

An overview of climate change adaptation in the Canadian agriculture sector

Building Resiliency in Maritime Agriculture August 19, 2019



Agriculture and Agriculture et Agri-Food Canada Agroalimentaire Canada

Outline:

- Agriculture in Canada
- Anticipated climate trends, impacts, risks and opportunities
- Agricultural adaptation
- AAFC
- Closing remarks

Background: Canadian Agriculture

Top Commodities by Province and Territory



Climate Change and Agriculture

- Increase temperature
- Shift in precipitation
- Increase in extreme events
- Rising sea levels



- Longer growing season
- Shift in cropping patterns/pest and diseases
- Water stresses (excess and shortages)
- Infrastructure (on-farm and transportation)
- Change in suitability of agricultural lands



Impacts from climate change will impact production and exacerbate existing agri-environmental risks

- Changes in growing seasons can increase risk of contamination from nutrients and pesticides.
 - Potential for new crops in certain areas, including northward expansion of agriculture, increasing fertilizer use and conversion from forages to annual crops.
- Changes in precipitation and extreme weather (intensity and frequency of storms) can increase nutrient runoff and result in more irrigation demand.
 - Increased runoff potential, risk of soil erosion and nutrient runoff, crop losses; increased disruption to farm operations from precipitation, storms, hail and tornados; increased risk of drought.
- More very hot days can impact crops and livestock.
 - Increased risk of heat stress on crops and livestock thus reducing productivity.
- More and new pests and diseases can increase risk of contamination from pesticides.
 - Greater chance of over-wintering survival, and northward expansion of pests and diseases including invasive species.

Changes and impacts will not be uniform...

Central Canada

- Average temperatures to increase by 4-5 °C in winter; 2-4°C in the growing season from 2041-2070.
- Projected increase of 5-30% in spring precipitation between 2041 and 2070; projected negligible change in precipitation for July and August.
- Last Spring frost dates moving earlier by as much as one to three weeks, and first fall frosts being delayed by 1-3 weeks, resulting in an extension of the growing season by as much as 3-6 weeks across the Central Canada agricultural regions.

- Warmer spring weather may allow planting 1-3 weeks earlier, however wetter springs may delay planting/seeding operations due to waterlogged fields.
- Increased evapotranspiration due to higher summer temperatures could increase water stress in plants.
- Increased temperatures could affect livestock health, resulting in reduced milk, egg and meat production and even fatalities; increase cooling costs for producers.
- Greater incidences of freeze-thaw could place strain on infrastructure such as farm buildings.
- (for northern areas of central Canada) Increase in frost-free days, longer growing season, opportunity for warmer-weather crops (including corn, soybeans), as well as a potential northwards expansion in agricultural production where soils permit.
- New pests, diseases and weeds likely.

Changes and impacts will not be uniform...

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Atlantic Canada

- Average temperatures to increase by 3-5°C in winter; 2-3.5°C in the growing season from 2041-2070.
- Projected increase of 0-15% in spring and summer precipitation between 2041 and 2070, with greatest impacts in New Brunswick.
- Last Spring frost dates moving earlier by as much as 19 to 25 days (from May 27 to May 2 in Edmundston under 8.5 RCP, by May 27 to May 12 under 4.5 RCP; and from May 14 to April 19 in Charlottetown under 8.5 RCP and from May 14 to April 26 under 4.5 RCP), and first fall frosts being delayed by 14-20 days, resulting in an extension of the growing season by as much as 30-50 days across Atlantic Canada.
- Continued and likely increased variability for temperature and precipitation extreme events.
- Sea level rise by 105cm in NB, 108cm in PEI, 140 in NL, and 100cm in NS over next 100 years.

- Increase in frost-free days, longer growing season, opportunity for warmer-weather crops (including corn, soybeans).
- Rising sea level, erosion and storm surges could negatively impact the Atlantic region, particularly PEI.
- Flooding or waterlogged soil due to increased precipitation could negatively impact agriculture. Wetter springs may delay planting/seeding operations due to waterlogged fields.
- Soil conditions (acidity, erosion) may limit the expansion of agriculture in the Atlantic Provinces.
- In some parts of Atlantic Canada, the milder winter temperatures could have implications for over-wintering of pests and diseases.
 - Intrusion of salt water in agricultural lands likely to comprise soil and surface water quality

Agriculture and adaptation

- Sector is inherently adaptive
 - ability to adapt annual management decisions to gradual climatic changes, and seize opportunities
 - key to adaptive capacity is access to information that will help inform management and investment decisions
- Extreme events will be more challenging, can be beyond individual producer to manage
- Adaptive capacity of sector will also be influenced by offfarm/region factors
 - Example: water and land use decisions, regulations, and transportation networks

Region

Adaptation Examples

British Columbia

- Regional risk and opportunity assessments

- Regional-scale adaptation plans and
- Supporting farm-level adaption

(BC Agriculture & Food Climate Action Initiative's planning projects, led by the BC Agricultural Research & Development Corporation)



Completed (GF2)

- 1. Cowichan
- 2. Delta
- 3. Fraser Valley
- 4. Okanagan
- 5. Cariboo
- 6. Peace

Planned / Underway (CAP)

- 7. Vancouver Island (summer 2020)
- 8. Kootenay & Boundary (summer 2019)
- 9. Bulkley-Nechako & Fraser-Fort George

https://www.bcagclimateaction.ca/regional/risks-opportunities/

- To be done
- 10. Thompson-Nicola & Columbia-Shuswap







Adaptation Examples

Prairies

(Alberta to Manitoba)

- <u>Agricultural Solutions to Climate Change: Findings from the</u> <u>Manitoba Agricultural Climate Initiative (KAP)</u> – 2018
- Moving Toward Prairie Agriculture 2050 (A.I.A.) 2014
- <u>Adaptation to Climate Change in Management of Prairie</u> <u>Grasslands (SRC) – 2012</u>
- Evaluation of the Effects of Climate Change on Forage and Livestock Production and Assessment of Adaptation Strategies on the Canadian Prairies (PARC)

	Adaptation Examples		
Prairies (Alberta to Manitoba)	 Improving irrigation efficiencies and expansion (AB & SK) Surface water management for both regional excess moisture and drought conditions (across prairies) Improving drainage management and building community capacity for drought response plans (SK) Improved hydrologic modelling (e.g. Assiniboine River and Bow/S. Sask. River). Increasing water retention and wetland conservation projects 		



Soil improvement in the Prairies – continued adoption of no-till and reduction of summerfallow.



Variable Rate Irrigation

Large and small scale water retention

Region	Adaptation Examples
Ontario	 Research into impacts on crop yields, Insurance tools and modelling for new crop varieties, Climate change impacts for Lake Simcoe region, and improved water efficiency research.
	"Scenario-based risk assessment decision support modelling tools

"Scenario-based risk assessment decision support modelling tools for regional climate change and climate extremes, impacts and adaptation in agricultural watersheds" <u>https://carleton.ca/envisionontarioag/</u>

Ontario's Agricultural Soil Health and Conservation Strategy (2018-2030)

Region	Adaptation Examples
Quebec	 -Improving efficiencies in water use and agroforestry management for landscape resiliency, -Improving access for weather network data (Agrométéo). -Research addressing climate change risks, especially related to pest/disease pressures from climate change, led by Ouranos. -Developed a regional adaptation assessment tool for horticulture. - Conseil pour le développement de l'agriculture du Québec (CDAQ) working groups made up of farmers and stakeholders from various sectors have been created to help identify adaptation measures and prepare an adaptation plans for ten agricultural regions in Québec. - <u>https://agriclimat.ca/en/</u> (2017-2020).
Territories	 Work on permafrost soils, local food and food security issues. Biosecurity program for emerging risks to animal and plant health.

Other adaptation efforts

- Improving the integration of climate change mitigation and adaptation into Environmental Farm Plan material and Emergency Management Planning exercises.
- Provincial/territorial delivered incentive programs supporting climate-smart "beneficial management practices" (BMPs)
 - Improved soil and nutrient management practices
 - Water supply management designed for adaptation purposes
 - Retrofits and upgrades to farm assets to support flood and wildfire protection
- OGD and NGO incentive programs to support nature based solutions in agricultural landscapes
 - Wetland, riparian and grassland restoration and conservation

AAFC science, programming and collaboration supporting sector resilience...

Research and Development:

Evaluation of new and existing crops and genetic varieties under changing climate conditions and under irrigation.

• Collaboration between AAFC, universities and private plant breeders.

Development of beneficial management practices (BMPs) for sustainable crop and livestock production.

 Living Laboratories Initiative to develop BMPs, including for water management (e.g., controlled subsurface and tile drainage, nutrient management, agroforestry and riparian practices, grassland management).

Evaluation of irrigation practices for improved water and energy use efficiency and resource protection.

• Variable rate irrigation, precision irrigation, and irrigation scheduling.

Development of monitoring, assessment and forecasting technologies and decision support tools.

• AAFC contributions to ECCC-led Canadian Centre for Climate Services; AAFC-led work including Drought Watch, GEOGLAM, LeafNet, crop metrics, sustainability metrics, crop yield forecasts.



Breeding and Varietal Evaluation



Variable Rate Irrigation Technology

AAFC science, programming and collaboration supports sector resilience...

Programs:

Investment in on-farm education and actions.

- FPT cost-shared on-farm programs delivered by PTs build producer awareness of environmental risks and accelerate adoption of technologies and practices to reduce these risks and adapt to climate change (\$436 million over 5 years).
- Build producer awareness of environmental risks through Environmental Farm Plans.

Knowledge transfer activities to accelerate adoption and innovation

- Climate assessment of sector opportunities and risks on agricultural production and decision support tools (e.g. water quality and hydrologic modelling).
- Assess and demonstrate beneficial management practices and technologies to improve managing climate and on-farm water (e.g. Living Laboratories Collaborative Program).

Risk management programming

- Business Risk Management (BRM) programs minimize impacts caused by natural hazards, and assist producers with recovery from natural disasters (AgriInsurance, AgriRecovery, AgriRisk).
- BRM programs are demand-driven (approx. \$1.5 billion/year).







AAFC science, programming and collaboration supports sector resilience...

Collaboration:

- AAFC's efforts in supporting the sector are principally done through collaboration with:
 - International governing bodies that oversee management of transboundary water (e.g., International Joint Commission's Red River Board; Great Lakes Water Quality Agreement).
 - Other federal government departments and agencies with complementary mandates (e.g., Canadian Drought Monitor (ECCC/NRCAN); Global Institute for Water Security (ECCC/University of Saskatchewan); AAFC-ECCC Joint Science Memorandum of Understanding); Canadian Food Inspection Agency (plant and animal pest and disease monitoring and research)
 - Place-based organizations that manage water in a specific area (e.g., Canada-Saskatchewan Irrigation Development Centre, Canada-Manitoba Crop 20 Diversification Centre).

Closing Remarks

	U.S.	AUS.	NZ.	CAN.
Overarching agricultural adaptation strategies/frameworks in place	e)	E)	{} *	£ *
Agriculture sector vulnerability assessments undertaken	S	} ∗	£ *	€ *
Agricultural adaptation funding available	S	₹ *	S	€}
Adaptation as a priority research area	S	€}	S	€}
Knowledge transfer activities	S			₹ *

Note: Asterisk denotes areas where the activity is being undertaken, but is either dated, ad hoc, or at a very high level.

Closing Remarks

- Challenges for Climate Adaptation
 - Recent attention to climate change has been focused more on mitigation versus adaptation.
 - There is skepticism on climate change in agriculture community.
 - There is some perception that "we've seen this already"
 - Acute versus chronic impacts

- Barriers to Adaptation:
 - Knowledge: technical scientific knowledge and data on climate change forecasts and expected impacts on the sector and producer awareness of the issues
 - *Funding:* research/program delivery and resources

Closing Remarks

Sustainable sourcing and public trust

Food processing and retail companies are making commitments around sustainability of their supply chain

- General Mills committed to sustainably source all its oats and wheat by 2020
- Unilever By 2020 committed to source 100% of agricultural raw materials sustainably.
- McDonald's Canada first to buy verified sustainable beef sourced in Canada

Other jurisdictions' mandates and regulations are also driving demand for sustainable production

– E.U. and U.S. certification of feedstock for biofuels

Input providers are taking action to promote stewardship

Fertilizer Canada developed and promotes 4R nutrient stewardship:
 the right product at the right place and time, and in the right amount



Sectors and industry are taking action to report on sustainability claims









Questions

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