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## **Global Indices Research**

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A contributing paper to  
the Benchmarking Canada's Agri-Food Sustainability Leadership Project



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## **An Evaluation of Global Indices on the Canadian Agri-Food Sector**

The Benchmarking Agri-Food Sustainability Project led by multiple stakeholders aims to establish a national index to measure the Canadian agri-food sector in a scientific and unbiased manner. The empirical measurement of food systems' sustainability is an ongoing challenge for researchers, highlighting the complexity of food systems and their components<sup>i,ii</sup>. Though it may appear expedient to adopt global indices 'as is' especially when they paint a good picture of Canada, careful assessment is necessary to verify the relevance and accuracy of each index as global indices account for the disparity between countries by using high-level or proxy indicators. Prompted by questions of relevance and the accuracy of how the Canadian agri-food sector is depicted in different indices, the current review aims to assess *the relevance of four global indices as measures of sustainability of the Canadian agri-food sector* within the categories of biodiversity, sustainable agriculture, and the environment. These four indices were chosen based on the divergence of ranks assigned to Canada and its agri-food sector. Additional indices exist and new ones continue to emerge that could have been considered in the analysis. The analysis found that not all indicators used in an index were scientifically sound, nor relevant for all countries assessed by the index, thus highlighting the need for cautious assessment. Further corroboration for these findings is found within the literature and has been reported by researchers elsewhere<sup>iii</sup>. Missing or outdated data sources continue to be a hindrance – a fact highlighted by all four indices, indicating the ongoing need for data collection and reporting. Furthermore, the lack of conceptual clarity in the selection of indicators or how they are measured poses challenges to the broad adoption of these indices.

**The 2020 Environmental Performance Index (EPI)<sup>iv</sup>** published by Yale and Columbia universities provides a summary of the state of sustainability in 180 countries on environmental health and ecosystem vitality, using 32 indicators spread across 11 issue categories, nearly a quarter (24%) of which is dedicated to climate change mitigation.

- Canada's overall rank: 20

**The 2020 Global Innovation Index (GII)<sup>v</sup>** ranks 131 world economies based on their innovation capabilities. The GII is published by Cornell University, the World Intellectual Property Organization (WIPO) and INSEAD (European Institute of Business Administration) and consists of seven pillars divided between two sub-indices: The Innovation Input Sub-Index and the Innovation Output Sub-Index.

- Canada's overall rank: 17

**The 2018 Food Sustainability Index (FSI)<sup>vi</sup>** published by The Economist Intelligence Unit and the Barilla Centre for Food and Nutrition (BCFN) ranks 67 countries on food sustainability. Comprised of 38 indicators and 90 metrics scaled 0-100, the sustainability of food is measured across the following categories: food loss and waste, sustainable agriculture, and nutritional challenges.

- Canada's overall rank: 3



## **Measuring the Sustainability of Canadian Agriculture: An analysis of global indices and their indicators**

Despite high rankings for some indicators in the four indices, there are many indicators where Canada's rank was low. For example, Canada ranked 101 out of 129 in the 2020 EPI indicator 'tree cover loss'. Here, the indicator 'tree cover loss' served as a proxy for land conversion due to agriculture. Canada also ranked 65 out of 67 in the 2019 FSI, based on the rate of deforestation reported by the Global Forest Watch. Both these rankings portray great concern regarding the rate of deforestation in Canada. According to data from the National Deforestation Monitoring System, agriculture was the second-leading cause for deforestation in 2017 accounting for 35% of the 0.01% of the forests lost that year<sup>viii,ix</sup>. The rates of deforestation due to agriculture has been on decline in Canada from 1990-2017, with rates dropping by over 50% in that period. Therefore, deforestation in Canada is perhaps not as alarming as the rankings may otherwise suggest. Moreover, the emphasis placed on deforestation among global indices likely reflects the preoccupation with this issue, particularly in the Global South.<sup>x</sup> The importance of context in choosing the correct indicators to measure environmental sustainability has been highlighted by Dong<sup>xi</sup> and others. This becomes especially important when looking at the rankings for indicator categories and their components. For example, Canada's rank for 'biodiversity habitat index' in the EPI would indicate that the country is performing excellently in this sector, yet the indicator 'species habitat index' in the same index would imply otherwise. Context, weighting, and how sub-indices are nested within the broader categories that they belong to can therefore paint a differing picture.

An example of questionable relevance is the indicator 'the number of ISO 14001:2015 certificates issued' as a measure of creative output of an economy reported in the 2020 GII. The ISO 14001:2015 by the International Standards Organization specifies the requirements for an environmental management system that an organization can use to enhance its environmental performance<sup>xii</sup>. Though Canada ranked 67<sup>th</sup>, of 131, for this indicator, findings by Fura and Wang (2017)<sup>xiii</sup> raise questions about the accuracy and scientific validity of this indicator. Fura and Wang found no relationship between the number of ISO 14001 certificates and the level of socioeconomic development at the national level based on data from 28 EU member states.

Data source and timelines are two other concerns that impose limitations on the validity of indicators used in global indices. The 'crop diversity (calories diversity measured by Shannon Index)' indicator to measure biodiversity in the 2019 SFS is an example of these limitations, with data sources dated between 2009-2011. Crop diversity is an important indicator that measures the resilience of agricultural biodiversity. Over the last 50 years, while agricultural productivity has increased significantly, monoculture, fertilizer use and changes in plant breeding have led to a reduction in the diversity of cultivated crop species in North America. Despite concerns with reduced crop diversity, Renard (2016)<sup>xiv</sup> found that agricultural products diversified regionally over time, and that the regional differences could provide a measure of resilience despite a perceived lack of genetic diversity. Furthermore, Renard (2016) highlighted the importance of providing context with regards to both space and time to fully capture agro-biodiversity changes over time.

Greenhouse gas (GHG) emissions continue to be a challenge for Canada, as indicated by Canada’s rank in the 2020 EPI (168) and 2019 SFS (33) for this indicator. According to the ‘National Inventory Report 1990–2018: Greenhouse Gas Sources and Sinks in Canada’, total GHG emissions from the agriculture sector increased from 47 Mt CO<sub>2</sub> eq in 1990 to 59 Mt CO<sub>2</sub> eq in 2018, an increase of 27% from the 1990 levels, due to an increase of 121% in the use of inorganic nitrogen fertilizers<sup>xv</sup>. However, the contributions of the agriculture sector have remained largely stable in the range of 71-73 Mt CO<sub>2</sub> eq between 2005-2018, despite significant growth in production over that time. Emission levels have remained stable largely thanks to the contribution of practises such as no-tillage, adoption of precision agricultural technology, improvements in animal genetics and nutrition, advancements in crop breeding, etc., which are likely to continue offering further reductions in emissions. Despite the poor ranking Canada received for GHG emissions in these indices, agricultural GHG emissions have declined and stabilized over the past 27 years – a fact that is overlooked when evaluating the sustainability of Canadian agriculture by global indices.

The trade-off between the choice of indicators and the number of countries for which data is available, and how the number of indicators could significantly affect the aggregate score of a country was elucidated upon by Béné et al. (2019)<sup>xvi</sup>. Thus, highlighting the fact that these scores are relative, rather than absolute. Any global index consists of a mixed bag of indicators: *indicators that are relevant and accurately highlight areas where Canada outperformed or underperformed*, and *indicators that are more appropriate for other economies but not truly relevant to Canada*. Global indices, no matter how robust they aim to be, are far from being ‘one-size fits all’ measures of sustainability. Therefore, Canada should consider the development of its own agri-food index, based on a careful selection of indicators, developed in consultation with multiple stakeholders from the vast agri-food industry.

Summary of insights from analysis:		
Purpose of global indices <i>“What is the intent?”</i>	Design issues (indicator selection) <i>“What benchmarking challenges &amp; shortcoming are revealed?”</i>	Utility <i>“What lessons for Canada to keep in mind to benchmark its performance?”</i>
Measuring food system sustainability to compare country performance and shape global dialogues and understanding  Linking environmental performance to other indicators of sustainability (social, health, etc., not assessed in this paper)  Acknowledged selectivity of indicators and use of proxies to measure performance on priorities to enable global comparisons	Scientific soundness  Country-appropriateness  Data quality and timeliness  Indicator clarity and context  Indicator number (per issue)	Canada is being measured by a diversity of global indices and will continue to be so  Global indices identify issues “on the global agenda” that may not fit the domestic context in every respect  There is no one-size-fits-all when it comes to index design or selection of indicators that are country-relevant and accurate

Table 2. A summary of findings based on the current review of select indicators and four global indices.

## References:

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- <sup>iv</sup> <https://epi.envirocenter.yale.edu/epi-country-report/CAN>; 2020
- <sup>v</sup> Global Innovation Index (2020); [https://www.wipo.int/edocs/pubdocs/en/wipo\\_pub\\_gii\\_2020.pdf](https://www.wipo.int/edocs/pubdocs/en/wipo_pub_gii_2020.pdf)
- <sup>vii</sup> <https://foodsustainability.eiu.com/country-profile/ca>; <https://foodsustainability.eiu.com/country-ranking/>
- <sup>viii</sup> International Centre for Tropical Agriculture, CGIAR, 2019, <https://cgspace.cgiar.org/handle/10568/106313>
- <sup>viii</sup> In 2017, Canada had a total of 347,035,050 ha of forest land (34.8% of total land area) of which only 35,385 ha (0.01%) was deforested, with another 755,884 ha (0.2%) harvested. [The State of Canada's Forests \(2019\)](#)
- <sup>ix</sup> Canada's deforestation rates have declined over the past 27 years (from 1990-2017) from 64,000 ha annually to about 35,000 ha. [Ministry of Natural Resources \(2019\)](#)
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