animal welfare, WHOA: https://www.woah.org/en/what-we-do/animal-health-and-welfare/animal-welfare/

2 The FAO notes that improving animal nutrition and feed innovation and efficiency, use of advanced genetics, and adopting good land-use and grazing management and good housing practices can boost productivity, reduce environmental impacts and improve the care and welfare of farmed animals. As a result, the FAO points out that industrialized countries have reduced their overall land requirements for livestock by 20% while at the same time doubling the total meat production. FAO: https://www.fao.org/publications/card/fr/c/CA1201EN/

The codes address an array of assurance practices for on-farm assessments respective to each sector, including validating compliance. The implementation of the codes is managed by livestock associations, and the approach varies by industry. For some species, adherence to the animal care code is mandatory to access markets; for instance, a producer cannot sell chicken to a Canadian processor unless certified by the Chicken Farmers of Canada's *Animal Care Program*. Other organizations have integrated animal care provisions from the codes into their voluntary certification programs, such as the Canadian Roundtable for Sustainable Beef's *Certified Sustainable Beef Framework*; this includes third-party audited certification of participating beef operations. Provincial governments have jurisdiction over on-farm animal care and some reference the codes in their respective legislation.

20.1.1 Animal care codes of practice

Description	Source	Result: Farmed species with an NFACC code
The number and names of species with NFACC animal care codes.	National Farm Animal Care Council (NFACC)	14 codes for: • Beef cattle • Dairy cattle • Veal cattle • Pigs • Goats • Sheep • Chicken, turkey and breeders • Pullets and laying hens • Farmed deer • Farmed fox • Farmed mink • Farmed salmonoid • Rabbits • Equine 1 code for: • Transportation

[Good husbandry and veterinary care practices helps reduce inappropriate use of antimicrobials, addressed in the Food Integrity Indicators.]

Applicable U.N. Sustainable Development Goal (SDG): Farm animals are not explicitly included in the SDGs, but animal agriculture forms an implicit part of sustainable food production systems.

Appendix | GLOBAL CONTEXT

The following section considers how Canada's choice of Index indicators and metrics align with a selection six leading global sustainability standards and indices.[3] While not intended to be comprehensive, the review highlights key differences and similarities as context for Canada's approach.

Overview of how this topic is typically addressed in the selected global standards:

- "Animal care" and "animal health" are typically addressed together using various expressions interchangeably (e.g., animal care, animal welfare, humane practices).
- The topic of animal care is typically addressed from a "practice-based" standpoint, with a focus on the existence and implementation of animal welfare policies and/or husbandry protocols.
- Quantitative indicators can also be used to report the percentage of production volume that is certified/audited to third-party animal health and welfare standards.

Overview of how this topic is typically addressed in the selected global indices:

- Animal care is covered only in one of the three selected indices (FSI). In this case, the quality of animal welfare regulations as well as the livestock density (units per agricultural land area) are used as performance indicators. This approach is partly based on the Animal Protection Index (API), an index produced by World Animal Protection to rank countries around the globe according to their legislation and policy commitments to protecting animals, handles the matter.

3 The three selected standards are the Global Reporting Initiative (GRI), with a particular focus on chapter 13 on Agriculture, Aquaculture and Fishing, the benchmarking methodology developed by the World Benchmarking Alliance (WBA), and the Sustainability Assessment of Food and Agriculture systems (SAFA) from the FAO. Together, these three standards cover an extensive list of topics related to agri-food sustainability based on which organizations can assess and/or report their performance. The three indices are the Environmental Performance Index (EPI) from the Yale Center for Environmental Law & Policy, the Sustainability Food Index (SFI) from *The Economist*, and the United Nations' Sustainable Development Report (SDR).

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  Arrell Food Institute (University of Guelph), BMO, Canadian Agri-Food Policy Institute, Canadian Produce Marketing Association, Canadian Roundtable of Sustainable Beef, Chicken Farmers of Canada, CropLife Canada, Enterprise Machine Intelligence & Learning Initiative, Farm Credit Canada, Fisheries Council of Canada, Food and Beverage Manitoba, Fruit & Vegetable Growers of Canada, Genome Alberta, Global Institute for Food Security, Keystone Agricultural Producers, Manitoba Agriculture, Manitoba Forage and Grasslands Association, Maple Leaf Foods, Protein Industries Canada, Telus Agriculture, TrustBix Inc., Winfield United Canada

- Substantive in-kind support from all partners (see Appendix 1)

B. Steering group

Agriculture and Agri-Food Canada (*ex-officio*)
Canadian Federation of Agriculture
Canadian Roundtable for Sustainable Beef
Chicken Farmers of Canada
Global Institute for Food Security
Manitoba Agriculture
Ontario Ministry of Agriculture, Food and Rural Affairs
Protein Industries Canada
Pulse Canada
Statistics Canada (*ex-officio*)

C. Project management

David McInnes, Founder & National Coordinator, National Index on Agri-Food Performance; and Principal, DMci Strategies

Sharon Savoie, Financial Administrative Assistant

D. Consultant team

Project 2-B: Governance review
Karen Haugen-Kozyra, President, Viresco Solutions
Rebecca Johnson, Sustainability Specialist

Project 3-A: Sourcing the Index metrics & methodologies
Susie Miller, Executive Director, Canadian Roundtable for Sustainable Crops

Jean-Michel Couture, Partner & Senior Consultant, Groupe AGÉCO (Including for the "global context" analysis; for administrative purposes, this was part of project 4-A); the Groupe AGÉCO team also included:

- Bertrand Montel, Director Scientific Affairs
- Hugues Imbeault-Tétrault, Scientific Affairs Advisor
- Ryan Jonhson, PhD. Candidate, Analyst
- Simon Nadeau, Analyst

Laurette Dubé, Professor, Marketing; James McGill Chair of Consumer and Lifestyle Psychology and Marketing; Chair and Scientific Director, McGill Centre for the Convergence of Health, and Economics

Tirtha Dhar, Chair and Associate Professor; Chair, Department of Marketing and Consumer Studies, University of Guelph

Byomkesh Talukder, Post-Doctoral Fellow, Planetary, York University; Smart City and Food Systems, McGill Centre for the Convergence of Health, and Economics

E. Service provider team

Report & website design
Janice Van Eck

Reports & website update translation
Megalexis

Appendix 1 | List of partners, Phase 3

A&W Food Services of Canada Inc.
Agriculture & Agri-Food Canada
Agropur Dairy Cooperative
Alberta Agriculture & Irrigation
Albert Barley
Alberta Biodiversity Monitoring Institute, University of Alberta
Alberta Wheat Commission
Alltech
Animal Nutrition Association of Canada
Arrell Food Institute, University of Guelph
Association of Equipment Manufacturers
BASF Canada Inc.
Bayer Crop Science
BC Food & Beverage
Bioenterprise Canada
BMO
Bonnefield Financial Inc.
Botaneco
Canada Grains Council
Canada Organic Trade Association
Canadian Agri-Food Automation & Intelligence Network
Canadian Agri-Food Policy Institute
Canadian Agri-Food Sustainability Initiative
Canadian Agricultural Human Resource Council
Canadian Animal Health Institute
Canadian Aquaculture Industry Alliance
Canadian Canola Growers Association
Canadian Centre for Food Integrity
Canadian Federation of Agriculture
Canadian Food Innovation Network
Canadian Forage & Grasslands Association
Canadian Pork Council
Canadian Produce Marketing Association
Canadian Roundtable for Sustainable Beef
Canadian Roundtable for Sustainable Crops
Canadian Supply Chain Food Safety Coalition
Canadian Wildlife Federation
Catalyst Agri-Innovations Society
Cereals Canada
Chicken Farmers of Canada
Cleanfarms
Corteva
CropLife Canada
Dairy Farmers of Canada
Dairy Processors Association of Canada
Danone
Deans Council - Agriculture, Food & Veterinary Medicine
Deloitte
Dietitians of Canada
Ducks Unlimited Canada
EggTech Ltd.
Emerging Ag Inc.
Enterprise Machine Intelligence & Learning Initiative
Environment & Climate Change Canada
Export Development Canada
Farm & Food Care Saskatchewan
Farm Credit Canada
Farm Management Canada
Federated Co-operatives Limited
Fertilizer Canada
Field to Market Canada
Fisheries Council of Canada
Food & Beverage Atlantic
Food & Beverage Canada
Food & Beverage Manitoba
Food Banks of Canada
Food Processing Skills Canada
Fresh Hemp Foods Ltd
Food, Health & Consumer Products Canada
Fruit & Vegetable Growers of Canada
Gaia Protein

Genome Alberta
Global Food Lead
Global Institute for Food Security
Grain Growers of Canada
Grand Valley Fortifiers
Greenfield Global
Indigenous Works
Innovation, Science and Economic Development Canada
Keystone Agricultural Producers of Manitoba
Lassonde
Le Conseil de la transformation alimentaire du Québec
Loblaw Companies Ltd.
Manitoba Agriculture
Manitoba Forage & Grassland Association
Maple Leaf Foods
McGill University, Desautels Faculty of Management, Centre for Convergence of Health & Economics
Ministry of Agriculture, Fisheries and Food (Québec)
Ministry of Agriculture, Government of Saskatchewan
Mushrooms Canada
National Research Council Canada
National Zero Waste Council, an initiative of Metro Vancouver
New Brunswick Department of Agriculture, Aquaculture and Fisheries
Nova Scotia Department of Agriculture
Nutrien
Olds College (Alberta)
Ontario Cattle Feeders' Association & Ontario Corn-Fed Beef
Ontario Ministry of Agriculture, Food and Rural Affairs
Osler Hoskin & Harcourt LLP
Pet Food Association of Canada
Plant Nutrition Canada
Prince Edward Island Federation of Agriculture
Protein Industries Canada
Pulse Canada
Régénération Canada
Restaurants Canada
Retail Council of Canada
Roquette Canada Limited
Royal Bank of Canada
Saskatchewan Flax Development Commission Board
Saskatchewan Forage Seed Development Commission
Save-on-Foods LP (Pattison Food Group)
Second Harvest
Smart Cities (Guelph-Wellington)
Standards Council of Canada
Statistics Canada
Syngenta Canada
Team Alberta Crops
Telus Agriculture & Consumer Goods
The Semex Alliance
TheoryMesh
TrustBIX Inc.
United Farmers of Alberta Co-operative Ltd.
University of British Columbia
University of Ottawa
- Faculty of Health Sciences
- Smart Prosperity Initiative

University of Toronto
Vineland Research and Innovation Centre
Waterpoint Lane
Wine Growers of Canada
WinField United Canada

Appendix 2 | Global indices and standards considered in the pilot

The global sustainability landscape accounts for a large and growing number of schemes, including standards, indices, and certifications. Several of these were selected for assessment (see Table 2).

The work was carried out for each of the pilot's 20 indicators. This process led to a high-level description of how the topic is typically accounted for in global standards and indices, and to list noteworthy similarities and differences with the Index's content. The assessment also identified items that could require further consideration in subsequent Index work.

Table 2: List of selected reporting global standards and indices

SELECTED REPORTING STANDARDS		
World Benchmarking Alliance World Benchmarking Standards (WBA)	GRI Global Reporting Initiative (GRI)	SAFA Food and Agriculture Organisation (FAO)'s Sustainability Assessment of Food and Agriculture systems (SAFA)
SELECTED GLOBAL INDICES		
EPI Environmental Performance Index Environmental Performance Index (EPI)	SUSTAINABLE DEVELOPMENT REPORT United Nations' Sustainable Development Report (SDR)	ECONOMIST IMPACT Sustainability Food Index (SFI)

Reporting standards offer a framework for organizations to disclose both positive and negative impacts.

Three reporting standards were taken into consideration in the assessment

Reporting standards offer a framework for organizations to disclose both positive and negative impacts on the environment, society, and the economy. They are widely used by agri-food organizations globally. The selected standards are for the most part practice-based (as opposed to outcome-based) and designed to score individual producers and food companies (as opposed to provide consolidated results); each are globally influential in defining best practices with respect to sustainability disclosure.

- **The Global Reporting Initiative (GRI)**: Content was drawn for the most part from GRI's chapter 13 on Agriculture, Aquaculture and Fishing standard.[1] Its work is part of the global harmonization process taking place globally with respect to sustainability reporting, in conjunction with the development of the development of the

1 https://www.globalreporting.org/standards/

International Sustainability Standards Board (ISSB).

- **The World Benchmarking Alliance (WBA)**:[2] Its benchmarking methodology benchmarks the sustainability performance of food and agricultural organizations globally. The methodology is informed and aligned with existing frameworks and reporting initiatives.

- **The Sustainability Assessment of Food and Agriculture systems (SAFA)**, the United Nations' (UN) Food and Agriculture Organisation (FAO):[3] It offers a holistic and comprehensive framework that encompasses all aspects of sustainable cropping, livestock husbandry, fisheries, aquaculture, and forestry production, postharvest, processing, distribution, and marketing.

Three global indices were considered in the review

Several global agri-food indices compile weightings of indicators and calculate performance ratings to compare the sustainability of companies, sectors, and countries. Their scope and methodology used to assess performance vary widely, depending on their intent.

Several global agri-food indices compile weightings of indicators and calculate performance ratings to compare the sustainability of companies, sectors, and countries.

- **The Environmental Performance Index (EPI), Yale Center for Environmental Law & Policy**:[4] This Index provides a data-driven summary of the state of sustainability around the world. Using 40 performance indicators across 11 issue categories, the EPI ranks 180 countries on climate change performance, environmental health, and ecosystem vitality.

- **The Sustainability Food Index (SFI), *The Economist***:[5] It examines how food systems are performing across three pillars: food loss and waste, sustainable agriculture, and nutritional challenges. Its 38 indicators and 95 sub-indicators address societal, environmental, and economic themes in 78 countries.

- **The United Nations' Sustainable Development Report (SDR), formerly the SDG Index & Dashboards**:[6] It is a global assessment of countries' overall progress towards achieving the Sustainable Development Goals. (This index is not specific to the agri-food sector.)

Additionally, several theme-specific standards and indices were considered for some of Canada's 20 Index indicators (see Table 3).

2 https://assets.worldbenchmarkingalliance.org/app/uploads/2021/02/Food-and-Agriculture-Benchmark-methodology-report.pdf
3 https://www.fao.org/nr/sustainability/sustainability-assessments-safa/en/
4 https://epi.yale.edu/#:~:text=About%20the%20EPI,environmental%20health%2C%20and%20ecosystem%20vitality
5 https://impact.economist.com/projects/foodsustainability/
6 https://dashboards.sdgindex.org/map

Table 3: Additional global schemes referenced

World Resource Institute (WRI), Aqueduct Water Risk Atlas	CDP	World Intellectual Property Organization (WIPO), Global Innovation Index (GII)	International Finance Corporation (IFC), Global Map of Supply Chain Risks in Agro-Commodity Production	ISO
Notre Dame Global Adaptation Initiative	SBTi	WWF Water Risk Filter	World Animal Protection	2021 AMR Preparedness Index

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