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Status of Climate Change Adaptation in Canada's Agricultural Sector

Research Paper

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Écoressources

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Executive Summary

The aim of this study is to offer a snapshot of provincial and territorial programs that can help the agricultural sector adapt to climate change. Information comes primarily from consultations with the majority of provincial and territorial civil servants working on the adaptation to climate change of the agricultural sector in Canada.

The provincial and territorial governments have been increasingly active in their efforts to help the agricultural sector adapt to climate change. Each offers programs facilitating adaptation, although adaptation is rarely their sole focus.

The following table offers an overview of provincial and territorial initiatives aimed at helping the agricultural sector adapt to climate change. It shows that governments focus primarily on initiatives geared to local realities, and secondly on research.

Table: Summary of Provincial Territorial Actions to help Agricultural Sector Adapt to Climate Change

| Province/territory | Research | Awareness | Agricultural insurance | Other measures facilitating adaptation |
|---------------------------|-----------------|------------------|-------------------------------|---|
| British Columbia | ⊙ | | | ⊙ |
| Alberta | ⊙ | • | ⊙ | ⊙ |
| Saskatchewan | ⊙ | | | ⊙ |
| Manitoba | ⊙ | • | • | ⊙ |
| Ontario | ⊙ | • | • | ⊙ |
| Quebec | ⊙ | • | ⊙ | ⊙ |
| New Brunswick | | • | | ⊙ |
| Nova Scotia | ⊙ | | | ⊙ |
| Prince Edward Island | • | | | ⊙ |
| Newfoundland and Labrador | | | | ⊙ |
| Yukon | • | | | ⊙ |
| Northwest Territories | | | | ⊙ |
| Nunavut | | | | • |

Legend:

- Announced measures
- ⊙ Measures funded or implemented

Looking at these government programs, we can already see certain trends in the integration of adaptation initiatives:

- In the western provinces, the objective of adapting the agricultural sector to the impacts associated with climate change is integrated into a number of government initiatives;
- Ontario, Quebec and the Atlantic provinces are concentrating on mobilizing actors and resources, both internally and within the applicable organizations;
- The territorial governments are focusing for the most part on food security, because communities are faced with the modification or extinction of hunted or fished species, and northern conditions are complicating the production of food; and
- Only a few governments are preparing to seize potential opportunities, namely Ontario, Alberta, Newfoundland and Labrador, and the Yukon.

The Department of the Environment generally coordinates efforts by the government apparatus in the area of climate change and then transfers its sectoral responsibilities to the Department of Agriculture. Officials are faced with a number of challenges when putting in place adaptation initiatives for the agricultural sector, chief among them:

- competition among government priorities;
- heightened uncertainty and scope of climate change impacts;
- lack of resources;
- difficulty bringing together the competencies and expertise necessary to carry out effective actions; and
- the skepticism of a number of stakeholders, both in government and the agriculture industry.

Table of Contents

| | |
|---|----|
| Executive Summary | 1 |
| Introduction | 4 |
| Methodology | 4 |
| Interviews..... | 4 |
| Review of the Literature..... | 5 |
| Results | 6 |
| British Columbia | 6 |
| Alberta | 7 |
| Saskatchewan..... | 8 |
| Manitoba..... | 9 |
| Ontario..... | 10 |
| Quebec..... | 11 |
| New Brunswick | 13 |
| Nova Scotia | 14 |
| Prince Edward Island | 15 |
| Newfoundland and Labrador | 15 |
| Yukon | 15 |
| Northwest Territories..... | 16 |
| Nunavut..... | 17 |
| Synthesis and Interpretation..... | 18 |
| Coordination of Adaptation Efforts within Governments | 18 |
| Government Initiatives to help Agricultural Sector Adapt to Climate Change | 19 |
| <i>Support for Research</i> | 20 |
| <i>Raising Awareness</i> | 20 |
| <i>Agricultural Insurance</i> | 21 |
| <i>Indirect Support for Adaptation Measures through Existing Programs</i> | 21 |
| Reference | 22 |
| Notes..... | 24 |

Introduction

Adapting to climate variations has always been a daily concern of agricultural producers. Indeed, it is a fundamental characteristic of agriculture. Agricultural and agri-food systems adapt to climate variations not only through crop and farming choices, but also through a host of other measures, such as farming practices, agri-food business management methods, infrastructure, types of organization, research programs, communication/information mechanisms, and policies. From the standpoint of organization, examples include scouting systems, insect and pest monitoring networks, and community irrigation and water retention systems. Governments also help agricultural producers manage this type of risk by offering a whole range of tools, including crop insurance systems and other support programs.

Since agriculture by definition involves adjustments to climate variations, we should ask ourselves what methods are currently used to adapt to these variations, as this may help Canada's agricultural producers, processors, distributors and institutions deal with the feared longer-term impacts of climate change.

The aim of the project is twofold: to offer a snapshot of provincial and territorial programs that can help the agricultural sector adapt to climate change, and to gain a clearer understanding of the role that the Canadian government can play in this adaptation.

Methodology

The information contained in this report comes from two main sources: interviews and a review of the literature.

Interviews

Between November 2009 and February 2010, we interviewed the majority of provincial or territorial civil servants dedicated to the adaptation of the agricultural sector to climate change in Canada. In total, 19 government or paragonovernmental officials in Quebec, Ontario, Manitoba, Saskatchewan, Alberta, British Columbia, Prince Edward Island (PEI), Nova Scotia, New Brunswick, Nunavut and the Yukon were interviewed. These representatives are directly involved in the government strategy, and most work in the Department of Agriculture or of the Environment within their respective provincial or territorial government.

The questionnaire included the following questions:

1. To your knowledge, has your organization or other organizations from your provincial government adopted plans or programs aiming specifically at facilitating the adaptation of the agri-food sector to climate change?
2. What bodies are responsible for developing adaptation policies or measures?

3. With what bodies does this (department, institution, administration) cooperate with regards to climate change measures?
4. What kind of activities are being planned/organized? (research, extension, insurance, etc.)
5. Has the sector (farmers, organizations and businesses) been consulted on policy projects?
6. How has the science brought its input in the process?
7. Which tools have been used to assess the vulnerability of the sector or the opportunities brought about?
8. Has a monitoring process been put in place? If yes, have some results been published?
9. Which challenges are you facing or have you dealt with in the design or implementation process?
10. How are resources transferred or allocated to the issue of adaptation?
11. Are there adequate resources working on adaptation?
12. Before we hang up, would you recommend to me some key stakeholders I should talk to?

Insurance program managers were also interviewed and were asked the following questions:

1. How important is climate change in the evolution of the insurance programs offered to agricultural producers in your province?
2. How do you factor climate change into insurance products/programs? Do they affect damages? Frequency of payment? Average payment?
3. What challenges are you facing in the process of integrating climate change into insurance products? Data quantity? Data quality? Other priorities?

The respondents were contacted and interviewed in their official language of choice. One respondent responded by email (at her request). All the others responded by telephone.

Review of the Literature

Our review of the literature basically focused on provincial plans relating to climate change and/or agriculture, as well as on provincial programs offering the agricultural sector direct or indirect support in adapting to climate change. All of the information contained in these plans or programs appears in the following section, and is footnoted as well as detailed in the bibliography.

The analysis of the provincial and territorial programs and action plans dealing with, or benefiting directly or indirectly from, agricultural adaptation to climate change is summarized in the following section, by province and territory. The results of the interviews are integrated into this analysis so as to include information not yet made public.

Results

This section assesses the initiatives taken by Canada's provinces and territories to help the agricultural sector adapt to climate change. It contains an analysis of each jurisdiction's programs and action plans for the agricultural sector, as well as the results of interviews with government officials.

British Columbia

The Government of British Columbia considers climate change adaptation and mitigation as challenges for the agricultural sector, as indicated in the Climate Action Plan¹ and the British Columbia Agriculture Plan.² The primary emphasis of these strategic plans is mitigation of climate change in the agricultural sector, but increasing attention is being paid to adaptation.

In February 2010, the government released its three-part climate change adaptation strategy: research and education; integration of adaptation into government activities; and risk assessment and implementation of priority actions. The British Columbia Ministry of Agriculture and Lands (BCMAL) is also preparing an adaptation strategy.

The province's forestry sector is a leader in climate change adaptation efforts. This is because forestry is the first major economic sector that has had to revamp its ways of doing things to adapt to climate change.

Many steps are currently being taken that indirectly help the agricultural sector adapt to climate change, such as programs aimed at securing water resources. In particular, the Water for Agriculture program (a component of the BC government's Living Water Smart plan³) operates on three key fronts:

- Securing access to water for agricultural land reserves, where the water supply is critical;
- Helping farmers manage water demand; and
- Requiring more efficient water use.

Other multisectoral actions are being considered, like basing irrigation water licences on actual water needs and the need for efficient irrigation systems, and adopting the Irrigation Industry Association of British Columbia's Certified Irrigation Designer and Certified Irrigation Technician Programs. There is also a plan to require large water users to measure and report their water use. To improve irrigation management, the government has developed an Irrigation Scheduling Calculator that determines water demand based on real-time climate data, water levels, soil and current climate conditions.⁴ This can prove very useful for farmers.

In addition, the Water Balance Project⁵ seeks to make water use more efficient through a sophisticated water management model and a website. This project will

have agricultural applications. It is being implemented in the Okanagan Valley, but may be expanded to other regions in the future.

The Ministry is also planning to ensure that implementation of green farming plans and promotion of best management practices, or BMPs, are geared more to helping the agricultural sector adapt to climate change.

A number of research initiatives are underway, carried out by government ministries and the University of Victoria (which heads up the Pacific Climate Impact Consortium⁶), among others. There is also the Climate Action Initiative⁷, which provides information on mitigation and adaptation in the agricultural sector. This initiative is being led by agricultural producers and processors, as well as officials in various bodies. The aim of the research is to improve the government's policies and actions.

Some of these research initiatives seek to study petroleum product supply trends and their impact on the agricultural sector, or to prepare the province for the eventuality that the productive capacity of food exporting regions – particularly California, Texas and Florida – is diminished by the impacts of climate change. During our interviews, British Columbia was the only province that mentioned food security as an issue (the territories also did so). BC feels that its system of protecting agricultural land, established 40 years ago, is one of the best policies for ensuring climate change adaptation. It should be pointed out that British Columbia's and Quebec's agricultural land protection systems are reputed to be the two strictest in Canada.

The Climate Action Plan mentions the Bioenergy Network, an initiative aimed at diversifying agricultural production revenues.⁸ Generating carbon credits is also considered an opportunity for the agricultural sector to amass additional revenues.⁹

Alberta

For several years now the agricultural sector in the Canadian prairies has had to contend with frequent water shortages, and has thus been particularly exposed to the effects of climate change. In fact, most of Canada's irrigated agricultural land is found in Alberta. Thus, climate change adaptation by the agricultural sector is an integral part of several programs and initiatives.

In its 2008 Climate Change Strategy, Alberta Environment called for a specific adaptation strategy that will deal with impacts in various sectors (including agriculture). Identify the risks and vulnerabilities, and develop and coordinate measures.¹⁰ For the agricultural sector, the Strategy calls for development of opportunities to generate carbon credits from sequestration projects on agricultural lands.¹¹

The Strategy also mentions the government's commitment to adopt sectoral adaptation strategies. Alberta Agriculture Food and Rural Development (AAFRD)

is in the process of developing its own strategy, comprising future or continuing initiatives such as:

- participation in interministerial committees, particularly the Greenhouse Gas Climate Change Technical Team and the Alberta Climate Change Adaptation Team (ACCAT);
- various workshops for different target groups;
- support for research and innovation (development of new cultivars, etc.), in partnership with universities, provincial and federal research centres, and innovation agencies within the ministries concerned; and
- energy efficiency, particularly in irrigation.

A number of more specific actions are also worth noting. The *Alberta Land Stewardship Act* requires the largest watershed committees to produce a land use plan that takes account of the impacts of climate change. Under the auspices of AAFRD, the Irrigation Management Climate Information Network¹² provides up-to-date information on irrigated crop water use and decision support tools to help irrigators make on-farm water management decisions.

In addition, the Agriculture Financial Services Corporation (AFSC), which administers and offers agricultural insurance programs, funds weather stations and increased data gathering to keep better track of climate change impact trends. The Environmentally Sustainable Agriculture Initiatives Program (ESAIP), managed by the Agricultural Research and Extension Council of Alberta (ARECA) and funded by AAFRD, supports projects with indirect benefits for adaptation in the agricultural sector.¹³

Alberta is also a member of the Prairie Adaptation Research Collaborative (PARC) described in the section on Saskatchewan. An initiative of Natural Resources Canada and co-funded by the prairie provinces, this partnership among the Governments of Canada, Alberta, Saskatchewan and Manitoba carries out research on the impacts of climate change in the prairie provinces with a view to improving policy making in a number of sectors. The research focuses mainly on management and planning of surface, underground and irrigation aquatic resources during times of surplus and drought, as well as on ecosystems (vulnerability assessment, estimates of environmental goods and services produced, etc.). The committees have representation from officials in a number of ministries and ministerial agencies, including: Environment, Forests, Climate, Water Management, Local Governments, Infrastructures, etc.

In addition, Alberta would like to place a greater emphasis on awareness and education with regard to the impacts of and adaptation to climate change.

Saskatchewan

In 2009 the provincial government passed Bill 95, which calls for the creation of various climate change research and funding organizations focusing on such things as mitigation and adaptation.¹⁴ The creation of the Technology Fund

provided for in this legislation could open the door to funding for projects fostering adaptation to climate change in the agricultural sector.

In a news release issued in June 2007, the Saskatchewan government announced plans for sectoral climate change adaptation strategies.¹⁵ Saskatchewan Agriculture is working on this at present.

Because drought is the climate change impact of most concern to Saskatchewan Agriculture, this ministry is very active in monitoring and building the capacities of businesses and communities to deal with this problem. The Saskatchewan Watershed Authority¹⁶, a Crown corporation responsible for water management, is playing a lead role in this process. In addition, an agreement was signed with the University of Victoria to jointly carry out research into the impacts of climate change. Research topics include drought and carbon use reduction technologies. Currently, Saskatchewan seems to be relying mainly on PARC (see above) to assess the impacts of climate change.¹⁷

Manitoba

Since the coming into force of the *Climate Change and Emissions Reduction Act*, the Government of Manitoba has been required to report regularly on the impacts of climate change and on climate change adaptation and mitigation programs in 2010, 2012 and then every four years.¹⁸

Manitoba Agriculture, Food and Rural Initiatives (MAFRI) recently went back to work on adaptation by the agricultural sector. In recent months it had prepared an interim report on adaptation, but then shifted the priority to mitigation (a program was launched in the fall of 2009). Starting in 2010, the Department plans to shift the focus of an interdepartmental working group from mitigation to adaptation.

There are also plans for several sub- and extra-departmental divisions to be tasked with a number of missions, including extension, communication, policy, agricultural insurance via the Manitoba Agricultural Services Corporation (MASC), activities in conjunction with Agri-food Innovation & Adaptation (a government group engaged in research on crops that works closely with producers), and the PARC initiative described earlier. A number of consultation and information exchange activities are planned between now and the spring of 2010, both with producers and with experts and organizations outside MAFRI.

Two programs managed by MAFRI may address adaptation. The first, the Manitoba Sustainable Agriculture Practices Program¹⁹, focuses on mitigation activities while the second, the Agricultural Sustainability Initiative²⁰, funds technology demonstrations or transfers that encourage sustainable agro-environmental practices. Priority projects are those focusing on water quality management, environmental goods and services and improvements in crop system efficiency, which contribute indirectly to adaptation by the agricultural sector.

Two other programs aimed at wetland and water resource conservation may also help the agricultural sector adapt to climate change: the Wetland Restoration Incentive Program and Integrated Watershed Management Planning. The creation of the Manitoba Ecological Goods and Services Initiative Working Group, tasked with recommending policy instruments in such areas as agriculture, could definitely help design climate change adaptation tools for the agricultural sector.

According to the 2005 policy paper *Green and Growing - Building a Green and Prosperous Future for Manitoba Families*, agriculture represents an opportunity to reduce greenhouse gas emissions.²¹

Ontario

The province's response to the issue of climate change is coordinated by the Ministry of the Environment, and in particular the Climate Change Secretariat. The Environment and Land Use Policy Unit coordinates the actions of the Ontario Ministry of Agriculture, Food and Rural Affairs, or OMAFRA. This office currently comes under the Food Safety and Environmental Policy.

Recognizing the challenges posed by climate change adaptation in Ontario's Action Plan on Climate Change²², the Ministry of the Environment called for the creation of an Expert Panel on Adaptation. The Panel has submitted various recommendations to OMAFRA on how to take into consideration the impacts of climate change on the agricultural sector.²³ These include developing a mechanism for assessing climate-related risks and opportunities by 2011 by such means as consultations, beefed up policies on risk management, and crop insurance, as well as enhancing the province's ability to anticipate animal and plant diseases.

To date, no decision has been taken by the government in response to these recommendations. However, OMAFRA expects exchanges with agricultural organizations to pick up steam on the heels of the Expert Panel's recommendations. In designing its strategic framework, OMAFRA is thinking of including climate change mitigation and adaptation within its environmental priorities.

In addition, Ontario's Action Plan on Climate Change deals with mitigation measures in the agricultural sector. It encourages the use of agricultural carbon offset initiatives as part of a carbon market mechanism, and calls for financial support for biogas biodigesters.²⁴

Although support programs for mitigation measures have been put in place in Ontario, only those programs focusing on rural communities²⁵, agricultural innovations²⁶, crop insurance, food bio-security and environmental farm plans²⁷ introduced as part of the federal program "Growing Forward" can contribute, at least indirectly, to climate change adaptation in the agricultural sector.

Research carried out under a rural policy agreement between the University of Guelph and OMAFRA²⁸ could focus in part on climate change adaptation by the agricultural sector, since climate change has been selected as a priority theme of this research. Some of the research currently underway, either carried out or funded by OMAFRA, has to do with adaptation.

OMAFRA offers certain programs whose primary focus is not climate change adaptation. Still, these initiatives can contribute to adaptation. Also, OMAFRA says it is determined to place understanding and awareness of the impacts of climate change at the heart of its priorities and actions in the near future, so as to respond to such issues as rising temperatures, water shortages and extension of productive areas to the north.

Quebec

Le ministère du développement durable de l'environnement et des parcs (MDDEP) has undertaken to develop a government strategy centred on climate change adaptation. The Department of Agriculture, Fisheries and Food (MAPAQ) will be responsible for the agricultural sector in this regard. MAPAQ is cooperating closely with “La Financière agricole du Québec”, MDDEP, Agriculture and Agri-Food Canada (AAC) and the Union des producteurs agricoles (UPA) in this area, as is the case with its other activities. The government is also counting on the Ouranos consortium to carry out part of the knowledge acquisition and research work in adaptation. In future, the resources to support adaptation are expected to come from the petroleum royalties that are used to fund Quebec’s Action Plan on Climate Change.

Although a number of actors are involved in the process, it seems that the province’s agricultural adaptation strategy is in its infancy. There are many reasons for this:

- Despite its interannual variability, Quebec’s climate varies less than that of other regions; and
- The economic stability generated by food production under the supply management system and by insurance products that cover production costs spares most of Quebec’s producers climate-related concerns and reduces the need to actively manage this risk.

The upshot is that there are very few programs aimed at helping the agricultural sector adapt to climate change. Consequently, no formal assessment or monitoring process has been put in place.

MAPAQ and the provincial government are faced with a number of challenges when it comes to defining and implementing a specific policy on adaptation:

- Due to the unpredictability of the future climate and the complex interactions between biological elements and economic factors in agriculture, which render the impacts of climate change uncertain, it is difficult to distinguish adaptation measures from the bulk of management best practices that are already being promoted or supported.

- It is also felt that most agricultural enterprises will adapt to climate change as it arises, and that adaptation measures will be implemented in due course, based on needs.
- Implementation of certain “no regret” measures, for example better use of agroclimatic data by producers, is often limited by a lack of quality historical agroclimatic data.
- Quebec lacks expertise in agroclimatology, and the few specialists it has are generally overworked.
- Other challenges are taking up more of the agricultural sector’s attention.

Thus, Quebec does not have any programs aimed specifically at implementing adaptation measures in the agricultural sector. Several programs under the Growing Forward initiative²⁹ do make a contribution, though, through support for agro-environmental measures on the farm and for technological innovation in the agri-food sector. The latter, funded by MAPAQ and AAC, provides financial support for applied research, experimental development and technological adaptation projects to enable the agri-food industry to respond to society’s expectations regarding economic and regional development, food security, animal health and environmental protection.³⁰ Although some of the funded projects concentrate on GHG emission mitigation activities, there is reason to believe that some of the funded innovations might facilitate climate change adaptation by the agri-food sector.

MAPAQ’s Prime-Vert program, co-funded by AAC, provides financial and technological support for sustainable agricultural practices that can include adaptation projects in the agricultural sector.³¹ But since no list of funded projects was available at the time the present report was drafted, we cannot determine whether certain adaptation projects received support under this program. It should be noted that adaptation is not specifically mentioned as an objective of the program, whereas greenhouse gas (GHG) mitigation constitutes the primary objective of some of the measures contained in Prime-Vert. The emphasis on mitigation is no doubt attributable in part to the impetus generated by Quebec’s 2006-2012 Action Plan on Climate Change³², which added new measures to Prime-Vert and funding for GHG emission mitigation technologies.³³

To increase the knowledge that could facilitate adaptation, financial support for the Ouranos consortium is proposed in Quebec’s 2006-2012 Action Plan on Climate Change and in the “Plan d’action concerté sur l’agroenvironnement et la cohabitation harmonieuse ” 2007-2010.³⁴ According to the latter plan, adaptation measures needed to mitigate the repercussions of climate change on Quebec’s agricultural activities could take the form of strategies to address water shortages and the introduction of new species and hybrid species that are more resistant to heat and drought. This plan considers that changes brought on by GHG emissions might offer development opportunities that must be seized (e.g. introducing new crops). The plan calls for documenting the question of risks and opportunities related to climate change by means of sectoral studies on climate change adaptation (in cooperation with Ouranos) and designing awareness materials

aimed at farmers. Quebec's 2006-2012 Action Plan on Climate Change provides for \$10 M in financial support to Ouranos for adaptation (measure 26), as well as consolidation of water resource monitoring networks (measure 22).

Ouranos also manages the Regional Adaptation Collaboratives program created by Natural Resources Canada. In partnership with agricultural organizations, this program seeks to help the agricultural sector adapt through awareness, networking, development/transfer of information tools on climate change and its evolution to foster improved management of agroclimatic risks. Four projects are in the development stage: a) analysis of crop protection risks; b) agroclimatic atlas of Quebec (with crop heat unit map (UTM)); c) updating of standards and criteria for design of agricultural water development works; d) agroclimatic mission of the "Centre de référence en agriculture et agroalimentaire du Québec" (CRAAQ) and tools for farmers. Ouranos also helped develop other R&D projects in plant protection, agroclimatology and integrated soil and water management in a climate change context.

All in all, the provincial government is confident about the agricultural sector's adaptability. It considers this sector well structured, dynamic and innovative. MAPAQ feels that with this spirit of innovation, the agricultural sector will be able to adapt and to identify new opportunities as they arise.

New Brunswick

Although the New Brunswick Climate Change Action Plan recognizes the importance of countering the impacts of climate change on agriculture³⁵, no concrete measures are being considered. Regarding mitigation, the Plan talks about reviewing the potential of carbon sequestration on agricultural land, which can indirectly benefit adaptation in this sector.

The Climate Change Action Plan 2007-2008 Progress Report mentions that the New Brunswick Department of Agriculture and Aquaculture worked with farmers to develop and promote mitigation practices as well as practices that reduce vulnerabilities to climate change impacts.³⁶ These actions have been carried out mainly in the areas of energy efficiency as well as waste and manure management.³⁷

The Department of Agriculture recently struck an interdepartmental committee on climate change adaptation by the agricultural sector. Its first meeting was scheduled for January 2010. The main government organizations interested in this issue are the Climate Change Secretariat within the Department of the Environment and the land development division, one of the three main divisions of the Department of Agriculture.

Through this committee, the government plans to make information available to agricultural producers to help them make the best possible business decisions.

Nova Scotia

In its Climate Change Action Plan, Nova Scotia has outlined a number of adaptation actions it plans to take.³⁸ Some of these measures could certainly benefit agriculture, including:

- launch a Web-based clearinghouse of information on practices and support for adaptation;
- create an Adaptation Fund within Nova Scotia Environment;
- incorporate climate change impacts and adaptation response plans into the strategies of all provincial departments by 2012;
- consider climate change in Nova Scotia Environment's environmental assessment process;
- begin work on a provincial vulnerability assessment and progress report on adaptation, to be updated biannually;
- continue to work with the other Atlantic provinces on common adaptation goals;
- create an interdepartmental steering committee and external advisory committee responsible for coordinating adaptation efforts and providing adaptation policy advice, in 2009;
- develop a strategy to ensure the sustainability of the province's natural capital, to be led by the Department of Natural Resources; and
- develop a water resource management strategy by 2012 that takes into account the impacts of climate change on water quality and quantity.

The Nova Scotia Climate Change Directorate, which comes under Nova Scotia Environment, is overseeing the government's response to the issues posed by climate change. The Nova Scotia Department of Agriculture is currently integrating these objectives and developing its approach.

A few specific actions have already been implemented, including dyke elevation and increasing the number of critical sites requiring heightened monitoring. The tidal dyke system consists of 241 km of dyke with 260 aboiteaux structures, protecting 17 400 hectares of fertile farm land as well as other infrastructures, including roads.³⁹

To date, the accent has been on energy, from a "no regret" perspective: the Nova Scotia Department of Agriculture has supported agricultural producers in energy efficiency and economy measures, with climate change representing but one of several rationales, since businesses see these efforts as sound management.

In addition, the Nova Scotia Department of Agriculture offers a general program – the Farm Investment Fund⁴⁰ – that co-funds various agricultural management projects and investments: business succession planning; water management; fencing; biodiversity management; etc. The Department feels that a number of private initiatives in the area of adaptation could benefit from government funding under this program.

The Department of Agriculture and the Nova Scotia Agriculture College (NSAC) are co-managing a number of agricultural research projects, some having to do with agricultural adaptation.

Prince Edward Island

Prince Edward Island's climate change plan provides for measures encouraging mitigation of agricultural GHG emissions.⁴¹ It contains an assortment of initiatives that could help the agricultural sector adapt, particularly in the area of land management. The plan includes incentives for reforestation of marginal agricultural land, reduced tillage management and an assessment of the mitigation potential of various agricultural practices. The government plans to create an interdepartmental working group to identify and manage climate-related risks, but agriculture is not specifically mentioned. There is also a plan to incorporate climate change outcomes into the environmental impact assessment process.

Newfoundland and Labrador

Although the Newfoundland and Labrador Climate Change Action Plan sees adaptation as a challenge, it does not contain specific adaptation measures for the agricultural sector. The plan mentions various partnership programs with the federal government concerning mitigation and adaptation to climate change in the agricultural sector, including⁴²:

- The Technology Adoption Program in partnership with the federal government seeks to help local farmers improve competitiveness through new technology and advances in science, and to evaluate new crop varieties and storage systems;
- The diversification initiative provides assistance to producers to diversify into new crops and practices;
- The New Direction Research Program supports new technologies, including those that will help the industry adapt to climate change; and
- The Soil, Air and Water Quality Conservation and Enhancement Program supports projects that minimize the impacts or risks to soil, air, water and biodiversity as a result of agricultural activity. Also, the plan calls for a development strategy focusing on potential agricultural opportunities in the northern areas of the province.

Yukon

Although the Yukon government recognizes the importance of climate change adaptation action and research, it feels that agriculture can derive certain benefits from climate change.⁴³ As stated in the Climate Change Action Plan, the government plans to put measures in place to mitigate the impacts of climate change on agriculture, where necessary.

The government also hopes to create a centre of excellence that can help increase knowledge of the impacts on agriculture. There are also plans for a Yukon infrastructure risk and vulnerability assessment to determine adaptation strategies needed in response, a Yukon water resources risk and vulnerability assessment and an assessment of the risks to forest health. Since adaptation is a

local jurisdiction, the municipalities' action plans could also take into account the impacts of climate change on agriculture. Agricultural producers have taken part in information and communication activities dealing with adaptation at the community level, one example being Dawson, a community in which a number of producers are found.

Yukon believes that it is exposed to a high risk of food shortages due to climate change. There are various factors behind this:

- Much of its population is often dependent on hunting or gathering, and climate change affects the distribution of species – and in some cases threatens their very existence;
- Northern conditions (low temperatures, water flow regimes, soil quality, etc.) complicate food production; and
- Food is often shipped in from afar, and access is limited (for example, only one highway goes into Yukon, and a number of communities can be reached only by boat or plane). These transportation infrastructures are threatened by the impacts of climate change (National Round Table on the Environment and the Economy, 2009).

The department responsible for Yukon agriculture – the Yukon Department of Energy, Mines and Resources (YDEMR) – is charged with increasing agricultural production in the territory in order to further secure the population's food supply. The Yukon Climate Change Secretariat and Yukon Department of Energy, Mines and Resources want to ensure that Yukon's agricultural producers have access to climate projections so that they can improve their decision making. To that end, the Yukon government is relying on the Northern Climate Exchange⁴⁴ to use its expertise to interpret scientific data for governments and territorial populations. The University of Alaska-Fairbanks also generates a great deal of relevant information.

YDEMR is also working on a number of other projects, among them: developing new crop varieties adapted to conditions in Yukon and/or producing economic information on their use; extension services for farmers; developing infrastructures and irrigation capacities.

A number of projects and initiatives are being carried out thanks to funding from federal departments, including Indian and Northern Affairs Canada (INAC), which runs a series of programs dealing specifically with climate change and including a specific component on adaptation.⁴⁵ The Prairie Farm Rehabilitation Administration (PFRA), which comes under Agriculture and Agri-Food Canada and Natural Resources Canada, is also worth noting.

Northwest Territories

In the climate change plan, the department responsible for climate change issues indicates that adaptation should be dealt with separately from mitigation and that an adaptation strategy should be developed once a mitigation strategy has been implemented.⁴⁶

A report on the impacts of climate change highlights the need to adopt an adaptation plan, although it makes no mention of agriculture.⁴⁷

The Agriculture in the Environment Program, which comes under the federal “Growing Forward” program, provides support for developing regional environmental plans, collecting data on soil, vegetation and water, and implementing environmental plans on the farm.⁴⁸ This support could indirectly benefit adaptation by the agricultural sector.

Nunavut

Nunavut has not put in place a climate change plan, although the need to take adaptation into account in a future plan is recognized.⁴⁹ Nunavut has very few agricultural operations. Thus, the unit charged with the territorial government’s response to climate change feels that adaptation of hunting and gathering activities, as well as food security, are priority issues for the agricultural sector.

Synthesis and Interpretation

In all the provinces and territories, we saw an effort to integrate and take account of the challenges that climate change poses for the agricultural sector in various policies and various sectoral programs (e.g. energy, the environment). There is increasing coordination of actions by those responsible for questions related to adaptation by the agricultural sector to climate change.

Discussions with officials in the departments responsible for implementing initiatives related to adaptation by the agricultural sector and consideration of the public documentation on these questions have led us to form certain overall observations:

- The agricultural sector in the western provinces has had to contend with droughts for several years, and is increasingly reliant on irrigation. Consequently, its efforts to adapt to climate change impacts have been numerous; adaptation is integrated into several government initiatives.
- In Ontario, Quebec and the Atlantic provinces, stakeholders in government and the agricultural industry generally seem less concerned by the impacts of climate change. Most of these governments have structured their mitigation strategy and are gradually shifting resources toward adaptation; they are thus in a preparatory phase. They are focusing on mobilizing the various actors within government so as to make adaptation a priority, and on coordinating government and civil society expertise and resources by forming task forces.
- The territories are dealing with a special set of circumstances. Their agricultural sector is generally small, and their populations rely more on hunting and gathering. As a result, climate change is a direct threat to the food security of northern communities, which are faced with the possibility of changes to or extinction of hunted or fished species; also, northern conditions complicate the production of food.
- Provincial and territorial climate change strategies rarely offer specific recognition of the potential opportunities that climate change presents for the agricultural sector. But there are exceptions: Ontario, Newfoundland and Labrador and Yukon say they are preparing to seize these potential opportunities. Other provinces, such as Alberta, plan to develop opportunities for generating carbon credits through projects involving carbon sequestration in agricultural soils.

Coordination of Adaptation Efforts within Governments

The province's or territory's Department of the Environment generally coordinates the government's climate change efforts and then delegates sectoral responsibilities to the Department of Agriculture, which in turn delegates them to a unit that is fairly high up on its organization chart. It is not clear if the position of this responsibility in the departmental hierarchy reflects the importance attached to this issue, or the size of the province (which correlates to the quantity of resources at the government's disposal).

According to our information, there is a dearth of new resources being earmarked for adaptation preparations. What we are generally seeing is resources previously allocated to mitigation being shifted to adaptation. It should be pointed out that the paltry increase in (if not an outright freeze on) new resources are happening at a time when budgets are being cut left and right. So we can talk in terms of a slight *relative* increase in the resources allocated to agricultural adaptation to climate change.

The main challenges facing officials in the departments responsible for implementing agricultural adaptation initiatives are as follows:

- competition among government priorities;
- heightened uncertainty and scope of climate change impacts;
- lack of resources;
- difficulty bringing together the competencies and expertise necessary to carry out effective actions; and
- the scepticism of a number of stakeholders, both in government and the agriculture industry.

Government Initiatives to help Agricultural Sector Adapt to Climate Change

The following table offers an overview of the types of provincial and territorial initiatives aimed at helping the agricultural sector adapt to climate change. The initiatives are grouped into four categories:

- Research;
- Raising agricultural producers' awareness;
- Agricultural insurance (either adaptation of existing programs or creation of new mechanisms); and
- Implementation or funding of various adaptation measures.

Table: Summary of Provincial Territorial Actions to help Agricultural Sector Adapt to Climate Change

| Province/territory | Research | Awareness | Agricultural insurance | Other measures facilitating adaptation |
|---------------------------|----------|-----------|------------------------|--|
| British Columbia | ⊙ | | | ⊙ |
| Alberta | ⊙ | • | ⊙ | ⊙ |
| Saskatchewan | ⊙ | | | ⊙ |
| Manitoba | ⊙ | • | • | ⊙ |
| Ontario | ⊙ | • | • | ⊙ |
| Quebec | ⊙ | • | ⊙ | ⊙ |
| New Brunswick | | • | | ⊙ |
| Nova Scotia | ⊙ | | | ⊙ |
| Prince Edward Island | • | | | ⊙ |
| Newfoundland and Labrador | | | | ⊙ |
| Yukon | • | | | ⊙ |
| Northwest Territories | | | | ⊙ |
| Nunavut | | | | • |

Legend:

- Announced measures
- ⊙ Measures funded or implemented

Support for Research

The provinces and territories often seek partnerships with research centres to improve their knowledge and understanding of climate change. That is the case in Quebec, which provides financial support to the Ouranos consortium for research on adaptation by the agricultural sector. It is also the case with the Ontario Ministry of Agriculture, Food and Rural Affairs, which is cooperating with the University of Guelph on research priorities such as climate change. The Prairie provinces are collaborating on a joint research project that will study such things as the impacts of climate change on agriculture. Other provinces, such as P.E.I., have underscored the importance of research on the impacts of climate change in their action plans and intend to support this research.

Raising Awareness

The Quebec, Manitoba, New Brunswick, Alberta and Ontario action plans mention capacity building and support for activities that raise awareness of climate change impacts on the agricultural sector. Several provincial departments of agriculture

plan to shore up and structure the available information so that it benefits managers of agricultural enterprises. But very few activities have been carried out to date.

Agricultural Insurance

Crop insurance is generally managed and offered by provincial organizations and funded by the federal government, the provinces and agricultural producers. They generally protect against declines in yield caused by agronomic or climate conditions. Although these programs are managed by different organizations and can differ from one province to the next, it seems that the same basic mechanisms are used to calculate premiums and coverages.

For now, these institutions are not making any specific changes to take climate change into account. They adjust premiums and coverages based on previous yields and losses. Thus, the impacts of climate change are an implicit part of the process for updating insurance programs. To date, insurance program managers have not had enough information to go further in terms of integrating future climate change into their insurance products. Some institutions, including “Financière agricole du Québec and Agriculture Financial Services” (AFSC, in Alberta), are helping put in place data collection and research projects that could help them adapt their programs to climate change. In addition, Manitoba and Ontario are considering using insurance mechanisms as a means of dealing with climate change impacts.

Indirect Support for Adaptation Measures through Existing Programs

Each province offers programs or initiatives that directly or indirectly facilitate adaptation, although these programs rarely target this objective exclusively. Adaptation is becoming an increasingly large part of the provinces’ agricultural programs.

Basically, greater integration of climate change adaptation initiatives into government agricultural programs will continue to depend on a number of factors, including:

- the agricultural sector’s importance in each province or territory, both in absolute terms (net contribution to GDP) and in relative terms (percentage of agricultural GDP in a province’s total GDP);
- agricultural producers’ level of organization;
- type of representation by the agricultural sector in its dealings with government;
- government’s history and philosophy of intervention in agriculture;
- weighting of the various challenges facing the sector;
- agricultural sector’s level of vulnerability to climate change impacts in each province; and
- importance attached by federal government to climate change adaptation, and obligations or resources attached to this issue.

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² British Columbia Government. 2008. *The British Columbia Agriculture Plan, Growing a healthy future for B.C. families*. <http://www.agf.gov.bc.ca/Agriculture_Plan/Agriculture_Plan.pdf>, pp.14-19.

³ See: <<http://www.livingwatersmart.ca/business/agriculture.html>>.

⁴ See: <www.irrigationbc.com>.

⁵ See: <<http://bc.waterbalance.ca>>.

⁶ See: <www.pacificclimate.org>.

⁷ See: <<http://www.bcagclimateaction.ca/documents/CAI-FactSheet-4.pdf>>.

⁸ The Bioenergy Network was established in 2008 with a grant from the Government of British Columbia. This initiative acts as a catalyst for deploying near-term bioenergy technologies and organizing research for the development of new bioenergy technologies that are environmentally sustainable. <http://bcbioenergy.ca/about_us/index.html>.

⁹ See note 1 and 2

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¹² See: <<http://www.agric.gov.ab.ca/app49/imcin/index.jsp>>.

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¹⁵ See: <<http://www.gov.sk.ca/adx/asp/adxGetMedia.aspx?mediaId=150&PN=Shared>>, p.4

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²⁵ Four community-building programs managed by the Ontario Ministry of the Environment could provide indirect support for adaptation activities:

- Rural Economic Development Program (RED) helps communities find new ways to grow stronger and diversify their economies.

- Ontario Small Town and Rural Development Infrastructure Initiative (OSTAR) helps to improve infrastructure, such as roads and water systems, in small towns and agricultural areas. It also helps make the local economy more active. OSTAR is part of the Canada-Ontario Infrastructure Program (COIP).

- Millennium Partnerships Program helps larger rural municipalities find new ways to solve problems and pay for improvements. This initiative is also part of the Canada-Ontario Infrastructure Program (COIP).

- Canada-Ontario Municipal Rural Infrastructure Fund (COMRIF) helps small towns and rural communities fix local roads, repair bridges, and upgrade water and sewage treatment plants.

See: <http://www.omafra.gov.on.ca/english/rural/ind_rural_funding.htm>.

²⁶ The farm innovations program is managed by the Agricultural Adaptation Council (AAC) on behalf of Ontario's Ministry of Agriculture. It seeks to support adaptation to changes in demand for agricultural products through funding for agricultural technologies with farm applications. See: <<http://www.adaptcouncil.org/e/current-programs/fip.php>>.

²⁷ Environmental farm plans are co-managed by OMAFRA and the University of Guelph. See:

<http://www.omafra.gov.on.ca/english/policy/apf/apf_environment.htm>

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²⁹ Growing Forward is the successor to the Agricultural Policy Framework (APF). Launched in March 2008, this federal-provincial-territorial initiative represents an investment of \$1.3 billion over five years. Within the framework supplied by Growing Forward, the governments are investing in initiatives that foster competitiveness and innovation, put in place food safety insurance, biosecurity and traceability systems, improve farms' environmental performance, promote Canadian agriculture on international markets, help producers and processors gain access to these markets and help farmers get by without traditional programs dealing with business risk management.

For more details, visit the Growing Forward website at: <<http://www4.agr.gc.ca/AAFC-AAC/display-afficher.do?id=1238606407452&lang=eng>>.

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³¹ Prime Vert, launched on April 1, 2009 and due to expire on March 31, 2013, co-funds the following measures:

Part 7: Manure spreading equipment;

Part 8: Advisory services in matters of the agri-environment:

- 8.1 Agri-environmental support plan (PAA);

- 8.2 Agri-environmental advisory clubs;

- 8.3 Coordination of agri-environmental advisory clubs;

Part 10: Reduction of non-point source pollution.

- 10.1 Measures for reducing non-point source pollution;

- 10.3 Coordination of water management by watershed groups.

For further information: <http://www.mapaq.gouv.qc.ca/NR/rdonlyres/2F89F65C-E23E-4D0D-8F4D-87E4559DFE23/0/Agroenvironnement_Primevertcultivonsavenir.pdf> and

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