

October 2023

A National Agri-Food Water Action Plan

A *Research* Report prepared for CAPI
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Research
Report



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This report is supported in part by the RBC Foundation through RBC Tech For Nature and part of CAPI's larger environmental initiative, **Spearheading Sustainable Solutions**.



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Note from CAPI

Water security, food security, and national security are inextricably linked. This is because agriculture – the driver of food security – is limited by water quantity, quality, and availability. While Canadians often consider water to be an abundant natural resource, around the world pressures including increasing demand and climate change are demonstrating how precarious agriculture's relationship with water can be.

Responsible water planning must recognize the strong relationship between water and agri-food in Canada. CAPI offers this report as a guide toward an action plan on agri-food water in Canada to monitor better and manage water, and to foster coordination between watersheds and other jurisdictions. Governments must work together, and with the agriculture value chain and civil society to ensure Canada's viability as a material net exporter of agri-food products.

Key Takeaways

- Water security underpins food security and national security and should be considered a strategic asset. Without adequate availability and quality of water, food production and export are impossible.
- Canada has a fragmented and siloed model for water management. Data collection and reporting is far from standardized or complete. Watersheds should be used as the basis for research, innovation, and knowledge mobilization.
- Canada should invest in a mission-driven research call to respond to the grand challenge of conserving and leveraging water as a strategic asset. The R&D results of this research call can be translated into knowledge about how to help agriculture adapt to climate change.
- Federal leadership, including through the Canada Water Agency, will help to overcome the stumbling blocks in forming an agri-food water action plan. This includes a more comprehensive accounting of the economic and non-economic value of Canada's agri-food water.
- The greatest impact will be achieved when governments work together. FPT Agriculture Ministers should lead the development of a National Agri-Food Water Action Plan (NAFWAP). The process should include an expert panel, the release of a *The State of Agri-Food Water* report and the release of the NAFWAP in July 2025.

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Acronyms and abbreviations

AAFC	Agriculture and Agri-Food Canada
APF	agriculture policy framework
BMP	beneficial management practice
CWA	Canada Water Agency
FPT	federal/provincial/territorial
GDP	gross domestic product
NAESI	National Agri-Environmental Standards Initiative
NAFWAP	national agri-food water action plan
R&D	research and development
WEBS	Watershed Evaluation of Beneficial Management Practices
WTO	World Trade Organisation

1 Introduction

The planet is baking under a dome of greenhouse gases as July 2023 was the hottest month on record.¹ Canada is not immune to climate change; on the contrary, it is suffering from it. Droughts, record forest fires, torrential rains, floods – the cost of climate disruption runs into billions of dollars for the economy, health, and infrastructure. Canada's [National Adaptation Strategy](#) recognizes the devastation being experienced by farmers and the negative effects on the long-term economic viability of the agriculture and agri-food sector.²

This report brings much-needed attention and specificity to the management and governance of a vital resource, water, essential to food production. Without water, the equation is very simple: there is no agriculture. And without agriculture, no one is fed. We believe that the quantity and quality of water will not only redefine international trade in foodstuffs, but also domestic agricultural production, against a backdrop of climate disruption and an uncertain geopolitical climate. As the second-largest country on the planet, Canada not only has immense fertile land; it is also the world's faucet. The country is home to 20% of the world's freshwater reserves. It is also the world's fifth-largest food exporter.

It's fair to say that Canada is destined to play a key role in the global food security of a planet that will have 9.7 billion inhabitants by 2050.³ It can also be said that Canada's so-called abundance of water represents a competitive advantage for the country's 200,000 or so agricultural producers and agri-food processors. While primary agriculture depends on water for crops and livestock, processors have access (depending where in Canada they operate) to both water and low-cost renewable energy: hydroelectricity. By 2022, the Canadian agri-food system, powered by water and low-cost energy, employed 2.3 million people (1 in every 9 jobs in Canada) and generated \$143.8 billion, or 7% of Canada's GDP.

At a time when droughts are sabotaging crops in France, Spain, Argentina, Australia, Canada and the United States, and it is unlikely that mankind will be able to limit the temperature rise to 1.5 degrees Celsius by 2050,⁴ investment funds and major agri-food processors are doing their due diligence to identify where food is being produced on the planet and how this might change in the future as suitability shifts with a changing climate. Certain major players are already well established in Canada, where water is either guaranteed by irrigation, as in southern Alberta, or by precipitation, as in most of the Prairies as well as eastern Canada.

An in-depth article in the New York Times, "[America is Using up its Groundwater Like There's No Tomorrow](#)," reveals the overexploitation of the American aquifers that have largely made the USA the world's leading agricultural power.⁵ The article is based on months of data analysis and interviews with 100 experts. Excessive urban development and the operation of large industrial farms using irrigation are among the main reasons for this situation. Whether in the Midwest, Texas, or California (North America's orchard and vegetable garden), excessive pumping of groundwater is preventing aquifers from being recharged. As a result, water shortages caused by climate change are threatening the world's most productive agricultural sector.

The NYT article reveals that the overexploitation of American aquifers is due to a lack of groundwater governance between the various agencies and levels of government. The same scenario applies to the Colorado River, which supplies water to 40 million Americans in seven states and part of Mexico and irrigates 5.5 million acres (2.2 million hectares). What's more, the two dams that created the two great reservoirs of Lake Mead and Lake Powell

¹ Claire A. O'Shea, "NASA Clocks July 2023 as Hottest Month on Record Ever Since 1880," NASA, August 14, 2023, <https://www.nasa.gov/news-release/nasa-clocks-july-2023-as-hottest-month-on-record-ever-since-1880/>.

² Government of Canada, "National Adaptation Strategy for Canada," August 1, 2023, <https://www.canada.ca/en/services/environment/weather/climatechange/climate-plan/national-adaptation-strategy/full-strategy.html>.

³ United Nations Department of Economic and Social Affairs, Population Division, "World Population Prospects 2022: Summary of Results," 2022, 28, https://www.un.org/development/desa/pd/sites/www.un.org.development.desa.pd/files/wpp2022_summary_of_results.pdf.

⁴ United Nations Climate Change, "The Paris Agreement," What is the Paris Agreement?, accessed September 22, 2023, <https://unfccc.int/process-and-meetings/the-paris-agreement>.

⁵ Mira Rojanasakul et al., "America Is Using Up Its Groundwater Like There's No Tomorrow," *The New York Times*, August 28, 2023, sec. Climate, <https://www.nytimes.com/interactive/2023/08/28/climate/groundwater-drying-climate-change.html>.

supply power to thousands of businesses. To prevent this river from drying up, the Biden administration disbursed \$1.2 billion last July to compensate users, including farmers, for a substantial reduction in water consumption.⁶

To maintain its food leadership around the globe, might the United States be tempted to tap into the Great Lakes or divert water from shared rivers? We have already raised this question in a previous report, and the scenario is not impossible. Although the International Joint Commission exists to defuse border disputes over shared waters between Canada and the U.S., we were told that “we must remain vigilant” by a former politician with experience in several federal government ministries.

In Canada, water management is the responsibility of the provinces, and they have adopted policies for water protection and use. This does not prevent the emergence of conflicts of use between farmers, municipalities, and the industrial sector, or the protection of biodiversity in a province like Quebec, considered a nation of lakes and rivers. What’s more, the country is not free of potential inter-provincial conflicts, which the Prairies Provinces Water Board, for example, exists to mitigate. The organization has been in existence for 70 years and allocates the volume of water flowing from the Rocky Mountains into the rivers that cross Canada, Saskatchewan, and Manitoba. Climate change, however, is likely to exacerbate tensions in the Prairies, one of the world’s five breadbaskets.

With the creation of the Canadian Water Agency in the summer of 2023, the federal government assumed leadership, but it must maintain a collaborative approach given the responsibilities and powers of the provinces in water management. Working together on water management is essential to Canada assuming leadership as an agri-food net exporter with an endowment in freshwater. With only 40 million inhabitants including a contingent of professional farmers and innovative processors, Canada is blessed with abundant natural resources including water and therefore has an obligation to assume a leadership role. It is with this in mind that this guide toward an action plan is proposed.

⁶ Christopher Flavelle, “A Breakthrough Deal to Keep the Colorado River from Going Dry, for Now,” *The New York Times*, May 22, 2023, <https://www.nytimes.com/2023/05/22/climate/colorado-river-deal.html>.

2 Water issues in Canadian agri-food

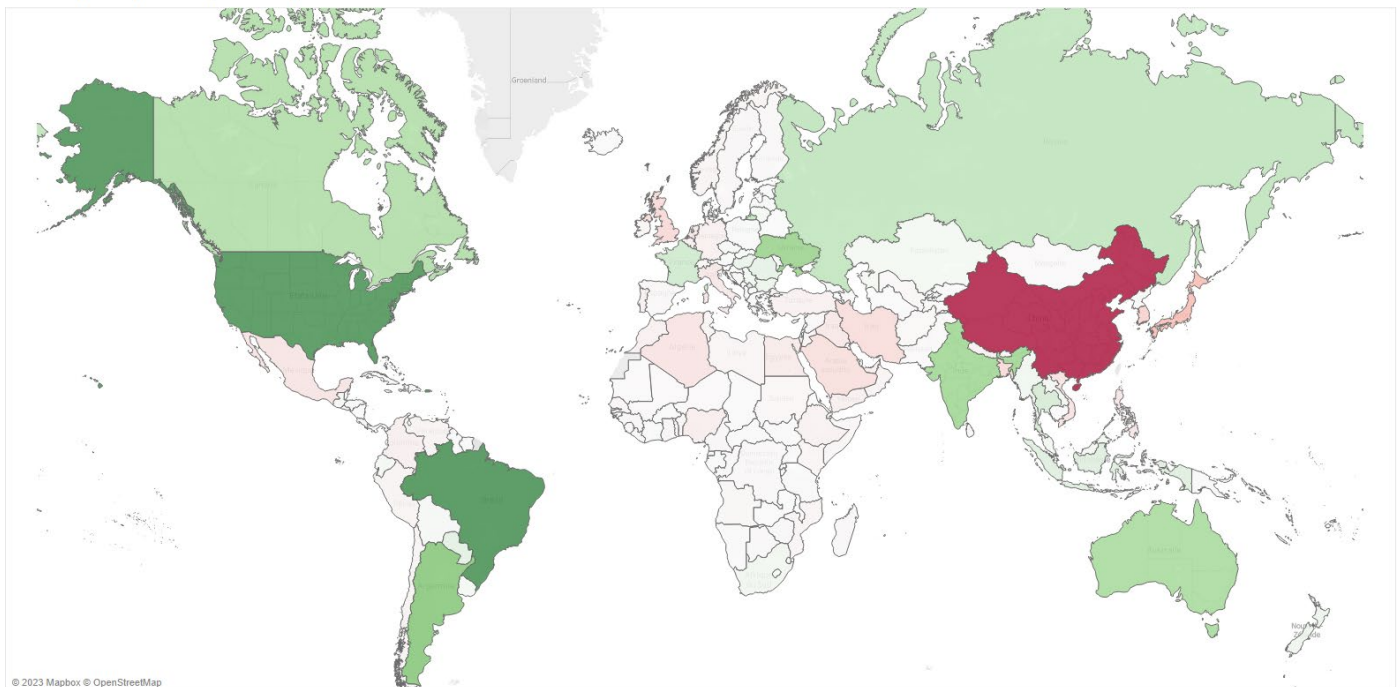
Multiple issues are affecting water quantity, quality, and availability in Canadian agri-food. Amid a changing climate, these include insufficient infrastructure or needed adaptations, and increasing pressure from multiple users in the same watershed. As global demand for Canada's agri-food exports is expected to continue to rise, this puts more pressure on Canada's agri-food system, and in turn, on water use.

2.1 Agri-food trade

Canada is one of the top ten significant net exporters (exports minus imports) of agri-food products. In the map below (Figure 1), net exporters (exports greater than imports) are shades of green, and net importers (exports less than imports) are in shades of red and pink. Darker colours indicate larger absolute values. Brazil and the United States are the largest net exporters, followed by India, Australia, Ukraine, Argentina, and Canada. China is by far the largest net importer of agri-food products. Otherwise said, the green countries feed the red countries.

Figure 1. Net exports of agri-food products

Net exports, 2021 (tonnes)



Data source: FAOSTAT, "Crops and livestock products," 2021. <https://www.fao.org/faostat/en/#data/TCL>. Image produced internally.

Canada is a net exporter of agri-food products. Production and exports will need to take into account the water required for crops, livestock, and food processing. Sustainable water management will be required from farm to fork.

2.2 What is virtual water?

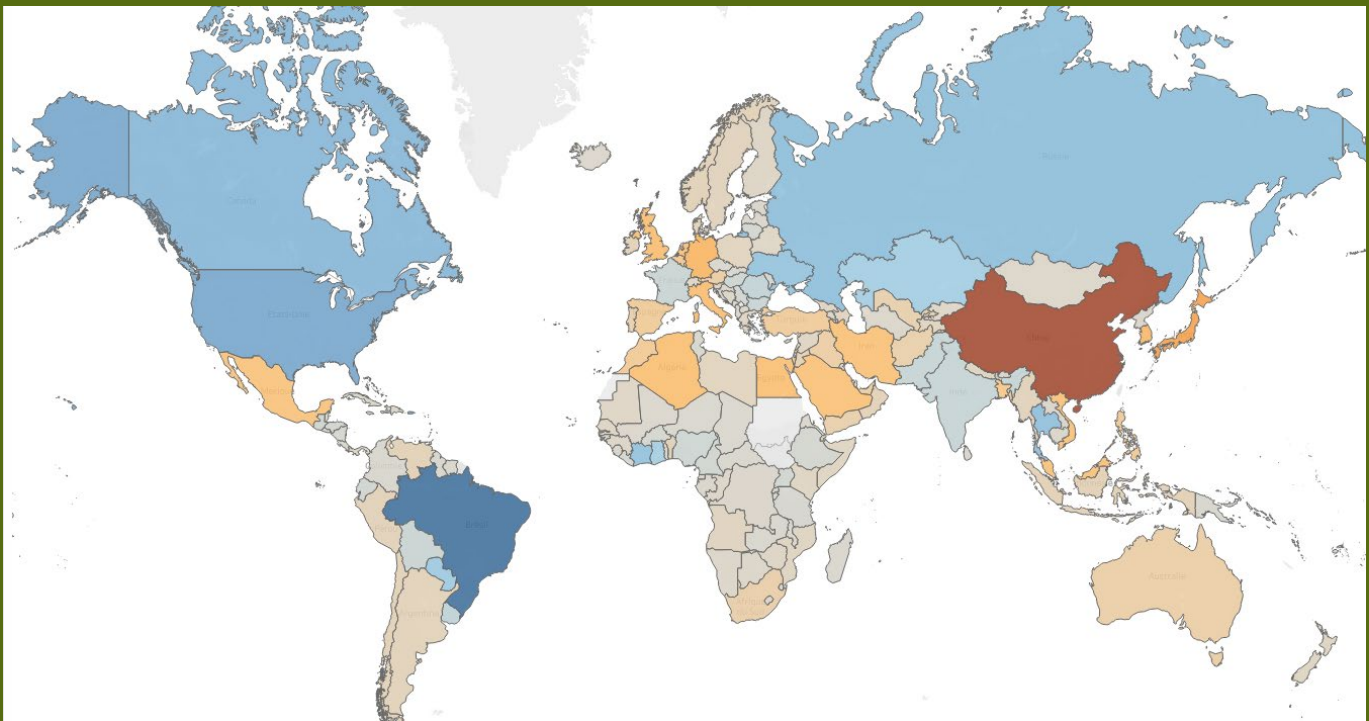
Virtual water represents the total water required to produce a crop or livestock product in a defined area. This measurement is called virtual water because it includes the water in the final product, but also water implied in the production process, such as precipitation, crop irrigation, cleaning vegetables, or diluting pollutants.

Virtual water can also be called a water “footprint.” The water footprint of the same product is different in each region because different countries have different climates, water endowments, and production processes. Countries will tend to specialize in products which have relatively low water requirements. For example, the water footprint for apples in Canada is 297 m³/tonne, and for watermelon it is 130 m³/tonne. By importing apples instead of growing them, Canada could “save” the 297 m³/tonne required to grow them; the same land could be redeployed to produce watermelons which require only 130 m³/tonne: a net savings of 167 m³/tonne (297 minus 130).

Figure 2 shows which countries are net exporters (shades of blue) and net importers (shades of orange) of virtual water embedded in crops and animal products. The darkest orange, China, represents the largest net importer of virtual water embedded in crops and livestock products. The largest net exporters of virtual water via agri-food products are Brazil, Argentina, the USA, and Canada.⁷

An important nuance should be added. The virtual water measure can be further broken down into green water (precipitation), blue water (surface and groundwater), and grey water (the amount of freshwater required to dilute the pollution created in the production process).⁸ In the map below, Canada’s virtual water exports are attributed largely to canola and wheat. In Canada, 86% of the water footprint for crops is green water (precipitation).⁹

Figure 2. Virtual water trade in crops and animal products, m³ (crops: 2016; animal products: 2020)



Data source: CWASI, “Download – CWASI Database,” CWASI-Coping with water scarcity in a globalized world, 2021, <https://www.watertofood.org/download>. Image produced internally.

⁷ CWASI, “Download - CWASI Database,” CWASI-Coping with water scarcity in a globalized world, 2021, <https://www.watertofood.org/download>.

⁸ M M Mekonnen and A Y Hoekstra, “The Green, Blue and Grey Water Footprint of Crops and Derived Crop Products,” December 2010, 42.

⁹ Mekonnen and Hoekstra.

2.3 Governance

Water management is broadly under the purview of provincial and territorial governments, which has led to a fragmented approach in Canada. Data collection is not homogeneous across provincial/territorial boundaries and can lead to non-standardized reporting. Governments and their agencies have varying levels of resources for reporting, program delivery, and technical assistance. Multiple stakeholders raised the non-uniformity in data collection, the need for more research, and expressed frustrations with duplication and fragmentation of funding for water-related initiatives.

Better coordination of data collection would lead to greater reporting capacity, more refined analysis of issues, and improved environmental outcomes. For instance, after ecosystem indicators were adopted in the International Joint Commission's Great Lakes Water Quality Agreement (renewed in 2012), parties made significant progress in terms of water quality in the subsequent three years.¹⁰

2.4 Access to water

In the west, access to water for irrigation, especially in the Palliser Triangle, is the dominant concern, and what is at stake is agricultural production and associated economic development. Two-thirds of all Canadian irrigated land is in Alberta, and the province generates \$5.4 billion of revenue, or about 30% of the province's total agriculture sales.¹¹ With the Lake Diefenbaker Irrigation Project, Saskatchewan has the opportunity to follow Canada's lead in maximizing the economic impact of the province's water resources.¹²

In the United States, over pumping of aquifers is causing huge earth fissures, sinkholes, and rivers to flow in opposite directions or dry up entirely.¹³ While groundwater in the United States and Canada are not identical, the experience of the USA demonstrates that water resources are not infinite. Moreover, some aquifers and water bodies in agricultural zones are shared between Canada and the United States. Concerns have been raised about water use (agricultural and domestic) in States such as Wisconsin and Illinois which, over the long term, could deplete the Great Lakes.¹⁴ More research and coordination is required to accurately estimate water balances in these lake-wide hydrological systems.¹⁵

2.5 Need for uniform data collection and knowledge transfer

This theme was raised by government representatives, NGOs, and researchers. The fragmented water governance model in Canada has led to a patchwork of systems across jurisdictions and watersheds. We heard about the difficulty in taking the lead if one jurisdiction is not aligned with its neighbours. Existing systems are not being used to their full potential: it is not until an emergency happens that system users learn about the gaps in data collection and monitoring.

Areas for future R&D expansion include mapping and surveying of wetlands, surface and groundwater, climate modelling, and technical expertise at the watershed level. The dearth of groundwater mapping in Canada has been highlighted for at least 20 years, including in a 2005 Senate Committee report entitled "Water in the West:

¹⁰ Debora VanNijnatter and Carolyn Johns, "The International Joint Commission and the Evolution of the Great Lakes Water Quality Agreement: Accountability, Progress Reporting, and Measuring Performance," in *The First Century of the International Joint Commission*, 2019, 418, <https://prism.ucalgary.ca/server/api/core/bitstreams/94980cb2-fd53-4bc8-8939-65ae021a6e10/content>.

¹¹ Alberta Irrigation Districts Association, "Economic Value of Irrigation Districts-A 2021 Study," Google Docs, 2021, https://drive.google.com/file/d/1YaWdoPpI3p8nF03q78JJWHImOzJHc_u/view?usp=share_link&usp=embed_facebook.

¹² Nicolas Mesly, "Irrigation: Saskatchewan's Unfulfilled Dream" (Canadian Agri-Food Policy Institute, October 2023).

¹³ Rojanasakul et al., "America Is Using Up Its Groundwater Like There's No Tomorrow."

¹⁴ U.S. Geological Survey, "Groundwater Decline and Depletion," Water Science School, June 6, 2018, <https://www.usgs.gov/special-topics/water-science-school/science/groundwater-decline-and-depletion>.

¹⁵ International Joint Commission, "Protection of the Waters of the Great Lakes," 2015 review of the recommendations from the February 2000 report, December 2015, https://legacyfiles.ijc.org/tinymce/uploaded/Publications/IJC_2015_Review_of_the_Recommendations_of_the_PWGL_January_2016.pdf.

Under Pressure”¹⁶ and a 2009 expert panel assessment report by the Council of Canadian Academies entitled “The Sustainable Management of Groundwater”¹⁷ (see Box 2). A complete wetland inventory has yet to be completed in Canada. Knowledge transfer is also essential for sustainable water management in agriculture (see Box 1).

2.6 Water, vital for agri-food production, food security, and national security

Global food production is facing major headwinds related to climate change, biodiversity loss, geopolitical instability, and devastating diseases for which there are still no vaccines (e.g., African swine fever). Worryingly, only about seven countries¹⁸, including Canada, have net exports which add up to between 72% and 95% of the world's net exports of food. The militarization of foodstuffs, protectionism, and the abandonment of the WTO rules-based multilateral trading system should be of great concern to the authorities.¹⁹

Wheat, the bread of nations, along with rice and corn, to feed mankind, is a good example of the link between food security and national security. Since Russia's war was declared in Ukraine on February 21, 2022, a fragile grain export agreement from these two countries, promoted by the United Nations and Turkey, has prevented a food crisis in importing countries, including Egypt, the world's largest wheat importer. The other breadbaskets of Canada, the United States, the EU (France) and Australia must make up for the shortfall to ensure adequate supply and world peace. The financial, economic, and ecological crisis of 2007-2008 caused food riots in some 40 countries. As a result, this crisis has put agriculture and food security back on the agenda of governments.

At the January 2023 event hosted by CAPI in Ottawa, "[Canadian Agri-Food in a Hungry World: Improving Canada's Position in a Shifting Geopolitical Landscape](#)," some stakeholders and experts made the connection between food insecurity, social disorder and political upheaval, national security, and economic security. "Canada does not think enough about how it can contribute to global food security, whereas we have a moral imperative to do so," said one.²⁰

The country also doesn't think enough about protecting its water in terms of food management and production. "We need to do better on water management and irrigation issues by investing in infrastructure to ensure long-term supply issues are addressed and future production capacity is buttressed."²¹

To add to the notion of water protection and national security, we must mention the possibility of massive exports of water from Canada to the United States. An expert in the geopolitics of water from Université Laval indicated that under the Canada-United States-Mexico Agreement (CUSMA) this possibility is conceivable. Although there is an International Joint Commission tasked with settling potential water conflicts between the two countries, "We have to be vigilant," a former federal government minister said in an interview.²²

2.7 Is there a price for water?

This question stems from the famous water paradox whereby human beings are willing to pay a fortune for diamonds – a luxury good – but water, a substance essential for life, has no value. There is a whole debate about whether water is a right, a commodity, or an essential or even sacred resource for the protection of life and biodiversity.

¹⁶ see Linda Nowlan, "Buried Treasure: Groundwater Permitting and Pricing in Canada" (The Walter and Duncan Gordon Foundation, March 2005), https://waterbucket.ca/wcp/files/2006/12/Linda-Nowlan_Buried-Treasure_2005.pdf; Senate of Canada, "Water in the West: Under Pressure" (Ottawa, November 2005), <https://sencanada.ca/en/content/sen/committee/381/enrg/rep/rep13nov05-e>.

¹⁷ Council of Canadian Academies, "The Sustainable Management of Groundwater in Canada," 2009, <https://cca-reports.ca/wp-content/uploads/2022/11/The-Sustainable-Management-of-Groundwater-in-Canada-Full-Report-EN.pdf>.

¹⁸ Canada, USA, European Union, Argentina, Brazil, Australia, New Zealand

¹⁹ Canadian Agri-Food Policy Institute, "What We Heard: Canadian Agri-Food in a Hungry World," February 2023, <https://capi-icpa.ca/explore/resources/what-we-heard-canadian-agri-food-in-a-hungry-world/>.

²⁰ Canadian Agri-Food Policy Institute, 6.

²¹ Canadian Agri-Food Policy Institute, 9.

²² Mesly, "Irrigation: Saskatchewan's Unfulfilled Dream."

Water is essential to Canadian farmers and agri-food processors. Agri-food business owners have indicated that the price of water and electricity are key to maintaining their competitiveness. At the moment, there is no measurement of water used in international trade in commodities under the auspices of the World Trade Organization (WTO) “because there is no price on water like there is on fertilizers to determine whether or not a product is subsidized,” according to an expert on international agricultural trade and senior economist at the Washington-based International Food Policy Research Institute (IFPRI).

Major infrastructure projects such as dams, irrigation canals, and pipelines are the result of massive public investment in the United States, Canada, India, Egypt, China, etc. Farmers, like other actors in society, benefit from these large public infrastructures. In Canada, farmers in the irrigation districts of Alberta and some areas of Saskatchewan, for example, will contribute financially to the maintenance or even development of certain infrastructures. As for the investments required to acquire irrigation equipment (pivots, pumps, etc.), these costs are borne by the farmers, although provincial programs exist to facilitate these acquisitions.

Some countries or states where water is a major problem due to water scarcity, such as Australia and California, have developed a water market where farmers compete with other economic actors to irrigate their crops or water their livestock.

Canada is not in this extreme situation, but the country would benefit from a better understanding of the water needs of its primary agriculture. Consider the food and beverage processing sector, which is a major user of water (e.g., slaughterhouses). Basically, food processors pay municipalities for their water, who in turn are responsible for infrastructure, such as wastewater treatment plants, and for supplying water to their citizens and industries. Water bottling companies, on the other hand, have been the subject of heated public debate because the fees paid to provincial governments are considered too low. Several citizens' associations are denouncing this shortfall, which could help finance watershed authorities. Using the watershed as the basis of water planning is the model used by government authorities to manage the quantity and quality of water between the different stakeholders, but adequate funding is required to support this governance model.

In the current context and in anticipation of the very near future, Canada would benefit from recognizing water as: (a) a strategic asset in the same vein as rare metals are considered a strategic asset; and, b) recognize Canada's agri-food sector as essential to its economy (and to its own food security and that of the world), at least as important as the development of a battery industry and an electric vehicle fleet in Canada.

A word should be said here about the quality of water and pollution from agriculture in the country's waterways. Water quality is greatly affected by soil leaching, pesticides, fertilizers like nitrogen and phosphorus, feces, etc. Whether it's the boundary waters of the Great Lakes, Lake Champlain, the St. Lawrence River, or the great rivers that flow from the Rockies into the Prairies, all agronomists and experts agree that water quality is linked to soil health. Healthy soil is like an athlete: it doesn't need constant medication in order to perform. Several beneficial management practices (BMPs) have been identified to ensure healthy soil, including crop rotations, cover crops which offer protection from erosion (among other things), building riparian buffers to protect waterways, and the use of GPS technology and variable rate equipment to distribute fertilizers at the right rate in the right place at the right time.

Both the federal government and some provinces are encouraging the adoption of these measures through the Sustainable Canadian Agriculture Partnership ([Sustainable CAP](#)). However, farmers are subject to economic factors, such as: fluctuating commodity prices; increasing input prices (fertilizer, seed, and fuel); debt (rising interest rates to counter inflation); carbon taxes in some provinces; and so on. This raises a point of debate: should farmers be paid for ecological services to protect water?

This question leads to another raised in this research: should Canada put a price on ecological goods and services? Researchers are looking into this question. These ecological services have been valued in billions of dollars, including by the Toronto Green Belt Foundation.²³

Box 1. Canadian Council of Academies report, 2013

Knowledge transfer is needed to achieve sustainable water management in agriculture

In its 2013 publication entitled "[Water and Agriculture in Canada: Towards Sustainable Management of Water Resources](#)," the Council of Canadian Academies (CCA) identified *knowledge transfer* as one of five key areas needing additional science and action.²⁴ This knowledge transfer (together with governance structures, valuation techniques, and economic incentives) is essential for sustainable water management because it drives a host of outcomes: better management decisions, the uptake of sustainable practices, and stronger relationships among stakeholders.

Knowledge includes scientific research and traditional and local knowledge. The co-production of knowledge occurs when different representatives from the farm community come together to perform research. The co-production of knowledge is one way that farmers can be leaders in sustainable water management.

The success of policy action is limited by the uptake, or changing behaviour, of those targeted by the policy. To translate knowledge into action, it must be effectively communicated. The CCA finds that *extension work* is the most effective knowledge transfer strategy in agriculture. Extension workers are experts from the private agribusiness sector, the public sector, or scientists from research stations who work with farmers on a regular basis in their home communities. The benefits of extension work include greater coordination of rural producers, development of technologies and tools which are best suited to the end users, skills transfer, and connecting farmers to markets, scientists, innovators, and technology developers.²⁵

One of the reasons extension work is so effective at translating knowledge into action is because it often involves *social learning*: "the development of knowledge, skills, and attitudes, by connecting to others."²⁶ As agricultural stakeholders connect with others, they create collective experiences, either in-person or virtual. These collective experiences help create buy-in from producers and make them more sympathetic to the message which is being communicated. With this approach, knowledge can translate to action and, ultimately, adoption of sustainable water management practices in Canadian agriculture.

²³ Green Belt, "Ontario's Wealth, Canada's Future: Appreciating the Value of the Greenbelt's Ecoservices," Greenbelt Foundation, March 15, 2021, https://www.greenbelt.ca/greenbelt_ecoservices.

²⁴ Council of Canadian Academies, "Water and Agriculture in Canada: Towards Sustainable Management of Water Resources" (Ottawa: The Expert Panel on Sustainable Management of Water in the Agricultural Landscapes of Canada, 2013), xvi, <https://cca-reports.ca/wp-content/uploads/2022/11/Water-and-agriculture-in-Canada-Full-Report-EN.pdf>.

²⁵ Council of Canadian Academies, 174.

²⁶ Council of Canadian Academies, 169.

3 Policy scan

This section scans the development of water policy and budget commitments by the federal government starting in 1970.

3.1 Chronology of water policy

A timeline is shown here of policy developments in Canada which directly or indirectly relate to water, beginning in 1970. The five-year agriculture policy frameworks (dark green) are also included because they enhanced water stewardship at the farm level. Each of the elements pictured here is described in greater detail below.

Figure 3. Timeline of agri-food water policy in Canada

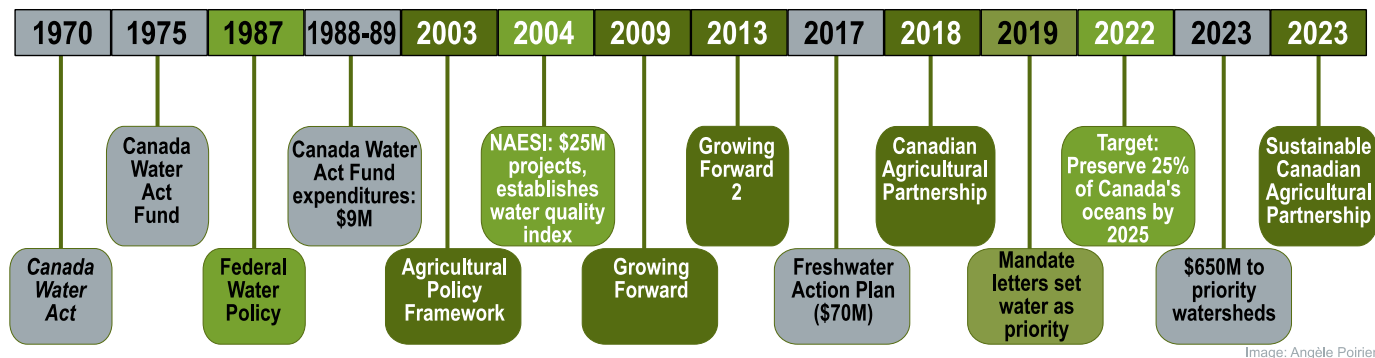


Image: Angèle Poirier

Image produced internally by Angèle Poirier.

In 1970, the *Canada Water Act* was passed, providing a framework for federal-provincial-territorial (FPT) joint planning and cost-sharing in relation to water management and water infrastructure projects.

In 1975, The Canada Water Act Fund was established in 1975 with expenditures split into two categories: policy and planning, and structural projects such as water supply and flood control. The greatest amount of policy spending was in 1988-89 with approximately two-thirds of total Fund expenditures (\$9M) going to policy and planning. Through the '90s, total Fund expenditures fell to less than a million in 1997-98, all of which was allocated to policy and planning.²⁷

In 1984, Canada's Ministry of Environment undertook the Inquiry on Federal Water Policy (the "Pearse Inquiry") to propose a federal policy framework around water.²⁸ The final report (1985) contained 55 recommendations to the federal government including the adoption of "integrated watershed management."²⁹ The report provided the basis for the *Federal Water Policy* in 1987 but was never enacted.³⁰

In 2003, Agriculture and Agri-Food Canada's (AAFC's) five-year agriculture policy framework (APF) was released (in contrast to the earlier three-year agreements).³¹ This provided funding to provinces for delivery of programs including the adoption of water conservation practices. Alberta was the most water-focussed province, with four different water-related programs: (1) the Canada-Alberta Farm Water Program (to develop long-term, reliable fresh water on farms and ranches); (2) the Irrigation Rehabilitation Program (to renew infrastructure in the various irrigation districts); (3) the development of protocols and information materials to target BMPs related to

²⁷ Larry Booth and Frank Quinn, "Twenty-Five Years of the Canada Water Act," *Canadian Water Resources Journal* 20, no. 2 (1995): 65–90.

²⁸ Peter H. Pearse and Frank Quinn, "Recent Developments in Federal Water Policy: One Step Forward, Two Steps Back," *Canadian Water Resources Journal / Revue Canadienne Des Ressources Hydriques* 21, no. 4 (January 1, 1996): 329–40, <https://doi.org/10.4296/cwrj2104329>.

²⁹ Centre for Constitutional Studies, "Water Law: The Interjurisdictional Context," *Constitutional Studies*, 2008, <https://www.constitutionalstudies.ca/2008/08/water-law-the-interjurisdictional-context/?print=print>.

³⁰ Pearse and Quinn, "Recent Developments in Federal Water Policy."

³¹ Grace Skogstad, "An Overview of Policy Goals, Objectives, and Instruments for the Agri-Food Sector" (Canadian Agri-Food Policy Institute, February 2011), <https://capi-icpa.ca/wp-content/uploads/2011/02/An-Overview-of-Policy-Goals-Objectives-and-Instruments-in-the-Agri-Food-Sector-2011.pdf>.

Canada soil, air, and biodiversity; and (4) the Water Quality Monitoring program which would track water quality in 23 streams in agricultural areas across Alberta.³²

In 2004, Environment Canada (now Environment and Climate Change Canada) began a five-year project (2003-04 to 2007-08) together with Agriculture and Agri-Food Canada (AAFC): the National Agri-Environmental Standards Initiative (NAESI). This \$25 million project developed agri-environmental indicators on water, biodiversity, pesticides, and air.³³ Measurement and reporting continues to this day. The latest report (August 2023) shows that across Canada, the risk of water contamination by nitrogen and pesticides³⁴ has generally increased through time. The risk is higher in regions where agriculture is more intensive.³⁵

Also in 2004, AAFC initiated the Watershed Evaluation of Beneficial Management Practices (WEBs) program as part of the five-year agriculture policy framework.³⁶ This nine-year program measured the economic and water quality impacts of selected BMPs in nine different watersheds: one in each of the provinces except Newfoundland.³⁷ The study's final report revealed two practices which could protect water quality while providing economic incentives for farmers: controlled tile drainage and conservation tillage.³⁸

In 2008, the second five-year agricultural policy framework took effect: Growing Forward. In consultations for this framework, held in May 2008, stakeholders expressed the need for a national water management and drought strategy.³⁹ There was general support for the WEBs program (initiated in 2004), but some stakeholders felt the program required greater scope and better knowledge transfer to the public about on-farm water stewardship.

In 2013, Growing Forward expired and was replaced by Growing Forward 2 (GF2). The evaluation of BMPs at the watershed level (WEBs program) continued under GF2, but the economic costs and benefits for farmers were still not fully understood. A greater understanding of water stewardship practices was recommended for GF2.⁴⁰

In Budget 2017, \$70.5 million were dedicated over five years to a new Freshwater Action Plan: \$25.7M (36%) to the Lake Winnipeg Basin and \$44.8M (64%) to the Great Lakes.⁴¹ To address water quality issues, the Lake Winnipeg Basin had also received support previously: \$18M in 2007-2012 and another \$18M in 2012-2017.⁴²

In 2018, GF2 was replaced by the fourth agricultural policy framework: the Canadian Agricultural Partnership (CAP). The CAP focussed on three areas: trade and markets for agri-food products; advancing science and innovation; and strengthening skills in the agri-food sector.⁴³

³² Agriculture and Agri-Food Canada, "Agricultural Policy Framework," Spring 2005, 28–37, <https://publications.gc.ca/collections/Collection/A34-3-2005E.pdf>.

³³ Agriculture and Agri-Food Canada, "Agri-Environmental Indicators," abstract, Resource management, August 2, 2023, <https://agriculture.canada.ca/en/environment/resource-management/indicators>.

³⁴ Pesticide risk data is only available to 2011; nitrogen risk data is available to 2016.

³⁵ AAFC, "Nitrogen Indicator," search interface, Agriculture and Agri-Food Canada, June 3, 2021, <https://agriculture.canada.ca/en/agriculture-and-environment/agriculture-and-water/nitrogen-indicator>; AAFC, "Pesticides Indicator - Agriculture.Canada.Ca," Agriculture and Agri-Food Canada, April 29, 2022, <https://agriculture.canada.ca/en/agriculture-and-environment/agriculture-and-water/pesticides-indicator>.

³⁶ Agriculture and Agri-Food Canada, "Watershed Evaluation of Beneficial Management Practices," Managing water sustainably, April 3, 2019, <https://agriculture.canada.ca/en/environment/watershed-protection/watershed-evaluation-beneficial-management-practices>.

³⁷ V. Stuart, ed., "Watershed Evaluation of Beneficial Management Practices (WEBs): Final Report" (Ottawa: Agriculture and Agri-Food Canada, 2017), 2, https://publications.gc.ca/collections/collection_2017/aac-aafc/A22-500-6-2016-eng.pdf.

³⁸ Agriculture and Agri-Food Canada, "Watershed Evaluation of Beneficial Management Practices."

³⁹ Agriculture and Agri-Food Canada, "Growing Forward: What We Heard," 2008, 11, https://publications.gc.ca/collections/collection_2008/agr/A34-10-1-2008E.pdf.

⁴⁰ "Next Agricultural Policy Framework: Report of the Standing Committee on Agriculture and Agri-Food," March 2017, 30, <https://www.ourcommons.ca/Content/Committee/421/AGRI/Reports/RP8717216/agrirp05/agrirp05-e.pdf>.

⁴¹ Environment and Climate Change Canada, "Evaluation of Freshwater Action Plan: Great Lakes Protection Initiative," August 25, 2022, <https://www.canada.ca/en/environment-climate-change/corporate/transparency/priorities-management/evaluations/freshwater-action-plan-great-lakes.html>.

⁴² Environment and Climate Change Canada, "Lake Winnipeg Basin Initiative," Reports and publications, August 16, 2018, <https://www.canada.ca/en/environment-climate-change/services/water-overview/comprehensive-approach-clean/lake-winnipeg/reports-publications/basin-initiative.html>.

⁴³ Agriculture and Agri-Food Canada, "Canadian Agricultural Partnership," 2018, https://agriculture.canada.ca/sites/default/files/legacy/resources/prod/doc/cap/cap_factsheet_feb18-eng.pdf.

The 2019 mandate letters from Canada's prime minister to both the Minister of Environment and Climate Change and to the Minister of Agriculture and Agri-Food Canada listed the creation of the Canada Water Agency (CWA) as a top priority. The objective of the CWA was to help keep water "safe, clean, and well-managed."⁴⁴

In 2022, the Government of Canada Adaptation Action Plan (GOCAAP) was released.⁴⁵ The Plan commits to protecting 25% of Canada's oceans by 2025. It also plans to modernize the *Canada Water Act* (1970), through the Canada Water Agency, to reflect climate change and Indigenous rights.

On April 1, 2023, the five-year Canadian Agricultural Partnership was replaced with the five-year Sustainable Canadian Agricultural Partnership ("Sustainable CAP"). This framework added the Resilient Agriculture Landscape Program (RALP) which will subsidize those BMPs which provide the greatest benefits to society through ecological goods and services.⁴⁶ Examples of water-related programs under the RALP are: protecting and treating livestock water; protecting riparian areas from cattle grazing; and planting trees to protect surface water sources.⁴⁷

The 2023-24 budget dedicated \$85.1M over five years to the Canada Water Agency (CWA).⁴⁸ The CWA will be a standalone Agency under the Environment and Climate Change Canada. Its headquarters will be in Winnipeg, Manitoba, with regional offices meant to improve "coordination and collaboration with provinces, territories, and Indigenous Peoples."⁴⁹ The federal budget of 2023-24 also committed \$650M (over 10 years) to priority watersheds, \$420 of which (65%) was dedicated to the Great Lakes. In addition, the Budget committed \$22M to freshwater science coordination.⁵⁰

⁴⁴ Prime minister of Canada, "ARCHIVED - Minister of Agriculture and Agri-Food Mandate Letter," Prime Minister of Canada, December 12, 2019, <http://www.pm.gc.ca/en/mandate-letters/2019/12/13/archived-minister-agriculture-and-agri-food-mandate-letter>; Prime minister of Canada, "ARCHIVED - Minister of Environment and Climate Change Mandate Letter," Prime Minister of Canada, December 12, 2019, <http://www.pm.gc.ca/en/mandate-letters/2019/12/13/archived-minister-environment-and-climate-change-mandate-letter>.

⁴⁵ Government of Canada, "Government of Canada Adaptation Action Plan," October 3, 2023, <https://www.canada.ca/en/services/environment/weather/climatechange/climate-plan/national-adaptation-strategy/action-plan.html>.

⁴⁶ Agriculture and Agri-Food Canada, "Sustainable Canadian Agricultural Partnership," Initiatives, June 19, 2023, <https://agriculture.canada.ca/en/department/initiatives/sustainable-canadian-agricultural-partnership>.

⁴⁷ Alberta, "Resilient Agricultural Landscape Program," 2023, <https://www.alberta.ca/resilient-agricultural-landscape-program>; Saskatchewan, "Resilient Agricultural Landscapes Program," Programs for Farmers and Ranchers, 2023, <https://www.saskatchewan.ca/business/agriculture-natural-resources-and-industry/agribusiness-farmers-and-ranchers/sustainable-canadian-agricultural-partnership/programs-for-farmers-and-ranchers/resilient-agricultural-landscapes-program#eligible-expenses>.

⁴⁸ "Keeping Our Waters Clean Now and into the Future" (Winnipeg, Manitoba, May 24, 2023), <http://www.pm.gc.ca/en/news/news-releases/2023/05/24/keeping-our-waters-clean-now-and-future>.

⁴⁹ Environment and Climate Change Canada, "Canada Water Agency," June 28, 2023, <https://www.canada.ca/en/environment-climate-change/services/water-overview/canada-water-agency.html>.

⁵⁰ Canadian Water Network, "Budget 2023 Is a Freshwater Budget," *What's Going On* (blog), April 13, 2023, <https://cwn-rce.ca/2023/04/13/budget-2023-is-a-freshwater-budget/>.

Box 2. Canadian Council of Academies report, 2009

“From a science perspective, what is needed to achieve sustainable management of Canada’s groundwater resources?”

The federal government posed this question to the Council of Canadian Academies (CCA). The answer was an assessment report by an expert panel, published in 2009.⁵¹

The report points to the importance of groundwater. It is the source of potable water for over 80% of Canada’s rural population. The report also highlights the growing number of threats to this water: urbanization, contamination from human activity (agriculture, mining, or poor quality control in rural wells), expansion of the energy sector, and climate variability.

Although the knowledge exists to sustainably manage Canada’s groundwater, this knowledge is not being uniformly applied. Points raised by the panel include:

- using the watershed or groundwatershed as the basis for water management;
- a labour shortage in hydrology and groundwater science;
- reaching consensus on groundwater data collection priorities and access to these data;
- increasing the clarity and application of water legislation;
- and integrated management of water. What currently exists is a patchwork of jurisdictional responsibilities which approach surface water, groundwater, water quality, and water quantity as separate and independent issues.

A recent *New York Times* article describes the over pumping of aquifers in the United States.⁵² Canada’s groundwater is not identical to that in the States, but no water source is inexhaustible. The CCA report from 2009 proposes a prudent, long-term view. Groundwater sustainability means considering groundwater availability and quality, protecting eco-systems, and allocating water to maximize its economic and non-economic benefits.

4 Opportunities

The research and engagement undertaken throughout this project highlighted significant challenges facing Canada’s agriculture and food system, however those challenges also create significant opportunities. Those opportunities should drive policy making in Canada.

The opportunities include:

- **Being proactive, not reactive.** Around the world water is increasingly a scarce resource. It is essential that Canada avoid the challenges facing other regions. Taking a proactive approach to water management is essential to avoiding a crisis.
- **Adopting a systems approach.** Water flows across national, topographic, and political boundaries. Changes in policy can affect different water sources (such as groundwater versus surface water), and the behaviour of water users can be felt in neighbouring watersheds. Moreover, solutions need to address ecological problems but also be economically sound. And, consider the fact that Canadian farmers are being asked to produce more food and more ecological goods and services, but with less land. Keep linkages in mind when making plans or policies.
- **Recognizing water’s economic value.** This was raised as an opportunity during consultations during the transition period from the Agriculture Policy Framework (2003-2008) and Growing Forward (2008-2013).

⁵¹ Council of Canadian Academies, “The Sustainable Management of Groundwater in Canada.”

⁵² Rojanasakul et al., “America Is Using Up Its Groundwater Like There’s No Tomorrow.”

Conservation practices have long been researched and incentivized at the farm level through the various APFs – for example, providing subsidies for planting trees or building fences to protect waterways – but the benefits and costs of these practices is not well known. With a better understanding of the economic value of water and conservation practices, incentive programs could be tailored to maximize water use efficiency.

- **Positing farmers as leaders.** The series of papers entitled “Toward a Canada Water Agency” (a [discussion document](#) and a [“what we heard” report](#)) mentioned supporting the agri-food sector through regional adaptation of data and planning, and incentivizing water conservation, and BMPs. However, agriculture formed a small part of these documents, and there was no acknowledgement of the advancements already made in water conservation at the farm level, or the economic value of water through irrigation or food processing. There is an opportunity to position farmers as more than just stakeholders, but leaders in water policy and planning.
- **Embracing active adaptive management.** The understanding of effective water management is evolving and it can take years to see and understand outcomes. Moreover, some solutions or technologies may have not been viable in the past but could be in the future. Making ongoing and incremental efforts, monitoring results, and improvements based on performance will generate more sustainable outcomes.
- **Investing in R&D and innovation.** There is a need to increase the understanding of water, its quantity and quality and the impact of agri-food on it. There is also a need to innovate new practices and technologies that deliver more sustainable water use. Canada is often an adopter of innovation, but can do more to be a creator of it.
- **Creating the Canada Water Agency.** The stated purpose of the CWA is not to regulate or oversee water management. Greater communication and clarity around the role of the CWA as a facilitator and enabler will help provinces, territories, and jurisdictions have confidence that water management and regulation will remain under their respective purviews. This should become clear when legislation is introduced in late 2023.
- **Collaborative federal leadership.** The federal government can use the CWA as a leadership tool by embracing being a convener. The CWA can help the Federal Government show leadership by building consensus around questions such as: is water a right? is it a commodity? Is water conservation a priority? What are the most pressing risks to water in agri-food? What strategic advantages can be leveraged in Canada’s relative abundance of freshwater? Reaching consensus around common values also creates accountability among the different water stakeholders: provincial and territorial governments, Indigenous peoples, farmers, conservation groups, watershed authorities, and researchers. With federal leadership, trust can be built among these stakeholders, which leads to a greater willingness to share resources such as data and expertise.

5 Conclusions

There is a growing consensus around the need to think more strategically and systemically, and to place greater value on water, especially when it comes to agriculture and food in Canada. The urgency of the need to produce more food, more sustainably, while adapting the food system to extreme weather and climate change should be felt by governments, farmers, food processors and everyone that is involved in the food system from field to fork.

The challenges facing agriculture and food underscore the need for a new social contract. Urban sprawl, for example, is eroding the best farmland in the country. Once covered with asphalt, condos, or shopping malls, these lands will likely never again produce food. When Canada is already experiencing an unprecedented housing crisis and there are calls to pursue more aggressive population growth⁵³, it is essential to ask what role agriculture will place in the face of increasing conflicts between users. The dynamic playing out on land will increasingly play out with water and a different approach is needed.

Water must be managed at the watershed level. There needs to be a balance between the needs of different users. However, it is critical to understand that agriculture is not like other users. As indicated by an agronomist and consultant: “Producers can make an effort to feed the world, but if, by 2050, citizens are still pouring water over asphalt-covered parking lots in the middle of a heat wave to wash their cars or cool themselves off, we will still be very far from sustainable management.”⁵⁴

In an era of increasing climate and geopolitical change and conflict, water is undoubtedly the challenge of the 21st century. For Canadian agriculture and food there is tremendous potential to turn that challenge into an opportunity. Adopting a strategic vision and systems-based approach through a National Agri-Food Water Action Plan (NAFWAP) is an important first step in that direction.

Additional conclusions include:

- Canada's 200,000 farmers are the primary stewards of the environment on and around the land they farm and they must play a critical role managing water as a strategic asset. They must be supported through knowledge transfer and improved water management technology. The environmental services provided by farmers, including protecting water quality, should be quantified and remunerated.
- Governments will need to invest in new infrastructure that is “flexible” – that is, able to withstand weather extremes such as flooding or droughts.
- Water can be a strategic advantage for increasing food processing, providing competitive hydroelectricity rates, access to quality and quantity not available in other regions and an asset in their conservation and recycling programs.
- Governments need to engage in long-term research and development, standardize data collection on surface and groundwater, and climate modelling to understand water availability and drought risk.
- There is a need to go further to understand the water needs and rights of First Nations for food production and food processing, either for self-sufficiency or for accessing domestic and international markets. Food production and processing can be a development tool for Indigenous communities.
- There is the potential for massive exports of water from Canada to the United States. Although there is an International Joint Commission tasked with settling potential water conflicts between the two countries, the agriculture and food system must remain vigilant.

⁵³ Century Initiative, “Century Initiative,” n.d., <https://www.centuryinitiative.ca/>.

⁵⁴ Nicolas Mesly, “Water: A Source of Concern for Agricultural Producers and Agri-Food Processors in Quebec” (Canadian Agri-Food Policy Institute, March 2023), 9, <https://capi-icpa.ca/wp-content/uploads/2023/03/2023-03-20-Water-Perspective-Report-Nicolas-Mesly-EN.pdf>.

6 Recommendations

6.1 Short term: four action areas

- (1) **Set standards.** The subsidiary approach to water governance, while appropriate given Canada's varying hydrology and topography, has led to a minimalist approach to data-gathering. Reform could include at least two things: standardizing data collection and reporting across every jurisdiction in Canada; and incorporating climate modelling. Key reporting areas could include aquifer capacities, an economic account of ecological goods and services provided by farmers, and the economic value of agri-food water use, such as in irrigated crops or food processing.
- (2) **Invest in mission-driven research.** An initial \$18 million investment in a mission-driven research call would restore funding to the 1990 level of the *Canada Water Act* Fund (\$9M, adjusted for inflation, 1990 to 2023). Mission-driven research responds to a grand challenge, identified by government through broad engagement.⁵⁵ A starting point for that grand challenge is how to conserve and leverage water to adapt agriculture in the face of climate change.
- (3) **Invest in infrastructure.** Governments are already investing in infrastructure, but more must be done. These investments will vary across the country reflecting the unique challenges the sector faces with water. For example, previous case studies identified the need for irrigation in Saskatchewan and drainage in Quebec.⁵⁶
- (4) **Plan at the watershed level.** Watersheds in Canada already have done good work and are ready to join the national dialogue on agri-food water management in Canada. Proper budget and federal coordination will aid in bringing watershed-level expertise to the forefront.

6.2 Medium and long term: Create the NAFWAP

Governments across Canada should commit to a national agri-food water action plan (NAFWAP) to position Canada to sustainably manage and strategically leverage one of Canada's most valuable natural assets.

To deliver a meaningful and ambitious NAFWAP, Ministers should undertake the following:

- (1) **Launch an FPT expert panel (July 2024).** Ministers should launch an expert panel at the July 2024 FPT Agriculture Ministers Meeting. This panel should be multidisciplinary (including experts in agri-food, land use, and hydrology) and should:
 - a) **Prepare a *State of Agri-Food Water* report.** The first report should be released in 2025 and then be updated every two years. The report will enable evidence-informed action and should include: a water balance sheet and budget for the sector, projections on use and availability, highlight new R&D and projected investments.
 - b) **Recommend an action plan.** Building from the *State of Agri-Food Water* report, the expert panel should recommend a short-, medium-, and long-term action plan to governments.
- (2) **Release a National Agri-Food Water Action Plan (NAFWAP) (July 2025).** Ministers should build on the work of the expert panel by committing to an ambitious collaborative NAFWAP that will guide policy and programming on agri-food water in Canada. The NAFWAP should include:

⁵⁵ Patrick Galvin and Jeff Kinder, "Mission-Driven Research and Innovation" (Institute on Governance, November 2022), <https://iog.ca/wp-content/uploads/2022/11/2022-11-28-GSINN-Mission-Driven-Research-and-Innovation-Discussion-paper.pdf>.

⁵⁶ Mesly, "Water: A Source of Concern for Agricultural Producers and Agri-Food Processors in Quebec"; Mesly, "Irrigation: Saskatchewan's Unfulfilled Dream."

- a) **Strategy:** NAFWAP should commit to ambitious outcomes related to agri-food and water and set out the strategic priorities for achieving them. At the core of the strategy should be an objective of sustainably managing agri-food water such that it is valued, protected, and leveraged to position Canada to feed the world.
- b) **Actions:** The NAFWAP must go beyond strategy and commit governments to an ambitious set of actions to achieve the outcomes. The actions should be informed by the guiding principles outlined in this report.
- c) **Collaboration and coordination:** The NAFWAP should commit governments to co-ownership of the plan, and the actions it outlines should reflect the shared responsibility and different mandates of federal and provincial governments and the farmers, processors, civil society and other partners responsible for delivering on it.
- d) **Long-term research and development:** The NAFWAP should build on the initial commitment to mission-driven research in water and establish mechanisms to set water-related R&D priorities and to fund that research.

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