Climate Change and Agricultural Policy

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• Provide an overview of Ontario’s climate change policy related to agriculture.

• Identify opportunities and barriers for data collection and use in agricultural policy and program development.

• Discuss two examples where data is used to support climate change policy related to agriculture:
  – Agricultural Soil GHG Mitigation Initiative
  – Climate Modelling
Climate Change Risks to Agriculture

- Water: too much or too little - increased risk of flooding, droughts
- Loss in productivity involving annual and perennial crops
- Increased heat stress on livestock
- Increase in pest volumes and numbers of pest species
- Changing habitat: altered geographical distribution of animal and plant diseases
- Increased risk of soil erosion
Opportunities for Agriculture

Average Winter temperature
CGCM2, A2 scenario

- Northward extension of crop production – soil permitting
- Increase in diversity of crop species, varieties
- Increased productivity in current production areas
- Increase biomass from CO2
Ontario Climate Change Policy

Policy Goals

Climate Change Strategy (November 2015)

- A Prosperous Low-Carbon Economy with World-Leading Innovation, Science and Technology
  - Investment and Risk Capital Actions
  - Research and Innovation Strategy
  - Assist Businesses in their Low-Carbon Transition
  - Build Green Infrastructure

- Adaptation and Risk Awareness
  - Climate Change Adaptation and Government Decision-Making Alignment
  - Climate Modelling and Risk Assessment Collaborative
  - Approach to Assess Carbon Sequestration
  - Climate Change and Agricultural Sector Initiatives Alignment

- Government Collaboration and Leadership
  - Climate Change Legislation
  - Climate Change Integrated with Government Decision-Making and Infrastructure Planning
  - Aboriginal Implementation Frameworks
  - Carbon Neutral Government

- Reducing Greenhouse Gas Emissions Across Key Sectors
  - Zero Emission Vehicles Actions
  - Goods Movement Actions
  - Low Carbon Fuels
  - Net-Zero-Energy Buildings Actions
  - Create Incentive Programs
  - Transportation and Land Use Planning Initiatives

- A Resource-Efficient, High Productivity Society
  - Climate Change in Long Term Energy Plans
  - Resource Recovery and Waste Reduction Framework
  - Review of Policies and Programs that Incent Fossil Fuel Use and Technology

Policy Tools

Climate Change Mitigation and Low Carbon Economy Act (2016)
- Formalizes reduction targets

- Cap and Trade Program
- Offsets program

Climate Change Action Plan

New Climate Change Adaptation Plan
Mitigation
• The Climate Change Action Plan identifies programs to reduce GHG emissions to be funded through cap and trade proceeds. Including:
  – Up to $115 Million to aid the transition of the food and beverage processing, and covered agriculture sectors to low-carbon operations,
  – Up to $20 Million toward pilot projects for Renewable Natural Gas Transportation Fuelling using agricultural and food waste; and
  – Up to $30 Million to implement an Agriculture Soil Health Strategy.

Adaptation
• The Climate Change Strategy also identified new focus for adaptation activities:
  – Integrating climate change adaptation considerations in infrastructure decision-making
  – Aligning climate change objectives with agriculture and natural systems – pollinator health, soil health, food security and assisting sector with adapting to climate impacts
  – Developing an approach to assess emissions and absorption from agriculture, forestry and other land uses
  – Establishing a climate modeling consortium for climate data
Agriculture and Mitigation

- Agriculture accounts for 6% of Ontario’s GHG emissions profile

- Opportunity to reduce emissions from main sources of agricultural based GHGs:
  1) Soils
  2) Enteric Fermentation
  3) Manure

- Data plays an important role in monitoring emissions, setting goals, and tracking progress towards GHG reduction targets.

- There are challenges associated with measuring data.

- Farmers collect a significant amount of data but we don’t always have access.
Use of Data in Climate Change Policy

• Big data revolution in agriculture.

• Almost all new farm equipment is equipped with sensors.

• Ability to measure and collect data on:
  • Soil chemistry and biology characteristics
  • Nutrient use and application
  • Biomass and carbon sequestration

• Use of this data will be critical for multiple climate change programs (e.g. carbon offsets) but barriers exist to accessing this data and a solution is needed.
Using Data to Support Soil Health

• Soil GHG Mitigation initiative, under Ontario’s Climate Change Action Plan, will focus on farm best management practices to reduce net GHG emissions from agricultural soils.

• Will rely on research findings, remote sensing, soil testing and scientific models to help determine which BMPs will have the greatest GHG reductions.

• A range of methods and technologies will be used to update Ontario’s soil maps,
  – Light Detection and Ranging (LiDAR), remote sensing,
  – Geographic Information System tools,
  – predictive digital soil mapping and
  – specialized computer software.

• The program will need to collect data to demonstrate GHG reductions.
MOECC will be releasing a new Adaptation Plan in 2017.

The updated plan will provide details of a new climate modelling consortium, a commitment under Ontario’s Climate Change Strategy.

This modelling consortium will help decision-makers understand potential climate impacts so they can make effective, climate-resilient decisions. It will provide:

- a one-window repository for information about current impacts and projections for the future, and
- access to expertise to understand how climate change may affect different activities or lines of business, and help plan for and manage risks in areas such as farming, infrastructure, and public health

The Consortium may be modelled after the Quebec Innovation Cluster on regional climatology – Ouranos.
Potential Modelling Uses

Municipalities / Indigenous Communities
- Air temperature; Rainfall (mean / heavy); TEK
- Integrating impacts in official plans
- Planning Cooling centres for heat waves
- Infrastructure Risk assessment
- Case Studies

Agricultural Sector
- Air temperature; relative humidity; Rainfall (mean / heavy)
- Crop planning (e.g., pear or grape species to plant)
- Pest management
- Case Studies

Resource Sector
- Rainfall (mean / heavy); Solar Radiation; wind
- Mine closure plans
- Species planning for replanting
- Forest Fire Planning
- Case Studies

Private Sector (e.g., Insurance, Financial Services)
- Rainfall (mean / heavy); Wind speed; Relative humidity
- Insurance sector policies/rates
- Long-term investment planning for tourism
- Case Studies

Understanding Impacts – variables to determine future conditions

Promoting Local Adaptive Solutions
There is limited work on modeling climate change impacts on the Ontario agri-food sector. Research projects are in progress on-
- Development of climate change risk assessment framework
- Threat assessment of spotted wing drosophila in southern Ontario
- Surface and ground water availability
- Effect of climate change on crop yield

Research is needed to map climate change risk and vulnerabilities of agri-food sub-sectors and to refine the models for accuracy and application to Ontario agri-food sectors

Areas where modeling would help:
- Understanding climate change impacts on soil health, water availability, nutrient loss and biodiversity and predicting pest dynamics and new pests.
- Assessing farm to regional scale BMP effectiveness.
- Developing better metrics/coefficients for GHG emission for better estimation at provincial scale.
- Assessing potential climate change impacts on different crops and animals and the potential impact on food and beverage processing subsectors as a result of impact on supply chain (e.g. changes in costs and availability of agriculture inputs such as crops and livestock and other inputs (energy)).
- Benefit/cost analysis of adaptive solutions.
Discussion

• What are the gaps in understanding climate change impacts which could be addressed by data/big data? How do we fill these gaps?

• How do you think we can overcome barriers in getting access to the data stakeholders are collecting?

• We are unlikely to get climate models that scale all the way down to a growing region. What are the risks associated with using provincial-wide climate model data to influence policy development?

• What additional data do you think we need to start collecting now in anticipation of emerging climate-change related issues?