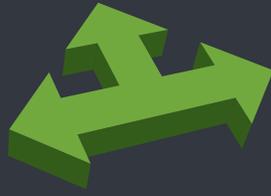


National Index on Agri-Food Performance



May 2022 | **Phase 2C Final Report** | Part 2

INDEX INDICATORS

Poised to Showcase Canada's Agriculture
and Food Sustainability Credentials

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National Index on Agri-Food Performance



About Phase 2C Final Report Publications

The final report of phase 2C (October 2021 to May 2022) of the National Index on Agri-Food Performance has four parts, separately published:

Part 1 | SYNTHESIS OF RESULTS

Key messages, synthesis of results, next steps and detailed acknowledgements of the funders, governance, partners, and people involved in this work.

Part 2 | INDEX INDICATORS

Process/methodology overview and details on Index indicators (Figure 1).

Part 3 | HIGHLIGHTS OF PROJECTS

Summaries of most projects; highlights of what is pertinent to inform the Index and future work.

Part 4 | RESEARCH PAPERS

Three papers on policy, consumer trust, and ESG (environment, social, governance) factors.

INVESTOR ACKNOWLEDGEMENTS



Protein Industries Canada's Capacity Building Program for Phase 2C (Oct 2021–May 2022).

All partners have contributed financial and/or in-kind support for the National Index initiative across each phase of work since 2020.



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1. WHAT THE INDEX IS ABOUT

This report summarizes work undertaken from October 2021 to May 2022 to develop Canada’s first agri-food sustainability index, the proposed National Index on Agri-Food Performance (the “Index”).¹

PARTNERS

The Index is the outcome of a private–public partnership, now counting some 86 partners, including agri-food associations, companies, social, environmental and Indigenous NGOs, academia, innovation organizations, financial institutions, federal and provincial governments, and municipal initiatives, among others. (See acknowledgements for the list of partners.)

TOP-LINE RESULT

The partners developed a list of draft indicators to measure sustainability performance from agricultural production to food retail. Its scope includes four sustainability blocks: Environment, Food Integrity (including food safety), Economic, and Societal Well-Being (see Figure 1). This part 2 of the final report on the phase elaborates on the process to select the measures and presents in detail the proposed Index.



Figure 1. Four sustainability blocks of the proposed National Index on Agri-Food Performance

¹ The Index is currently conceptual and is being proposed by the partners. All references to “the Index” imply that it is a work-in-progress.

2. APPROACH AND METHODOLOGY

Developing the Index has involved a comprehensive step-by-step approach as explained below.²

I. PROCESS OF WORK

DETAILING THE INDICATORS, SUB-INDICATORS AND METRICS

From October 2021–April 2022, four partner working groups were dedicated to developing the Index, devoting over 70 virtual working group sessions, alone, to do so. (Other partner working group meetings to manage all other work undertaken in this phase, some of which directly informed the Index, required an additional 80 virtual meetings.³)

REVIEWING THE INDEX

During this phase, the draft Index was externally reviewed by Canadian academia and global organizations. This prompted some changes to indicators and metrics and this informed the approach to governance and communications. (A summary of that input is included in part 3 of this final report; see commentaries on projects 1E and 3B.)

SETTING UP THE PILOT

The work of this current phase is expected to enable an Index pilot in 2022–2023, the commencement of phase 3.

II. TEN PRINCIPLES FOR INDEX DEVELOPMENT

The following principles and guidance were developed by the partners to inform Index work.⁴

- 1. Urgency:** Canadian food system players are driven to develop this Index and align to meet global goals (e.g., UN SDGs).
- 2. Collaborative:** Partners representing the food system work pre-competitively to develop consolidated measures of sustainability.
- 3. Shared understanding of sustainability:** Economic sustainability (viability) of farms and companies is linked to environmental/social sustainability which is also informed by the ESG (environmental, social, governance) factors.
- 4. Relevance:** Indicators reflect Canada’s agricultural and food context and are globally relevant.
- 5. Credible measures:** Indicators emphasize being outcomes-focused; some practice-based results may be required to fill data gaps.
- 6. Data & Index limitations:** Not everything can be measured. Index will not be prescriptive of actions of producers or companies, nor score or rank the sector. Does not measure consumer diet choices.
- 7. Materiality:** Index will be a “farm to retail”, not a “farm to fork” view. It will largely measure what is directly related to and in the control of production (all forms of agriculture, and fisheries/aquaculture), processing and food retailing, and bioproducts sectors. Measures intend to show meaningful results and progress.
- 8. Verifiable:** Index is third-party reviewed.
- 9. Reviewable:** Index will be updated to meet emerging needs, such as considering metrics disaggregation (e.g., by province, commodity).
- 10. Transparent:** Publish Index, methodologies and partner involvement.

² Does not include work undertaken in previous phases 1 to 2B, 2020–2021.

³ Includes steering and all-partner meetings. Does not include stakeholder outreach meetings or individual partner dialogues.

⁴ Sourced from this project’s reports, *Benchmarking Canada’s Agri-Food Leadership* (pp. 9, 12, 17, 20–23), *The Business Case for Establishing Canada’s National Index on Agri-Food Performance* (pp. 4, 7, 10, 24, 26, 29), and from partner guidance on the development of draft indicators (unpublished).

III. SELECTING THE INDICATORS AND SUB-INDICATORS

Partners considered in depth the importance, relevance and materiality of each proposed indicator, sub-indicator and appropriate metric (see Figure 2).

The four partner working groups dedicated to developing this Index content for each of the four sustainability blocks basically considered these questions, explicitly or implicitly, in their discussions.

IV. SELECTING METRICS

Considering the availability and adequacy of metrics essentially was a process of deciding on the national metrics we have and the metrics we need and the gaps. (An assessment of key data issues and opportunities is found in part 3 of this final report; see the commentary on project 1.)

While some data sources were identified in this phase, the preparation of the final basket of metrics, and the complete list of sources, will be undertaken in the next phase. Therefore, the initial list of proposed Index metrics (referenced in section 3) is not necessarily complete.

IMPORTANCE of indicator	RELEVANCE of indicator	MATERIALITY of indicator
1. Does it align with global sustainability goals?	1. Is it applicable across sector (or to sub-sectors)?	1. Is the selected indicator pertinent?
2. Does it show progress made to date & areas to improve?	2. Is it suitable for Canada's agri-food context?	2. Is evidence available to support it and its metrics?
3. Does it meet consumer or regulatory needs / expectations?	3. Is it "within the control of" the sector?	3. Is a proxy required instead?
4. Does it meet marketplace needs / expectations?	4. Is it outcome or practice-based?	4. Does it require a new metric?

Figure 2: Considerations for selecting metrics for each sub-indicator

V. PRESENTING THE INDEX

The following section presents the complete list of proposed indicators, sub-indicators, and metrics for each of the four sustainability blocks, starting with a summary of all indicators and sub-indicators (Figure 3). Then, each block, starting with the environment, is introduced by a preamble and footnotes provide references and other details. As well, each indicator starts with a commentary and explanatory notes elaborate on the sub-indicators. Overall, this Index material is intended to be a work in progress.

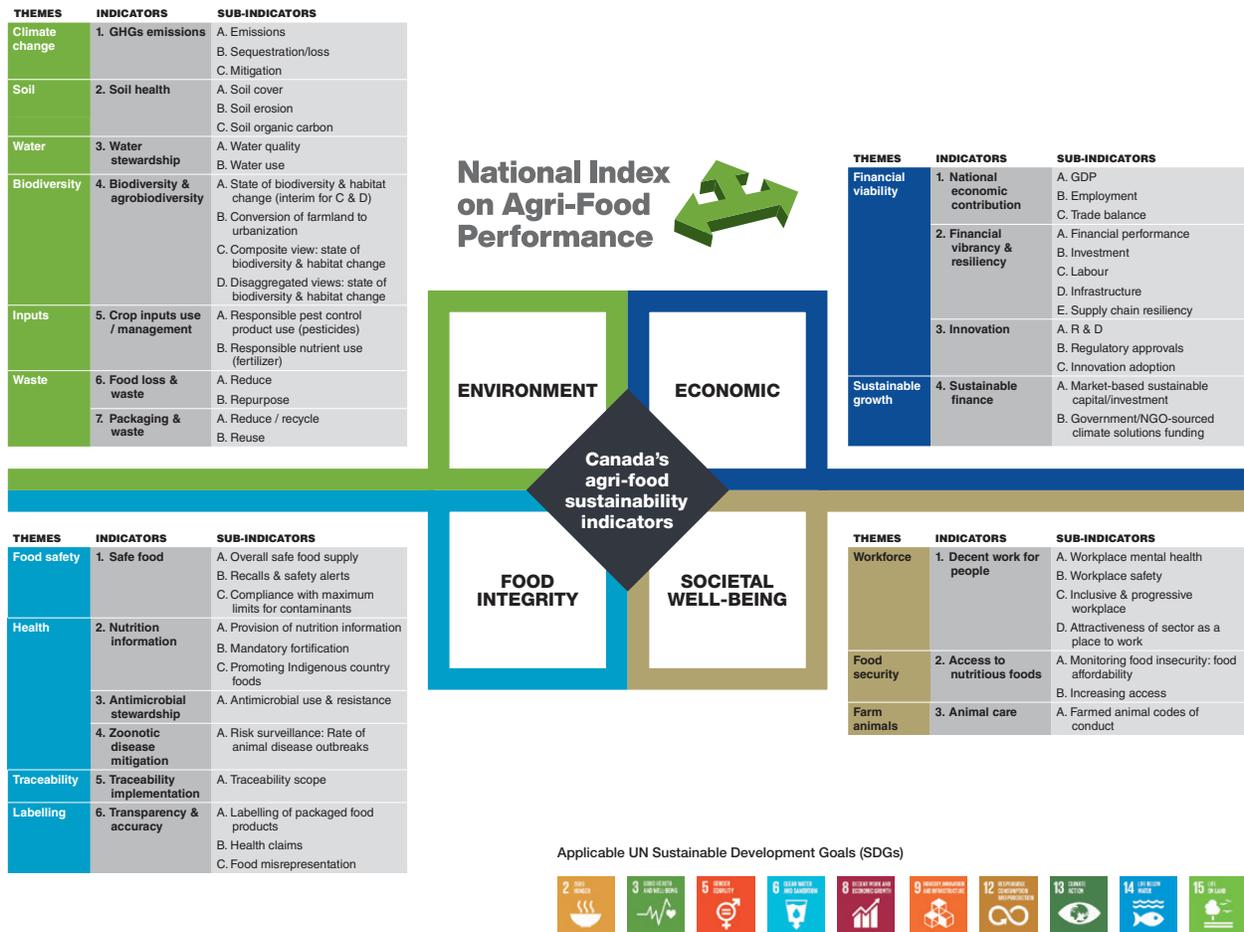


Figure 3. Summary of indicators & sub-indicators

3. THE PROPOSED NATIONAL INDEX ON AGRI-FOOD PERFORMANCE

I. ENVIRONMENT INDICATORS

A. About

There is a global call to urgently transform how food is produced.⁵ With global biodiversity “declining faster than at any time in human history” global agriculture and food is in the spotlight. The global food system is responsible for some 34% of greenhouse gas emissions,⁶ 80% of deforestation and 70% of freshwater use,⁷ among other impacts. Here and abroad, agri-food is increasingly expected to account for its impacts.⁸ Canada’s agriculture has a positive story to tell.⁹

Canada is the world’s fifth largest food exporter. Crop and livestock production contributes some 10% of Canada’s overall GHG emissions¹⁰ and the sector is responsible for 8% of the country’s water abstractions with only some 5% of land devoted to production.¹¹ Canada is a GHG-efficient producer of animal protein¹² and has been a leading adopter

of no-till agriculture, practices that bode well for a world increasingly measuring low-carbon food production and scrutinizing the pace of change. Showing Canada’s agriculture and food journey to deliver greater climate and environmental solutions and where more progress can be made is a key intent of this work.¹³

Proof of sustainability outcomes is required. It is needed to meet regulatory requirements, access certain global markets, deliver on national and global goals, and to respond to consumer expectations. (In 2021, most Canadians (53%) report to be “very concerned” about climate change, a tracking high.¹⁴) It is required to comply with corporate sustainable sourcing commitments. Demonstrating performance is becoming important to access favourable credit terms and

⁵ The landmark 2020 Intergovernmental Science-Policy Platform on Biodiversity and Ecosystem Services (IPBES) report documented the unprecedented decline of nature, declaring that “transformative changes [are] needed to restore and protect nature”. *Global Assessment Report on Biodiversity & Ecosystem Services*: <https://www.un.org/sustainabledevelopment/blog/2019/05/nature-decline-unprecedented-report/>

⁶ It is estimated that agriculture by itself amounts to 13.5% of total anthropogenic emissions; agriculture plus land use emissions is 24% of the total with the balance of food system related emissions accounting for the other 10%. Crippa, M., Solazzo, E., Guizzardi, D. et al. Food systems are responsible for a third of global anthropogenic GHG emissions. *Nat Food* 2, 198–209 (2021). <https://doi.org/10.1038/s43016-021-00225-9>; <https://www.nature.com/articles/s43016-021-00225-9>

⁷ Global agriculture uses some 50% of habitable land use and some 70% of freshwater use. *The State of Food Security and Nutrition in the World, 2020*, FAO: <http://www.fao.org/3/ca9692en/CA9692EN.pdf>; Water at a Glance, FAO: <https://www.fao.org/3/ap505e/ap505e.pdf>

⁸ Refer to target 7: “Improving biodiversity on agricultural lands is key to sustaining natural systems...” in *2020 Biodiversity Goals and Targets for Canada, Sixth National Report to the Convention on Biological Diversity*: <https://www.canada.ca/en/environment-climate-change/services/biodiversity.html>.

⁹ See “Canada’s federal, provincial and territorial Ministers of Agriculture set the direction for the next agricultural framework,” News Release, November 2021: <https://www.canada.ca/en/agriculture-agri-food/news/2021/11/canadas-federal-provincial-and-territorial-ministers-of-agriculture-set-the-direction-for-the-next-agricultural-framework.html>

¹⁰ <https://agriculture.canada.ca/en/agriculture-and-environment/climate-change-and-air-quality/greenhouse-gases-and-agriculture>

¹¹ Land use: *Study: Accounting for ecosystem change*, January 25, 2022, Statistics Canada catalogue no. 11-001-X; Water use in Canada, OECD: <https://www.oecd.org/agriculture/topics/water-and-agriculture/documents/oecd-water-policies-country-note-canada.pdf>

¹² *Clean Growth in Agriculture*, March 2019, Canadian Agri-Food Policy Institute: https://capi-icpa.ca/wp-content/uploads/2019/03/2019-03-22-CAPI-CEF-Final-Report_WEB-1.pdf, page 20. For beef: Beauchemin, K.A., Janzen, H.H., McAllister, T.A., & McGinn, S.M. (2011). “Mitigation of greenhouse gas emissions from beef production in western Canada – Evaluation using farm-based life cycle assessment,” *Animal Feed Science and Technology*, 166–167, pp. 663–677. doi : 10.1016/j.anifeedsci.2011.04.047; Canadian Roundtable for Sustainable Beef. (2016). *National Beef Sustainability Assessment – Environmental and Social Life Cycle Assessments*. Calgary, AB: Deloitte. https://crsb.ca/wp-content/uploads/2021/12/Assessment-and-Strategy_summary_report_2016.pdf

¹³ <https://www.canada.ca/en/agriculture-agri-food/news/2021/03/backgrounder-agricultural-climate-solutions.html>

¹⁴ Results are up a significant 6% in 2021 over 2020. This ranks as the 3rd issue of concern overall. The number 1 and 2 issues for Canadians are the cost of food (61%) and keeping healthy food affordable (55%); Canadian Centre for Food Integrity public trust research, 2021.

attract investment. Various countries are also positioning their respective food systems as being “the most sustainable”¹⁵ and “climate-smart.”¹⁶ Backing up claims is a competitiveness issue and necessary for credibility.

The following indicators portray environmental sustainability for agricultural production, processing, and food retail (and some perspectives on fisheries, seafood, and aquaculture). This Index also needs to be inspired by the view of sustainability offered by Indigenous peoples. The Royal Commission on Aboriginal Peoples reflected on the special relationship of Indigenous peoples to the land, a relationship that is at once “...both spiritual and material, not only one of livelihood, but of community and indeed of the continuity of their cultures and societies.”¹⁷ Land is not understood exclusively as an economic commodity or an economic asset, but it is also considered a critical part of the expression of Indigenous nationhood, identity, and culture. How Canada stewards sustainability is essential to its identity and to its future well-being and prosperity.

While the availability of quality data and evidence is an issue for a number of proposed indicators,¹⁸ this Index presents what is currently available and needs to be developed. Canada’s trusted food value proposition – including its environmental sustainability leadership – will depend on how well its agri-food sector marks progress on a widening list of environmental matters.

¹⁵ Example: The EU sees European food becoming “the global standard for sustainability” and it intends to use trade policy to shape sustainability responses and standards abroad. *An EU Green Deal for Trade Policy and the Environment*, Institute for European Environmental Policy, February 6, 2020: <https://ieep.eu/publications/an-eu-green-deal-for-trade-policy-and-the-environment>

¹⁶ See reference to climate-smart agriculture: U.S. Executive Order 14008, Jan. 27, 2021: <https://www.whitehouse.gov/briefing-room/presidential-actions/2021/01/27/executive-order-on-tackling-the-climate-crisis-at-home-and-abroad/>

¹⁷ *Royal Commission on Aboriginal Peoples*, Volume 2, Part 2, p. 438.

¹⁸ This Environment document elaborates on the data gaps and opportunities to develop better metrics. It also recognizes what currently exists, such as Agriculture and Agri-Food Canada’s *Environmental Sustainability of Canadian Agriculture: Agri-Environmental Indicator Report Series – Report #4*. <https://agriculture.canada.ca/en/agriculture-and-environment/agri-environmental-indicators/environmental-sustainability-canadian-agriculture-agri-environmental-indicator-report-series-report>

THEMES	INDICATORS	SUB-INDICATORS
Climate change	1. GHGs emissions	A. Emissions B. Sequestration/loss C. Mitigation
Soil	2. Soil health	A. Soil cover B. Soil erosion C. Soil organic carbon
Water	3. Water stewardship	A. Water quality B. Water use
Biodiversity	4. Biodiversity & agrobiodiversity	A. State of biodiversity & habitat change (interim for C & D) B. Conversion of farmland to urbanization C. Composite view: state of biodiversity & habitat change D. Disaggregated views: state of biodiversity & habitat change
Inputs	5. Crop inputs use / management	A. Responsible pest control product use (pesticides) B. Responsible nutrient use (fertilizer)
Waste	6. Food loss & waste	A. Reduce B. Repurpose
	7. Packaging & waste	A. Reduce / recycle B. Reuse

Figure 4: Environment Indicators summary, Phase 2C

B. Environment themes, indicators, sub-indicators & metrics

THEME | CLIMATE CHANGE

INDICATOR 1 | GHGs emissions

With the global focus on climate change, tracking the food system's contribution to national greenhouse gases (GHGs) and its role in reducing these and improving environmental impacts is a significant gauge of environmental performance.

SUB-INDICATORS (and sub-indicator metrics)

A. Emissions

- a. Agri-food sector greenhouse gases (GHGs)
 - i. Total for sector
 - ii. As a percentage (%) of national total GHGs
- b. Disaggregated views of agri-food
 - i. Total distribution, processing, retail GHGs
 - ii. Total production agriculture GHGs
 - I. Absolute – sources
 1. Carbon dioxide (CO₂)
 2. Methane (CH₄)
 3. Nitrous oxide (N₂O)
 - II. Absolute – contributors
 1. Animal agriculture
 2. Crops
 3. All other agriculture
 4. Aquaculture & fisheries
 - III. Intensity – contributors
 1. Animal agriculture
 2. Crops
 3. All other agriculture
 4. Aquaculture
 5. Nitrogen-use efficiency

B. Sequestration/loss

- a. Soil organic carbon change

C. Mitigation

- a. Overall (sector-wide) ratio of energy use: fossil fuels vs. renewable sources
- b. By sub-sector:
 - i. Production
 - ii. Distribution
 - iii. Processing
 - iv. Retailing

CONTEXT

The UN campaign *Race to Zero* (involving some 120 countries, including Canada, and thousands of companies and others) is a global effort to speed adoption of net-zero carbon commitments.¹⁹ Canada has set a target to reduce its greenhouse gas (GHG) emissions by 40–45% by 2030 (baseline 2005) and achieve net-zero emissions by 2050.²⁰ Canada is also a signatory of the *Global Methane Pledge* to reduce global methane emissions by almost one third by 2030.²¹ Moreover, Canada has set a goal to reduce nitrous oxide emissions from fertilizer by 30% below 2020 levels through 2030.²²

By considering emissions, sequestration, and mitigation, this indicator presents a holistic and balanced picture of climate change impacts by measuring greenhouse gas (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 limiting. There is interest in such measures by food companies because most environmental impacts and exposures are to be found in their supply chains.”²³

¹⁹ *Race to Zero*: https://go2.bio.org/NDkwLUViWi05OTkAAAF_HJ0h1GcoQSMpDj5B3jtHLBhTEyxDaomGRfP5cMwtE8glbTFGYUYK5-ffZW1jqpcWYftwA=

²⁰ “Government of Canada confirms ambitious new greenhouse gas emissions reduction target,” Press Release, July 12, 2021: <https://www.canada.ca/en/environment-climate-change/news/2021/07/government-of-canada-confirms-ambitious-new-greenhouse-gas-emissions-reduction-target.html>

²¹ Joint EU-US Press Release on the Global Methane Pledge, September 18, 2021: https://ec.europa.eu/commission/presscorner/detail/en/IP_21_4785

²² *A Healthy Environment and a Healthy Economy*, Environment and Climate Change Canada, December 2020, page 45

²³ Scope 3 emissions are those occurring in company supply chains both up- and downstream and make up an average of 89% of food and beverage companies’ total emissions; *Smarter metrics in climate change and agriculture*, WBCSD, March 2020: <https://www.wbcsd.org/Programs/Food-and-Nature/Food-Land-Use/Scaling-Positive-Agriculture/Resources/Smarter-metrics-for-climate-change-and-agriculture-Business-guidance-for-target-setting-across-productivity-resilience-and-mitigation>. See also *CDP Supply Chain: Changing the Chain*, CDP Supply Chain Report 2019/20; https://cdn.cdp.net/cdp-production/cms/reports/documents/000/004/811/original/CDP_Supply_Chain_Report_Changing_the_Chain.pdf?1575882630

Considerable global attention is devoted to whether agricultural soils are carbon sinks or sources. If the rate of carbon input exceeds the rate of loss, carbon accumulates. Carbon is depleted if the rate of carbon added is less than the rate of the loss and soil becomes a carbon source. Sequestering carbon improves soil productivity and removes carbon dioxide from the atmosphere. A major milestone was reached in 2000: “for the first time in Canada’s history, agricultural soils sequestered more carbon than was emitted”, notes Agriculture and Agri-Food Canada.²⁴ This outcome was largely achieved by farmers’ soil management practices to address soil degradation brought on by desertification risk and erosion. Sequestration does have limits. For Canada, soil carbon accumulation is expected to peak (around 2040) but good farming practices can continue to conserve soil and maintain this sink rather than increase it.²⁵

NOTES ON SELECTED SUB-INDICATORS:

A. EMISSIONS

a. Total agri-food emissions: This metric would calculate emissions for the sector overall. Emissions data on production agriculture’s emissions is available and reported, including feed produced in Canada for livestock (i.e., via the National Inventory Report).²⁶ However, while some commodity sectors and individual companies track their respective performance, a consolidated food system view of GHG emissions (from production to retail) has not been produced.²⁷ Doing so would provide a more complete view of scope 1, 2, 3 emissions.²⁸

○ **Alignment with Canada’s climate change targets:** The published Index is expected to include a narrative on how these results contribute to Canada’s climate change commitments and GHG reductions targets, consistent with the Paris targets.

b. By sub-sector:

i. Distribution, processing, food retail GHGs: This metric would include GHGs for the sector beyond the farm-gate.

ii. Production agriculture GHGs: This sub-indicator disaggregates animal agriculture, crops, aquaculture and fisheries. References to “all other agriculture” refers to a consolidation of remaining segments not disaggregated.

○ **Absolute vs. intensity measures:** While agriculture contributes some 10% of Canada’s overall GHG emissions,²⁹ agriculture accounts for 31% of national methane (CH₄) emissions and 76% of national nitrous oxide (N₂O) emissions, up from 53% in 1990.³⁰ Explaining agriculture’s GHGs impacts requires considering absolute and intensity measures, as noted below.

- Measuring GHGs on a per capita basis (with Canada’s relatively small population) can portray Canada’s GHGs negatively and without proper context.³¹ Agriculture’s emissions need also to be linked to production output or reported

²⁴ *Greenhouse gases and agriculture*, Agriculture and Agri-Food Canada: <https://agriculture.canada.ca/en/agriculture-and-environment/climate-change-and-air-quality/greenhouse-gases-and-agriculture>

²⁵ *Greenhouse gases and agriculture*: <https://agriculture.canada.ca/en/agriculture-and-environment/climate-change-and-air-quality/greenhouse-gases-and-agriculture>

²⁶ Statistics Canada produces GHG emissions data from its Physical Flow Accounts (PFA) and Environment and Climate Change Canada’s National Inventory Report.

²⁷ Statistics Canada’s PFA can provide a more detailed picture of emissions along the supply chain through linkages with the Agriculture and Agri-Food Economic Account (AAEA); Statistics Canada: Table 38-10-0097-01 Physical flow account for greenhouse gas emissions; <https://doi.org/10.25318/3810009701-eng>

²⁸ More granular metrics on scope 1, 2, 3 emissions are not readily available. As Index work proceeds, this will be reconsidered; this may include calculations that differentiate between biogenic and national ecosystem conversion.

²⁹ Note there are differences of measurement. Statistics Canada’s physical flow estimates for GHG emission estimates are based on the UN System of Environmental Economic Accounting (SEEA) guidelines and are closely linked to economic statistics. They differ from the GHG emission estimates released by Environment and Climate Change Canada (ECCC), which is responsible for producing the National Inventory Report on Greenhouse Gas Sources and Sinks in Canada. ECCC’s inventory is the official benchmark for GHG emissions in Canada and is based on the guidelines from the United Nations Framework Convention on Climate Change.

³⁰ https://publications.gc.ca/collections/collection_2020/eccc/En81-4-2018-1-eng.pdf

³¹ Example: Taking action on climate change makes up nearly a quarter (24%) of the Yale Environmental Performance Index, an assessment of 180 countries’ environmental and biodiversity performance. European countries dominate the list with 16 of the top 20 positions, with Canada ranking

as emissions intensity. A lower GHG emissions efficiency vis-à-vis competitors is a comparative advantage as attention to GHG performance increases.³² However, an increase in production can still lead to an increase in absolute emissions, even if emissions intensity decreases. The caution is that standalone metrics require an appropriate narrative to help explain changes in GHGs over time.

- Many Canadian commodity associations have contracted qualified experts to calculate GHG emissions using IPCC or other protocols to permit the measurement of current emissions and plan for emission reductions.

B. SEQUESTRATION/LOSS

This sub-indicator involves reporting on:

- a. Soil organic carbon change is an estimate of how much CO₂ is removed or added to the atmosphere through agriculture. In addition to indicating changes in soil health, the change in SOC provides an indication of potential reductions in atmospheric CO₂, which can offset greenhouse gas emissions.

C. MITIGATION

Adopting beneficial management practices and technologies can reduce fuel use (and costs) by farmers and companies, alike. Increasing renewable energy use throughout the sector can further help deliver environmental and economic benefits. Tracking the shift to renewables includes biofuels and so-called green energy sources (solar, wind, hydro and anaerobic digestion). The Index provides the opportunity to establish a sector baseline and mark progress to fewer emissions. The selected metric presents a ratio of fossil to renewable fuel use on a consolidated basis and by sub-sector, agriculture, transport, processing, and retail.

Applicable U.N. Sustainable Development Goal (SDG): 13.2, 13.3.b.

[This indicator is linked to Soil Health, below, and to Sustainable Growth in the Economic Indicators.]

THEME | SOIL

INDICATOR 2 | Soil health

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

SUB-INDICATORS:

(and sub-indicator metrics)

- A. Soil cover
- B. Soil erosion
- C. Soil organic carbon

CONTEXT

Improving soil health reduces greenhouse gases (GHGs) and improves soil productivity, key outcomes of *climate-smart* farming. Maintaining good soil health is a recognized priority and work is underway to better understand its regional variations, progress, and vulnerabilities.³³ While the role soil plays in sequestering carbon is addressed above, this indicator emphasizes broader measures that can determine soil health.

NOTES ON SELECTED SUB-INDICATORS:

A universal challenge is improving the way soil health is measured. 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 sub-indicators and include, for instance, soil biota which is a critical component of healthy soil. (More soil research would inform how to address lack of clear definition of soil health and how to measure it may also enable the development of other measures such as on nutrient balance contribution, soil infiltration, and soil biodiversity.) Proxies of soil health must therefore be used, with soil carbon being particularly significant:

A. 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. Agriculture

20th overall. Canada's ranking on per capita GHG emissions is Canada 168th globally. <https://epi.yale.edu>

³² Efficient Agriculture as a Greenhouse Gas Solutions Provider", 2019, CAPI.

³³ Soil Health Report Card, Soil Conservation Society of Canada: <https://soilcc.ca/programs/sccc-soil-health-report-card/>

and Agri-Food Canada's (AAFC) *Soil Quality Agri-Environmental Performance Index* combines information about the risk of soil loss, contamination by trace elements, the buildup of salt and the reduction of organic matter in the soil. Results indicate that overall soil conditions have improved since the early 1980s.³⁴ The contributing on-farm practices include reduced or no-till farming, decline of tilled summer fallow and cover cropping.

B. SOIL EROSION

Soils can be eroded by water and wind which impacts their health and the health of the surrounding ecosystem. 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 2011, the majority of farmland (74%) in Canada was at very low risk from soil erosion."³⁵ This outcome is significantly attributed to producers' efforts to improve land management practices, including widespread adoption of conservation tillage.

C. 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. It is reported to farmers who submit soil samples for laboratory analysis. An indicator of relative soil organic carbon is calculated by Agriculture and Agri-Food and mapped across the agricultural soils of Canada.³⁶

[This indicator is linked to indicators on GHGs' emissions, crops inputs (i.e., fertilizer), and water stewardship]

SDG: 2.4

³⁴ <https://agriculture.canada.ca/en/agriculture-and-environment/agri-environmental-indicators/environmental-sustainability-canadian-agriculture-agri-environmental-indicator-report-series-report>

³⁵ <https://agriculture.canada.ca/en/agriculture-and-environment/soil-and-land/soil-erosion-indicator>

³⁶ <https://agriculture.canada.ca/en/agriculture-and-environment/soil-and-land/soil-organic-matter-indicator>

THEME | WATER

INDICATOR 3 | Water stewardship

Issues of water use and quality in global food production and supply are becoming more acute as the impact of climate change intensifies.

SUB-INDICATORS:

(and sub-indicator metrics)

A. Water quality

- a. National freshwater quality
- b. Regional water quality

B. Water use

- a. Food production:
 - i. Crop agriculture
 - ii. Livestock use
 - iii. Wet land drainage and/or retention
- b. Processing

CONTEXT

With climate change “intensifying the water cycle,”³⁷ 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.³⁸ However, scrutiny of water stewardship is increasing³⁹ and some companies and jurisdictions are setting targets to improve watersheds, reduce pollutants and improve water use efficiencies.⁴⁰

Canada’s agri-food sector is facing greater localized impacts and uncertainty, such as from more intense rainfall and flooding to frequency of

droughts and reductions in seasonal snow cover. Those regional vulnerabilities were revealed by the severe Prairie drought and flooding in southern British Columbia in 2021. It is also important to discern agriculture’s role and contribution to various water use and quality issues. In Canada, water systems’ ecologies are affected by agriculture, mining, forestry and by urban and industrial impacts.⁴¹ More detailed water reporting would improve understanding of such water issues, including mitigation efforts to minimize water impacts in this sector; these can include nutrient and pesticide runoff in addition to water consumption through irrigation.

NOTES ON SELECTED SUB-INDICATORS

Data issues:

- **Data granularity:** While agricultural water pollution is typically a diffuse source, it is difficult to direct (or remove) responsibility of agriculture being a contributor. Water issues 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.
- **New metric:** Agriculture and Agri-Food Canada’s Compound Index for Water Quality models water risks from pesticides and other contaminants, phosphorus, nitrogen, and coliform.⁴² This tool models the risks of water contamination associated with the use of inputs but does not measure the actual impact of the

³⁷ *Climate change widespread, rapid, and intensifying – IPCC*, August 9, 2021

³⁸ 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>

³⁹ 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

⁴⁰ For example, with 85% of its water footprint from ingredient sourcing (growing and transporting crops), General Mills is working with suppliers to improve at-risk watersheds by 2025. General Mills: <https://www.generalmills.ca/en/Home/Responsibility/Sustainability/water-stewardship>; Cargill has identified priority watersheds: https://www.cargill.com/sustainability/priorities/water-resources?sf248861355=1&mkt_tok=NDkwLUVlW05OTkAAAF_IcLyrQfThraE6r_LWxUdUlcBkm8vfQhwSsGFTLxGijqiV5TbioCHkd3AU7JTvjSngDIAb-T9CnpANSovhgDqdyprwbteO34mCV3ipSIELg-0. Quebec’s benthic health index for degraded watercourses aims to improve water quality by achieving a 15% reduction in total phosphorus levels in watercourses. Quebec’s Ministry of Agriculture, Fisheries and Food, Sustainable agriculture plan (2020-2030) / *Agir, Pour une Agriculture Durable, Plan 2020-2030*: https://cdn-contenu.quebec.ca/cdn-contenu/adm/min/agriculture-pecheries-alimentation/publications-adm/dossier/plan_agriculture_durable/PL_agriculture_durable_MAPAQ.pdf?1603387733 Quebec is also identifying microplastics in water systems as a potential priority for its next Sustainable Development Governmental Strategy 2022-2027, although the source of such contaminants is not yet clear. Manitoba is developing nutrient (nitrogen and phosphorus) targets for the Lake Winnipeg watershed.

⁴¹ Environment and Climate Change Canada monitors water and river quality: <https://www.canada.ca/en/environment-climate-change/services/environmental-indicators/water-quality-canadian-rivers.html>

⁴² <https://agriculture.canada.ca/en/agriculture-and-environment/agri-environmental-indicators/environmental-sustainability-canadian-agriculture-agri-environmental-indicator-report-series-report>

use of these inputs. Environment and Climate Change Canada tracks Canadian river water quality.⁴³ The Pest Management Regulatory Agency, a branch of Health Canada, is planning better monitoring of water for pesticide residue. As well, a new Canada Water Agency was announced in 2020 to improve freshwater management across Canada, although it is still under development and details on its work has yet to be released.⁴⁴ There are also water monitoring activities conducted at the provincial, regional, and municipal level. Better integrating national and regional measurements of water quality would improve transparency and inform actions. In short, a new integrated approach to measuring environmental impacts and water management is required.

A. WATER QUALITY

As expressed above, a new metric is required to provide more granular insights for:

a. National freshwater quality

b. Regional water quality

B. WATER USE

Agriculture is the 5th largest user of water in Canada, but the largest withdrawer of water, consuming some 80% of water it used (as opposed to returning it to the source, unlike most other big water users, such as for hydroelectric generation).⁴⁵ Canadian agriculture is largely *green water* dependent (reliant on rainfall), although irrigation use is increasing.

a. Food production:

i. Crop agriculture: (Development of water withdrawals as a descriptor of sustainability remains under review and is deferred to the next phase of work.)

- o **Irrigation:** While only about 1% of total Canadian crops and pastures are irrigated,⁴⁶ certain semi-arid regions of Canada are irrigation-reliant and irrigated water use is increasing due to dry weather conditions in western Canada.⁴⁷

ii. Livestock: Extensive systems, confined feeding/intensive livestock operations

iii. Wet land drainage and/or retention:

Removing water from farmed land (not land conversion) can be in the form of tile drains (primarily eastern/central Canada) and surface drains (primarily western Canada). The benefits include economic reasons, reduced GHG emissions due to less nitrous oxide production under anaerobic conditions and this can improve soil health. This can also have environmental impacts, such as nutrient and pesticide runoff, water contamination (e.g., bacteria), and sedimentation. [Note, this metric addresses wet land, not wetlands. The biodiversity indicator, below, addresses the health of wetlands.]

b. Food processing: Food processing is *blue water* dependent; it relies on municipal-sourced water and can be a heavy water user.⁴⁸ In

⁴³ ECCC metrics rated rivers fair to excellent at 82% of the monitored sites from 2017 to 2019. <https://www.canada.ca/en/environment-climate-change/services/environmental-indicators/water-quality-canadian-rivers.html>. See also ECCC's Canadian Aquatic Biomonitoring Network, an aquatic biomonitoring program for assessing health of freshwater ecosystems. <https://www.canada.ca/en/environment-climate-change/services/canadian-aquatic-biomonitoring-network.html> ECCC tracks other matters, such as Bisphenol A which is monitored in the Canadian environment. BPA includes being found in microwaveable food containers and many other common household and consumer items. BPA may also enter the environment through the application of biosolids from wastewater treatment on agricultural fields. <https://www.canada.ca/en/environment-climate-change/services/evaluating-existing-substances/environmental-monitoring-surveillance-support-chemicals-management-plan-bisphenol-a-canadian-environment.html>

⁴⁴ <https://www.canada.ca/en/environment-climate-change/news/2020/12/government-of-canada-launches-consultations-on-new-canada-water-agency.html>

⁴⁵ <https://www.canada.ca/en/environment-climate-change/services/environmental-indicators/water-withdrawal-consumption-sector.html>

⁴⁶ Environment and Climate Change Canada. Globally, some 20% of cultivated land is irrigated but this represents some 40% of food produced worldwide (FAO: <http://www.fao.org/water/en/>).

⁴⁷ Western producers (largely in Alberta and including in British Columbia and Saskatchewan) used some 35% more water to irrigate their crops in 2018 over 2016. Agricultural Water Survey, 2018: <https://www150.statcan.gc.ca/n1/daily-quotidien/190912/dq190912d-eng.htm>

⁴⁸ "Green water" refers to rainfall/precipitation stored in soil; "blue water" is sourced from surface/groundwater; irrigated water; and, "gray water:" is freshwater/pollutants mix that meet water quality standards.

2009, Canada's food industries accounted for some 8.7% of water withdrawals used by manufacturing industries.⁴⁹ More recent data embeds food processing into overall manufacturing and disaggregated data would be required to express this sub-indicator metric for this sector.

Note, the Canadian Food Inspection Agency monitors water use in food processing for safety, such as for microbiological or chemical hazards.⁵⁰ Matters relating to food safety are addressed in the Food Integrity Indicators.

SDG: 6.3, 6.4, 6.5, 6.6

⁴⁹ <https://www150.statcan.gc.ca/n1/pub/16-401-x/2012001/part-partie1-eng.htm>

⁵⁰ <https://inspection.canada.ca/preventive-controls/preventive-control-plans/water-for-use-in-the-preparation-of-food/eng/1511377944601/1511377945080>

THEME | BIODIVERSITY

INDICATOR 4 | Biodiversity and agrobiodiversity

Sustainable and resilient food production systems are intimately linked to ecosystems' resilience and well-being.

SUB-INDICATORS:

(and sub-indicator metrics)

Currently available data & metrics:

A. State of biodiversity and habitat change

- a. Wildlife Habitat Capacity on Farmland Index
- b. Wild capture fisheries

B. Conversion of farmland to urbanization (class 1, 2, 3 soils)

For prospective development to replace sub-indicator A, above:

C. Composite view: state of biodiversity and habitat change

(Comprised of total gains (restoration) and losses (conversion) of on-farm habitats valuable to biodiversity)

- a. Forests
- b. Riparian
- c. Native grasslands
- d. Wetlands
- e. Marginal land

D. Disaggregated views: state of biodiversity and habitat change

- I. Habitat types:
 - a. Forests
 - b. Riparian
 - c. Native grasslands
 - d. Wetlands
 - e. Tame/perennial grasslands (note, in disaggregated view only)
 - f. Marginal land
- II. Species:
 - a. Farmland birds (trend)
 - b. Beneficial insects (habitat trend)
 - c. Agrobiodiversity (genetic biodiversity)
 - i. Crop varietal (trend)
 - ii. Livestock animal breed (trend)

CONTEXT

The long-term well-being and resiliency of productive landscapes (and seascapes) for food production are connected to ecosystem and habitat health. As expectations rise about addressing and protecting biodiversity,⁵¹ the proposed improvements to metrics collection, below, would ensure relevance to the Canadian agricultural context and better equip stakeholders to monitor and respond to biodiversity change on agricultural land and seascapes.

NOTES ON SELECTED SUB-INDICATORS:

Data issues:

- 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.
- *Species at risk* is not proposed as an indicator because addressing its conditions extend well-beyond the farm landscape.⁵²
- Selecting data sources with a national scope would be ideal. However, without adequate data, partial data sets can nevertheless provide insights on the state of biodiversity.
- As finer-level data becomes available, new metrics can be considered: hedgerow, shrubland, native plant biodiversity (relevant to agricultural buffer zones, etc.), field margins (e.g., fencerow, grassy margins, etc.).
- It is recognized that getting detailed data, such as to monitor fine-scale biodiversity habitat trends, requires significant investment and is a realistic limitation. Thus, trade-offs between cost and data granularity will be required.

A. STATE OF BIODIVERSITY AND HABITAT CHANGE:

- a. **The Wildlife Habitat Capacity on Farmland Index (WHCFI):** This existing metric (part of Agriculture and Agri-Food Canada's (AAFC) Agro-Environmental Indicators) measures habitat availability for terrestrial vertebrates on agricultural lands (and is showing biodiversity decline).⁵³ WHCFI's strength is in creating a spatial trend of habitat associations among hundreds of wildlife species on farmland across Canada. Its limitations are focusing exclusively on vertebrate species (and not including invertebrates and pollinators) and giving equal weighting to the importance of breeding and feeding habitat. (Feeding habitat may not improve the outlook for wildlife if breeding habitat is unavailable.) Building on the WHCFI, more inclusive measures are proposed by providing a composite view (see C) of habitat change and disaggregated views (D).

The approach emphasizes habitat quantity. 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, breeding, 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.

- 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

⁵¹ The UN Convention on Biological Diversity is currently negotiating a new global biodiversity framework that is expected to influence the global biodiversity agenda: <https://www.cbd.int/doc/press/2021/pr-2021-08-18-actionagenda-en.pdf>. The CBD is also looking further ahead to 2050: <https://www.cbd.int/doc/c/abb5/591f/2e46096d3f0330b08ce87a45/wg2020-03-03-en.pdf>

⁵² A conclusion made in *Biodiversity, A contributing paper of the Benchmarking Canada's Agri-Food Sustainability Leadership Project* (January 2021) and reaffirmed by partners in further work in 2022.

⁵³ <https://www.canada.ca/en/environment-climate-change/services/environmental-indicators/wildlife-habitat.html>

given that 97% of the commercial fishery is ocean based.⁵⁴ 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.⁵⁵ According to the department's 2020 Sustainability Survey of Fisheries, 98% of Canada's commercial fisheries are harvested at approved levels, as determined by Canada's sustainable fisheries management framework.⁵⁶ Maintaining and rebuilding healthy stocks is a joint responsibility of industry and government. (Note, perspectives on environmental impacts on freshwater fish are captured in other sub-indicators, such as on Inputs, below.)

B. FARMLAND LOSS TO URBANIZATION

A new metric is proposed to respond to an emerging issue of concern, the conversion of prime farmland particularly near larger urban centres. (While included in this Index, this metric would not form part of the proposed new composite view.)

- **Prime farmland loss:** The loss of prime agricultural land due to urbanization and industrial expansion can attract publicity and it raises questions about long term-food security and jurisdictional responses, such as on municipal planning policies. Understanding how prime agricultural land (i.e., with a Land Suitability Rating System of either class 1, 2, 3) is converted could become more acute as population pressures increase. This metric is not intended to point to producer practices, but it would provide insight on such changes and policy responses.⁵⁷

C. COMPOSITE VIEW: STATE OF BIODIVERSITY AND HABITAT CHANGE:

This proposed measure would present an overall view of land-use and habitat change relevant to food production. It would 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 (gain), forest conversion to crops (loss) or afforestation (gain). At this point, measuring landscape heterogeneity is not included in the suggested composite metric. Ongoing work by AAFC 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), could ultimately be incorporated into this proposed broader metric.

D. DISAGGREGATED VIEWS: STATE OF BIODIVERSITY AND HABITAT CHANGE:

Proposed metrics on the state of biodiversity for specific habitats and species 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 of Canada's polygon geographic scale.⁵⁸ As finer-scale data becomes available, this metric will incorporate habitats that are not currently measured, such as marginal land.

⁵⁴ 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-epcj2AhVUCM0KHUGVBkQQFnoECAQQAQ&usq=AOvVaw0GrjvsFdKBqj84UkGuaXv3>

⁵⁵ 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>

⁵⁶ Of the 180 major stocks assessed in Canada in 2020, 177 stocks (98%) were harvested at or below a removal reference or an approved level, and from 2012 to 2020 the percentage of stocks harvested above approved levels has been consistently low; <https://www.canada.ca/content/dam/eccc/documents/pdf/cesindicators/sustainable-fish-harvest/2022/harvestlevelofkeyfishstocks-en.pdf>

⁵⁷ Conservation easements can incentivize farmland conservation, including farmland-based ecological gift programs. Exploratory work is underway in Alberta to develop conservation easements.

⁵⁸ <https://sis.agr.gc.ca/cansis/nsdb/slc/index.html>

I. Habitat types:

- a. 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. Conversion of forests to agricultural land is similarly low and declining from about 42,000 hectares in 1990 to some 12,000 hectares in 2018.⁵⁹ The intent of this metric is to focus on agricultural activities on forests.
- b. 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.
- c. 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. 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. Native grasslands are very important to biodiversity in Canada but only some regional datasets exist.
- Tame grasslands:** This habitat is important to wildlife. Currently, there is a lack of data to distinguish between tame and native grasslands.

d. 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.

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

II. Species:

a. Farmland birds: Selecting native species populations that are sensitive to agricultural production is relevant.⁶⁰ 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.

b. 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).

⁵⁹ *Canada's Forests: Adapting to Change, The State of Canada's Forests, Annual Report 2020*, Canadian Forest Service, Natural Resources Canada: <https://cfs.nrcan.gc.ca/publications/download-pdf/40219>

⁶⁰ Note, a farmland bird index exists for the EU; http://appsso.eurostat.ec.europa.eu/nui/show.do?dataset=env_bio2&lang=en

c. Agrobiodiversity: Agrobiodiversity is the variety of domesticated cultivars of crops and breeds of livestock. Tracking agrobiodiversity is gaining greater global interest⁶¹ as it offers a means to monitor heterogeneity trends in ecosystems and the connection with natural landscapes and species.⁶²

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

SDG: Life on land: 15.1, 15.3, 15.5, 15.9; Life below water: 14.1, 14.2, 14.4

THEME | INPUTS

INDICATOR 5 | Crop inputs use / management

Optimizing production “inputs” (notably pest control products and fertilizer) is about ensuring productivity and minimizing environmental and other impacts.

SUB-INDICATORS: (and sub-indicator metrics)

A. Responsible pest control product use (pesticides)

- a. Proposed new metric calculating (volume of product) x (hazard associated with products) x (mitigation or responsible use measures)

B. Responsible nutrient use (fertilizer)

- a. Percentage of cropland using 4R Nutrient Stewardship practices

CONTEXT

The essential global challenge is about producing more food with less environmental impact. How producers manage two inputs (pest control and nutrient products) is at the heart of how best to achieve this outcome.⁶³ On the one hand, some governments are seeking absolute reductions in use and prohibitions on certain products.⁶⁴ On the other, there is a global effort to take a ground up approach to improve producer use and management of inputs.⁶⁵ 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

⁶¹ 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/>

⁶² 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

⁶³ See, for example: <https://www.euractiv.com/section/agriculture-food/news/commission-not-afraid-of-global-coalition-against-eus-food-policy/>

⁶⁴ 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. The UN Convention on Biological Diversity’s is also developing goals on such matters. 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.

⁶⁵ See, for example, <http://www.nutrientchallenge.org>

customer, societal and regulator expectations. New “priority” metrics are required to respond.

NOTES ON SELECTED SUB-INDICATORS:

A. 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 water monitoring.⁶⁶ Largely speaking, sales-based data is being collected to extrapolate environmental risk. Sales-based data is not outcome-driven.

- Pesticide safety is regulated. Compliance with maximum residue limits (MRLs) and label adherence⁶⁷ provides a key outcome-based metric. This is addressed in the Health and Food Safety indicators.
- 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.”⁶⁸ The EU has developed their own indicator to estimate the trends in risk or hazard posed by chemical use.⁶⁹ However, its Harmonized Risk Indicator focuses on product hazard defined using volumes applied times a hazard factor (defined by their regulatory approvals system) and does not include mitigation efforts. In short, developing the optimum IPM outcome-based metric is required

to meet producer needs and regulatory expectations.

- 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. To demonstrate continuous improvement in risk reduction, a new metric would be based on the volume of product, hazard associated with products (to be defined) and mitigation or responsible use measures.⁷⁰ If successfully developed, this indicator could form part of a suite of measures, such as on label safety (noted above), 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 sub-indicators 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 Health and Food Safety 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

⁶⁶ Statistics Canada’s Farm Management Survey (FMS) has information on pesticides, including by type of pest use (fungicide, insecticides, herbicides, biopesticides).

⁶⁷ <https://www.canada.ca/en/health-canada/services/consumer-product-safety/pesticides-pest-management.html>

⁶⁸ 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. Such BMP-adoption may not necessarily lead to total pesticide reductions. USDA research as reported by Field to Market noted that a significant increase in IPM practices adoption was met with an increase of total pesticide during the same time period in the 1990s, page 14. See also the FAO definition of IPM which involves “the careful consideration of all available pest control techniques and subsequent integration of appropriate measures that discourage the development of pest populations and keep pesticides and other interventions to levels that are economically justified and reduce or minimize risks to human and animal health and/or the environment.” <https://www.fao.org/agriculture/crops/thematic-sitemap/theme/pests/ipm/en/>

⁶⁹ EU: https://ec.europa.eu/food/plants/pesticides/sustainable-use-pesticides/harmonised-risk-indicators_en

⁷⁰ As a more holistic measure of environmental and human health, this new metric would need to consider risk; that is, the degree to which pest management control products are toxic for pollinators, invertebrates, etc. It may also need to address water solubility and persistence impact, matters that may be modified by incorporating mitigation into the calculation. (Project partner discussions, 2021–2022.)

workplace safety (which would include poisonings and other pesticide-related safe-handling incidences).

B. RESPONSIBLE NUTRIENT USE:

Producers deploy a variety of tools using beneficial management practices (BMPs) to limit the environmental impacts of commercial fertilizers, manure and other 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, an industry standard. It is about applying nutrients at the right source at the right rate, right time, and right place, and guidance for choosing practices. Industry is increasingly monitoring and reporting the adoption of 4R practices.⁷¹ This is also a relevant metric given the targets being set by the sector and government to deploy 4R.⁷² Many farmers have adopted environmental farm plans (EFPs) which include nutrient management practices. Provincial regulations can prescribe 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 generally follow 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.⁷³ Until such comprehensive outcome-based metrics are available, this indicator tracks 4R practices as an interim measure.⁷⁴

Links to other indicators:

- **GHG emissions:** Responsible nutrient management practices help to reduce greenhouse gas emissions associated with crop production.⁷⁵
- **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.⁷⁶
- **Water stewardship:** BMPs reduce nutrient losses to water ways.⁷⁷

⁷¹ 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).

⁷² The Canola Council of Canada and Canadian Canola Growers Association have a goal to decrease by 40% the land required to produce one tonne of canola and to utilize 4R nutrient stewardship practices on 90% of canola acres. Saskatchewan has a goal of having 25% of its cropland under 4R designation by 2025. Canola Council of Canada: *Strategic Plan, 52 by 2025*: <https://www.canolacouncil.org/about-us/strategic-plan/>; *Canola Digest – Science Edition 2018*. Canola Growers of Canada: *Canola's Sustainable Future*: <http://www.ccca.ca/policy/Documents/Sustainability-201909.pdf>; Sustainable reliable supply: <http://keepitcoming.ca/our-priorities/sustainable-reliable-supply/>; *Saskatchewan's Climate Resilience Measurement Framework*: <https://www.saskatchewan.ca/business/environmental-protection-and-sustainability/a-made-in-saskatchewan-climate-change-strategy/climate-resilience-framework-and-reports>

⁷³ A Review of the Recent Scientific Literature Documenting the Impact of 4R Management on N₂O Emissions Relevant to a Canadian Context, Dr. David Burton. <https://fertilizercanada.ca/wp-content/uploads/2018/08/NERP-Science-Review-Paper-.pdf>

⁷⁴ Fertilizer Canada's *Fertilizer Use Survey* reports on the uptake of good fertilizer practices (from 2015 to present for Corn, Winter Wheat, Soybean, Spring Wheat, Durum Wheat, Barley, Flax, Sunflower, Canola, Oats, Perennial Forages, and Lentils) and within Statistics Canada's Farm Management Survey; <https://www23.statcan.gc.ca/imdb/p2SV.pl?Function=getSurvey&SDDS=5044>. Each survey captures the use of 4R BMPs, and the area of crops produced for each farmer surveyed. The results can therefore be attributed to the proportion the total area of cropland harvested.

⁷⁵ 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>

⁷⁶ 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.

⁷⁷ 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>.

- **Biodiversity:** Optimum fertilizer use enables crop production and biodiversity.⁷⁸

SDG: 2.4, 14.1

THEME | WASTE

INDICATOR 6 | Food loss & waste

Reducing food loss and waste 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.

SUB-INDICATORS: (and sub-indicator metrics)

A. Reduce

- a. Composite number on progress to reduce food waste and loss
 - i. Food loss: production to processing
 - ii. Food waste: restaurant, food services, retail

B. Repurpose

- a. Number of government programs to encourage food repurposing
- b. Processing by-products to upcycling or animal feed

CONTEXT

Fifty-eight percent (58%) of all food produced in Canada is lost or wasted.⁷⁹ Typical for advanced economies, the leading source of avoidable food loss and waste (FLW) in Canada is primary processing and further manufacturing representing a combined 43% of this total. While 21% of food waste occurs at the household level,⁸⁰ 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 2025.⁸¹

Some waste is unavoidable (e.g., bones, cobs, etc.). It is estimated that about 32% of all FLW in Canada could be avoidable.⁸² Finding new uses of food

⁷⁸ 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.>

⁷⁹ *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.

⁸⁰ *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

⁸¹ 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/>

⁸² *Circular Food Solutions in Canada: A Coast to Coast Landscape Scan*, October 2021, page 32.

for human consumption is best, such as selling misshaped vegetables, creating new food processing opportunities or diverting foods to food charities.⁸³ 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.⁸⁴

There is considerable activity underway to address FLW (and improve “circularity”⁸⁵) among supply chain players, innovators, NGOs, municipalities, and others.⁸⁶ Responding to FLW also prompts broader questions, such as whether reducing plastic (next indicator) might actually increase food waste and about whether food costs and prices need to better reflect the externalities of bringing food to the marketplace⁸⁷ (also known as true cost accounting).⁸⁸

The global Food Loss and Waste Protocol provides guidance for quantifying and reporting on FLW and for encouraging reduction strategies.⁸⁹ However, there is no standardized, finer-grained methodology available in Canada to assess FLW (such as by weight, by GHG emission or by economic cost).⁹⁰ A lack of good data prevents getting an accurate picture of the situation and progress being made on an ongoing basis. This will inhibit what can be measured in this Index.

NOTES ON SELECTED SUB-INDICATORS:

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

A. REDUCE:

a. Composite number on progress to reduce food waste and loss: An aggregated number is collected and disaggregated, below.

i. Food loss: Currently, an estimated 6% of avoidable food loss occurs in production; 5% in distribution and 43% in food processing and manufacturing.⁹¹ It is proposed that collecting such data over time would present the trendline to monitor change.

ii. Food waste: An estimated 25% of avoidable food waste occurs from restaurants/hotels, food services and retail.

B. REPURPOSE:

a. While this Index aims to measure outcomes, responding to the FLW in a concerted way is relatively nascent and little data is available to mark progress (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.

SDG: 12.3, 12.6

⁸³ 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>

⁸⁴ *Circular Food Solutions in Canada: A Coast to Coast Landscape Scan*, October 2021, page 85

⁸⁵ “A circular economy aims to maintain the value of products, materials and resources for as long as possible by returning them into the product cycle at the end of their use, while minimizing the generation of waste.”, FAO: <http://www.fao.org/land-water/overview/covid19/circular/fr/>

⁸⁶ See for instance: <https://www.canada.ca/en/environment-climate-change/services/managing-reducing-waste/food-loss-waste/taking-stock.html#toc14>

⁸⁷ *Avoidable Crisis of Food Waste Report*, <https://secondharvest.ca/wp-content/uploads/2019/01/Avoidable-Crisis-of-Food-Waste-Technical-Report-January-17-2019.pdf> pp 26-27. Consumers express mixed views about being asked to pay for sustainability on the one hand and some are willing to pay a premium for it on the other; see the Canadian Centre for Food Integrity report on Consumer Trust to this project, 2022: www.agrifoodindex.ca

⁸⁸ Canadian Centre for Food Integrity report on Consumer Trust to this project, 2022

⁸⁹ Food Loss and Waste Accounting and Reporting Standard: <https://www.flwprotocol.org>

⁹⁰ *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>. Standardization is also emphasized by the Canadian Stewardship Services Alliance in: <https://www.cssalliance.ca/harmonized-producer-responsibility/> The Canadian Food Policy Advisory Council is also considering ways to reduce food waste: <https://agriculture.canada.ca/en/about-our-department/key-departmental-initiatives/food-policy/canadian-food-policy-advisory-council>

⁹¹ All food waste/loss data: Value Chain Management International (2019) and referenced by the National Zero Waste Council: <http://www.nzwc.ca/focus-areas/food/issue/Pages/default.aspx>

THEME | WASTE

INDICATOR 7 | Packaging & plastic

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

SUB-INDICATORS: (and sub-indicator metrics)

A. Reduce / recycle

- a. Production: packaging and plastics recycling
- b. Processing/retail:
 - i. Mass of single use plastic packaging used
 - ii. % of products on shelves with certified compostable packaging
 - iii. % of packaging from recycled materials

B. Reuse

- a. Production:
 - i. Sustainable packaging adoption
- b. Processing/retail

CONTEXT

Canada's national target is zero plastic waste by 2030.⁹² This echoes the UN Convention on Biological Diversity's 2030 draft goal proposing to eliminate the discharge of plastic waste.⁹³ Only 14–18% of global plastic waste is being recycled.⁹⁴ In Canada some 15% is recycled.⁹⁵ 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 2025.⁹⁶ 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.⁹⁷ At 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.

NOTES ON SELECTED SUB-INDICATORS:

A. 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 Producer Responsibility programs operated by Cleanfarms.⁹⁸ (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.

b. Processing/retail: Data is being collected on a consolidated basis by the Canada Plastics Pact 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.⁹⁹ While aligning with national best practices is desired, the lack of suitable sector-wide data might require using consumer-facing data in this Index to determine recycling volumes from processors and retailers.

Improving recycling outcomes faces several issues. For instance, measuring the mass of single use plastic packaging is being considered by the Canada Plastics Pact (CPP) which works economy wide. Some plastic

⁹² Government of Canada: <https://www.canada.ca/en/environment-climate-change/services/managing-reducing-waste/reduce-plastic-waste/canada-action.html>

⁹³ Convention for Biological Diversity: <https://www.cbd.int/doc/press/2021/pr-2021-08-18-actionagenda-en.pdf>

⁹⁴ EIU: <https://ocean.economist.com/rethinking-plastics/breathing-life-into-plastic-waste/>

⁹⁵ Over 85% of products are thrown away to landfill: <https://roadmap.plasticspact.ca>

⁹⁶ See *Roadmap to 2025* for the complete list of targets, Canada Plastics Pact: <https://plasticspact.ca>

⁹⁷ See company and other goals reviewed for this project: *A Report on Agri-Food Sustainability Targets*, October 2020: www.agrifoodindex.ca

⁹⁸ *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>

⁹⁹ *Roadmap to 2025*, Canada Plastics Pact: <https://plasticspact.ca>

materials are highly recyclable (e.g., PET 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.

B. REUSE:

a. Production: Documenting agriculture-related reuse is underway, such as using refillable containers for crop protection products and reusable bins for the delivery of seed.

b. Processing/retail: There is a lack of data now available in the marketplace given the infancy of reuse of packaging volumes.

SDG: 12.3, 12.4, 12.6

II. FOOD INTEGRITY INDICATORS

A. About

Essentially, food integrity is about assuring that the food offered to the consumer is safe, responsibly produced, of stated quality, and sustainable. While food integrity can be widely defined and interpreted, it can include how the food system adheres to scientific principles, maintains a credible regulatory process,¹⁰⁰ including inspection and surveillance practices, and conforms to accepted standards and best management practices and meets transparency expectations.

Canada has a reputation for having one of the safest food systems anywhere.¹⁰¹ Food safety cannot be taken for granted. Incidents will happen but a key measure of responsibility is how such occurrences are contained when they do occur. The indicators below (see Figure 5) reflect, in part, the processes used to ensure a safe food supply, including world leading standards and protocols as well as a culture of continuous improvement.

While countries and companies generally do not compete on the basis of food safety, *per se*, consumers do make value decisions about how and where food is produced. Consumer food purchases can be driven by concerns that are perceived to be related to food safety, such as provenance or origin (including 47% of Canadian consumers being “very concerned” about safety of imported food), food production methods (33% are very concerned about GMOs, genetically modified organisms), use of pesticides (41% very concerned) and animal husbandry (42% very concerned about use of hormones in farm animals).¹⁰² Good labelling practices are one part of many important actions being taken to

ensure consumers trust the food they buy.¹⁰³

These indicators also address key human-animal agriculture health issues. The globally-recognized *One Health* concept encourages food players to address the linkages between animal, human and environmental health¹⁰⁴ – and the COVID-19 pandemic reinforced this. A number of indicators, below, are directly or indirectly relevant to advancing animal health or addressing human-animal food safety considerations. (Note that animal care is considered in the Societal Well-Being Indicators.)

In short, how companies, sectors and countries steward food safety and ensure the integrity of the food system is fundamental to protect brands – and can be a differentiator.¹⁰⁵ Food safety leadership is a Canadian food brand-driver.

¹⁰⁰ See, for instance, CFIA’s Policy on Scientific Integrity, principle 6: <https://inspection.canada.ca/science-and-research/our-research-and-publications/scientific-integrity/policy/eng/1561041348653/1561041348909>

¹⁰¹ *Food Safety and You*: <https://www.canada.ca/en/health-canada/services/general-food-safety-tips/food-safety-you.html>; in 2014, The Conference Board of Canada, in collaboration with the University of Guelph’s Food Institute, ranked Canada 1st out of 17 OECD countries: <https://www.canada.ca/en/news/archive/2014/11/canada-food-safety-system-ranked-world-best.html>. Says the Canadian Food Inspection Agency: “The Canadian food supply is one of the safest in the world.” <https://inspection.canada.ca/food-safety-for-consumers/canada-s-food-safety-system/how-we-decide-to-recall-a-food-product/eng/1332206599275/1332207914673>

¹⁰² Canadian Centre for Food Integrity, *2021 Public Trust Research*

¹⁰³ *The role of digital technologies in livestock traceability and trade*, Trade Policy Brief #36, FAO: p. 1: <https://www.fao.org/policy-support/tools-and-publications/resources-details/en/c/1309559/>

¹⁰⁴ <https://www.oie.int/en/what-we-do/global-initiatives/one-health/>

¹⁰⁵ See, for example, General Mills’ views about food safety: “Food safety leadership is a differentiator for General Mills, but not an area of competition.” <https://www.generalmills.com/en/responsibility/food-safety>

THEMES	INDICATORS	SUB-INDICATORS
Food safety	1. Safe food	<ul style="list-style-type: none"> A. Overall safe food supply B. Recalls & safety alerts C. Compliance with maximum limits for contaminants
Health	2. Nutrition information	<ul style="list-style-type: none"> A. Provision of nutrition information B. Mandatory fortification C. Promoting Indigenous country foods
	3. Antimicrobial stewardship	<ul style="list-style-type: none"> A. Antimicrobial use & resistance
	4. Zoonotic disease mitigation	<ul style="list-style-type: none"> A. Risk surveillance: Rate of animal disease outbreaks
Traceability	5. Traceability implementation	<ul style="list-style-type: none"> A. Traceability scope
Labelling	6. Transparency & accuracy	<ul style="list-style-type: none"> A. Labelling of packaged food products B. Health claims C. Food misrepresentation

Figure 5: Food Integrity Indicators summary, Phase 2C

B. Food Integrity themes, indicators, sub-indicators & metrics

THEME | FOOD SAFETY

INDICATOR 1 | Safe food

Mitigating food safety risks is essential to protect the health and safety of consumers as well as to foster a positive national food reputation.

SUB-INDICATORS (and sub-indicator metrics)

A. Overall safe food supply

- a. Percentage of tested imported and domestic food products in compliance with federal regulations (the Product Content Compliance Indicator)
- b. Canadian participation in Codex
- c. Inspections:
 - i. Risk-based inspections and audits
 - ii. Number of food inspectors
 - iii. Number of inspections annually

B. Recalls & safety alerts

- a. Percentage of public warnings for high-risk food recalls that are issued within 24 hours of a recall decision

C. Compliance with maximum limits for contaminants

- a. Maximum residue limits (MRLs) requirements and number of violations annually for:
 - i. Pesticides
 - ii. Veterinary drugs
 - iii. Other contaminants

CONTEXT

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.¹⁰⁶ 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 2021, research noted that 47% of Canadians have concerns with imported foods, down from 2020.¹⁰⁷ Canada's robust approach to food safety, reflected by a comprehensive number of sub-indicators and metrics (below) 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.

- **Agencies to enforce food safety:** Health Canada, the Public Health Agency of Canada, and the Canadian Food Inspection Agency (CFIA) are the nationally 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 establishments and including being part of Canada's sentinel site monitoring network.¹⁰⁸

NOTES ON SELECTED SUB-INDICATORS:

A. OVERALL SAFETY OF CANADA'S FOOD SYSTEM:

- a. **Percentage of tested imported and domestic food products in compliance with federal regulations (Product Content Compliance Indicator):** One key metric informs the public whether food in the Canadian marketplace is safe and accurately represented. The Product Content

¹⁰⁶ Result from Product Content Compliance Indicator, CFIA: InfoBase: <https://www.tbs-sct.gc.ca/ems-sgd/edb-bdd/index-eng.html#infographic/de>

¹⁰⁷ Canadian Centre for Food Integrity, *2020 Public Trust Research*: <https://www.foodintegrity.ca/wp-content/uploads/2020/11/ENG2020Summit-Research-HR-new.pdf>; and 2021 report. Note, this more recent report did not probe on consumer safety concerns in restaurants/grocery stores.

¹⁰⁸ Sentinel sites: <https://www.canada.ca/en/public-health/services/surveillance/foodnet-canada.html>

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 2019-20, this overall food safety indicator indicated that 98.4% of tested foods were safe and accurately represented (with a target set for 95%).¹⁰⁹ (The 2020-21 result has yet to be posted on the Treasury Board website.)

b. Canadian participation in Codex: The Codex Alimentarius enables international food standards, guidelines and codes of practice that contribute to the safety, quality and fairness of global food trade.¹¹⁰ Canada is a member country, and its work is coordinated through the Food Directorate, Health Products and Food Branch of Health Canada and involves multiple government departments including Agriculture and Agri-Food Canada, CFIA, Pest Management Regulatory Agency (PMRA), among others.¹¹¹ This metric reports on the extent to which Canada participates in Codex activities or committees.

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

B. RECALLS:

The number 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 food contaminated with bacteria, viruses, parasites, chemicals, undeclared allergens or from foods contaminated with physical hazards, such as glass or metal fragments.¹¹² This Index does not disaggregate rates of incidence by food type (e.g., meat, fish, vegetables). 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).¹¹³ (Most of the recalls relate to allergen alerts. Each year, more than 4 million Canadians get food poisoning.¹¹⁴ Such incidences include the consequences of food handling practices by consumers, themselves, so that measuring the incidence of foodborne illness is considered out of scope for this Index.) 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.

C. COMPLIANCE WITH MAXIMUM LIMITS FOR CONTAMINANTS:

Health Canada establishes science-based maximum limits to protect against contaminants in our food supply, enforced by CFIA. These can apply to a variety of substances, such as pesticides, natural toxins, veterinary drugs, and other adulterating substances, etc.¹¹⁵ As examples, the PMRA establishes maximum residue limits (MRLs) for pesticides, the Veterinary Drug Directorate sets MRLs for veterinary drugs, and the Food and Drugs Regulations apply maximums

¹⁰⁹ <https://www.tbs-sct.gc.ca/ems-sgd/edb-bdd/index-eng.html#orgs/dept/65/infograph/results>

¹¹⁰ *About Codex Alimentarius*: <https://www.fao.org/fao-who-codexalimentarius/about-codex/en/>

¹¹¹ <https://www.canada.ca/en/health-canada/services/food-nutrition/international-activities/codex-alimentarius.html>

¹¹² <https://inspection.canada.ca/food-safety-for-consumers/canada-s-food-safety-system/how-we-decide-to-recall-a-food-product/eng/1332206599275/1332207914673>

¹¹³ *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>

¹¹⁴ <https://www.canada.ca/en/health-canada/services/food-nutrition/food-safety/food-related-illnesses.html>

¹¹⁵ <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>

for various chemical contaminants (e.g., mycotoxins). 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.¹¹⁶ The PCCI reports on the monitoring of samples that are subjected to MRL testing. The scope includes both pesticides and veterinary drugs.

a. Pesticides: MRLs apply to both Canadian and imported food.¹¹⁷ 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.”¹¹⁸ Therefore, trace amounts of pesticides 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.¹¹⁹ Additionally, non-compliance can occur for a variety of reasons such as missing or misaligned MRLs with the importing country and/or product. (The efficient use and risk management of pesticides is addressed in the Environment Indicators.)

b. Veterinary drugs: As above.

c. Other contaminants: CFIA conducts surveys on potential food hazards, including

year over year comparisons for various contaminants such as microbial hazards and chemical residues.¹²⁰ Results from CFIA’s surveillance programs are published in its food safety testing reports.¹²¹ Data from the CFIA’s National Chemical Residue Monitoring Program verifies compliance of foods to Canadian standards and guidelines for chemical residues and contaminants. This data is captured in PCCI data collection and reporting, as addressed further above.

OTHER RELATED MATTERS (NOT MEASURED):

- **Risk management:** The Safe Food for Canadians Regulations require preventive control plans (PCPs) to be implemented in food processing.¹²² (This may include adoption of Hazard Analysis Critical Control Points (HACCP) assessments.¹²³) 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 and GMOs (genetically modified organisms) are detailed in the *Guidelines for the Safety Assessment of Novel Foods*.¹²⁴ (In that document, Health Canada notes that:

¹¹⁶ <https://www.canada.ca/en/health-canada/services/food-nutrition/food-safety/chemical-contaminants/maximum-levels-chemical-contaminants-foods.html>

¹¹⁷ 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>

¹¹⁸ <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>

¹¹⁹ *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>

¹²⁰ <https://inspection.canada.ca/food-safety-for-industry/food-chemistry-and-microbiology/food-safety-testing-bulletin-and-reports/aflatoxins/eng/1557171015830/1557171066945>

¹²¹ <https://inspection.canada.ca/food-safety-for-industry/food-chemistry-and-microbiology/food-safety-testing-bulletin-and-reports/eng/1453324778043/1453327843364>

¹²² 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

¹²³ 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>

¹²⁴ <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>

“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.¹²⁵ (Note, speed of regulatory approvals for novel foods is addressed by indicator 3 in the Economic Indicators.)

- **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. However, CFIA does consider or investigate food issues where a safety concern is identified, such as from a consumer complaint. (Although consumer trust polling shows a concern with specific issues such as hormones (42% are “very concerned”), pesticides (41%), and genetically modified crops (33%), these levels have decreased year over year. Relative to other issues, consumer concerns about food safety overall are quite low (32% very concerned), indicating a strong level trust in the country’s regulatory system.¹²⁶)

SDG: 2.1, 12.4, 14.1

THEME | HEALTH

INDICATOR 2 | Nutrition information

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

SUB-INDICATORS (and sub-indicator metrics)

A. Provision of nutrition information

- a. Nutrition Facts Table
- b. Canada Food Guide

B. Mandatory fortification

C. Promoting Indigenous country foods

CONTEXT

Regulations stipulate how processed foods must meet minimum standards of nutritional transparency and healthiness.¹²⁷ 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 serving 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.

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.¹²⁸

This indicator is primarily concerned with the national approach taken to promote good disclosure practices and selects three proxies.

¹²⁵ <https://www.canada.ca/en/health-canada/services/food-nutrition/genetically-modified-foods-other-novel-foods.html#a3>

¹²⁶ Canadian Centre for Food Integrity, *2021 Public Trust Research*

¹²⁷ Food and Drugs Regulation, Part B: https://laws-lois.justice.gc.ca/eng/regulations/c.r.c.,_c._870/index.html

¹²⁸ Commentary from Indigenous Works, a project partner

NOTES ON SELECTED SUB-INDICATORS:

A. PROVISION OF NUTRITION INFORMATION:

a. Nutrition Facts Table: This sub-indicator reports on the percentage of the food supply required to carry a mandatory nutrition table.¹²⁹

b. National Food Guide: This sub-indicator reports on the presence of such a national guide and its frequency of update.¹³⁰

B. MANDATORY FORTIFICATION:

Reporting on this sub-indicator is based on the number of products required to be fortified.

C. PROMOTING INDIGENOUS COUNTRY FOODS:

The nutritional needs of Indigenous communities need to respect the true imputed value and use of “country foods”. 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.]

SDG: Not specifically addressed; related to deliver on SDG 2

THEME | HEALTH

INDICATOR 3 | Antimicrobial stewardship

Antimicrobial drugs are important to human and veterinary medicine but given the health threat posed by antimicrobial resistance, attention is rising to reduce antimicrobial use across society and in the agri-food sector.

SUB-INDICATORS (and sub-indicator metrics)

A. Antimicrobial use and resistance

- a. Use
 - i. Aggregated use of medically important antimicrobials (trend)
 - ii. Disaggregated use by farmed animal species

- b. Resistance
 - i. National antimicrobial resistance surveillance (trend)

CONTEXT

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.¹³¹ The Public Health Agency of Canada reports that antimicrobial resistance (AMR) is “worsening” in society at large as serious human infections caused by antimicrobial organisms become more frequent.¹³² 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.¹³³ Since 2014, there has been an 11% decrease in the kilograms of antimicrobials distributed for use in animals, although there was a 6% increase between 2017 and 2018.¹³⁴ In Canada, 95% of

¹²⁹ Nutrition Facts Table: <https://www.canada.ca/en/health-canada/services/understanding-food-labels/nutrition-facts-tables.html>

¹³⁰ National Food Guide: <https://food-guide.canada.ca/en/>

¹³¹ WHO Fact Sheet: *Antimicrobial resistance*, 13 October 2020: <https://www.who.int/news-room/fact-sheets/detail/antimicrobial-resistance>

¹³² 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>

¹³³ 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>

¹³⁴ 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>

animal health product manufacturers report on antimicrobial sales for use in animal agriculture, voluntarily provided by the Canadian Animal Health Institute.¹³⁵ Canadian consumer views about antibiotic use have improved significantly since 2016. Still, some 32% of consumers remain “very concerned” (2021).¹³⁶ This indicator reflects the efforts being taken to steward and track the use of antimicrobials in the sector.

NOTES ON SELECTED SUB-INDICATORS:

A. ANTIMICROBIAL USE AND RESISTANCE:

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.
- The Public Health Agency of Canada and Health Canada designed and developed the online reporting tool, the Veterinary Antimicrobial Sales Reporting (VASR) system.¹³⁷
- 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) provides Canadian veterinarians with information to avoid the risk of residues in meat, milk or eggs when they deem

extra-label antimicrobial use to be medically appropriate.

The outcome of this activity is measured by the following:

a. Use:

- i. **Aggregated use:** Currently, antimicrobial sales data is the primary source of information among producers, not use data.
- ii. **Disaggregated use by livestock species:** As noted above, use data on a national basis is unavailable but such information would be indicative of what is needed to better track antimicrobial use. This metric includes the aquaculture sector.

b. Resistance:

- i. **National antimicrobial resistance surveillance:** Developing this measure will draw from the Public Health Agency of Canada’s Canadian Antimicrobial Resistance Surveillance System (CARSS) and the Canadian Integrated Program for Antimicrobial Resistance Surveillance (CIPARS). CIPARS reports annually on antimicrobial use through questionnaires administered to volunteer sentinel farms for broiler chickens, grower-finisher pigs, and turkeys, on aquaculture and crops as well as 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.¹³⁸ Antimicrobial use surveillance for dairy and feedlot beef cattle exists but on a shorter-term project basis with CIPARS.

SDG: 3.9d

¹³⁵ Canadian Antimicrobial Resistance Surveillance System – Update 2020

¹³⁶ Canadian Centre for Food Integrity, 2021 Public Trust Research

¹³⁷ <https://www.canada.ca/en/public-health/services/antibiotic-antimicrobial-resistance/animals/veterinary-antimicrobial-sales-reporting.html>

¹³⁸ <https://www.canada.ca/en/public-health/services/surveillance/canadian-integrated-program-antimicrobial-resistance-surveillance-cipars/cipars-reports.html>

THEME | HEALTH

INDICATOR 4 | Zoonotic disease mitigation

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.

SUB-INDICATORS (and sub-indicator metrics)

A. Risk surveillance: rate of animal disease outbreaks

- a. Rate of animal disease outbreaks of zoonotic concern

CONTEXT

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 H₁N₁, SARS and Ebola. Today, some 75% of the known emerging infectious diseases in humans worldwide are zoonotic-related.¹³⁹ As biodiversity losses escalate and human-wild animal proximity increases, the risk of zoonotic diseases rises.

The seriousness of the issue underscores a global and Canadian shift, “a new paradigm for animal health”. 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.¹⁴⁰ The Public Health Agency of Canada’s (PHAC) Centre for Food-borne, Environmental and Zoonotic Infectious Diseases¹⁴¹ 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 national identification system for cattle, a program that enables foreign animal disease investigations and responses to natural emergencies.¹⁴² 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.

NOTES ON SELECTED SUB-INDICATOR:

A. RISK SURVEILLANCE

In 2022, the Canadian Food Inspection Agency will be introducing a new high-level indicator on the rate of animal disease outbreaks of zoonotic concern.¹⁴³

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

SDG: 2.1

¹³⁹ UNEP: <https://www.unenvironment.org/news-and-stories/story/coronaviruses-are-they-here-stay>; <https://www.ncbi.nlm.nih.gov/pmc/articles/PMC7919776/>

¹⁴⁰ Canadian Food Inspection Agency: <https://inspection.canada.ca/animal-health/terrestrial-animals/diseases/decision-analysis-tool/eng/1623936151828/1623936322009>

¹⁴¹ PHAC: <https://www.canada.ca/en/public-health/services/infectious-diseases/centre-food-borne-environmental-zoonotic-infectious-diseases.html>

¹⁴² In reference to the Canadian Cattle Identification Agency radio frequency identification indicator. Chain of Custody Requirements, Canadian Roundtable on Sustainable Beef (CRSB): <https://www.crsbcertified.ca/assets/Uploads/Framework-Documents/CRSB-Chain-of-Custody-Requirements-v1.1.pdf>; *Canadian Beef Advantage*, Canadian Cattlemen’s Association: <https://canadabeef.ca/canadian-beef-advantage/> The beef sector’s certification program for biosecurity, animal care and environmental stewardship also helps to meet retailer and consumer quality expectations. (Verified Beef Production Plus program: <http://www.verifiedbeef.ca/about-vbp/what-is-vbp.cfm>)

¹⁴³ 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).

THEME | TRACEABILITY

INDICATOR 5 | Traceability implementation

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.

SUB-INDICATORS (and sub-indicator metrics)

A. Traceability scope

- a. Federally regulated requirement
- b. Sector coverage of traceability requirements:
Percentage of inspected establishments that have implemented preventive food safety control plans

CONTEXT

Traceability is a key food safety tool. 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, per se, traceability enables more timely investigation and recall when warranted. This is vital to help build consumer confidence and enable market access. Canada’s Safe Food for Canadians Regulations (SFCR) requires agri-food sector-wide traceability requirements.¹⁴⁴

NOTES ON SELECTED SUB-INDICATORS:

A. TRACEABILITY SCOPE

This sub-indicator focuses on the role traceability plays in food safety. Traceability has widespread 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.

- a. Federally regulated requirement:** This sub-indicator indicates whether traceability is a

federal requirement as it is under the Safe Foods for Consumers Regulations.¹⁴⁵

b. Sector coverage of traceability requirements:

This sub-indicator elaborates on the above and reports on its breadth of coverage. Traceability is required for the importing, exporting, producing, manufacturing, distributing, storing, and selling food.¹⁴⁶ (Complementary initiatives involving food product and animal health tracking are addressed elsewhere in these indicators.) Traceability compliance data is not reported on, per se, by CFIA but is an implicit part of the licensing approval process under the regulator’s auspices. This sub-indicator denotes the percentage of inspected establishments that have implemented preventive food safety control plans that meet requirements of regulations under the SFCA. (Traceability being one of the new requirements under the SFCA.) CFIA collects and publishes data on the number of licensed establishments inspected annually.

SDG: Not specifically addressed; related to SDG 12

¹⁴⁴ <https://inspection.canada.ca/english/reg/jredirect2.shtml?sfcrsac>; <https://inspection.canada.ca/food-safety-for-industry/toolkit-for-food-businesses/traceability/eng/1427310329573/1427310330167>

¹⁴⁵ <https://inspection.canada.ca/food-safety-for-industry/traceability/traceability/eng/1522294721005/1522294781171>

¹⁴⁶ <https://inspection.canada.ca/food-safety-for-industry/toolkit-for-food-businesses/traceability/eng/1427310329573/1427310330167>

THEME | LABELLING

INDICATOR 6 | Transparency and accuracy

Giving consumers confidence about the food they buy requires assurances about what stands behind the claims being made about the food.

SUB-INDICATORS (and sub-indicator metrics)

A. Labelling of packaged food products

- a. Number of annual labelling violations

B. Health claims

- a. Number of approvals and rejections

C. Food misrepresentation

- a. Number of incidences

CONTEXT

Transparency is key to build trust. While the selected sub-indicators 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.¹⁴⁷

NOTES ON SELECTED SUB-INDICATORS:

A. LABELLING OF PACKAGED FOOD PRODUCTS:

Overall, Canada's approach to food labelling is about having an effective system in place to prevent and minimize a misrepresentation of food products. As noted in indicator 1, during inspection of food production facilities across Canada in 2019–20, 98.4% of tested foods were deemed to be safe and accurately represented.¹⁴⁸ (Other labelling matters are also important to consumers, such as about the nutritional content of foods which is addressed in indicator 2.) 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. Data on labelling violations is available but is not currently being reported on or published.

B. HEALTH CLAIMS:

Currently, 16 health claims have been approved and three have been rejected by Health Canada.¹⁴⁹ Approved claims include fruit and vegetable consumption and the reduced risk of heart disease and oat products and blood cholesterol lowering. Health claims are only approved after a rigorous process of considering scientific evidence which enables such a claim to be used in labelling and advertising. CFIA does not track and report on the number of health label violations, per se. However, the Product Content Compliance Indicator (noted above, Indicator 1) would capture any safety non-compliance or accuracy misrepresentations generally with food; this would include those matters relating generally to food fraud.

C. MISREPRESENTATION:

Intentionally misrepresenting food (often described as “food fraud”) can be major events and have far-reaching impact with food safety, economic, societal, and/or reputational implications.¹⁵⁰ Globally, not a lot is known about the extent of such misrepresentation – the intentional and economically motivated misrepresentation or adulteration of an ingredient, food or beverage. The CFIA estimates that about 10% of all commercially sold food products worldwide is affected by it.¹⁵¹ Still, this has the potential to damage “Brand Canada” in domestic and global markets.¹⁵² CFIA reports that food fraud is most often reported for olive oil, honey, dry spices, fish, fruit juices and organic food products.

¹⁴⁷ 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>

¹⁴⁸ Result from Product Content Compliance Indicator, CFIA

¹⁴⁹ <https://www.canada.ca/en/health-canada/services/food-nutrition/food-labelling/health-claims/assessments.html>

¹⁵⁰ Examples of major food fraud events have involved Chinese milk-contamination (2018) and European horse meat (2013).

¹⁵¹ <https://inspection.canada.ca/food-label-requirements/labelling/consumers/food-fraud/eng/154844446366/1548444516192>

¹⁵² *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.

Recently, CFIA flagged 74 cases of non-compliance with labelling laws, a relatively low number which has remained steady over the past five years.¹⁵³ The reported cases are those of misrepresentation and as such, regulatory violations. The CFIA conducts enhanced surveillance activities to address risks associated with certain foods. This includes risk-based, targeted sampling and testing to determine if a food commodity is accurately represented. Information on these surveillance activities, along with testing results, are compiled into reports and posted on the CFIA website. The agency uses information gathered through these activities to inform its future targeted surveillance activities to help tackle food fraud and protect Canadians. The proposed metric focuses on the number of commodities targeted by CFIA; information that will be available from the reports published by CFIA.

SDG: Not specifically addressed

¹⁵³ Arrell Food Institute: https://arrellfoodinstitute.ca/wp-content/uploads/2021/05/UG_Arrell-Foods_09_Food-Fraud_Final-2.pdf, page 6

III. ECONOMIC INDICATORS

A. About

In 2017, a pivotal report signaled the importance of the agri-food sector to Canada. The Advisory Council on Economic Growth – “the Barton report” – identified this sector as one of a handful with “significant untapped potential” to drive future prosperity.¹⁵⁴ It was an unprecedented call-to-action that elevated the vital role of agri-food in the Canadian economy and it offered a vision statement to rally the sector and policy-makers to leverage the country’s food opportunity, “Canada will become the trusted global leader in safe, nutritious, and sustainable food for the 21st century.”¹⁵⁵ The report made clear the link between an economically successful sector and fulfilling that vision.

Economic sustainability goes hand in hand with delivering on positive social and environmental sustainability outcomes. These indicators reflect the importance of viable and profitable farms and companies, as represented by two themes. First, *financial viability* spans a host of indicators to report on the current financial health of producers and agri-food companies and how Canada is working to improve sector competitiveness. Second, *sustainable growth* acknowledges that this sector (as well as the economy as a whole) is undergoing a transition to a low-carbon economy. Its metrics identify several leading (rather than lagging) sub-indicators to present emerging competitiveness markers for a changing economy.

Worldwide, many agri-food companies are reporting on their progress to deliver on the UN Sustainable Development Goals (SDGs) and to assess environment, social, governance (ESG) factors so to meet public disclosure requirements being set by investors and in capital markets. SDG 12.6 encourages “companies, especially large and transnational companies, to adopt sustainable

practices and to integrate sustainability information into their reporting cycle.” These Economic Indicators do not report on how Canada’s agri-food sector is making progress towards the SDGs or ESG on an individual farm or company basis. Rather, developing Canada’s National Index on Agri-Food Performance adheres to the spirit of this SDG and the “G” in ESG factors, “governance”.¹⁵⁶ This National Index provides transparency about tracking performance against a suite of sustainability priorities.

¹⁵⁴ *Unleashing the Growth Potential of Key Sectors*, Advisory Council on Economic Growth, February 6, 2017: <https://www.budget.gc.ca/aceg-ccce/pdf/key-sectors-secteurs-cles-eng.pdf>. (See also the reference to the 2018 ISED Economic Table for Agri-Food vision statement in these notes, below.)

¹⁵⁵ *Unleashing the Growth Potential of Key Sectors*, Advisory Council on Economic Growth, February 6, 2017: <https://www.budget.gc.ca/aceg-ccce/pdf/key-sectors-secteurs-cles-eng.pdf>

¹⁵⁶ *Core food & agriculture indicators for measuring the private sector’s contribution to the SDGs – Supplementary guidance*, Office of the Chief Statistician, FAO, March 22, 2021; draft: http://assets.fsnforum.fao.org.s3-eu-west-1.amazonaws.com/public/Methodology_note_of_core_indicators_food_and_agriculture_22.03.20_CONSULTATION.pdf

THEMES	INDICATORS	SUB-INDICATORS
Financial viability	1. National economic contribution	A. GDP
		B. Employment
		C. Trade balance
	2. Financial vibrancy & resiliency	A. Financial performance
		B. Investment
		C. Labour
		D. Infrastructure
		E. Supply chain resiliency
	3. Innovation	A. R & D
B. Regulatory approvals		
C. Innovation adoption		
Sustainable growth	4. Sustainable finance	A. Market-based sustainable capital/investment
		B. Government/NGO-sourced climate solutions funding

Figure 6: Economic Indicators summary, Phase 2C

B. Economic themes, indicators, sub-indicators & metrics

THEME | FINANCIAL VIABILITY

INDICATOR 1 | National economic contribution

Metrics demonstrate the importance and robustness of Canada's food system relative to other major economic sectors.

SUB-INDICATORS (and sub-indicator metrics)

A. Gross Domestic Product (GDP)

- Total agri-food sector (\$)
- Relative to other major industries (%)
- Total sector change over time (%)
- By segment: production, processing, retail (\$)
- Provincial GDP break-down – for a-d

B. Employment

- Total agri-food sector
- By segment (production, processing, retail)
- Production as a % of all primary resource sector
- Processing as a % of all manufacturing sector
- Food retail as a % of all retail sector
- By Indigenous identity, employment in agri-food

C. Trade balance

- Total agri-food sector exports (\$)
- Total exports relative to other major Canadian exports (%)
- Relative to global trade (%)
- Trade balance overall
- Trade balance, processing sector (trend)

CONTEXT

Canada's agri-food sector is one of the country's largest employers, employing 1 in 8 jobs. In manufacturing, nearly 20% or 1 in 5 jobs work in the food and beverage processing.¹⁵⁷ More people work in food 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, this indicator demonstrates the overall importance of the sector in terms of its contribution to the Canadian economy. A profitable and successful sector – as represented by a host of economic measures – is key to being more sustainable and improving positive outcomes. (The assessment of sustainability impacts is addressed elsewhere, such as in the Environment Indicators.)

NOTES ON SELECTED SUB-INDICATORS:

Where applicable, "agri-food" includes all "food, fuel, fibre" (also referred to as biofuels/bioproducts), fisheries and aquaculture segments.

A. GROSS DOMESTIC PRODUCTION (GDP):

GDP is a recognized measure of economic production and how fast the economy and sectors are growing. It is also a basis to compare performance against other industries.¹⁵⁸ ("Gross" includes capital consumption costs, that is the costs associated with the depreciation of capital assets, such as buildings, machinery and equipment.¹⁵⁹)

B. EMPLOYMENT:

This sub-indicator measures the relative importance of agri-food as a major employer. (Note that matters relating to workers' well-being and labour shortages are addressed in Societal Well-Being Indicators.)

C. TRADE BALANCE:

This sub-indicator emphasizes 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

¹⁵⁷ Statistics Canada – Annual Employment by Industry (<https://www150.statcan.gc.ca/t1/tbl1/en/cv.action?pid=1410020201>); in Manufacturing (NAICS 31-33); in Food and Beverage Processing (NAICS 311,3121, & 3123) (2020)

¹⁵⁸ Bank of Canada: <https://www.bankofcanada.ca/core-functions/monetary-policy/measuring-economic-growth/>

¹⁵⁹ Statistics Canada: <https://www23.statcan.gc.ca/imdb/p2SV.pl?Function=getSurvey&SDDS=1301>

-17% (most countries are net importers).¹⁶⁰ The trade balance is highlighted for food processing because, in the recent past, this sector experienced consecutive years of trade deficits. 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.¹⁶¹

- **About food imports:** As a trade-dependent and open economy, food imports are important to consumers, processors, and retailers, alike. As such, this Index does not track “import replacement” nor imply that food imports are a negative outcome. Note that national food self-sufficiency is addressed under “food security” in the Societal Well-Being Indicators.

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

¹⁶⁰ *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

¹⁶¹ 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.

THEME | FINANCIAL VIABILITY

INDICATOR 2 | Financial vibrancy & resiliency

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

SUB-INDICATORS (and sub-indicator metrics)

A. Financial performance

- a. Ratio of farm receipts over expenses (net farm income; 3-5 year rolling average)
- b. Farm receipts adjusted for government payments
- c. Farm debt-asset ratio
- d. Return on investment, processing sector

B. Investment

- a. Food processor plant capacity utilization
- b. Investment in machinery & equipment as a % of assets by segment
 - i. Production sector
 - ii. Processing sector
 - iii. Retail sector
- c. Productivity growth, processing sector

C. Labour

- a. Labour productivity
- b. Labour gap
 - i. Production sector
 - ii. Processing sector
 - iii. Retail sector
 - iv. Consolidated view: rural vs. urban

D. Infrastructure

- a. Broadband connections
 - i. Urban
 - ii. Rural
 - iii. Indigenous communities
- b. Rail performance report
- c. Controlled growing environments (trend)
- d. Indigenous clean/bioenergy projects (agriculture/food related)

E. Supply chain resiliency

- a. International supply and demand vulnerabilities

CONTEXT

The 2018 federal Economic Table Report on Agri-Food flagged key issues to enable economic growth, including on labour, infrastructure,

broadband, and investment.¹⁶² This indicator acknowledges the importance of taking such a holistic view of financial well-being but does not necessarily report on the same metrics for each agri-food segment. As well, many macro-economic factors influence financial viability, such as the general business environment, monetary policy, and taxation. These are beyond the scope of this Index. This indicator does not measure risk management, per se; this matter would be captured in how a farm or business performs overall, as represented by the sub-indicators. While global food systems demonstrated their “remarkable” resiliency during COVID-19,¹⁶³ the pandemic has 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.

NOTES ON SELECTED SUB-INDICATORS:

A. FINANCIAL PERFORMANCE:

While individual business-owners can rely on a vast number of metrics to monitor or report on their respective financial performance,¹⁶⁴ this indicator selects several proxies for such measurements. Farm receipts are also adjusted for government payments; this provides insight on the direct payments made to producers (aggregated).

B. INVESTMENT:

Investing in machinery, technology and equipment is regarded as a sector-wide leading indicator of competitiveness.¹⁶⁵ See also Indicator 4, below, 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.¹⁶⁶

C. LABOUR:

Meeting the labour needs of the Canadian economy and the agri-food sector is vital to operate and compete. There are many labour and human resources issues of importance. This indicator must be selective. For instance, helping farms and companies improve their financial position and ensure productivity requires skills development-adoption, a leading sub-indicator. This Indicator also addresses a key issue, the labour gap, the difference between supply and demand, the shortage of Canadians to work. For production agriculture in 2017, alone, the gap was estimated to be 63,000 workers and is forecasted to increase.¹⁶⁷ Similar labour market research and forecasts is available for the food and beverage manufacturing sector.¹⁶⁸ (See also the Societal Well-Being Indicators for more about workers and labour, training, skills development, etc.)

D. INFRASTRUCTURE:

a. Broadband connections: The Canadian Radio-television and Telecommunications Commission (CRTC) reports that 87% of Canada has broadband or mobile connections and some 46% of rural Canada and Indigenous communities are similarly connected, although rural coverage and coverage in Indigenous communities are

¹⁶² 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>

¹⁶³ *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/>

¹⁶⁴ See, for instance, the report from Canadian Roundtable for Sustainable Crops: *The Sustainability Report for Financial Viability*

¹⁶⁵ 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

¹⁶⁶ *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>

¹⁶⁷ Labour Market Information, Canadian Agricultural Human Resource Council: <https://cahrc-ccrha.ca/programs/agrilmi/lmi-framework>

¹⁶⁸ Labour Market Information, Food Processing Skills Canada: <https://fpssc-ctac.com/reports/>

both improving.¹⁶⁹ 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, a matter that is addressed under Indicator 3 on Innovation, ahead.

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 2018.¹⁷⁰ 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.

c. Controlled growing environments: The growth of greenhouses and urban farming infrastructure is an indicator of the interest in producing more nutritious food locally and the investments being made in this space.

d. Indigenous clean/bioenergy projects: Indigenous peoples have an inherent desire to protect and safeguard the environment and this can be a catalyst for Indigenous businesses tied to improving sustainability. This may help to explain the recent rapid growth of clean energy projects across Indigenous communities.¹⁷¹ This sub-indicator tracks such activity.

E. SUPPLY CHAIN RESILIENCY:

Several agri-food segments are particularly vulnerable to international supply disruptions.¹⁷² 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. This sub-indicator reports on international supply and demand vulnerabilities for Canada, including its agri-food sector. In doing so, research work using Statistics Canada data identifies what it describes as two indices; it measures 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. The identified metrics used here would reflect those sub-sectors relevant to agriculture and food. Flagging such issues can help frame food system dialogues on ways to address vulnerability and enhance resiliency.

SDG: 2.3, 9.4

¹⁶⁹ The CRTC notes: "Rural broadband availability of speeds 50Mbps and higher saw the greatest improvements, growing from 43.0% to 65.4%. Broadband availability in Indigenous communities (reserves) also saw significant growth, rising from 32.3% to 46.5%". *Communications Monitoring Report (CMR)*, 2020 (page 103), Canadian Radio-television and Telecommunications Commission (CRTC): <https://crtc.gc.ca/eng/publications/reports/policymonitoring/2020/index.htm>. Note that The CMR measures 50 Mbps download speeds and 50/10 Mbps with an unlimited data cap. The figures used on p. 103 refer to 50 Mbps download only. Rural coverage at 50 Mbps is 65%, while rural coverage at 50/10/unlimited is only 46% (ISED).

¹⁷⁰ <https://www.ic.gc.ca/eic/site/098.nsf/eng/00022.html>

¹⁷¹ In 2019, Indigenous participation has been advanced in some 152 medium-large scale solar, wind, hydro, and bioenergy clean energy projects. It is projected that an additional 50-60 medium-large renewable energy projects with Indigenous participation could come online over the next several years; Lumos Clean Energy Advisors, Powering Reconciliation, A Survey of Indigenous Participation in Canada's Growing Clean Energy Economy: <https://indigenoucleanenergy.com/wp-content/uploads/2017/10/Powering-Reconciliation-A-Survey-of-Indigenous-Participation-in-Canadas-Growing-Clean-Energy-Economy.pdf>

¹⁷² *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>

THEME | FINANCIAL VIABILITY

INDICATOR 3 | Innovation

Innovation is key to competitiveness, including boosting productivity and adding value, and improving environmental performance.

SUB-INDICATORS (and sub-indicator metrics)

A. Research & Development (R&D)

- a. Public-sector R&D spending (directed to agri-food, \$; trend)
 - i. Ratio requirement for public-private contributions
- b. Private sector R&D spending (national/aggregated)
 - i. \$; trend
 - ii. R&D intensity
- c. Published Canadian agri-food academic papers (number; trend)

B. Regulatory approvals

- a. Administrative burden (federal):
 - i. For departments relevant to production
 - ii. For departments relevant to processing
 - iii. For departments relevant to retail
- b. Novel foods approval (timeline; trend)
- c. Crop protection products approval (timeline; trend)

C. Innovation adoption

- a. Production agriculture innovation (survey metrics)
- b. Supporting Indigenous entrepreneurship and businesses
 - i. Number of Indigenous communities with agri-food strategies
 - ii. Growth of Indigenous clean energy projects (agriculture-linked)
 - iii. Number of capital pools dedicated to Indigenous agri-food
- c. Other sectors (when information becomes available)

CONTEXT

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.”¹⁷³ 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.

NOTES ON SELECTED SUB-INDICATORS:

A. 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 2017.¹⁷⁴ Documenting the total amount of agri-food innovation spending, which can span many government programs, informs one sub-indicator. Public sector R&D spending is also informed by the ratio required to allocate those funds.

A second sub-indicator is about industry R&D. This includes expenditures from the Business Expenditure on Research and Development (BERD) program.¹⁷⁵ Measuring industry R&D intensity (associating sector R&D to sales) offers additional insight. As well, capturing academic research broadens the perspective although scientific advancement (and citations) does not necessarily translate into new businesses or products (i.e., commercialization outcomes). However, scientific research is a bedrock activity for enabling future innovation and contributing to more sustainably outcomes.

B. REGULATORY APPROVALS:

a. Administrative burden: The federal government’s Administrative Burden Baseline establishes metrics of federal regulations and

¹⁷³ Levers of Change, UN Food Systems Summit: <https://www.un.org/en/food-systems-summit/levers-of-change>

¹⁷⁴ ISED: Indicators and targets: Growing business investment in research and development

¹⁷⁵ <https://www.ic.gc.ca/eic/site/062.nsf/eng/00088.html>

associated forms that impose administrative burden on business.¹⁷⁶ This sub-indicator reports on the incidence and trendline to address such matters for departments relevant to primary production and beyond the farm gate, notably for food processing and retail.

b. Novel foods: Canada's regulatory system is widely held up as a significant contributor of consumer and marketplace confidence in the food system (see, for instance, the reliance on the regulatory system to demonstrate food safety in the Food Integrity Indicators). 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. Speed of decision-making and regulatory burden are frequently identified issues; however, measuring these are inherently challenging as is a lack of data. Two proxies are selected to address this matter: the speed to approve novel foods important to food manufacturers, notably food additives assessed by Health Canada¹⁷⁷ and, timely science-based regulatory approvals of crop protection products. It is acknowledged that approving plants with novel traits represent one type of approval (access to biotechnology) that is only applied to a handful of crops.

c. Crop protection products: In the future, other metrics could be identified to gauge regulatory approvals, such as for both new and re-evaluated crop protection products. If the availability of appropriate data is recognized, accessing continued pesticide availability through gains and losses of active ingredients and of crop-pest combinations on agricultural pesticide labels could be such candidates. This metric could track access to such technology based on regulatory decisions made by the Pest Management Regulatory Agency.

C. 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 sub-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.

a. Production agriculture innovation: Available survey findings include insights on improved crop products, improved livestock or poultry products and production and management practices; some perspectives are available on advanced technologies.¹⁷⁸

b. Supporting Indigenous entrepreneurship and businesses: The formation and number of dedicated institutions to support Indigenous agriculture and agri-food activity could be measured. Such support 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, a suggested metric. This indicator also suggests marking progress on the growth of Indigenous clean energy projects linked to agriculture and the availability of capital pools dedicated to Indigenous agriculture/agri-food businesses. These latter outcomes may become suitable metrics in the future once data becomes available.

c. Other, to be developed: Given the importance of advanced technology-adoption to a sustainable and economically successful food system, the following section offers what could be used, ultimately, to inform future metrics development.

¹⁷⁶ <https://www.canada.ca/en/government/system/laws/developing-improving-federal-regulations/requirements-developing-managing-reviewing-regulations/administrative-burden-baseline.html>

¹⁷⁷ Health Canada guidance: <https://www.canada.ca/en/health-canada/services/food-nutrition/reports-publications/guide-preparation-submissions-food-additives.html>

¹⁷⁸ *Farm Management Survey and Farm Financial Survey*, Statistica Canada

- **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.¹⁷⁹ Insights on such activity remains survey-based and reveals modest adoption rates.¹⁸⁰ (Note, documenting the penetration rate of broadband is addressed in Indicator 2, above.)
- **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,¹⁸¹ and improve climate change resilience.¹⁸² Such technologies also create new value-added opportunities, such as improving the nutritional quality of foods (e.g., through biofortification).¹⁸³
- **Clean technology adoption:** The adoption of clean/green technologies across the agri-food sector can improve productivity and reduce greenhouse gas (GHG) emissions.¹⁸⁴ The use of on-farm bioenergy (biogas) and biorefinery adoption, for instance, demonstrates how “waste” can become a source of new value. Documenting such *circular economy* activity faces a lack of data. (Measuring food waste flows, recycling matters, and GHG emissions are addressed in the Environment Indicators.)

SDG: 2.4, 2.5/2.A, 9.4, 9.5, 9.5/9.A

THEME | SUSTAINABLE GROWTH

INDICATOR 4 | Sustainable finance

Mobilizing capital is a catalyst to meet global sustainability goals, minimize risks, mitigate climate change and create new economic opportunities.

SUB-INDICATORS (and sub-indicator metrics)

A. Market-based sustainable capital/investment

- a. Reported volume of uptake in Canada (\$; trend)

B. Government & NGO-sourced “climate solutions” funding

- a. Availability in Canada (\$; trend)
- b. Uptake (%)

CONTEXT

Capital flows are vital to enable the transition to a low-carbon economy, a development described as “sustainable finance”.¹⁸⁵ Leveraging such capital is, therefore, a key leading indicator of future value for the agri-food sector. This reflects a broader national priority. Canada launched the Sustainable Finance Action Council (2021) to “support the growth of a strong, well-functioning, sustainable finance market”. Doing so “is a critical part of Canada’s work to meet its 2030 Paris target, achieve net-zero emissions by 2050, and ensure that Canada continues to have a prosperous economy.”¹⁸⁶ This sub-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.

¹⁷⁹ The Economic Table Report for Agri-Food proposes that Canada should double private-sector R&D expenditures and achieve 100% broadband coverage with 100 Mbps download and 50 Mbps upload speeds by 2025.

¹⁸⁰ In one finding, for instance, agriculture’s digital intensification performance is low; <https://www150.statcan.gc.ca/n1/daily-quotidien/210224/dq210224c-eng.htm>

¹⁸¹ *Scientific achievements in agriculture*; AAFC: <https://agriculture.canada.ca/en/news-agriculture-and-agri-food-canada/scientific-achievements-agriculture>

¹⁸² IPCC. 2019. Climate Change and Land: <https://www.ipcc.ch/srccl/chapter/chapter-5/>, table 5.1

¹⁸³ <https://www.topcropmanager.com/biofortification-of-pulses-could-make-canada-a-preferred-supplier-19905/>

¹⁸⁴ 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

¹⁸⁵ <https://www.canada.ca/en/environment-climate-change/services/climate-change/expert-panel-sustainable-finance.html>

¹⁸⁶ <https://www.canada.ca/en/department-finance/news/2021/05/canada-launches-sustainable-finance-action-council.html>

OTHER RELATED MATTERS:

- **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, currently assign a sub-indicator to carbon market activity.
- **Border carbon adjustments (BCAs):** BCAs are a global work in progress. BCAs are about reconciling a situation where “domestic companies incurring carbon costs may compete with foreign businesses that do not face equivalent carbon costs.”¹⁸⁷ BCAs could become a tool to ensure that “domestic goods face similar carbon costs to foreign goods in export markets by rebating carbon costs where applicable.”¹⁸⁸ 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. Corporations are reporting on ESG, including in their supply chains.¹⁸⁹ However, there are a vast array of ESG metrics in use, measures are not standardized, and ESG-adoption remains uneven. As

well, ESG-backed financial instruments (e.g., green bonds) are rather nascent as is extending financing terms generally based on improved performance on greenhouse gas emissions, protecting biodiversity and other ESG outcomes.¹⁹⁰ As such, a specifically labelled ESG metric is not proposed at this time, although ESG factors have influenced this Index.

NOTES ON SELECTED SUB-INDICATORS:

A. MARKET-BASED SUSTAINABLE CAPITAL/ INVESTMENT:

Market-based or “private” sources include financial institutions and publicly reported sustainable investments across the Canadian economy. While being able to disaggregate this number for the agri-food sector is unlikely, this number is indicative of the trend and availability of sustainable capital.

It is acknowledged that individual agri-business companies are starting to fund programs to finance sustainable agriculture, such as paying farmer-customers to sequester carbon and reduce on-farm environmental impacts.¹⁹¹ Given the challenging of documenting such proprietary activity, such activity is not included in this metric.

B. GOVERNMENT & NGO-SOURCED “CLIMATE SOLUTIONS” FUNDING:

Public-sources of capital include governments, Crown Agencies, and publicly funded NGOs. (One example of federal funding is Agricultural Climate Solutions, a \$200 million three-year

¹⁸⁷ <https://www.canada.ca/en/department-finance/programs/consultations/2021/border-carbon-adjustments/exploring-border-carbon-adjustments-canada.html>

¹⁸⁸ <https://www.canada.ca/en/department-finance/programs/consultations/2021/border-carbon-adjustments/exploring-border-carbon-adjustments-canada.html>

¹⁸⁹ *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

¹⁹⁰ *Maple Leaf Foods became the first Canadian company to receive sustainability-linked credit terms*, BMO Press Release, Dec. 11, 2019

¹⁹¹ See the mention of companies paying for environmental services in *The Business Case for Establishing the National Index on Agri-Food Performance*, June 2021, footnote 28, p. 20. Bayer pays farmers (currently available through its pilot in the U.S. and Brazil) for verifying cover crop and no-till adoption. Improving soil health is good to increase crop yields, it meets company sustainability objectives and carbon credits generated from these activities could be sold to organizations to meet others’ sustainability goals (*Bayer Carbon Program*, FAQs). Nutrien announced a program to provide monetary credits to producers to reduce scope 3 emissions (*2021 Environmental, Social, Governance (ESG) Report*). Plus, McDonald’s and Cargill, among others involved in the beef value chain, financial reward a quarterly premium per head to Canadian beef producers for supplying Certified Sustainable Beef. (see also *The Business Case*, footnote 27.) Since that report was written, Corteva announced a scheme to pay farmers for adopting climate-friendly practices and reduce environmental impacts (*Corteva Carbon Initiative*). Other companies are encouraging producers to adopt regenerative agriculture practices.

fund for farmers to adopt best management practices to store carbon and reduce GHGs.¹⁹²⁾ “Uptake” is measured so discern any differential between funding that is announced and funding that is subscribed to.

SDG: 8.2, 8.4

¹⁹² *Agricultural Climate Solutions, On-Farm Climate-Action Fund*, Agriculture and Agri-Food Canada: https://agriculture.canada.ca/en/agriculture-and-environment/agricultural-climate-solutions?utm_source=ext_web&utm_medium=vanity_url&utm_campaign=not_applicable&utm_content=2021-06-29_01

IV. SOCIETAL WELL-BEING INDICATORS

A. About

A sustainable and trusted food system must deliver “broad-based benefits for society.”¹⁹³

Despite being one of the wealthiest nations in the world, over 5 million people living in Canada struggle with food insecurity.¹⁹⁴ Perhaps more than ever, Canadian society at large is awakening to the treatment and human rights of Indigenous peoples and other marginalized populations. In global and national conversations, creating a just food system is the goal and is underscored by the right to food.¹⁹⁵ This is informing ways to redress food insecurity and give people equal access to economic opportunities in the sector, among other interventions. COVID-19 has also brought attention to the welfare of farm workers, in food processing and in consumer-facing roles, such as at grocery stores and restaurants.

The agri-food sector, like other segments across the economy, is competing for talent and labour. How this sector attracts and retains people and the speed with which it enables equal opportunities and benefits for women and other underrepresented people is fundamental to the sector’s future success.¹⁹⁶ This segment presents several metrics to track the state and progress of fulfilling this priority.

Across the private and public sectors, reporting on equity, diversity and inclusion practices is generally increasing. Capital markets are playing a role here as well. Investors are assessing how companies and their supply chains disclose so-called non-financial risks based on environmental, social, governance factors. How

companies treat people – the “S” of ESG – is gaining more attention.¹⁹⁷ Others are tracking performance, too. The World Benchmarking Alliance’s new Food and Agriculture Index tracks sustainability performance of the world’s largest food companies. It counts more indicators for social inclusion than environmental and nutritional indicators combined, although they are equally weighted.¹⁹⁸ Producers and processors are being asked to disclose their practices in order to get access to some market channels (such as getting onto a grocery shelf) or to access some markets (such as to the EU).¹⁹⁹

As a benchmark of Canada’s agri-food sustainability, this Index presents a number of societal priorities (and humane animal care is included here) that fall under the domain of the sector, itself. Improving the well-being of people spans the gamut of agri-food, economic, health, education, social and environmental sectors and policies. It is acknowledged that these disclosures represent only one sector’s actions as part of a broader effort to improve the well-being of Canadian society.

¹⁹³ Referencing the FAO’s definition of sustainable food. *The Code of Conduct for Responsible Food Business and Marketing Practices*, EU, June 2021: https://ec.europa.eu/food/system/files/2021-06/f2f_sfpd_coc_final_en.pdf.

¹⁹⁴ <https://www150.statcan.gc.ca/n1/pub/45-28-0001/2020001/article/00039-eng.htm>

¹⁹⁵ *Briefing Note 1 of 5 – 5 Big Ideas for a Better Food System A Proposal on A Food Policy for Canada*, Food Secure Canada: https://foodsecurecanada.org/sites/foodsecurecanada.org/files/briefing_notes_right_to_food_fsc5bigideas_072017_2.pdf

¹⁹⁶ Attracting people to the sector is a competitiveness issue. RBC indicates, for instance, that hundreds of thousands of people are needed to enable the transition to a low-carbon economy. *The \$2 Trillion Transition: Canada’s Road to Net Zero* (2021): <https://thoughtleadership.rbc.com/the-2-trillion-transition/>

¹⁹⁷ “The “S” in ESG,” *Forbes*, April 6, 2021: <https://www.forbes.com/sites/guidehouse/2021/04/06/the-s-in-esg/?sh=173b05b73839>

¹⁹⁸ *Methodology for the Food and Agriculture Benchmark: A roadmap for corporate action*, 24 February 2021, World Benchmarking Alliance: <https://www.worldbenchmarkingalliance.org/research/food-and-agriculture-methodology/>

¹⁹⁹ Producers and companies are being asked to report on the externalities they generate, that is the impact food production has on people and the planet. Ideally, sustainability is about moving to a state that constantly seeks to minimize externalities.

THEMES	INDICATORS	SUB-INDICATORS
Workforce	1. Decent work for people	A. Workplace mental health
		B. Workplace safety
		C. Inclusive & progressive workplace
		D. Attractiveness of sector as a place to work
Food security	2. Access to nutritious foods	A. Monitoring food insecurity: food affordability
		B. Increasing access
Farm animals	3. Animal care	A. Farmed animal codes of conduct

Figure 7: Societal Well-Being Indicators summary, Phase 2C

B. Societal Well-Being themes, indicators, sub-indicators & metrics

THEME | WORKFORCE

INDICATOR 1 | Decent work for people

The decency of work for people who work across the food system is essential to ensure food production and supply every day.

SUB-INDICATORS (and sub-indicator metrics)

A. Workplace mental health

- a. Producers
- b. Business owners (post-farm gate)
- c. Employees

B. Workplace safety

- a. Accidents, annually & trend
 - i. Production sector
 - ii. Processing sector
- b. Fatalities, annually & trend
 - i. Production sector
 - ii. Processing sector

C. Inclusive and progressive workplace

- a. Fairly treating Temporary Foreign Workers:
 - i. Compliance rate: requirements & trend
- b. Women in senior management positions/owners: processing / food retail sectors (%; trend)
- c. Women in senior farm ownership positions/ (co)ownership
- d. Women and underrepresented groups on sector association boards
- e. Indigenous employment in sector (%; trend)
- f. Gender wage parity

D. Attractiveness of sector as a place to work

- a. Exposing young students: Agriculture in the Classroom engagement annually
 - i. Rural & urban trends
- b. Engaging youth & young farmers: 4-H annual participation (trend; by gender)
- c. Institutional education & training
 - i. Availability of academic food processing & food service training programs
 1. By program type
 2. By province
 - ii. Enrollment in post-secondary programs
 1. Primary production
 2. Food processing / food service

CONTEXT

This indicator is about 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.²⁰⁰ 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.

(This indicator is linked to several others: The financial and economic contribution that the sector makes to Canada's economy is addressed in the Economic Indicators. As well, given the importance of broadband connectivity to the economic prospects of the sector, this matter is specifically addressed by the Economic Indicators. In addition, a clean environment is vital for health and well-being; environmental measures are addressed by the Environment Indicators.)

NOTES ON SELECTED SUB-INDICATORS:

A. 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. This can be particularly acute for women and young farmers, according to a recent survey of the Canadian farming population.²⁰¹ Initiatives are underway to address this situation, including a government project to develop more data on

²⁰⁰ <https://www.casa-acsa.ca/en/canadian-agricultural-safety-association/>

²⁰¹ Released at the outset of the pandemic (which therefore does not include its full impact on people), some 62% of farmers have mid-stress scores and 14% with high stress. *Healthy Minds, Healthy Farms, Exploring the Connection between Mental Health and Farm Business Management, Final Report*, May 2020, Farm Management Canada: <https://fmc-gac.com/mental-health/>

farmer and rural mental health.²⁰²

B. 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.²⁰³ Better outcomes are likely attributable to safer best practices adoption, injury prevention promotion, improved emergency planning, etc.²⁰⁴

C. INCLUSIVE AND PROGRESSIVE WORKPLACE:

Ensuring that under-represented population segments can participate in and contribute to the success of the sector is important.²⁰⁵ This 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.²⁰⁶ The average Canadian wage gap between men and women is calculated to favour men by nearly 30%.²⁰⁷ Including more women on association boards reflects a global and Canadian trend to improve corporate good governance practices.²⁰⁸ 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. It is recognized that society is increasingly expecting equitable treatment of underrepresented populations.²⁰⁹

D. 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.²¹⁰ Selected sub-indicators are proxies for how the agri-food sector exposes young people to 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 sub-indicator.

○ **Institutional education and training:** A diversity of institutions across the country offer a broad variety of programs to educate, train, mentor and offer apprenticeships.²¹¹

²⁰² 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

²⁰³ <https://www.casa-acsa.ca/en/cair/>

²⁰⁴ See more on this matter from the Canadian Agriculture Safety Association: <https://www.casa-acsa.ca/en/cair/>

²⁰⁵ On average, in 2019, some 2% of paid positions in food and beverage manufacturers were of First Nations, Inuit or Métis individuals and 9% filled by recent permanent immigrants. *Labour Market Information Survey, 2020*, Food Processing Skills Canada, page 21

²⁰⁶ Ontario Federation of Agriculture, OFA Viewpoint (2021): <https://ofa.on.ca/wp-content/uploads/2021/03/Women-in-Ag-Statistics-Messaging.pdf>

²⁰⁷ See 3.7.2 in Charlebois, S.; Hill, A.; Vezeau, J.; Hunsberger, L.; Johnston, M.; Music, J. Assessing a Nation's Competitiveness in Global Food Innovation: Creating a Global Food Innovation Index. *World* 2022, 3, 27–66. <https://doi.org/10.3390/world3010002>

²⁰⁸ 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>

²⁰⁹ The Canadian government is embracing a “gender-based analysis plus” (GBA+) method to assess wages and barriers in terms of addressing poverty. <https://www.canada.ca/en/employment-social-development/programs/poverty-reduction/reports/strategy.html#h2.13>

²¹⁰ 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

²¹¹ 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

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.

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

THEME | FOOD SECURITY

INDICATOR 2 | Access to nutritious food

Improving food security involves social, health, education and economic policy and includes working with Indigenous People 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.

SUB-INDICATORS (and sub-indicator metrics)

A. Monitoring food insecurity: food affordability

- a. Food price changes (year-over-year)
- b. Food insecure households (national, trend)
 - i. By gender
 - ii. By age
 - iii. By geographic region
 - iv. By First Nations, Métis, Inuit Identity
 - v. By race

B. Increasing access

- a. Northern/remote communities: Nutrition North Canada
- b. Prevalence of federal, provincial & municipal food strategies (number; date of implementation; trend)
- c. Indigenous well-being:
 - i. Food sovereignty or food security strategies
 - ii. Traditional connection with food
- d. Temporary Foreign Workers' income (trend)

CONTEXT

A sustainable food system is about ensuring food security.²¹² 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.²¹³ One in seven Canadians are food insecure.²¹⁴ 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.

²¹² *Sustainable food systems: Concept and framework*, FAO: <https://www.fao.org/3/ca2079en/CA2079EN.pdf>

²¹³ *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.

²¹⁴ "Almost one in seven (14.6%) Canadians indicated that they lived in a household where there was food insecurity in the past 30 days"; <https://www150.statcan.gc.ca/n1/pub/45-28-0001/2020001/article/00039-eng.htm>

The terms *household food insecurity* and *food security* are often used interchangeably but refer to different concepts. *Food security* is a broader concept than *food insecurity* and is an outcome of a functioning food system that promotes social and environmental sustainability.

- **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 two issues, respectively, for Canadians are the cost of food (61%) and keeping healthy food affordable (55%).²¹⁵ (Concerns with climate change rank third.)
- **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.²¹⁶

OTHER RELATED MATTERS:

- **Sustainable food:** It is acknowledged that there is a global dialogue about what is a "healthy and sustainable diet."²¹⁷ This Index as a whole is intended to portray the overall sustainability of the Canadian agri-food system, 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.²¹⁸
- **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, etc. These important matters are more relevant to social, health and incomes safety net policy considerations.

NOTES ON SELECTED SUB-INDICATORS:

A. MONITORING FOOD INSECURITY:

These metrics report on the affordability of food.

a. Food price changes: While Canadians pay comparatively less for food, historically and relative to other countries,²¹⁹ the affordability issue affects people and populations differently. The Consumer Price Index reports on changes in food prices and observes impacts for commodities and foodstuffs.²²⁰

b. Food insecure households: SDG 2.1 seeks to end hunger and ensure food access by

²¹⁵ Canadian Centre for Food Integrity public trust research, 2021.

²¹⁶ Statistics Canada's Household Food Survey Module does not measure these aspects of food security.

²¹⁷ 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*

²¹⁸ 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>

²¹⁹ See, for instance, <https://www.cbc.ca/news/canada/food-eats-up-less-of-our-spending-but-costs-us-more-1.1054574>

²²⁰ <https://www150.statcan.gc.ca/n1/daily-quotidien/211215/dq211215a-eng.htm>

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 Aboriginal, Métis, Inuit Identity.²²¹ This is also the sub-indicator that would be capture “affordability” of food, another significant aspect of the food insecurity issue.

B. INCREASING ACCESS:

a. Nutrition North Canada: This federal subsidy program enables access to food directly from registered grocers and suppliers in Canada’s North. 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.²²²

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, and municipal jurisdictions. Tracking the prevalence of food strategies by jurisdictions is 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. These strategies can include improving access to nutritious foods and encouraging healthy eating habits, among many consumer-facing objectives.

c. 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 metrics are foundational to enable Indigenous people to better measure their relative performance in the sector and enable their progress to improve well-being.

i. Food sovereignty or food security

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

ii. 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.]

SDG: 2.1

²²¹ The Government of Canada reports food insecurity prevalence using the Household Food Insecurity Survey Module (HFSSM).

²²² <https://www.nutritionnorthcanada.gc.ca/eng/1415647255632/1415647437113>

THEME | FARM ANIMALS

INDICATOR 3 | Animal care

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.

SUB-INDICATORS (and sub-indicator metrics)

A. Farmed animal codes of practice

- a. Number of codes of practice for the care and handling of major farm animal species

CONTEXT

The World Organization for Animal Health (OIE), 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.”²²³ The OIE 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.²²⁴ This indicator presents the Canadian agri-food sector’s approach through the development of farmed animal responsible care codes.

NOTES ON SUB-INDICATOR:

A. FARMED ANIMAL CODES OF PRACTICE:

Supported by a comprehensive set of federal and provincial regulations, Canada’s National Farm Animal Care Council (NFACC) has published 15 different codes of practice for farm animal care, covering all major and minor farm animal species in the country (e.g., beef cattle, dairy cattle, chickens, sheep, goats, farmed salmonids) as well as a code for transportation.²²⁵ The existence of the NFACC codes therefore plays a key role promoting a common understanding of animal care requirements across the country, are used by provincial regulators and enforcement authorities, and provide a basis for on-farm assessment programs. Emphasizing a science-informed and consensus-based approach, NFACC brings diverse stakeholders together to set animal care standards, including animal agriculture industry groups, animal welfare advocates, governments, scientists, veterinarians, and the food industry.

Many farm animal commodity groups have taken the NFACC’s code requirements and created industry animal care assessments programs to validate compliance with its stated practices. For instance, the animal care module in the dairy sector’s program validates that all Dairy Code of Practice requirements are implemented on farm and validation is mandatory.²²⁶ The chicken industry has taken the same approach; a producer cannot sell chicken to a Canadian processor unless certified on the Animal Care Program. Matters of non-compliance, enforcement and assurance for the codes are handled by each respective sector.²²⁷

The Canadian Food Inspection Agency (CFIA) tracks and reports on the Administrative

²²³ *Animal welfare*, OIE: <https://www.oie.int/en/what-we-do/animal-health-and-welfare/animal-welfare/>

²²⁴ 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 total meat production; FAO: <http://www.fao.org/3/CA1201EN/ca1201en.pdf>, p. 101

²²⁵ National Farm Animal Care Council: <https://www.nfacc.ca/code-development-process>

²²⁶ *Code of Practice for the Care and Handling of Dairy Cattle, ProAction*, Dairy Farmers of Canada: <https://www.dairyfarmers.ca/proaction/resources/animal-care>

²²⁷ For instance, chicken farmers are audited annually, and measures of enforcement vary by province (for example, monetary penalties, reductions in allocation, or license suspensions can be used for any issues of non-compliance. *Raised by a Canadian Farmer Animal Care Program*, Chicken Farmers of Canada: <https://www.chickenfarmers.ca/high-animal-care-standards/>

Monetary Penalties (AMPs) issued for violations of federal acts and regulations enforced by the CFIA including the Health of Animals Act and Regulations.²²⁸

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

SDGs: Farm animals are not explicitly included in the SDGs, but animal agriculture forms an implicit part of sustainable food production systems.²²⁹

²²⁸ <https://inspection.canada.ca/about-cfia/transparency/regulatory-transparency-and-openness/compliance-and-enforcement/amps/fact-sheet/eng/1547233099837/1547233100149>

²²⁹ *World Livestock, Transforming the livestock sector through the Sustainable Development Goals*, FAO, 2018: <http://www.fao.org/3/CA1201EN/ca1201en.pdf>

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4. ACKNOWLEDGEMENTS

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- Enabling the PIC application, Project co-leads: Global Institute for Food Security and Pulse Canada
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- Substantive in-kind support by all partners (see lists: partners and partner working groups)

II. STEERING GROUP

Canadian Federation of Agriculture
Canadian Produce Marketing Association
Canadian Roundtable for Sustainable Beef
Chicken Farmers of Canada
CropLife Canada
Fisheries Council of Canada
Fruit & Vegetable Growers of Canada
Global Institute for Food Security
Pulse Canada
Agriculture and Agri-Food Canada, *ex-officio*
Environment and Climate Change Canada, *ex-officio*
Statistics Canada, *ex-officio*

III. PROJECT MANAGEMENT

David McInnes, Coordinator, National Index on Agri-Food Performance; and Principal, DMci Strategies
Sharon Savoie, Financial Administrative Assistant

IV. PARTNERS

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Alberta Biodiversity Monitoring Institute, University of
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Alltech
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A&W Food Services of Canada Inc.
Bayer Crop Science
Bioenterprise Canada
Birds Canada
BMO
Bonnefield Financial Inc.
Canada Organic Trade Association
Canadian Agricultural Human Resource Council
Canadian Agri-Food Sustainability Initiative (CASI)
Canadian Animal Health Institute
Canadian Aquaculture Industry Alliance
Canadian Canola Growers Association
Canadian Federation of Agriculture
Canadian Food Innovation Network
Canadian Forage & Grasslands Association
Canadian Produce Marketing Association
Canadian Roundtable for Sustainable Beef (CRSB)
Canadian Roundtable for Sustainable Crops (CRSC)
Canadian Supply Chain Food Safety Coalition
Canadian Wildlife Federation
Catalyst Agri-Innovations Society
Cereals Canada
Chicken Farmers of Canada
Cleanfarms
Le Conseil de la transformation alimentaire du Québec
(CTAQ)
Corteva
CropLife Canada
Danone
Dean's Council – Agriculture, Food & Veterinary
Medicine
Ducks Unlimited Canada
EggTech Ltd.
Enterprise Machine Intelligence & Learning Initiative
(EMILI)
Environment & Climate Change Canada
Faculty of Health Sciences, University of Ottawa
Farm Credit Canada
Federated Co-operatives Limited
Fertilizer Canada
Field to Market Canada
Fisheries Council of Canada
Food & Beverage Canada
Food & Beverage Manitoba
Food Banks of Canada
Food, Health & Consumer Products Canada
Food Processing Skills Canada
Fruit & Vegetable Growers of Canada
Gaia Protein
Genome Alberta
Global Food Lead
Global Institute for Food Security
Greenfield Global
Indigenous Works
Innovation, Science & Economic Development Canada
Lassonde
Loblaw Companies Ltd.
Manitoba Agriculture & Resource Development
Maple Leaf Foods
McGill University (Desautels Faculty of Management;
Centre for Convergence of Health & Economics)
Ministère de l'Agriculture, des Pêcheries et de
l'Alimentation, Québec
Ministry of Agriculture, Government of Saskatchewan
National Research Council Canada
National Zero Waste Council, an initiative of
Metro Vancouver
Nutrien
Olds College (Alberta)
Ontario Cattle Feeders' Association & Ontario
Corn-Fed Beef
Ontario Ministry of Agriculture, Food & Rural Affairs
Osler Hoskin & Harcourt LLP
Plant Nutrition Canada
Protein Consortium (Manitoba)
Protein Industries Canada
Pulse Canada
Regeneration Canada
Retail Council of Canada
Saskatchewan Flax Development Commission Board
Second Harvest
Smart Cities (Guelph-Wellington)
Smart Prosperity Initiative, University of Ottawa
Standards Council of Canada
Statistics Canada
Syngenta Canada
Telus Agriculture
TrustBIX Inc.
Vineland Research & Innovation Centre

V. PARTNER WORKING GROUPS (CO-LEADS)

For the complete list of members, refer to website: agrifoodindex.ca. (Other partners and invited stakeholders attended working group discussions, not included.)

Project 1A: Environment Indicators working group

Keith Currie (Canadian Federation of Agriculture),
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Paul Thoroughgood (Ducks Unlimited Canada), co-lead

Project 1B: Food Integrity Indicators working group

Monica Hadarits (Canadian Roundtable for Sustainable
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Jane Proctor (Canadian Produce Marketing
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Project 1C: Economic Indicators working group

Sav Bellissimo (Federated Co-operatives), co-lead
Susie Miller (Canadian Roundtable for Sustainable
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Project 1D: Societal Well-Being Indicators working group

Rebecca Lee (Fruit & Vegetable Growers of Canada),
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co-lead

Project 1E: Academic review working group

Roger Larson (Deans Council - Agriculture, Food and
Veterinary Medicine), co-lead
Rene Van Acker / Alice Raine (University of Guelph),
co-lead

Project 2: Data platforms working group

Dan Lussier (Enterprise Machine Intelligence & Learning
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Deb Wilson (TrustBix), co-lead

Project 3A & 3B: Global organizations' reviews & global governance working group

Martin Beaulieu (Statistics Canada), co-lead
Jennifer Lambert (Loblaw Companies), co-lead

Project 4: Policy ecosystem working group

Sylvie Cloutier (Le Conseil de la transformation alimen-
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Brian Treacy (Bayer), co-lead

Project 5: Consumer trust working group

Aimee Rae (Canadian Aquaculture Industry Alliance),
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Justine Taylor (CropLife Canada), co-lead

Project 6: Environmental, social, and governance (ESG) factors working group

Andrea Gruza (Bonfield Financial), co-lead
Pierre Turner (Lassonde), co-lead
John Uhren (BMO), co-lead

Project 7: Final report

Guidance from all partners

Project 8: Communications & outreach

Guidance from all partners

Project 9: Website working group

Alice Raine (Arrell Food Institute, University of Guelph),
co-lead
Bronwynne Wilton (Canadian Agri-Food Sustainability
Initiative), co-lead

VI. CONSULTANT TEAM

Project 2: Groupe AGÉCO

Jean-Michel Couture, Partner, Senior Advisor
Simon Nadeau, Analyst

Project 3A: Groupe AGÉCO

Jean-Michel Couture, Partner, Senior Advisor
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Project 3B: Viresco Solutions

Karen Haugen-Kozyra, President
Rebecca Johnson, Sustainability Specialist
With input from Jean-Michel Couture, Groupe AGÉCO

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Tyler McCann, Managing Director
Margaret Zafiriou, Research Associate
Angèle Poirier, Research Assistant

Project 5: Canadian Centre for Food Integrity

John Jamieson, President & CEO
Ashley Bruner, Research Coordinator

Project 6: RealAlts Inc.

Catherine Ann Marshall, Principal

VII. REVIEWERS AND INTERVIEWEES

Reviewers

Project 1E – Academic review of Index indicators

Enabled by the Deans Council - Agriculture, Food and
Veterinary Medicine

Project 1A: Environment

- Peter Tyedmers, Professor, Faculty of Management,
School for Resource and Environmental Studies,
Dalhousie University
 - Benjamin Goldstein, Assistant Professor, Bioresource
Engineering and Head of the Sustainable Urban-Rural
Futures (SURF) lab, McGill University
-

Project 1B: Food Integrity

- Larry Goodridge, Director, Canadian Research
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 - Mohamed Rhouma, Assistant Professor, pathologie
et microbiologie, Université de Montréal
 - Sylvia Checkley, Associate Professor, Ecosystem and
Public Health, University of Calgary
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Project 1C: Economic

- Stuart Smyth, Associate Professor, Department of
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 - Ryan Cardwell, Professor, Faculty of Agricultural
and Food Science, Department of Agribusiness and
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-

Project 1D: Societal Well-Being

- Will Valley, Associate Dean, Equity, Diversity, and
Inclusion, University of British Columbia
 - Katy Proudfoot, Associate Professor and Director of
the Sir James Dunn Animal Welfare Centre at Atlantic
Veterinary College, University of Prince Edward Island
-

Interviewees

Project 2 – Data platforms roadmap; interviews:

- Canadian Agri-Food Sustainability Initiative
 - Canadian Roundtable for Sustainable Beef
 - Canadian Roundtable for Sustainable Crops
 - Chicken Farmers of Canada
 - SAI Platform
-

Project 3A – Global organizations’ reviews of Index indicators; interviews

- Global Alliance for the Future of Food
 - Global Reporting Initiative
 - United Nations Food & Agriculture Organization
 - World Benchmarking Alliance
 - World Business Council on Sustainable Development
-

Project 3B – Global governance; interviews:

- Bord Bia (Irish Food Board)
 - Global organizations, projects 2 and 3A
-

Project 4 – Policy ecosystem; interviews:

- Some 36 partners and stakeholders
 - Australian Farm Institute
-

VIII. SERVICE PROVIDER TEAM

Report & website design

Janice Van Eck

Website translation

Bleublancrouge (2021)

Reports & website update translation

Megalexis (2022)

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