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Strengthening *BC's Agriculture Sector* in the Face of Climate Change

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EXECUTIVE SUMMARY

The science to date is unequivocal: the climate is changing and getting warmer, and it is occurring faster than most climate models and projections have indicated. Recent extreme weather events—such as the 2012-2013 record high temperatures and drought in the United States (US) and Australia, Russia's heat wave and flooding in Pakistan in 2010—have demonstrated the vulnerability of agricultural production and food prices to these events that are projected to increase in frequency and severity as the climate changes.

British Columbia (BC) is not exempt. Its agricultural sector is also vulnerable to the direct impacts of climate change, as well as the resulting shifts in global economic conditions. The agriculture sector in BC is characterized by a high level of diversity, an unusually limited land base, the prevalence of small, family-owned farms, and an aging producer population. These characteristics impose a high degree of exposure to potential climate change impacts. BC's farmers and agricultural organizations are now being called on to take on increasing risk, costs and responsibility, with fewer resources at their disposal.

While coping with uncertain factors—such as weather and commodity prices—has always been a common element of farming life, climate change raises the stakes. But the common assumption that a warming climate will be a boon for agriculture production in northern climes is now recognized to be false—the full suite of projected changes indicates that the risks to agricultural viability are substantial. The scope, scale and pace of climate change are expected to exceed anything previously experienced. To the farmer on the land, this means that the past is no longer a sufficient guide to the future. Average and extreme conditions are shifting, complexity and variability are rising, and cumulative and long-term climate impacts are increasing.

This white paper builds on the findings of the BC Agriculture Climate Change Risk & Opportunity Assessment of 2012. The assessment is the most comprehensive evaluation to date of potential climate change impacts, risks and opportunities for agriculture provincially. It is based on perspectives gathered from agricultural producers and other specialists about the ability of farmers and their industry as a whole to adapt to a changing climate, and the approaches, tools and resources required to support such adaptation.

The focus here is specifically on the critical role that government policy-makers play in addressing the complexity that climate change imposes on the agricultural sector. In that context, the paper makes the following recommendations, all aimed to assist government in taking needed steps that will ensure BC agriculture's resilience into the future.

1. Review existing governance, management and policy-making structures to increase adaptability
2. Conduct collaborative, applied research (e.g. variety trials, risk assessments)
3. Enhance training and support for climate change innovation by farm businesses
4. Build the long-term capacity of the agriculture industry by enabling new entrants

5. Improve income stability for farmers in the short and long-term
6. Invest in climate-smart water infrastructure improvements
7. Integrate adaptation and agricultural impacts into land use planning and management
8. Continue to protect farmland through the Agricultural Land Reserve (ALR) and bolster the Agricultural Land Commission's (ALC) resources to support viable agricultural production in a changing climate
9. Lay the groundwork for large-scale transitions

Improving adaptation and risk management will require changes to specific practices, programs and policies, and shifting to a decision model that can proactively adapt to changing conditions. Governance structures are currently not designed to respond well to the level of complexity, interconnectedness and speed of change now upon us. The hierarchical nature of ministries can also create silos where information is not being shared or coordinated, thereby disconnecting decision-makers from what is happening on the ground.

Adaptation demands more integrated, collaborative and future-oriented governance structures. The existing knowledge and assets in the industry should be at the centre of strategies to enhance agricultural resilience, while providing additional resources and attention to addressing gaps and barriers that limit the industry's current adaptive capacity.

The resilience of the BC agriculture sector is already being stretched, even before climate change impacts are factored in. With an aging producer population, growing land use pressures, increasing demands and diminishing resources, action must be taken to avoid surpassing a critical point that will see BC's agricultural enterprise significantly diminished.

1. INTRODUCTION

Human well-being is dependent on the sustainable production of food in an increasingly globalised food system. Evidence and understanding of the potential impacts of climate change on food production is rapidly accumulating [1-3], accompanied by increasingly urgent calls for agricultural adaptation to those impacts. [4-7]

This message has hit home in recent years as extreme weather events have resulted in food shortages whose impacts have been felt around the world. Close to home the most extensive drought since the mid-1950s hit the United States in the summer of 2012, affecting 60% of crop and livestock producing areas there. As a result, significant increases in commodity prices and livestock feed prices are being felt in 2013.[8] Prior to this, world food prices hit their highest point ever in April, 2011[9] after a series of extreme weather events in 2010—including flooding in Pakistan and in Queensland Australia, an extraordinary heat wave in Russia, and intense late-spring rainfall in Saskatchewan and Manitoba— all contributed to major crop failures.[10] These kinds of events are projected to become much more common as climate change progresses.

Global climate impacts affect the availability and price of many essential foods, as well as the economic conditions faced by BC farmers. Currently the province imports more than half its food, with the extent of self-reliance varying dramatically for different products .[11,12,13] With an increasingly export-oriented vegetable and fruit sector, the majority of the vegetables and fruit consumed in BC are imported from California. Anticipated climate impacts in that state include diminished yields, shorter periods of crop development, reduced product quality, and shifts in growing regions suitable for specialty crops. [14,15] By the end of the century, the Sierra Nevada snowpack is predicted to be up to 70% lower than at present, which would lead to significant water shortages in California due to heavier reliance on already scarce groundwater resources. [14,16,17] This year may be a harbinger of climate change to come: Farmers in the western San Joaquin Valley in central California—part of the region that produces about one-eighth of the US food supply—were told by the U.S. Department of the Interior in late March that because of an abnormally low snowpack in the Sierras, they will receive only 20% of their 'normal' allocation of irrigation water in the summer of 2013.[18]

Important work outlining climate change impacts and adaptation for the agriculture sector in Canada has been done over the years, particularly looking at the Prairies, Ontario and the Okanagan region of BC.[19-23] The 2007 book "Farming in a Changing Climate" provides a comprehensive overview of research specific to adaptation for Canadian agriculture.[24] In 2011, a national review of agriculture and climate change adaptation was prepared for the federal government, outlining challenges, adaptation options and policy & research gaps.[25]

Studies specific to the BC agriculture context have almost exclusively focused on the Okanagan region. Extensive research there has examined climate change impacts, vulnerability and adaptive capacity, water management and crop suitability for agriculture.[26-31] A multi-year, multi-partner project to develop an agriculture water demand model was developed in the Okanagan Basin and is now being transferred to other parts of the province.[32]

This white paper is informed by the BC Agriculture Climate Change Adaptation Risk & Opportunity Assessment [33], completed in 2012 and led by the BC Agriculture Council's Climate Action Initiative (CAI) designed to address the priorities identified in the industry's BC Agriculture Climate Change Action Plan. The assessment is the first-ever province-wide assessment of climate change impacts for agriculture. It brings together perspectives from agricultural producers and other specialists about their ability to adapt to projected challenges and opportunities in a changing climate, and also identifies approaches, tools and resources required to better support adaptation. Data were collected through interviews and focus groups with producers and specialists across the province. The complete provincial report and series of five region- and commodity-specific reports are available at www.bcagclimateaction.ca .

The overriding picture that emerges from this research is of an agriculture sector that has a great capacity for innovation and resilience, but its capacity is being strained by mounting pressures. This will only increase as the projected changes in BC's climate come to bear. Alleviating the pressure will require decisions to be made that promote resilience. This white paper offers recommendations that will assist policy-makers to identify and take steps to achieve this.

2. BC'S AGRICULTURE SECTOR

For most BC residents, the issues facing agricultural producers are not common knowledge, in part because of the shift of the population away from rural communities and farming life. Other changes have accompanied this transition. For example, contemporary production systems enable individual farms to produce much greater quantities of food and, consequently, the economics of production have shifted. Throughout North America, average farm sizes have increased and the number of farmers has decreased. The agriculture sector in BC, however, is characterized by unique circumstances: a high level of product diversity, an unusually limited land base, the prevalence of small, family-owned farms, and an aging producer population.

2.1 Diverse geography, climatology, and production types

Geography and climate in BC farming communities vary widely, depending on latitude, coastal versus inland location and topography. Accordingly, BC has a broad range of soil types but only a small portion of the land base is considered arable. The variation in land, soils and climate from one region to the next, supports production of more than 200 different commodities across the province.[34] While a range of farm types is present in each region of the province, certain production systems are concentrated in particular areas. The Peace region produces the vast majority of BC's grain, oilseeds and forage seeds, while most cattle ranches are located in the southern and central interior, the Peace region and the Kootenays. Most tree fruit and grape production is located in the Okanagan. The Fraser Valley, Metro Vancouver and Vancouver Island host a range of farm types, including berry, vegetable and livestock operations. The Fraser Valley is home to the majority of dairy and poultry production in the province, while greenhouse, nursery and mushroom operations are concentrated in the Lower Mainland.[35] Organic production is on the rise in the province, with 569 (2.9%) farms certified or in transition to organic in 2011 [36], and another 2,700 farms reporting organic production methods without certification in 2006.[37]

2.2 Limited land base under pressure

Less than five per cent of BC's land is considered arable, although up to 15% has agricultural potential. And only one per cent of the total land base is classified as prime farmland (class 1 to 3 in BC's Land Inventory classification system). In contrast, approximately 17% of Alberta's land base qualifies as prime farmland.[38] Of this very limited arable land base in BC, much sits in close proximity to urban areas. While the Agricultural Land Reserve has played a key role in preserving what little arable land there is for agricultural use, this has not prevented land prices from escalating. The average value of farmland in BC is more than twice the Canadian average, and significantly higher in regions close to urban centres.[39] In other parts of the province, resource exploration and extraction is placing pressure on land currently designated for agricultural use.

2.3 Majority of small, family-owned farms

BC has always had a high proportion of small farms. In 2010, 65% of farms in the province were under 70 acres in size, and 29% of these were less than 10 acres.[40] Shifts in recent years have been towards more small and large farms, and a decrease in mid-sized farms; farms with cash receipts of over $500,000 increased by 7.1% between 2006 and 2010.[36] These are

predominantly family-owned or sole-proprietor businesses (68%) or informal partnerships (26%).[40.]

Revenues of farm businesses in BC vary widely. In 2010 the 1274 largest farms (representing 6.4% of all farms) generated 74.5% of gross farm receipts in the province.[36] Over half of farm operators had off-farm jobs or businesses in 2010.[36] For a range of reasons, average farm gross receipts in BC tend to be lower than the national average.[46] In recent years, net farm income in BC as a whole has been consistently negative, in part due to the costs of production outpacing revenues.

2.4 An aging producer population

The knowledge, experience and assets of existing farmers are a highly valuable resource. However many farmers are now nearing retirement and in many cases there are insufficient new entrants into the industry to replace them. In 2011, 54% of BC farm operators were over 55 years old – up from 45% in 2006 – while only 5.4% were under 35.[40]

2.5 Doing more with less

There are many examples of producers adapting and innovating to enhance resilience to climate change and variability. For example, many of the cherry growers in the Okanagan have been reaching new markets by developing value-added products or organizing new export opportunities. They have also mobilized to monitor and control the spotted wing drosophila, a fly that became established in the valley in 2009/10 and threatens the future of the entire industry.

A noticeable trend in BC, however, is that farmers are being called on to take on increasing risk, costs and responsibility, with fewer resources at their disposal. This pressure comes from both shifts in government policy and market conditions. On one hand, farmers face an ever-growing list of regulations and standards with which they must comply. When regulations around food safety or environmental standards are developed or changed, it is producers who bear the costs of compliance and learning, and shoulder the paperwork requirements. Producers and agricultural organizations are being increasingly stretched to fulfill roles previously served by government—for example, research and extension services that provide farmer education or share new knowledge on agricultural practices. As a result, it is not uncommon for these organizations to function in "emergency response" mode, having to address the most pressing issues of the day with little remaining capacity to attend to more systemic or slowly developing gaps and challenges.

In addition, as costs for inputs (e.g. seed, fertilizers, energy, feed, water), land and meeting consumer demands increase, BC producers are, by and large, price takers in a globalized market system. They sell their products to both domestic and export markets, but having a relatively small proportion of market share means that they have little ability to influence prices received, either locally or abroad. BC producers have always adapted to changes, variability and volatility, and in many ways are the definition of resilient. But the resilience of any system has limits, which becomes evident when climate change is considered in addition to the various pressures outlined above.

3. BC'S CLIMATE IN THE 2020's

The science to date is unequivocal: BC's climate is changing and getting warmer, and this is occurring faster than most climate models and projections have indicated to date. Over the past century the average annual temperature in BC has increased 1.2°C on average (between 0.5 and 1.5°C). Annual precipitation has also increased, on average by 22% (ranging from 10 to 50% by region), with the greatest increases in winter and spring.[41] In terms of extremes, there have been more heavy rainfall events in the spring, and an increase in both extreme wet and extreme dry conditions in summer.[42] There has also been an increase in extreme hot and decrease in extreme cold temperatures [43], along with more frequent and severe wildfires.[27] The table on page 10 outlines the projected 2020s climate change scenario for BC (on average). In the Risk & Opportunity Assessment, this information formed the basis for focus group discussions with agricultural producers and specialists, to identify what the possible impacts, risks and opportunities would be for agriculture.[33]

4. HOW CLIMATE CHANGE RAISES THE STAKES

Farmers are in the business of adapting to changing conditions. To be successful, producers must skillfully anticipate and respond to shifts in weather, markets, regulations and public opinion. For example, farmers and producer organizations undertake regular variety trials to be able to update and adjust to changes in growing conditions and technology. In areas where water is limited, technologies such as drip irrigation have been adopted to reduce water use and enhance efficiency. In interior and northern BC, a collective shift to no-till agriculture has enhanced the industry's resilience to changing conditions by enhancing soil health, increasing water retention and reducing costs.

But climate change takes the situation beyond what has been experienced in the past, and producers won't be able to weather these challenges alone. Already organizations and many individual farmers are being stretched to the limits, especially as government scales back its role in supporting areas such as research, extension and funding for infrastructure. Also, much of the existing experience and knowledge within the industry and the public service is on the verge of being lost due to farmers' retirement.

TABLE – BC'S FUTURE CLIMATE AND REGIONAL IMPACTS [12]

Variable	Time frame	Change	Description (BC Average)	Examples of Possible Regional Impacts
Temperature [41]	2020s	Increase	• Continue warming trend • Greater warming in north than south, inland than coastal, winter than summer • Increasing frost free days and growing degree days	• A longer growing season could increase the range of suitable crops in some regions and may increase productivity • In the Interior, warmer winters may increase the frequency of rain-on-snow events and thaw-freeze cycles, creating hazardous conditions for livestock, increasing winterkill of grasses and management costs • Warmer winters affect the survival and distribution of pests and diseases
Precipitation [41]	2020s	Increase	• Continuing increase in annual precipitation (e.g., 0% to +7% by the 2020s) • Increase in precipitation in fall, winter, spring, and a decrease in summer • Significant decrease in winter and spring snowfall in most regions • Increasing proportion of precipitation falling as rain rather than snow in most areas	• In most regions, increased seasonal precipitation and flood risk increase pressure on drainage and water management and increase nutrient leaching • Variable spring and fall precipitation affects pollination, and interrupts planting, harvesting and spraying schedules
Extremes	2020s	Increase	• Continuing increase in extreme hot and decrease in extreme cold temperatures [43] • Intensity and magnitude of precipitation events is projected to increase [42,44,45] • More frequent and severe wildfires [27]	• More frequent droughts in various regions may decrease crop yields and increase costs • Uncertainty exacerbates management complexity and risk in all regions • In many regions, drier summers increase wildfire risk • In the Okanagan, extreme heat events increase demand for water, cause sun scald, and reduce the size and quality of apples
Hydrology	2020s	Varies	• While total amount of runoff is projected to increase, peak flow volumes in the spring will decline and occur earlier [46] • Lengthening of the period of dry conditions and low flows in the summer [47] • Previously snowmelt-dominated or hybrid systems will be in transition to hybrid and rain-dominated regimes, which experience more unpredictable peak flows and increased risk of flash flooding in the winter • There are few data available on soil moisture in BC. Snow-dominated and hybrid basins are likely to see an increase in spring soil moisture	• In all regions, changing hydrological patterns could create water stress for crops and livestock in summer/fall • In the Fraser Valley, possible river flooding increases crop and infrastructure damage and costs, interruption of supply lines, and salination
Sea Level Rise [48]	2100	Increase	• 80 to 120 cm at the Fraser River Delta • 50 to 80 cm at Nanaimo	• Increases risk of storm surge flooding and salination of productive land in the Fraser River delta

While some climate projections are variations on conditions already familiar to producers, others represent fundamentally new challenges. Some of these are outlined below.

4.1 Variability

The projected increase in variability of conditions is a primary concern because it introduces a new level of uncertainty into decision-making. In a given year, for example, a producer could face both extreme wet and extreme dry conditions requiring decisions to be made in advance as to how best to invest already stretched resources, given limited information and experience with such conditions. Should projections indicate a shift toward more frequent extreme wet conditions, for example, producers could invest in drainage infrastructure and maintenance, or shift to more moisture-tolerant crops. But the projections do not suggest single-direction shifts. In most cases both wet and dry extremes can be anticipated, and few crop varieties can tolerate the entire range of extremes. Moreover, few farmers have the resources to invest in enhanced technology to deal with extremes at both ends.

4.2 Changes to average conditions & extremes

Changes to average conditions, such as annual or seasonal temperature increases, will require adjustments and could eventually drive significant transitions including expanded production or new crops in some areas. Increases in extreme conditions and the potential for abrupt shifts (e.g., the introduction and establishment of a new pest or disease) pose an acute risk to production systems. However, the unpredictability in timing and frequency of such events makes it difficult to plan for, or invest in, mitigating these risks. The viability of insurance programs is likely to be challenged if insurance is seen as the only way to cope. Some other issues—such as disruptions to pollination, inadequate water supply or salination of soils—are effectively unmanageable for producers.

4.3 Complexity

Overall, climate change increases the complexity of management and decision-making for agricultural operations. The scale and rate of climate change is such that traditional innovation and experimentation cycles may be inadequate to keep pace. For example, variety trials to ensure suitability in increasingly variable conditions may need to be conducted more systematically and in artificially adjusted settings. This is of particular concern for perennial crops that can take 10 or more years to come into full production.

4.4 Cumulative impacts

A succession of individually manageable climate change impacts can build to have an unmanageable effect. Large, high impact events are a major concern but a series of smaller events can also create significant pressure, and typically there is less awareness and support in this kind of scenario. A clear example of the impact this could have is associated with the insurance system referred to above. Currently, BC producers may qualify for payments in situations where conditions give rise to significant losses. The amount that is paid out to a producer is referenced to the farm's revenue over the past few years. While this may function effectively when extreme conditions occur quite rarely, when impacts occur in consecutive years it would simply serve to put a farm out of business more slowly. This is the kind of unintended consequence of a program design that is based on historical conditions—a model that is no longer appropriate.

4.5 Long-term view

Institutions and individuals tend to focus on shorter-term issues, and so adopting a long-term view will be challenging. This will be particularly so given that capacity is already stretched, and the prevailing mode of "emergency response" takes attention away from more systemic, long-term challenges or opportunities. The reduction in farm succession exacerbates this concern.

5. A CLIMATE-RESILIENT FUTURE FOR BC AGRICULTURE

Meeting the climate challenge requires that systems and institutions take into account the changing climatic conditions facing the agriculture sector. Governance structures are not designed to respond well to the level of complexity and interconnectedness and speed of changes now being faced. Four-year election cycles naturally favour actions with short-term paybacks. Decision-making that is isolated in "silos" of hierarchically organized ministries leads to situations where actions that are rational from the perspective of one Ministry, can completely contradict efforts in another Ministry. Similarly, a key challenge identified by participants is the disconnect between farmers' realities on the ground and decision-making in government. These structural issues compound the challenges of taking effective action on climate change.

Governance and decision-making can develop into more adaptive forms. The following adaptation principles are a starting point.

Principle	Application
Integrated	Interrelated aspects of the whole system are taken into account and coordinated. Climate change information and adaptation considerations are a standard part of decision-making.
Flexible	Policy and regulations enable decision-making and action that is responsive and adequately flexible to deal with unexpected and changing conditions.
Collaborative	Collaborative approaches to knowledge generation, planning and decision-making contribute to building capacity to deal with uncertainty and complexity. Decision-making and actions are enabled across levels of governance and stakeholders. Local and regional scales play a primary role.
Transparent	With a flexible system, the need for transparency, communication and trust increases. Transparency also facilitates shared decision-making and responsibility.
Proactive & Future-oriented	Action is taken in advance of pending challenges, and a longer-term view is adopted. The best knowledge available is applied, taking into account that uncertainty is an inherent part of climate change.
Resilient	Policies and regulations enhance the capacity to cope with change, variability and shocks, and to learn and adapt to new information and experience. Continual re-evaluation and adjustments are made.

6. RECOMMENDATIONS

Based on these principles, the following recommendations aim to ensure the resilience of the agriculture sector in a changing climate. While all agricultural producers and even consumers have a role to play in this, these actions are recommended for government policy- and decision-makers, who will play a critical role.

1. Review existing governance, management and policy-making structures to increase adaptability

i. Embed the principles of adaptation into the design of policy, regulation and decision-making processes to enhance information sharing and joint decision-making, clarify roles and responsibilities and increase responsiveness of policy to on-the-ground changes

ii. Directly involve producers, agricultural specialists and agricultural organizations in policy development and implementation

iii. Support long-term and strategic planning by agricultural organizations to deal proactively with the climate change (eg: through targeted programs and funding)

iv. Plan for future food production and security

2. Conduct collaborative, applied research

The future will not look like the past, and so dealing with it constructively will require investment in applied research that spans disciplines and involves end users in its development. Specific areas of focus for collaborative research include:

i. In-depth risk & vulnerability assessments for commodities in BC

ii. Crop, breeding and variety trials, and experimentation specific to projected climate conditions

iii. Application of climate-model projections to agricultural production needs

iv. Development and assessment of technologies and practices that enhance resilience

v. Monitoring and response programs to deal both with rapidly and gradually evolving critical issues such as pest, disease & weed management

3. Enhance training and support for climate change innovation by farm businesses

Adaptation and the societal benefits of farming provide value to all British Columbians, while the risk and expense is borne primarily by individual producers. To support the industry's capacity for innovation:

i. Increase and maintain extension services for producers (e.g. technical advice, specialist on-farm advisors)

ii. Develop new programming, incentives, tools and funding to support innovation by early adopters, and transition/change management for farm businesses

iii. Provide targeted resources and support for diffusion of climate change adaptive practices, technologies and models. This could be modeled after the Environmental Farm Program.

iv. Assist with costs of transitioning to more climate-resilient business models

4. Build the long-term capacity of the agriculture industry by enabling new entrants

Facilitating a transfer of land, assets and knowledge to the next generation of farmers is critical to effective adaptation to climate change.

i. Develop resources for more industry and post-secondary agricultural training within BC

ii. Develop programs to facilitate the transfer of knowledge and assets from experienced producers to new farmers

5. Improve income stability for farmers in the short-and-long-term

Volatility in prices, international market conditions, regulations and extreme weather all influence farm incomes. Economies of scale, value-added production and supply management systems can buffer these vagaries to some extent. However, greater income stability is an important key in maintaining a viable provincial agriculture sector as climate changes. Toward this end:

i. Provide greater investment and support for business development to enhance financial resilience for agricultural businesses

ii. Review existing insurance, income stabilization and business risk management programs to ensure effectiveness in the context of greater variability and extremes in projected climate conditions

iii. Develop programming and funding support for implementing business models that enhance financial stability for farm businesses (eg: supply management and value-added options)

iv. Foster development of cooperative systems for purchasing, processing, distribution, marketing, insurance and infrastructure, particularly for small operations & industries

6. Invest in climate-smart water infrastructure improvements

A priority is the need for improved water management infrastructure to adapt to changes in seasonal hydrology. To this end:

i. Promote and support water sources and storage infrastructure—regional and/or on-farm, as appropriate

ii. Improve irrigation infrastructure and efficiency

iii. Improve on-farm and regional drainage infrastructure, with attention to leased land where lack of ownership creates a disincentive to invest

7. Integrate adaptation and agricultural impacts into land use planning and management

Land and infrastructure development adjacent to farms can negatively impact agricultural production—for example by altering water quality, drainage, and nearby water courses—and this influences potential impacts and adaptation options for agriculture in the future. An integrated approach would include:

i. Ensure that water access rights for farming are guaranteed into the future in all provincial and regional water management policies and the Water Act

ii. Conduct regional agricultural adaptation planning across BC and integrate recommendations into existing plans and policies of local and regional governments

iii. Set provincial standards and/or enabling legislation to require agriculture and climate change adaptation considerations to be included in land and resource management and development decisions by provincial, local and regional governments

8. Continue to protect farmland through the Agricultural Land Reserve (ALR) and bolster the Agricultural Land Commission's (ALC) resources to support viable agricultural production in a changing climate

The ability of agriculture to adapt to future climate change hinges on preservation of the land base for agricultural uses. The ALR and the role of the ALC in strengthening agricultural production in the province are key assets that contribute to adaptability. Thus:

i. Ensure the ALC has the ongoing resources needed to fulfill its mandate, including its recent commitment to re-focus on enhancing agricultural production

ii. Integrate climate change impacts and adaptation in all decisions involving ALR land

9. Lay the groundwork for large-scale transitions

In the short-term, the emphasis will be on incremental adaptation actions that improve the resilience of agriculture in the face of climate change. But in more vulnerable parts of the province and industry, and over the mid- to long-term, climate change is very likely to affect agriculture in ways that will require more significant transitions or even whole-scale changes. By identifying options and planning ahead at a collective level, these transitions can be eased and supported for overall benefit.[49]

7. CONCLUSION

The agriculture industry in British Columbia is unique in many respects. As such, climate change impacts and potential adaptations must be understood and developed for this specific context. The BC Agriculture Climate Change Risk & Opportunity Assessment provides a starting point for this effort, and has revealed an array of risks and opportunities facing the industry in light of projected changes to the climate in this region.
While it is commonly assumed that a warming climate will be a boon for production in a northern climate, the full suite of projected changes actually indicate that the risks to agricultural viability are substantial.

Improving adaptation and risk management will require changes to specific practices, programs and policies, as well as a shift to decision-making that can adapt proactively to changing conditions. This demands more integrated, collaborative and future-oriented governance structures. The existing knowledge and assets in the industry should be at the centre of strategies to enhance agricultural resilience, while providing additional resources and attention to addressing gaps and barriers that limit the industry's current adaptive capacity.

The resilience of the BC agriculture sector is already being stretched, even before climate change impacts are factored in. With an aging producer population, growing land use pressures, increasing demands and diminishing resources, the stress on the industry will only intensify unless action is taken toward building long-term resilience.

Above all, the public and elected officials in this province are faced with a fundamental question: is a thriving and resilient agriculture system a priority for BC and, if so, what are we willing to do to ensure that its viability is maintained now and in the future?

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