

Technical Paper

Proposed Performance Management Framework

Ministry of Agriculture
Climate Change Adaptation Program



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Disclaimer

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Cover photographs (clockwise from top left):

Precipitation in the Fraser Valley, grasshopper damage in the Peace Region, Fraser River flood risk, rangeland in the Cariboo Region. Source: B.C. Ministry of Agriculture.

Executive Summary

Climate Adaptation Program

The BC agriculture sector is an important contributor to the economy, with \$2.9 billion in farm cash receipts in 2014. The sector is highly diverse, due to BC's varied topography and climate conditions. The agricultural land base is small, comprising about five percent of the province.

Climate change projections indicate that over the coming decades the B.C. agricultural sector will have to deal with significantly changing conditions. B.C. producers will face increased management complexity, business costs, and uncertainty due to impacts such as drought, excess moisture, flood risk, and pests and diseases. There will also be an increase in growing days and opportunities for new crops. Successful adaptation will be required for the industry to manage the risks, take advantage of the opportunities, and maintain growth and profitability.

The B.C. Ministry of Agriculture is working in partnership with the industry to build the sector's adaptive capacity and resilience. Through Growing Forward 2, a federal-provincial-territorial initiative, approximately \$5.7 million in funding has been allocated over 2013-2018 to the climate adaptation program.

- The program is industry-led and is delivered by the B.C. Agriculture and Food Climate Action Initiative (CAI). (See www.bcagclimateaction.ca for more information).
- The program supports the development and implementation of multi-partner regional adaptation strategies in key agricultural areas of the province, and the piloting and demonstration of adaptation practices on B.C. farms and ranches.
- The program's projects provide collaborative solutions to regional issues, farm-level toolkits and manuals, producer decision support tools, and opportunities for knowledge transfer and raising the profile of agriculture adaptation across the sector.

Figure ES.1 and Table ES.2, below, show how the program's outputs build the first stage of adaptation ("soft adaptation") and create the circumstances for the second stage (hard adaptation) in which priority strategies and actions are implemented and adaptive practices adopted by producers, local governments, and others.

Performance Management Framework

With the significant investment in adaptation programming, it is important for the Ministry of Agriculture, the B.C. Agriculture Council, producers, and other partners/stakeholders to be able to assess whether the program's goals are being achieved over the longer term.

The performance management framework (PMF) proposed here builds on the program's existing performance measurement strategy for 2013-2018 (appended to this report). The PMF goes further, by defining criteria for longer-term success (beyond 2018), metrics for measuring that success, and developing a monitoring and evaluation (M&E) system for program evaluation.

The M&E system involves identifying key performance indicators, gathering baseline measurements, and then tracking progress over time. Table ES.2, below, shows examples of key

performance indicators that could be used for the baseline survey, program outputs and program outcomes.

Special design attention must be paid to the long-time frames and unique complexity, uncertainty, and variability inherent in climate change adaptation and resilience, and to the fact that they are the result of complex changes that cannot be measured directly.

Appropriate resourcing and capacity will be required to implement the PMF and manage the M&E system – to develop M&E plans and schedules; prepare, test and administer surveys; collect and analyze data, prepare and present report, and periodically update the M&E system. A common practice is to allocate 5 to 10 percent of total program cost. For a program similar to the current one, this would correspond to a budget of approximately \$250,000 to \$500,000 and one full-time staff position over five years.

Recommendations

1: Evaluate financial capacity of sector to invest in adaptation

- Financial viability of farms and the economic resources available to them is one of the most important drivers of farm-level adaptation, and therefore of sector resilience.

2: Cost and benefit analysis of agricultural climate change adaptation

- An economic analysis of the costs and benefits would help demonstrate the societal benefits of investing in of agricultural climate change adaptation in BC.

3: Define criteria for measuring program success

- The Program goal is to increase resilience in the sector. Indications of success would include the presence of the proven adaptive technologies and the climate-resilient infrastructure in the sector.
- A key question is: What is the optimal level of the presence of the technologies and innovations that credibly represent significant progress towards the Program goal?

4: Establish capacities for M&E

- Investments in M&E should be regarded as an essential investment in Program success. In that regard, it is recommended that the resources be mobilized and the capacities for M&E be put in place as soon as it is feasible to do so.

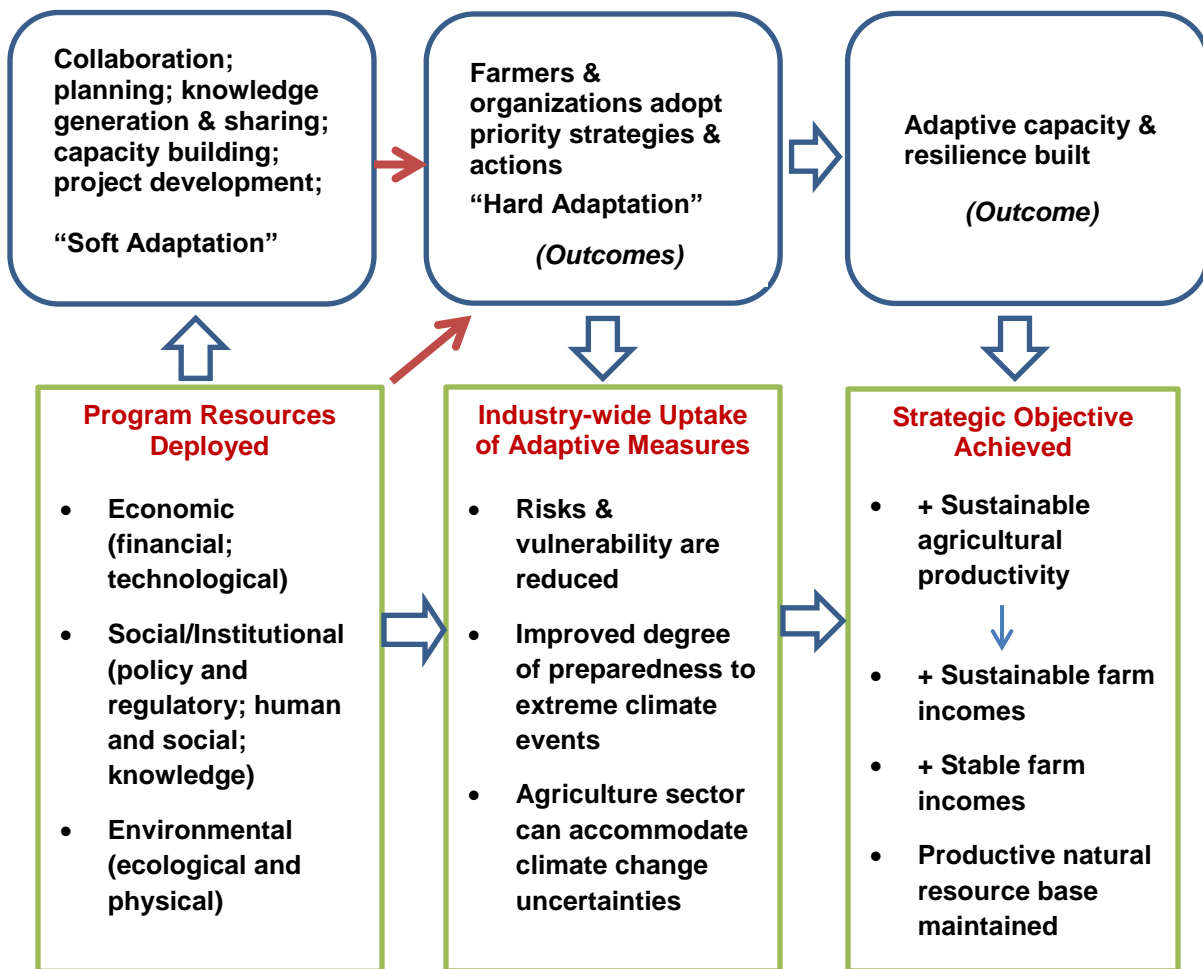
5: Program planning review committee

- It is recommended that the Ministry of Agriculture and partners establish a committee to review the program planning and implementation process and make recommendations for ensuring the continuity and sustainability of the Program's benefits and impact, and for the improvement of future adaptation programs.

Attachments to Executive Summary

- Figure ES.1 Pathway To Adaptive Capacity and Resilience
- Table ES.1 Climate Adaptation Program Logic Model
- Table ES.2 Key Performance Indicators for Baseline Survey, Outputs, and Outcomes

Figure ES.1 Pathway To Adaptive Capacity and Resilience



- Program outputs such as collaboration, knowledge and information, resources and tools build the first stage of adaptation (“soft adaptation”) and create the circumstances for the second stage (hard adaptation) in which priority strategies and actions are implemented and adaptive practices adopted by producers, local governments, and others.
- Large-scale adoption would reduce risks and vulnerability and improve preparedness for extreme events, enabling the sector to better accommodate climate change uncertainties.
- These outcomes are expected to lead to sustained and enhanced agricultural productivity and to the overall viability of the agriculture sector (i.e. the program’s strategic objective).

Table ES.1 Climate Adaptation Program Logic Model

The logic model shows the relationships among the resources that are invested, the activities that take place, and the impacts and changes that result.

Outputs	Immediate Outcomes <i>change in knowledge</i> <i>6-18 months</i>	Intermediate Outcomes <i>change in behaviour & practices; 2-3 years</i>	End Outcomes <i>high level change in state 5-10 years</i>
Regional Adaptation Strategy Outputs RAS reports Workshops Workshop materials Advisory Committee meetings	Local governments and producers have knowledge of climate change stressors projected to impact their areas and of priority strategies and actions to facilitate agricultural adaptation Local governments and producers are engaged and committed to RAS process	Local government and industry participation in implementation of strategies External (non-partner) participation in strategy implementation Expanded knowledge and awareness of agricultural climate change adaptation across B.C.	Agricultural climate change projects are adopted by other organizations allowing projects to continue in some form beyond the life of the performance evaluation Other jurisdictions are referencing, building on, or using project materials (<i>measured qualitatively</i>)
Regional Adaptation Project Outputs Completed projects Project deliverables	Projects are implemented collaboratively to build capacity and knowledge of adaptation of regional partners	Public/widespread information transfer Pilots/demonstrations Individualized information transfer and planning to producers Small to medium group information transfer to producers	Projects have enhanced adaptive capacity in the region (<i>measured qualitatively</i>) Projects are adopted by other organizations, allowing projects to continue in some form beyond the life of the performance evaluation Other jurisdictions are referencing, building on, or using project materials (<i>measured qualitatively</i>)
Farm Adaptation Innovator Program Project Outputs Projects Information summaries, updates, fact sheets	Producers are aware of adaptation practices being tested Industry partners are investing in adaptation	Producers have knowledge and resources for specific actions to facilitate agricultural adaptation	Increased adaptive capacity (<i>measured qualitatively</i>)

Source: B.C. Ministry of Agriculture. 2014. Performance Measurement Strategy 2013-2018

Table ES.2 Example Performance Indicators for Baseline Survey, Outputs and Outcomes

Baseline Survey	Outputs Evaluation	Outcomes Evaluation
<ol style="list-style-type: none"> 1. Percentage (number) of farmers with knowledge of climate change risk to agriculture in their region 2. Percentage (number) of farmers with knowledge of priority adaptive strategies and actions 3. Percentage (number) of farmers with knowledge of decision-making tools and resources 4. Percentage (number) of farmers with budgetary allocations to implement priority strategies and actions 5. Percentage (number) of farmers seeking to access Program products to plan adaptation efforts 6. Percentage (number) of farmers seeking technical assistance to implement priority strategies and actions 7. Percentage (number) of farmers convinced of the risks of climate change to agriculture 8. Percentage (number) of farmers regarding adaptation to climate change as his/her personal responsibility 9. Percentage (numbers) of farmers and industry partners implementing any kind of adaptation technology 10. Percentage (number) of farmers and industry stakeholders with built climate change resilient infrastructure (e.g. water storage, irrigation, drainage systems) 	<ol style="list-style-type: none"> 1. Number of farm-level toolkits and manuals developed, piloted and demonstrated 2. Farm-level toolkits and manuals rolled out to farmers 3. Number of producer decision-support tools developed 4. Number of producer decision-support tools rolled out to farmers 5. Number of climate change education and outreach projects conducted 6. Number of climate change knowledge and information sharing networks established 7. Number of Farm Adaptation Innovator projects developed, tested and piloted 8. Number of Farm Adaptation Innovator projects rolled out to farmers 9. Number of industry partners reached by the Program 10. Number of farmers reached by the Program 11. Number of information factsheets and other printed materials developed and distributed 12. Number of workshops conducted 	<ol style="list-style-type: none"> 1. Percentage (number) of farmers accessing Agriculture Weather Monitoring & Decision Support Tool 2. Percentage (number) of farmers accessing Collaborative Pest Monitoring Tool 3. Percentage (number) of farmers using Farm Water Planning toolkit in adaptation planning 4. Number of industry stakeholders and local gov'ts with wildfire preparedness plans 5. Percentage (number) of farmers with wildfire preparedness plans 6. Number of industry stakeholders and local governments with proposals to upgrade agricultural dams 7. Percentage (number) of farmers participating in the maintenance of agricultural dams 8. Percentage (number) of farmers adopting Integrated Farm Water Planning toolkit 9. Percentage (number) of farmers adopting Wildfire Preparedness & Mitigation Planning & Resources 10. Percentage (number) of farmers participating in the Cooperative Maintenance & Enhancement of Agricultural Dams 11. Percentage (number) of farmers using Management Intensive Grazing for adapting to climate change 12. Number of drought alert systems installed 13. Number of drainage and irrigation systems built 14. Number of industry partners leading implementation of regional adaptation projects 15. Percentage (number) of farmers adopting priority strategies and actions in each agricultural region

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Acronyms

BC	British Columbia
CAI	BC Agriculture & Food Climate Change Action Initiative
CAT	Climate Action Team
CCAP	Climate Change Adaptation Program
FAO	Food and Agriculture Organization of the United Nations
PMF	Performance Management Framework
PMS	Performance Management Strategy
M&E	Monitoring and Evaluation
OECD	Organization for Economic Cooperation and Development
RAS	Regional Adaptation Strategies
RAP	Regional Adaptation Projects
FAIPP	Farm Adaptation Innovator Program Projects

Glossary

Adaptation: Adjustment in natural or human systems in response to actual or expected climatic stimuli or their effects, which moderates harm or exploits beneficial opportunities.

Adaptive capacity: The ability of a system or a sector to adjust to climate change (including climate variability and extremes) to moderate potential damages, to take advantage of opportunities, or to cope with the consequences.

Adaptive management: A process of iterative learning about a system or program to generate knowledge that can be used to gain the best short-term outcomes, as well as improve management outcomes in the future.

Anticipatory adaptation: Adaptation that takes place before impacts of climate change are observed.

Autonomous adaptations: Adjustments individuals make in response to climate change in the absence of government incentives or action. For example, an agricultural producer may choose to upgrade his or her irrigation infrastructure to improve the farm's productivity, or pilot a new variety of crop which they judge to be better suited to the changing regional climate.

Baseline information: Information usually consisting of facts and figures collected at the initial stages of a program or project and that provides a basis for measuring progress in achieving program or project outputs, outcomes and impacts.

Baseline survey: An analysis describing the situation in a program or project area. It includes data on individual stakeholders prior to a development intervention. Progress (results and accomplishments) can be assessed and comparisons made against the baseline survey. It also serves as an important reference for the completion evaluation.

Capacity: The ability of individuals and organizations to perform functions effectively, efficiently and in a sustainable manner.

Climate variability: Variations in the mean state and other statistics (such as standard deviations, or statistics of extremes) of the climate on all temporal and spatial scales beyond that of individual weather events.

Climate change: A change of climate that is attributed directly or indirectly to human activity that alters the composition of the global atmosphere and that is in addition to natural climate variability observed over comparable time periods.

Evaluation: Evaluation is an assessment of a planned, ongoing, or completed intervention to determine its relevance, efficiency, effectiveness, impact and sustainability.

Goal: The higher-order program or sector objective to which a development intervention, such as a project, is intended to contribute. Thus it is a statement of intent.

Hard adaptation: Refers to adaptation measures that can be more readily quantified, e.g. water storage facilities built, irrigation systems installed, drainage and dike systems constructed.

Indicator: Quantitative or qualitative factor or variable that provides a simple and reliable basis for assessing achievement, change or performance. A unit of information measures over time that can help show changes in a specific condition. A given goal or objective can have multiple indicators.

Impact: To have a strong, negative and direct impact on a person or system.

Logical framework: An analytical, presentational and management tool that involves problem analysis, stakeholder analysis, developing a hierarchy of objectives and selecting a preferred implementation strategy.

Monitoring and evaluation (M&E): The combination of monitoring and evaluation which together provide the knowledge required for: a) effective project management and b) reporting and accountability responsibilities.

Monitoring: Monitoring is a continuous process of collecting and analyzing information to compare how well a project, or program or policy is being implemented against expected results.

Monitoring & evaluation system: An M&E system is a management information system (MIS) that provides data to management regarding the operation and effects of the project.

Output: The amount of something produced or generated by a person, system or program in a given period of time.

Outcome: A final product or the desired end result arising from some action or intervention.

Planned adaptations: Adaptive actions taken by government to provide public goods or incentives to motivate action by the private sector. Governments may choose to participate in planned adaptation because certain adaptation actions have benefits that cannot be captured by private individuals, resulting in under-investment. Some examples would include development of new irrigation infrastructure, land-use arrangements and property rights, water pricing and training for the private and public sector (capacity building).

Qualitative: Something that is not summarized in numerical form, such as minutes from community meetings and general notes from observations. Qualitative data normally describe people's knowledge, attitudes or behaviours.

Quantitative: Something measured or measurable by, or concerned with, quantity and expressed in numbers or quantities.

Resilience: The capacity of a system to cope with change, and to withstand stresses and catastrophe.

Risk: The likelihood of an event occurring combined with the severity of expected impacts.

Stakeholders: An agency, organization, group or individual with a direct or indirect interest in the program, or who is affected positively or negatively by the implementation and outcome of the program.

Soft adaptation: Refers to adaptation measures that are more qualitative in nature, such as institutions and communication networks established, collaborative action fostered, and planning and development processes.

Mainstreaming: The process of integrating climate risks and adaptation issues into traditional sectoral development and investment practices.

Vulnerability: The degree to which a system is susceptible to and unable to cope with the adverse effects of climate change, including climate variability and extremes. Vulnerability is a function of the character, magnitude, and rate of climate change and variation to which a system is exposed, its sensitivity, and its adaptive capacity.

1.0 Introduction

1.1 Agriculture Climate Change Adaptation Program

Background

The BC agriculture sector is an important contributor to the economy, with \$2.9 billion in farm cash receipts in 2014 (Ministry of Agriculture, 2015). Due to the province's varied topography and climate conditions, the sector is highly diverse, with grain, oilseeds, and forage seeds produced in the Peace Region, cattle and ranches in the southern and central interior, tree fruits and grapes in the Okanagan Valley, and a range of farm types in the Lower Mainland and Vancouver Island (berries, vegetables, dairy, and poultry) (Climate Action Initiative, 2012). The agricultural land base is proportionately very small, comprising about five percent of BC.

The scope and the scale of projected climate change impacts on BC agriculture are expected to be unprecedented. This will result in increased management complexity, business costs, and uncertainty, due to impacts such as drought, excess moisture, flood risk, and pests and diseases. There will also be an increase in growing days and opportunities for new crops. Successful adaptation will be required for the industry to manage the risks and take advantage of the opportunities.

The B.C. Ministry of Agriculture is working in partnership with the industry to build the sector's adaptive capacity and resilience. Through Growing Forward 2, a federal-provincial-territorial initiative, approximately \$5.7 million in funding has been allocated over 2013-2018 to the climate adaptation program.

- The program is industry-led and is delivered by the B.C. Agriculture and Food Climate Action Initiative (CAI). (See www.bcagclimateaction.ca for more information).
- The program supports the development and implementation of multi-partner regional adaptation strategies in key agricultural areas of the province, and the piloting and demonstration of adaptation practices on B.C. farms and ranches.

The overarching assumption is that adaptation and adaptive capacity will enhance the sector's resilience to climate change. Resilience will enable the sector to maintain long-term productivity and viability amid climate variability. (CAI, 2013 Risk & Opportunity Assessment).

Approach to resilience

The Program approaches resilience through building adaptive capacity in the sector. This is achieved by deploying policy and regulatory resources, financial resources, human and social resources, knowledge resources, and physical resources in the sector. The resources build the capacity and create the enabling and supportive environment in which adaptation and resilience are realized. Section 2 of the paper explains in more detail the concepts of adaptive capacity, adaptation and resilience.

Priority strategies and actions

At the regional scale, priority strategies and actions are developed through participatory and stakeholder-led processes involving agricultural producers, farmers' organizations, provincial government ministries, local governments, and other partners. The priority strategies and actions are detailed in the Regional Adaptation Strategies (RAS).¹ Potential partners, including possible lead organizations are identified for projects addressing each priority action. The potential partners are expected to play a leading and/or supportive role in providing oversight during implementation of the regional strategies and actions (CAI, 2013 Regional Adaptation Strategies series).

The RAS projects address the complex regional adaptation issues that are beyond the capacity of individual farmers, and include research, analyses and pilots/demonstrations that are to generate information, recommendations, adaptation options, resources and tools to facilitate adaptation decision-making, planning and action.

A full listing of the RAS projects is provided in Appendix 6. The projects are broadly categorized as:

- **collaborative solutions to regional issues**, e.g. the project in the Cariboo region dealing with cooperative maintenance and enhancement of agricultural dams, and the Cowichan region project to pilot a drought alert system;
- **farm-level tool kits and manuals**, e.g. Cowichan integrated farm water planning pilot;
- **producer decision support tools**, e.g. agriculture weather monitoring and collaborative pest monitoring projects in the Peace region;
- **knowledge transfer**, e.g. the water storage knowledge transfer resources project in the Cowichan region; and
- **raising the profile of agricultural adaptation**, e.g. agriculture and climate change education and outreach in Delta.

Adaptation at the farm level is supported through the Farm Adaption Innovator Program (FAIP), which focuses on adaptive capacity in physical resources, knowledge resources, and human and social resources. The FAIP generates innovations in farm practices, approaches and technologies that modify farm production practices and build the climate-resilient infrastructures that can accommodate climate change shocks and climate variability. It is intended that if the program outputs are shown to be useful, they will be rolled out more broadly and that farmers will integrate them into farming operations. Appendix 5 lists the FAIP projects.

The implicit assumption in Program documents seems to be that agricultural producers and industry stakeholders in each agricultural region would access and apply the decision-making

¹ Regional Adaptation Strategies have been completed for Cowichan, Delta, the Peace, the Cariboo, the Fraser Valley. A regional strategy for the Okanagan was underway at time of writing. The RAS documents are available at: <http://www.bcagclimateaction.ca>

tools in adaptation matters, and implement the suite of proven adaptive technologies and innovations in sufficiently large numbers to enable the sector to mitigate and adjust to the projected climate change stressors and risks. The level of adoption is expected to be self-sustaining in the long-term, which is well beyond the duration of the current Program.

1.2 Purpose of the Paper

In 2014 the Ministry of Agriculture developed a Performance Measurement Strategy (PMS) for the Program for 2013-2018. The PMS clearly defines the Program goal and reports planned outputs, the expected responses of stakeholders, and timeframes for achieving immediate, intermediate and end outcomes. However, because the PMS concerns only the first five years of the program, it does not define the criteria for longer-term success of the Program success and the metrics for measuring that success. Also, a systematic framework and accompanying monitoring and evaluation (M&E) system to formally evaluate the Program are yet to be developed. Therefore, this paper extends the PMS by developing a performance management framework (PMF) and M&E system to systematically evaluate the Program. The PMF highlights the Program approach to resilience, defines a logical pathway to resilience, proposes the criteria for measuring Program success and the metrics for measuring that success, and develops a set of contextually sensitive performance indicators that are related to the Program goals and deliverables. The expected responses of farmers and industry stakeholders to the products generated by the Program, and their participation in implementing adaptive priority strategies at farm and regional levels are also evaluated.

1.3 Structure of the Paper

The paper is structured as follows:

- Section 2 briefly explains the key concepts of resilience, adaptation and adaptive capacity that are widely used in Program documents, and establishes the conceptual and operational linkages among them;
- Section 3 highlights best practices and guidance instruments in M&E of agriculture climate change adaptation programs;
- Section 4 is an overview of the performance management framework; and
- Section 5 outlines the approach to M&E and how the system might be operationalized.
- Section 6 provides concluding remarks and recommendations.

2.0 Key Concepts

2.1 Introduction

This section explains the key concepts widely used in the Program documents. These include including resilience, adaptation and adaptive capacity. The conceptual and operational nexus among resilience, adaptive capacity and adaptation, as well as the Program's approach to building adaptive capacity and resilience are highlighted.

2.2 Resilience

Resilience is defined and operationalized in a number of different ways. The IPCC (2012) in Brook et al. (2013) defines resilience as “the ability of a system and its component parts to anticipate, absorb, accommodate, or recover from the effects of a hazardous event in a timely and efficient manner.” A system may be made more resilient in a number of ways, including by managing human and environmental components in a manner that maintains the system's status quo (such as managing water resources to better cope with drought) or transforming into a new system when the current system becomes untenable, e.g. eliminating irrigation and agricultural production if drought risk is too extreme (Engle 2011, Walker et al. 2006, and Folke 2006).

In the context of climate change resilience is generally defined as being able to respond to, cope with and recover from climate variations and impacts, i.e., remaining in or returning to the old state or even developing a new state [positive change] in response to climate impacts (Malone 2009 and Ibarrarán et al. 2008). Resilience includes coping strategies, awareness, plans and the capacity to respond (adaptive capacity) and prior adaptation actions to reduce the impacts of climate change. In this context resilience overlaps significantly with adaptation, to the point that it is often used as a synonym for adaptation.

Resilience: an operational approach

Four broad approaches to operationalizing resilience are used in the literature: (1) vulnerability approach (2) adaptive capacity approach (3) formal capitals approach and (4) components and determinants of resilience approach. The BC Agriculture Climate Change Program uses the adaptive capacity approach to build resilience to climate change. In that approach resilience is understood as the presence of, and the deployment of, set of resources and capacities (Béné et al. 2012 in Lisa et al. 2015).

Swanson et al. (2009) observed that some commentators use the terms “resilience” and “adaptive capacity” interchangeably, while others implicitly equate resilience with adaptive capacity. Elasha et al. (2005) also seem to suggest that assessing adaptive capacity is the equivalent of assessing [community] resilience. Berkes and Jolly (2001) in Ellis (2014) collected data and measured communities' adaptive capacity even though socio-ecological resilience was

their primary focus. Malone (2009) proposed that the similarity between resilience and adaptive capacity might allow the measurements used in adaptive capacity approaches to be used in measuring resilience. The previous examples suggest that resilience is considered to be akin to adaptive capacity. The two terms are often utilized in conjunction with each other. Building adaptive capacity builds resilience, i.e. the outcome of adaptive capacity is resilience to climate change. Appendices 1-3 show a generic set of output and/or outcome resilience indicators that are commonly associated with agricultural climate change adaptation.

2.3 Adaptive Capacity

Adaptive capacity is generally described as the presence of necessary resources and the capacity of people to mobilize those resources to build resilience over the short, medium and long terms. The key features of adaptive capacity as applied to agriculture include the ability of the industry to: (1) take deliberate and planned adaptation decisions and actions in anticipation of climate change events, when climate change events are about to happen, and when climate change events have occurred (2) avoid or minimize potential damages of climate change (3) cope with the consequences of damages when they occur, and (4) take advantage of the opportunities presented by climate change (FAO, 2013).

Wall & Marzall (2004), in a study conducted in Ontario to assess adaptive capacity in rural communities for meeting climate and weather risks, posited that adaptive capacity depends on social, human, institutional, natural and economic resources. Swanson et al. (2009) list economic resources, technology, information and skills, infrastructure, institutions, and equity as determinants of adaptive capacity. The CAI (2012) listed five interrelated types of resources or categories of adaptive capacity: (1) Financial Resources (2) Physical Resources (3) Human and Social Resources (4) Knowledge Resources, and (5) Policy and Regulatory Resources. For convenience, the adaptive resources are partitioned into social and institutional resources, economic resources, and environmental resources as depicted in Table 2.1.

Table 2.2 highlights the relationship between the categories of adaptive resources and resilience to climate change. It posits that greater economic resources increase adaptive capacity, while the lack of financial resources limits adaptation options. Likewise, policies and regulations may constrain or enhance adaptive capacity. Economic policies and resources influence technological developments, capacity building, and social, institutional and physical infrastructures. In that regard, financial viability may be considered as a base requirement for agricultural systems to adapt to climate change, and policies and regulations as that which frames the capacity of agricultural producers and stakeholders to build resilience in the sector.

The discussion above is intuitive: building resilience in the agriculture sector requires a supportive and enabling policy and regulatory framework, adequate financial resources, and built capacity of agricultural producers.

Table 2.1: Resources of Adaptive Capacity in Agriculture

Resource	Sub-Component	Indicator Group
Economic	<ol style="list-style-type: none"> 1. Financial 2. Technological 	<ul style="list-style-type: none"> • Markets, processing • Farm income • Insurance & risk management • Access to financial resources • Technological resources
Social & Institutional	<ol style="list-style-type: none"> 1. Policy & Regulatory Resources 2. Human & Social Resources 3. Knowledge Resources 	<ul style="list-style-type: none"> • Government programs & services • Regulatory mechanisms & governance structure • Networks associations & resource sharing • Farm operators & labour • Community & interface • Research development & technology • Access to information & extension • Knowledge, experience, perceptions, education & skills
Environment	<ol style="list-style-type: none"> 1. Ecological 2. Physical Resources 	<ul style="list-style-type: none"> • On farm infrastructure • Off farm & regional infrastructure • Land, water & ecology

Source: Modified from Miller et al. (2013); CAI (2012); and Wall & Marzall (2004)

Table 2.2: Nexus: Adaptive Resources and Adaptive Capacity

Resource	Rationale
Economic Resources	<ul style="list-style-type: none"> • Greater economic resources increase adaptive capacity • Lack of financial resources limits adaptation options • Both availability of and entitlement to resources are important • Greater financial assets mean greater ability to recover from material loss • Diverse employment opportunities provide more options if climate affects particular type of occupation
Environmental	<ul style="list-style-type: none"> • Lack of technology limits range of potential adaptation options • Less technologically advanced regions are less likely to develop and/or implement technological adaptations • Greater variety of infrastructure can enhance adaptive capacity, since it provides more options • Characteristics and location of infrastructure (e.g. irrigation, drainage and dike, and water storage systems) also affect adaptive capacity • The quality and type of infrastructure affects severity of climate change impact
Social & Institutional	<ul style="list-style-type: none"> • Lack of informed, skilled and trained personnel reduces adaptive capacity • Response to climate impacts is enhanced with residents who have strong skills and ingenuity • Greater access to information increases likelihood of timely and appropriate adaptation • Well-developed social institutions help to reduce impacts of climate related risks and therefore increase adaptive capacity • Policies and regulations may constrain or enhance adaptive capacity

Source: Adapted from Dolan, et al. (2001) and Wall & Marzall (2004)

2.4 Adaptation

In the literature, resilience is often used as a synonym for adaptation and for vulnerability and risk reduction. According to FAO/OECD (2012), “Resilience can be described as the capacity of systems, communities, households or individuals to prevent, mitigate or cope with risk, and recover from shocks.” Greater resilience can be achieved by reducing vulnerabilities and increasing adaptive capacity. This can be achieved by reducing exposure, reducing sensitivity and increasing adaptive capacity.

Adaptation can be directed to reduce the potential risks, or to benefit from opportunities associated with climate change. Adaptation in the context of agriculture refers to the capacity of agricultural production systems to withstand the stresses imposed by climate change, and to maintain or surpass levels of productivity.

The goal of adaptation is to build the adaptive capacity that enhances resilience of the agriculture sector to climate change.

The suite of adaptation strategies in agriculture ranges from:

- Routine farm management measures and practices (e.g. changing timing of operations, adoption of conservation tillage practices and diversification in production systems);
- Specific farm measures and practices that mitigate climate change risks (e.g. water management and water storage, drainage and flood protection systems, wildfire risk reduction, and pest and disease monitoring and management);
- Technological innovations (e.g. crop development, early warning systems, land and water use options, engineering solutions, diversification of production, intensification of production);
- Investment of funds by public agencies in order to develop or improve irrigation schemes;
- Modification of farm support programs; and
- Development of new plant varieties.

Some of the climate change literature categorizes adaptation as either “**soft adaptation**” or “**hard adaptation**”. Soft adaptation refers to those aspects of climate change adaptation and resilience that are not easily quantified, such as planning processes, knowledge and skills development, and the building of institutions and networks. Hard adaptation, on the other hand, refers to those aspects of climate change adaptation and resilience that are more easily quantified, such as the numbers of irrigation systems built, dams constructed, hectares of land terraced, or farms establishing adequate drainage systems. Soft adaptation (regarded as the precursor to hard adaptation) generates the knowledge and information that enables stakeholders to make decisions about hard adaptation and creates the capabilities among them to implement the adaptive strategies and actions that correspond to hard adaptation. Soft adaptation builds the foundation for hard adaptation.

The main distinction between soft adaptation and hard adaptation seem to be that whereas the former is more concerned with the development of knowledge and information, planning, capacity building, preparation and delivery of adaptation resources (the process of adaptive capacity) that enable stakeholders to adapt to climate change, the latter emphasizes the physical and concrete on-farm, community and regional implementation of adaptive measures and practices that directly counteract climate change impacts and thus strengthen resilience (outcome of adaptive capacity). However, it should be noted that in some contexts, soft adaptation may also refer to institutional changes such as the provision of public flood warning and risk information, and the organization of local emergency groups that use the information. These are regarded as adaptive measures, but may not involve physical infrastructure.

2.5 Conclusion: Adaptive Capacity and Resilience

The literature concerned with agriculture adaptation to climate change suggests that the terms resilience, adaptive capacity and adaptation, are for the most part synonymous with the ability of the agriculture sector to adapt to climate change, i.e. reduce climate related risks, withstand and rebound from climate change impacts, and remain viable. However, while the outcomes are the same, there appear to be subtle differences in the usage. Adaptation and adaptive capacity seem to involve both processes and outcomes, while resilience seems to be more of an outcome with adaptation and adaptive capacity as the process of building resilience. Governments (or affiliated organizations) are usually the primary agents in building adaptive capacity, while primary agents in adaptation can be governments (planned adaptation) or farmers (autonomous adaptation). In spite of the apparent differences, resilience, adaptive capacity and adaptation are in principle conceptually and operationally similar, with considerable overlap among them. **Therefore, we assume here that programs directed to building adaptive capacity will build resilience to climate change.**

2.6 BC Agriculture: Resilience, Adaptive Capacity and Adaptation

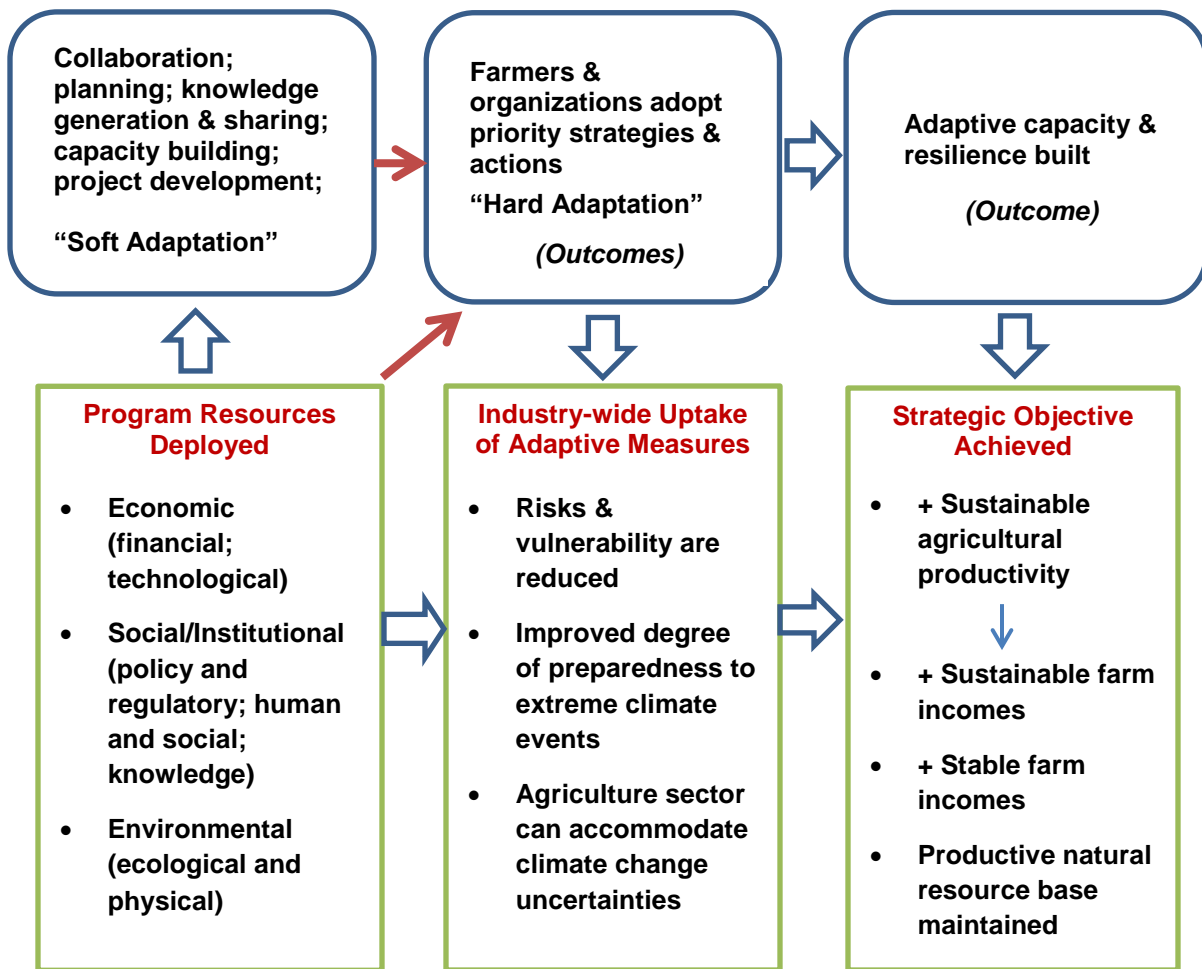
The B.C. Ministry of Agriculture's Climate Change Adaptation Program took the adaptive capacity approach to building resilience to climate change. The Program avers that adaptation will enhance the sector's resilience and capacity to remain viable in the face of climate variability. Adaptive resources to increase the resilience of the industry have been deployed, albeit at an initial level (see Table 2.1) to reduce the climate related risks in agricultural regions of B.C., improve the preparedness for extreme climate events and help the sector to better accommodate climate change uncertainties. These outcomes are in turn expected to enhance agricultural productivity and the competitiveness and viability of agriculture in a changing climate.

Figure 2.1 depicts the pathway to resilience that is implicit in the Program documents. Program outputs include: stakeholder collaboration fostered; climate change knowledge and information generated and shared; resources and tools developed; and projects and strategies

developed, piloted and tested. These outputs, which better correspond to the concept of soft adaptation, build what might be regarded as the first stage of adaptive capacity, and create the environment for launching the second stage (hard adaptation), i.e. the implementation of the priority strategies and actions.

The intent is that the priority strategies and actions would diffuse through the agriculture sector as agricultural producers, farmer’s organizations and local governments (in sufficiently large numbers) voluntarily implement them. Large-scale adoption of the priority strategies and actions would reduce risks and vulnerability and improve preparedness for extreme events, enabling the sector to better accommodate climate change uncertainties. These outcomes are expected to lead to sustained and enhanced agricultural productivity and to the overall viability of the agriculture sector (i.e. the Program’s strategic objective).

Figure 2.1: Pathway to Adaptive Capacity and Resilience



Caveat: Adaptation Programs

Moser (2009), in Tompkins et al. (2010), observes that simply because individuals, organizations or regions have the knowledge, capacity and resources to undertake adaptation, does not guarantee action, i.e. that adaptation is happening. Common barriers to adaptation include the public good nature of threatened resources, a failure in collective decision-making, a lack of clarity over who is responsible for action (public or private sector) and other factors (Tompkins et al. 2005 in Tompkins et al. 2010). The message is that it should not be assumed that adaptation is happening; that adaptation is happening must be demonstrated by evidence. A performance management framework can help to generate the evidence that allows judgments to be made about whether or not program outcomes are realized, i.e. adaptation or adaptive capacity is being built. A performance management framework can also help to satisfy the need for accountability and provide opportunities for learning.

3.0 Best Practices and Considerations In M&E

While many organizations and institutions have identified M&E of climate change adaptation programs as a core component of climate risk management and adaptive planning (Preston et al. 2011), the research on how to monitor and evaluate climate change adaptation programs appears to be at an early stage, and consequently there is currently no one way to approach M&E of adaptation interventions (Ford et al. 2013 and GIZ 2013).² However, some best practices and factors that are to be considered in M&E of climate change adaptation programs are emerging. Some of the practices in the literature are highlighted below.

3.1 Considerations for Climate Change Adaptation M&E

Climate change adaptation programs are not regular development programs

Adapting to climate change involves decision-making “with continuing uncertainty about the severity and timing of climate change impacts” (OECD, 2015). The M&E system must take into account the complexity, uncertainty and variability inherent in climate change adaptation and resilience, and be guided accordingly (Dinshaw et al. 2014). Some of the unique characteristics of climate change adaptation are shown below.

1. Long time frames – climate change is a long-term process that can extend beyond the span of usual program management cycles. The real impact of climate change adaptation interventions may not be apparent for decades.

² The USA, Kenya, Morocco, Tunisia, Northern Ireland, Wales, Scotland, Germany, Finland, the Philippines and the United Kingdom are in the process of developing adaptation indicators and M&E frameworks. Some of these countries (Germany, Finland, the Philippines and the United Kingdom) are more advanced in the process than others.

2. Measuring non-events – particular adverse weather may not occur during the program cycle, and “success” may constitute stabilization or preparedness rather than improved adaptive capacity or resilience.
3. Lack of universal indicators – while there are unambiguous indicators for climate change itself (e.g. average global temperature, CO₂ levels), adaptation and resilience must be contextualized to a sector, locale or region. In the context of BC, indicators that correspond to the local conditions must be developed.
4. Some aspects of climate change and resilience (e.g. institutional capacity, behaviour change) are not always measurable, and, for those, qualitative assessments might be more appropriate or feasible.
5. Contribution versus attribution – M&E approaches usually seek to demonstrate that changes can be attributed specifically to a particular intervention. However, the complexity of agricultural climate change adaptation and related interventions (multi-sectoral responses, cross-thematic focus, and long time frames) may require that program implementers simply demonstrate how their program contributes to overall adaptation.
6. The inability to unambiguously define endpoints for agricultural adaptation and resilience given the complex nature and the state of flux in the social, economic and ecological factors concerned with them.
7. Other: measurements may involve a range of stakeholders; M & E is not incorporated into project design; and obtaining data may be expensive, complex, and difficult.

The implication of these caveats is that, given the complex and dynamic and non-linear characteristics of agricultural climate change adaptation and resilience, the traditional approaches to M&E need to be modified. This paper is guided by these considerations.

3.2 Best Practices and Guidance Instruments

3.2.1 Design M&E system at program planning

The M&E framework should be designed when the adaptation plans are being formulated, and operationalized at program commencement. The M&E system can then monitor implementation progress to ensure that the program is implemented properly, that it achieves the desired outcomes, and that learning is provided to improve the design of future programs (FAO, 2013). It is very difficult to reverse engineer M&E into a program after it is designed and implemented.

3.2.2 Analysis of program environment

Climate change adaptation programs do not operate in vacuums, but are affected by factors in the environments in which they are implemented. It is therefore necessary that to the extent possible, a comprehensive analysis of the social, economic, political, legal and educational factors that might affect program implementation should be performed. The analysis will reveal *ex ante* the relevant external factors that must be accommodated in developing and implementing programs.

3.2.3 Fully articulate program philosophy

The programs' scope, philosophy, mission, vision, objectives, goals and timeframes should be fully articulated and stated in the plan. This makes clear the premises under which the program will be operating and what the expectations are at given times.

3.2.4 Combination of output and outcome indicators

Lamhauge et al. (2011) divided climate adaptation interventions into five categories. This report partitions those categories into two broad classes, to frame and organize output and outcome indicators.

1) Adaptive strategies and practices that directly reduce climate risks and build the resilience of the agriculture sector.

- These activities have the most direct impact on agricultural stakeholder's ability to adapt to climate, and include adaptive measures such as water conservation, and flood prevention.
- They correspond to "hard adaptation" and can be tracked and measured by outcome indicators.

2) Interventions that influence the resilience of the agriculture sector.

- These activities correspond to "soft" adaptation and can be tracked and measured by output or process indicators, and include:
 - a) Policy and administrative management for climate change, i.e. activities that ensure climate change risks are mainstreamed into policies and regulations, planning, and negotiations;
 - b) Education and training; planning and project development; knowledge creation and dissemination; i.e. activities focused on changing the behaviour of agricultural stakeholders in accordance projected climate conditions. Such activities do not directly reduce stakeholders vulnerability, but equip them with information that helps them to better understand climate change

issues, prepare for and adapt to current and projected climate change risks and extreme events;

- c) Climate change studies and research, i.e. activities that support risk reduction by supplying information needed to understand where training, policy and risk reduction activities are needed most; and
- d) Coordination, i.e. activities that support dialogue between stakeholders, dissemination of research, and enhancement of relevant communities of practice.

The distinctions above allow M&E to track and measure interventions separately. While output indicators measure the planning and delivery of adaptation, they may be inadequate to measure the achievement of adaptive capacity and progress toward resilience. Outcome indicators are more appropriate for measuring achievement of Program short, medium and long term goals. Indeed, as Harley et al. (2008) observe, there is no guarantee that successful development and implementation of an adaptation policy means effective adaptation is taking place. For example, education and training, knowledge and awareness, and stakeholder collaboration, as necessary and important as they are, have only marginal impact on resilience if agricultural producers and industry stakeholders do not adopt on-farm the adaptive strategies and actions these processes develop and promote.

Lamhauge et al. (2012) and Harley et al. (2008) recommend that the M&E system should use both output and outcome indicators to measure progress towards adaptive capacity and resilience. As climate adaptation is still in the early stages, output indicators are likely to be most important in the short term, with outcome indicators becoming more relevant in the long term. Ford et al. (2013) similarly suggest output indicators may be most important in the short term given that, in some cases, the full extent of the impact of climate change and adaptation interventions may not occur for decades, and data for some outcome indicators may not be available for many years. Dinsha et al. (2014) argue further that, on account of the complexity and the methodological challenges associated with climate change adaptation, it is necessary to combine different qualitative and quantitative methods to monitor and evaluate climate change adaptation.

3.2.5 Recognize the limitations of indicators

The pool of indicators currently in use may not address all the changes that occur as a result of climate change, nor can they fully report on the effectiveness of all climate adaptation measures (Cannel et al. 2003). Measuring climate adaptation through the use of indicators is very complex and there are numerous challenges. However, while indicators are limited in their ability to adequately and accurately reflect all aspects of the complex and dynamic nature of adaptive capacity and resilience, they can nevertheless illustrate the extent to which progress is being made towards adaptive capacity and resilience in the agricultural sector. In that regard, indicators are useful proxies of the real state of adaptation.

3.2.6 Evaluate planning process

Preston et al. (2010) argue that M&E system should evaluate not only program outputs and outcomes but the process of program planning as well. The authors posit that an evaluation of program planning provides lessons that can be used to develop more effective and better implemented adaptation programs. The evaluation might examine the program logical framework or theory of change; meaning and validity of key assumptions; *a priori* assessment of barriers and limiting factors; clarity and definitions of outputs, outcomes and impacts; definition of the criteria for success; metrics for measuring that success; and management of uncertainty, among other things.

4.0 Overview of the Performance Management Framework

The performance management framework (PMF) proposed here is intended to help Program management to systematically evaluate progress toward adaptive capacity and resilience both in the short-term (i.e. during the Growing Forward 2 (GF2) funding period 2013 - 2018) and the longer term (i.e. beyond the GF2 period). The PMF seeks to answer important questions that have implications for the Program, climate change adaptation policy, and the development of future adaptation programs:

- What are the Program successes and failures?
- Has the Program led to successful adaptation?
- What progress is being made in building resilience in the sector?
- What lessons can be learned for future adaptation programs?

The information generated by the PMF's implementation is expected to help Program administrators and stakeholders to make informed judgments about the progress made toward resilience in the sector; factors that enhance or limit progress towards that goal; future resource requirements; and Program management.

The PMF has three purposes:

1. Evaluate the short-term, medium-term and the long-term progress toward adaptive capacity and resilience in the agriculture sector.
 - The goal of the Program is to build resilience to climate change. The PMF, by tracking adaptation outcomes, provides the information to determine if, in practice, resilience is built.³

³ Preston et al. (2010) warn that adaptation planning [programming] must be not simply a worthwhile stop on a long-term process of social and institutional learning but a robust approach to securing short-term reductions in climate change risks. The point is that program implementers must ensure that climate change adaptation programs do not just spawn a cycle of research and capacity building but must also focus efforts on substantive actions that build resilience.

2. Provide opportunities for learning and adaptive management.
 - In the absence of evaluations, opportunities for learning are lost. The evaluations can provide lessons that can be used to develop more effective and better implemented programs, e.g. BC adaptation programming after 2018.
3. Provide accountability for the Ministry of Agriculture, the BC Agriculture Council, and agricultural producers and industry stakeholders.
 - Given the socio-economic, environmental significance of climate change, investments in the Program and the outcomes achieved must be transparent.

The PMF is expected to help the B.C. Ministry of Agriculture and other stakeholders to better understand the response of the agriculture sector to the program interventions and the key factors that are influencing the response, as well as the progress towards adaptive capacity.⁴ The information will enable the Ministry and stakeholders to make informed judgements concerning the ongoing and ultimate success of the climate change adaptation program, and has implications for future policy and program development, and investments in the agriculture sector. The PMF is made operational through the M&E system outlined below in Section 5.

5.0 Monitoring & Evaluation (M&E)

5.1 Approach to M&E

The Results-Based Management (RBM) approach is used to develop the M&E system. Results-Based Management is a management strategy that focuses on performance and achievement of outputs, outcomes and impacts. RBM generally consists of two components: (1) implementation measurements to ensure that program inputs and activities comply with the program budget and work plan, and (2) result measurements examining the achievement of outputs, outcomes and impacts, as well as the strengths and weaknesses of program design (OECD, 2015).

The function of the M&E system is to generate the evidence that adaptive capacity and resilience are increasing in the agriculture sector (see Section 2). This is to help ensure that the Program is well targeted and achieves its strategic objective, *“Agricultural production is sustained and enhanced as the sector proactively adapts to climate change.”* The M&E system may also provide the opportunity for feedback and learning, and help to identify positive synergies between Program efforts towards adaptation and other objectives of the Ministry of Agriculture, for example, agricultural development, climate change mitigation, or economic growth.

⁴ The PMF does not attempt to establish causality between Program interventions and results in the field or to explain why changes have occurred. To do so require specific program design and methodological approaches employed at the planning stage. However, given the Program’s scope, focus and interventions in the targeted population, to some degree its impact can be isolated and associations made between desired outcomes and observed impacts in the sector.

The M&E system outlined provides an approach to systematically evaluate progress towards the immediate, intermediate and end-outcomes. The Program logic model and the deliverables for the Regional Adaptation projects and Farm Adaptation Innovator projects provide the foundation for the proposed M&E system.

5.2 Program Logic Model

The programming logic model shows the logical relationships among the resources that are invested, the activities that take place and the impacts and changes that result. The logic model presents the outputs and immediate, intermediate and end outcomes for each of the three Program areas. According to the logic model, the outputs resulting from Program activities are to lead to changes in knowledge and awareness (immediate outcomes realized in 6-18 months), which in turn lead to changes in behaviour and practice (intermediate outcomes realized in 2-3 years). The change in behaviour and practice lead to high level change in state, i.e. resilience in the sector (end outcomes realized in 5-10 years). (B.C. Ministry of Agriculture. 2014. Performance Measurement Strategy 2013 - 2018).

5.3 External Factors Affecting Program Outcomes

Neither climate change adaptation nor adaptation programs occur in a vacuum. For many adaptation programs, reality is complex and unpredictable, and they are impacted by unaccounted external economic, political and other factors either positively or negatively. This is the experience of the Ministry's adaptation program. While the Program logic model outlines timeframes for short, medium and long term outcomes, discussions with the CAI reveal the on-the-ground realities that are affecting the timeframes by which the targeted short, medium and long term outcomes are likely to be achieved. Issues affecting the rate of Program implementation have emerged that need to be responded to: resource constraints, unclear mandates, and complex political and regulatory issues are affecting the rate of implementation and Program reach. A particular challenge is how to transfer information and knowledge to stakeholders and engage them in climate change adaptation leadership. To date, the Program's direct reach has been limited to about four hundred farmers (2 percent of farmers in BC) who have attended regional adaptation workshops. (Although a much larger number of people have accessed the CAI's materials through social media and the CAI website).

Table 5.1: Program Logic Model

Outputs	Immediate Outcomes <i>change in knowledge</i> <i>6-18 months</i>	Intermediate Outcomes <i>change in behaviour &</i> <i>practices; 2-3 years</i>	End Outcomes <i>high level change in</i> <i>state; 5-10 years</i>
RAS Outputs RAS reports Workshops Workshop materials Advisory Committee meetings	Local governments and producers have knowledge of climate change stressors projected to impact their areas and of priority strategies and actions to facilitate agricultural adaptation Local governments and producers are engaged and committed to RAS process	Local government and industry participation in implementation of strategies External (non-partner) participation in strategy implementation Expanded knowledge and awareness of agricultural climate change adaptation across B.C.	Agricultural climate change projects are adopted by other organizations allowing projects to continue in some form beyond the life of the performance evaluation Other jurisdictions are referencing, building on, or using project materials (<i>measured qualitatively</i>)
RA Projects Outputs Completed projects Project deliverables	Projects are implemented collaboratively to build capacity and knowledge of adaptation of regional partners	Public/widespread information transfer Pilots/demonstrations Individualized information transfer and planning to producers Small to medium group information transfer to producers	Projects have enhanced adaptive capacity in the region (<i>measured qualitatively</i>) Projects are adopted by other organizations allowing projects to continue in some form beyond the life of the performance evaluation Other jurisdictions are referencing, building on, or using project materials (<i>measured qualitatively</i>)
FAIP Project Outputs Projects Information summaries, updates, factsheets	Producers are aware of adaptation practices being tested Industry partners are investing in adaptation	Producers have knowledge and resources for specific actions to facilitate agricultural adaptation	Increased adaptive capacity (<i>measured qualitatively</i>)

Source: B.C. Ministry of Agriculture. 2014. Performance Measurement Strategy 2013-2018

At the current stage of implementation, Program activities are focused on addressing the adaptation issues that concern the farming community and that are beyond the ability of the individual farmer to address, knowledge and information transfer to small groups, and work with leaders in the industry. Since resilience in the sector depends on the actions taken by significant numbers of farmers and stakeholders in the key agricultural regions, resources are

required to develop the mechanisms that will extend the Program to the stakeholders who are expected to utilize its products and implement the suite of targeted adaptive practices. Given that the timing of the evaluations is contingent on Program implementation, the timelines are adjusted to better reflect the realities of the Program environment.

5.4 Planned Program Outputs and Deliverables

Planned Program outputs include the Regional Adaptation Strategies (RAS) workshops, reports, workshop materials, advisory committee meetings; Regional Adaptation (RA) projects and project deliverables completed; and Farm Adaptation Innovator Program (FAIP) projects completed, and related factsheets and information materials produced and distributed.⁵

5.4.1 Regional Adaptation (RA) projects

The RA projects emanating from the Regional Adaptation Strategies address complex regional adaptation issues, and deliver results for the sector in the key areas of: (1) collaborative solutions to regional issues, (2) farm-level tool kits and manuals, (3) producer decision-support tools, and (4) raising the profile of agricultural adaptation. Through these areas the Program aims to:

- Tackle the relevant adaptation concerns, such as water management and supply or management of extreme events (e.g. wildfire, flooding) that require stakeholder collaboration at the regional level .
 - project examples: Cooperative maintenance and enhancement of agricultural dams (Cariboo); Pilot drought alert system (Cowichan)
- Develop practical planning tools and adaptive technologies to assist farmers to plan, evaluate and reduce the risks associated with changing climate and climate variability. The tools and technologies developed are specific to the risks facing the region and individual farms.
 - project examples: Integrated farm water planning pilot (Cowichan); Wildfire preparedness and mitigation planning and resources (Cariboo)
- Generate the usable and accessible information and tools including adaptation options that enable producers to make informed investment and production decisions that increase productivity and throughput, reduce risks, and build on-farm resilience.
 - project examples: Agriculture weather monitoring and decision-support tool (Peace); Collaborative pest monitoring pilot (Peace)
- Build information networks, create knowledge and provide information to enhance the understanding of the public and industry stakeholders in matters concerned with

⁵ See www.bcagclimateaction.ca for details on these programs.

agricultural climate change adaptation. This education is to facilitate initiatives to integrate agricultural adaptation in community and regional decisions.

- project example: Agriculture and climate change education and outreach (Delta).

5.4.2 Farm Adaptation Innovator Program (FAIP) projects

The projects are designed to build adaptive capacity, and focus on the areas of adaptive capacity related to physical resources, knowledge resources, and human and social resources.⁶ The program promotes innovations in farm practices, approaches and technologies that facilitate climate change adaptation, and provides support for projects that demonstrate farm practices and technologies that reduce weather related production risks and/or develop information and knowledge sharing resources and capacity to facilitate adaptation. Funding is considered for projects dealing with soil and crop management, livestock pasture and range management, water management, and whole farm and business management. Appendix 5 lists the FAIP projects.

- project examples: Adapting BC Horticulture through Protected Crop Research and Demonstration; Keyline Water Management: Field Research and Education in the Capital Region; and Innovative Management Practices for Resiliency.

5.5 Other Ministry of Agriculture Programs Contributing to Adaptation

Climate change adaptation programs sometimes operate in the same environment as other interventions that can affect adaptation either positively or negatively. The Beneficial Management Practices (BMP) Program and the Agricultural Water Demand Model (AWDM) are programs implemented by the BC Ministry of Agriculture that can contribute to agricultural adaptation. The BMP Program and AWDM have different goals and operate differently from the Climate Change Adaptation Program. The Program can further be differentiated by its singular emphasis on climate change adaptation and the scope of its operations.

5.5.1 Beneficial Management Practices (BMP) Program

The BMP program provides financial incentives to encourage farmers to adopt agricultural practices that have environmental and sustainability benefits, including those that help them to adopt adaptation practices to mitigate the risks associated with climate change.⁷ Adaptation practices supported by the program include improving water use efficiency; planting crops and crop varieties that are drought resistant; adjusting storm water management for heavier run-off; reintroduction of native grasses for pasturing; use of organic matter, crop cover and shading to retain soil moisture; and other agricultural practices that support adaptation. The BMP Program is linked to the Ministry's Environmental Farm Plan Program.

⁶ The program design is described in the Farm Adaptation Innovator Program program guide, available at: <http://www.bcagclimateaction.ca/farm-level/adaptation-innovator-program>

⁷ For more information see <http://www2.gov.bc.ca/gov/content/industry/agriculture-seafood/programs/growing-forward-2/beneficial-management-practices> and <https://www.bcac.bc.ca/ardcorp/program/environmental-farm-plan-program>

5.5.2 Agriculture Water Demand Model (AWDM)

The AWDM, a water management planning tool, was developed for the Okanagan, an agricultural region in BC. The AWDM is part of the response to the pressures on water resources in the region. Climate change impacts are projected to increase the usage of stored water during the summer months, and also to increase the amount of water required to grow a crop. The AWDM is designed to provide current and future agriculture water demands for the Okanagan Basin. The intent of the model is to help inform decisions to reserve water for agricultural lands. The model calculates water use on a property-by-property basis and sums each property to obtain a total for the entire basin or sub-basins. Crop, irrigation system type, soils and climate data are used to calculate the water demand. The tool can be used for any region for which there is appropriate land use and climate information.⁸

5.6 Overview of M&E System

The M&E focuses on:

- Program progress toward achieving planned outputs
- status of knowledge and awareness of climate change adaptation among agricultural producers and industry partners
- industry partners' participation and leadership in implementing regional adaptation projects
- agricultural producers' use of tools and resources in decision-making on adaptation, and
- sector-wide adoption of the adaptive strategies generated from Program deliverables, i.e. the numbers of farmers and stakeholders implementing the suite of priority strategies and actions.

The M&E system will therefore indicate how Program achievements relate to stated deliverables; farmers' and industry stakeholders' response to the information and products generated; and the spread of the information and products across the industry. In addition, since the information and products are designed to build adaptive capacity and resilience, the M&E system will, over time, give an indication of the progress towards resilience in the sector.

The M&E system uses output (process) and outcome, qualitative and quantitative indicators to track and/or measure the aspects of the program that relate to soft adaptation and hard adaptation.

- **Soft adaptation** indicators relate to knowledge and awareness created, networks built, research and analyses conducted and the information generated, decision-making resources and tools developed, projects developed and tested, and adaptive strategies and actions rolled out to farmers.

⁸ More information on the Agricultural Water Demand Model can be found at:
<http://www2.gov.bc.ca/gov/content/industry/agriculture-seafood/agricultural-land-and-environment/water/water-management/agriculture-water-demand-model>

- **Hard adaptation** indicators relate to the downstream aspect of the Program, e.g. farmers and industry stakeholders use of the farm-level tool kits and manuals, and the producer decision-support tools in decision-making; farmers and industry stakeholders adoption proven priority strategies and actions.

The indicators will show Program implementation progress and the extent to which the outputs produced are leading to the achievement of short, intermediate and long-term goals.

5.6.1 Monitoring

Monitoring is concerned with the systematic collection of data on pre-defined indicators to report the implementation of program activities. Monitoring provides the reliable and consistent information that allows stakeholders to assess how effectively the program inputs are transformed into the desired outputs through the planned activities. In that regard, implementation problems can be identified and practical solutions sought, and implementation plans updated. Program monitoring corresponds to the first component of the Results-Based Management framework – implementation measures to ensure that Program inputs and activities are in compliance with the budget and work plan and that targeted outputs are generated. Descriptive data to assess the status of on-going implementation activities (e.g. types and levels of resources used, financial and other provisions, disbursement of funds, reports and reporting, activities completed, and outputs generated) are collected on an on-going basis all through the implementation of the Program.

Program documents report the activities and outputs generated from Program investments to date. Table 5.2 is a summary of the activities and outputs. Monitoring and reporting of program activities and outputs, including targets for workshops, workshop materials produced, projects completed and project deliverables realized, are expected to continue over the next two years. Information on implementation challenges and successes, disbursement of funds and learning experiences, and the validity of key assumptions should also be included in the monitoring reports.

The Program outputs shown in Table 5.2, below, are designed to help agricultural producers and industry partners to better understand the potential impacts of climate change and climate variability on agriculture, equip them to make informed decisions about adaptation, and assist with implementation of technologies/innovations that reduce on-farm and regional climate change risks.

Table 5.2: Summary of Program Activities & Outputs

Implementation Monitoring	Purpose	Outputs
<p>Activities</p>	<ul style="list-style-type: none"> Assess planned Program activities completed and status of on-going activities 	<ul style="list-style-type: none"> RAS workshops conducted RAS reports produced Workshop materials produced Regional Advisory Committee meetings held
<p>Outputs</p>	<ul style="list-style-type: none"> Assess outputs achieved against planned targets 	<ul style="list-style-type: none"> Collaborations fostered Partnerships built Information networks developed Knowledge transferred Stakeholders reached Regional Adaptation projects <ul style="list-style-type: none"> Collaborative solutions to regional issues Farm-level tool kits & manuals Producer decision-support tools Raising the profile of agricultural adaptation Farm Adaptation Innovator projects developed, piloted and transferred

5.6.2 Evaluation

Evaluation relates to the second component of the RBM framework (results measurements examining the achievement of the desired outcomes, as well as the strengths and weaknesses of program design). The proposed evaluations are to help determine the extent to which the Program outputs have led to the achievement of the desired short, medium and end outcomes, such as building resilience in the sector, and providing learning for planning future agricultural adaptation programs. Evaluations are performed for the aspects of the Program corresponding to hard adaptation, i.e. changes in knowledge and awareness, changes in behaviour and actions and progress toward adaptation and resilience.

5.7 Considerations for M&E

5.7.1 Define criteria for Program success

While the Program goal is well established, i.e. to build resilience to climate change, the criteria for success and the metrics for measuring that success are not apparent. It has to be appreciated that adaptation and resilience are the result of complex changes that cannot be measured directly. In that regard, perhaps the best the Program can do is demonstrate progress towards adaptation and resilience by using a credible proxy.

- Given the fact that the Program is largely farm-based, meaning that Program investments are directed to creating the supportive and enabling environment that will facilitate stakeholders' individual and collective adoption of adaptive strategies and actions, possible criteria could be the numbers of agricultural producers and industry partners in each agricultural region implementing the suite of adaptive strategies and innovations that are designed to enable the industry to withstand current and projected climate related stressors.
- A proxy measure could be that at least 80 percent of agricultural producers and industry partners individually and collectively have implemented the proved and prescribed adaptive technologies. Eighty percent seems to be a credible target representing a level of adoption at which the industry would be positioned to cope with, recover from and adapt to climate change shocks. (It may be possible to apply rigorous analytical methods to derive a more objective measure – this could be an area for future research.)

5.7.2 Resources for implementing M&E system

The Innovation and Adaptation Services (IAS) Branch, Ministry of Agriculture may need to acquire additional resources, i.e. budget and personnel for M&E activities. Someone with training and experience in M&E or an agency might be contracted to manage the M&E system, i.e. develop M&E plans and schedules; prepare, test and administer survey instruments; collect, store, collate and analyze data; prepare and present reports; and periodically update the M&E system. M&E costs are variable and largely depend on how the M&E plan is structured and implemented. A common rule of thumb is to allocate at least 5 percent of total program cost, and some international organizations budget up to 10 percent of program cost. For a program similar to the current one, this would correspond to a budget of approximately \$250,000 - \$500,000 and one full time staff position over five years.

5.7.3 Data and information requirements

The data on the chosen output and outcome indicators are to be obtained from both primary and secondary sources. Data for the output indicators are likely to be obtained from internal Program documents, reports, Program management meetings and briefings, and meetings with stakeholders. The data on outcome indicators and baseline measurements are most likely to be obtained through surveys of agricultural producers, farmer's organizations, industry partners and local governments. Some data might be available from secondary sources such as BC Stats and Statistics Canada. Data can be stored and analyzed in Microsoft Excel. Descriptive statistics (e.g. percentage increase in the number of farmers adopting and integrating adaptive strategies into farm operations) are adequate to analyze the data.

Primary data can be collected using structured questionnaires. The M&E practitioner may choose also to collect supplementary primary data through focus groups and key informant interviews. This qualitative data, which might include the subjective perceptions of stakeholders about climate change, the Program operations, and criteria for Program success,

can provide useful information that may benefit this Program and future climate change adaptation programs.

5.7.4 Sample frame, sampling and sample size

The sample frame is the agricultural producers and industry stakeholders in the agricultural regions of BC that the Program aims to reach.⁹ Random sampling methods can be used to obtain a representative sample of farmers. When selecting the sample size, care should be taken to ensure that the sample is large enough to instill confidence in the results of the survey, i.e. the sample results are close as possible to the results that would be obtained if all the farmers in the sample frame were interviewed.¹⁰ To decrease the sample size would decrease the confidence level or increase the margin of error – i.e. there would be an increased likelihood of error in the sampling, but a smaller number of responses would be required. Likewise, increasing the sample size would increase the confidence level and decrease the margin of error.

5.7.5 Reports and reporting

The M&E report is an important management tool. A M&E report would typically include a statement of the purpose and objectives of the monitoring activity or evaluation exercise; a description of the data collection methods; a summary and analysis of the findings; the implications of the findings for Program management; and recommendations, including lessons learned and the expected management response. More details may be added to the report depending on the need for additional information.

5.7.6 Summary measure of adaptive capacity and resilience (optional)

It might prove useful to construct a simple index of adaptation for each of the agricultural regions. The purpose of the index would be not to compare the regions but to: (1) show the trajectory or the progress made toward adaptation over time, and (2) help the Program management to quickly identify the regions that are falling behind, and might require greater investments of adaptive resources, i.e. social/institutional, economic or environmental. The method used for constructing the United Nations Human Development Index could be adopted. Selected core social/institutional, economic and environmental output indicators are mathematically aggregated (with or without weights) to form an index of adaptation and resilience.

⁹ Sample frame or sampling frame is a list of the accessible population (i.e. the population of interest) from which the sample is drawn. It may include individuals, households, institutions or items. The sample is the group of individuals, households or institutions selected to be in the study. (Trochim 2006; and Hair et al. 1998)

¹⁰ The sample size can be determined scientifically by using the formula: $n = (Z * s/E)^2$, where n - is the desired sample size, i.e. the number of responses required; Z - is the z score associated with the degree of confidence selected (1.90, 1.96 or 2.58 corresponding respectively to 90 percent, 95 percent or 99 percent confidence respectively); s - is the sample deviation of the pilot survey or estimated from knowledge of the population; and E - is the amount of error allowed.

5.7.7 Update M&E system

Periodic update of the M&E system and further refinement of indicators will enable the system to be flexible and to accommodate changes as the Program evolves and BC begins to experience more fully the projected impacts of climate change. This exercise will enable the M&E system to be sensitive to changing conditions and new developments in agricultural climate change adaptation.

5.8 Operationalizing the M&E System

5.8.1 Baseline survey

There are currently no baseline measurements showing the current level of stakeholder knowledge about climate change, the climate-related risks to agriculture and their farming operations, the adaptive strategies and actions to counteract the risks, their perceptions of climate change, and adaptive measures autonomously adopted. A necessary first step would be to conduct a baseline study in each agricultural region to generate baseline measurements about the status of the performance indicators listed in Table 5.3. The baseline measurements provide a reference point against which progress toward resilience is measured. Baseline data are compared with the same outcome indicators at various times during implementation and at the end of the Program to assess how conditions have changed over time.

Funding of the Program began in 2013 and is to end in 2018. A further five-year funding arrangement that makes provisions for agricultural climate change adaptation is anticipated to start in 2018. Given this scenario and the fact that the Program is in the third year of implementation, efforts might be made to conduct the study by July 2018 or as soon as it is feasible to do so. The performance indicators listed in Tables 5.3, 5.4 and 5.5 are subsets of the indicators that can be used in the baseline and other surveys. It is expected that other indicators will be developed and used. Appendix 6 provides additional performance indicators that might be used in the evaluations.

Table 5.3: Baseline Survey: Sample of Performance Indicators

Performance Indicator	Purpose	Data & Method
1. Percentage (number) of farmers with knowledge of climate change risk to agriculture in their region	<p>Obtain baseline measurements on performance indicators related to Program targeted short and intermediate outcomes</p> <ul style="list-style-type: none"> • Assess farmers’ knowledge and awareness of climate change risks • Assess farmers’ knowledge of decision-making tools & resources, priority adaptive strategies to mitigate the risks • Assess farmers’ perceived access to decision-making tools and resources, and priority strategies and actions • Assess farmers’ perceptions of climate change • Assess planning for adaptation • Assess implementation of adaptive technologies 	Administer questionnaire to a random sample of farmers in each agricultural region.
2. Percentage (number) of farmers with knowledge of priority adaptive strategies and actions		The primary information obtained might be supplemented by secondary data by key informant
3. Percentage (number) of farmers with knowledge of decision-making tools and resources		interviews with the Climate Action Initiative, the Ministry of Agriculture Climate Action
4. Percentage (number) of farmers with budgetary allocations to implement priority strategies and actions		Team, and focus groups
5. Percentage (number) of farmers seeking to access Program products to plan adaptation efforts		interviews with other industry stakeholders.
6. Percentage (number) of farmers seeking technical assistance to implement priority strategies and actions		
7. Percentage (number) of farmers convinced of the risks of climate change to agriculture		
8. Percentage (number) of farmers regarding adaptation to climate change as his/her personal responsibility		
9. Percentage (numbers) of farmers and industry partners implementing any kind of adaptation technology		
10. Percentage (number) of farmers and industry stakeholders with built climate change resilient infrastructure (e.g. water storage, irrigation, drainage systems)		

5.8.2 Evaluation of Program outputs

The evaluation of program outputs or implementation monitoring is the ongoing analysis of Program progress toward achieving planned outputs. The analyses will identify implementation successes and failures, as well as the challenges and problems in implementation, and will indicate the remedial actions that are to be taken. The planned Program outputs include planning, fostering collaborations and partnerships, building information networks, creating and sharing knowledge, and developing decision-making tools and resources, and adaptive technologies and innovations. To date, program interventions have largely focused on adaptation outputs. The Program began to generate these outputs in 2013 and expects to continue doing until the end of the funding cycle in 2018. Because soft adaptation is what can be measured at this time the evaluation should begin there. Implementation monitoring may begin by June 2016, and thereafter every 6 months up to 2018, the end of the Program. Table 5.4 shows a sample of the performance indicators for measuring implementation progress.

Table 5.4: Output Evaluation: Sample of Performance Indicators

Performance Indicator	Purpose	Data & Method
<ol style="list-style-type: none"> 1. Number of farm-level toolkits and manuals developed, piloted and demonstrated 2. Farm-level toolkits and manuals rolled out to farmers 3. Number of producer decision-support tools developed 4. Number of producer decision-support tools rolled out to farmers 5. Number of climate change education and outreach projects conducted 6. Number of climate change knowledge and information sharing networks established 7. Number of Farm Adaptation Innovator projects developed, tested and piloted 8. Number of Farm Adaptation Innovator projects rolled out to farmers 9. Number of industry partners reached by the Program 10. Number of farmers reached by the Program 11. Number of information factsheets and other printed materials developed and distributed 12. Number of workshops conducted 	<ul style="list-style-type: none"> • Evaluate achievement of Program deliverables against targets • Evaluate participation of industry partners in delivering and/or supporting implementation of adaptive strategies and actions 	<p>Review Program documents and reports</p> <p>Conduct key informant interviews with the Climate Action Initiative, and Ministry Climate Action Team</p> <p>Focus group interviews with industry stakeholders</p>

5.8.3 Evaluation of Program outcomes

The suite of Program outputs are intended to engender decisions and actions among farmers and industry stakeholders in favour of adaptation, and equip them to lead in adaptation efforts and to address the range of current and projected climate-related risks. The outcome evaluations measure the aspect of the program that correspond to “hard adaptation” and will help to show farmers’ use of Program products and the level of participation by industry partners in delivering and/or supporting implementation of adaptive strategies and actions. The evaluation of Program outcomes is part of the periodic analysis of the extent to which the outputs generated by the Program are translated into the targeted short-term, intermediate and end goals. The evaluation is divided into two sections: (a) decision making by stakeholders and (b) implementation of prescribed adaptive technologies by decision-makers.

a. Stakeholder decision-making in adaptation

The Program develops and provides stakeholders with information, tools and resources, including adaptation options that are intended to help them to integrate adaptation in decision-making. The analysis will help to reveal the extent to which stakeholders are using these products in adaptation matters. The result will help to identify the factors that facilitate or constrain decision-making in adaptation. Table 5.5 presents a sample of the performance indicators that can be used in the evaluation.

b. Stakeholder implementation of priority adaptive strategies

The long-term outcome is that stakeholders (individually and collectively) adopt the adaptive technologies/innovations and practices. These products modify farm production practices and/or develop the on-farm and regional climate-resilient infrastructure that can accommodate climate change shocks. The analysis will reveal the extent to which stakeholders are implementing the suite of necessary adaptive measures, i.e. physical on-the-ground downstream actions such as water management and flood mitigation systems; communal water storage and irrigation systems built; communal dike and drainage systems constructed; and drought warning systems installed. The results, compiled over time, will enable stakeholders to make judgements about the level of saturation of the technologies/innovations in the sector, and movements toward adaptation and resilience.

Given the constraints to Program implementation, the rate of implementation progress, and the current emphasis, the reasonable indications are that the on-farm and industry-wide implementation of the adaptive technologies/innovations will likely begin after 2018, possibly by 2023.¹¹ This, however, is contingent on the availability of financial resources to develop the mechanisms to extend Program reach and influence in the sector. That being the case, an evaluation to assess conditions on the ground might be performed at the end of the Program in

¹¹ The products generated from Program activities, e.g. the producer decision-making tools, and the farm-level toolkits and manuals, FAIP projects are just beginning to be rolled out to stakeholders. Appendices 5-9 show regional adaptation projects, their objectives and short and long term performance measures.

2018 and a final evaluation in 2025. Table 5.6 presents a sample of the performance indicators that can be used in the evaluation. Appendix 2 shows the climate related risks to agriculture in each region and the projects that are developed to specifically address and mitigate those risks. Some of the adaptive measures have already emerged, while others are expected to emerge over the next several years.

**Table 5.5: Outcome Evaluation (Stakeholder Decision-Making)
Generic Sample of Performance Indicators**

Performance Indicator	Purpose	Data & Method
1. Percentage (number) of farmers requesting/accessing Agriculture Weather Monitoring & Decision Support Tool	Evaluate farmer utilization of the tools and resources in decision-making.	Select performance indicators that are specific to each agricultural region.
2. Percentage (number) of farmers requesting/accessing Collaborative Pest Monitoring Tool	Evaluate industry partners utilization of tools and resources in community and regional planning.	Develop and administer questionnaire to a random sample of farmers in each agricultural region.
3. Percentage (number) of farmers using Farm Water Planning toolkit in adaptation planning	<ul style="list-style-type: none"> Assess the application of the producer decision-support tools in decision-making at farm, community and community levels. 	The primary information obtained might be supplemented by secondary data obtained by key informant interviews with the Climate Action Initiative, the Ministry Climate Action Team;
4. Number of industry stakeholders (local governments) with wildfire preparedness plans		focus groups interviews with other industry stakeholders;
5. Percentage (number) of farmers with wildfire preparedness plans		and review of Program documents and reports.
6. Number of local governments with proposals to upgrade agriculturally significant dams		
7. Percentage (number) of farmers participating in the maintenance of agriculturally significant dams		

**Table 5.6: Outcome Evaluation (Stakeholder Implementation)
Generic Sample of Performance Indicators**

Performance Indicator	Purpose	Data & Method
<ol style="list-style-type: none"> 1. Percentage (number) of farmers adopting Integrated Farm Water Planning toolkit 2. Percentage (number) of farmers adopting Wildfire Preparedness & Mitigation Planning & Resources toolkit 3. Percentage (number) of farmers participating in the Cooperative Maintenance & Enhancement of Agricultural Dams 4. Percentage (number) of farmers using Management Intensive Grazing for adapting to and mitigating climate change 5. Number of drought alert systems installed 6. Number of drainage and irrigation systems built 7. Number of industry partners leading in the implementation of regional adaptation projects 	<p>Evaluate farmer uptake of adaptive products generated by the Program</p> <p>Evaluate industry partners participation and leadership in implementing regional adaptation strategies</p> <ul style="list-style-type: none"> • Assess farmers’ behaviour and practice toward adaptation & resilience • Assess the level of adoption of the adaptive strategies and actions on-farm • Assess presence in farm communities of the physical infrastructure necessary to mitigate flooding, drought and wildfires 	<p>Select performance indicators that are specific to each agricultural region.</p> <p>Develop and administer questionnaire to a random sample of farmers in each agricultural region.</p> <p>The primary information obtained might be supplemented by secondary data obtained by key informant interviews with the Climate Action Initiative, the Climate Action Team; focus groups interviews with other industry stakeholders; and review of Program documents and reports.</p>
<ol style="list-style-type: none"> 1. Percentage (number) of farmers adopting suite of priority strategies and actions in each agricultural region 2. Average percentage of farmers adopting suite of priority strategies and actions across BC 	<ul style="list-style-type: none"> • Evaluate spread of adaptive strategies and actions in agricultural regions • Evaluate progress toward resilience in the sector 	<p>The analysis of the data will show the percentage of farmers in each agricultural region who have adopted one or more of the prescribed adaptive strategies and actions. An average for BC can be constructed.</p>

5.8.4 Evaluate Program planning process

Many programs fail to achieve planned goals. Poor or inadequate planning, poor management, and implementation challenges are among the many reasons for program failure. Preston et al (2010), in a study of climate change adaptation plans from three developed nations found that adaptation plans were largely underdeveloped, and that some of the critical issues of adaptive capacity were neglected. Tompkins et al. (2010) highlight some nuances related to climate change adaptation that are sometimes not adequately examined in planning. This evaluation, performed at the end of the Program, may provide valuable lessons for the development of future adaptation programs. The method, evaluation criteria and reporting are proposed for consideration.

Method: Establish an independent Program Planning Review Committee composed of policy analysts, program/project planners, climate change specialists and technical experts and representatives of other relevant disciplines to review the process by which the Program was developed and implemented, and to make recommendations for improvements. Program documents and supporting materials, stakeholder interviews, and focus groups can be used in the review.

Evaluation criteria: These include but are not restricted to reviews of the logical framework and program logic or theory of change; meaning and validity of key assumptions; assessment of barriers and limiting factors; clarity and definitions of outputs, outcomes and impacts; criteria for success; delineation of the pathway to success; and monitoring and evaluation.

Report: The report and recommendations circulated to Program management, the CAI, BC Ministry of Agriculture, farmers' organizations and industry stakeholders can be applied to improve the effectiveness of future adaptation programs.

Table 5.7 provides a sample of the performance indicators and the corresponding questions to generate data from primary sources. Some additional indicators (without survey questions) are presented below. It is expected that the M&E practitioner will develop other appropriate performance indicators and survey questions.

Table 5.7 Survey Instrument: Sample Indicators and Survey Questions

Indicator	Survey Questions
<p>1. Percentage (number) of farmers with knowledge of climate change risk to agriculture in their region</p>	<p>1.1 On a scale of one to ten with one being the lowest and ten the highest, how would you rate your knowledge of climate change risks to agriculture in your region?</p> <p>1.2 What are some of the priority climate change risks to agriculture in your region? Please list as many as you can.</p> <p>1.3 How convinced are you that the risks you identified in question 1.2 will occur in your lifetime? (not convinced, moderately convinced, strongly convinced)</p> <p>1.4 How did you become aware of the climate change risks to agriculture in your region?</p> <p>1.5 What or who contributed most to your knowledge of the climate change risks to agriculture in your region?</p>
<p>2. Percentage (number) of farmers with knowledge of priority adaptive strategies and actions.</p>	<p>2.1 On a scale of one to ten with one being the lowest and ten the highest, how would you rate your knowledge of the priority strategies and actions that are necessary to counteract the risks identified in question 1.2?</p> <p>2.2 What are some of the priority strategies and actions that are necessary to counteract the risks identified in question 1.2? Please list as many as you can.</p> <p>2.3 On a scale of one to ten with one being the lowest and ten the highest, how would you rate your ability to access the priority strategies and actions identified in question 2.2?</p> <p>2.4 How confident are you that the priority strategies and actions will work? (not confident, moderately confident, very confident)</p> <p>2.5 What or who contributed most to your knowledge of the priority strategies and actions?</p>
<p>3. Percentage (number) of farmers with knowledge of decision-making tools and resources</p>	<p>3.1 On a scale of one to ten with one being the lowest and ten the highest, how would you rate your knowledge of the resources & tools that can help you to make decisions about climate change?</p> <p>3.2 What are some of the resources & tools that can help you to make decisions about climate change? Please list as many as you can.</p> <p>3.3 On a scale of one to ten with one being the lowest and ten the highest, how would you rate your ability to access the resources & tools that can help you to make decisions about climate change?</p> <p>3.3 How did you become aware of the resources and tools?</p> <p>3.5 What or who contributed most to your knowledge of the priority strategies and actions?</p>

Table 5.7 Survey Instrument: Sample Indicators and Survey Questions (Continued)

Indicator	Survey Questions
<p>4. Percentage (number) of farmers who have accessed decision-making tools & resources</p> <p><i>(Includes Agriculture weather monitoring & decision-support tools; and Collaborative pest monitoring pilot project. See CAI Lunch & Learn Presentation, Sept. 30, 2015 for more of the tools and resources)</i></p>	<p>4.1 What tools and resources do you plan to use to choose options for on-farm adoption or make decisions about climate change? Please list the tools.</p> <p>4.2 When do you plan to use these tools? Please state the year.</p> <p>4.2 What tools and resources have you used to choose adaptation options for on-farm adoption or make decisions about climate change? Please list the resources and tool.</p> <p>4.3 On a scale of one to ten with one being the lowest and ten the highest, how would you rate the usefulness of the tools and resources you used?</p>
<p>5. Percentage (number) of farmers with plans to implement priority strategies and actions</p> <p><i>(Farm-level toolkits and manuals includes: Integrated farm water planning; Wildfire preparedness & mitigation planning & resources; flooding preparedness and mitigation; and others. See CAI Lunch & Learn Presentation, Sept. 30, 2015 for more of the farm-level toolkits)</i></p>	<p>5.1 What priority strategies and actions do you plan to implement on your farm? Please list them.</p> <p>5.2 When do you plan to implement the priority strategies and actions? Please state the year</p> <p>5.3 How much will it cost to implement the priority strategies and actions? Please state the cost for each strategy.</p> <p>5.4 What organizations do you think can assist you to implement the priority strategies and actions? Please list them.</p> <p>5.5 What organizations did you contact or plan to contact to help you prepare or implement the priority strategies and actions? Please list.</p>

Section 5 has presented a simple and practical M&E system for application in the climate change Program. Sufficient details have been given so as to allow Program management to take the actions that are necessary to implement the system, and for the M&E practitioner to develop a plan for implementing the system. There are challenges when attempts are made to develop an M&E system for a program that is an advanced stage of implementation. This and other factors were taken into account and informed judgements as to what was feasible at this stage of implementation. The PMF and the M&E system outlined may be considered as a work in progress, to be further developed as more guidance instruments become available in the future. Nevertheless, it is believed that they have current practical value and can contribute to the overall success of the Program.

6.0 Conclusions and Recommendations

6.1 Conclusions

This paper developed a performance management framework that included an approach to Program monitoring and evaluation. The framework and M&E system are intended to generate the information that will help Program management and stakeholders to answer the important questions that have implications for Program success, climate change adaptation policy, and future program development:

- What are the Program successes and failures?
- What progress is being made toward resilience in the sector?
- What constitutes successful adaptation?
- What lessons can be learned for planning future agricultural adaptation programs?

The answers provided are expected to help Program management and stakeholders make informed judgments about the Program.

The M&E system and the performance indicators chosen are contextualized to the Program goals and deliverables, as well as the hoped for response of farmers, industry stakeholders, and local governments to the products generated by the Program, and their participation in implementing adaptive priority strategies at the local level.

The paper explained the key concepts, i.e. resilience, adaptation and adaptive capacity, that are widely used in the Program literature, and showed the conceptual and operational nexus among them. The Program approach to building adaptive capacity and resilience was also established. Special considerations for monitoring and evaluating agricultural climate change adaptation programs, and best practices for such programs were highlighted.

The paper also showed the capacities and actions that are required to operationalize the M&E system; proposed possible criteria to define Program success; and provided practical guidelines for developing an M&E plan. The details provided are deemed sufficient to allow Program management to put the necessary capacities for M&E in place, and the M&E practitioner to develop a plan for operationalizing the system.

This paper, given the limitations in scope and time, could not attempt to address in depth issues concerned with agricultural adaptation planning and programming, nor every aspect of Program M&E. In that regard, there is the potential to further develop the paper as research generates more guidance instruments for agricultural climate change adaptation programs. The paper, nonetheless, has provided a practical framework for M&E that can contribute to the success of the Program and that of future agricultural climate change adaptation programs undertaken by the B.C. Ministry of Agriculture.

6.2 Recommendations

Perusal of the Program documents and adaptation literature together with the anecdotal evidence suggest that financial viability of farms and the economic resources available to them is one of the most important drivers of adaptation at the farm-level, and as a consequence, resilience in the sector. It is intuitive that greater economic resources are likely to increase adaptive capacity, while the lack of financial resources is likely to limit adaptation options. The CAI (2015) notes a strong relationship between economic stability and adaptation, pointing out that investments in planning and implementing adaptive measures at the farm level are more likely to occur on farms with stable incomes and higher profit margins. While farmers may have the capacity and willingness to invest in adaptation, the lack of financial resources may constrain them to do otherwise. The following recommendations stem from the undesirable scenario described above.

Recommendation 1: Evaluate financial capacity of the sector to invest in adaptation

It might be necessary to conduct an assessment of the financial capability of the farming sector in each region to make investments in climate change adaptation. The assessment also has implications for broader agricultural development, e.g. the public and/or private instruments that may help farmers to increase the productivity and profitability of the farm enterprise. The data for the evaluation might be available from secondary sources such as Statistics Canada, BC Statistics, the Ministry of Agriculture, Program documents and reports or other sources. A survey among farmers may also generate the necessary information.

Recommendation 2: Cost and benefit analysis of agricultural climate change adaptation

The underlying assumption in climate change adaptation programs is that the cost of adapting to climate change is likely to be less than the costs of the impacts that would otherwise occur without adaptation. Using a scenario analysis approach, Donahue (2014) estimated the economic benefit if all feasible adaptation measures were effectively implemented in the Cowichan, Cariboo, Peace, and Okanagan regions. The economic benefit of adaptation was calculated as the difference between industry revenues with adaptation and without adaptation should a climate stressor event occur in the year 2035. The estimated benefit of adaptation ranged from \$105 million to \$270 million. The cost of implementing the suite of feasible adaptation measures was not estimated. Estimates of the societal costs and benefits of agricultural adaptation are not available.

An economic analysis of the costs and the benefits of agricultural climate change adaptation in BC would help to demonstrate the societal benefits of investing in climate change adaptation. Making explicit the benefits of agricultural adaptation and the costs can help to promote advocacy and societal support for agricultural climate change adaptation, justify investments in the sector, and help to influence funding decisions in favour of adaptation. The economic analysis combined with the evaluation proposed above can help to determine what share of the

cost of adaptation farmers and industry are able to bear and the level of public financing required. It may also allow other avenues for financing adaptation to be explored.

Recommendation 3: Define criteria for measuring Program success

The Program goal is to increase resilience in the sector. While adaptation and resilience cannot be measured directly, Section 5.7 proposes a pragmatic approach to measure progress towards the Program goal. Program interventions are building adaptive capacities and developing the technologies and innovations that, when deployed, would enable the industry to reduce risks, cope with, recover from, and adjust to the shocks associated with climate change and extreme weather events. These objectives harmonize with the concept of adaptation and resilience. Conceivably, therefore, that which is of critical importance and indicative of Program success is the presence of the proven adaptive technologies and the climate-resilient infrastructure in the sector. The question then, is: What is the optimal level of the presence of the technologies/innovations that credibly represent significant progress toward, or achievement of the Program goal? This is an important question requiring critical reflection on the part of Program management.

Recommendation 4: Establish capacities for M&E

The monitoring and evaluation (M&E) system proposed can help to improve the performance of the Program, leading to improved outcomes. In that regard, the investments in M&E should be regarded not as a burden on Program resources but rather as an essential investment in Program success. In that regard, it is recommended that the resources be mobilized and the capacities for M&E be put in place as soon as it is feasible to do so.

Recommendation 5: Establish a Program planning review committee

The Ministry of Agriculture and partners establish a committee to review the program planning and implementation process and make recommendations that may help to ensure the continuity and sustainability of the Program's benefits and impact, and for the improvement of future adaptation programs. The review may examine the factors mentioned in Section 5.8.4, as well as the financial, political, legal, regulatory, social and other factors that can influence program implementation, impact and sustainability.

7.0 References

1. B.C. Ministry of Agriculture. 2014. *BC Climate Change Adaptation Program: Performance Measurement Strategy, 2013-2018*.
2. B.C. Ministry of Agriculture. 2015. *British Columbia Agrifood Industry Year in Review 2014*. http://www2.gov.bc.ca/assets/gov/farming-natural-resources-and-industry/agriculture-and-seafood/statistics/industry-and-sector-profiles/year-in-review/bcagrifood_yearinreview_2014.pdf
3. BC Agriculture and Food Climate Action Initiative. 2012. *BC Agriculture & Climate Change Regional Adaptation Strategies Series*. <http://www.bcagclimateaction.ca/regional/overview/adaptation-strategies>
4. BC Agriculture and Food Climate Action Initiative. 2012. *BC Agriculture Climate Change Adaptation Risk and Opportunity Assessment, Provincial Report*. <http://www.bcagclimateaction.ca/regional/overview/risks-opportunities>
5. BC Agriculture and Food Climate Action Initiative. 2010. *BC Agriculture Climate Change Action Plan*. <http://www.bcagclimateaction.ca/wp/wp-content/media/BC-Agriculture-Climate-Change-Action-Plan.pdf>
6. BC Agriculture and Food Climate Action Initiative. 2013. *BC Agriculture and Climate Change Regional Adaptation Strategies series: Cowichan*. <http://www.bcagclimateaction.ca/wp/wp-content/media/RegionalStrategies-Cowichan.pdf>
7. BC Agriculture and Food Climate Action Initiative. 2013. *BC Agriculture and Climate Change Regional Adaptation Strategies series: Delta*. <http://www.bcagclimateaction.ca/wp/wp-content/media/RegionalStrategies-Delta.pdf>
8. BC Agriculture and Food Climate Action Initiative. 2013. *BC Agriculture and Climate Change Regional Adaptation Strategies series: Peace*. <http://www.bcagclimateaction.ca/wp/wp-content/media/RegionalStrategies-Peace.pdf>
9. BC Agriculture and Food Climate Action Initiative. 2014. *BC Agriculture and Climate Change Regional Adaptation Strategies series: Cariboo*. <http://www.bcagclimateaction.ca/wp/wp-content/media/RegionalStrategies-Cariboo.pdf>
10. BC Agriculture and Food Climate Action Initiative. 2015. BC Agriculture and Food Climate Action Initiative Presentation to Ministry of Agriculture Staff, 30 September, 2015.
11. Bene, C., R.Wood, A.Newsham, and M. Davis. 2012. *Resilience: New utopia or New Tyranny? Reflections about the Potential and Limits of the Concept of Resilience in Relation to Vulnerability Reduction Programmes*. Brighton: Institute of Development Studies. <https://www.ids.ac.uk/files/dmfile/Wp405.pdf>
12. Berkes, F. and D. Jolly. 2001. *Adapting to Climate Change: Social-Ecological Resilience in a Canadian Western Arctic Community*. *Conservation Ecology* 5:18. <http://www.ecologyandsociety.org/vol5/iss2/art18>

13. Bours,D., C. McGinn, and P. Pringle. 2014. *Monitoring and Evaluation for Climate Change Adaptation and Resilience: A Synthesis of Tools, Frameworks and Approaches, Second Edition*. SEA Change CoP and UKCIP.
<http://www.ukcip.org.uk/wp-content/PDFs/SEA-Change-UKCIP-MandE-review-2nd-edition.pdf>
14. Brook,N., S.Anderson, I.Burton, S.Fisher, N.Rai, and I.Tellam. 2013. *An Operational Framework for Tracking Adaptation and Measuring Development, Working Paper No. 5*. IIED.
<http://pubs.iied.org/10038IIED.html>
15. Cannell, M., T. Brown, T. Sparks, T. Marsh, T. Parr and G. George. 2003.
Review of U.K. Climate Change Indicators. Department for Environment Food and Rural Affairs.
[http://www.ecn.ac.uk/iccuk/.](http://www.ecn.ac.uk/iccuk/)
16. Dinshaw, A., S. Fisher, H. McGray, N. Rai, and J. Schaar. 2014. *Monitoring and Evaluation of Climate Change Adaptation: Methodological Approaches*. OECD Environment Working Papers, No. 74, OECD publishing, Paris.
[http://www.oecd.org/officialdocuments/publicdisplaydocumentpdf/?cote=ENV/WKP\(2014\)12&docLanguage=En](http://www.oecd.org/officialdocuments/publicdisplaydocumentpdf/?cote=ENV/WKP(2014)12&docLanguage=En)
17. Dolan,H. A., B.Smit., M.W.Skinner., B. Bradshaw., and C. R. Bryant. 2001. *Adaptation to Climate Change in Agriculture: Evaluation of Options*. Department of Geography, University of Guelph. Occasional Paper No. 26.
[http://www.uoguelph.ca/gecg/images/userimages/Dolan%20et%20al.%20\(2001\).pdf](http://www.uoguelph.ca/gecg/images/userimages/Dolan%20et%20al.%20(2001).pdf)
18. Donahue, K. 2014. *Regional Economic Impact of Climate Change in BC Examined through Scenario Analysis*. BC Ministry of Agriculture.
<http://pics.uvic.ca/sites/default/files/Climate%20Stressor%20Scenarios-%20Final%20Report%20pdf.pdf>
19. Elasha, B.O., N.G. Elhassan, H. Ahmed and S. Zakieldin. 2005. *Sustainable Livelihood Approach for Assessing Community Resilience to Climate Change: Case Studies from Sudan*. Assessments of Impacts and Adaptations of Climate Change (AIACC) Working Paper No. 17.
http://www.iflea.org/pdf/AIACC_WP_No017.pdf Accessed 13 October 2015.
20. Ellis, J. 2014. *Climate Resilience Indicator Literature Review*. Columbia Basin Trust.
www.cbt.org/uploads/pdf/IndicatorsClimateAdaptation_LiteratureReview_forweb_FINAL.pdf
21. Engle, N. L. 2011. *Adaptive Capacity and its Assessment*. Global Environmental Change 21:647-656.
<http://www.sciencedirect.com/science/article/pii/S0959378011000203>
22. FAO. 2013. *Climate Smart Agriculture Sourcebook*.
<http://www.fao.org/docrep/018/i3325e/i3325e.pdf>
23. Folke, C. 2006. *Resilience: The Emergence of a Perspective for Social-Ecological Systems Analyses*. Global Environmental Change 16: 253-267.
<http://www.sciencedirect.com/science/article/pii/S0959378006000379>

24. Ford, J.D., L. Berrang-Ford, A. Lesnikowski, M. Barrera and S. Jody Heymann. 2013. How to track adaptation to climate change: a typology of approaches for national-level application. *Ecology and Society* 18:40.
<http://dx.doi.org/10.5751/ES-05732-180340>.
25. GIZ. 2011. *Making Adaptation Count: Concepts and Options for Monitoring and Evaluating of Climate Change*.
http://pdf.wri.org/making_adaptation_count.pdf
26. GIZ. 2014. *Monitoring and Evaluating Adaptation at Aggregated Levels: A Comparative Analysis of Ten Systems*.
https://gc21.giz.de/ibt/var/app/wp342deP/1443/wp-content/uploads/filebase/me/me-guides-manuals-reports/GIZ_2014-Comparative_analysis_of_national_adaptation_M&E.pdf
27. Hair, J. F., R.E.Anderson, R.L.Tatham, and W.C.Black. 1998. *Multivariate Data Analysis, Fifth Edition*. Prentice Hall, Upper Saddle River, New Jersey.
<http://www.abebooks.com/9780138948580/Multivariate-Data-Analysis-5th-Edition-0138948585/plp>
28. Harley, M., L., Horrocks and N. Hodgson. 2008. *Climate Change Vulnerability and Adaptation Indicators*. European Topic Centre on Air and Climate Change.
http://acm.eionet.europa.eu/docs/ETCACC_TP_2008_9_CCvuln_adapt_indicators.pdf.
29. Harley, M. and J. van Minnen. 2009. *Development of Adaptation Indicators*. European Topic Centre on Air and Climate change Technical.
http://acm.eionet.europa.eu/docs//ETCACC_TP_2009_6_Adaptation_Indicators.pdf
30. Ibararán, M.E., E.L. Malone and A.L. Brenkert. 2008. *Climate Change Vulnerability and Resilience: Current Status and Trends for Mexico*. U.S. Department of Energy.
http://www.pnl.gov/main/publications/external/technical_reports/PNNL-18136.pdf
31. IPCC. 2007. *Climate Change 2007: Synthesis Report*. Contribution of Working Groups I, II and III to the Fourth Assessment Report of the Intergovernmental Panel on Climate Change.
https://www.ipcc.ch/publications_and_data/publications_ipcc_fourth_assessment_report_synthesis_report.htm
32. IPCC. 2012. Field, C.B., V. Barros, T.F. Stocker, D. Qin, D.J. Dokken, K.L. Ebi, M.D. Mastrandrea, K.J. Mach, G.K. Plattner, S.K. Allen, M. Tignor, and P.M. Midgley. *Managing the Risks of Extreme Events and Disasters to Advance Climate Change Adaptation*. A Special Report of Working Groups I and II of the Intergovernmental Panel on Climate Change.
https://www.ipcc.ch/pdf/special-reports/srex/SREX_Full_Report.pdf
33. Kadir, T., L.Mazur, C. Milanes, and K. Randles. 2013. *Indicators of ClimateChange in California*. California Environmental Protection Agency, Office of Environmental Health Hazard Assessment.
<http://oehha.ca.gov/multimedia/epic/pdf/ClimateChangeIndicatorsReport2013.pdf>

34. Lamhauge, N., E.Lanzi, and S. Agrawala. 2012. *Monitoring and Evaluation for Adaptation: Lessons from Development Co-operation Agencies*. OECD Environment Working Papers, No. 38, OECD Publishing.
<http://dx.doi.org/10.1787/5kg20mj6c2bw-en>
35. Lisa, E., F.Schipper, and L. Langston. 2015. *A Comparative Overview of Resilience Frameworks: Analysing Indicators and Approaches, Working Paper 422*. Overseas Development Institute.
<http://www.odi.org/sites/odi.org.uk/files/odi-assets/publications-opinion-files/9754.pdf>
36. Malone, E.L. 2009. *Vulnerability and Resilience in the Face of Climate Change: Current Research and Needs for Population Information*. Population Action International.
http://populationaction.org/wp-content/uploads/2009/08/Malone_resilience.pdf
37. Sebastián, M., S.W. Yoon, and B.K. Yu. 2013. Vulnerability Indicators of Adaptation to Climate change and Policy Implications for IDB Projects. Inter-American Development Bank Policy Brief No. IDB-PB-184.
<http://idbdocs.iadb.org/wsdocs/getdocument.aspx?docnum=37725582>
38. Moser, S.C. 2009. *Good Morning America! The Explosive U.S. Awakening of the Need for Adaptation*. NOAA Coastal Services Center and California Energy Commission.
http://www.preventionweb.net/files/11374_MoserGoodMorningAmericaAdaptationin.pdf
39. Natural England. 2010. *Climate Change Adaptation Indicators for the Natural Environment*.
<http://publications.naturalengland.org.uk/publication/45007>
40. OECD. 2010. *Evaluating Development Co-operation: Summary of Key Norms and Standards*. Organisation for Economic Co-operation and Development Press.
<http://www.oecd.org/development/evaluation/dcdndep/41612905.pdf>
41. OECD. 2015. *National Climate Change Adaptation: Emerging Practices in Monitoring and Evaluation*. Organisation for Economic Co-operation and Development Press.
<http://www.oecd.org/env/cc/national-climate-change-adaptation-9789264229679-en.htm>
42. Preston, B.L., R.M. Westway, and E.J. Yuen. 2010. *Climate Adaptation Planning in Practice: An Evaluation of Adaptation Plans from Three Developed Nations*. Mitigation and adaptation strategies for global change 16: 407-438.
<http://link.springer.com/article/10.1007%2Fs11027-010-9270-x#/page-1>
43. Prowse, M. and B. Snilstveit. 2010. *Impact Evaluation and Interventions to Address Climate Change: A Scoping Study*. The International Initiative for Impact Evaluation (3ie).
<http://www.gsdr.org/go/display&type=Document&id=3926>
44. Smit, B. 1993. *Adaptation to Climate Variability and Change*. Environment Canada.
45. Swanson, D., J. Hilley, H.D. Venema and R. Grosshans. 2009. *Indicators of Adaptive Capacity to Climate Change for Agriculture in the Prairie Region of Canada*. The Prairie Climate Resilience Project. International Institute for Sustainable Development.
http://www.iisd.org/pdf/2009/pcr_adaptive_cap_ag.pdf

46. Tompkins, E. L., W.N. Adger, E. Boyd, S. Nicholson-Cole, K. Weatherhead, and N. Arnell. 2010. *Observed Adaptation to Climate Change: UK Evidence of Transition to a Well-Adapting Society*. *Global Environmental Change* 20: 627-635.
<http://www.sciencedirect.com/science/article/pii/S0959378010000415>
47. Tompkins, E.L. and W.N. Adger. 2005. *Defining Response Capacity to Enhance Climate Change Policy*. *Environmental Science and Policy* 8: 562–571.
<https://ethree.com/downloads/Climate%20Change%20Readings/International%20Climate%20Policy/Tompkins%20-%20Define%20Response%20Capacity.pdf>
48. Trochim, W.M.K. 2006. *Research Methods: Knowledge Base*.
<http://www.socialresearchmethods.net/kb> (search for “sampleterm”)
49. Tyler, S. and K. Tyler. 2015. *Climate Change Adaptation Strategy 2015-2018 (Draft)*. Innovation and Adaptation Services Branch, B.C. Ministry of Agriculture.
50. Walker, B., L. Gunderson, A. Kinzig, C. Folke, S. Carpenter, and L. Schultz. 2006. *A Handful of Heuristics and Some Propositions for Understanding Resilience in Social-Ecological Systems*. *Ecology and Society* 11:13.
<http://www.ecologyandsociety.org/vol11/iss1/art13/>
51. Wall, E. and K. Marzall. 2004. *Climate change and adaptive capacity in Tweed: Profiling resources*. Presentation for the Annual Conference of the Canadian Rural Revitalization Foundation.
<http://www.docfoc.com/climate-change-and-adaptive-capacity-in-tweed-profiling-resources-ellen-wall>

Appendix 1: Selected Social/Institutional Output and Outcome Resilience Indicators

Output Indicators	Outcome Indicators
1. Policy, strategy and regulation formulated for agricultural adaptation to climate change	1. Proportion of budget allocated to support agricultural climate adaptation programs
2. Development of relevant climate change policies, strategies and actions on a local, regional and provincial level	2. Proportion of budget allocated to agricultural research and development
3. Evidence of climate change mainstreaming in national, regional and local agricultural development plans	3. Increase in number of agricultural producers participating in regional climate change dialogues and initiatives
4. Number of people benefiting from capacity development projects	4. Adaptive responses implemented in some priority areas
5. Knowledge of climate change impacts on agriculture	5. Number of farmers reporting they are adapting to climate change
6. Level of confidence in proposed adaptation strategies	6. Number of farmers reporting implementing adaptive measures and strategies
7. Willingness/readiness to implement proposed adaptation strategies	
8. Ability to implement proposed adaptation strategies	
9. Accessibility to the adaptation technology	
10. Available resources for implementation	
11. Access to resources for implementation	
12. Research into farming techniques that accommodate climate change	
13. Number of farmers reporting improved capacity to implement adaptive measures and practices	
14. Number of farmers reporting climate change risks as a present or future reality	
15. Number of farmers reporting confidence in proposed adaptation strategies	
16. Number of farmers with developed climate change adaptation plans	
17. Number of farmers reporting intent to implement adaptive measures and practices within the next five years	
18. Number of local government agencies and farmers organizations with plans and allocated financial resources to implement adaptive measures and strategies	
19. Level of technical support available to farmers to implement adaptive measures and practices	

Source: Adapted from (Ellis, 2014; Lisa et al. 2015; FAO, 2013; and Swanson et al. 2007)

Appendix 2: Selected Economic Output and Outcome Resilience Indicators

Output Indicators	Outcome Indicators
<ol style="list-style-type: none"> 1. Level of public financial resources available to farmers for climate change adaptation 2. Level of farmer access to financial resources for climate change adaptation 	<ol style="list-style-type: none"> 1. Proportion of income derived from climate-sensitive sources 3. Stability of farm income 4. Diversity of farm income 5. Number of agricultural producers with increased access to financial resources 6. Marketing and commercialization chains that are adapted to changing climatic conditions 7. Level of financial support available to farmers 8. Changes in farm household income 9. Volatility of commodity market price variability 10. Improved economic resilience from income diversification 11. Uptake of insurance to cover weather extremes

Source: Adapted from (Ellis, 2014; Lisa et al. 2015; FAO, 2013; and Swanson et al. 2007)

Appendix 3: Selected Environmental Outcome Climate Change Resilience Indicators

Outcome Indicators
<ol style="list-style-type: none"> 1. Number of irrigation systems that raised drought prevention standards 2. Number of soil and water conservation works established 3. Number of farms adopting conservation tillage and permanent crop cover 4. Number of farmers adopting: water storage, farm drainage, nutrient management, intensive grazing, shelterbelts, fire prevention practices 5. Improved water availability from soil and water conservation activities 6. Presence of a flood risk monitoring system 7. Presence of a drought risk monitoring system 8. Introduction of drought/heat resistant crops 9. Estimated required water storage capacity in drought-prone regions 10. Estimated actual water storage capacity in drought-prone regions

Source: Adapted from (Ellis, 2014; Lisa et al. 2015; FAO, 2013; and Swanson et al. 2007)

Appendix 4: Climate Change Risks & Regional Adaptation Projects

Region & Risk	Regional Adaptation Project
Delta <ul style="list-style-type: none"> • <i>Flooding</i> • <i>Ponding</i> • <i>Sea level rise</i> 	<ol style="list-style-type: none"> 1. Potential economic and agricultural production impacts of climate change related flooding in the Fraser delta 2. Flooding preparedness and mitigation pilot project (Phase 1) 3. Collaborative climate change and agriculture communications strategy 4. Agricultural vulnerabilities to coastal flooding (forum) 5. Flooding preparedness and mitigation pilot project (Phase 2) 6. Agriculture and climate change outreach and education pilot project 7. Delta drainage and sub-irrigation project 8. Fraser river salinity modelling and monitoring
Cowichan <ul style="list-style-type: none"> • <i>Drought</i> • <i>Extreme weather events</i> 	<ol style="list-style-type: none"> 1. Integrated farm water planning pilot (Phase 1) 2. Business case for regional agricultural extension services 3. Identify areas of vulnerability to extreme events, and develop agriculture specific informational materials and strategies to prepare for and mitigate the impacts of extreme events (Phase 1) 4. Enhancing local processing and storage 5. Business case for regional agricultural extension services 6. Extreme weather events preparedness & mitigation pilot project (Phase 2) 7. Pilot drought alert system (in progress) 8. Water storage knowledge transfer resources
Peace <ul style="list-style-type: none"> • <i>Drought</i> • <i>Flooding</i> • <i>Wildfires</i> • <i>Pest outbreaks</i> 	<ol style="list-style-type: none"> 1. Increasing availability of agriculturally relevant weather data (Phase 1) 2. Collaborative monitoring pilot project in the BC Peace (pests, diseases, weeds, and invasive species) 3. Feasibility study: defining a new approach to agricultural land use inventory in the BC Peace 4. Evaluation of irrigation potential in the BC Peace region 5. Peace agriculture weather monitoring and decision support tools 6. Increasing availability of agriculturally relevant weather data (Phase 1)
Cariboo <ul style="list-style-type: none"> • <i>Wildfires</i> • <i>Drought</i> • <i>Flooding</i> • <i>Heat stress for cattle</i> • <i>Foot rot in cattle</i> 	<ol style="list-style-type: none"> 1. Wildfire preparedness and mitigation planning and resources 2. Cooperative maintenance and enhancement of agriculturally significant dams (report and workshop) 3. Agricultural dams – knowledge transfer resources 4. Livestock surface water assessment and options
Fraser Valley <ul style="list-style-type: none"> • <i>Flooding</i> • <i>Drought</i> • <i>Extreme precipitation</i> 	<ol style="list-style-type: none"> 1. Freshet flooding and Fraser Valley agriculture: evaluating impacts and options for resilience 2. Enhanced collaboration for agricultural drainage and ditch management 3. Agricultural water workshops series

Source: CAI, 2015, 2014 and CAI, 2013.

Appendix 5: Farm Adaptation Innovator Program (FAIP) Projects

Adaptive Resource	FAIP Projects	Focus
<p>Physical</p>	<ul style="list-style-type: none"> • Adapting BC horticulture through protected crop research and demonstration • Adapting to low light growing conditions using high tunnel structures • Regional moisture sensor network and crop irrigation predictive model • Improving on-farm drainage management to reduce the impacts of climate change in Delta, BC 	<ul style="list-style-type: none"> • Land, water, ecology – practices and management that support farm land, water and ecological systems and reduce climate/weather related production risks • Farm infrastructure – infrastructure such as water storage, irrigation systems, and drainage or water control works
<p>Knowledge</p>	<ul style="list-style-type: none"> • Keyline water management: field research and education in the capital region • Expanding cherry production in BC under climate change • Climate change impact risk assessment tool for ponds used as livestock water sources • Vented orchard covers to protect cherries from rain and hail • Innovative forage practices • Strategies to improve forage yield and quality while adapting to climate change 	<ul style="list-style-type: none"> • Knowledge, experience, education and skills • Access to information and extension – approaches that effectively match modes of farmer information acquisition with new knowledge (knowledge transfer) • Research, development and technology – applied farm research, development and technology
<p>Human & Social</p>	<ul style="list-style-type: none"> • Innovative practices for resiliency • Economic, social and environmental benefits of riparian rehabilitation as a climate change adaptation strategy • Evaluation of thrips damage to potatoes in a changing climate • Using management-intensive grazing for adapting to and mitigating climate change 	<ul style="list-style-type: none"> • Farm operators and labour – increasing the business management and planning abilities of farm operators and labour • Networks, associations, and resource sharing – increasing the effectiveness of organizations to better serve and build the capacity of farmers

Source: CAI

Appendix 6: Regional Adaptation Strategies Projects

Table A6.1: Cowichan Regional Adaptation Strategies Projects

Projects	Objectives	Performance Indicators
<p>1. Integrated Farm Water Planning Pilot</p> <p>Develop and deliver “Farm Water Plan” pilot project</p> <p>Also supports:</p> <ul style="list-style-type: none"> • Increase demonstration, technical information and incentives for managing storm water • Storm water and drainage management planning and implementation for Cowichan farms • Maximize agricultural water use conservation and efficiency 	<ul style="list-style-type: none"> • To increase awareness of the potential impacts of climate change on farm-level water management • To develop a holistic and integrated approach to farm-level water planning that will improve all aspects of water management • To increase the ability of Cowichan farmers to manage through more variable precipitation, extended dry periods and/or excessive precipitation events 	<p><i>Near-term performance indicators include:</i></p> <ul style="list-style-type: none"> • Availability of a transferable integrated farm level water planning approach • Availability of information regarding specific farm-level water issues and their linkages to climate change (and gaps in resourcing) in the Cowichan • Strengthened linkages between farm water management issues and broader regional water goals • Increased interest in an integrated approach to farm level water planning <p><i>Medium to long-term performance indicators (beyond project timeline/scope):</i></p> <ul style="list-style-type: none"> • Broad distribution/utilization of integrated water management planning process (in Cowichan and beyond) • Implementation of water plan recommendations at farm level

Source: CAI. 2013. Regional Adaptation Strategies, Cowichan

Table A6.1: Cowichan: Climate Change Risks and Regional Adaptation Strategies Projects (continued)

Risks & Projects	Objectives	Performance Indicators
<p>2. Collaborative Water Management Phase 1</p> <p>Integrate climate change impacts, water and agriculture into existing and new regional plans</p> <p>Also supports:</p> <ul style="list-style-type: none"> • Develop collaborative storm water & drainage management for the agricultural land base • Increase demonstration, technical information & incentives for managing storm water • Identify & fill information gaps regarding Cowichan region water resources • Expand capacity for water storage & irrigation in the Cowichan region • Maximize agricultural water use conservation & efficiency 	<ul style="list-style-type: none"> • Increase collaboration between regional partners on water related strategies • Effectively integrate agricultural climate change and water issues into regional planning and decision-making • Create specific project plans and develop funding options for priority water-related projects with a particular focus on strategies to: <ul style="list-style-type: none"> - Develop collaborative storm water and drainage management for the agricultural land base - Identify and fill information gaps regarding Cowichan region water resources - Expand capacity for water storage and irrigation 	<p><i>Near-term performance indicators include:</i></p> <ul style="list-style-type: none"> • Development of collaborative water proposals and projects • Increased integration of agricultural adaptation and water issues into planning and processes at regional level and with related organizations <p><i>Medium to long-term performance indicators (beyond project timeline/scope):</i></p> <ul style="list-style-type: none"> • Delivery of collaborative water projects that achieve priority strategies and actions from the <i>Cowichan Adaptation Strategies</i>
<p>3. Business Case for Regional Agricultural Extension Services</p> <p>Conduct a scan and evaluation of options for funding agricultural extension</p>	<ul style="list-style-type: none"> • Identify options for sustainable local extension services suitable for the Cowichan context • Increase the availability of extension support and expertise in the Cowichan, particularly for new entrants and farm businesses in transition 	<p><i>Near-term performance indicators include:</i></p> <ul style="list-style-type: none"> • Identification of extension options that are applicable to the Cowichan • Review and consideration of models by project partners <p><i>Medium to long-term performance indicators (beyond project timeline/scope):</i></p> <ul style="list-style-type: none"> • Implementation of one or more of the options identified through the study • Availability of collaboratively supported extension services for producers in the Cowichan

Source: CAI. 2013. Regional Adaptation Strategies, Cowichan

Table A6.1: Cowichan: Climate Change Risks and Regional Adaptation Strategies Projects (continued)

Risks & Projects	Objectives	Performance Indicators
<p>4. Extreme Weather Events Preparedness and Mitigation Pilot Project</p> <ul style="list-style-type: none"> Undertake risk assessment (Phase 1) Develop support tools for emergency preparedness (Phase 2) 	<ul style="list-style-type: none"> Increase knowledge and understanding of vulnerabilities to extreme events for agricultural operations in the Cowichan Reduce the vulnerability of agricultural operations to the negative impacts associated with extreme events (e.g. flooding, wind, extreme heat, wildfire) Pilot a group approach to planning, preparedness and mitigation for extreme events in agricultural areas 	<p><i>Near-term performance indicators include:</i></p> <ul style="list-style-type: none"> Increased availability of materials that document vulnerabilities to extreme weather events in the Cowichan Availability of transferable process for group planning, preparedness and mitigation for extreme events (for agricultural contexts) <p><i>Medium to long-term performance indicators (beyond project timeline/scope):</i></p> <ul style="list-style-type: none"> Broader application of the planning process piloted through the project Implementation of actions identified through the planning process
<p>5. Options to Enhance Local Agricultural Processing and Storage</p> <p>Identify barriers and opportunities for increasing local processing and storage of Cowichan agricultural products</p>	<ul style="list-style-type: none"> Identify options/solutions for addressing challenges and opportunities facing the value-added food processing industry Develop strategic direction for enhancing processing and storage Increase the options/flexibility for Cowichan producers to process and store primary products 	<p><i>Near-term performance indicators include:</i></p> <ul style="list-style-type: none"> Availability of improved information regarding existing processing/storage resources, as well as gaps, issues and opportunities Strategic direction for enhancing local processing/storage <p><i>Medium to long-term performance indicators include (beyond project timeline/scope):</i></p> <ul style="list-style-type: none"> Implementation of identified options

Source: CAI. 2013. Regional Adaptation Strategies, Cowichan

Table A6.2: Delta: Climate Change Risks and Regional Adaptation Strategies Projects

Risks & Projects	Objectives	Performance Indicators
<p>1. Agricultural Production and Economic Vulnerabilities Associated with Coastal Flooding In BC's Lower Mainland</p> <p>Evaluate (economic and food security) implications of sea level rise and inundation for Delta's agricultural land base</p> <p>Also supports:</p> <ul style="list-style-type: none"> • Incorporate agricultural issues into decision-making processes regarding sea level rise & diking • Undertake dike improvements & raise dike levels to address sea level rise • Improve flooding impact mitigation measures 	<ul style="list-style-type: none"> • Strengthen the understanding of the vulnerabilities of BC's agricultural sector to coastal flooding (due to sea level rise and storm surge events) • Provide an evaluation of potential impacts to farm businesses, agricultural production and agricultural soils • Strengthen the basis for decision-making, planning and action regarding coastal flooding for agricultural producers, producer organizations and local and provincial governments 	<p><i>Near-term performance indicators:</i></p> <ul style="list-style-type: none"> • Availability of data and analysis regarding agricultural economics, land base and production vulnerabilities associated with coastal flooding • Integration of findings into planning and decision-making regarding coastal flooding mitigation

Source: CAI. 2013. Regional Adaptation Strategies, Delta

Table A6.2: Delta: Climate Change Risks and Regional Adaptation Strategies Projects (continued)

Risks & Projects	Objectives	Performance Indicators
<p>2. Forum: Agricultural Production and Economic Vulnerabilities Associated with Coastal Flooding In BC's Lower Mainland</p> <p>Facilitate information exchange regarding sea level rise projections, risks and current plans/processes</p> <p>Also supports:</p> <ul style="list-style-type: none"> • Strategy 1.1 Incorporate agricultural issues into decision-making processes regarding sea level rise & diking • Strategy 1.2 Undertake dike improvements & raise dike levels to address sea level rise • Strategy 1.3 Improve flooding impact mitigation measures 	<ul style="list-style-type: none"> • Build collaboration and partnerships to address issues identified in the study • Integration of agricultural vulnerabilities data/considerations in planning and decision-making regarding coastal flooding mitigation • Development and implementation of strategies to address identified issues and vulnerabilities 	<p><i>Near-term performance indicators:</i></p> <ul style="list-style-type: none"> • Increased awareness of the findings of Project (agricultural land/production vulnerabilities due to coastal flooding) • Integration of agricultural vulnerabilities data/considerations in planning and decision-making regarding coastal flooding mitigation <p><i>Medium to long-term performance indicators (beyond project timeline/scope):</i></p> <ul style="list-style-type: none"> • On-going collaboration across jurisdictions to implement options/strategies initiated through the Forum

Source: CAI. 2013. Regional Adaptation Strategies, Delta

Table A6.2: Delta: Climate Change Risks and Regional Adaptation Strategies Projects (continued)

Risks & Projects	Objectives	Performance Indicators
<p>3. Flooding Preparedness and Mitigation Pilot Project</p> <p>A. Enhance community and farm-level emergency planning for agricultural operations at risk of inundation</p> <p>B. Provide information regarding site-specific flood mitigation measures to producers</p>	<ul style="list-style-type: none"> • Improve the level of planning preparedness for flooding at the municipal, agricultural community, and individual producer levels within the Corporation of Delta • Provide flooding preparedness planning support for 5-10 Delta producers • Strengthen the tools available for producers (potentially across the province) to voluntarily plan and prepare for flooding • Identify practical measures to increase farm resilience to flooding impacts 	<p><i>Near-term performance indicators:</i></p> <ul style="list-style-type: none"> • Updates completed for Delta Livestock Inventory and Evacuation Plans • Identification of priority actions for flooding preparedness/mitigation (i.e. common areas of risk or issues of particular concern) • Availability of improved information regarding preparedness and mitigation <p><i>Medium to long-term performance indicators: (beyond project timeline/scope):</i></p> <ul style="list-style-type: none"> • Broader delivery or integration of planning support to farms in BC flood risk areas OR • Application (by partners) of key findings from pilot regarding priority areas of focus for preparedness/mitigation <ul style="list-style-type: none"> • Implementation of preparedness/mitigation actions

Source: CAI. 2013. Regional Adaptation Strategies, Delta

Table A6.2: Delta: Climate Change Risks and Regional Adaptation Strategies Projects (continued)

Risks & Projects	Objectives	Performance Indicators
<p>4. Delta Farm-Level Adaptation: Pilot and Demonstration Priorities</p> <ul style="list-style-type: none"> • Pilot and demonstrate drainage management options • Develop research and demonstration projects with a focus on salinity reduction and management • Conduct agronomic and economic viability scan for more salt-tolerant crops • Pilot and demonstrate management approaches in Delta (research plots or with willing producer partners) • Identify partners and priorities 	<ul style="list-style-type: none"> • Identify research, demonstration and pilot priorities • Build collaborative approaches for project development and implementation • Strengthen linkages between producer groups and researchers • Develop implementation options and/or projects to accomplish actions associated with research, demonstration and pilots 	<p><i>Near-term performance indicators:</i></p> <ul style="list-style-type: none"> • Agricultural organizations and researchers come together to discuss agricultural adaptation issues and priorities (for research, pilots, demonstration) • Agricultural adaptation research projects (pilots/demonstration) are implemented in Delta
<p>5. Collaborative Communications Strategy</p> <ul style="list-style-type: none"> • Initiate a collaborative communications strategy • Develop and implement a collaborative communications strategy 	<ul style="list-style-type: none"> • Build collaboration between producer groups and other groups in Delta with an interest in agriculture/food security/climate change adaptation • Increase public knowledge and understanding of local agriculture and climate change adaptation issues • Strengthen community support for the agriculture sector in Delta 	<p><i>Near-term performance indicators:</i></p> <ul style="list-style-type: none"> • Improved availability of information about Delta agriculture • Strengthened linkages across organizations with an interest in Delta agriculture, food security, climate change adaptation <p><i>Medium to long-term performance indicators: (beyond project timeline/scope):</i></p> <ul style="list-style-type: none"> • Increased (community level) consideration and concern regarding agriculture’s future in Delta, including climate change impacts

Source: CAI. 2013. Regional Adaptation Strategies, Delta

Table A6.3: Cariboo: Climate Change Risks and Regional Adaptation Strategies Projects

Risks & Projects	Objectives	Performance Indicators
<p>1. Wildfire Preparedness and Mitigation Planning and Resources</p> <ul style="list-style-type: none"> • Collaborative approaches to fuel & wildfire management • Develop collaborative agriculture wildfire plans • Farm-level wildfire damage mitigation planning • Develop agriculture specific wildfire preparedness and mitigation resources • Develop individual farm/ranch level wildfire plans <p>Also supports: Develop collaborative fuel-management strategies for high-risk agricultural interface areas</p>	<ul style="list-style-type: none"> • Minimize the damage to agricultural productivity and infrastructure associated with wildfire events • Improve collaboration with the agricultural community, in wildfire preparedness, mitigation and recovery • Strengthen the (agriculture-specific) information and resources available in emergency situations • Identify costs, issues and barriers around implementation of mitigation measures 	<p><i>Near-term performance indicators:</i></p> <ul style="list-style-type: none"> • Availability of support tools for individual farm fire preparedness/planning • Completion of ~2 collaborative plans • Linking of collaborative plans to regional and provincial plans/processes • Broad availability of agricultural wildfire preparedness and mitigation resources <p><i>Medium to long-term performance indicators (beyond project timeline/scope):</i></p> <ul style="list-style-type: none"> • Implementation of preparedness and mitigation actions as a result of planning processes • Strengthened base of information and collaboration during fire events
<p>2. Livestock Surface Water Assessment and Options</p> <ul style="list-style-type: none"> • Maintain rangeland productivity in a changing climate • Pilot alternate livestock water development options 	<ul style="list-style-type: none"> • Evaluate existing (and potential future) livestock water shortages and surface water limitations • Identify parameters for resilient surface water development • Maintain rangeland productivity • Maintain livestock health and production yield through water shortages • Provide recommendations for locally suitable options for livestock water maintenance and development • Encourage strategic land based investment in water development on Crown range 	<p><i>Near-term performance indicators:</i></p> <ul style="list-style-type: none"> • Assessment of livestock water and range productivity/accessibility vulnerabilities in the Cariboo region • Assessment of the suitability of current livestock water technologies for future conditions • Initiation of pilot project (including cost-benefit) for livestock water development option <p><i>Medium to long-term performance indicators (beyond project timeline/scope):</i></p> <ul style="list-style-type: none"> • Increased availability of information regarding alternative livestock watering approaches • Implementation of alternative livestock water development options and infrastructure • Improved resilience and viability of rangeland with livestock water limitations

Source: CAI. 2013. Regional Adaptation Strategies, Cariboo

Table A6.3: Cariboo: Climate Change Risks and Regional Adaptation Strategies Projects (continued)

Risks & Projects	Objectives	Performance Indicators
<p>3. Cooperative Maintenance & Enhancement of Agriculturally Significant Dams</p> <p>Maintain and enhance agriculturally significant dams</p> <ul style="list-style-type: none"> • Inventory and prioritize existing dams/water storage • Develop cooperative approaches to dam assessments, upgrades, maintenance and management 	<ul style="list-style-type: none"> • Ensure future availability of sufficient and sustainable water supply for agricultural production • Identify potential cost and risk-sharing models for agricultural dams • Build collaboration and partnerships to address agricultural dam upgrades and maintenance • Identify, describe and document co-benefits associated with dams and their maintenance/upgrades 	<p><i>Near-term performance indicators:</i></p> <ul style="list-style-type: none"> • Engagement of partners in process • Completion of comprehensive inventory • Development of collaborative/cost-share model <p><i>Medium to long-term performance indicators (beyond project timeline/scope):</i></p> <ul style="list-style-type: none"> • Implementation of a cooperative process for technical support, maintenance and management and upgrades of agricultural dams • Transferring of process to other areas of the province

Source: CAI. 2013. Regional Adaptation Strategies, Cariboo

Table A6.4: Peace: Climate Change Risks and Regional Adaptation Strategies Projects

Risks & Projects	Objectives	Performance Indicators
<p>1. Feasibility Study: Defining a New Approach to Agricultural Land Use Inventory in the Peace</p> <ul style="list-style-type: none"> Undertake agricultural water demand modeling 	<ul style="list-style-type: none"> Evaluate the feasibility of conducting an alternative form of ALUI including: <ul style="list-style-type: none"> Assessing local data needs that might be met through ALUI/AWDM processes Evaluating data collection methods Define a new and cost-effective approach that will support various agricultural initiatives in the region 	<p><i>Near-term performance indicators include:</i></p> <ul style="list-style-type: none"> Identification of an ALUI approach that is practical and cost-effective for the Peace region Identification of local data needs that would be met by ALUI & AWDM Application of findings to decisions regarding next steps for ALUI and AWDM for the Peace region
<p>2. Evaluation of irrigation potential in the BC Peace region</p> <ul style="list-style-type: none"> Evaluate priority areas for agricultural water storage and/or irrigation infrastructure development Undertake cost-benefit/feasibility study of irrigation and collective water storage options for key agricultural areas 	<ul style="list-style-type: none"> To help establish the future potential for irrigation and water demand for crop production in the Peace region To help identify structure and scale-appropriate irrigation systems based on current and future cropping scenarios To identify physical and institutional constraints related to irrigation in the Peace region To establish preliminary cost-benefit estimates for various irrigation and cropping scenarios 	<p><i>Near-term performance indicators include:</i></p> <ul style="list-style-type: none"> Availability of new and more detailed information regarding irrigation potential associated with various supply sources Effective distribution and communication of findings to local agricultural organizations and local government Improved understanding of irrigation potential in the Peace region Application of findings to next steps with AWDM <p><i>Medium to long-term performance indicators (beyond project timeline/scope):</i></p> <ul style="list-style-type: none"> Consideration and integration of findings by local agricultural groups and local governments – specifically in local and regional planning Implementation of additional research and/or feasibility activities (if warranted by finding)

Source: CAI. 2013. Regional Adaptation Strategies, Peace

Table A6.4: Peace: Climate Change Risks and Regional Adaptation Strategies Projects (continued)

Risks & Projects	Objectives	Performance Indicators
<p>3. Peace Agriculture Weather Monitoring and Decision Support Tools</p> <ul style="list-style-type: none"> Evaluate options for improving weather data collection and analysis (e.g. costs, timelines, long-term sustainability) Implement selected option and ensure availability of weather data to producers 	<ul style="list-style-type: none"> To establish a collaborative approach to expanding and maintaining the weather monitoring network within the BC Peace region; To Increase the quantity and quality of weather data available to support producer decisions (real-time, seasonal and long-term); and To increase the availability of relevant decision support tools for Peace region producers 	<p><i>Near-term performance indicators include:</i></p> <ul style="list-style-type: none"> Increased weather monitoring in agricultural areas with significant gaps Improvement of overall geographic coverage of weather monitoring data Availability of Peace-specific decision support tools On-going participation of partners in collaborative maintenance of monitoring system <p><i>Medium to long-term performance indicators (beyond project timeline/scope):</i></p> <ul style="list-style-type: none"> Continued maintenance of monitoring network Expansion of both monitoring network and its linkages to agricultural research Development of additional agricultural decision support tools
<p>4. Increasing Availability of Agriculturally Relevant Weather Data (Phase 1)</p> <ul style="list-style-type: none"> Evaluate options for improving weather data collection and analysis 	<ul style="list-style-type: none"> Identify options for improving access to weather data for agricultural purposes Develop a strategy for increasing availability of weather data for agricultural producers in the Peace Increase the quantity and quality of weather data available to support producer decisions (seasonal and short-medium term) 	<p><i>Near-term performance indicators include:</i></p> <ul style="list-style-type: none"> Development of a strategy to address agricultural weather data gaps Adoption of the strategy by industry organizations <p><i>Medium to long-term performance indicators (beyond project timeline/scope):</i></p> <ul style="list-style-type: none"> Implementation of strategy to address weather data gaps including: <ul style="list-style-type: none"> New monitoring stations (if needed) Integration of existing monitoring into agricultural networks New weather data informational tools

Source: CAI. 2013. Regional Adaptation Strategies, Peace

Table A6.4: Peace: Climate Change Risks and Regional Adaptation Strategies Projects (continued)

Risks & Projects	Objectives	Performance Indicators
<p>5. Collaborative Monitoring Pilot</p> <ul style="list-style-type: none"> • Convene key partners to determine best approach for sustainable monitoring of pests, diseases, weeds and invasive species • Implement monitoring to collect critical data regarding pests, diseases, weeds and invasive species 	<ul style="list-style-type: none"> • Determine priority gaps – areas of risk – and issues with respect to monitoring and data processing/sharing • Increase availability of data and analysis for the BC Peace regarding the presence of agriculturally significant pests, diseases, weeds • Improve the ability to evaluate if (and how) the prevalence and distribution of pests, diseases and weeds in the BC Peace is changing and to quickly identify risks to agricultural production • Improve long-term capacity to track changes occurring in prevalence and distribution of pests 	<p><i>Near-term performance indicators include:</i></p> <ul style="list-style-type: none"> • On the ground monitoring of economically significant pests, pathogens and weeds (in the BC Peace) • Availability to producers of the monitoring information of monitoring data • Improved local capacity and expertise to monitor pests, pathogens and weeds • Improved linkages with AAFC experts and data processing opportunities <p><i>Medium to long-term performance indicators (beyond project timeline/scope):</i></p> <ul style="list-style-type: none"> • On-going monitoring of BC Peace (economically significant) pests, pathogens and weeds • Long-term capacity to monitor changes in distribution and prevalence of pests, pathogens, weeds

Source: CAI. 2013. Regional Adaptation Strategies, Peace.

Table A6.5: Fraser Valley: Climate Change Risks and Regional Adaptation Strategies Projects

Risks & Projects	Objectives	Performance Indicators
<p>1. Freshet Flooding and Fraser Valley Agriculture: Evaluating Impacts and Options for Resilience</p> <ul style="list-style-type: none"> Determine agricultural economic and production impacts associated with freshet flooding and assess options to mitigate losses, increase resilience, and speed recovery. 	<ul style="list-style-type: none"> Evaluate the potential costs and production impacts associated with freshet flooding Identify and evaluate options for mitigation of flooding impacts and losses for agriculture Identify & evaluate options for efficient and effective post-flood recovery Strengthen sector awareness, engagement and preparedness regarding flood risk in the Fraser Valley 	<p><i>Near-term performance indicators:</i></p> <ul style="list-style-type: none"> Availability of data and analysis regarding agricultural economic, land base and production vulnerabilities associated with freshet flooding Increase awareness, engagement and preparedness regarding flood risk and potential impacts to agriculture <p><i>Medium to long-term performance indicators (beyond project timeline/scope):</i></p> <ul style="list-style-type: none"> Implementation of options/strategies for mitigation Implementation of options/strategies for effective post-flood recovery Integration of findings into planning and decision-making regarding flooding preparedness and mitigation
<p>2. Enhanced Collaboration for Agricultural Drainage & Ditch Management</p> <p>Develop a coordinated cross-agency approach to agricultural to agricultural ditch & drainage management</p> <ul style="list-style-type: none"> Assess the current state of agricultural ditches and drainage across the FVRD Develop options to improve coordination of ditch and drainage management 	<ul style="list-style-type: none"> Assess the current state of agricultural ditches/drainage and evaluate potential impacts of climate change Identify areas of priority for management and infrastructure improvements Strengthen communication and coordination for effective and timely agricultural ditch and drainage maintenance Create a primary updated information source for clear and consistent information for producers about ditch and drainage maintenance 	<p><i>Near-term performance indicators:</i></p> <ul style="list-style-type: none"> Completion of assessment Completion of ~2 workshops Availability of updated information about processes/requirements re: agricultural ditches Clear points of contact for producers regarding drainage/ditch maintenance <p><i>Medium to long-term performance indicators (beyond project timeline/scope):</i></p> <ul style="list-style-type: none"> Improved resource availability for addressing runoff, ditching and drainage approaches Implementation of streamlined processes for producers to address challenges associated with drainage and ditching

Table A6.5: Fraser Valley: Climate Change Risks and Regional Adaptation Strategies Projects (continued)

Risks & Projects	Objectives	Performance Indicators
<p>3. Agricultural Water Workshop Series</p> <ul style="list-style-type: none"> • Address critical information gaps to assist producers with water management decisions • Strengthen knowledge transfer of water management tools, technologies and resources 	<ul style="list-style-type: none"> • To provide producers with: <ul style="list-style-type: none"> - Information regarding the current and future regulatory and water supply contexts in the region - Access to expertise regarding existing water management tools and resources - Technical information regarding agricultural water management • Local demonstration(s) of successful implementation of best practices and technologies 	<p><i>Near-term performance indicators include:</i></p> <ul style="list-style-type: none"> • Completion of two workshops in the Fraser Valley events on water regulation, supply and management • Completion of (1) tour of FVRD innovative water management sites • A high level of interest in aforementioned workshops/tour • Availability of a knowledge transfer resource as a result of sessions • Increased knowledge of regulatory changes, water supply and climate change issues • Increased interest in adoption of resources, practices and technologies <p><i>Medium to long-term performance indicators (beyond project timeline/scope):</i></p> <ul style="list-style-type: none"> • Continued distribution of knowledge transfer resource • Increased uptake in existing water management resources and increased demand for additional knowledge transfer/water resources • Increased optimization of agricultural water (implementation of adaptive approaches)

Source: CAI. 2013. Regional Adaptation Strategies, Fraser Valley

Appendix 7: B.C. Ministry of Agriculture Climate Change Adaptation Program Performance Measurement Strategy 2013-2018

(See next page)



**B.C. Ministry of Agriculture
Climate Change Adaptation Program**

Performance Measurement Strategy 2013-2018

Growing Forward 2

Date: November 27, 2014



Canada

1. Introduction

The Growing Forward 2 (GF2) Agri-Innovation Program provides funding to advance innovation and competitiveness in five areas of activity, one of which is climate change adaptation. A Federal-Provincial bilateral performance measurement strategy (PMS) has been implemented to measure performance indicators for innovation (Innovation PMS).

While the broad performance indicators for innovation from the Innovation PMS can be applied to the program, climate change adaptation is a unique component of innovation which is more effectively measured using specific performance indicators. Development of climate change adaptation specific performance indicators is not a requirement of the GF2 agreement. However, specific measurements will enable a more refined evaluation of the successes and challenges of the program and assist in informing future program direction.

The format for this climate change adaptation PMS follows the format of the Federal-Provincial-Territorial PMS for cost-shared programming (January 9, 2014). Reporting for the climate change adaptation performance indicators is described in this document for the five-year GF2 program from 2013-2018.

The climate adaptation program PMS has three main components:

- i. program logic model
- ii. performance measurement plan (quantitative performance indicators)
- iii. template for Qualitative Summary Report

2. Key Considerations

In a paper titled *How to track adaptation to climate change*, Ford et al. state that tracking climate change adaptation progress is constrained by the complex nature of adaptation and the absence of measurable outcomes or indicators.¹² While outcome-based approaches are widely used for monitoring and evaluation, their use in an adaptation context is constrained by the difficulty of attributing vulnerability reduction to adaptation action. Moreover, the effectiveness of adaptation may not be evident for many decades and is dependent on uncertain and unknown future climatic and socioeconomic conditions. In addition, “successful” adaptation would likely be perceived differently by, and among, scholars, policy makers, and various communities and stakeholders.

GF2 is a five year program with climate change adaptation projects starting and ending at various dates over 2013-2018. Many projects build on one another during the life of the program and some projects will only end in 2018. The end outcomes for the climate change adaptation PMS will be the most challenging to evaluate, as the performance indicators qualitatively measure a change in state five to

¹² Ford, J.D., L. Berrang-Ford, A. Lesnikowski, M. Barrera and S. Jody Heymann. 2013. How to track adaptation to climate change: a typology of approaches for national-level application. *Ecology and Society* 18(3):40. <http://dx.doi.org/10.5751/ES-05732-180340>

ten years from project completion. Therefore, monitoring beyond the end of GF2 will be required to measure and report on long term outcomes.

3. Strategic Objective

The Ministry of Agriculture's Service Plan (2014/15 - 2016/17) includes goals and objectives related to climate change and the Innovation PMS includes end outcomes for innovation which include climate change. Working with these objectives and outcomes, the following strategic objective/outcome for the climate change adaptation program has been developed.

Agricultural production is sustained and enhanced as the sector proactively adapts to climate change.

4. Program Description

The climate change adaptation program is designed to help industry to lead and improve its capacity to adapt successfully to climate change, and thereby to enhance its competitiveness and sustainability. Program delivery is through the BC Agriculture & Food Climate Action Initiative. The program provides funding for:

- development and implementation of collaborative regional adaptation strategies
- piloting, demonstration and sharing of innovative adaptation at the farm level
- communications about adaptation and adaptation programming
- program administration, program management and project development functions

5. Program Areas

The climate change adaptation program is divided into three program areas for development of the PMS logic model and performance measurement plan:

- Regional adaptation strategies (RAS)** for collaborative and regional scale agricultural adaptation action planning
- Regional adaptation (RA) projects** to implement actions in the Regional Adaptation Strategies
- Farm adaptation innovator (FAI) projects** conducted to increase the capacity of BC farmers to adapt to climate change and weather related production risks and impacts

6. Programming Logic Model

The attached logic model (Table 1. Climate Change Adaptation – Programming Logic Model on page 6) shows the logical relationships among the resources that are invested, the activities that take place and the impacts or changes that result. The logic model presents the **outputs** and immediate, intermediate and end **outcomes** for each of the three program areas.

Key Assumptions

- *Involvement of local government and industry partners through participation and financial contribution is a strong indicator of success*
- *Level of financial contribution relative to the overall project budget does not necessarily reflect the level of involvement and commitment because government and industry budgets are often very limited and in-kind contributions are often made*
- *Increased knowledge and awareness of climate change projections, impacts and adaptation strategies among government and industry builds adaptive capacity*
- *Fostering collaboration between partners, and testing pilot/demonstration projects builds government and industry capacity for future project implementation*

7. Performance Measurement Plan

The Performance Measurement Plan contains the performance indicators used to measure progress against Logic Model elements, sets the bar for progress, and details the what, how, who, and when for collecting data. The indicators identified are to guide program design, management and reporting.

Quantitative Measurements

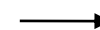
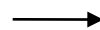
Each of the three program areas is addressed in a separate table ([Table 2](#). Regional Adaptation Strategies (RAS) – Performance Indicators [RAS](#) on page 8, [Table 3](#). Regional Adaptation Projects – Performance Indicators [RA projects](#) on page 11, [Table 4](#). Farm Adaptation Innovator Fund – Performance Indicators on page 14), which lists the outcomes, performance indicators, targets, target dates, data sources and frequency of data collection. The results for immediate and intermediate outcomes from each of the five years of the GF2 program will be recorded annually and summarized in the fifth year (2018).

Qualitative Measurements

A Qualitative Summary Report ([Appendix 1](#). Annual/Interim/Final Qualitative Summary Report on page 14) of the performance indicators will be submitted annually to provide details which are difficult to quantify. An interim report for September 30, 2015 and a five year summary report for 2013-2018 will also include results for end outcomes.

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Table 1. Climate Change Adaptation – Programming Logic Model								
Activities <i>What we do</i>		Outputs <i>What we produce</i>		Immediate Outcomes <i>Change in knowledge/awareness</i> (6-18 months)		Intermediate Outcomes <i>Change in behaviour/practice</i> (2-3 years)		End Outcomes <i>High-level change in state</i> (5-10 years)
Regional Adaptation Strategies (RAS) Develop strategies to approach climate adaptation from a regional perspective (see Table 2 , Regional Adaptation Strategies (RAS) – Performance Indicators on page 8)	→	RAS reports	→	Local governments and producers have knowledge of climate change stressors projected to impact their areas and of priority strategies and actions to facilitate agricultural adaptation	→	Local government and industry participation in implementation of strategies	→	Agricultural climate change projects are adopted by other organizations allowing projects to continue in some form beyond the life of the performance evaluation
		RAS workshops						
		Workshop materials		Expanded knowledge and awareness of agricultural climate change adaptation across B.C.				
		Advisory Committee meetings						
Regional Adaptation Projects Conduct projects to implement the Regional Adaptation Strategies (RAS) (see Table 3 , Regional Adaptation Projects – Performance Indicators on page 11)	→	Completed projects	→	Projects are implemented collaboratively to build capacity and knowledge of adaptation of regional partners	→	Public/widespread information transfer	→	Projects have enhanced adaptive capacity in the region (<i>measured qualitatively</i>)
		Individualized information transfer and planning to producers				Other jurisdictions are referencing, building on, or using project materials (<i>measured qualitatively</i>)		
								Small to medium group information transfer to producers
Farm Adaptation Innovator Fund		Projects		Producers are aware of adaptation practices being tested.		Producers have knowledge and resources for specific actions to		Increased adaptive capacity (<i>measured qualitatively</i>)



<p>Conduct farm level adaptation projects to build climate change adaptive capacity</p>		<p>Information summaries/ updates/ fact sheets</p>				<p>facilitate agricultural adaptation</p>		
<p>(see Table 4. Farm Adaptation Innovator Fund – Performance Indicators on page 14)</p>		<p>Reports</p>		<p>Industry partners are investing in adaptation</p>				

Table 2. Regional Adaptation Strategies (RAS) – Performance Indicators

Outputs/Outcomes	Performance Indicator	Baseline	5 Year Target (2013-2018)	Data Source	Frequency	Results					
						2013/14	2014/15	2015/16	2016/17	2017/18	2013-2018 (5 year)
Outputs <i>What we produce</i>											
Regional Adaptation Strategies reports	Number of RAS reports completed (3 completed in 2012/13 and released in 2013/14 are included)	3	4 more RAS reports = 7 in total	Program Manager	Annually with Q4 reporting	3 released: Cowichan, Delta, Peace	1 completed: Cariboo				
Regional Adaptation Strategies workshops	Number of workshops	0	3 workshops per strategy = 21 workshops	Program Manager	Annually with Q4 reporting						
	Number of workshop participants	0	20 per workshop = 420 in total	Program Manager	Annually with Q4 reporting						
Advisory Committee meetings	Number of Advisory Committee meetings and number of attendees	0	3 meetings per strategy = 21 meetings	Program Manager	Annually with Q4 reporting						
Workshop materials	Number of workshop materials developed.	0	Per strategy: Maps (6) (including base maps, temperature and precipitation maps), climate effects (1) and agriculture impacts (1) handouts, info graphic (1) and profile sheets (6)	Program Manager	Annually with Q4 reporting						
Immediate Outcomes <i>Change in knowledge/awareness (6-18 months)</i>											
Local governments and producers have knowledge of priority strategies and actions to facilitate agricultural adaptation	Number of attendees at Regional Adaptation Strategies workshops who reported gaining new knowledge	0	30 per region = 210 in total	Workshop feedback forms	Annually with Q4 reporting						
	Number of presentations to initiate process and engage advisory committee, local government and/or industry partners	0	1 per region = 7 in total	Program Manager	Annually with Q4 reporting						
	Numbers of letters/outreach to industry and local government	0	7 letters per region = 49 in total.	Program Manager	Annually with Q4 reporting						
Local governments and	Percentage of return participants	0	50% per region	Program	Annually with						

Table 2. Regional Adaptation Strategies (RAS) – Performance Indicators

Outputs/Outcomes	Performance Indicator	Baseline	5 Year Target (2013-2018)	Data Source	Frequency	Results					
						2013/14	2014/15	2015/16	2016/17	2017/18	2013-2018 (5 year)
producers are engaged and committed to Regional Adaptation Strategies process	between first and second workshops in each region			Manager	Q4 reporting						
	Number of local government and industry participants committed to Advisory Committee	0	5 per region = 35 in total	Program Manager	Annually with Q4 reporting						
	Amount of local government funding committed to the strategies process	0	\$ 5 000 per region = \$35 000 in total	Program Manager	Annually with Q4 reporting						
All Immediate Outcomes	Relevant Performance Indicators	<i>Qualitative Assessment</i>		Program Manager	Annually with Q4 reporting						
Intermediate Outcomes <i>Change in behaviour/practice (2-3 years)</i>											
Local government and industry participation in implementation of strategies	Number of Regional Adaptation Strategies projects implemented	9 completed projects	Minimum of 3 projects per RAS = 21 projects	Program Manager	Annually with Q4 reporting						
	Amount of industry and government funding committed to Regional Adaptation Strategies projects	0	\$10 000 per RAS = \$70 000 in total	Program Manager	Annually with Q4 reporting						
	Number of local government and industry participants committed to Regional Working Groups	0	5 per region = 35 in total	Program Manager	Annually with Q4 reporting						
	Number of local partners responsible for project administration.	0	1 per region = 7 in total	Program Manager	Annually with Q4 reporting						
External (non-partner) engagement in strategy implementation	Amount of funding from external organizations committed to Regional Adaptation Strategies projects	0	\$5 000 per RAS = \$35 000 in total	Program Manager	Annually with Q4 reporting						
Expanded knowledge and awareness of agriculture climate change adaptation across B.C.	Number of downloads of Strategies from CAI website	TBD	TBD	Web analytics	Annually with Q4 reporting						

Table 2. Regional Adaptation Strategies (RAS) – Performance Indicators

Outputs/Outcomes	Performance Indicator	Baseline	5 Year Target (2013-2018)	Data Source	Frequency	Results					
						2013/14	2014/15	2015/16	2016/17	2017/18	2013-2018 (5 year)
All Intermediate Outcomes	Relevant Performance Indicators	<i>Qualitative Assessment</i>		Program Manager	Annually with Q4 reporting						
End Outcomes <i>High-level change in state (5-10 years)</i>											
Regions are adapting to climate change	Number of actions that have been addressed through a project	0	3 per region (interim) 6 per region (final)	Program Manager	Sep 30/15 (interim report) & Mar 31/18 (final report)						
	Percentage of impact area strategies that have been addressed in whole or in part through a project	0%	20% per region (interim) 35% per region (final)	Program Manager	Sep 30/15 (interim report) & Mar 31/18 (final report)						
Projects from strategies are adopted by other organizations allowing projects to continue in some form beyond the life of the performance evaluation	Number of projects adopted by third party organizations or provincial government.	0	1 per region = 7 in total	Program Manager knowledge from contacts	Mar 31/18 (final report)						
All End Outcomes	Relevant Performance Indicators	<i>Qualitative Assessment</i>		Program Manager	Sep 30/15 (interim report) & Mar 31/18 (final report)						

Table 3. Regional Adaptation Projects – Performance Indicators											
Outputs/Outcomes	Performance Indicator	Baseline	5 Year Target (2013-2018)	Data Source	Frequency	Results					
						2013/14	2014/15	2015/16	2016/17	2017/18	2013-2018 (5 year)
Outputs <i>What we produce</i>											
Projects completed	Number of projects completed.	0	Minimum of 4 per RAS = 28 in total	Program Manager	Annually with Q4 reporting						
Project deliverables	Number of project deliverables.	0	Minimum of 8 per RAS = 56 in total	Program Manager	Annually with Q4 reporting						
Immediate Outcomes <i>Change in knowledge/awareness (6-18 months)</i>											
Projects implemented collaboratively to build capacity and knowledge of adaptation of regional partners	Number of projects approved by working group and Growing Forward 2 review committee	0	Minimum of 3 per RAS = 21 in total	Program Manager	Annually with Q4 reporting						
	Number of partners on project implementation	0	Minimum of 2 per RAS = 14 in total	Program Manager	Annually with Q4 reporting						
All Immediate Outcomes	Relevant Performance Indicators	<i>Qualitative Assessment</i>		Program Manager	Annually with Q4 reporting						
Intermediate Outcomes <i>Change in behaviour/practice (2-3 years)</i>											
Public/widespread information transfer	Number of outputs that are publicly available	0	3 per RAS = 21 in total	Program Manager	Annually with Q4 reporting						
	Number of media stories pertaining to adaptation projects.	0	4 per year = 28 total per year	Program Manager	Annually with Q4 reporting						
Individualized information transfer and planning to producers	Number of participants in project pilots/ one-on-one planning pilots	0	5 per pilot project. (# of pilots 2-4	Program Manager	Annually with Q4 reporting						
Small-medium group information transfer to	Number of participants in project pilots/ group planning processes	0	10 per pilot project (# of pilots 2-4	Program Manager	Annually with Q4 reporting						

Table 3. Regional Adaptation Projects – Performance Indicators

Outputs/Outcomes	Performance Indicator	Baseline	5 Year Target (2013-2018)	Data Source	Frequency	Results					
						2013/14	2014/15	2015/16	2016/17	2017/18	2013-2018 (5 year)
producers	Number of forums/presentations	0	2 per region = 14 in total	Program Manager	Annually with Q4 reporting						
	Information summaries/updates	0	5 per region = 35 in total	Program Manager	Annually with Q4 reporting						
Local governments and producers have knowledge of specific actions to facilitate agricultural adaptation	Number of participants in pilots who reported gaining new knowledge	0	4 per pilot project (# of pilots 2-4)	Survey by Program Manager	Annually with Q4 reporting						
	Percentage of participants in forums/presentations who reported gaining new knowledge	0	75% of participants	Survey by program Manager	Annually with Q4 reporting						
	Number of inquiries and interest about tools and resources from government, producers, academic, non-profit organizations and others who are not directly involved via working group	0	12	Program Manager	Mar 31/18 (final report)						
All Intermediate Outcomes	Relevant Performance Indicators	<i>Qualitative Assessment</i>		Program Manager	Annually with Q4 reporting						
End Outcomes <i>High-level change in state (5-10 years)</i>											
Projects have enhanced adaptive capacity in the region	Increased resilience and adaptive capacity related to: financial resources, policy and regulatory resources, human and social resources, knowledge resources and physical resources	<i>Qualitative assessment</i>		Project completion reports	Sep 30/15 (interim report) & Mar 31/18 (final report)						
Projects are adopted by other organizations allowing projects to continue in some form beyond the life of the performance evaluation	Number of projects adopted by third party organizations or provincial government	0	1 per region = 7 in total	Program Manager	Sep 30/15 (interim report) & Mar 31/18 (final report)						

Table 3. Regional Adaptation Projects – Performance Indicators

Outputs/Outcomes	Performance Indicator	Baseline	5 Year Target (2013-2018)	Data Source	Frequency	Results					
						2013/14	2014/15	2015/16	2016/17	2017/18	2013-2018 (5 year)
Other jurisdictions are referencing, building on or using project materials	Evidence of other jurisdictions engaging with materials through posing questions, attending presentations and/or requesting meetings with CAI or other partners		<i>Qualitative assessment</i>	Program Manager & interviews with project partners (conducted by 3 rd party)	Mar 31/18 (final report)						

Table 4. Farm Adaptation Innovator Fund – Performance Indicators											
Outputs/Outcomes	Performance Indicator	Baseline	5 Year Target (2013-2018)	Data Source	Frequency	Results					
						2013/14	2014/15 (pilot year)	2015/16	2016/17	2017/18	2013-2018 (5 year)
Outputs <i>What we produce</i>											
Projects	Number of projects	0	Minimum of 10	Project Manager	Annually with Q4 reporting	n/a					
Information transfer	Number of field days and other information transfer events	0	Minimum of 10	Project Manager	Annually with Q4 reporting	n/a					
Reports	Number of project reports	0	Minimum of 10	Project Manager	Annually with Q4 reporting	n/a					
Immediate Outcomes <i>Change in knowledge/awareness (6-18 months)</i>											
Producers are aware of adaptation practices being tested	Number of attendees at field days	0	Minimum of 10 per demo/pilot	Project Manager	Annually with Q4 reporting	n/a					
Partners are investing in adaptation	Amount of non-Growing Forward 2 funding committed to projects per year	0	\$75,000-\$150,000 per year	Project Manager	Annually with Q4 reporting	n/a					
Intermediate Outcomes <i>Change in behaviour/practice (2-3 years)</i>											
Producers have knowledge and resources for specific actions to facilitate agricultural adaptation	Number of project summaries, industry fact sheets and resources on quality/yield effectiveness and/or cost effectiveness of practices	0	Minimum of 10	Project Manager knowledge from funding recipient	Annually with Q4 reporting	n/a					
End Outcomes <i>High-level change in state (5-10 years)</i>											
Increased adaptive capacity	Evidence of increased resilience and adaptive capacity related to: financial resources, policy and regulatory resources, human and social resources, knowledge resources and physical resources		<i>Qualitative Assessment</i>	Interviews with funding recipients (interviews conducted by third party)	Mar 31/18 (final report)	n/a					

Appendix 1. Annual/Interim/Final Qualitative Summary Report

– template follows on next page –



PERFORMANCE MEASUREMENT STRATEGY

QUALITATIVE SUMMARY REPORT

Title: Climate Change Adaptation Program

[Annual_Interim_Final +Date]

Growing Forward 2

Contract Number:



1. PROJECT IDENTIFICATION

Contract #:	
Project Name:	
Delivery Agent:	
Project Manager:	
AGRI Project Liaison:	
GF2 (Innovation) Funding:	\$ _____ for [term]

2. PROJECT DESCRIPTION AND SUMMARY

Background	Summary
Description:	
Goal: What did you hope to achieve?	
Region	Summary
<i>A brief description of the relevant immediate, intermediate and/or end outcomes by region</i>	
Cowichan Region	
Delta Region	
Peace Region	
Cariboo Region	
Fraser Valley Region	
Okanagan Region	
Region #7 TBD	

3. PERFORMANCE MEASUREMENT PLAN TABLES 2, 3 & 4

Attach the performance measurement plan tables:

- Table 2 Regional Adaptation Strategies (RAS) – Performance Indicators
- Table 3 Regional Adaptation Projects – Performance Indicators
- Table 4 Farm Adaptation Innovator Fund – Performance Indicators

4. ATTACHMENTS

Attach links to project report(s) where appropriate

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