CLIMATE CHANGE ADAPTATION PROGRAM

BC Agriculture Climate Change Action Plan

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BC AGRICULTURE & FOOD

BC Agriculture

Climate Change Action Plan

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Table of contents

Acknowledgement Statement
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Disclaimer Statement
Agriculture and Agri-Food Canada (AAFC), the BC Ministry of Agriculture and Lands (BCMAL) and the Investment Agriculture Foundation of BC (IAF), are pleased to participate in the production of this Plan. We are committed to working with our industry partners to address issues of importance to the agriculture and agri-food industry in British Columbia. Opinions expressed in this Plan are those of the BC Agriculture & Food Climate Action Initiative Advisory Committee and not necessarily those of BCMAL or AAFC.

Introduction: BC Agriculture's Climate Change Action Plan

The BC Agriculture & Food Climate Action Initiative

The *BC Agriculture and Food Climate Action Initiative* (the "Initiative") is a joint project of the BC Agriculture Council and the Investment Agriculture Foundation. Initiative activities began in May of 2008. The Initiative is led by an Advisory Committee made up of agricultural producers and food processors from around the province, as well as representatives from various government agencies.[1]

The Initiative was created to: increase industry understanding of the implications of climate change, respond to and address climate change issues and opportunities, strengthen agriculture's climate change networks, act as a forum for sharing resources, information and tools, and communicate and collaborate with relevant BC government agencies. During its two years, the Initiative Advisory Committee has sought to accomplish, or make progress toward, all of these goals.[2]

The primary deliverable of the Initiative is this Action Plan which is intended to provide the BC agriculture and agri-food community with the necessary strategies to meet the challenges of climate change. The objectives of the Plan are:

- To develop tools and resources that enable BC's agricultural producers to assess and reduce greenhouse gas emissions;
- To facilitate an increase in economic opportunities (cost savings, revenue diversification and market competitiveness) associated with GHG mitigation and clean energy production on BC farms ; and
- To develop tools and resources that enable BC's agricultural producers to evaluate vulnerability to the impacts of climate change and to integrate climate change adaptation into decision-making.

The context of Agriculture's Climate Change Action Plan

The work of the BC Agriculture and Food Climate Action Initiative has existed within a rapidly changing context. The BC government has set strong policy direction with respect to climate change and continues to work toward meeting its emission reduction targets (including on-going participation in the development of the Western Climate

[1] For a list of Climate Action Initiative Advisory Committee member organizations, please see Appendix A. For details regarding Climate Action Initiative activities to date please see Appendix B.
[2] From: Climate Action Initiative Terms of Reference, 2008.

Initiative's cap and trade system). Local governments are now actively engaged in developing greenhouse gas emission inventories and planning for emission reductions.[3]

More recently, the BC government released their Climate Change Adaptation Strategy which outlines priority actions for supporting province-wide adaptation.[4] The focus on adaptation is anticipated to increase in the future.

At the same time, the federal government has a number of initiatives underway including development of a Canadian carbon offset system, a "roadmap" for climate change adaptation in agriculture, and various tools and programs (such as the recently announced Energy Loans program through Farm Credit Canada).

Globally, the economic opportunities associated with "clean" goods and technologies continue to expand. While the economic downturn may have dampened political will in some jurisdictions, there remains a strong momentum in the private sector to create alternatives to fossil fuels, reduce greenhouse gas emissions and to identify associated diversification and marketing opportunities. All industries will continue to be impacted by these shifts and will be challenged to view their businesses in a new way.

The Initiative has also been tasked with looking forward and developing strategic direction in a time of fiscal restraint. This context influences how BC's agricultural producers view their industry and their businesses, as well as overall capacity to manage change. An economic downturn does not diminish the value of this Action Plan and its goals. If anything, the economic environment increases the importance of addressing industry's capacity to manage risk. However, the recommended strategic approaches reflect the current constraints facing both industry and government.

Guiding principles

The Agriculture and Food Climate Action Initiative Advisory Committee (the "Advisory Committee") has developed a set of guiding principles for the Action Plan. The principles serve two important purposes. First, they reflect the Advisory Committee's understanding of the impacts and opportunities associated with climate change in BC. Second, the principles identify the values that inform the Action Plan and provide guidance for *how* the Plan's goals and strategies can best be achieved. Therefore, the guiding principles reflect both what the Advisory Committee has learned through the planning process, and the values it believes should be carried forward in implementation.

[3] For more information on BC climate actions see: www.livesmartbc.ca
[4] http://www.livesmartbc.ca/government/adaptation.html

Climate change is a growing concern for BC's agricultural operations

The Advisory Committee accepts that human activity is impacting the climate which is changing in unprecedented ways. Climate change, particularly through extreme weather events, is already impacting agricultural producers and their ability to plan. Climate change is also creating greater uncertainty about the future of agricultural operations and an increasing need for new kinds of information.

Current information and data is insufficient

Over the course of its two years, the Initiative has built a foundation of knowledge that has facilitated the development of this Action Plan. However, one of the Advisory Committee's important messages is that practical information and data (particularly for farm level decision-making) remains lacking. Data systems are needed that are relevant, timely, accurate and adequately supported. Continuing to build knowledge and improve data collection is a primary focus of the Action Plan.

A provincial food strategy is required

While this Action Plan supports the agriculture sector in addressing many challenges and opportunities associated with climate change, there are issues that fall beyond its scope. The Action Plan will be most effective if adopted as part of a comprehensive provincial food strategy that supports the development and maintenance of a sustainable and secure food system in the context of a changing climate.

Expansion of production capacity is needed

Climate change is anticipated to affect global food systems by resulting in: food shortfalls, altered trade patterns, population migrations and growing interest more secure local food supplies. Within this context, contraction of BC's food production and processing capacity is unacceptable. Rather, BC must seek to expand its capacity for food production, re-build lost production and processing infrastructure and develop expertise to serve local markets and to develop new products.

Maintaining competitiveness is critical

Actions or strategies that reduce the economic viability or competitiveness of BC agriculture will not improve the environmental or social health of the province. If food production-related emissions are simply displaced or leaked to other jurisdictions, this does not support greenhouse gas mitigation objectives or the health of BC's economy.

Decision-making is influenced by scale

While maintaining a provincial and "pan-agricultural" perspective, it must also be acknowledged that the impacts and opportunities associated with climate change vary

according to geography, capacity and perspective. Responding effectively to climate change requires an understanding of the differing circumstances and time horizons applied at various scales of decision-making.

While it is critical for policy development and sector-wide strategic planning to focus on long term and province-wide strategic outcomes, the economics of agriculture dictate a focus on more immediate and localized outcomes. This means that strategies to support mitigation and adaptation must take into account how farm level decisions are currently made and the need for regional and farm scale solutions. Likewise, factoring longer term outcomes into investment decisions may ultimately improve the viability of BC farm businesses.

Success requires collective action

The Action Plan contains the assumption that there is the continued need for the sector to act collectively. Due to its significant diversity, at any given moment in time, commodity groups in BC may be facing seemingly distinct climate change-related challenges. For some commodities, managing energy costs is the highest priority, for others it is adapting to drought and reduced access to water supply. In all cases, applying a strategic and coordinated approach strengthens the ability of the industry to respond effectively.

Partnerships are necessary

In part due to the current economic context, the Action Plan emphasizes the need build partnerships. In tackling the challenges associated with climate change, the BC agriculture sector cannot (and should not) act in isolation. There is immense potential benefit in cultivating partnerships with others – across economic sectors, government departments and jurisdictions – interested in achieving similar outcomes. Therefore, there are many strategies and actions in the plan focused in strengthening partnerships.

The scope of the Action Plan

The Action Plan encompasses both climate change mitigation (reduction of greenhouse gas emissions) and climate change adaptation (planning for, and responding to, changes in climate). This reflects the Initiative's desire to develop a comprehensive plan, as well as the importance of preparing industry for managing the challenges associated with both aspects of climate change.

The Action Plan provides both strategic direction and concrete actions. It is expected to be a "living document" and to be revisited annually. While much of the strategic direction will likely remain consistent, it is anticipated that areas of priority may shift over time, as may the actions deemed to be most effective in achieving the goals and strategies.

In keeping with the Initiative's mandate, the Action Plan is pan-agricultural. Given the very different issues facing food processors and agricultural operators, it was an on-going challenge of the Initiative to do justice to supporting both. It should be acknowledged that the majority of the Plan maintains a focus on primary agriculture.

However, where possible, the Plan addresses the interests of both. Consistent with the Plan principles, the strategies and actions support innovation and economic diversification for the sector while complementing climate change mitigation and adaptation objectives.

To develop a Climate Action Plan that is sufficiently comprehensive to meet the needs of every commodity, region and agri-food business in the province is not realistic. Therefore, the Plan is not intended to address issues specific to individual commodities but incorporates awareness that depending on the issue, certain agricultural groups may experience disproportionate impacts.

The timeframe for implementation of the Action Plan is three years; August 2010 to August 2013. Some strategies and actions may take longer than anticipated to implement and others may be accomplished more quickly. However, with commitment from all partners, three years should be sufficient to achieve significant progress in all areas of the Plan.

The Structure of the Action Plan

The Action Plan is divided into two parts, the first addresses climate change adaptation and the second climate change mitigation.

Adaptation & Mitigation

To date mitigation has been the driving force behind government climate change policy, legislation and regulation and it is also the focus of emerging economic opportunities and incentives. In response to this, the work of the Climate Action Initiative has also focused primarily on mitigation – supporting the agriculture sector with addressing greenhouse gas emissions. As a result, the mitigation portion of the Plan includes greater detail and clarity regarding strategies and actions.

However, adaptation is an area of high priority; improving agriculture's resilience in the face of climate change is a matter of critical importance, not only for the sector, but for society as a whole. It is for this reason that the adaptation section is placed at the front of the Action Plan.

The adaptation and mitigation sections each include: topic areas, goals, strategies and actions. Table 1 summarizes the Plan topics and goals. Tables 2-5 summarize the goals, strategies and actions for each topic.

Topics

The broad scope of Topic 1, "Strategic Adaptation," reflects current state of knowledge regarding agricultural climate change adaptation in BC. It is anticipated that as the implementation of the Plan moves forward, more specific strategies and actions will be delineated.

Before further strategic direction can be defined, improvement of the available information is required. Filling the information gaps does not necessarily mean focusing on climate change models. What is required is a summary of existing knowledge, an assessment of the risks and opportunities facing the industry and the identification and evaluation of options for improving industry resilience. Therefore, the Plan's primary focus for adaptation is on increasing the information available to enable strategic decision-making.

The mitigation portion of the Plan is divided into three interconnected topics. The emissions associated with agricultural production are often distinguished from those associated with energy and require separate consideration. For this reason the focus of "Farm practices & greenhouse gas mitigation" is strategies associated with soils, livestock and nutrient management. Nonetheless, in many cases the goals and strategies identified within this topic will also support work in the area of energy.

Energy is divided into two separate topics to indicate the need for distinct strategies to accomplish the goals in these areas. "Farm energy & fuel efficiency" focuses on maximizing efficiency of energy and fuel consumption and "Clean agricultural energy production" focuses on increasing the energy production on BC farms and/or with agricultural by-products.

Goals, Strategies & Actions

The goals are intended to state the outcome that is sought. In the simplest terms the goals should answer the question: What are we trying to achieve? The strategies articulate how the goals will be accomplished. The strategies should answer the question: *How* do we achieve our goals?

The actions drill down to the level of specific activities. Actions answer the questions: *What* will we do? What steps will we take? The actions provide a level of detail that is generally absent from strategic plans because appropriate actions are determined by circumstances that change frequently. However, strategic plans that do not incorporate this level of detail are frequently left to languish on a shelf. This is because such plans fail to translate high level goals and strategies into concrete actions. It is also extremely

difficult to assess progress on goals and strategies. Therefore, the Action Plan includes actions but this portion of the Plan will remain flexible and responsive.

Implementing Actions

To provide additional direction regarding implementation, a priority level from 1-3 (one being the highest priority) has been assigned to each action. Timelines have been identified for each action as some activities must necessarily be completed before others. These timelines are likely to change and require flexibility but they provide an initial temporal framework.

A lead organization or agency has been identified for each action, along with possible partners. These are intended to be recommendations of the Initiative Advisory Committee and it is understood that implementation will be influenced by a number of factors. While it is hoped that the identified leads are the appropriate responsibility centres, in almost all cases partnerships will be required to accomplish the tasks.

Indicators of Success

Measuring success in implementing this Plan will be challenging because in many cases results will be difficult to quantify. More specific and measureable targets will emerge with development of each action item. However, it is important to determine how we define success and to be able to assess progress in achieving the Plan's goals. Therefore, at the end of each set of strategies and actions, is a series of Indicators of Success to provide a means for evaluating accomplishments over time.

Climate Action Initiative
BC AGRICULTURE & FOOD

Table 1: Summary of Topics & Goals

Part I. ADAPTATION Strengthening sector resilience	**Part II. MITIGATION Toward a low carbon economy**		
Topic 1. Strategic adaptation	Topic 2. Farm management practices & greenhouse gas mitigation	Topic 3. Farm energy & fuel efficiency	Topic 4. Clean agricultural energy production
Goal 1.1 Improve the state of knowledge regarding risks and opportunities associated with climate change	**Goal 2.1** Strengthen agricultural producer knowledge of linkages between farm practices and GHG mitigation	**Goal 3.1** Increase available information about energy/fuel use on BC farms	**Goal 4.1** Support assessment and development of farm-scale energy and fuel production opportunities across BC
Goal 1.2 Address priority adaptation research and development gaps	**Goal 2.2** Improve the state of knowledge regarding agricultural GHG "sources and sinks" in BC	**Goal 3.2** Maximize implementation of energy/fuel efficiency practices and technologies on BC farms	**Goal 4.2** Increase commercial clean agricultural energy production in BC
Goal 1.3 Enable consideration of agricultural climate change adaptation issues in government decision-making	**Goal 2.3** Increase availability of technical and financial support for implementation of GHG mitigation practices on farms		
Goal 1.4 Integrate climate change adaptation considerations into decision-making of agricultural organizations and operations	**Goal 2.4** Increase local government and community access to information regarding agriculture and GHG mitigation		

Part I: Agriculture & Climate Change Adaptation

Strengthening sector resilience

Defining climate change adaptation

Climate change adaptation is the response (of individuals, groups and governments) to actual or anticipated changes in climate. When appropriate adaptations are selected, they should increase resilience in the face of changes in climate.

Agricultural producers are accustomed to weather conditions influencing their activities. Decision-making in response to variations in weather is a constant element of farming life. Many of the approaches used by farmers to respond to weather are valuable and applicable in the context of a changing climate.[5]

Adaptation which utilizes existing knowledge and technology to respond to changes that are experienced is defined by the Intergovernmental Panel on Climate Change as "autonomous adaption."[i] However, climate change creates the potential for variations and extreme events of a magnitude and scale not previously experienced. This is likely to push farmers beyond their existing capacity to adapt.

Planned or strategic adaptation involves a systematic assessment and response to climate change. Strategic adaption engages institutions and utilizes planning and policies to establish or strengthen favourable conditions for effective adaptation. For example, strategic adaptation may involve investment in new technologies and infrastructure. A broad strategic approach increases the tools available to agricultural producers to anticipate and manage change.

To be effective at the farm level, strategic adaptation to climate change must take into consideration broad socio-economic factors, how agricultural producers make decisions, and in particular, what factors enhance or discourage adaptation.

BC's climate future

As a land-based industry, agriculture is particularly vulnerable to climatic changes.

[5] Weather generally refers to the day-to-day or month-to-month state of the atmosphere, including short-term variation. Weather identifies what is happening outside (precipitation, temperature etc.) at any given moment. Climate refers to statistical weather information over a longer term interval and includes long term cycles and patterns. For example, when a region is said to have a cool winter climate, this is based on years of statistical averages and extremes (30 years is the most common unit for assessing climate).

Between 2010 and 2039, the Intergovernmental Panel on Climate Change projects average warming of 1-3°C across much of North America and, beyond this period, annual warming is expected to increase. The following broad changes are identified for BC in the report *From Impacts to Adaptation: Canada in a Changing Climate:* [ii]

- Increasing climate variation and more extreme weather events with an increase in the associated damage costs
- Shrinking of glaciers with many expected to disappear within 100 years; resulting in serious impacts on water availability and hydrology
- Reduction of snow accumulations, particularly at lower elevations
- Warming by 2-7°C by 2080 – impacting sea levels, precipitation patterns and ecosystems
- Increasing frequency and severity of wildfires
- Increasing frequency and severity of pest, disease and invasive plant outbreaks

These changes are likely to have consequences for food production through impacts to health and quality of crops, pasture, forests and livestock. The biophysical changes are anticipated to result in socio-economic impacts which could also be felt in BC, even if the more dramatic changes to climate are occurring elsewhere. Potential impacts include: declines in yield and production, fluctuations in world market prices for food, changes in geographic distribution of trade regimes, and an increasing number of people at risk of hunger.

BC Agriculture and a changing climate

Less than 5 percent of land in BC is suitable for agriculture, which was one of the primary reasons for the development of the Agricultural Land Reserve between 1974 and 1976.[iii] However, land continues to be removed from the Reserve and 86 percent of the land excluded since 2002 has been in regions with the highest concentration of prime farmland.[iv]

Some research predicts BC will experience increasing agricultural capability and a broader range of suitable crops. However, it is likely that climate change will increase uncertainty and the costs associated with weather damage for BC's agricultural operations. While there is value in assessing future crop suitability, such work must also include a realistic evaluation of possible changes in precipitation and hydrology, as well as the current socio-economic context of agriculture in BC.

Although BC agriculture is highly productive, net farm incomes vary widely. The size of the operation influences income but regardless of size, many farm businesses are experiencing increasing input costs and pressure from global commodity prices. BC agriculture continually faces stiff competition from inexpensive imports.

It is estimated that about between 40 and 50% of the food consumed in the province is imported and a significant percentage comes from California which has recently been experiencing severe drought conditions.[v] As climate change impacts are felt in other jurisdictions, heavy reliance on imported food may become increasingly problematic and costly.

Despite the importance of maintaining a viable agriculture sector, to date the issue of agricultural adaptation to climate change has received little attention in BC. There is a critical need to determine how best to support the industry with climate change adaptation and how to increase food security in the face of a changing climate.

It is beyond the scope of this Plan to address the broader issue of the food security of British Columbia. A comprehensive provincial food strategy would set the stage for a long term commitment to a strong and vibrant agriculture sector with the capacity to manage the transitions associated with a changing climate.

Progress on climate change adaptation

Within the many published reports that address the topic of climate change, it is generally acknowledged that agricultural adaptation is a critical issue.[6] Yet identifying adaptation priorities for BC agriculture remains a significant challenge and has not moved forward as quickly as mitigation activity.

While reducing greenhouse gas emissions is no simple task, climate change mitigation has clear and measureable outcomes. GHG mitigation is also increasingly embedded in government policy and consumer expectations. There is growing impetus for the private sector to participate in climate change mitigation (regulatory requirements, economic incentives, public perception etc).

In some parts of the world – such as portions of Australia – agricultural producers are experiencing considerable stress as they struggle to adapt to recent climate extremes. In much of Canada, there is less immediate pressure to assess the sector's exposure to the risks associated with climate change.

While there may be uncertainty regarding the localized impacts of climate change, there are many adaptations that have the potential support and strengthen the industry regardless of the specifics of the change. Identifying and strengthening successful "no-regret" adaptation strategies is a valuable first step and will also clarify where there are gaps that require additional attention. "No regret" measures are those adaptations that

[6] Amongst the jurisdictions that have focused on adaptation assessments and planning for agriculture are: Australia, New Zealand, the United Kingdom and California. The European Commission has also undertaken a vulnerability assessment for the European agriculture sector.

will assist producers to cope with a range of plausible changes and that also have socio-economic or environmental co-benefits. Particularly with the uncertainty regarding climate change, these measures help to ensure adaptation investments are sound.

Perhaps unsurprisingly, much of the dialogue about agricultural adaptation – in all jurisdictions – has been led by researchers. Governments are poised to increase their focus in this area and are likely to begin assessing the impacts of policies and resource and land management decisions in the context of climate change. The agriculture industry will wish to participate fully in this process. For this reason, adaptation is defined by the Initiative as being a high priority area moving forward.

Topic #1 Strategic adaptation

Where are we now?

To date the amount of activity focused on agricultural adaptation to climate change in BC has been limited. The BC Ministry of Environment, Climate Action Secretariat (CAS) leads and coordinates the BC government's institutional initiatives on adaptation and provides strategic oversight in this area.

In addition to integrating adaptation into government operations, the Province's Climate Change Adaptation Strategy places priority on assessing risk and implementing priority adaptation in climate sensitive sectors. The strategies and actions identified below will be coordinated with, and will complement and strengthen, provincial government work in this area.

While not defined specifically in terms of climate change adaptation, important adaptation-related activities have been led by the BC Ministry of Agriculture and Lands (MAL). The majority have (appropriately) been focused on water management and the development of water use planning tools. This work provides a strong basis for strategic adaptation – enabling assessments of water use and guiding decision making with this data is a significant step.

The Environmental Farm Plan Program and Beneficial Management Practices Program include practices that improve soil quality, increase effective irrigation management and encourage planting of shelterbelts and riparian areas. These practices are likely to increase the capacity of farms to impacts associated with climate change (particularly changes in hydrology).

The Ministry of Agriculture and Lands and the Investment Agriculture Foundation have also provided support for economic diversification and sustainable land management practices (both adaptation strategies) in areas such as Agroforestry, and more recently, waste to energy technologies.

At the national level, the Canadian Climate Impacts and Adaptation Network (established by Natural Resources Canada) produced a series of reports on agricultural adaptation issues prior to its closure in 2007.[vi] A handful of high level, multi-provincial research projects have been conducted with funding support from Natural Resources Canada, as well as a BC-specific study of climate change impacts on water demand for agriculture in the Okanagan.[vii]

In addition, the Agri-Environment branch of Agriculture and Agri-Food Canada is in the process of developing a "roadmap" for agricultural adaptation to climate change. This plan may provide a strong framework to guide adaptation activities. However, it is likely

to be relatively high level and more detailed planning at the provincial, regional and commodity levels will be required.

Where are we going?

All of the adaptation-related content in the Action Plan is found beneath the single topic heading of "Strategic Adaptation." This reflects the current level of knowledge and capacity in the area of agricultural adaptation. As defined in the introduction, strategic adaptation is intended to generate a planned and systemic response to climate change. More knowledge is needed regarding the challenges, risks and opportunities.

The goals, strategies and actions identified below, aim to build the *ability* to act strategically in British Columbia. Agreement amongst partners that this is an area of priority is necessary, including a commitment to factoring agricultural adaptation into decision-making at all levels.

A supportive framework of information and resources is required so that planning and decision-making is informed by an understanding of the potential impacts of climate change on agriculture. The strategies and actions identified in the Plan are intended to increase knowledge and generate tools and resources for the three critical levels of decision-making (government, industry organizations and agricultural operations).

Table 2: Summary of strategic adaptation Goals, Strategies & Actions

Part I. ADAPTATION Strengthening sector resilience	Topic 1. Strategic adaptation	
Goals	*Strategies*	*Actions*
Goal 1.1 Improve the state of knowledge regarding risks and opportunities associated with climate change	Strategy 1.1.1 Assess the risks/opportunities, for agriculture in BC, associated with climate change	• Conduct a (region-by-region) climate change vulnerability assessment for agriculture in BC • Facilitate the development of commodity-based climate change adaptation plans
	Strategy 1.1.2 Strengthen collection and coordination of weather data	• Assess weather data collection in BC's agricultural regions • Fill data collection gaps and confirm that needs of researchers and agricultural producers are met
Goal 1.2 Address priority agricultural adaptation research and development gaps	Strategy 1.2.1 Communicate key industry research needs to the research community and potential partners	• Organize regional "BC Agriculture Adaptation" workshops to identify adaptation R&D priorities & strategies • Foster partnerships for collaborative R&D in BC and with other jurisdictions
Goal 1.3 Enable consideration of agricultural climate change adaptation issues in government decision-making	Strategy 1.3.1 Develop educational resources to inform government policy, planning and programming re: agricultural adaptation	• Develop/disseminate tools to assess impacts of policy, planning and programs on agriculture's capacity to adapt • Initiate outreach to local governments to share existing educational resources • Coordinate workshop series with local governments to increase knowledge of mitigation and adaptation issues

Part I. ADAPTATION Strengthening sector resilience	Topic 1. Strategic adaptation	
Goals	*Strategies*	*Actions*
	Strategy 1.3.2 Increase sector representation in relevant local government planning activities	• Coordinate with BC agricultural organizations to facilitate industry representation in local planning activities • Provide educational materials on adaptation issues to support sector participation in local planning activities
Goal 1.4 Integrate climate change adaptation considerations into decision-making of agricultural organizations and operations	Strategy 1.4.1 Develop knowledge & resources to support informed decisions at the agricultural organization and farm level	• Conduct a (region-by-region) climate change risk/opportunity assessment for agriculture in BC • Facilitate development of commodity-based climate change adaptation plans • Integrate consideration of climate change adaptation into government programming for agriculture, particularly programming intended to protect producers from risk
	Strategy 1.4.2 Identify and communicate models/best practices for farm-based climate change adaptation	• Conduct a scan of adaptive practices from within BC and other jurisdictions and develop recommendations for further research • Conduct small scale regional testing/demonstration or prioritize for further BC-based research

Goal 1.1

Improve the state of knowledge regarding risks and opportunities associated with climate change

Strategy 1.1.1 Assess the risks/opportunities, for agricultural production in BC, associated with climate change

Actions:

a) Conduct a (region-by-region) climate change vulnerability assessment for agriculture in BC that includes: [7]
   a. High level assessment of climate patterns and recent extreme events and potential impacts of climate change on each region
   b. A "from the ground" regional engagement process with producers (and industry specialists) to identify experienced changes, current approaches and gaps/needs
   c. Identification and prioritization of critical knowledge/information gaps
   d. Collation and analysis of information gathered and recommendations

Priority level	1
Timeline	August 2010 to August 2011
Lead	CAI[8]
Potential partners	BCAC, MoE, MAL, PICS, PCIC, IAF, industry associations[9]

b) Facilitate the development of commodity-based climate change adaptation plans by:[10]
   a. Developing a template commodity-based climate change adaptation plans
   b. Identifying (technical and financial) mechanisms to facilitate/support commodity-based planning
   c. Facilitating a pilot project for commodity adaptation plans

Priority	1
Timeline	August 2011 to August 2013
Lead	CAI, industry associations
Potential partners	IAF, BCAC, MAL

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[7] Also see Strategy 1.4.2, Action a.
[8] CAI = BC Agriculture & Food Climate Action Initiative
[9] BCAC = BC Agriculture Council, MoE = Ministry of Environment, MAL = Ministry of Agriculture & Lands, PICS = Pacific Institute for Climate Solutions, PCIC = Pacific Climate Impacts Consortium , IAF = Investment Agriculture Foundation
[10] Also see Strategy 1.4.2, Action b. Following the completion of the regional risk assessment, commodity-based assessment/planning will enable commodity groups to identify specific challenges opportunities and develop plans to manage adaptation.

Strategy 1.1.2 Strengthen collection and coordination of weather data required by agricultural producers and researchers[11]

Actions:

a) Assess weather data collection in BC's agricultural regions by:
   a. Reviewing currently available information
   b. Identifying critical gaps
   c. Consulting with industry about additional data needs

Priority level	1
Timeline	September to December 2010
Lead	CAI, MAL
Possible partners	MoE, Environment Canada, PCIC, PICS, IAF, industry associations

b) Fill data collection gaps and confirm that data requirements of researchers and agricultural producers are met (Also see Strategy 1.4.2 Action c)

Priority level	1
Timeline	January 2011 onward
Lead	CAI, MoE, MAL
Possible partners	Various

Indicators of Success:

- Improved understanding of regional vulnerabilities/capacities/needs for agricultural adaptation in BC
- Application of improved knowledge to inform agricultural adaptation priorities
- Implementation of supportive framework for commodity adaptation planning
- Participation of commodity groups in adaption planning
- Increased availability of weather data that meets the needs of agricultural producers (for decision-making purposes)

Goal 1.2

Address priority agricultural adaptation research and development gaps[12]

Strategy 1.2.1 Communicate key industry research needs to the research community and potential partners

[11] The BC Ministry of Environment is already playing a coordination role for meteorological networks in BC. The work in this Strategy should link into this existing activity.

[12] It is assumed that many research gaps will have been identified through the regional risk/opportunity assessment (Strategy 1.1.1, Action a)

Actions:

a) Organize regional "BC Agriculture Adaptation" workshops to identify adaptation R&D priorities and strategies[13]

Priority level	2
Timeline	November 2011 to March 2012
Lead	CAI, MAL
Possible partners	Industry associations, MoE, PICS, IAF, AAFC[14]

b) Foster partnerships for collaborative R&D in BC and with other jurisdictions

Priority level	2
Timelines	August 2011 onward
Lead	CAI, MAL
Possible partners	Various

Indicators of Success:

- Improved understanding of agricultural adaptation R&D priorities
- Effective targeting of R&D resources for climate change adaptation (through improved communication of priorities and cross-jurisdictional partnerships)

Goal 1.3

Enable consideration of agricultural climate change adaptation issues in government decision-making[15]

Strategy 1.3.1 Develop educational resources to inform government policy/planning & programming (regarding agricultural adaptation)

Actions:

a) Develop and disseminate tools to assess impacts of existing and emerging policy, planning and programming on agriculture's capacity to adapt to climate change

Priority level	1
Timeline	September 2011 onward[16]
Lead	MAL, MoE
Possible partners	BCAC

[13] These workshops will be organized following the completion of the assessment to focus specifically on research and development. They will also provide follow-up with participants regarding the assessment.
[14] AAFC = Agriculture & Agri-Food Canada
[15] Also see Goal 2.4
[16] This Action is intended to be undertaken following the completion of the adaptation assessment.

b) Initiate outreach to local governments to share existing educational resources (See Strategy 2.4.1, Action a)[17]

Priority level	2
Timeline	On-going
Lead	MAL, BCAC
Possible partners	CAI, MoE, UBCM, MCRD[18]

c) Coordinate workshop series with local governments, in agricultural regions, to increase knowledge of the sector's mitigation and adaptation issues (See Strategy 2.4.1, action b)[19]

Priority level	2-3
Timeline	September 2011 – September 2012
Lead	MAL, BCAC
Possible partners	CAI, MoE, UBCM

Strategy 1.3.2 Increase sector representation in relevant local government planning activities[20]

Actions:

a) Coordinate with BC agricultural organizations to facilitate industry representation in local planning activities

Priority level	2
Timeline	January 2011 – January 2012
Lead	BCAC
Possible partners	Industry associations, MAL

b) Provide educational materials (on adaptation issues) to support sector participation in local planning activities

Priority level	2
Timeline	January 2011 – January 2012
Lead	BCAC
Possible partners	Industry associations, MAL

[17] Work is currently underway to link Climate Action Initiative materials to the web-based Climate Action Toolkit for local governments in BC.
[18] UBCM = Union of BC Municipalities, MCRD = Ministry of Community & Rural Development
[19] Workshops could be linked to UBCM Conference and to Planning Institute of BC Annual Conference
[20] Relevant planning activities are those that impact agricultural lands or resources relevant to agricultural production. Official community plans, regional growth strategies and watershed or water management planning are all examples of planning that impacts agricultural adaptation.

Indicators of Success:

- Integration of agricultural adaptation issues into government processes, planning and decision-making
- Increased participation of the agriculture sector in local government processes/planning

Goal 1.4

Integrate consideration of climate change adaptation into the decision-making of agricultural organizations and operations

Strategy 1.4.1 Develop knowledge and resources to support informed decisions at the agricultural organization and farm level

Actions:

a) Conduct a (region-by-region) climate change risk/opportunity assessment for agriculture in BC (See Strategy 1.1.1, Action (a) for details).

b) Facilitate development of commodity-based climate change adaptation plans (See Strategy 1.1.1, Action (b) for details).

c) Integrate climate change adaptation into government programming for agricultural producers, particularly programs intended to protect producers from risk (Business Risk Management)

Priority level	2
Timeline	September 2011 onward
Lead	MAL
Possible partners	AAFC, BCAC

Strategy 1.4.2 Identify and communicate models/best practices for farm-based climate change adaptation

Actions:

a) Conduct a scan of adaptive practices from within BC and other jurisdictions and make recommendations for further research[21]

Priority level	1
Timeline	August 2010 to May 2011
Lead	CAI
Possible partners	MAL, MoE, PICS, IAF

[21] This Action item is compatible with Strategy 1.1.1 (Actions a) and could be completed in conjunction with this study. Results should be integrated into Strategy 1.2 1, Action a.

b) Where adaptations appear to have promise (but are not widely implemented) conduct small scale regional testing/demonstration or prioritize for further BC-based research

Priority level	2
Timeline	January 2012 onward
Lead	MAL, industry associations
Possible partners	Various

Indicators of Success

- Participation of producers and commodity groups in regional assessment and development of adaptation plans
- Integration of climate change adaptation issues into decision-making at sector organization and individual farm levels
- Incorporation of adaptation into government programming for producers
- Improved availability of information regarding farm level adaptation options

Part II: Climate Change Mitigation

Toward a low carbon sector

Agriculture and greenhouse gas emissions

Overall, BC agriculture is a relatively small contributor to greenhouse gas emissions. According to the *British Columbia Greenhouse Gas Inventory Report 2007*, 3.5% of BC's greenhouse gas emissions were attributed to agriculture.[viii] Most individual agricultural operations in BC have low and diffuse emissions and they are unlikely to be regulated through proposed (Western Climate Initiative) emission thresholds.

The sources of greenhouse gas emissions attributed to agriculture within the inventory include: enteric fermentation (ruminant digestion), manure management, agricultural soils (soil disturbance and fertilizers) and cleared range / deforestation. Food processing, energy consumption on farms and transportation associated with food production are currently incorporated into other portions of the inventory.

While the inventory provides a ballpark measure of agriculture emissions, it relies on standard estimates associated with agricultural emission sources. This means that, in most cases, regional differences or operational specifics, such as management practices, are not incorporated. This is, in part, due to the complexities described below.

There are three greenhouse gases relevant to agricultural activities: carbon dioxide (CO_2), methane (CH_4) and nitrous oxide (N_2O). The agriculture sector contributes a relatively high proportion of methane and nitrous oxide. Methane has approximately 23 times the greenhouse gas impact of carbon dioxide and is released primarily through livestock digestion and manure. Nitrous oxide has about 310 times the greenhouse effect of carbon dioxide and its main agricultural sources are soil disturbance and fertilizer application. Carbon dioxide itself is primarily released through the burning of fossil fuels for energy and the operation of farm equipment.

Agriculture's role in climate change mitigation

Measuring the specific emissions associated with agriculture is complex because of the range of agricultural practices and the variables of the soil, climate and land cover for each farm. Nonetheless, there are clear opportunities for emission reductions in agriculture — many are also associated with long-term cost savings. When agricultural producers adjust farm practices and/or technologies to reduce their greenhouse gas (GHG) emissions or to sequester (store) carbon in soils or vegetation, they are engaging in greenhouse gas mitigation.

In a global context, agriculture is thought to have significant potential for mitigating climate change in three key areas: through reduction of emissions associated with farm practices (including management practices and fossil fuel use), through enhancement of "removals" (by storing carbon) and through displacement of emissions in broader society through production of clean energy.[ix22]

Opportunities, challenges & co-benefits

Despite its relatively small carbon footprint, there are multiple benefits to maximizing efforts to reduce the BC agriculture sector's GHG emissions. Government emission reduction targets are increasing pressure across the economy to reduce emissions.[23] Proactive reductions will help to ensure that agriculture remains beneath (future) regulatory thresholds and may support participation in market niches for low carbon and green products. For portions of the industry, reducing emissions may help to retain or establish competitive advantage, in particular in jurisdictions considering carbon labels.

Emission reductions may also result in co-benefits including revenue diversification, improved efficiencies and cost savings. Among these apparent benefits are opportunities associated with energy efficiency and clean energy production. Experience with agricultural energy efficiency initiatives in other jurisdictions shows that there is potential for improvement and cost savings this area. Clean agricultural energy production results in new revenue opportunities. Both waste to energy technologies and other renewable sources, such as solar, wind and geothermal, are well suited to the agricultural context.

While the inception of the Pacific Carbon Trust signaled the emergence of a regulated carbon offset market in BC, to date the opportunities for the agriculture sector have been limited. However, there is still the chance that more agricultural emission reduction and removal activities will qualify for offset incentives in the future, as an increasing number of jurisdictions introduce emission caps and regulations.

With the Western Climate Initiative on track for first phase implementation in 2012, the value of agricultural carbon offsets is likely to increase. There are also other incentives and supports available for agricultural producers interested in emission reduction and it is likely that these types of supports will continue to evolve.

[22] More details regarding specific agricultural practices associated with GHG mitigation is available in Fact Sheet #3 (Agriculture & Greenhouse Gas Mitigation). www.bcagclimateaction.ca
[23] http://www.env.gov.bc.ca/epd/climate/reduce-ghg/legislation.htm

Topic #2 Farm management practices & greenhouse gas emissions

Where are we now?

Many of the beneficial management practices already familiar to the BC's agricultural producers also contribute to greenhouse gas mitigation. The strongest existing mechanisms in BC for supporting voluntary agricultural emission reductions are the Environmental Farm Plan Program (EFP) and Beneficial Management Practices Program (BMP).[x] The BMP program includes practices that reduce GHG emissions and is likely to integrate more over time.

Numerous farmers in BC have undertaken incremental GHG reductions and removals through changes to farm management practices. Some of these changes include use of conservation tillage, implementation of nutrient and manure management plans, improved agronomic practices (such as reduction in summer and bare fallow and use of cover crops) and planting/integrated management of riparian areas and shelterbelts.

However, thinking of these practices in relation to GHG mitigation is relatively new. While the linkages between farm practices and emission reduction are known, there is limited BC-based research documenting specific impacts of farm practices on greenhouse gas emission levels.

Where are we going?

Encouraging voluntary emission reductions through education, development of effective programming and technical and financial support are the next steps toward supporting low carbon agriculture in BC. Ensuring that the EFP/BMP programs are maximizing their benefit with respect to emission reduction is a cost effective and efficient option. Programs that support agricultural emission reductions also have potential (through data collection) to improve knowledge of agricultural sources and sinks and to contribute to more accurate inventories at the provincial and local government levels.

In the context of legislated targets and growing consumer awareness, it is also increasingly crucial that the agriculture sector be able to account for its emission reductions. Without measurement – the industry loses a significant opportunity to take credit for its actions (and to improve access to financial incentives).

Coordinating and prioritizing research on agricultural sources and sinks will enable focused use of (the limited) resources in this area. It is currently very challenging for agricultural producers to assess their emissions and identify options for reductions. There are also insufficient resources available to guide local and regional governments in understanding and assessing agricultural emissions and mitigation potential. For this reason, the actions below focus on improving availability of educational resources, tools and technical support.

Table 3: Summary of Farm Management Practices & GHG Emissions Goals, Strategies & Actions

Part II. MITIGATION Toward a low carbon sector	Topic 2. Farm management practices & greenhouse gas mitigation	
Goals	*Strategies*	*Actions*
Goal 2.1 Strengthen agricultural producer knowledge of linkages between farm practices & GHG mitigation	Strategy 2.1.1 Provide producers with information/technical resources regarding farm practices and GHG mitigation	• Integrate available information regarding management practices and GHG emissions into existing technical resources for industry • Develop commodity-specific "GHG mitigation and management practices" fact sheets
Goal 2.2 Improve the state of knowledge regarding agricultural GHG "sources and sinks" in BC	Strategy 2.2.1 Identify gaps in current knowledge and prioritize research needs	• Form an agriculture GHG mitigation technical committee
	Strategy 2.2.2 Communicate key industry research needs to the research community & potential partners	• Facilitate improved availability of research priorities to all interested parties • Foster partnerships with other jurisdictions to identify opportunities for collaborative R&D activity
	Strategy 2.2.4 Explore viability of implementation of carbon footprint assessments for farm businesses	• Conduct scan of carbon footprint assessments and provide recommendations regarding viable approaches • Conduct pilot project for carbon footprint assessment(s) • Develop template for carbon footprint assessments

Part II. MITIGATION **Toward a low carbon sector**	Topic 2. Farm management practices & greenhouse gas mitigation	
Goals	*Strategies*	*Actions*
Goal 2.3 Increase availability of technical and financial support for implementation of GHG mitigation practices on farms	Strategy 2.3.1 Maximize benefits associated with GHG emission reductions occurring through BMPs	• Form an agriculture GHG mitigation technical committee • Develop (basic) mechanisms for tracking & reporting sector emission reductions occurring through BMPs • Facilitate linkage between BMPs and other incentives
	Strategy 2.3.2 Increase agriculture sector participation in carbon offset markets	• Facilitate partnerships with agencies and businesses purchasing carbon offsets • Seek to clarify eligible agriculture project areas and establish protocols for agriculture offsets (with the PCT) • Identify and implement mechanisms to support small and medium sized offset projects
	Strategy 2.3.3 Identify options for remuneration for agricultural EG&S	• Conduct scan of EG&S programs • Explore opportunities for partnerships in developing agricultural EG&S programming in BC
Goal 2.4 Increase local government and community access to information regarding agriculture and GHG mitigation	Strategy 2.4.1 Provide educational materials for local governments to increase knowledge of agriculture and GHG mitigation	• Conduct outreach to local governments to share existing educational resources • Initiate workshop series with local governments to increase knowledge of sector's mitigation/adaptation issues • Share good news stories re: sector climate change mitigation activities through existing mechanisms

Goal 2.1

Strengthen agricultural producer knowledge of linkages between farm practices and greenhouse gas mitigation

Strategy 2.1.1 Provide producers with informational/technical resources regarding farm practices and GHG mitigation

Actions:

a) Integrate available information regarding management practices and GHG emissions into existing technical resources for industry including:
   a. EFP Manuals
   b. Grower Guides
   c. Grower Short Course, technical workshops/conferences
   d. Extension services offered to producers

Priority level	1
Timeline	On-going
Lead	MAL
Possible partners	CAI

b) Develop commodity-specific "GHG mitigation and management practices" fact sheets

Priority level	2-3
Timeline	January 2011 to January 2012
Lead	CAI, MAL
Possible partners	IAF

Indicators of Success:

- Increased availability of information on farm practices and GHG mitigation
- Higher level of producer awareness of farm practices and GHG emissions
- Increased implementation of practices associated with GHG mitigation

Goal 2.2

Improve the state of knowledge regarding agricultural GHG "sources and sinks" in BC

Strategy 2.2.1 Identify gaps in current knowledge and prioritize research needs

Actions:

a) Form an agriculture GHG mitigation technical committee (including MAL, AAFC, industry) with two primary functions:
    a. To develop a strategic research priority list to guide government and industry investment in this area (including annual review of priorities)
    b. To provide technical support for integration of GHG information into existing programs (BMPs) and resources

Priority level	1
Timeline	September 2010 onwards
Lead	MAL, CAI
Possible partners	AAFC, BCAC, industry associations

Strategy 2.2.2 Communicate key industry GHG mitigation research needs to the research community and potential partners

Actions:

a) Facilitate improved availability of research priorities to all interested parties

Priority level	2
Timeline	January 2011 onwards
Lead	MAL, CAI
Possible partners	AAFC, BCAC, industry associations

b) Foster partnerships with other jurisdictions to identify opportunities for collaborative research

Priority level	2
Timelines	January 2011 onward
Lead	MAL, CAI
Possible partners	AAFC, MoE, industry associations, relevant academic/research partners

Strategy 2.2.3 Integrate BC-specific data into Holos[24]

Actions:

a) Develop partnerships to support identification of: key data needs, process for inclusion of data and resourcing options for expanding Holos

[24] Holos is a greenhouse gas emissions calculator developed by Agriculture & Agri-Food Canada researchers. It is whole-farm modelling software intended to assist agricultural producers to estimate GHG emissions based on data entered for their farm. It enables testing of various scenarios to identify possible ways of reducing emissions. To be applicable for BC industry, inclusion of BC-specific data is required.

Priority level	2
Timeline	On-going
Lead	TBD
Possible partners	MAL, CAI, AAFC, industry associations

b) Where possible, gather BC-specific data and integrate into Holos

Priority level	2
Timeline	Spring 2011 onward
Lead	TBD
Possible partners	MAL, CAI, AAFC, industry associations

Strategy 2.2.4 Explore the viability of conducting carbon footprint assessments for BC farm businesses

Actions:

a) Conduct scan of existing approaches to carbon footprint assessments and provide recommendations regarding viable approaches[25]

Priority level	1
Timeline	July 2010 to October 2010
Lead	CAI
Possible partners	MAL, IAF

b) Conduct pilot project carbon footprint assessment(s) with specific commodities

Priority level	2
Timeline	November 2010 to April 2011
Lead	CAI
Possible partners	Industry associations, MAL, IAF

c) Develop template for carbon footprint assessments for BC agriculture

Priority level	TBD (based on outcome of Action b)
Timeline	May/June 2011
Lead	CAI
Possible partners	Industry associations, MAL, IAF

[25] This study will include an evaluation of potential market impacts/opportunities and existing and emerging voluntary or mandatory carbon labeling schemes.

Indicators of Success:

- Improved understanding of BC agricultural mitigation research priorities
- Effective targeting of R&D resources for climate change mitigation (through improved communication of priorities and cross-jurisdictional partnerships)
- Availability of BC-specific tools to assist agricultural producers with assessing/reducing emissions

Goal 2.3

Increase availability of technical and financial support for implementation of GHG mitigation practices on BC farms

Strategy 2.3.1 Maximize the benefits associated with greenhouse gas emission reductions occurring through implementation of BMPs

Actions:

a) Form an agriculture GHG mitigation technical committee (See Strategy 2.2.1, Action a)

b) Develop basic mechanisms for tracking & reporting sector emission reductions occurring through implementation of BMPs

Priority level	1
Timeline	On-going
Lead	MAL
Possible partners	ARDCorp, CAI

c) Facilitate linkage between BMPs and other incentives[26]

Priority level	1
Timeline	Spring 2011 to Spring 2012
Lead	MAL, ARDCorp
Possible partners	CAI

Strategy 2.3.2 Increase agriculture sector participation in carbon offset markets

Actions:

a) Facilitate partnerships with agencies and businesses purchasing carbon offsets (particularly the Pacific Carbon Trust)

[26] For example, some projects may be eligible for federal funding programs or for rebate/incentive programs offered by utility companies. Note: If alternate incentives are available, projects may not qualify for GHG offset incentives (in the BC regulated system). To qualify as an emission offset, projects must prove financial, technical or other obstacles that are only overcome by receipt of the offset incentive.

Priority level	1
Timeline	Ongoing
Lead	ARDCorp
Possible partners	PCT, CAI, MAL, MoE

b) Seek to clarify eligible agriculture project areas and establish protocols for agriculture offsets (with the PCT)

Priority level	2
Timeline	TBD
Lead	ARDCorp, PCT
Possible partners	CAI, MAL, MoE

c) Identify and implement mechanisms (such as administrative streamlining and/or aggregation) to support small and medium sized agriculture offset projects

Priority level	2
Timeline	TBD
Lead	ARDCorp, PCT
Possible partners	MAL, CAI

Strategy 2.3.3 Identify options for remuneration for agricultural ecological goods and services (EG&S) [27]

Actions:

a) Conduct scan of existing EG&S programs and develop recommendations for BC

Priority level	2
Timeline	January 2011 to May 2011
Lead	MAL, CAI
Possible partners	BCAC, MoE, AAFC

b) Explore opportunities for partnerships in developing agricultural EG&S programming in BC

Priority level	2
Timeline	June 2011 to December 2011
Lead	CAI, BCAC, MAL
Possible partners	BCAC, industry associations, MoE

[27] Particularly those not well-suited to a BMP or carbon offset model including: Pasture and range management, riparian management, restoration of native vegetation, cover cropping, weed and invasive species management and other practices associated with carbon sequestration.

Indicators of Success

- Increased uptake of GHG mitigation BMPs
- Implementation of a measurement system for BMP emission reductions
- Increased number and type of agricultural projects qualifying for (PCT) offset incentives
- Availability of analysis of agricultural EG&S models
- Development of partnerships to explore EG&S options for BC

Goal 2.4

Increase local government and community access to information regarding agriculture and GHG mitigation[28]

Strategy 2.4.1 Provide educational materials for local governments to increase knowledge of agriculture and GHG mitigation[29]

Actions:

a) Conduct outreach to local governments to share existing educational resources[30] (Also see Strategy 1.3.1 , Action b)

Priority level	2
Timeline	On-going
Lead	MAL, BCAC
Possible partners	CAI, CAS, UBCM

b) Initiate workshop series with local governments to increase knowledge of the sector's mitigation and adaptation issues[31] (See Strategy 1.3.1, Action c)

Priority level	2-3
Timeline	September 2011 – September 2012
Lead	MAL, BCAC
Possible partners	CAI, CAS, MoE, UBCM

c) Share good news stories regarding sector climate change mitigation through existing mechanisms such as UBCM, Climate Action Secretariat outreach and the BC Climate Action Toolkit

Priority level	1
Timeline	September 2010 onward

[28] Actions under this Goal could be combined with actions under (Goal 1.3).
[29] This is particularly important as local governments begin to fulfill their commitments within the Climate Action Charter.
[30] Work is currently underway to link Climate Action Initiative materials to the web-based Climate Action Toolkit for local governments in BC.
[31] Workshops could be linked to UBCM Conference and to Planning Institute of BC Annual Conference

Lead	MAL, BCAC
Possible partners	CAI, CAS, MoE

Strategy 2.4.2 Increase sector representation in local government Climate Action Charter activities

Actions:

a) Coordinate sector participation in community Climate Action Charter activities by:
   a. Communicating the importance of sector representation to local governments and requesting notification of relevant processes
   b. Alerting sector organizations regarding local planning/inventories
   c. Supporting sector organizations with educational materials

Priority level	1-2
Timeline	September 2010 to September 2011
Lead	BCAC, MAL
Possible partners	CAI, CAS, MCRD

Indicators of success

- Improved local government and community understanding of challenges and opportunities associated with agricultural GHG mitigation
- Increased participation of producers, agricultural associations and/or advisory committees in local inventories and emission reduction planning/strategies

Topic #3: Farm energy & fuel efficiency

Where are we now?

With relatively small margins and limited capacity to withstand higher input costs, many agricultural operations are vulnerable to cost pressures associated with fossil fuels. This occurs both through direct fuel consumption and through the use of derivative products, such as fertilizers. This vulnerability became particularly apparent in 2008, when gas prices rose rapidly and has also been exacerbated by the carbon tax.

Agricultural operations have diverse sources of fuel (including diesel fuel, motor gas and natural gas) and the sector consumes a relatively small amount of electricity. Because many individual agricultural operations fall below the thresholds for utility Demand Side Management programs, there are likely untapped opportunities for energy efficiency and GHG emission reductions at these sites. Due to the lack of specific, targeted support for energy efficiency on farms, there is no comprehensive information regarding agricultural energy/fuel use (benchmarking) and efficiency opportunities in BC.

Where are we going?

Energy efficiency is an issue that delivers generally accepted benefits and numerous partners have an interest in this area. This facilitates a positive point of contact with project partners and agricultural operators to explore broader issues such as energy production and emission reduction.

A number of jurisdictions have initiated energy efficiency pilot projects or programs that include on-farm assessments.[32] These programs have frequently identified energy efficiency opportunities. Modeling on the approaches taken in other jurisdictions, a partnership has been created between industry, government and the utility companies (BC Hydro and Terasen Gas) to deliver a BC Farm Energy Assessment Pilot Project.

The pilot project will be completed by autumn of 2010 and will provide a framework for benchmarking as well as improved clarity about efficiency opportunities and appropriate resources and incentives to encourage implementation. It is anticipated that next steps will include broader delivery of farm energy assessments in BC as well as identification of mechanisms to support implementation of efficiency practices and technologies on farms of all types and sizes.

Food processors in the province already have an energy efficiency manager in place to support assessments of electricity consumption and efficiency. However, the program focuses on large users and there may be benefits in the production of additional educational materials, particularly for small and medium sized food processors.

[32] Among the jurisdictions reviewed: Maryland, Ontario, Alberta, Saskatchewan, PEI and Massachusetts.

Table 4: Summary of Farm Energy & Fuel Efficiency Goals, Strategies & Actions

Part II. MITIGATION Toward a low carbon economy	Topic 3. Farm energy & fuel efficiency	
Goals	*Strategies*	*Actions*
Goal 3.1 Increase available information about energy/fuel use on BC farms	Strategy 3.1.1 Gather baseline energy and fuel consumption data for the sector and identify key efficiency opportunities	• Develop assessment tool and conduct BC Farm Energy Assessment Pilot Project • Collect baseline data through energy assessments • Conduct energy assessment pilot project for medium/small farms and small scale processors
Goal 3.2 Maximize implementation of energy/fuel efficiency practices and technologies on BC farms	Strategy 3.2.1 Provide energy assessment tools for the BC agriculture sector	• Highlight key energy efficiency opportunities through educational resources for the agriculture sector • Deliver farm energy assessments for BC producers • Enable energy efficiency "self assessments" through development of manuals for small-scale producers and processors
	Strategy 3.2.2 Generate tools & resources for implementation of efficiency practices and technologies on BC farms	• Integrate priority energy efficiency practices and technologies into BMP Program • Facilitate increased availability of incentives for implementation of efficiency measures/technologies
	Strategy 3.2.3 Measure progress against benchmarks and integrate new technologies and opportunities	• Conduct follow-up survey/site visits with producers who have undertaken energy assessments to determine level of implementation • Collect data on implementation of energy efficiency improvements by measuring uptake of incentives

Goal 3.1

Increase available information about energy/fuel use on BC farms

Strategy 3.1.1 Gather baseline energy and fuel consumption data for the sector and identify key efficiency opportunities

Actions:

a) Develop assessment tool and conduct BC Farm Energy Assessment Pilot Project

Priority level	1
Timeline	March to October 2010
Lead	CAI
Possible partners	MAL, ARDCorp, Terasen Gas Inc., BC Hydro, MEMPR, industry associations, IAF

b) Collect baseline/benchmark data through farm energy assessments[33]

Priority level	2
Timeline	From implementation of assessments onward
Lead	ARDCorp, MAL
Possible partners	BC Hydro, Terasen Gas

c) Conduct energy assessment pilot project for medium/small farms and small scale processors[34]

Priority level	3
Timeline	September 2011 to February 2012
Lead	CAI
Possible partners	Various

Indicators of Success:

- Identification of key energy efficiency (and associated cost savings and GHG emission reduction) opportunities
- Identification of areas of need and gaps in current programming and incentives
- Development of an energy assessment tool applicable across the sector

[33] The sample included in the pilot project is too small for full benchmarking. However, if (following the pilot) assessments made broadly available, it will be possible to develop benchmarks and track progress.
[34] This pilot would result in different data and tools/resources from the first pilot project. Rather than a focus on delivery of farm assessments, this project would support development of manuals to enable small and medium sized producers/processors to assess their own efficiency opportunities.

Goal 3.2
Maximize implementation of energy/fuel efficiency practices and technologies on BC farms

Strategy 3.2.1 Provide energy assessment tools for the BC agriculture sector

Actions

a) Highlight key energy efficiency opportunities through educational resources for the agriculture sector[35]

Priority level	2
Timeline	October 2010 to March 2011
Lead	CAI
Possible partners	MAL, ARDCorp, Terasen Gas, BC Hydro, MEMPR

b) Deliver farm energy assessments for BC agriculture producers

Priority level	1
Timeline	Spring 2011 onwards
Lead	ARDCorp, MAL
Possible partners	Terasen Gas, BC Hydro, industry associations

c) Enable energy efficiency "self assessments" through development of manuals for (small/medium sized) producers and processors

Priority level	3
Timeline	January 2012 to June 2012
Lead	CAI
Possible partners	MAL, ARDCorp, Terasen Gas Inc., BC Hydro, MEMPR

Strategy 3.2.2 Generate tools & resources for implementation of efficiency practices and technologies on BC farms

Actions:

a) Integrate priority energy efficiency practices/technologies into Beneficial Management Practices Program[36]

[35] Resources could include an initial fact sheet following completion of the pilot project as well as "success stories" to serve as demonstration of practices and technologies as uptake occurs. In some cases, there may also be benefit in on-farm demonstration.
[36] It is understood that there are many priorities for the limited funding available for BMPs. The extent to which energy efficiency practices are incorporated will depend on priorities and available funds.

Priority level	2
Timeline	Spring 2011
Lead	MAL, ARDCorp
Possible partners	CAI

b) Facilitate increased availability of incentives for implementation of efficiency measures/technologies

Priority level	1
Timeline	October 2011 onward
Lead	CAI, ARDCorp
Possible partners	Various

Strategy 3.2.3 Measure progress against benchmarks and integrate new technologies and opportunities

Actions:

a) Conduct follow-up survey/site visits with producers who have undertaken energy assessments to determine level of implementation

Priority level	3
Timeline	September-November 2011
Lead	CAI
Possible partners	MAL, ARDCorp, Terasen Gas, BC Hydro, MEMPR, industry associations

b) Collect data on implementation of energy efficiency improvements by measuring uptake of available incentives

Priority level	2
Timeline	August 2010 onwards
Lead	CAI
Possible partners	ARDCorp, MAL, Terasen Gas, BC Hydro

Indicators of Success:

- Availability of farm energy assessments to BC farmers
- Participation from agricultural producers in farm energy assessments
- Increased availability of incentives for agricultural energy efficiency improvements
- Implementation of efficiency options identified through assessments

Topic #4: Clean agricultural energy production

Where are we now?

While increased energy efficiency will assist the agriculture sector to reduce fossil fuel consumption, another possibility is alternative sources of energy and fuel. These sources would ideally be reliable, renewable and cost-effective. Particularly when margins are slim, agricultural producers will not choose risky or costly solutions. However, many agricultural operations have the advantage of being able to supply at least some portion of their own energy or fuel needs. While this requires up-front investment, the long-term benefits may be considerable.

To date, much of the clean agricultural energy production activity in BC has been focused on anaerobic digestion (AD). Several digesters are either under construction or in the conceptual stages. A feasibility study, educational tours and workshops have been implemented. In addition, a joint industry/government committee has been established to facilitate AD projects in BC. MAL has worked with various agencies to improve transparency and streamline relevant regulatory processes. AD technology is a logical starting point because it is well suited to the BC context, has multiple co-benefits, and has been proven in other jurisdictions.

These efforts are already expanding to include other technologies and are likely to continue to grow. Through its Innovative Clean Energy fund, the BC government has contributed to several agricultural energy demonstration projects.[37] The Agricultural Research and Development Corporation has partnered with the BC Bioenergy Network to develop the Renewable Agri-Energy Initiative which is intended advance business opportunities and overcome barriers to energy production on BC farms.

Both BC Hydro and Terasen Gas have increasing interest in working with agricultural energy projects. In 2008, Terasen Gas issues a Request for Expressions of Interest for biogas production and agricultural producers were amongst the participants.

Despite efforts to date, there are currently few examples clean agricultural energy production in BC. This is largely attributable to BC's relatively low cost of energy (particularly electricity) which is does not support the level of investment required for production of agricultural energy.[38] Jurisdictions that have successfully developed agricultural energy have provided start-up grants and feed-in-tariffs.[39]

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[37] A complete listing of approved projects is available at: http://www.tted.gov.bc.ca/ICEFund/ApprovedProjects/Pages/default.aspx

[38] This includes rates offered through BC Hydro's Standing Offer Program which have been insufficient to effectively enable renewable agricultural energy.

[39] Feed-in tariffs support the development of renewable energy technologies through provision of a prescribed (favorable) price per kilowatt hour of energy generated. Feed-in tariffs are higher than existing market prices and are usually guaranteed over a period of time (often 20 years) to provide assurance to investors.

Where are we going?

Energy/fuel production could be a natural extension of many agricultural operations which possess feedstock in byproducts and crops. In addition, agricultural operations often possess the land base to facilitate small scale wind, solar or geo-exchange systems that are compatible with agricultural production. In some cases there are revenue diversification opportunities and in others, producers could acquire independence from fossil fuels and medium to long term cost savings.

Regional and/or commodity specific approaches would likely benefit agricultural energy production. By conceptualizing clean energy production as a regional issue, there is the potential to partner with other industries in proximity to agricultural operations. Alternately, collaboration with neighboring farms might enable shared infrastructure or capital costs.

Another consideration is whether there may be short and long term approaches to improving energy alternatives for agriculture. For example, relying on pine beetle wood to fuel biomass boilers may be a viable short-term solution for some businesses but long term strategies (for biomass or alternate technologies) will also be necessary.

For agricultural producers to begin investing in energy and fuel self-sufficiency, a number of shifts are required. While external factors will influence the rate of change, producers must necessarily begin to perceive their resources and businesses differently. Likewise, it is necessary for local governments and communities to increase their understanding of agriculture and expand their perception of sustainable agricultural activities. These shifts in thinking will facilitate the development of economic opportunities, stabilize agricultural incomes and support more diversified rural economies.

In order to increase clean energy production on BC farms, the Plan identifies two parallel and complementary courses of action. The strategies and actions within Goal 4.1 are intended to support development of “farm scale” energy and fuel production. This is energy and fuel intended primarily for farm use.

The strategies and actions within Goal 4.2 are intended to support the development of commercial agricultural clean energy and fuel production. The scale of commercial energy production will vary but would be sufficient to enable the marketing and sale of an energy or fuel and to provide a new potential revenue source for the producer.

Table 5: Summary of Clean Agricultural Energy Production Goals, Strategies & Actions

Part II. MITIGATION Toward a low carbon economy	Topic 4. Clean agricultural energy production	
Goals	*Strategies*	*Actions*
Goal 4.1 Support assessment and development of farm-scale energy and fuel production opportunities across BC	Strategy 4.1.1 Build knowledge of farm-scale energy and fuel production options in BC	• Conduct cost-benefit analyses of clean energy technologies for farm-scale production including, where possible, case studies of existing projects • Facilitate pilot demonstration projects that enable data collection and technology transfer
	Strategy 4.1.2 Build capacity of agricultural producers to assess and develop their energy production potential	• Develop and/or disseminate educational resources for farm energy production (See Strategy 4.2.1, Action c) • Facilitate regional "agricultural energy" working groups with broad cross-section of participants • Identify/strengthen cost-share, offset, granting and lending opportunities for farm scale clean energy and fuel production
Goal 4.2 Increase commercial clean agricultural energy production in BC	Strategy 4.2.1 Support development of commercial agricultural energy opportunities through improved knowledge and capacity	• Form technology-specific working groups for technologies with commercial promise • Conduct feasibility studies to evaluate commercial viability of technologies • Develop/disseminate educational resources for commercial energy production options (See Strategy 4.1.2, Action a)

Part II. MITIGATION Toward a low carbon economy	Topic 4. Clean agricultural energy production	
Goals	*Strategies*	*Actions*
	Strategy 4.2.2 Remove barriers for commercial clean energy production as an ancillary agricultural activity	• Increase understanding/knowledge of agricultural energy opportunities with regulating provincial and municipal agencies and streamline regulatory processes • Facilitate development of a supportive feed-in-tariff structure for clean energy technologies in BC • Conduct survey of BC consumers to determine level of interest in paying premium for clean agricultural energy • Develop and disseminate educational resources regarding agricultural energy for local and regional governments
	Strategy 4.2.3 Support farm energy business development & management	• Provide services to assist and support emerging farm energy businesses • Facilitate expansion of financial opportunities/business models available to producers developing energy businesses
	Strategy 4.2.4 Identify and address research gaps for agricultural bioenergy/ biofuel production in BC	• Conduct feasibility study for BC agricultural bioenergy/biofuel opportunities that evaluates regional infrastructure requirements and competitive advantages • Conduct assessment of BC agricultural bioenergy/biofuel feedstock options

Goal 4.1
Support assessment and development of farm-scale clean energy and fuel production opportunities across BC

Strategy 4.1.1 Build knowledge of farm-scale energy and fuel production options in BC

Actions:

a) Conduct cost-benefit analyses of clean energy technologies for farm-scale production including, where possible, case studies of existing projects

Priority level	1
Timeline	September 2010 to September 2011
Lead	CAI
Possible partners	MAL, ARDCorp, MEMPR

b) Facilitate pilot demonstration projects that enable data collection and technology transfer[40]

Priority level	2
Timeline	Ongoing
Lead	ARDCorp
Possible partners	CAI, various funders, industry associations

Strategy 4.1.2 Build capacity of agricultural producers to assess and develop their energy production potential

Actions:

a) Develop and/or disseminate educational resources for farm energy production options including workshops, tours and webinars (See Strategy 4.2.1, Action c)

Priority level	2
Timeline	On-going
Lead	ARDCorp, MAL, CAI
Possible partners	MEMPR

b) Facilitate regional "agricultural energy" working groups including broad cross-section of participants (forestry, local industry etc)[41]

[40] In some cases there are projects already underway that can serve as demonstration and technology transfer opportunities. An additional benefit of demonstration is that it builds awareness and confidence, both with agricultural producers and with potential project partners and financers.
[41] These working groups may also serve to generate partnerships and identify opportunities for commercial scale agricultural energy production.

Priority level	2
Timeline	January 2012 onward
Lead	ARDCorp
Possible partners	CAI, MAL, EMPR, local governments

c) Identify/strengthen cost-share, offset, granting and lending opportunities for farm scale clean energy and fuel production

Priority level	2
Timeline	January 2011 onward
Lead	ARDCorp
Possible partners	CAI, BCAC, Various

Indicators of Success:

- Increased availability of BC-specific information and demonstration for farm-scale clean energy production
- Increased number of farm-scale energy production projects in BC
- Development of partnerships for the purpose of clean agricultural energy production

Goal 4.2
Increase (commercial scale) clean agricultural energy production in BC

Strategy 4.2.1 Support development of commercial agricultural energy opportunities through improved knowledge and industry capacity

Actions:

a) Form technology-specific working groups for technologies with commercial promise

Priority level	2
Timeline	On-going
Lead	ARDCorp
Partners	MAL, industry associations, relevant agencies

b) Conduct feasibility studies to evaluate commercial viability of technologies

Priority level	2
Timeline	On-going
Lead	ARDCorp, MAL, IAF
Possible partners	Industry associations, various funders

c) Develop and/or disseminate educational resources, including workshops, tours, conferences and webinars, for commercial energy production options (See Strategy 4.1.2, Action a)

Priority level	2
Timeline	On-going
Lead	ARDCorp, MAL, CAI
Possible partners	MEMPR

Strategy 4.2.2 Remove barriers for commercial agricultural energy production as an ancillary agricultural activity

Actions:

a) Increase understanding/knowledge of agricultural energy opportunities with regulating provincial and municipal agencies and streamline regulatory processes

Priority level	2
Timeline	On-going
Lead	MAL
Possible partners	BCAC, MoE, ALC

b) Facilitate development of a supportive feed-in-tariff structure for clean energy technologies in BC

Priority level	1
Timeline	On-going
Lead	BCAC
Possible partners	BC Hydro, ARDCorp, MAL

c) Conduct survey of BC consumers to determine level of interest/commitment in paying a premium for clean agricultural energy

Priority level	1
Timeline	September 2010
Lead	ARDCorp
Possible Partners	Terasen Gas, BC Hydro, MEMPR

d) Develop and disseminate educational resources regarding clean agricultural energy for local and regional governments

Priority level	2
Timeline	On-going

Lead	ARDCorp, MAL
Possible partners	CAS, UBCM

Strategy 4.2.3 Support agricultural clean energy business development & management

Action:

a) Provide services to assist and support emerging farm energy businesses

Priority level	1
Timeline	TBD
Lead	ARDCorp
Possible partners	BC Bioenergy Network

b) Facilitate expansion of financial opportunities/business models available to producers developing energy businesses

Priority level	1
Timeline	TBD
Lead	ARDCorp
Possible partners	BC Bioenergy Network

Strategy 4.2.4 Identify and address research gaps for agricultural bioenergy/biofuels production in BC

Actions:

a) Conduct a feasibility study of BC agricultural bioenergy/biofuel opportunities that evaluates regional infrastructure requirements & competitive advantages

Priority	2-3
Timeline	TBD
Lead	MAL, industry associations
Possible partners	ARDCorp

b) Conduct assessment of BC agricultural bioenergy/biofuel feedstock options

Priority	TBD (by outcome of above)
Timeline	TBD
Lead	MAL, industry associations
Possible partners	ARDCorp

Indicators of Success:

- Increased availability of BC-specific information and demonstration for commercial-scale agricultural clean energy production
- Increased number of commercial-scale energy production projects in BC
- Development of partnerships for the purpose of clean agricultural energy production

Appendix A

Climate Action Initiative Advisory Committee

Sector representation

- Poultry & eggs
- Grains, oilseed & forage
- Aboriginal agriculture
- Horticulture
- Cattle
- Dairy
- Small Scale Food Processors Association
- BC Food Processors Association

Ex-officios and government representatives

- Agriculture & Agri-food Canada
- BC Ministry of Agriculture & Lands
- BC Climate Action Secretariat
- BC Ministry of Environment
- Investment Agriculture Foundation of BC

Appendix B

Key Climate Action Initiative Deliverables to Date

Building Capacity & Outreach

Developing practical and accessible informational resources for producers/processors is an important element of Initiative activities and has included the following:

Website: www.bcagclimateaction.ca
The website will serve as an information hub for agricultural producers seeking resources on a broad range of climate change topics. The site will continue to grow and evolve as more information is developed and can be shared with industry.

Funding Catalogue
The Funding Catalogue provides a quick reference point on grants and loans available to assist producers/processors with implementing projects related to climate action.

Fact Sheet Series
Eight fact sheets have been completed to date and two more are under development. Topics range from carbon offsets to renewable energy technologies. Fact sheets include background information, associated challenges and opportunities and resources.

Direct outreach to industry
The Initiative Coordinator has spoken with industry groups around the province on a range of topics, including the Growers Short Course, various AGMs and a panel discussion at a Canadian Federation of Agriculture meeting.

Contributing to the Policy Dialogue

Amongst the stated purposes of the Initiative is its support role assisting industry to respond to, and participate in, climate change policy dialogue.

The Initiative has undertaken research and analysis that has supported the agriculture sector as it has participated in the following consultations:

- BC's Greenhouse Gas Emission Offset Regulations (August 2008)
- Greenhouse Gas Reporting Regulations (for operations that will be required to report within cap and trade) (November 2008)
- Canada's Offset System (August 2009)
- Western Climate Initiative White Paper on offsets (August 2009)
- Cabinet Committee on Climate Action and Clean Energy (background for industry submission made April 2010)

Facilitating partnerships

A key aspect of Initiative activity is building networks and relationships across relevant agencies/organizations. The background research and analysis conducted by the Initiative is helpful in identifying where fruitful partnerships might evolve and where there may be mutual benefits.

In some cases, working relationships will transition from CAI to ARDCorp as business opportunities or program development opportunities arise. To date, the Initiative has maintained contact or built relationships with the following groups:

- Ministry of Agriculture & Lands
- Ministry of Environment & Climate Action Secretariat
- Ministry of Energy Mines and Petroleum Resources
- Pacific Institute for Climate Solutions
- Abbotsford Soil Conservation Association (Holos GHG Calculator)
- Terasen Gas
- BC Hydro
- Pacific Carbon Trust

On-farm energy efficiency assessment pilot project

The Initiative (along with MAL) has successfully secured partnerships with Terasen Gas and BC Hydro (as well as the Agriculture Research and Education Corporation and the Ministry of Energy Mines & Petroleum Resources) to launch a BC on-farm energy efficiency assessment pilot project. Through the project, 25 farms from across the province will participate in high level energy assessments including all fuel types. The assessments will identify opportunities for increasing energy efficiency on BC farms. The assessments will take place between May and July of 2010.

Endnotes

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