



HOUSE OF COMMONS  
CHAMBRE DES COMMUNES  
CANADA

# **STEWARDS OF THE LAND: EXAMINING CANADIAN AGRICULTURE'S ENVIRONMENTAL CONTRIBUTION**

**Report of the Standing Committee on Agriculture and  
Agri-Food**

**Kody Blois, Chair**

**NOVEMBER 2023  
44th PARLIAMENT, 1st SESSION**

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Chair**

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## **NOTICE TO READER**

### **Reports from committees presented to the House of Commons**

Presenting a report to the House is the way a committee makes public its findings and recommendations on a particular topic. Substantive reports on a subject-matter study usually contain a synopsis of the testimony heard, the recommendations made by the committee, as well as the reasons for those recommendations.

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# **THE STANDING COMMITTEE ON AGRICULTURE AND AGRI-FOOD**

has the honour to present its

## **THIRTEENTH REPORT**

Pursuant to its mandate under Standing Order 108(2), the committee has studied environmental contribution of agriculture and has agreed to report the following:



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# LIST OF RECOMMENDATIONS

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*As a result of their deliberations committees may make recommendations which they include in their reports for the consideration of the House of Commons or the Government. Recommendations related to this study are listed below.*

## **Recommendation 1**

**The Committee recommends that the Government of Canada create a framework to encourage Canadian farmers who use nature-based solutions to climate change on their farms, in recognition of the good work already being done by farmers to reduce farm emissions, including no-till, low-till, cover cropping and intercropping agroecological farming methods, for example, by considering paying them for the ecosystem services they provide..... 8**

## **Recommendation 2**

**The Committee recommends that the Government of Canada work to encourage best practices by which farms in eastern Canada can sequester more carbon per hectare, such as reducing soil compaction..... 9**

## **Recommendation 3**

**The Committee recommends that the Government of Canada, in collaboration with provinces and territories:**

- invest in research and technology to help cattle producers build upon conservation practices already in use;**
- develop a comprehensive plan to protect and restore native grasslands, to better understand land conservation and reduction of industry emissions, while increasing carbon sequestration; and**
- consider ways to continue to enhance and incorporate the role of livestock animals in regenerating grasslands..... 9**

**Recommendation 4**

The Committee recommends that the Government of Canada, in partnership with stakeholders as well as with provincial, territorial, and municipal governments:

- collect information on grasslands, pasturelands, and wetlands, to balance urban expansion, agricultural production, and environmental protection, in respect of their respective jurisdictions;
- investigate methods by which to reclaim unused federal land for the purpose of converting it into productive farmland, blended with native ecosystems; and
- promote regenerative agriculture in urban and suburban areas..... 10

**Recommendation 5**

The Committee recommends that the Government of Canada develop a national soil strategy action plan to improve soil monitoring, data-sharing and promote best practices to improve and protect soil health, in collaboration with researchers, land holders, industry, provincial and territorial governments, respecting their jurisdictions, as well as First Nations, and academics, in a manner similar to the analysis and evaluation of the strategy introduced by the government of Australia in 2022. .... 11

**Recommendation 6**

The Committee recommends that the Government of Canada recognize the importance of the 4R Nutrient Stewardship Program as a sustainable fertilizer management tool and encourage the adoption of other “smart” fertilizer application methods..... 14

**Recommendation 7**

The Committee recommends that the Government of Canada support the livestock sector in reducing methane emissions and its impact on climate change by creating a new environmentally-driven and science-based regulatory pathway for agricultural and veterinary products with environmental benefits, such as 3-NOP feed additives..... 20

**Recommendation 8**

The Committee recommends that the Government of Canada further its support for Indigenous-led research to promote Reconciliation and the use of Indigenous knowledge systems in sustainable farming and agriculture. .... 21

**Recommendation 9**

The Committee recommends that the Government of Canada recognize environmentally positive measures by:

- working with industry and researchers to approve a method for assessing the environmental contribution of an innovation that provides fair value to farmers implementing these innovations;
- supporting growth and investments in the plant-based proteins agriculture and agri-food sectors;
- giving farmers access to funding using a decentralized approach, not necessarily as part of a set government program, since entrepreneurs are in a better position to decide the right time to invest; and
- providing recognition and compensation for environmentally positive measures introduced in the past. .... 23

**Recommendation 10**

The Committee recommends that the Canadian Food Inspection Agency (CFIA), as part of its new risk assessment of United States bee imports, assess the possibility of allowing imports from smaller entities (e.g., states, municipalities and individual businesses), within the United States, notably those located in safe zones in northern climates that meet Canadian requirements, while also addressing Canadian beekeeper concerns over bees with so-called “Africanized” genetics. If the CFIA chooses not to allow additional imports from the United States, it should explain its reasons for this decision and make clear the corrective actions United States beekeepers would have to take to reduce the risk associated with their imports. .... 27

**Recommendation 11**

The Committee recommends that the Government of Canada in partnership with the beekeeping sector and the provinces and territories:

- invest more in apiculture research with the goal of making Canada self-sufficient in producing and selecting queens and bees;
- investigate the existence and extent of possible causal relationships between soil degradation, climate change, and increased concentrations of parasites of desired species like honeybees, including but not limited to varroa mites, hive beetles, and wax moths;
- employ advanced technology to protect and facilitate breeding of pollinators; and
- support greater networking among government, academia and industry research and development centres on all causes of insect pollinator mortality..... 29

**Recommendation 12**

The Committee recommends that the Government of Canada support the research and development of new biopesticides. .... 31

**Recommendation 13**

The Committee recommends that the Government of Canada ensure the Pest Management Regulatory Authority has the necessary resources to fulfill its mandate and that it conduct a comprehensive study on pesticides, including neonicotinoids, that examines their impact and cumulative effect on humans, bees, and native pollinators as well as their economic impact on the agricultural industry. .... 31

**Recommendation 14**

The Committee recommends that the Government of Canada work with the provinces and territories to develop a strategy to utilize and diversify natural infrastructure, including wild forages, to protect native pollinators on agricultural land. .... 32



# STEWARDS OF THE LAND: EXAMINING CANADIAN AGRICULTURE'S ENVIRONMENTAL CONTRIBUTION

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## THE ENVIRONMENTAL CONTRIBUTION OF AGRICULTURE

### Introduction

The relationship between farmers and their environment is complex and multifaceted. Agricultural activities not only ensure a stable food supply but can also contribute to preserving the environment through the application of good management practices that minimize agriculture's impact on the soil, water, and air. Farmers are also on the front line of environmental change: their activities are strongly affected by natural disasters and extreme weather events, but their practices can also help to mitigate the effects of and better adapt to climate change.

To better understand this complex relationship, on 4 February 2021, the Agriculture and Agri-Food Committee (the Committee) agreed to undertake a study on the relationship between the environment and agriculture in Canada under the terms of the following motion:<sup>1</sup>

That, pursuant to Standing Order 108(2), the committee undertake a study on the best practices, tools, accessible technologies, and ways in which the Government of Canada can recognize the important role of agriculture and partner with producers to reduce the environmental impact of agriculture, reduce greenhouse gas emissions, reduce carbon footprints, promote soil health, reduce dependency on fossil fuels and encourage producers to continue adopting environmentally friendly practices; that this study include hearing from witnesses with specific knowledge on this topic; that this study include an invitation to appear to the Minister of Agriculture and Agri-food and departmental officials.

This study was interrupted after three meetings, however, when the 43rd Parliament was dissolved on 15 August 2021, bringing an end to all committee work. On 31 January 2022 the reconstituted Committee adopted a motion to resume the study

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1 House of Commons, Committee on Agriculture and Agri-Food (AGRI), [\*Minutes of Proceedings\*](#), 4 February 2021.



and expand its scope to cover “soil health and the important role that it plays in combatting climate change” including by studying the effect “on profitability and sustainability, of various fertilizer, weed and pest management strategies on soil health.”<sup>2</sup> On 5 October 2022, the Committee adopted a supplementary motion to hold two meetings on “the problem of bee mortality” with the aim of studying this subject and identifying its causes<sup>3</sup>.

This report summarizes the evidence heard during the Committee’s meetings on this study and makes recommendations to the federal government. The first part provides an overview of the contribution and impact of agricultural practices in Canada as presented by the witnesses, for example with respect to agricultural soils, biodiversity, fertilizer use and agricultural and food residues. The second part focuses on witness testimony on the federal government’s involvement in these issues, for example with respect to pollution pricing, the regulation of new technologies, and research and innovation. Finally, issues related to bee mortality are presented in a separate section.

## Agriculture and the Environment in Canada

### The Fundamental Role of Soil

Soil plays a key role in the interaction between farmers and their environment. In 2015, the United Nations Food and Agriculture Organization (FAO) revised its [World Soil Charter](#), whose preamble reflects the importance given to soil health on a global scale:

Soils are fundamental to life on Earth but human pressures on soil resources are reaching critical limits. Careful soil management is one essential element of sustainable agriculture and also provides a valuable lever for climate regulation and a pathway for safeguarding ecosystem services and biodiversity.

The Committee’s meetings highlighted the importance of soil preservation to farmers. [Darrin Qualman](#), Director of Climate Crisis Policy and Action with the National Farmers Union, said that soil health is key to “reducing input use [and] increasing resilience, water, filtration and drought resistance.” [Angela Bedard-Haughn](#), Dean and Professor, College of Agriculture and Bioresources, University of Saskatchewan, highlighted the ecosystem services provided by soil, including its crucial role in water, carbon, and nitrogen cycles.

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2 AGRI, [Minutes of Proceedings](#), 31 January 2022.

3 AGRI, [Minutes of Proceedings](#), 5 October 2022.

Notably, soil can act as a “sink” where carbon can remain for very long periods of time.<sup>4</sup> Plants take up carbon dioxide (CO<sub>2</sub>) from the atmosphere through photosynthesis and extract carbon, which also forms the building blocks of their tissues, such as their stems and roots. At the end of their growth cycle, plants decay, and the above-ground carbon is released back into the atmosphere while the below-ground carbon is incorporated back into the pool of soil organic carbon, which makes up the bulk of soil organic matter. Soil organic carbon will remain stable unless the soil is disturbed.<sup>5</sup> Agricultural practices can potentially promote the plant growth cycle, mitigate soil disturbance and play an important role in the make-up of soil organic carbon stocks.

Witnesses outlined several factors that can affect agricultural soil health.

[Dr. Bedard-Haughn](#) said that the adoption of no-till farming has dramatically improved the health of western Canadian soils and increased carbon stocks. However, she added that the persistence of these stocks depends on maintaining these beneficial practices over time.<sup>6</sup> [Mike Ammeter](#), Chair of the Canadian Canola Growers Association, discussed the multiple benefits of this practice on soil:

Farmers have a proven track record of adopting innovation that benefits the environment, like conservation tillage or zero till. Over a decade ago, I personally began to practice zero till on my farm as a way to use finite resources more efficiently and to improve soil conditions. By voluntarily adopting this practice, farmers like myself have improved soil cover, sequestered carbon and reduced soil erosion risk while reducing fuel and labour requirements. In 1991, 7% of Canadian farmland was seeded with no-till practices. By 2016, this number had increased to over 60%.

Other beneficial soil management practices can minimize disturbance and even restore soils. [Jennifer Haverstock](#), a certified crop advisor and professional agrologist at Perennia Food and Agriculture, said that her organization promotes cover cropping to build soil resiliency, control erosion, and improve water-holding capacity, as well as sequester carbon.

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4 AGRI, *Evidence*, [Louis-Pierre Comeau](#) (Research Scientist, Landscape and Soil Carbon, Department of Agriculture and Agri-Food [AAFC]); and [Ed Gregorich](#) (Research Scientist, Agrienvironment Division, AAFC).

5 Canadian Agri-Food Policy Institute, [Carbon Sequestration in Agricultural Soils: Addressing Canada's Climate Change Targets](#), 21 April 2022.

6 AGRI, *Evidence*, [Angela Bedard-Haughn](#) (Dean and Professor, College of Agriculture and Bioresources, University of Saskatchewan, As an Individual).



## Recommendation 1

**The Committee recommends that the Government of Canada create a framework to encourage Canadian farmers who use nature-based solutions to climate change on their farms, in recognition of the good work already being done by farmers to reduce farm emissions, including no-till, low-till, cover cropping and intercropping agroecological farming methods, for example, by considering paying them for the ecosystem services they provide.**

Conversely, some practices degrade soil quality. To illustrate this fragile balance, [Daniel Bernier](#), an advisor with the Union des producteurs agricoles, explained how the use of increasingly heavy machinery on farms has led to soil compaction. He said this problem is due in large part to the labour shortage; farmers compensate by using heavier equipment that, while enabling them to work more quickly, more efficiently, and with fewer passes, can also cause compaction.<sup>7</sup> Agronomist [Jean Caron](#) explained that compaction leads to a decrease of available oxygen in the soil for microbes, which then use nitrogen in the soil to breathe. This generates emissions of nitrous oxide—a greenhouse gas—and reduces the availability of nitrogen for the plants.<sup>8</sup> He also stressed the influence of climatic and regional soil conditions on the severity of this problem:<sup>9</sup>

Soils in eastern Canada, so in Ontario, Quebec and New Brunswick, are worked under very wet conditions. This is also the case for soils in British Columbia’s Fraser Valley. In general, soils in the east become much more sensitive to compaction than soils in the west, where there are greater water deficits.

Some witnesses pointed out, however, that some of the beneficial practices that can prevent compaction are not easily applicable everywhere in Canada. For example, the wetter climate of eastern Canada makes it also more challenging to implement practices such as no-till<sup>10</sup>.

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7 AGRI, *Evidence*, [Jean Caron](#) (Agronomist, Professor, Natural Sciences and Engineering Research Council of Canada Industrial Research Chair in Conservation and Restoration of Cultivated Organic Soils, Université Laval, Soil Science and Agrifood Engineering Department, As an Individual).

8 Ibid.

9 Ibid.

10 AGRI, *Evidence*, [Susie Miller](#) (Executive Director, Canadian Roundtable for Sustainable Crops).

## Recommendation 2

**The Committee recommends that the Government of Canada work to encourage best practices by which farms in eastern Canada can sequester more carbon per hectare, such as reducing soil compaction.**

In terms of livestock, native grasslands are well suited to carbon storage because of the limited soil disturbance, the fertilization provided by animals, and root growth resulting from animal grazing. [Andrea Stroeve-Sawa](#), Council Director, Canadian Roundtable for Sustainable Beef estimates that beef farmers in Canada manage a total of 34 million grazing acres, "a globally endangered ecosystem with less than 20% remaining intact", providing habitat for over 60 species at risk and sequestering an estimated 1.5 billion tonnes of carbon.

However, witnesses representing the livestock and forage sectors said they were alarmed by the loss of growth in these lands. [Cedric MacLeod](#), Executive Director of the Canadian Forage and Grassland Association, said Census of Agriculture data shows a loss of roughly 1 million acres of native grasslands between 2011 and 2016, and a consequent loss of carbon stored in those soils. That loss was driven in part by the economic challenges in the beef industry in the 2000s, following Bovine Spongiform Encephalopathy (BSE).<sup>11</sup> However, representatives of the Canadian Cattlemen's Association said that land use changes are also because cattle producers have less access to risk management tools, like crop insurance, than crop producers.<sup>12</sup>

## Recommendation 3

**The Committee recommends that the Government of Canada, in collaboration with provinces and territories:**

- **invest in research and technology to help cattle producers build upon conservation practices already in use;**
- **develop a comprehensive plan to protect and restore native grasslands, to better understand land conservation and reduction of industry emissions, while increasing carbon sequestration; and**

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11 AGRI, *Evidence*, [Ed Gregorich](#) (AAFC); and [Duane Thompson](#) (Chair, Environment Committee, Canadian Cattlemen's Association).

12 AGRI, *Evidence*, [Duane Thompson](#) (Canadian Cattlemen's Association).



- **consider ways to continue to enhance and incorporate the role of livestock animals in regenerating grasslands.**

As a first step in protecting grasslands, [Paul Thoroughgood](#), National Manager of Agriculture and Sustainability with Ducks Unlimited Canada, recommended that the government complete a “Canada-wide inventories for things like grasslands and wetlands” given their ecological importance. Similarly, [Duane Thompson](#), Chair of the Canadian Cattlemen’s Association’s Environment Committee, suggested the development and adoption of a “comprehensive land use strategy by all levels of government and stakeholders to strike a balance between urban expansion, agricultural production and environmental protection.” [Eric Toensmeier](#), Director of the Perennial Agriculture Institute, supported the development of such a strategy through [Bill C-203, An Act respecting soil conservation and soil health](#), which would require the government to “develop a national strategy to promote efforts across Canada to conserve and improve the health of soil.” He also emphasized the importance of encouraging the development of agroforestry in livestock systems, pointing out that carbon sequestration rates are “three to five times higher than on those with the improved cropping and improved grazing systems alone.”<sup>13</sup>

[Paul Thoroughgood](#) also called for special attention to be paid to habitats such as wetlands and natural grasslands which are “often viewed as unproductive and even as liabilities, which makes them ripe for removal.” He points out that preserving these habitats can generate considerable environmental benefits, taking the example of “maintaining four acres of wetlands [which can store] as much carbon as would be sequestered by no-tilling an entire quarter section of cropland on the Canadian prairies for 25 years”.

#### **Recommendation 4**

**The Committee recommends that the Government of Canada, in partnership with stakeholders as well as with provincial, territorial, and municipal governments:**

- **collect information on grasslands, pasturelands, and wetlands, to balance urban expansion, agricultural production, and environmental protection, in respect of their respective jurisdictions;**

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13 AGRI, *Evidence*, [Eric Toensmeier](#) (Director, Perennial Agriculture Institute).

- **investigate methods by which to reclaim unused federal land for the purpose of converting it into productive farmland, blended with native ecosystems; and**
- **promote regenerative agriculture in urban and suburban areas.**

#### **Recommendation 5**

**The Committee recommends that the Government of Canada develop a national soil strategy action plan to improve soil monitoring, data-sharing and promote best practices to improve and protect soil health, in collaboration with researchers, land holders, industry, provincial and territorial governments, respecting their jurisdictions, as well as First Nations, and academics, in a manner similar to the analysis and evaluation of the strategy introduced by the government of Australia in 2022.**

### **Biodiversity**

In addition to their important role in greenhouse gas (GHG) reduction efforts, grasslands are home to important biodiversity. [Mr. Thompson](#) said that cattle pastures are critical habitats for threatened bird species on the prairies. [Andrea Brocklebank](#), Executive Director of the Beef Cattle Research Council, said that an Alberta Biodiversity Monitoring study found that most birds and mammals do just as well or better on cattle pastures as they would in a natural setting.

Some witnesses mentioned the biodiversity benefits that can be achieved through regenerative agriculture techniques. While he acknowledged that the concept of regenerative agriculture lacks a uniform definition, [Dr. Mervin St. Luce](#), Research Scientist at the Department of Agriculture and Agri-Food, said that it essentially consists of looking at “food production within a natural system as much as possible. That includes both pesticide reduction and, depending more on the soil, building the soil diversity ecosystem to be able to produce food.”

Another researcher from the department said that biodiversity is a fundamental part of an agro-ecological approach, which includes promoting below-ground biodiversity by encouraging diversified crop rotation.<sup>14</sup> [Ryan Cullen](#), a small-scale and urban agricultural entrepreneur at City of Greens Farm, which advocates the use of regenerative agriculture techniques, added that their approach aims to integrate social, environmental and economic considerations into agricultural production:

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14 AGRI, *Evidence*, [Reynald Lemke](#) (Research Scientist, Environmental Health, AAFC).



On our farm, we plan and manage our farm holistically following regenerative farming principles, meaning we consider how our resource base, our decisions, our production systems and outcomes not only affect our bottom line but also positively affect our environment and the people in our community. Regenerative agriculture is all about managing holistically, so we make decisions that are not just based on economics but include the social and environmental impacts and outcomes as well.

## Fertilizer and Precision Agriculture

Fertilizers are necessary for good plant growth, but their overuse can damage the environment, especially when the nutrients—particularly nitrogen—are not fully used by plants. Excess nutrients can leach into rivers and groundwater, where they promote the growth of pests that can lead to eutrophication and acidification.<sup>15</sup> Fertilizers are also a source of GHG emissions not only when produced,<sup>16</sup> but also when their application ends up putting excess nitrogen in soils, resulting in emissions of nitrous oxide, a GHG that accounts for almost half of agricultural emissions.<sup>17</sup> Darrin Qualman, Director of Climate Crisis Policy and Action at the National Farmers Union detailed the different ways in which fertilizers can contribute to GHG.

In its manufacture, nitrogen fertilizer is a major source of carbon dioxide. [...] In its use in farm fields, nitrogen creates emissions of nitrous oxide, and nitrogen fertilizer produces significant sources of methane from its natural gas feedstock. [...] There is a wide range of damaging environmental impacts from nitrogen overuse, including ocean dead zones, acidification and nitrate pollution of groundwater.

While agricultural inputs such as fertilizer may have detrimental environmental impacts, [Dr. Justine Taylor](#), Director, Stewardship and Sustainability at CropLife Canada, highlighted the technologies, including fertilizers, or pest control products that “allow for land to be more productive, which then allows for more land to be held in its natural state.”

In December 2020, the government announced that it would seek to reduce nitrous oxide emissions “from fertilizer application to 30% below 2020 levels.” During their appearance before the Committee in June 2021, Agriculture and Agri-Food Canada (AAFC) officials said that they would be consulting the sector about this target.<sup>18</sup> Some witnesses expressed concern that this target may not have the desired effect on nitrous

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15 AGRI, *Evidence*, [Darrin Qualman](#) (Director of Climate Crisis Policy and Action, National Farmers Union).

16 Ibid.

17 Government of Canada, [Greenhouse gases and agriculture](#).

18 AGRI, *Evidence*, [Matt Parry](#), (Director General, Policy Development and Analysis Directorate, Strategic Policy Branch, AAFC).

oxide emissions, and may affect the profitability of farm businesses.<sup>19</sup> After the department's consultations ended on 31 August 2021, the government reiterated that the voluntary target applied only to GHG emissions from the use of fertilizer—not the amounts used—and that the government would seek to achieve it in a manner that is “flexible, collaborative, and based in science.”<sup>20</sup>

When applied optimally, it is possible to both minimize the environmental impact of fertilizers and maximize yields. That is the purpose of the 4R Nutrient Stewardship Program, which “emphasizes applying the right source of fertilizer at the right rate at the right time and in the right place.”<sup>21</sup> For [Jennifer Haverstock](#), better management of fertilizer application also means economic benefits for farmers, since “applied fertility goes directly to feeding the crop, giving farmers more return on their dollar.” [Clyde Graham](#), Executive Vice-President of Fertilizer Canada, welcomed AAFC's “formal recognition ... of 4R nutrient stewardship as an innovative solution to support greenhouse gas reductions.” He also encouraged the government to make this technique the focus of the federal strategy to reach the target of reducing GHGs from fertilizer by 30%. Other practices can also reduce these emissions. [Eric Toensmeier](#) pointed out that agroforestry cropping systems can limit nitrous oxide emissions by having tree roots capture excess fertilizer not used by crops.

Precision agriculture—“a practice that uses automated data gathering technologies, such as variable rate mapping, artificial intelligence, and digital imagery, to guide targeted farm management activities”<sup>22</sup>—provides interesting synergy with the 4R program according to [Keith Currie](#), First Vice-President of the Canadian Federation of Agriculture<sup>23</sup>. He gave the example of using “crop and soil sensors” that optimize the rate of fertilizer application, thereby reducing nitrous oxide emissions by 15% to 25%. He more broadly described the benefits of precision agriculture:

Precision ag technology also significantly improves fuel efficiency by using fleet analytics and auto-guidance systems, which reduces the number of passes needed for sprayers, tillage and harvesters. One U.S. study found that this would decrease fuel use by up to

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19 AGRI, *Evidence*, [Wade Barnes](#), (Chief Executive Officer, Farmers Edge Inc.).

20 Government of Canada, [Canada's fertilizer emissions reduction target](#).

21 AGRI, *Evidence*, [Clyde Graham](#) (Executive Vice-President, Fertilizer Canada); and [Candace Laing](#) (Vice-President, Sustainability and Stakeholder Relations, Nutrien Ltd.).

22 Government of Canada, [Scaling Down Precision Agriculture](#).

23 Keith Currie is now president of the Canadian Federation of Agriculture. In accordance with the minutes, he is referred to with the title he held when he testified before the Committee.



6%, which is the equivalent of 18,000 flights. The same study stated that this fuel use could decrease a further 16% with a broader adoption of this technology.

Wade Barnes, Chief Executive Officer of Farmers Edge Inc., explained how his company provides such services and that widespread use of these technologies “is due to the fact that it’s good business to implement these types of technologies. It saves the soil, and it saves moisture to place nitrogen in the right spots.”

### Recommendation 6

**The Committee recommends that the Government of Canada recognize the importance of the 4R Nutrient Stewardship Program as a sustainable fertilizer management tool and encourage the adoption of other “smart” fertilizer application methods.**

### Recycling Farm Residue and the Fight Against Food Waste

Agricultural production generates many usable by-products, which helps maximize the resources used in their production. The Committee met with several organizations that are working to commercialize these by-products. One such organization is Bioindustrial Innovation Canada, which provides “critical strategic investment advice and services to business developers, mostly start-ups, on clean, green and sustainable technologies.” The organization estimates that the agricultural sector generates more than 50 million metric tons of sustainable agricultural residues that are available for conversion into industrial bioproducts such as plastics and resins.<sup>24</sup> In order to provide this sector with the necessary capital, it is encouraging the federal government to launch a “national green business accelerator initiative.”<sup>25</sup> Its executive director, A. J. (Sandy) Marshall, gave examples of how these residues are being used:

Low-carbon hydrogen, renewable natural gas, and biofuels generated from renewable resources are reducing the carbon intensity of the energy pool used for housing and mobility. Biochemicals and biomaterials can be used to produce materials to replace fossil-based alternatives for advanced manufacturing applications, such as automotive, truck and bus, aerospace and construction.

For Mr. Toensmeier, Canada could potentially supply its bioproducts and biomaterials industry with feedstock from agroforestry production systems. He believes that Canada’s climate is conducive to growing willows and poplars, two types of trees whose wood can be used in the material and chemical feedstock industries.

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24 AGRI, *Evidence*, A. J. (Sandy) Marshall (Executive Director, Bioindustrial Innovation Canada).

25 Ibid.

Agricultural products can sometimes be used as an energy source. [Mr. Everson](#) raised the potential for canola to become a significant source of biofuel in Canada and an important contributor to the transportation sector's GHG emission targets. He said that this is encouraged by the introduction of the [Clean Fuel Regulations](#), which will require a phase down of the carbon intensity of fuels sold in Canada and a minimum biofuel content of 5% for gasoline and 2% for diesel. [David Wiens](#), Vice-President, Dairy Farmers of Canada, referred to the potential of biodigesters, which convert organic material such as bovine manure into biogas that can be used as an alternative energy source while also reducing methane emissions from manure storage by up to 60%. However, he pointed out that these facilities are very costly and that "government funding for biodigesters, as well as other forms of renewable energy," would be welcome.

[Dr. Bedard-Haughn](#) cautioned that removing crop residue from fields to produce energy can end up reducing the amount of carbon returning to the soil and undo sequestration efforts. She recommends conducting full life-cycle analyses to determine under what conditions crop residue disposal is appropriate.<sup>26</sup> According to Bioindustrial Innovation Canada, some technologies avoid this issue. For example, thermal conversion technologies convert residual materials into biocarbon, which is then used as fertilizer, limiting the loss of nutrients caused by agricultural production and returning carbon to the soil.<sup>27</sup>

Recycling food waste is another way to improve the sector's environmental performance. [Bruce Taylor](#), President of the engineering firm Enviro-Stewards, pointed out that nearly one-third of the world's food production is wasted, and he estimated that the cost of water used to produce the food wasted in Canada is \$49 billion per year. He also noted that food waste adds to GHG emissions as it produces methane when it ends up in landfills. He welcomed AAFC's [Food Waste Reduction Challenge](#), which rewards waste reduction projects, as a step in the right direction to address this issue.

The livestock sector also plays an important role in the commercialization of agricultural and food waste. [Andrea Stroeve-Sawa](#) highlighted that about 58% of food are lost or wasted every year and explained that the cattle industry is uniquely positioned to upcycle products that are not suitable for human consumption, such as "crops damaged by weather or pests, by-products of manufacturing" but also fruits and vegetables that do not meet retail standards for appearance.

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26 AGRI, *Evidence*, [Angela Bedard-Haughn](#) (As an Individual).

27 AGRI, *Evidence*, [A. J. \(Sandy\) Marshall](#) (Bioindustrial Innovation Canada).



The Committee also heard from [Greg Wanger](#), Founder and Chief Executive Officer of Oberland Agriscience, a company based in Nova Scotia founded in 2017 that breeds black soldier flies and uses organic waste and residues to feed them. Oberland Agriscience provides companies along the food supply chain with opportunities to meet environmental and social governance targets by reducing their GHG emissions from food waste. He explained how his product can be used as a versatile feed for the livestock, poultry, and aquaculture industry:

The soldier fly naturally accumulates very high amounts of calcium. As an insect species it accumulates thousands of ppm—parts per million—of calcium within its body, and when fed to livestock or poultry, it is a very readily absorbable bioavailable source of calcium. [...] It's also been shown in the hog or swine industry that feeding a supplement of black soldier fly larvae to the hogs actually reduces intestinal distress and that leads to healthier and more productive pigs on the farm. It's likewise in the salmon industry. Out here in Nova Scotia, we're very linked to the aquaculture industry. Salmon naturally in the wild would spend a lot of their time in rivers eating insects in the rivers, so their metabolism is geared towards that kind of feedstock, so supplementing their feed with soldier fly is great as well.

[Mr. Wanger](#) called on the government to support data collection and research into insect farming and uses of the industry's products, and to provide greater flexibility in the regulatory framework for the management of waste materials used as feedstock in his industry.

## Government Initiatives

### Carbon Pollution Pricing

Implementing a carbon pollution pricing system is one way the government is aiming to cut Canada's GHG emissions across the economy, particularly in the agricultural sector. The [Greenhouse Gas Pollution Pricing Act](#), which came into force on 21 June 2018, introduced a federal fuel charge, which applies to the Canadian agricultural sector in what are known as “backstop jurisdictions”<sup>28</sup> and covers 21 fuel types.<sup>29</sup> Farmers can obtain a [fuel charge exemption certificate](#). To qualify, they must demonstrate that the fuel is a “qualifying farming fuel” and that it is intended to be used exclusively for the

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28 The federal carbon pollution pricing system automatically applies in those provinces and territories that do not enforce a carbon pricing scheme of their own that meets the federal government's [national minimum stringency standards](#) for such systems.

29 Canada Revenue Agency, [Fuel Charge Rates](#).

operation of “eligible farming machinery” as defined by the Act. There is also a specific exemption for greenhouse operators.<sup>30</sup>

Recognizing that “many farmers use natural gas and propane in their operations,” the government announced in [Budget 2021](#) its intention “to return a portion of the proceeds from the price on pollution directly to farmers in backstop jurisdictions (currently Alberta, Saskatchewan, Manitoba, and Ontario).” On 9 June 2022, the [Economic and Fiscal Update Implementation Act, 2021](#) received Royal Assent and provided a new refundable tax credit to farmers. In addition to this Act, [Bill C-234, An Act to amend the Greenhouse Gas Pollution Pricing Act](#) seeks to expand the definitions of “eligible farming machinery” and “qualifying farm fuel” to add propane and natural gas to its list of exempted fuels. At the time of this report’s publication, the Standing Senate Committee on Agriculture and Forestry had completed its study of this bill.

When she testified in relation to [Bill-206, An Act to amend the Greenhouse Gas Pollution Pricing Act](#) during the 43rd Parliament, [Karen Ross](#), director of Farmers for Climate Solutions, explained that “putting a price on carbon pollution is essential to achieving Canada's emissions reduction commitments” and encourage a transition to alternative technologies that do not use any fossil fuels. [Keith Currie](#) also acknowledged that carbon pricing provides “a market incentive to switch to lower-emission fuels and improve fuel efficiency.” However, he added—echoing many witnesses—that for some farming practices, farmers face a lack of alternatives to fuel use. This is particularly the case for grain drying, which uses natural gas or propane, both of which are not eligible for an exemption.<sup>31</sup> Although the Agriculture Carbon Alliance acknowledged that there are some technologies available for grain drying, including the use of agricultural biomass, there are scalability issues given the size of farms in Western Canada and the lack of labour to implement them.<sup>32</sup> For these reasons, a number of witnesses expressed support for [Bill C-234](#), which would add natural gas and propane to the list of farming fuels that qualify for an exemption from the fuel charge.<sup>33</sup>

While the fuel charge targets GHG emissions from fuel combustion, most agricultural GHG emissions come from enteric fermentation, agricultural soils, and manure

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30 Government of Canada, [Fuel charge relief](#).

31 AGRI, *Evidence*, [Keith Currie](#) (First Vice-President, Canadian Federation of Agriculture); and [Erin Gowriluk](#) (Executive Director, Grain Growers of Canada).

32 AGRI, *Evidence*, [Scott Ross](#) (Co-Chair, Agriculture Carbon Alliance); and [Dave Carey](#) (Co-Chair, Agriculture Carbon Alliance).

33 AGRI, *Evidence*, [Scott Ross](#) (Agriculture Carbon Alliance); [Mike Ammeter](#) (Chair, Canadian Canola Growers Association); and [Erin Gowriluk](#) (Grain Growers of Canada).



management.<sup>34</sup> In order to recognize efforts to reduce emissions or even absorb GHGs, Environment and Climate Change Canada officials described their department’s plan to implement a federal GHG offset system as follows:

[The federal greenhouse gas offset system] will encourage cost-effective reductions of greenhouse gas emissions from activities that are not covered by the federal carbon pollution pricing system, including many potential activities in the agricultural sector. Offsets can provide a financial incentive for an activity in the form of a credit that can be sold to offset an equivalent amount of greenhouse gas emissions from another source.<sup>35</sup>

The department still needs to develop offset protocols to determine what it calls a “consistent approach for quantifying emission reductions and removals for eligible activities.” At this stage, the department is actively working on a protocol for sustainable agricultural land management practices that capture soil organic carbon and is looking at additional offset protocols for activities such as livestock feed management, avoided conversion of grasslands, reduced nitrogen oxide emissions from fertilizers, anaerobic digestion, and livestock manure management.<sup>36</sup> The system would aim to recognize “changed behaviour going forward and not be a reward for early action.”<sup>37</sup>

Many witnesses welcomed this initiative to recognize practices that cut emissions or absorb GHGs but were concerned that farmers who were early adopters of cutting-edge technologies and techniques might be placed at a comparative disadvantage. For [Dr. Bedard-Haughn](#), the widespread adoption of no-till in Western Canada has considerably improved soil health and carbon sequestration since the 1980s. She believes that it is necessary to both reward the work already done and to incentivize continued best practices over time, otherwise the absorbed carbon risks being released back into the atmosphere. [Mr. Everson](#), added that incentivizing proactive farmers can encourage them to “move that to the next stage” and make the necessary investments to adopt new beneficial practices. Some witnesses encouraged the federal government to choose an earlier baseline year to account for early adoption of beneficial practices. [Aldyen Donnelly](#), Special Advisor, Carbon Markets with Terramera, told the Committee that Nori—a company that operates a private offset system in the U.S.—instead

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34 Environment and Climate Change Canada, “Chapter 5: Agriculture,” [National Inventory Report: Greenhouse Gas Sources and Sinks in Canada 1990–2021](#), 2023.

35 AGRI, *Evidence*, [John Moffet](#) (Assistant Deputy Minister, Environmental Protection Branch, Department of the Environment).

36 Ibid.

37 AGRI, *Evidence*, [John Moffet](#) (Department of the Environment).

used 1999 as the baseline year to measure carbon stock changes because it was difficult to obtain the data needed to make earlier estimates of carbon stocks.

## Regulation of New Technologies

The Committee heard from many witnesses that, to encourage the adoption of practices that reduce GHG emissions, the government should ensure that regulations allow them to adopt the technologies of the future.

At the time the Committee held the majority of its hearings, witnesses from the livestock sector frequently referred to the potential of certain feed additives to reduce methane emissions—a GHG—in cattle; 3-nitrooxypropanol (3-NOP) is one of the substances used in these animal feeds, and studies have demonstrated it can reduce methane emissions from enteric fermentation.<sup>38</sup> While many witnesses expressed interest in the potential of certain animal feeds, many felt, at the time of their testimony, that due to their technical characteristics some of these substances might not be eligible to be approved as a feed additive under Canadian regulations, but instead would have to go through the longer and more expensive veterinary drug approval process.<sup>39</sup> As such, [Ms. Stroeve-Sawa](#), recommended “that a feed pathway be developed” to allow the registration of these products under feeds and not veterinary drugs. The Committee acknowledges that it has heard of measures taken by Health Canada and the Canadian Food Inspection Agency (CFIA) to allow, on a case-by-case basis, products containing 3-NOP to follow the regulatory pathway for animal feed additives.

Witnesses also stressed the need for regulatory agencies to take a science-based approach that promotes innovation in areas such as plant breeding and pesticide licensing.<sup>40</sup> [Ian Affleck](#), Vice-President, Biotechnology, CropLife Canada, welcomed the government’s \$50 million investment in the Pest Management Regulatory Agency (PMRA) to strengthen its mandate, but said he would like to see this funding focused on the “timely delivery of innovations to farmers” and on program delivery rather than just on oversight. PMRA is responsible for pesticide regulation in Canada by registering and

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38 [Aklilu Alemu et al. “Use of 3-nitrooxypropanol in a commercial feedlot to decrease enteric methane emissions from cattle fed a corn based finishing diet,” \*Journal of Animal Science\*, 2021.](#)

39 AGRI, *Evidence*, [Frank Annau](#) (Director, Environment and Science Policy, Canadian Federation of Agriculture); [Andrea Stroeve-Sawa](#) (Council Director, Canadian Roundtable for Sustainable Beef); and [Duane Thompson](#) (Canadian Cattlemen’s Association).

40 AGRI, *Evidence*, [Mike Ammeter](#) (Canadian Canola Growers Association); and [Ian Affleck](#) (Vice-President, Biotechnology, CropLife Canada).



revaluating pesticides “after a stringent, science-based evaluation that ensures any risks are acceptable” and promoting sustainable pest management.<sup>41</sup>

### Recommendation 7

**The Committee recommends that the Government of Canada support the livestock sector in reducing methane emissions and its impact on climate change by creating a new environmentally-driven and science-based regulatory pathway for agricultural and veterinary products with environmental benefits, such as 3-NOP feed additives.**

Gene editing is another technological innovation that requires regulatory modernization. This new technology allows plant developers to “make targeted changes to a plant’s DNA” and helps speed up breeding programs.<sup>42</sup> Between 19 May and 16 September 2021, the CFIA held consultations to determine how gene-edited products should be treated from a regulatory perspective.<sup>43</sup> In May 2023, the Agency published [new guidelines](#) for gene-edited plants and other plants with novel traits under the *Seed Regulations*. [Erin Gowriluk](#), believes that it is important that farmers have access to this technology, particularly in light of climate change, to allow for the development of drought-tolerant seeds.

### Support for Research, Innovation and Data Access and Collection

AAFC has a network of 20 research centres distributed across Canada, with scientists who help “guide agricultural production towards sustainable and resilient agroecosystems and agricultural landscapes.”<sup>44</sup> The Committee was introduced to the work done by these research centres by hearing from several departmental scientists working on topics of environmental interest such as the study of soil carbon stability, nitrous oxide emissions, carbon cycling and sequestration, and the impact of beneficial soil management practices.<sup>45</sup>

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41 Government of Canada, [Pest Management Regulatory Agency](#).

42 Government of Canada, [Summary of the guidance for determining whether a plant is subject to Part V of the Seeds Regulations](#).

43 Government of Canada, [Guidance for Determining Whether a Plant Is Subject to Part V of the Seeds Regulations: Closed Consultation](#).

44 AGRI, *Evidence*, [Gilles Saindon](#) (Assistant Deputy Minister, Science and Technology Branch, AAFC).

45 AGRI, *Evidence*, [Louis-Pierre Comeau](#) (AAFC); [Reynald Lemke](#) (AAFC); [Ed Gregorich](#) (AAFC); and [Judith Nyiraneza](#) (Research Scientist, Crop Nutrient Management, AAFC).

[Judith Nyiraneza](#), a research scientist with Agriculture and Agri-Food Canada, presented the P.E.I. living lab project, which she leads, to improve soil and water quality. The [Living Laboratories Initiative](#) is a new research approach by the department that involves “farmers, scientists, and other collaborators to develop and test innovative practices and technologies” that address environmental issues by building on farmers’ experience and knowledge. Funding of \$185 million over 10 years has been allocated for this initiative, and four living labs have been created in Atlantic Canada (Prince Edward Island), the eastern Prairies (Manitoba), Quebec, and Ontario. On July 14, 2022, the government announced the creation of nine additional living labs, in British Columbia, Alberta, Saskatchewan, New Brunswick, Nova Scotia, and Newfoundland and Labrador.<sup>46</sup>

This new innovation support initiative has been welcomed by key industry representatives as an approach that is tailored to the specific issues in each region. The Canadian Federation of Agriculture and the Agriculture Carbon Alliance have both recommended expanding this initiative further into Western Canada to address challenges that arise from extreme weather events, such as droughts and floods, frequently experienced in that region.<sup>47</sup>

Other witnesses focused more on federal funding for research and innovation programs. [Ms. Brocklebank](#) believes that federal funding has not kept up with the growing demand for new research programs on sustainability in the agricultural sector, reporting that the ratio of government to industry funding was generally declining. She suggests that “[c]ore institutional funding for agriculture needs to be rejuvenated to hire researchers and bolster infrastructure.” The need to invest in extension programs that get new knowledge to farmers was also raised.<sup>48</sup>

## Recommendation 8

**The Committee recommends that the Government of Canada further its support for Indigenous-led research to promote Reconciliation and the use of Indigenous knowledge systems in sustainable farming and agriculture.**

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46 Government of Canada, “[Government of Canada launches nine new living labs: collaborative on-farm solutions to combat climate change in agriculture](#),” *news release*, 14 July 2022.

47 AGRI, *Evidence*, [Keith Currie](#) (Canadian Federation of Agriculture); and [Scott Ross](#) (Agriculture Carbon Alliance).

48 AGRI, *Evidence*, [Andrea Brocklebank](#) (Executive Director, Beef Cattle Research Council); and [Jennifer Haverstock](#) (Manager, Horticulture, Perennia Food and Agriculture Inc.).



## Other Federal Initiatives

The witnesses who appeared before the Committee generally spoke about the importance of government programs to support the adoption and maintenance of sustainable practices.

The [On-Farm Climate Action Fund](#) was established in 2021 to support farmers in adopting beneficial management practices that reduce their GHG emissions and promote carbon sequestration. Twelve organizations were selected under this program to redistribute funding to help farmers adopt these practices. The program takes a flexible approach in which participating organizations were tasked to submit a delivery plan that would best achieve the targeted outcomes adapted to their region. The fund is part of the Government's [Agricultural Climate Solutions](#) which also include Environment and Climate Change Canada's Nature Smart Climate Solutions Fund—a fund aiming at the conservation and restoration of wetlands, peatlands, grasslands, and forests to capture and store carbon—and Natural Resources Canada's Two Billion Trees program.

Several of the organizations that appeared before the Committee are Fund recipients. For example, the Union des producteurs agricoles has received funding to “reward Quebec farmers who adopt beneficial management practices in terms of cover crops and nitrogen management,” and the Canola Council of Canada has conducted a project setting a target for nitrogen use on the Prairies.<sup>49</sup> [Rosalie Gillis-Madden](#), Technical Manager, On-Farm Climate Action Fund, Perennia Food and Agriculture, who runs an On-Farm Climate Action Fund project in Nova Scotia and in Newfoundland and Labrador, explained that although the program is generating a lot of interest from producers, those who had previously adopted such practices were sometimes reluctant to participate:

Many farmers have already started these [best management practices], and [the On-Farm Climate Action Fund] only funds new adopters of the best management practices, so there is some hesitation with existing farmers feeling like they're a little bit left out of the funding program, but there is certainly great interest. It's something we've been promoting at Perennia for years. We're really excited to see funding behind the implementation of some of these practices.

[Mr. Ammeter](#) spoke about the importance of farm business risk management programs such as AgriStability or AgriInvest to ensure the economic stability of farms, which he believes will allow farmers to make their own investments in new technologies or equipment that will improve the sustainability of their operations. Drawing parallels with

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49 AGRI, *Evidence*, [Daniel Bernier](#) (Advisor, Agricultural Research and Policy—Environment, Union des producteurs agricoles); and [Jim Everson](#) (Canola Council of Canada).

the cross-compliance system in place in the European Union, where access to certain subsidies is subject to the implementation of environmental measures, some witnesses said that they would not like to see such a model replicated in Canada. The Grain Growers of Canada justified this position by explaining that farmers are facing unprecedented risks and that their access to these programs is essential. The Canadian Cattlemen's Association felt that this could result in farmers managing their operations according to programs, rather than optimizing their production systems.<sup>50</sup>

### **Recommendation 9**

**The Committee recommends that the Government of Canada recognize environmentally positive measures by:**

- **working with industry and researchers to approve a method for assessing the environmental contribution of an innovation that provides fair value to farmers implementing these innovations;**
- **supporting growth and investments in the plant-based proteins agriculture and agri-food sectors;**
- **giving farmers access to funding using a decentralized approach, not necessarily as part of a set government program, since entrepreneurs are in a better position to decide the right time to invest; and**
- **providing recognition and compensation for environmentally positive measures introduced in the past.**

## **Conclusion**

Canadian agriculture has a long tradition of environmental stewardship and farmers have constantly looked for innovative ways to reduce their environmental impact while increasing their production. The federal government can take several actions to help farmers to unleash their full innovative potential and preserve natural resources for future generations. In cooperation with stakeholders and the provinces and territories, it can provide a national framework for data collection, allowing, for example, farmers to identify opportunities to preserve grasslands and wetlands in their operations. The federal government can promote efforts to reduce emissions in agriculture, such as the 4R Stewardship program and other fertilizer application methods, and it can identify and

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50 AGRI, *Evidence*, [Erin Gowriluk](#) (Grain Growers of Canada); and [Duane Thompson](#) (Canadian Cattlemen's Association).



encourage practices that increase carbon sequestration in agricultural soils. The Committee also heard from witnesses who identified new technologies and methods available in other countries that reduce on-farm emissions, but that do not necessarily fit into Canada’s existing pathways for regulatory approval. The federal government should examine the way it evaluates these products to ensure Canadian farmers continue to lead the world in sustainable food production.

## BEE MORTALITY

### Introduction

On [5 October 2022](#), the House of Commons Standing Committee on Agriculture and Agri-Food adopted a motion to “set aside two of the meetings scheduled for the study on the environmental contribution of agriculture to study exclusively the problem of bee mortality, identify its causes and make relevant recommendations to the government[.]” The Committee held three meetings on this topic between 24 April 2023 and 31 May 2023, and heard from Government of Canada officials, representatives of Canadian and United States (U.S.) beekeeping organizations, individual beekeepers, and a witness from an environmental organization. This appendix contains the Committee’s observations and recommendations regarding the testimony heard during these meetings.

### Honey Bees in Canadian Agriculture

Honey bees and other pollinators play an essential role in agricultural ecosystems. The Food and Agriculture Organization of the United Nations estimates the worldwide value of food crops that rely on pollination to be at least US\$235 billion a year.<sup>51</sup> In Canada, bees play a direct role in producing honey, the natural value of which reached \$253 million in 2022,<sup>52</sup> and they also provide up to 90% of the harvest value of agricultural products such as berries, tree fruits, and hybrid canola seeds through pollination. Agriculture and Agri-Food Canada (AAFC) estimates that honey bee pollination contributes \$7 billion per year in additional harvest value to these products.<sup>53</sup>

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51 Food and Agriculture Organization of the United Nations, [Why bees matter: The importance of bees and other pollinators for food and agriculture](#), 20 May 2018, p. 6.

52 Statistics Canada, [Table 32-10-0353-01: Production and value of honey](#).

53 Agriculture and Agri-Food Canada, [Statistical Overview of the Canadian Honey and Bee Industry and the Economic Contribution of Honey Bee Pollination, 2021](#).

Honey bees were introduced in North America by European settlers in the 17<sup>th</sup> century to facilitate familiar crop production methods. In regions with cold winters, such as Canada, beekeepers maintain their hives during the colder months using insulation and other management practices. Nonetheless, bee mortality during this period is common. Prior to 1987, for instance, a mortality rate of 10% was commonly reported in North America while Ontario's Provincial Apiarist explains that a 15% mortality rate was traditionally considered the maximum acceptable winter loss in Canada.<sup>54</sup>

Bee mortality, however, has been on the rise in recent decades. In the winter of 2007–2008, Canadian beekeepers began to report overwinter mortality rates as high as 35%. This trend has continued in recent years, as beekeepers in some regions of Canada have recorded overwinter mortality rates that exceed 50% of their colonies. The winter of 2021–2022 resulted in an exceptionally high bee mortality rate in Canada. [Tom Rosser](#), Assistant Deputy Minister, Market and Industry Services Branch, Department of Agriculture and Agri-Food, characterized the 2021–2022 winter as “an exceptionally poor year,” noting that Canadian beekeepers experienced levels of honey bee mortality without precedent in available recorded data. The Canadian Association of Professional Apiculturists (CAPA) reported a national bee mortality rate of 45.5% during the 2021–2022 winter, with losses at the provincial level ranging from 15.3% in Nova Scotia to 57.2% in Manitoba.<sup>55</sup>

Scientists tend to attribute these elevated mortality rates to a combination of several factors, including parasites and pests, beekeeping management practices, abnormal temperatures, and the use of neonicotinoids, a class of agricultural pesticides that can cause damage to bees. According to a 2022 CAPA survey of Canadian beekeepers, the most frequently cited causes of mortality in their bee colonies that year were ineffective control against Varroa and other pests, poor quality queens, and weak colonies in the fall.<sup>56</sup>

## Federal Actions to Strengthen Canadian Honey Bee Colonies

### Import Controls

To help maintain and rebuild their colonies, Canadian beekeepers often import bees in the spring to replace those who died during the winter. The Canadian Food Inspection

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54 Government of Ontario, *2020 Provincial Apiarist report*.

55 Canadian Association of Professional Apiculturists (CAPA), *Canadian Association of Professional Apiculturists Statement on Honey Bee Wintering Losses in Canada (2022)*, p 1.

56 *Ibid.*, p. 6.



Agency (CFIA) is responsible for regulating the imports of animals, including honey bees, into and out of Canada. [Dr. Parthi Muthukumarasamy](#), Executive Director, International Programs Directorate, Canadian Food Inspection Agency, explained that the CFIA conducts “science-based risk assessments” to determine whether a country’s bee imports present an acceptable level of risk to the health of Canadian bees.

The CFIA divides honey bee imports into two categories: queen bees, who lay eggs that hatch into worker bees, and package bees, consisting of thousands of worker bees and a mated queen. Dr. Muthukumarasamy explained that while queen bees can be individually inspected for health and the presence of pests, honey bee packages, which contain anywhere from 8,000 to 12,000 honey bees, cannot be examined for these risks to the same degree of accuracy. As a result, Canadian beekeepers have more limited options for package imports. Currently, the CFIA allows the import of queen bees from Australia, Chile, Denmark, Italy, Malta, New Zealand, Ukraine, and the states of California and Hawaii in the United States, but only allows the import of honey bee packages from Australia, Chile, Italy, New Zealand, and Ukraine.

Since 1987, Canada has banned the import of package bees from the United States, following the detection of the Varroa mite in U.S. bee colonies. The CFIA most recently reaffirmed this ban in a [2013 decision](#), citing what it found to be a continued high risk of pest and pathogen transmission associated with such imports.

Several Canadian beekeeper organizations appearing before the Committee advocated relaxing these restrictions to allow them to purchase replacement bees from certain regions of the United States, particularly northern California.<sup>57</sup> These organizations argued that bees from the United States would not only be more cost-effective than those imported from Australia, New Zealand, and European countries, but also adapted to Canadian growing seasons. [John C. Hamilton](#), Apiary Manager, Nova Scotia Apiaries Divisions, Oxford Frozen Foods Ltd., explained that package bees from California would be better suited to Canadian production than those coming from the Southern Hemisphere:

The bees coming out of California are spring bees. Almond pollination starts on Valentine's Day. A month later it's finished, and there isn't really anything from then until June. There are minor pollination crops throughout the United States, but the big honey crops come from alfalfa and clover later in the year. There's an ample surplus of bees at that time of year, because they're big, strong colonies and you can

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57 AGRI, *Evidence*, [John C. Hamilton](#) (Apiary Manager, Nova Scotia Apiaries Divisions, Oxford Frozen Foods Ltd.), [Jeremy Olthof](#) (Past President, Alberta Beekeepers Commission), and [Ron Greidanus](#) (Delegate, Canadian Honey Council, Alberta Beekeepers Commission).

shake them. It's really quite effective. They are spring bees. They are not bees that are going into fall or winter in Australia and New Zealand. They are local bees.

Some witnesses from Canadian and U.S. beekeeping organizations also expressed their view that the CFIA's 2013 assessment no longer accurately reflects the risk of importing bees from the United States.<sup>58</sup> They noted that many of the risks outlined in the assessment, including amitraz-resistant Varroa, American foulbrood, and the small hive beetle, are already present in Canada. Similarly, while the 2013 assessment cites concerns over so-called "Africanized" honey bees with more aggressive genes, witnesses explained that bees with these characteristics would not be able to survive in Canadian winters and that advances in genetic testing allow bees with these features to be screened out of honey bee packages destined for Canada.

[Dr. Muthukumarasamy](#) explained that, in 2022, the CFIA requested stakeholders to submit new scientific evidence regarding honey bee health in the United States to help it determine whether a new risk assessment was needed. [He](#) explained that the CFIA would be deciding soon whether there was sufficient new data to conduct a re-assessment. In July 2023, the CFIA advised industry stakeholders that it would be conducting a new risk assessment that it expects to complete in early 2024.<sup>59</sup>

As honey bees commonly travel across the U.S.-Canada border for forage, several witnesses recommended that the two countries cooperate on topics surrounding bee health. [Ron Greidanus](#), Delegate, Canadian Honey Council, Alberta Beekeepers Commission, called for Canada and the United States to work together to develop a North American bee strategy to develop a common approach to bee pests and parasites.

## Recommendation 10

**The Committee recommends that the Canadian Food Inspection Agency (CFIA), as part of its new risk assessment of United States bee imports, assess the possibility of allowing imports from smaller entities (e.g., states, municipalities and individual businesses), within the United States, notably those located in safe zones in northern climates that meet Canadian requirements, while also addressing Canadian beekeeper concerns over bees with so-called "Africanized" genetics. If the CFIA chooses not to allow additional imports from the United States, it should explain its reasons for this decision and make**

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58 AGRI, *Evidence*, [John C. Hamilton](#) (Oxford Frozen Foods Ltd.), [Jeremy Olthof](#) (Alberta Beekeepers Commission), [Paul van Westendorp](#) (Provincial Apiculturist, Government of British Columbia), and [Daniel Winter](#) (President, American Beekeeping Federation).

59 Canadian Honey Council, [Notice to Industry: Import of honey bee packages from the United States/ l'importation de paquets d'abeilles des États-Unis \(CFIA/ACIA\)](#), 18 July 2023.



**clear the corrective actions United States beekeepers would have to take to reduce the risk associated with their imports.**

## Domestic Bee Production

Some witnesses also encouraged efforts to improve Canada’s self-sufficiency in honey bee supply and to reduce its reliance on imports. [Jake Berg](#), Chairman, Canadian Honey Council, explained that a problem with domestic queen bee production is timing: most beekeepers need queens earlier than they can be provided in Canada. Mr. Berg nonetheless called for more research into overwinter queen production to help fill this gap, particularly to address local shortages following winters where losses in one region of the country may be more severe than others.

[Maggie Lamothe Boudreau](#), Vice-President, Apiculteurs et Apicultrices du Québec, explained that she and other beekeepers in Québec were researching how to maintain reserves of queen bees over the winter months to help replenish colonies in the spring. [She](#) also called for efforts to simplify trade in queen bees and “nucleus colonies,” or small honey bee colonies consisting of a queen bee and worker bees, within Canada to promote greater self-sufficiency.

## Disease Monitoring and Surveillance

### Pests and Pathogens

Canadian bee colonies are vulnerable to several pests and pathogens that can spread diseases, make them less productive, and increase their mortality rate. Several witnesses highlighted the ongoing threat posed by *Varroa destructor*, also referred to as the Varroa mite, as well as American foulbrood and European foulbrood, pathogenic bacterial diseases. Witnesses also expressed concern over emerging threats. For example, [Daniel Winter](#), President, American Beekeeping Federation, encouraged Canada to maintain a proactive approach to the Tropiclaelaps mite, a parasitic mite present in several Asian countries that breeds three times faster than Varroa.

### *Varroa*

According to the 2022 CAPA survey referenced above, Canadian beekeepers cited the Varroa mite as the leading cause of honey bee mortality in their colonies during the winter months. The Varroa mite, which first emerged in bee colonies in Asia and migrated to North America in the 1980s, acts as a parasite and weakens honey bee colonies by causing physical damage to honey bees and transmitting pathogens through

colonies. This damage can be particularly severe during the winter months, when honey bees live in close-knit conditions to maintain a constant temperature and are unable to leave the hive, allowing pests and pathogens to spread widely.

The predominant tool used by Canadian beekeepers to protect their colonies against Varroa is Apivar, an acaricide whose active ingredient is the chemical amitraz. Several witnesses expressed concern, however, that Varroa mites may soon develop resistance to this drug and that no alternative products are commercially available in Canada.<sup>60</sup> [Ernesto Guzman](#), Professor, Canadian Association of Professional Apiculturists, acknowledged reports of amitraz resistance in Canada, but explained that his organization did not have “concrete evidence” of this phenomenon and called for more testing to determine resistance rates in different regions of the country.

Some beekeepers called for the development and speedy regulatory approval of amitraz alternatives. Several witnesses mentioned new formulations of oxalic acid as a promising pest control solution but explained that these new products were not yet available in Canada. [Frédéric Bissonnette](#), Acting Executive Director, Pest Management Regulatory Authority (PMRA), Department of Health, testified that the PMRA, which oversees the registration and use of pest control products in Canada, is “aware” of resistance to amitraz in Canadian bee colonies, but that it has not received applications for any new Varroa control product.

In addition to pest control products, [Jean-François Doyon](#), President, Les Ruchers D.J-F. Inc., highlighted the role that technology can play in helping beekeepers maintain healthy colonies. Mr. Doyon explained that his operation uses an app called Nectar to trace hive movements, the provenance of queens, and Varroa population counts, allowing him to better identify the causes of overwinter mortality. He acknowledged, however, that smaller operations may find it difficult to implement this type of technology and joined other witnesses in calling for governments to deploy “tech transfer” teams to help educate smaller bee colony operators on how to implement innovative technologies in their work.

## Recommendation 11

**The Committee recommends that the Government of Canada in partnership with the beekeeping sector and the provinces and territories:**

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60 AGRI, *Evidence*, [John C. Hamilton](#) (Oxford Frozen Foods Ltd.), [Jake Berg](#) (Chair, Canadian Honey Council), [Ron Greidanus](#) (Canadian Honey Council, Alberta Beekeepers Commission), [Jean-François Doyon](#) (President, Les Ruchers D.J-F. Inc.).



- **invest more in apiculture research with the goal of making Canada self-sufficient in producing and selecting queens and bees;**
- **investigate the existence and extent of possible causal relationships between soil degradation, climate change, and increased concentrations of parasites of desired species like honeybees, including but not limited to varroa mites, hive beetles, and wax moths;**
- **employ advanced technology to protect and facilitate breeding of pollinators; and**
- **support greater networking among government, academia and industry research and development centres on all causes of insect pollinator mortality.**

## **Habitat Conservation and Biodiversity**

### **Pesticides**

Agricultural producers use pesticides to control living organisms that are harmful to their crops, including some types of insects. These substances can, however, have unintended effects on organisms and have been shown to have an acute (immediately lethal) and chronic (longer-term) effect on bee larvae and adult bees.

As [Mr. Bissonnette](#) explained during his testimony, in the spring and summer of 2012, the PMRA received reports of abnormally high bee mortality levels, colony losses, and abnormal behaviour among honey bee populations in corn-growing regions in Ontario and Quebec.

Of the dead bee samples the agency analyzed from this region, 70% tested positive for residues of the neonicotinoid pesticides (also referred to as “neonics”) clothianidin and thiamethoxam, so-called “systemic pesticides” used to treat corn and soya seeds. These systemic pesticides are applied to planted seeds and are meant to be taken up by the plant as it grows, providing protection from soil-borne pests and early season pests during the beginning stages of a plant’s development. Since the treatment is taken up by the plant as it grows, the chemical may be present on the surface of the plant, and in its nectar and pollen, which are primary sources of food for bees. Nearby soil and water may also contain traces of the chemical due to the dust generated when planting the seeds. Bees can also be accidentally sprayed with the pesticide during application.

In response to these findings, in 2014, the PMRA published a collection of best management practices for pollinator protection when planting seeds treated with neonics. The PMRA claims that between 2014 and 2016, the number of “bee incidents” linked to neonics decreased by 70% to 80%.<sup>61</sup> In 2019, the PMRA re-evaluated the use of three pesticides (clothianidin, imidacloprid and thiamethoxam), specifically to assess their risk to pollinator health. These re-evaluations led to the agency prohibiting certain uses of these pesticides in agricultural settings that were found to be harmful to bees.

[Lisa Gue](#), Manager, National Policy, David Suzuki Foundation, explained that neonic pesticides are still widely used in treated seeds outside of Québec, where their use has been banned, unless prescribed by an agronomist.<sup>62</sup> Ms. Gue highlighted the effect she felt pesticides and other stressors were having on the health of native and wild pollinators in Canada, who, she explained, are often left unconsidered:

In addition to honeybees, which have been the focus of much of the previous testimony, there are more than 800 species of native bees in Canada that also play an important role in pollination. If we don't hear alarm bells ringing for native bees, it's largely because there's no one to ring them. Beekeepers, of course, actively monitor honeybee populations, whereas, as you heard from the witness in the previous round, wild bee populations are not only harder to track, but there are also fewer resources available to track them, though we know that many of these populations are also in decline.

### **Recommendation 12**

**The Committee recommends that the Government of Canada support the research and development of new biopesticides.**

### **Recommendation 13**

**The Committee recommends that the Government of Canada ensure the Pest Management Regulatory Authority has the necessary resources to fulfill its mandate and that it conduct a comprehensive study on pesticides, including neonicotinoids, that examines their impact and cumulative effect on humans, bees, and native pollinators as well as their economic impact on the agricultural industry.**

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61 Health Canada, [Neonicotinoids in Canada](#).

62 Government of Québec, [Understanding agronomic justification and prescription](#).



## Foraging Plants

Witnesses underlined the importance of honeybees and other pollinators having access to varied sources of forage. [Ms. Lamothe Boudreau](#) noted the importance of different varieties of crops for honey bee health:

[W]e need to have access to biodiversity. Pollen is extremely important for bees. It enables them to feed their brood and supply them with all the amino acids needed to nourish them. A shortage of pollen for a few weeks affects not only the generation of bees that suffers the shortage but also the next three or four generations. It is as if we and our children ate spaghetti for three weeks; we would lack vitamins and our children would not have all the vitamins they need in order to grow.

Two witnesses cited the European Union's [biodiversity strategy](#), which provides financial incentives to farmers to preserve hedgerows, riparian zones, and undisturbed habitats for wild pollinators, as a model initiative in this area.<sup>63</sup> [Mr. Doyon](#) called for farmers to stop mowing alongside roadways and instead to develop buffer strips and plant nectar-rich flowers to provide bees with high-quality forage. The Committee notes, however, that some Canadian farms face challenges that prevent them from adopting these practices. Some farms in Ontario, for example, have been affected by invasive Phragmites, a perennial grass that releases toxins into the soil that kill surrounding plant life.<sup>64</sup>

### Recommendation 14

**The Committee recommends that the Government of Canada work with the provinces and territories to develop a strategy to utilize and diversify natural infrastructure, including wild forages, to protect native pollinators on agricultural land.**

## Conclusion

The past decade has been a difficult one for Canadian beekeepers. The Committee heard testimony that persistently high levels of bee mortality have led some to question whether they can continue to operate, placing the future generation of beekeepers, and the essential pollination services they provide to farmers, in jeopardy. To address the sector's concerns, the federal government should ensure Canadian beekeepers can access secure and cost-effective imports, notably from safe zones in the United States.

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63 AGRI, *Evidence*, [Paul van Westendorp](#) (Government of British Columbia) and [Lisa Gue](#) (Manager, National Policy, David Suzuki Foundation).

64 Government of Ontario, [Phragmites fact sheet](#).

The federal government should also ensure the PMRA has the resources necessary to fulfill its mandate, namely, to provide producers access to effective pest control products in a timely manner and to ensure these products do not have adverse effects on pollinators and other parts of the ecosystem. The federal government should also examine opportunities for agricultural lands to provide pollinators with more diverse forage.



## APPENDIX A LIST OF WITNESSES

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The following table lists the witnesses who appeared before the committee at its meetings related to this report. Transcripts of all public meetings related to this report are available on the committee’s [webpage for this study](#).

Organizations and Individuals	Date	Meeting
<b>Agriculture Carbon Alliance</b> Dave Carey, Co-Chair Scott Ross, Co-Chair	2022/03/28	11
<b>Canadian Federation of Agriculture</b> Frank Annau, Director, Environment and Science Policy Keith Currie, First Vice-President	2022/03/28	11
<b>CroLife Canada</b> Ian Affleck, Vice-President, Biotechnology Justine Taylor, Director, Stewardship and Sustainability	2022/03/28	11
<b>Fertilizer Canada</b> Thomas Bruulsema, Chief Scientist, Plant Nutrition Canada Clyde Graham, Executive Vice-President	2022/03/28	11
<b>Logiag Inc.</b> Jacques Nault, Vice-President, Agronomy	2022/03/28	11
<b>Union des producteurs agricoles</b> Daniel Bernier, Advisor, Agricultural Research and Policy – Environment Martin Caron, General President	2022/03/28	11
<b>Canadian Forage and Grassland Association</b> Cedric MacLeod, Executive Director	2022/03/31	12

<b>Organizations and Individuals</b>	<b>Date</b>	<b>Meeting</b>
<p><b>Canadian Roundtable for Sustainable Beef</b></p> <p>Monica Hadarits, Executive Director</p> <p>Andrea Stroeve-Sawa, Council Director</p> <p>Kristine Tapley, Council Director</p>	2022/03/31	12
<p><b>Ducks Unlimited Canada</b></p> <p>James W. Brennan, Director, Government Affairs</p> <p>Paul Thoroughgood, National Manager of Agriculture and Sustainability</p>	2022/03/31	12
<p><b>As an individual</b></p> <p>Dr. Angela Bedard-Haughn, Dean and Professor, College of Agriculture and Bioresources, University of Saskatchewan</p> <p>Dr. Jean Caron, Agronomist, Professor, Natural Sciences and Engineering Research Council of Canada Industrial Research Chair in Conservation and Restoration of Cultivated Organic Soils, Université Laval, Soil Science and Agrifood Engineering Department</p>	2022/04/04	13
<p><b>Bioindustrial Innovation Canada</b></p> <p>A. J. (Sandy) Marshall, Executive Director</p>	2022/04/04	13
<p><b>Canadian Canola Growers Association</b></p> <p>Mike Ammeter, Chair</p> <p>Dave Carey, Vice-President, Government and Industry Relations</p>	2022/04/04	13
<p><b>Oberland Agriscience Inc.</b></p> <p>Greg Wanger, Founder and Chief Executive Officer</p>	2022/04/04	13
<p><b>As an individual</b></p> <p>Ryan Cullen, Small-Scale and Urban Agricultural Entrepreneur, City of Greens Farm</p> <p>Rod MacRae, Associate Professor, Faculty of Environmental and Urban Change, York University</p>	2022/05/02	16

<b>Organizations and Individuals</b>	<b>Date</b>	<b>Meeting</b>
<p><b>Canadian Cattlemen’s Association</b></p> <p>Fawn Jackson, Director, Policy and International Relations</p> <p>Duane Thompson, Chair, Environment Committee</p>	2022/05/02	16
<p><b>Canadian Roundtable for Sustainable Crops</b></p> <p>Susie Miller, Executive Director</p>	2022/05/02	16
<p><b>Grain Growers of Canada</b></p> <p>Erin Gowriluk, Executive Director</p>	2022/05/02	16
<p><b>Perennial Agriculture Institute</b></p> <p>Eric Toensmeier, Director</p>	2022/05/02	16
<p><b>Department of Agriculture and Agri-Food</b></p> <p>Louis-Pierre Comeau, Research Scientist, Landscape and Soil Carbon</p> <p>Ed Gregorich, Research Scientist, Agrienvironment Division</p> <p>Reynald Lemke, Research Scientist, Environmental Health</p> <p>Judith Nyiraneza, Research Scientist, Crop Nutrient Management</p> <p>Gilles Saindon, Assistant Deputy Minister, Science and Technology Branch</p> <p>Mervin St. Luce, Research Scientist, Swift Current Research and Development Centre</p>	2022/05/09	18
<p><b>Beef Cattle Research Council</b></p> <p>Reynold Bergen, Science Director</p> <p>Andrea Brocklebank, Executive Director</p>	2022/05/30	21
<p><b>Canola Council of Canada</b></p> <p>Jim Everson, President</p>	2022/05/30	21
<p><b>Perennia Food and Agriculture Inc.</b></p> <p>Rosalie Gillis-Madden, Technical Manager, On-Farm Climate Action Fund</p> <p>Jennifer Haverstock, Manager, Horticulture</p>	2022/05/30	21

<b>Organizations and Individuals</b>	<b>Date</b>	<b>Meeting</b>
<b>Canadian Honey Council</b> Jake Berg, Chair	2023/04/24	58
<b>Department of Agriculture and Agri-Food</b> Tom Rosser, Assistant Deputy Minister, Market and Industry Services Branch	2023/04/24	58
<b>Oxford Frozen Foods Ltd.</b> John C. Hamilton, Apiary Manager, Nova Scotia Apiaries Division	2023/04/24	58
<b>Alberta Beekeepers Commission</b> Ron Greidanus, Delegate, Canadian Honey Council Jeremy Olthof, Past President	2023/04/26	59
<b>Apiculteurs et Apicultrices du Québec</b> Maggie Lamothe Boudreau, Vice-President	2023/04/26	59
<b>Canadian Association of Professional Apiculturists</b> Ernesto Guzman, Professor	2023/04/26	59
<b>David Suzuki Foundation</b> Lisa Gue, Manager, National Policy	2023/04/26	59
<b>Government of British Columbia</b> Paul van Westendorp, Provincial Apiculturist	2023/04/26	59
<b>Les Ruchers D.J-F. Inc.</b> Jean-François Doyon, President	2023/04/26	59
<b>American Beekeeping Federation</b> Daniel Winter, President	2023/05/31	65
<b>Canadian Food Inspection Agency</b> Dr. Parthi Muthukumarasamy, Executive Director, International Programs Directorate Dr. Nancy Rheault, Senior Director and Deputy Chief Veterinary Officer, Animal Import/Export Division	2023/05/31	65
<b>Department of Agriculture and Agri-Food</b> Dr. Stephen F. Pernal, Research Scientist, Apiculture and Officer-in-Charge, Beaverlodge Research Farm, Science and Technology Branch	2023/05/31	65

<b>Organizations and Individuals</b>	<b>Date</b>	<b>Meeting</b>
<b>Department of Health</b> Frédéric Bissonnette, Acting Executive Director, Pest Management Regulatory Agency  Dr. Connie Hart, Senior Science Advisor, Environmental Assessment Directorate, Pest Management Regulatory Agency	2023/05/31	65
<b>National Association of State Departments of            Agriculture</b> Ted McKinney, Chief Executive Officer	2023/05/31	65



## **APPENDIX B LIST OF BRIEFS**

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The following is an alphabetical list of organizations and individuals who submitted briefs to the committee related to this report. For more information, please consult the committee's [webpage for this study](#).

**Alberta Beekeepers Commission**

**Animal Justice Canada Legislative Fund**

**Apiculteurs et Apicultrices du Québec**

**Canadian Honey Council**

**Fruit and Vegetable Growers of Canada**

**National Association of State Departments of Agriculture**



# REQUEST FOR GOVERNMENT RESPONSE

Pursuant to Standing Order 109, the committee requests that the government table a comprehensive response to this report.

A copy of the relevant *Minutes of Proceedings* ([Meetings Nos. 11-13, 16, 18, 21, 58-60, 65, 68, 69, 71, 72 and 76](#)) is tabled.

Respectfully submitted,

Kody Blois  
Chair

