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The state of Environmental Sustainability in Canadian Horticulture:
A Report Focusing on Greenhouse Gas Emissions

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1 Sustainability and sustainable agriculture

The United Nations Brundtland Commission defined sustainability as "meeting the needs of the present generation without compromising the ability of future generations to meet their own needs". Nations worldwide have used shared natural resources to provide for our basic needs, in areas such as agriculture, housing, and industrial and technological advancement of their societies, among others. However, our use of natural resources has extended beyond the fulfillment of basic needs and this exploitation of natural resources has grown exponentially in recent decades. This exploitation of resources has caused severe environmental impacts, such as climate change, air, water and land pollution, and habitat destruction, often causing the greatest negative impacts on the poorest among us. To address this draw on natural resources, all UN member states adopted 17 sets of Sustainable Development Goals (SDGs) as a collective action to end poverty, protect the planet and improve the lives and prospects of everyone, everywhere (UN Sustainable Development Agenda, 2015).

Sustainability is a multi-faceted word because it encompasses a wide range of interconnected concepts and considerations related to environmental, social and economic well-being. These three facets are also known as the three pillars of sustainability, as visualized in Figure 1 below. The Venn diagram representation of the sustainability pillars shows sustainability as the intersection of environment, society and economy. Whereas the concentric circle representation places the greatest weight on environmental aspects and emphasizes the need for a healthy environment to support an equitable society and a prosperous economy.

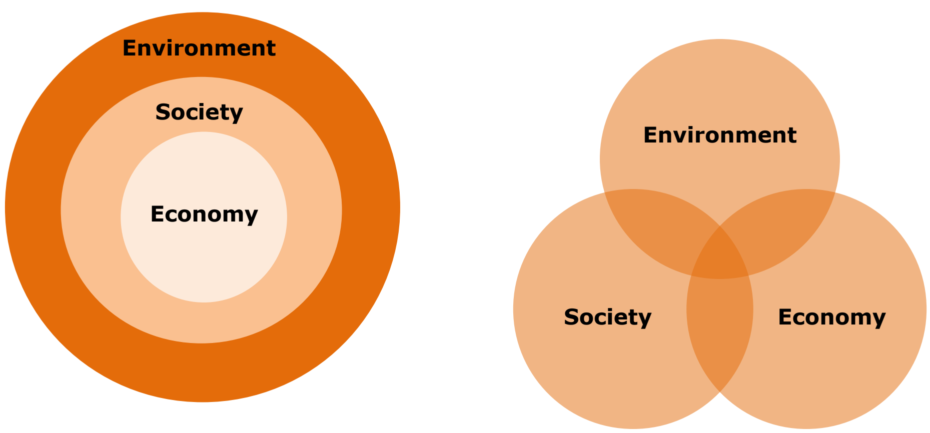

Figure 1: Concentric circles (left) and Venn diagram (right) representation of the three sustainability pillars. Source: Adapted from Purvis et al., (2017).

Sustainability is a concept relevant and necessary in every sector of human activity including agriculture. United Nations Environment Programme (n.d.) defines sustainable agriculture as "farming that meets the needs of existing and future generations, while also ensuring profitability, environmental health and social and economic equity". In this report we are examining the prospect of sustainability in the Canadian agricultural sector, specifically related to horticulture. While we are cognizant of all facets of sustainability, **our focus is primarily directed toward enhancing the sector's environmental sustainability**. This emphasis arises from the substantial demand for natural resources inherent in most agricultural operations within this industry.

Based on the United Nations' definition of sustainability and sustainable agriculture, we can define environmental sustainability in horticulture as the responsible management of resources required to meet horticultural needs without compromising the ability of future generations to meet their own. Horticulture farming requires input resources such as land, water, fuel, natural gas, electricity, machinery, and fertilizers. If not efficiently managed, overutilization of these resources might lead to soil degradation, water scarcity and pollution, biodiversity loss, contamination from fertilizer and pesticides, deforestation, and greenhouse gas (GHG) emissions. Environmental sustainability involves practices and policies that minimize harm to the environment, promote conservation of resources, and support the long-term health and viability of ecosystems.

Given the current concern of climate change, this report undertakes an examination of horticulture's environmental sustainability with a specific focus on the GHG emissions from the sector. Moreover, we do not confine the GHG emissions to the boundary of horticultural farms but undertake a systematic approach to understand emissions from the upstream (manufacturers of farm inputs, farms) and downstream (processors/retailers/wastes) sources in the sector.

2 Canada’s climate action in agriculture

In this section, we will focus on the targets set in the 2030 Emission Reduction Plan (ERP) to reach the goal of net-zero emission by 2050, particularly for the agricultural sector. The plans, policies and targets set in the 2030 ERP: Agriculture focuses on the mitigation of GHG emissions from the sources mentioned in Table 1 and supports adaptation practices to minimize the impact of climate change in agriculture. Adaptation to climate change is considered as equally important as mitigation strategies because the impact of climate change on Canadian agriculture has been observed in the form of droughts, floods and storms. Table 2 highlights the actions undertaken and new focus plans set in the 2030 ERP: Agriculture.

Table 1. 2030 Emission Reduction Plan – Agriculture[1]

Key Actions	Description
Sustainable Canadian Agricultural Partnership	• Launched $3.5-billion, five-year agreement between the federal, provincial and territorial governments to improve the competitiveness, innovation and resiliency of the agriculture and agri-food system. • Cost-sharing programs for on-farm environmental stewardship aiming to assist farmers in implementing Environmental Farm Plans and adopting beneficial management practices. These practices offer a range of environmental advantages, such as conserving soil and water, reducing emissions and emission intensity, and enhancing climate resilience.
Agriculture Clean Technology Program	• $330 million funds to establish an environment for the development and adoption of clean technologies that reduce emissions and increase competitiveness. • Prioritizes development of energy and energy efficiency, precision agriculture and bioeconomy technologies.
Nature-Based Climate Solutions	• Agricultural Climate Solutions Living Labs: A $185 million fund to develop and implement farming practices to tackle climate change through practices that reduce GHG emissions and increase carbon sequestration. • Agricultural Climate Solutions On-Farm Climate Action Fund: A $200 million initiative to promote on-farm practices to enhance nitrogen management, increase adoption of cover cropping and rotational grazing.
Resilient Agricultural Landscapes Program	• A $150 million fund to support carbon sequestration, adaptation and address other environmental co-benefits.
Transformative Science for a Sustainable Sector	• A $100 million fund over six years, starting 2022-23, to support fundamental and applied post-secondary research for net-zero emission agriculture.

3 Canadian agriculture - economic and environmental footprint

Canada's agriculture and agri-food system[2] is an integral part of the Canadian economy generating $143.8 billion (approx. 7%) of Canada's gross domestic product (GDP) and employing 2.3 million people in 2022 (Agriculture and Agri-Food Canada, 2023a). During the same year, the primary agriculture performed within the boundaries of a farm, nursery

[1] Table adapted from the 2030 Emission Reduction Plan: Agriculture https://www.canada.ca/content/dam/eccc/documents/pdf/climate-change/erp/factsheet-07-agriculture.pdf

[2] The agriculture and agri-food system include primary agriculture, processing industry, wholesalers, retailers and food service providers.

and greenhouse generated $36.6 billion (around 1.8%) of GDP. It is worth noting that agriculture is a significant source of GHG emissions. In 2021, agriculture as an economic sector, contributed 10% (69 Mt CO_2 eq.[3]) of Canada's total anthropogenic GHG emissions (Environment and Climate Change Canada, 2023a). Figure 2 highlights the GHG emission trends for different economic sectors in Canada.

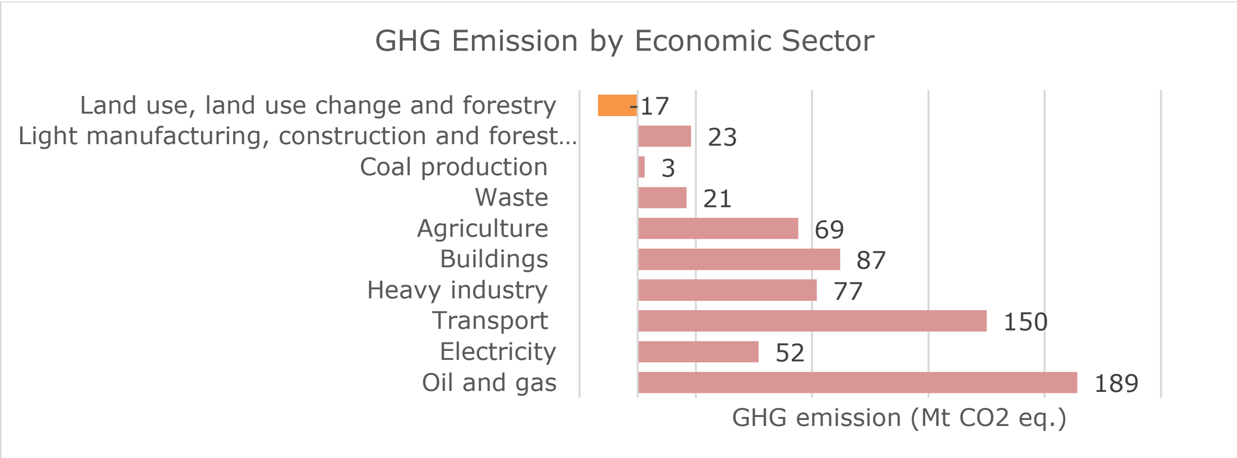

Figure 2: Sources of GHG emissions categorized by economic sectors[1]

Source: Environment and Climate Change Canada (2023a)

The GHG emissions from agriculture can be categorized into emission from livestock production, crop production and on-farm fuel use (see Figure 3 below). In 2021, livestock farming contributed more than half of the GHG emissions from primary agriculture. Crop production and on-farm fuel use emitted 28% and 21% of the agricultural emissions, respectively. A further break down of GHG emission from various sources of agricultural emission is presented in Figure 4. Additionally, if we look at the GHG emission intensity defined as the ratio between emissions of CO_2 eq. (in kg) to the output of the economy, we can see that agriculture emits five times more CO_2 per dollar generated than the overall Canadian economy (see Figure 5). Thus, agriculture is an emission intensive sector.

[3] 1 megatonne (Mt) = 1×10^9 kilograms

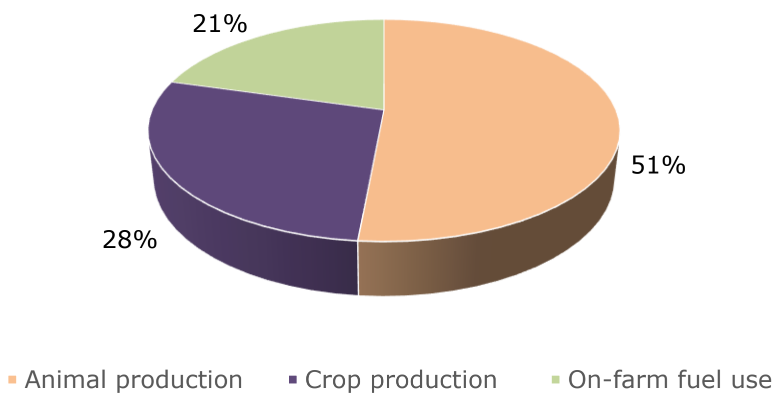

Figure 3: Sources of agriculture GHG emissions in 2021

Source: National Inventory Report, Environment and Climate Change Canada (2023a)

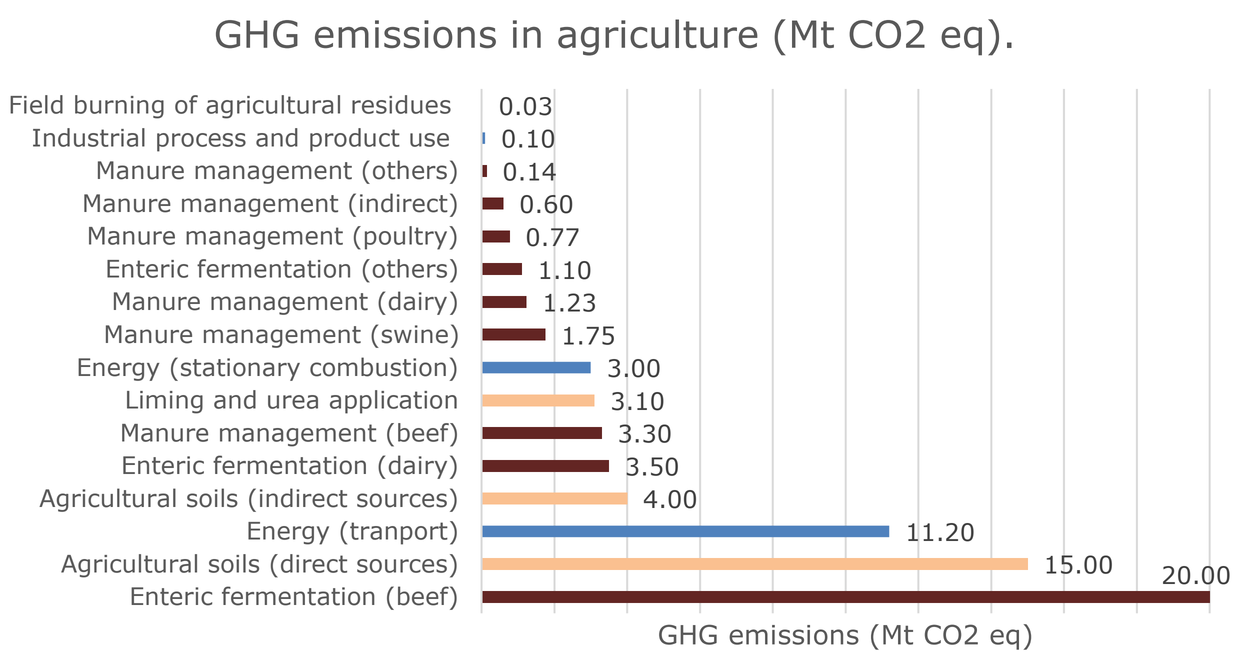

Figure 4: Sources of agriculture GHG emissions (breakdown) in 2021

Source: National Inventory Report, Environment and Climate Change Canada (2023a)

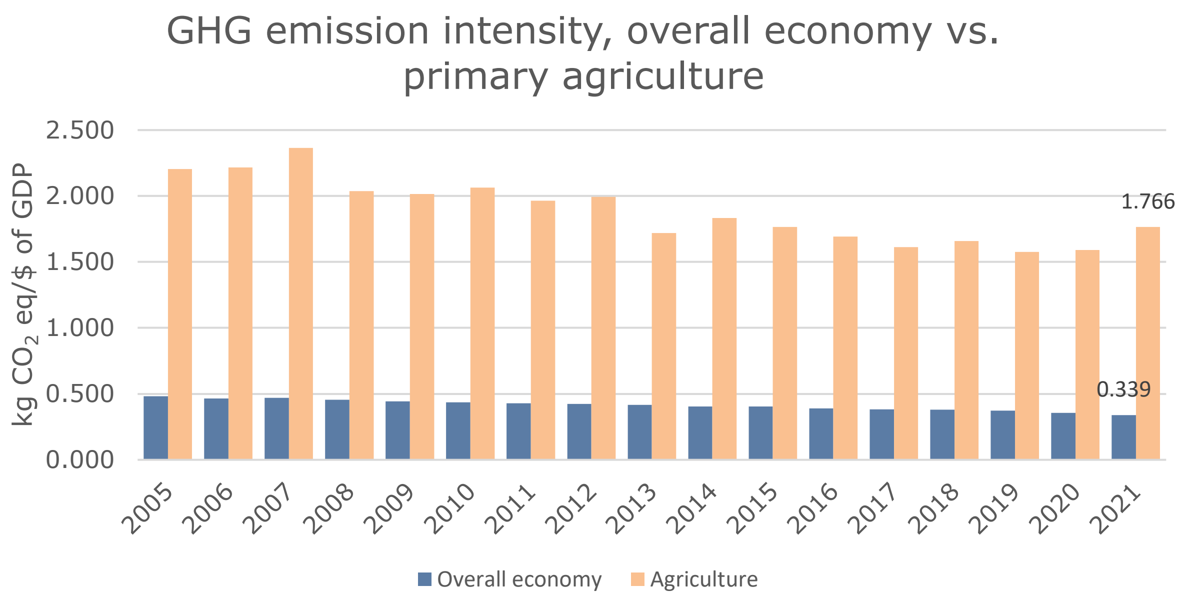

Figure 5: GHG emission intensity between primary agriculture and overall economy

Source: Calculated and generated by author using Statistics Canada data (2023a) and National Inventory Report (2023a)

3.1 Magnitude of agricultural greenhouse gas (GHG) emission sources

There are primarily three types of greenhouse gas emitted from agriculture – methane (CH_4), nitrous oxide (N_2O) and carbon dioxide (CO_2). Forty per cent of the total agricultural emission is the CO_2 equivalent of CH_4 sourced to enteric fermentation and manure management. Thirty-five per cent of the total agricultural emission is the CO_2 equivalent of N_2O from application of manure and other synthetic nitrogen fertilizer. The rest of the emission is carbon dioxide resulting from fuel used for on-farm transportation, stationary combustion and liming and urea application. Figure 6 provides a snapshot of the magnitude of GHG emissions including overall emission and its sources occurring in agriculture in 2020.

In Canada, almost 100% of methane emission in primary agriculture is from livestock production, i.e., enteric fermentation and manure management (National Inventory Report, 2023). Enteric fermentation is a physiological process occurring in ruminants' digestive system, in which microbes ferment the feed and produce methane as a by-product (Gibbs et al., 2000). Livestock manure management leads to methane emission when the manure starts decomposing under anaerobic conditions (Jun et al., 2000).

Crop production leads to both direct and indirect nitrous oxide emission including microbial nitrification and denitrification of fertilizer and manure nitrogen, leaching, runoff and volatilisation (Rochette et al., 2008). A small portion of N_2O emission occurs during the

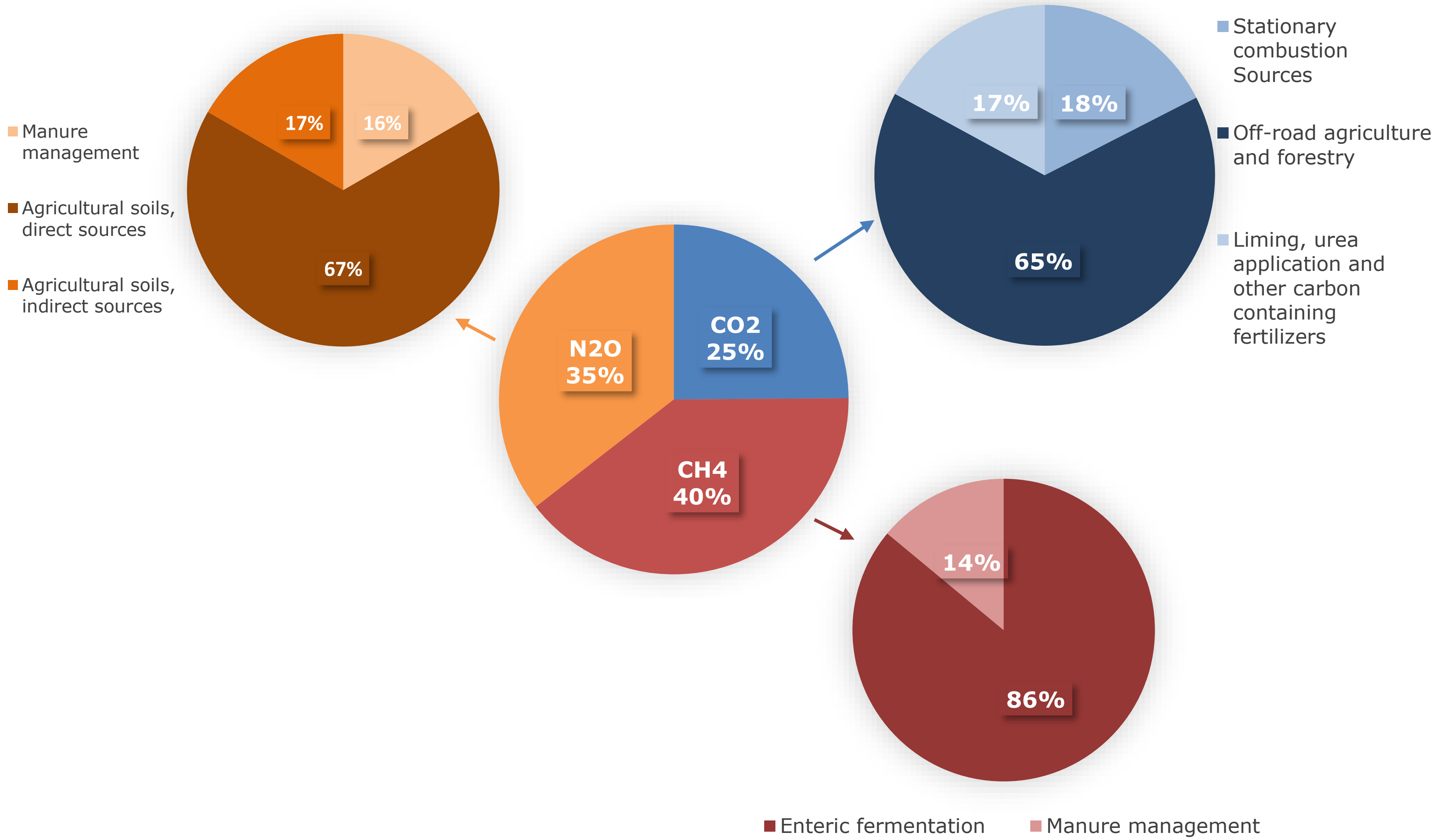

Figure 6: Relative magnitude of the sources of CO_2, N_2O and CH_4 emission from the agricultural sector in Canada in 2021

Source: Generated by author using the National Inventory Report, Environment and Climate Change Canada (2023a) process of livestock manure management. The majority of direct carbon dioxide emission in agriculture is the result of on-farm fuel use for transportation and combustion for heating barns. Additionally, agriculture CO_2 emissions occur from liming and the application of urea or other carbon-containing fertilizer (Environment and Climate Change Canada, 2023a). The major sources of emission in agriculture can be summarized in table 1 below.

Table 2. Sources of agricultural emissions

Activity	Emission source
Animal production	Enteric fermentation (CH_4)
	Manure management (CH_4 and N_2O)
Crop production	Manure application (N_2O)
	Direct N_2O emission from N fertilizer application
	Indirect N_2O emission due to volatilization and leaching
	Liming and other carbon containing fertilizer (CO_2)
On-farm fuel use	Stationary combustion (CO_2)
	On-farm transportation (CO_2)

4 Greenhouse gas emissions and sustainability prospects in Canadian horticulture

4.1 Horticulture in Canada – farm-gate value

We define Canadian horticulture as a distinct sector within Canadian agriculture. Canadian horticultural sector crops consist of fruits, field grown vegetables, greenhouse vegetables, ornamental products (floriculture, nursery, Christmas trees, sod), honey and maple products (Agriculture and Agri-Food Canada, 2023b). The farm cash receipts from major horticultural produce including fresh vegetables (field and greenhouse), fresh fruits and ornamental products were more than $13.7 billion in 2022. That is 25% of total crop receipts and 14% of total farm cash receipts. Figure 7 shows a relative magnitude of the horticultural sector compared to other agricultural sectors in terms of farm cash receipts indicating that horticulture is an integral and vibrant part of the Canadian agricultural economy.

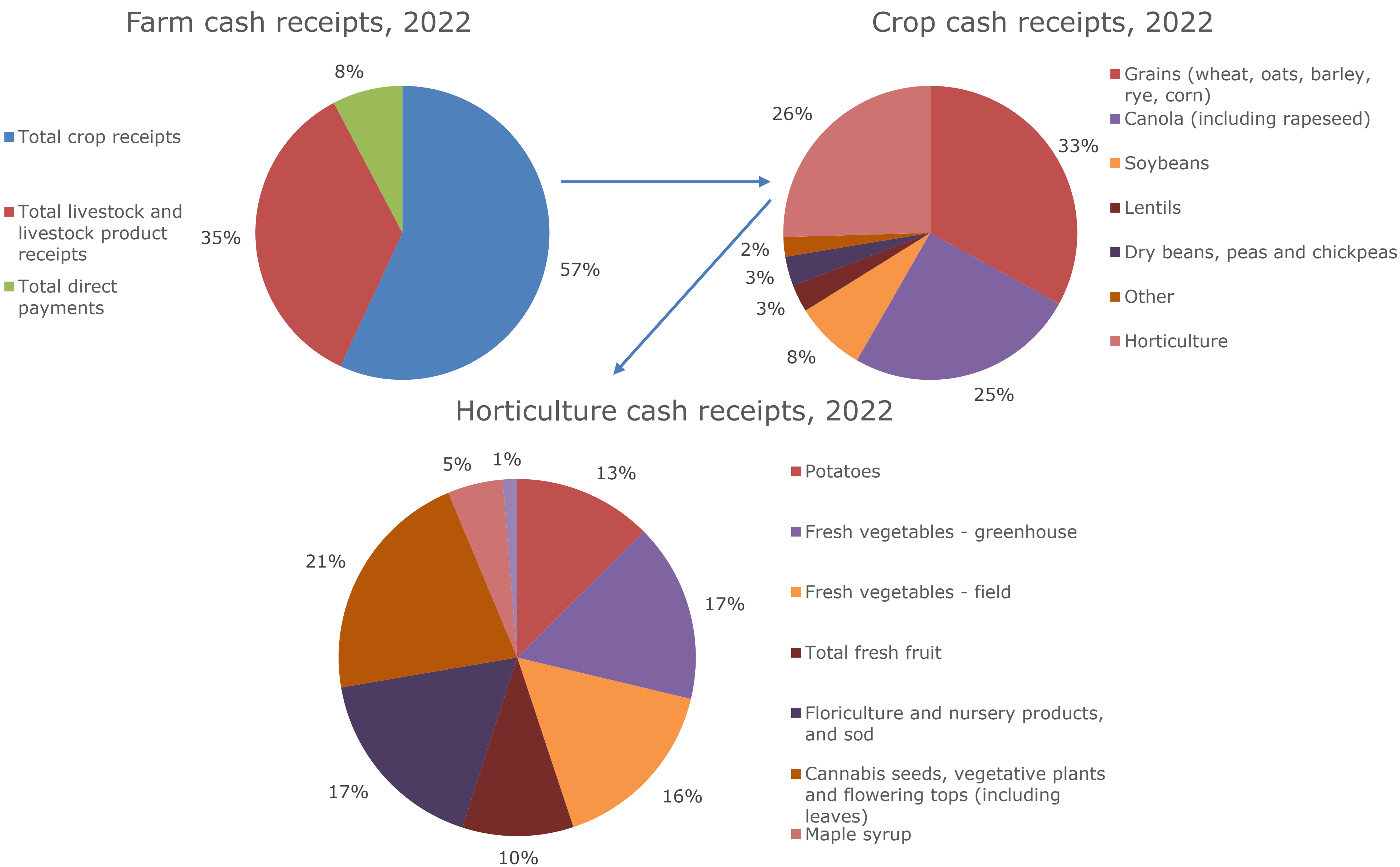

Figure 7: Relative magnitude of horticulture farm cash receipts compared with crop and total farm cash receipts in 2022

Source: Graphs generated by author using Statistics Canada Table: 32-10-0045-01 (2023b)

4.2 GHG footprint of the horticultural sector

As discussed in section 2.1, the primary agricultural sector emits GHGs during the production process. A go-to resource to analyze emissions from economic sectors, the National Inventory Report does not provide GHG emission information for specific crops. This is because measuring GHG emissions is a complex task due to the spatial and temporal variability of agricultural production systems. Furthermore, horticulture is a diverse and vibrant sector with more than 120 varieties of fruits and vegetables grown across Canada (Fruit and Vegetable Growers of Canada, n.d.). This diversity makes calculating a national average for the carbon footprint of the entire horticultural sector challenging.

Complex process-based models are used to estimate the soil carbon change (Smith et al., 1997), CH_4 emissions (Guest et al., 2017) and N_2O emissions (Grant et al., 2004) to determine Canada-specific emission factors. The national and provincial levels of CO_2, N_2O and CH_4 emissions are estimated using these emission factors which are incorporated into the Intergovernmental Panel on Climate Change (IPCC) Tier 2 methodologies (Desjardins et al., 2020). These emission estimates along with production data are used to calculate the carbon footprint or emission intensity for major crops in Canada (Dyer et al., 2010). Desjardins et al. (2020) provide an average estimate of GHG emissions on major field grown vegetables and fruits in Canada incorporating the CO_2 emissions from energy used to grow a particular fruit/vegetable and N_2O emissions from fertilizer use and crop residues.

Additionally, accounting the GHG emission associated with agricultural production is a challenging process because of the complexity of the life cycle of the product. Let’s use field grown tomatoes as an example. The life cycle of a field grown tomato in Canada does not begin directly at the field. It begins in a greenhouse where tomato seedlings are grown. These seedlings are planted in the field between April and May. Then, the tomatoes are mechanically harvested between mid-August and mid-October depending on the variety and are sent for processing. In this case, estimating carbon footprint for tomatoes should incorporate the activities in the greenhouse as well as in the field. On top of that, the upstream environmental burdens such as manufacturing of greenhouse equipment, plastics, fertilizers and pesticides, as well as emissions associated with production of fuel for transportation and heating should also be accounted.

A correct assessment of a complete environmental footprint should account for scope 1, 2 and 3 emissions, as underlined by the GHG Protocol Agricultural Guidance (n.d.). Scope 1 and 2 emissions account for on-farm emissions from agricultural activities and emissions from the production of purchased electricity, respectively. Whereas scope 3 emission entails a broad range of indirect sources of emissions associated with upstream (input providers such as seeds, fertilizers and pesticides) and downstream (processors, transportation and distribution, end-of-life and waste disposal, etc.) activities.

There is a systematic method to quantify environmental aspects and assess the potential environmental impacts of a product or service over its life cycle, which is known as Life Cycle Assessment (LCA). However, based on the requirement and scope of a study, one can choose different life cycle models such as cradle-to-farmgate, cradle-to-processing facility gate, cradle-to-retail gate, or cradle-to-grave. For example, an LCA study for the field grown tomatoes starting from raw material extraction through production would be classified as a cradle-to-farmgate model. There are a few LCA studies performed on fruits and vegetables in Canada such as grapes (Point et al., 2012), apples (Keyes et al., 2015), and greenhouse tomatoes (Dias et al., 2017; Andrews et al., 2009). Because of the diverse nature of horticulture, there remains a lack of research related to GHG emission, life cycle assessment and sustainability prospects in the domain of Canadian horticulture.

To better understand the current GHG emission baseline in the horticultural sector, we looked at several agricultural and grower associations in Canada. Table 3 lists some examples of agricultural products, associated agricultural organizations, the availability of environmental footprint reports and whether a roadmap has been created to meet the ERP 2030 and/or achieve net-zero by 2050. The farmgate livestock production such as beef, dairy, poultry and pork and their associated organization have published reports indicating the environmental footprint of their produce. In addition, the beef and dairy sectors even had a published roadmap to meet the 2030 emission reduction plan and net-zero commitments by the 2050 goal. The Grain Growers of Canada representing the Canadian grain farmers have announced a ‘road to 2050’ initiative to meet the goal of net-zero emissions by 2050. By contrast, the horticultural sector does not have any quantifiable reports on the environmental footprint of its produce, nor do they have any publicly available roadmaps or pathways on how they will meet the climate commitments.

Table 3. Agricultural and grower associations in Canada and commitments to emission reduction

Products (crops/livestock)	Agricultural associations in Canada	Environmental footprint			Roadmap to 2030 ERP/net-zero 2050
		GHG emission intensity	Water usage	Land usage	
Beef	Canadian Cattle Association	Yes (unclear)	Yes	Yes	Yes
Dairy	Dairy Farmers of Canada	Yes (0.94 kg CO_2 eq. per litre)	Yes	Yes	Yes
Pork	Canadian Pork Council	Yes (4.43 kg CO_2 eq. per kg)	Yes	No	No
Chicken	Chicken Farmers of Canada	Yes (2.4 kg CO_2 eq. per kg)	Yes	No	No
Grains	Grain Growers of Canada	n/a	n/a	n/a	Yes
Horticulture	Fruit and Vegetable Growers of Canada (FVGC)	n/a	n/a	n/a	n/a
	Ontario Fruit and Vegetable Growers' Association (OFVGA)	n/a	n/a	n/a	n/a
	Ontario Greenhouse Vegetable Growers (OGVG)	n/a	n/a	n/a	n/a
	Ontario Apple Growers (OAG)	n/a	n/a	n/a	n/a
	Grape growers of Ontario	n/a	n/a	n/a	n/a
	Ontario Tender Fruit Growers	n/a	n/a	n/a	n/a
	Flowers Canada Growers	n/a	n/a	n/a	n/a
	Canadian Ornamental Horticulture Alliance (COHA)	n/a	n/a	n/a	n/a
	Canadian Nursery Landscape Association (CNLA)	n/a	n/a	n/a	n/a
	Landscape Ontario	n/a	n/a	n/a	n/a

4.3 Fertilizer usage related emission

In 2020, the agricultural sector accounted for 75% of national N_2O emissions. Since 2005, the use of nitrogen fertilizer has increased by 89% and the N_2O emission from the use of nitrogen fertilizer has increased by 42% (see figure 8). We do not have estimates for emissions from fertilizer usage in the horticultural sector. The farm management survey in 2021 estimated that almost two-thirds of fruit, vegetable, berry and nut growers applied fertilizer (Statistics Canada, 2022). The same survey estimated that 43% of fruit, vegetable, berry and nut growers used surface broadcast method of fertilizer application without soil incorporation. Surface broadcasting fertilizer without soil incorporation is considered inefficient as it is prone to nutrient loss from leaching and run-off as well as volatilization. Therefore, one can fairly assume that the fertilizer usage associated emission from horticulture could be significant given the total yield and farmgate value of our horticultural produce.

A commitment has been set to reduce emissions from fertilizers by 30% from the 2020 levels by 2030 in the 2030 ERP: Agriculture. However, there have been no regulations on mandatory reduction in fertilizer usage. This target is expected to be achieved by providing support measures to producers, encouraging voluntary emission reductions from fertilizer use over an extended period.

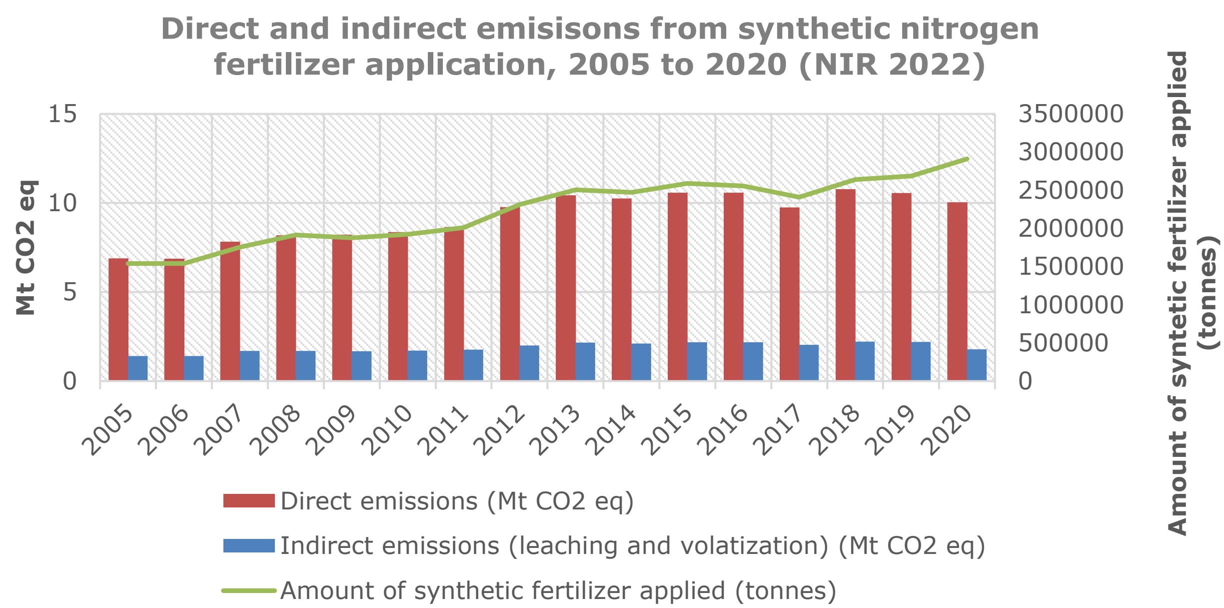

Figure 8: Direct and indirect emissions from synthetic nitrogen fertilizer application, 2005 to 2020

Source: National Inventory Report, Environmental and Climate Change Canada (2022)

The increment in N_2O emission on crop land is driven by the increased area under annual crop production, the increased area under fertilizer intensive crops and the increased soil degradation contributing to carbon (C) and nitrogen (N) losses from soil. Also, the emissions from fertilizer application are not spatially and temporally uniform across the Canadian agricultural landscapes. On top of that, N_2O emissions depend on soil temperature, soil water and nitrate availability, thus requiring the implementation of various strategies across the country to achieve the reduction target. It has been well documented in the literature that farmers over-apply fertilizer to their crops (Sheriff, 2005; Yadav et al., 1997). Thus, it is necessary to note that reduction in the amount of fertilizer used without compromising yield is a possible solution. To address this need, a common management practice called "4R Nutrient Stewardship" has been developed to advocate the responsible use of fertilizer (nutrients). The 4R stands for:

Right source:	To match the fertilizer type to crop needs
Right rate:	To match the amount of fertilizer to crop needs
Right time:	To assure nutrients are available when crop needs them
Right place:	To assure nutrients are placed where crops can use them

4.4 Horticulture and fossil fuel Use

Agriculture will be at the forefront of the Canadian economy as the world battles climate warming and moves away from non-renewable fossil fuel (Rubin, 2015). We cannot, however, ignore the fact that agriculture and the technologies that drive the agri-food environment are extremely reliant on non-renewable energy or fossil fuels. The entire food system accounts for 15% of global fossil use. Synthetic nitrogen fertilizer and pesticides are manufactured using fossil fuels as feedstocks. Petrochemicals for plastics used in food packaging, fossil fuels for running on- and off-farm machinery and transportation of farm inputs from manufacturers or farm produce to processing plants and retailers—all these activities rely on non-renewable energy.

Plastics are ubiquitous in horticulture, used in production, infrastructure, mulching, mechanization, packaging and shipping. Fertilizers and pesticides are very common farm inputs like in all agricultural practices. Additionally, horticultural produce from a greenhouse uses extra energy (heat and electricity) for production in a cold climate like Canada. The required energy comes from renewable sources (hydro, solar, wind or nuclear) as well as non-renewable sources (heating fuel and natural gas). Therefore, the horticultural sector is similar, in terms of reliance on fossil fuel compared to any other agricultural sectors.

In a recent United Nations Climate Change Conference of Parties (COP28), Canada became the first country to commit to cutting down methane emission associated with oil and gas production by 75% by 2030 from 2012 levels to become the cleanest producer of oil and gas (Environment and Climate Change Canada, 2023b). Canada is also one of the more than 150 countries signing the Global Methane Pledge, committing to cut down methane emission by 30% by 2030 from 2020 levels (Environment and Climate Change Canada, 2021). This is an exciting development as it will spur the demand for technological advancement and innovation seeking alternative sources of fertilizers, pesticides and plastic and development in renewable sources of energy. However, the federal government will have to subsidize the research and development to stimulate and foster green technological innovation.

4.5 Carbon sequestration and carbon sinks

Carbon sequestration is the process by which carbon dioxide is removed from the atmosphere and stored in various natural or artificial reservoirs, thus helping to mitigate the effects of climate change by decreasing the concentration of greenhouse gases in the atmosphere. In agriculture, it refers to the process of capturing and storing CO_2 from the atmosphere in agricultural systems, primarily in soil and vegetation. It is globally seen as an important greenhouse gas mitigation strategy. A "4 per 1000" initiative was launched at the United Nation Framework Convention on Climate Change Conference of Parties in 2015 (also known as UNFCC COP 21) with a goal to increase carbon stored in soil by 0.4% per year which can significantly neutralize the annual CO_2 increase in the atmosphere (The international "4 per 1000" initiative, n.d.). Canada sees carbon sequestration as a strategy to reach the 2030 emission reduction goal. Figure 9 below highlights the target to increase the carbon removals from 8 Mt CO_2 eq. in 2019 to 30 Mt CO_2 eq. in 2030 through Land-Use, Land-Use Change and Forestry (LULUCF), Nature-Based Climate Solutions (NBCS) and Agriculture. Thus, horticulture can play a role in carbon sequestration, helping to mitigate climate change.

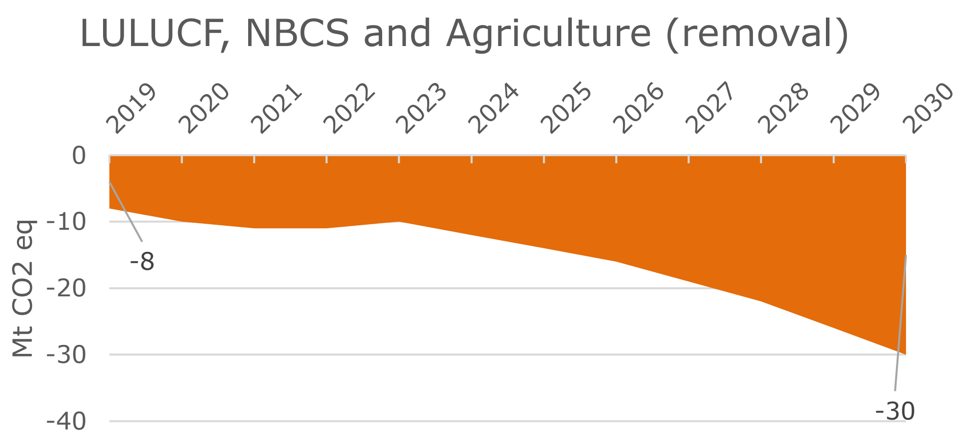

Figure 9: Pathway to 2030 - carbon removals

Source: Adapted from Canada's 2030 Emissions Reduction Plan (Government of Canada, n.d.)

4.6 Food Loss and Waste

Food Loss and Waste (FLW) is another source of greenhouse gas emission that intersects with the agricultural sector. According to the National Inventory Report (NIR) for 2023, the entire waste sector, including the treatment and disposal of solid and liquid waste, contributed 3.1% (21 Mt CO_2 eq.) to Canada's total emissions for the year 2021. The primary sources of emissions for the waste sector are solid waste disposal, including municipal solid waste (17 Mt), wastewater treatment and discharge (2.6 Mt), industrial wood waste landfills (0.7 Mt), biological treatment of solid waste (0.36 Mt), and incineration and open burning of waste (0.15 Mt) (Environment and Climate Change Canada, 2023a). The same inventory report estimates that 20% of national methane emissions come from the waste sector. Unfortunately, it does not sub-categorize solid waste disposal into food waste and other waste. Therefore, information on total GHG emission associated with postharvest and processing waste or household food waste directed to a landfill is not available.

FLW undermines the sustainability of the Canadian agri-food system. Agri-food related GHG emission is associated with fertilizer, water, land and fuel usage during the food supply chain's stages right from the farm to the landfills. When the food is lost or wasted, all environmental inputs used to produce, transport and process the food are lost leading to unnecessary CO_2 emissions. Social impact arises from the fact that 18% of Canadians felt some level of food insecurity in 2022 (Uppal, 2023). Edible surplus food could have been rescued and distributed to channels such as food banks to strengthen the level of food security in Canadian communities. Lastly, FLW results in considerable economic losses for all members within the value chain from growers to consumers. Consequently, the reduction of FLW enhances the triple bottom line of sustainability, encompassing people, profit and the planet.

A report by Value Chain Management International (VCMI) estimated that 35.5 million tonnes (58%) of food produced annually in Canada are lost or wasted, of which 11 million tonnes are avoidable FLW (Gooch et al., 2019). The same report estimated that almost six million metric tonnes of fruits and vegetables go wasted before reaching customers in Canada. The report also determined that two-thirds of this produce waste is avoidable, highlighting the potential of massive reduction or elimination. The remaining one third of fruit and vegetable loss is the unavoidable FLW. Vineland Research and Innovation Centre studied the potential opportunities for unavoidable FLW of the top seven horticultural crops highlighting options for landfill diversion and conversion to value-added products (Grygorczyk and Blake, 2022, see the full report here). The greenhouse gas emission associated with the horticulture FLW occurs throughout the entire agriculture and agri-food supply chain. Therefore, reducing FLW at each stage will not only save Canadians money but will also help reduce GHG emissions. The Government of Canada has launched a research fund "Food Waste Prevention and Diversion: Research and Capacity Building Fund" to help prevent and divert food waste from Canadian landfills.

5 Conclusion

The Government of Canada's emission reduction goals by 2030 and Net-Zero emission by 2050 will not become a success without the commitment and effort from all agricultural sectors including horticulture.

Currently, there is a lack of publicly available information related to quantifying the GHG footprint of horticulture in comparison to other sub-sectors such as livestock farming. We see the diverse nature of horticulture to be the reason behind this lack of information. Since the environmental footprint of producing a field tomato compared to a greenhouse tomato is likely very different, we need to embrace the diversity of the sector and commit to a better understanding of its environmental sustainability. Without understanding differences in the baseline environmental footprint and its sources across the horticultural value chain, any policy interventions to mitigate GHG emissions will be an ineffective one size fits all approach.

It is also important to understand that quantifying the environmental footprint of the horticultural sector is not just about associating its produce to its carbon dioxide equivalent. The story it entails is much broader and is the first step in maintaining, improving and communicating the environmental sustainability of the entire sector. Vineland Research and Innovation Centre is committed to support the sector in defining its economic viability and ensuring a sustainable future for Canadian horticulture.

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