



CLIMATE CHANGE ADAPTATION PROGRAM

Livestock and Horticulture Crops on Vancouver Island

BC Agriculture Climate Change Adaptation Risk and Opportunity Assessment

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Climate Action Initiative
BC AGRICULTURE & FOOD

BC Agriculture Climate Change Adaptation
Risk + Opportunity Assessment Series



Livestock & Horticulture Crops
Vancouver Island

— SNAPSHOT REPORT —



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The Action Plan is available at:
www.BCAgClimateAction.ca

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The results of this project will be applied to two new Climate Action Initiative projects in 2012–2013. The *On-Farm Adaptation Practices* project will explore appropriate farm level adaptation practices for BC agriculture. The *Regional Agricultural Adaptation Strategies* project will pilot a collaborative adaptation planning process involving local and regional government and the agriculture industry organizations as partners.

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Project Rationale & Methodology

THE BC AGRICULTURE CLIMATE CHANGE ADAPTATION RISK + OPPORTUNITY ASSESSMENT is intended to improve collective knowledge of how changes to the climate may impact agricultural commodities in key regions of BC, and the risks and opportunities associated with these impacts. The most important element of this assessment has been gathering perspectives from agricultural producers about their ability to adapt to current and projected challenges and opportunities, as well as identification of approaches, tools and resources required to better support adaptation.

To address the project's goals, a review of existing research in the areas of climate science and climate change and agriculture was conducted. Data regarding the current state of the BC sector was also reviewed. Original data was collected through thirty-seven interviews and twelve focus groups with producers and specialists across the province. Interviews were focused on assessing how well individual producers felt they could adapt to a range of current challenges and opportunities. The focus groups brought together small groups of producers and other specialists to discuss the projected changes in climate, and the associated risks and opportunities for their operations, regions and commodities.

This project is an initial step in building knowledge and understanding of the implications of climate change for BC agriculture. The incredible diversity of the BC agriculture sector cannot be captured in a single study. Due to the limited breadth and scope of this study, a select number of commodities and regions were included. However, this study does offer a foundation or baseline; a starting point for further

dialogue as well as guidance for development of approaches and resources to enhance BC's agriculture sector in a changing climate.

The overall findings of this project are available through a provincial report. In addition, a series of region/commodity "Snapshot" reports have been developed. This "Snapshot" report is intended to communicate the findings and key action items associated with *mixed livestock and horticulture crop production* on Vancouver Island, with a particular focus on the *Comox and Cowichan Valleys*. The study's overall recommendations (that apply across the province) are available through an *Executive Summary* document.

Report structure

- *Agricultural Profile* provides a high level description of the sector, its major characteristics and context
- *Adaptive Capacity* highlights challenges, strengths and variations in the Vancouver Island sector's capacity to adapt to challenging conditions
- *Climate Science* provides an introduction to the climate science, including a review of provincial and regional level climate trends and projections
- *Impacts, Risks & Opportunities* outlines the major climate change impacts, risks and opportunities for livestock and horticulture crops
- *Key Actions* highlights the priority actions identified through the focus groups



Agricultural Profile

Historical role of agriculture on Vancouver Island

SOME OF THE EARLIEST agricultural operations in the province were on Vancouver Island and the Gulf Islands. The first commercial farms were owned by the Hudson's Bay Company and were located in and around Fort Victoria in the 1840s.¹ However, the agricultural productivity of areas like the Comox and Cowichan Valleys brought settlement and development of agricultural production from the mid 1800s.

A great diversity of products were generated on Vancouver Island as early as 1900 when in the Comox Valley, farmers were producing grain, silage and a variety of livestock, fruit and vegetables.² Tree fruit was promoted as an area of focus for early commercial production but with the development of the sector in the Okanagan, this soon gave way to other commodities.

The dairy sector was established early as an important economic contributor for central and southern Vancouver Island. The first dairy cooperative in British Columbia, the Cowichan Creamery, was established in Duncan in 1895 and operated for 93 years, closing in 1988.³ The Comox Creamery was established in 1901 and by 1920 there were 2,700 milking cows in the Valley.⁴

Following World War I, the BC Government's Land Settlement Board encouraged veterans to settle and farm in agriculturally productive areas of the Island.⁵ However, with the expansion of transportation networks and global trade, it was the forestry and fishing sectors that became the economic drivers for many of Vancouver Island's rural communities, while agriculture served as a consistent element of local economies.

In recent years, Vancouver Island's population has continued to grow with the service sector, tourism and retirement as new drivers for investment.⁶ At the same time, there have been shifts in the agricultural base (outlined on page 5) that have led to growth in the number of small scale operations with a regional market focus. The Vancouver Island agriculture sector continues to reinvent itself and to play an important role in local economies for a number of Island communities.

Agricultural land base, soils & climate

Approximately 90% of Vancouver Island farms are located in the southeast portion of the Island⁷ between the Capital Region and the Comox Valley.⁸ As is the case in much of BC, urban populations on Vancouver Island are concentrated in those areas with the best agricultural land.

Climate conditions vary across the Island but are generally mild due to maritime influences and support some of the best growing conditions in the province. A relatively long season of production is possible for central and southern Vancouver Island because of the number of frost free days. The east coast of the Island (where most of the agriculture occurs) does not have the heavy rainfall of the western Island because it is in the rainshadow of the Vancouver Island mountain ranges. The Saanich Peninsula is also influenced by the rainshadow of Washington's Olympic Mountains.⁹

Precipitation varies considerably within the growing regions. However, for much of Vancouver Island's agriculturally productive area, a high proportion of precipitation falls in the "wet months" of October through March, while April to September tend to be dry.¹⁰ For example, in the Comox Valley average precipitation ranges from 1,200mm to 1,500mm per year, but monthly rainfall from May to September is generally less than 50mm.^{11*}

Vancouver Island's agricultural capacity is limited in many areas by the mountainous topography, climate, soils and landscape characteristics. However, in agricultural areas such as the Alberni Valley and Cowichan Valley, with irrigation and drainage, a high proportion of soils can be improved to Class 3 or better capability.¹² Aridity is the primary limitation on productivity for these areas. In the Comox Valley, soils also have high agricultural capability ratings; about 60% of the Agricultural Land Reserve (ALR) land is within classes 1 to 3. The challenges with soils in this region are acidity, moisture deficiency (60% require irrigation) and excess wetness (25% require drainage).¹³

In 2010, the total area within the ALR on Vancouver Island was about 104,000 hectares; about 2% of the total ALR.¹⁴ Almost 11% of the original Vancouver Island ALR allocation has been excluded, with the largest proportions lost in the Capital Region and Cowichan Valley. A substantial portion of this land was removed during a "fine tuning" of the ALR conducted by governments in the 1980s.¹⁵

* Further south, the Saanich Peninsula has a similar pattern with 813mm of precipitation (on average) annually and 102mm from June to August. In drier years, irrigation is also required in May and September.

Characteristics of Vancouver Island agriculture

In 2006, the average farm size for the Vancouver Island/Coast area was 19 hectares, considerably smaller than the provincial average of 143 hectares.¹⁶ At the time of the last Census there were 2,855 farms in the Vancouver Island/Coast area and about 4,245 farmers with an average age of 55.¹⁷

The smaller average farm size on Vancouver Island correlates to lower average farm revenues and farm income. Over the past 20 years, average gross farm receipts on Vancouver Island have been slipping further behind the provincial average.^{**} As is the case across BC, a small proportion of Vancouver Island farms earn the bulk of gross farm receipts. The number of farms with under \$10,000 per year in gross farm receipts is also relatively high.^{***}

For a range of reasons, in many of Vancouver Island's agricultural areas, quality agricultural land is not being farmed.¹⁸ According to the Comox Valley Economic Development Society, about a third of the region's available agricultural land is in production.¹⁹ In some cases, rural residential and forestry use make agricultural land inaccessible. However, there is also a concerted effort in some regions to support growth in the agriculture sector, in particular through the regional economic development agencies.^{****}

The agricultural products generated on Vancouver Island are extremely diverse. Some of the Island's products include poultry, cattle, dairy, greenhouse vegetables and a huge variety of field and horticulture crops from carrots and potatoes to berries and wine grapes. There are many mixed farms that produce a number of different products or are involved in small scale processing.

** In 2005, the provincial average in gross farm receipts (per farm) was \$133,641. On Vancouver Island the average was \$58,974. By contrast, in 1985, the provincial average for gross farm receipts (per farm) was \$55,552 and Vancouver Island's average was \$37,865.

*** 62% of Cowichan Valley farms earned less than \$10,000 in gross receipts in 2005. Close to 80% of farms in the Capital and Nanaimo regions were in this category.

**** The Comox Valley Economic Development Society and Economic Development Cowichan have both invested in supporting the sector for a number of years. The most recent example of these efforts was the role of these agencies in the Islands Agriculture Show (also supported by Port Alberni Economic Development).

The Vancouver Island industry has undergone a fairly rapid transition over the past couple of decades, with supply managed operations consolidating and many producers moving into niche markets. The Island's livestock industry has declined in recent years; the swine industry has all but disappeared from much of Vancouver Island. A number of dairies have sold off their quota and the remaining dairies have consolidated (in 2007, about 10% of the province's dairy industry was located on Vancouver Island).²⁰ While dairy is the dominant source of farm gate receipts on the Island, it currently supplies less than half of the regional demand.²¹

A similar transition has occurred in the poultry industry following the closure of the last large poultry processing plant on Vancouver Island (in 1999) and the subsequent removal of price premiums and lifting of the freeze on transferring quota. As recently as 2000, Vancouver Island produced 12% of the chicken in the province.²² By 2007, this had dropped to 5%.²³ It is estimated that Island chicken farms hold quota for about 20% of the chicken consumed on Vancouver Island.

Agriculturally, the Island has vast possibilities. It is not, and never will be, a grain growing country of wide areas like the middle Canadian provinces, although cereals grow very well on Vancouver Island. But for mixed farming, fruit growing, poultry raising, berry and vegetable raising, the raising of sheep, cattle and hogs, and for dairy farming, it is not to be excelled, and scarcely equaled, in fact, in any country.

— from *The Treasure Island*,
Vancouver Island Development League (1910)

These shifts have meant that a growing number of producers look to regional and niche markets for at least a portion of their sales. The industry has demonstrated significant capacity to adapt, both through consolidation and diversification. In addition, studies have indicated that new entrants are starting small farms on Vancouver Island²⁴; likely because the scale of investment is more accessible than elsewhere in the province.²⁵ Many Vancouver Island producers utilize direct marketing (including local farmers' markets and farm gate sales) for the majority of their sales.



Current Resilience & Adaptive Capacity

ADAPTING TO CHANGING and challenging conditions of all kinds is a constant element of agricultural practice, and producers have long been in the business of maximizing their resources to adjust to variability. This variability can occur in a range of areas including weather, markets, input prices and regulations. To effectively manage their operations farmers have to continually learn, change and adjust their approaches, as well as collaborate with a broad range of partners.

Adaptive capacity describes the *presence of necessary resources* and the *ability to mobilize those resources* to effectively respond to various challenging conditions in both the immediate and long-term. Resources may be at the farm or sector level, or a result of the broader social, biophysical, economic, or institutional context. In addition, knowledge resources, the ability to re-organize and the capacity for ongoing learning, are critical to mobilizing effective responses to climate change.²⁶ In part because future climate conditions may be unexpected or unprecedented, managing the effects of climate change requires, above all, flexibility to address a range of potential impacts and to change course as required.

Figure 1 outlines many elements that factor into the agriculture sector's ability to adapt. These elements are expressed as five interrelated types of resources:

It's very difficult for young people — it's really hard work for not big pay. People need to want this kind of life... In our family there's no one who will take over. It would be somebody outside of the family who would take over — the property might well be divided up and it's always been "chewed off" over the years.

— herb farm, small scale processor, Cowichan Valley

financial, physical, human & social, knowledge and policy & regulatory.²⁷

Evaluating the approaches, resources and tools *currently* utilized by producers to manage through challenging or changing conditions, is a first step in exploring the resilience of the industry.²⁸ For this reason, the interviews conducted with producers and other specialists focused on *existing resources and tools employed* to manage through variability or difficult conditions, as well as current barriers or challenges to adapting and overall resilience.

Some studies evaluate adaptive capacity through quantitative data. Various indicators can be used to measure the industry's capacity in certain areas.²⁹ This study does not employ a quantitative approach, in part because the BC sector's diversity does not lend itself well to this type of analysis. In addition, many

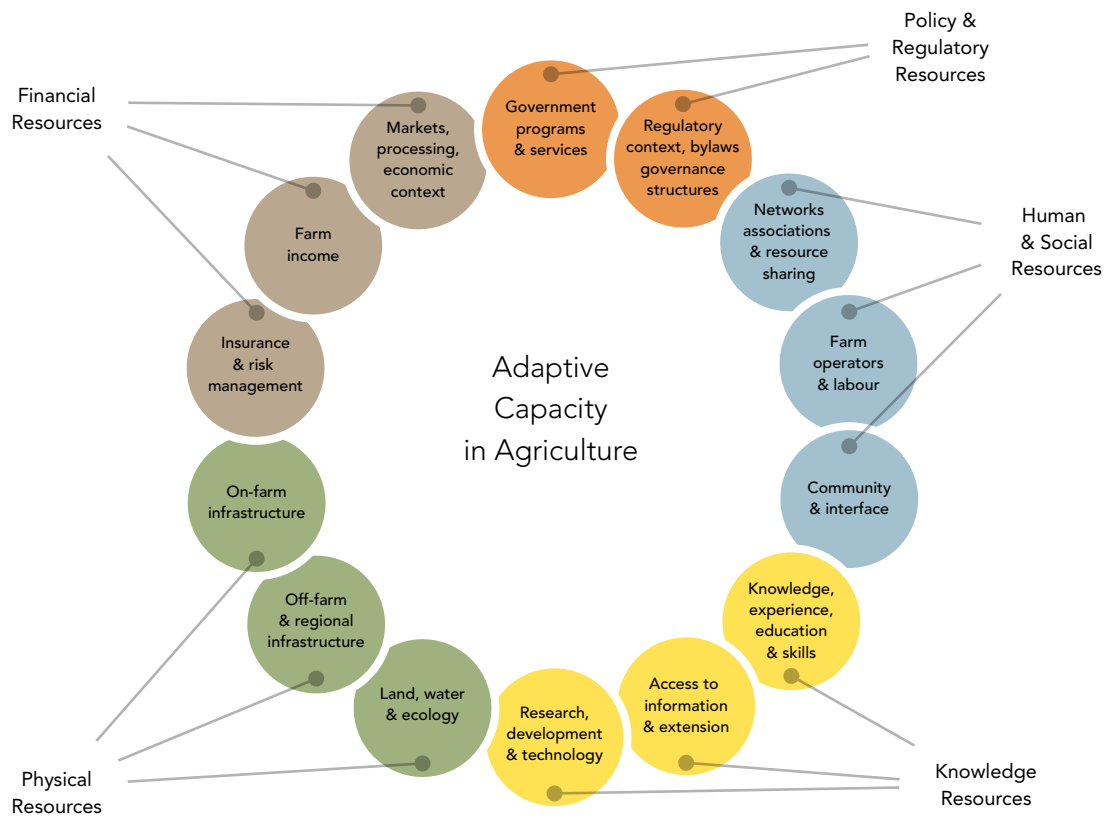


FIGURE 1. ADAPTIVE CAPACITY IN BC AGRICULTURE

elements of adaptive capacity cannot be meaningfully expressed in quantitative terms.

For this reason, the majority of the data that informs the analysis below was drawn from interviews with producers and other sector specialists; additional data was collected throughout the focus group sessions. The analysis is divided into the five categories of adaptive capacity identified in the diagram below, but with a focus on the specific issues and themes that emerged through the research.

Financial resources

With average farm incomes that are lower than elsewhere in the province, and a higher proportion of small scale operations, the challenges associated with profitability are particularly acute for many Vancouver Island farms. Farm businesses struggling with marginal economic circumstances are not likely to prioritize investing in new approaches or technologies.

Periodic economic setbacks, such as extreme weather, can also add up to make upgrading, innovating and reinvesting difficult. While input prices, including labour and land, have been rising, it is difficult for producers to pass these costs along to consumers and remain competitive. For Vancouver Island producers the cost of freight adds to the input costs and to the cost of moving products off Vancouver Island. While some dairy producers on Vancouver Island have consolidated (bought up land and quota) to expand their economies of scale, many other producers have opted for diversification strategies.

Diversification of products, markets and income streams is a means for maintaining profitability when prices and markets fluctuate, as well as providing a buffer through challenging weather conditions. Vancouver Island producers have diversified to an unusual degree both within operations and across the sector. Producers have also diversified their markets by strengthening regional and local marketing options,

and have developed a range of niche products and markets. Off farm income is also a major contributor to overall farm income, which creates an additional financial buffer.³⁰

Human & social resources

The primary asset for enhancing the resilience of agriculture is farmers themselves. However, across the province the current human and social resources of the sector are being stretched and this is impacting the ability to manage through difficult and changing conditions.

Farm operators

As noted in the agricultural profile, the demographics of Vancouver Island agriculture indicate that many producers are nearing retirement. When difficult conditions arise that require new approaches and investments, producers contemplating retirement are more likely to retain the status quo or to consider exiting the industry, which may also be the more cost-effective option. Producers with a longer planning horizon (new entrants or those with clear succession plans) are more likely to adapt to change or adopt new technologies and practices.

Networks & organizations

Producers use informal networks and word of mouth to share information about daily issues, challenges and new approaches. These informal networks are particularly important for producers with smaller scale and more remote operations, who may not participate in associations.

Vancouver Island's agricultural organizations are somewhat unique in that, with the exception of the supply managed commodities (dairy, poultry, eggs), most producers participate in agricultural organizations that are geographic in focus rather than commodity-specific. Producers may still seek out information through (mainland based) commodity organizations, but farmers' institutes and local farmers' market associations are the hub for many Island farmers to access various resources. For example, in the Comox Valley the Farmers' Institute has, over the years, been the delivery agent for programs such as wildlife compensation, provided

“The nature of our farms spreads production and price risks but does not allow for an economy of scale to improve profitability by adopting new processes or technology.”

— island agriculture specialist, Comox

a farm equipment cooperative and organized regular informational workshops.

While Vancouver Island industry organizations play an important role in supporting the ability of producers to adapt, without funding sources like a levy (a common source of funding for commodity organizations) they are particularly challenged with respect to financial (and therefore human) resources. In addition, with the previously described diversity of Island farms, providing information and support for the range of production systems is difficult.

Knowledge resources: Information, extension & research

Vancouver Island has many farmers with decades of experience in a range of agricultural production systems. At the same time, when producers encounter new or challenging circumstances, or wish to bolster their decision-making, they seek out information through a number of sources.

Web-based resources are increasingly drawn upon by producers for all types of information. Recently developed tools like the irrigation calculator, can be easily accessed on-line.³¹ Producers can also draw on web resources from comparable jurisdictions. However, for geographic or commodity specific information, most producers continue to utilize more traditional options, including educational workshops, field days, conferences or direct consultation with experts. Producers also share information with each other or seek it out through suppliers (of equipment, seeds, inputs, etc).

As the BC Ministry of Agriculture's role in extension has been substantially reduced, more producers across BC now pay for private consultants, or rely on (commodity) industry associations to provide extension and information. For producers on Vancouver Island, there are no extension agents through Island industry associations and for those

“Flooding is not really an issue for us, we are on the West Coast and normally get a lot of rain, however the intensity of the rain events seems to be changing with storms delivering up to four inches of water a day now. These major rain storms coupled with logging activities on local mountains are a real concern in terms of their potential to impact our water supply. A recent slide out of a logged area on our local mountain destroyed the water intakes of a former dairy farm and a meat processor near us..

— dairy farmer, Port Alberni Valley

with limited financial resources, access to extension is problematic.

At present, efforts are made to adapt information and research from other areas to Vancouver Island (through workshops, websites and publications). There is currently no established educational or research organization conducting agricultural research on Vancouver Island, and due to the sector’s diversity, development of local research and informational resources is challenging. While individual farms may conduct their own research, under these circumstances information dissemination can be difficult.

Physical resources

The nature and condition of on-farm and surrounding physical resources plays an important role in the ability of producers to adapt to difficult conditions. This is particularly true with respect to variability and extremes in weather, which can challenge the existing infrastructure and available physical resources.

On-farm infrastructure: Equipment, technology & farm practices

The condition and efficacy of on-farm physical resources is important for farm resilience and producers continually improve and adjust their equipment, technology and practices. Vancouver Island producers have adopted numerous approaches to manage new or challenging conditions. Examples of adaptive practices and technologies include: efficient irrigation systems, on-farm water storage, drainage improvements and the use of floating row

covers. A number of additional examples are provided in the following box.

Current management practices/approaches

- Irrigation efficiencies
- On-farm water sources & storage
- Suitable variety selection
- Planting, harvesting & market adjustments
- Local market development
- Drainage improvements
- Fire breaks, buffer zones, fuel removal
- Backup systems (e.g., generators)
- Soil management practices (cover crops, mulches, etc)

However, the extent to which producers are flexible with regards to investing in new technologies and practices is defined largely by other factors including: knowledge and information, financial resources and willingness to alter current approaches. The previously noted financial and informational constraints, and in some cases the small scale of production, are limiting factors for adopting more costly on-farm infrastructure.

Local & regional infrastructure

Much of the physical infrastructure that farm businesses depend on is located beyond the boundaries of the farm. Regional and local infrastructure plays a central role in the ability of producers to manage through challenging and variable conditions.

Despite removal of land from the Agricultural Land Reserve, the potential of Vancouver Island’s existing land base is considerable. The opportunity to expand production was noted by producers as a (current) lost opportunity and is identified in Agriculture Area Plans for a number of regions.³² This, along with the

favorable climate, creates an unusual level of flexibility for producers and the Island sector as a whole.

Along with residential development in the Island's agricultural valleys have come impacts on the agricultural landscape and its management. Residential interface issues are of particular concern where drainage, water and wildlife management infrastructure are affected. For some farm operations, forestry activity has impacted surrounding operations by altering hydrology or micro-climates. On Vancouver Island, infrastructure that requires collective and cooperative approaches for effective agricultural adaptation include: water supply, storage and consumption, drainage and ditch management, wildlife management and land use planning (particularly for impacts of competing land uses).

Policy & regulatory resources

The policy and regulatory framework shapes the interface between government and the agriculture sector. Agriculture is embedded in a complex regulatory framework with numerous government agencies. This can create a challenging and fragmented environment for producers managing through difficult or variable conditions.

For the smaller operations on Vancouver Island there is a concern that policy and regulation tends to have a "one size fits all" approach, which does not necessarily work for smaller businesses, or those in more remote areas. An example that was raised in the focus groups was the Meat Inspection Regulation, which, as an unintended consequence, created a particularly challenging situation for Vancouver Island's small scale livestock operations.

Producers also raised concerns regarding policy and regulatory frameworks that constrain producers with respect to their management options, which in turn reduce their ability to respond to changing or difficult conditions. Areas of particular concern were drainage and ditch management and wildlife management.



The Climate Science

Weather, variability & climate change

IF THERE'S ONE THING FARMERS KNOW, it's the weather. Weather is what happens on a particular day at a particular location. Farmers are continually required to adapt to weather conditions to effectively plan and manage their businesses.

In contrast, climate refers to long-term trends, patterns and averages over time. These are more difficult to observe through day-to-day or year-to-year experiences or records of weather. However, over a period of decades, recorded observations can be used to characterize the climate and identify changes.

Anyone who pays close attention to weather forecasts appreciates that predictions of weather are often limited in their accuracy. This is partly because of the many factors that impact climate systems (which in turn influence the weather we experience). In BC, we are familiar with the 3–7 year cycles of El Niño and La Niña (“ENSO”), which dramatically impact the average weather that we experience (see Figure 2). Compared to La Niña years, conditions in BC during El Niño years are typically warmer and drier in winter and spring, and less stormy in southern BC.

Adding to the complexity, the Pacific Decadal Oscillation (PDO) is a known pattern that shifts over longer time periods (20 to 30 years) and this impacts

temperature and precipitation conditions here in BC. It also has a warm and cool phase, and so it can either enhance or dampen the impacts of El Niño and La Niña conditions in a given year.

Figure 3 shows the difference between climate variability, oscillations, and climate change. The many factors that impact the weather create significant variation in what we experience from year to year. However, we are still able to chart averages over long periods of time.

BC climate change projections

According to thousands of climate scientists analyzing climate data around the world, the evidence to date is unequivocal: the global climate is changing, and becoming warmer.³³ As can be appreciated from the above discussion of variability and oscillations, this does not mean that conditions everywhere are becoming consistently warmer. All of the variables that impact climate will continue to influence the weather in many different ways.

In BC for example, warming has primarily been felt in an upward shift in BC's coldest winter temperatures. Winter average temperatures have been increasing more than summer average temperatures. In other words, BC has been getting less cold more rapidly than it has been getting more hot.³⁴ And changes will

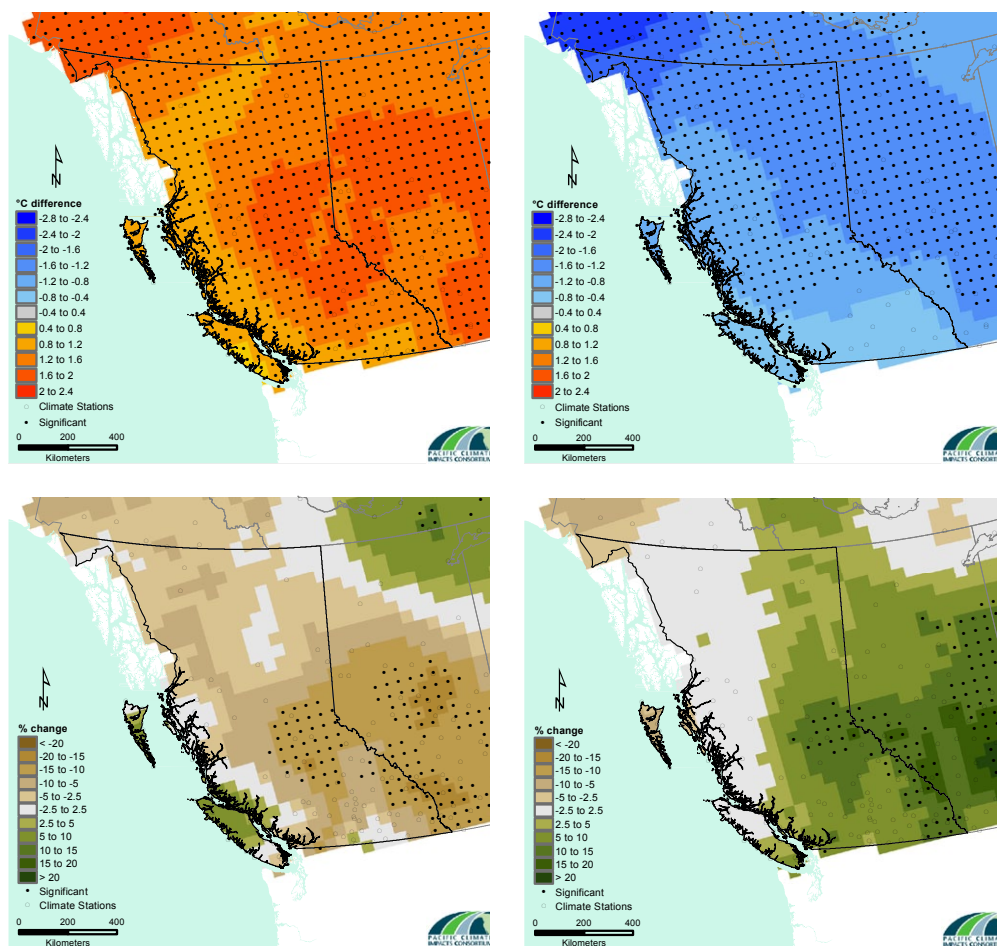


FIGURE 2. ENSO PATTERNS IN BC

The top two maps depict temperature differences (1900–2004) from the average during El Niño years (left) and La Niña years (right).

The two bottom maps depict precipitation variations from average (again with El Niño at left, La Niña at right).

Source: Pacific Climate Impacts Consortium, www.pacificclimate.org | Data source: Environment Canada CANGRID dataset

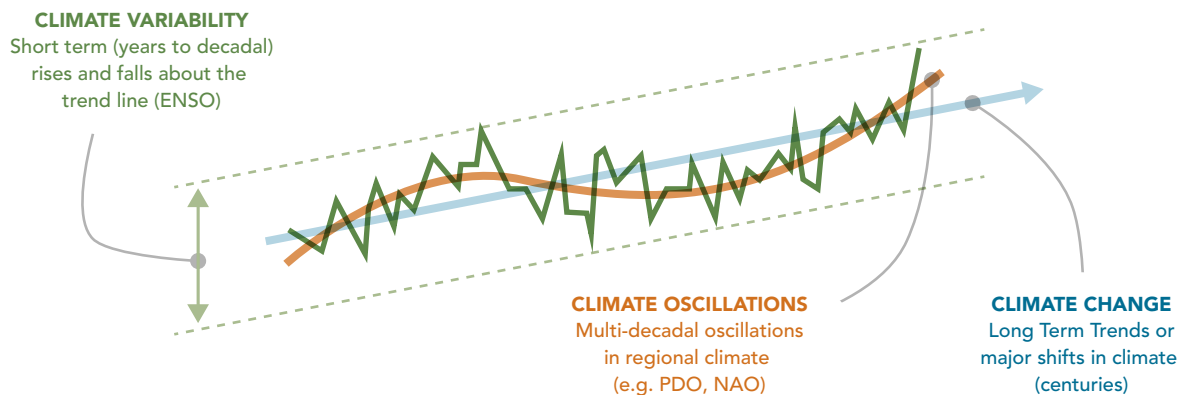


FIGURE 3. CLIMATE VARIABILITY, OSCILLATIONS & CHANGE

Diagram showing difference between climate variability, oscillations, and climate change.

Adapted from original, courtesy of Pacific Climate Impacts Consortium, www.pacificclimate.org

still impact each region of the province differently. So while the term “global warming” makes sense if you talk about the overall trend, at a regional level, “climate change” is a more appropriate way to describe what is occurring.

While rising sea levels do not directly impact all regions, this could potentially reduce the overall agricultural land base of the province. Global sea level has risen more than 20 cm since 1899³⁰, but this varies considerably by location due to land movement (rising or falling) and climate and weather variability. Future projections show that sea level rise will continue. Estimates for the BC coast over the next century suggest a possible sea level rise of at least 80

to 120 cm at the Fraser River Delta, and 50 to 80 cm at Nanaimo.³⁶

The tables below summarize potential changes in climate variables will affect agricultural production in the province. They provide overall changes on average for the whole province. There are significant variations in trends and projections for the different regions of BC, and the next section addresses these differences for the Cowichan and Comox Valleys specifically.

CLIMATE PROJECTIONS FOR BRITISH COLUMBIA IN THE 2020S

Source: Pacific Climate Impacts Consortium, www.Plan2Adapt.ca

	Time of Year	Projected Change from 1961–1990 Baseline	
		Range (BC)	Average (BC)
Average Temperature	Annual	+0.5 °C to +1.5 °C	+1.0 °C
Precipitation	Annual	+0% to +7%	+4%
	Summer	–4% to +5%	+0%
	Winter	+1% to +8%	+4%
Snowfall	Winter	–11% to +2%	–2%
	Spring	–55% to –7%	–30%
Growing Degree Days	Annual	+76 to +234 degree days	+163 degree days
Frost-free days	Annual	+6 to +16 days	+10 days

CLIMATE PROJECTIONS FOR BRITISH COLUMBIA IN THE 2050S

Source: Pacific Climate Impacts Consortium, www.Plan2Adapt.ca

	Time of Year	Projected Change from 1961–1990 Baseline	
		Range (BC)	Average (BC)
Average Temperature	Annual	+1.3°C to +2.7 °C	+1.8 °C
Precipitation	Annual	+2% to +11%	+6%
	Summer	–8% to +6%	–1%
	Winter	–2% to +16%	+8%
Snowfall	Winter	–16% to +2%	–10%
	Spring	–70% to –20%	–58%
Growing Degree Days	Annual	+191 to +459 degree days	+305 degree days
Frost-free days	Annual	+12 to +28 days	+20 days

Vancouver Island climate change projections: Cowichan & Comox Valleys

While regional climate data is improving rapidly in BC, at a local level there remain great differences in the data availability and a limited set of climate modeling studies to draw from. As a result, this summary draws from regional modeling where possible, and supplements this with broader scale studies as necessary.

Regional climate projections are produced by PCIC at a regional district level. The data for Cowichan Valley

and Comox-Strathcona* are presented in the tables below to illustrate the range of projected change for parts of Vancouver Island. For some variables the projected change is different enough from one agricultural area to another that it was not possible to use one set of data as illustrative of Vancouver Island overall.

Annual **temperatures** for Vancouver Island are expected to warm as much, or slightly less, than the provincial average. Seasonal temperatures also show a consistent upward trend. This translates into a greater increase in **growing degree days** for this region

* Cowichan Valley and Comox-Strathcona are presented here, as they were the sites of the two focus groups on Vancouver Island. Data for other parts of the island are available at www.plan2adapt.ca.

CLIMATE PROJECTIONS FOR THE COWICHAN VALLEY REGION IN THE 2020S

Source: Pacific Climate Impacts Consortium, www.Plan2Adapt.ca

	Time of Year	Projected Change from 1961–1990 Baseline		
		Range (Cowichan)	Average (Cowichan)	Average (BC)
Average Temperature	Annual	+0.4 °C to +1.2 °C	+0.9 °C	+1.0 °C
Precipitation	Annual	–2% to +7%	+3%	+4%
	Summer	–21% to +2%	–10%	+0%
	Winter	–3% to +8%	+1%	+4%
Snowfall	Winter	–44% to –7%	–24%	–2%
	Spring	–60% to –8%	–31%	–30%
Growing Degree Days	Annual	+132 to +353 degree days	+267 degree days	+163 degree days
Frost-free days	Annual	+4 to +13 days	+9 days	+10 days

CLIMATE PROJECTIONS FOR THE COWICHAN VALLEY REGION IN THE 2050S

Source: Pacific Climate Impacts Consortium, www.Plan2Adapt.ca

	Time of Year	Projected Change from 1961–1990 Baseline		
		Range (Cowichan)	Average (Cowichan)	Average (BC)
Average Temperature	Annual	+0.9 °C to +2.3 °C	+1.6 °C	+1.8 °C
Precipitation	Annual	–2% to +12%	+6%	+6%
	Summer	–30% to +2%	–19%	–1%
	Winter	–3% to +14%	+5%	+8%
Snowfall	Winter	–58% to –24%	–39%	–10%
	Spring	–70% to –20%	–53%	–58%
Growing Degree Days	Annual	+273 to +697 degree days	+476 degree days	+305 degree days
Frost-free days	Annual	+10 to +21 days	+15 days	+20 days

CLIMATE PROJECTIONS FOR THE COMOX-STRATHCONA REGION IN THE 2020S

Source: Pacific Climate Impacts Consortium, www.Plan2Adapt.ca

	Time of Year	Projected Change from 1961–1990 Baseline		
		Range (Comox-Strathcona)	Average (Comox-Strathcona)	Average (BC)
Average Temperature	Annual	+0.4 °C to +1.2 °C	+0.9 °C	+1.0 °C
Precipitation	Annual	–1% to +7%	+3%	+4%
	Summer	–17% to +3%	–9%	+0%
	Winter	–2% to +8%	+3%	+4%
Snowfall	Winter	–34% to –3%	–15%	–2%
	Spring	–61% to –5%	–31%	–30%
Growing Degree Days	Annual	+93 to +271 degree days	+192 degree days	+163 degree days
Frost-free days	Annual	+6 to +18 days	+14 days	+10 days

CLIMATE PROJECTIONS FOR THE COMOX-STRATHCONA REGION IN THE 2050S

Source: Pacific Climate Impacts Consortium, www.Plan2Adapt.ca

	Time of Year	Projected Change from 1961–1990 Baseline		
		Range (Comox-Strathcona)	Average (Comox-Strathcona)	Average (BC)
Average Temperature	Annual	+0.9 °C to +2.3 °C	+1.5 °C	+1.8 °C
Precipitation	Annual	–1% to +10%	+6%	+6%
	Summer	–24% to +1%	–15%	–1%
	Winter	–3% to +12%	+6%	+8%
Snowfall	Winter	–46% to –11%	–29%	–10%
	Spring	–70% to –16%	–50%	–58%
Growing Degree Days	Annual	+209 to +518 degree days	+338 degree days	+305 degree days
Frost-free days	Annual	+14 to +34 days	+23 days	+20 days

than the provincial average, and more additional growing degree days for the Cowichan Valley than in the Comox Valley. The number of additional **frost free days** will be slightly more than the provincial average in the Comox area and slightly less in the Cowichan Valley.

To illustrate the magnitude of projected temperature changes, the average annual temperature in BC by the 2080s is projected to increase by 2.8°C. This means that an *average* year in the 2080s will be as warm as the warmest years we have experienced in the past century.³⁷ While 2080 might seem like a long way off, this change will happen in stages over the intervening period.

Annual and seasonal **precipitation** is projected to increase slightly, with the exception of a decrease in precipitation in summer. With about a 10% decrease in the summer, this decrease is projected to be larger for Vancouver Island's agricultural areas than the provincial average. Warming in fall, winter and spring³⁸ will mean that an increasing amount of the precipitation will fall as rain, while less falls as snow. This is especially pronounced in the winter when the amount of precipitation falling as snow is projected to decrease much more for Vancouver Island than for the province as a whole.³⁹ A greater decrease in winter snowfall is projected for the Cowichan Valley than the Comox Valley.

Extreme weather events are projected to occur more frequently in BC in the future, and studies have shown some specific trends already.⁴⁰ These include an increase in heavy rainfall events in the spring, and an increase in extreme wet and extreme dry conditions in summer. The intensity and magnitude of precipitation events is projected to increase in the future. *Forest fires* have become more frequent and severe in western North America, and this trend is projected to continue.⁴¹

Trends show that while annual *streamflow* in streams along the south coast has increased, low flow levels have decreased.⁴² Projections for the Campbell River watershed to 2050 show an increase in runoff in the winter and fall.⁴³

For areas of Vancouver Island at higher elevations, the remaining snowpack will tend to melt more quickly, leading to an increase in spring runoff with peak

flows occurring earlier.⁴⁴ This will contribute to lower *water levels* later in the season and earlier drying out of smaller streams. The timing of high demand and low supply in the region tends to coincide, creating the potential for supply shortages. For areas at lower elevations, the diminishing (or nonexistent) snowpack means that spring runoff will typically decrease, while the potential for high flows driven by winter precipitation will increase.⁴⁵

Projections for Vancouver Island suggest a relative *sea level rise* of 10–90 cm by 2100.⁴⁶ Changes to precipitation patterns together with rising sea levels will shift the location of the fresh-saltwater interface further inland, potentially affecting *groundwater* in some areas.⁴⁷



Impacts, Risks & Opportunities

POTENTIAL AGRICULTURAL IMPACTS OF SIGNIFICANCE FOR LIVESTOCK & HORTICULTURE CROPS PRODUCTION ON VANCOUVER ISLAND BY 2020

Changing Conditions	Potential Agricultural Impacts
Increased precipitation in winter and spring	Reduced sunlight, waterlogged soils, more frequent flooding, disrupted planting & fertilization schedule, reduced productivity and quality, crop losses and damage, pressure on drainage infrastructure and water management, increased infrastructure costs (construction, maintenance)
Longer growing season	Increased horticultural productivity, improved return on investment
Changing hydrological regime, warmer and drier summer conditions	Decreased summer/fall water supply, increased horticultural productivity, decreased hay production (increased feed costs, decreased herd sizes)
Increase in extreme weather events (storms, rainfall, winds)	Power supply interruptions, infrastructure damage, increased risk of soil erosion and flooding, interruptions in input supplies & increased feed costs, reduced range of suitable livestock breeds, temporarily captive market, increased awareness of value of local food system
Increased forest fire risk	Asset and infrastructure damage, increased risk of livestock injury & mortality, costs and stress of evacuation & recovery, cascading effects on distribution and processing infrastructure

TO DEVELOP A PRACTICAL UNDERSTANDING of what these projected changes mean for agricultural production in the Vancouver Island region, small groups of producers from the horticulture and livestock industries were engaged in workshops focusing on the 2020 climate change scenario just described. This section presents the results of this exploration of potential impacts, risks and opportunities for mixed livestock and horticulture crop operations on Vancouver Island. Findings in this section also incorporate information gathered

through interviews and broader background research regarding climate change impacts.

Increased precipitation through winter and spring could have a significant impact on Vancouver Island producers. Individual operations have varying sensitivity to this issue depending on the natural features of their land, and whether drainage infrastructure is already in place. Timing of precipitation is a major concern for crop production. Management and infrastructure options are available, but often costly. The main challenge is the need for

coordination across landowners, jurisdictions and stakeholders to effectively manage excess moisture.

For the Comox Valley region in particular, an *extended growing season* represents a notable opportunity for enhanced production and profitability of farming. With the low frost risk in this area, a longer growing season means potential for greater productivity for a given level of input costs. As an extension of current practice, and with information readily available, there is great potential to take advantage of this opportunity.

Shifting hydrology patterns together with *warmer and drier summer conditions* will create the potential for increased productivity up to a point, depending on the adequacy of water supplies and irrigation infrastructure. Given increasing precipitation in other seasons, this was seen as an issue of storage and access as opposed to inadequate supply. Cost and coordination are limiting factors on the ability of individual producers to manage these conditions. It was noted that improved growing conditions (e.g., longer growing season) may attract more producers to this region, making joint investment in infrastructure feasible.

The projected increase in *extreme weather events* was seen as a significant challenge and (in a very extreme scenario) possibly an opportunity for Vancouver Island producers. This type of event poses similar challenges across the province, including soil erosion, flooding, infrastructure and crop damage and associated losses.

The geographic isolation of Vancouver Island creates a heightened vulnerability to interrupted supply lines and transportation systems. This risk was of particular concern for the livestock industry. The size of an operation and its dependence on imported feed and external energy supply give rise to variation in

“The degree of impact of all of these things — whether it’s one big event or many small events, they all impact small farms hugely. Any one of them has the ability to put small farms out of business. And small farmers because of financial resources have the least ability to manage these situations. They don’t have money for big generators, storage water systems or adequate irrigation systems. For most small farms it’s a month to month struggle.

— mixed livestock producer, southern Vancouver Island

the ability of individual operations to manage these impacts. While emergency preparedness could be improved, producers in this region are accustomed to dealing with stormy conditions.

Some producers believed that, in the most extreme scenario of temporary isolation of Island communities due to extreme weather, appreciation of the importance of regional production may be enhanced.

Increasing forest fire risk was of concern for some livestock producers, especially because more livestock is housed than in some other regions in BC. Increasing rural density enhances the risk at wildfire interface areas, and the potential for damage to infrastructure, assets and regional systems is significant.

Overall, the *combined effects of climate change* add to other pressures that could drive some operations out of business and create opportunities for others to expand. Small and large operations each have features that can enhance individual and collective resilience of agricultural production on Vancouver Island.



Key Actions

THE PURPOSE OF the BC Agriculture Adaptation Assessment is to develop a baseline assessment of potential risks and opportunities due to climate change, for the BC agriculture sector as a whole. For quick and easy reference, a provincial report *Executive Summary* document has been developed, which outlines key actions that apply across the province.

The dialogue that has occurred at the regional and commodity levels (through interviews, focus groups and informal discussion) has contributed critical information for the analysis and key actions in the provincial report, and provided a first look at the important issues regionally.

Key action items identified through the focus group sessions are noted below. The specific issues raised by mixed livestock and horticulture crop producers on Vancouver Island are an important first step toward a regional approach to agricultural adaptation.

Vancouver Island / livestock & horticulture crop producer focus groups

Food security & agriculture

Prioritization of agricultural production and food security in British Columbia at the policy level was

identified as a key first step in supporting the sector to manage the challenges associated with climate change.

Management practices & approaches

Managing the variable conditions on Vancouver Island already requires knowledge of many alternative practices and approaches. Looking ahead to the challenges associated with climate change, support for adaptive management practices and technologies will be increasingly important. An approach for identifying, demonstrating and incenting adaptive practices/technologies was suggested.⁴⁸ The National Water Supply Expansion Program was noted as having been of value. Assigning economic value to the environmental benefits provided by producers was seen as another means for supporting some adaptive practices.

Strengthening industry organizations

With a few exceptions, Vancouver Island producers aren't aligned by commodity to the degree that producers are elsewhere in the province. Despite the positive efforts of farmers' institutes and other regional organizations, it can be challenging for Island producers to organize on common issues. Stable funding, producer participation and collective action from Island industry organizations were deemed to be important for ensuring sector resilience in the future.

Extension, education & research

Existing gaps in education, extension and research support on Vancouver Island are seen as becoming more problematic in increasingly complex conditions. Identifying mechanisms to enhance the educational and extension options available is necessary, particularly as new farmers find themselves without sufficient supports.

Looking at the extent to which external resources are sufficient to fill informational and research gaps is an important first step. Where local information is needed, conducting local, collaborative research and demonstration will help to develop resources that are suited to the conditions and impacts for Vancouver Island.

Collective approaches to regulatory regimes & infrastructure management

As is the case across the province, many of the key adaptation issues in agricultural areas of Vancouver Island relate to off-farm infrastructure and collective management decisions. Developing cooperative and cross-agency approaches was a priority. Some of the areas of need identified were: water supply and storage, wildlife management, ditch and drainage management and overall land management (particularly competing land uses).

“We need to figure out how to store the winter water — winters are getting wetter and summers are getting drier. I need to dig a storage pond and store the water but no one is going to help me do that—it’s a [substantial] cost.”

— mixed livestock producer, Parksville

Evaluating the impacts of regulatory regimes on regional food systems was seen as an important step in improving agricultural sector resilience. It was suggested that better coordination across regulatory bodies and careful analysis of the potential impacts of regulations and regulatory changes, particularly around water resource management, is an important step.

Endnotes

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