SMALL FARMS AND CLIMATE CHANGE ADAPTATION IN BRITISH COLUMBIA

By

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Abstract

Small-scale farms in British Columbia (BC) face the challenge of adapting to both positive and negative climate change impacts, while maintaining their financial viability. This study explores the issue of climate change adaptation for small-scale farmers in British Columbia using semi-structured interviews and case study analysis. Small farms frequently employ soil preservation techniques, organic methods, and grow a diversity of crops, which make them more resilient to some of the negative implications of climate change while their propensity to experiment with new high value crops puts them in the position to take advantage of potential opportunities. Farm incomes have been declining across BC and the financial vulnerability of small-scale farms places their long-term survival at risk. This research examines ways to enhance small-scale farm resilience to climate change. Agricultural policies and regulations impact on large and small operations differently and policies are needed to ensure that both have the capacity to face increasing pressures from climate change.

Keywords: British Columbia; BC; small-scale; farm; climate change; adaptation
Executive Summary

There is scientific consensus that climate change is occurring and impacts can already be observed around the world. Many researchers have predicted both positive and negative climate change implications for agriculture in British Columbia, with differences dependent upon location and whether producers can and will adapt to the changing conditions that may include temperature, precipitation, susceptibility to crop pests and disease. Many factors contribute to a farm’s adaptive capacity including political institutions, programs and policies, financial resources, market forces, available information and technology. Agriculture in BC is comprised primarily of small-scale farms, which provide employment, strengthen rural communities, and provide food for local markets. In addition, small farms frequently use more labour-intensive, soil preservation methods such as: minimal-tillage, permaculture, and crop rotation. They are more likely to grow a diversity of crops and farms that fit this description are more resilient to some negative climate impacts. Nonetheless, small farms are vulnerable to extreme weather events and sustained changes in rainfall and temperature. Financial vulnerability is a threat at all times, and may hinder adaptation activities.

This paper addresses the following policy problem: small-scale farms in British Columbia face the challenge of adapting to both positive and negative climate change impacts, while also maintaining their financial viability. A process-based approach to understanding the vulnerability of small-scale agricultural producers is used. This entails semi-structured interviews with local farmers to determine susceptibility to climate impacts, past adaptive strategies, and barriers to meeting future challenges. Case study analysis is used in order to assess climate change adaptation policy in other regions with similar stresses and conditions.
Problems identified throughout the interviews include climate impacts on production (lower yields, lower quality) resulting in lower revenue and requiring adaptation (e.g., different crops or growing techniques), which involves additional time and investment. Farm finances and regulation are the top political and economic concerns for farmers. The interviews show that climate change is just one of many socio-economic concerns for small-scale farms and this may indicate that the full implication of climate change and adaptation requirements is not reaching them. Most interviewees mentioned that adaptations they considered successful did not appear to be taken up by many in their area, indicating that information dissemination is an issue. This is particularly relevant considering a low usage of BC-based information. Small-scale farms will adapt to climate change given enough resources to do so and successful adaptation depends on available information.

Case study analysis reveals that action is being taken at both the federal and state level in the US to ensure small farms have the financial capacity and guidance to cope with climate change. A great deal of work has already been done to ensure that small farms make use of business risk programs, insurance programs, conservation programs (which increasingly include climate adaptation measures), that small farms are financially viable, and that new products introduced (in order to diversify) have available markets.

The overarching policy aim is to ensure that small farms in BC are sustainable in the long run. Long-term sustainability depends on small farms being able to adapt to negative climate change implications and capture potential benefits. To achieve this, short-term goals are:

1. Ensure small-scale farms have the knowledge to adapt to positive and negative implications of climate change (e.g. through outreach, workshops and online content targeting small farms).
2. Ensure small-scale farms have the resources to adapt to positive and negative implications of climate change (increase participation in current provincial and federal programs).
Three policy alternatives for achieving the stated policy goals are assessed: 1) Climate Adaptation Assistance; 2) Extension for Small Farms; and 3) Small Farm Lens. The first is an augmentation of a current joint federal-provincial cost-sharing program for environmental farm management improvements. The second endeavours to improve small-scale farm access to relevant information (i.e. targeted extension). The third aims to improve government understanding of small-scale farm needs and to ensure regulations and programs take these into account. Each alternative is discussed in turn and is then evaluated according to four criteria.

Policy recommendations are based on how well alternatives meet the policy objectives and their overall score in the criteria metric used. Alternative 2, Extension for Small Farms, scored the highest although alternative 3, the Small Farm Lens, is the least expensive. Both alternatives could be implemented for slightly less than $4.5 million over five years, which stays within current provincial pledges to build local food capacity. The third alternative (Small Farm Lens) indirectly supports the main goals of this research, but also has potential to increase small farm viability. This research shows that financial vulnerability and information are the two biggest barriers that small farms face in adapting to climate change. Therefore, it is recommended that the Small Farm Lens alternative be adjusted to account for areas where it scored low in the measures used here and that it be implemented along with targeted extension services.

Alternatives 2 and 3 are considered excellent starting points, which may lead to the revision of current programs based on improved government knowledge of small-scale farm needs. Although these two alternatives are considered reasonable in reaching the short-term (5 year) goals they are not enough to achieve the long term goal of ensuring small farm sustainability. Therefore, it is recommended that consideration be given to developing a climate adaptation assistance program over the next few years. Successful program development requires stakeholder input, federal collaboration and further climate adaptation research.
Dedication

I would like to dedicate this to my family.
Acknowledgements

I would like to thank my friends and family for their encouragement and support. It has meant so much. I would also like to send a special thank you to EHS, CB, and CJ.
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Definitions

Small-Scale Farm - The government of BC defines small-scale farms as those that earn $50,000 or less in annual farm receipts.

Small-lot Farm - The government of BC defines small-lot farms as those that are 10 acres or less.

Small Farm - A term which may describe a farm in terms of income level, or in terms of acreage. In the US a small farm by income level is referred to as those with $250,000 in annual sales or less, or sometimes as those with $50,000 in sales or less (although the latter is increasingly referred to as limited resource farms). In terms of farm size, the USDA defines a small farm as one with 50 acres or less.
Acronym List

ALR - Agricultural Land Reserve
APHIS - Animal and Plant Health Inspection Service
ARDCorp - BC Agriculture Research and Development Corporation
ARPA - Agricultural Risk Protection Act
ARS - Agricultural Research Service
BCAC - British Columbia Agriculture Council
BCMAFF - British Columbia Ministry of Agriculture, Food and Fisheries
BCAFM - British Columbia Association of Farmers’ Markets
BCMAL - British Columbia Ministry of Agriculture and Land
BMP - Best Management Practice
BRM - Business Risk Management
CIG - Conservation Innovation Grants
CDA - Colorado Department of Agriculture
CSP - Conservation Stewardship Program
CSREES - Cooperative State Research, Education and Extension Service
DAP - Disaster Assistance Program
EFP - Environmental Farm Plan
EQIP - Environmental Quality Incentives Program
FDACS - Florida Department of Agriculture and Consumer Services
FIPI - Farm input price index
GCM - Global Circulation Model
IPCC - International Panel on Climate Change
NRCS - National Resources Conservation Service
PEP - Provincial Emergency Plan
RMA – Risk Management Agency
RME - Risk Management Education
SAM - Sustainable Agriculture Management
SF - Small Farm
USDA - United States Department of Agriculture
1: Introduction

There is scientific consensus that climate change is occurring and impacts can already be observed around the world (IPCC 2007). Agriculture is particularly sensitive to climate change impacts. Many researchers have predicted both positive and negative climate change implications for British Columbia. A number of climate change models that predict net gains to agriculture assume that agricultural producers have made the necessary adaptation (Baier, et al. 2005; Wall, et al. 2007; Antle, 2009). Many factors contribute to a farm’s adaptive capacity including political institutions, programs and policies, financial resources, market forces, and available information and technology (Bradshaw, et al. 2006; Bryant, et al. 2007; Skinner and Smite 2002).

Agriculture in BC is comprised primarily of small-scale farms that provide employment, strengthen rural communities, and provide food for local markets. In addition, small farms frequently use more labour-intensive soil preservation methods such as: minimum-tillage, organic growing, permaculture, and crop rotation. Small farms that fit this description are more resilient to some negative climate impacts. Nonetheless, small farms are vulnerable to extreme weather events and sustained changes in rainfall and temperature. Financial vulnerability is a threat at all times, and may hinder adaptation activities. Policies should aim to ensure that small-scale farms are sustainable in the future and have the capacity to adapt to climate challenges.

I address the following policy problem in this paper: Small-scale farms in British Columbia face the challenge of adapting to both positive and negative climate change implications, while also maintaining their financial viability. Stakeholders include: existing small-scale farmers who will benefit through improved capacity for dealing with climate change, those interested in becoming small farmers, communities which will have a more secure food supply, and the provincial government. I have taken a process-based approach to understanding
the vulnerability of small-scale producers to climate change. The process-based approach is a risk assessment methodology, which incorporates stakeholder input to determine the level of risk for a population from a particular stress. Semi-structured interviews with local farmers are used to determine susceptibility to climate impacts, past adaptive strategies and barriers to meeting future challenges. Case study analysis is used in order to assess climate change adaptation in other regions with similar stresses and conditions.

This study is organized into 12 sections. Section 2 provides a rationale for protecting small farms. Section 3 gives an overview of agriculture and small farms in BC. Section 4 outlines climate change predictions for BC. Section 5 outlines relevant policies already in place in BC. Section 6 provides the study methodology and a framework for analysis of small farm vulnerability to climate change. Sections 7 and 8 outline the findings from interview and case study analysis. Section 9 describes the policy goals for this research and provides criteria and measures to ensure these goals are met. Section 10 evaluates three policy alternatives and sections 11 and 12 provide recommendations and conclusions.
2: Small Farms

Small farms have many social and environmental benefits. Peterson (1997) finds that small farms are at least as efficient as larger operations when considerations such as environmental management are included in the assessment. Long run average cost curves that take other factors into account indicate diseconomies of scale as size increases. The United States Department of Agriculture (USDA), National Commission on Small Farms (1998) highlights several studies showing that small farms can equal, or exceed larger farms in crop production per acre. It also finds that small farms represent a diversity of cropping systems, typically practise better land management, and provide better protection of natural resources.

Small farms have numerous social benefits. MacCannell (1983) finds that as farm size increases land owners tend not to live in the community. Communities with a higher share of individual land owners have more vested interests in the surrounding environment and in the community. Children raised on farms gain extensive agricultural knowledge, which is lost when farming is not a financially viable career choice. The shift from small to large farms has had numerous consequences for communities including: population decrease, increase in income inequality (a decline in middle class), deteriorating education quality and less access to government and community services (National Commission on Small Farms, 1998; MacCannell, 1983).

Small farms do not necessarily practise better environmental management; other factors play a role such as culture, government regulation, and consumer demand. Small farms provide social benefits and act as pioneers in exploring new growth potential for niche markets (Steele, 2000).

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1 The shape of long-run average cost curves are determined by the relationship between the scale of a firm’s operation and the inputs needed to minimize costs. This relationship shows the extent that costs per unit production increase or decrease as output increases. Diseconomies of scale implies that larger firms are producing goods at an increased per unit cost.
In Canada small farms typically offer a wide diversity of products and the majority sell alternatives to mainstream commodities (Beshiri, 2009). Maynard and Nault (2005) find that small farms often have more sustainable practices, but are not financially sustainable. The next section will look at agriculture and small-scale farms in British Columbia.

Footnote: A mainstream commodity refers to the primary agricultural goods produced in a region – for example in BC this includes: dairy, hogs, poultry, apples, potatoes, steers, tomatoes, berries, etc. An example of a non mainstream, or specialty crop is one that is used/processed in a new way, a crop that is new to a region, or a new variety of an establish crop (a heirloom variety for example).
3: Farms in British Columbia

This section provides an overview of agriculture and agricultural trends in BC and then describes small farms in BC. Statistics Canada defines large farms as those with over $250,000 in farm receipts, (in 2005 constant dollars). In 2001, 10% of farms in BC fit this description and accounted for 80.8% of total provincial sales (Statistics Canada, 2009). However, while much of the production from large farms is directed outside of the province, smaller farms form an important part of BC’s local foods economy. The government of BC defines small-scale farms as those with $50,000 or less in farm sales (BCMAFF, 1999). Figure 1 illustrates the distribution of farms across Canada according to the BC definition. The province with the second highest percentage of small farms is British Columbia³.

Figure 1: Percentage of Large and Small Farms, 2008

CANSIM, Table 20037

³ The data does not include the number of farms earning under $10,000 in farm receipts. In 2006 there were 10,087 farms earning less than $10,000 in BC, i.e., almost half the total number of farms.
3.1 Agriculture in BC

The agricultural sector in BC makes up slightly less than 1% of total employment and just less than 1% of total provincial GDP (Government of BC, 2010; BCSTATS, 2010). Altogether 56% of food that can be economically grown in BC is produced in BC (BCMAL, 2006a). The number of farms in BC declined by 2.2% between 2001 and 2006, while average farm size increased and the total area of farmland rose by 9.6% (Table 1).

Table 1: BC Farms Statistics

<table>
<thead>
<tr>
<th></th>
<th>1931</th>
<th>1996</th>
<th>2001</th>
<th>2006</th>
</tr>
</thead>
<tbody>
<tr>
<td>Average farm size</td>
<td>136 acres</td>
<td>288 acres</td>
<td>315 acres</td>
<td>353 acres</td>
</tr>
<tr>
<td>Number of farms</td>
<td>26,079</td>
<td>21,835</td>
<td>20,290</td>
<td>19,844</td>
</tr>
<tr>
<td>Total area of land on farms</td>
<td>3.5 million acres</td>
<td>6.2 million acres</td>
<td>6.4 million acres</td>
<td>7.0 million acres</td>
</tr>
</tbody>
</table>

Source: Statistics Canada, 2006 & 2001

Between 1931 and 2006 the number of farms declined, while average farm size more than doubled. Much of this occurred from 1931 to 1970, and the number of farms increased slightly between 1971 and 1996, before declining again since 1996 (CANSIM II Table 1530039).

BC has 7 agricultural regions (Figure 2). The most important is the Lower Mainland-Southwest area (region 2) followed by Vancouver Island Coast (region 1). These two regions contain 42% of the farms in BC, but only 6% of the total agricultural land base. The Netchako region accounts for over one third of agricultural land in use in BC, with the majority concentrated in the Peace River sub-region followed by the Thompson-Okanagan region. In the 2001 Census, the largest decline in farm numbers occurred in the Lower Mainland-Southwest Region (Statistics Canada, 2001).
Farms in BC have the second lowest total net income in the country after Alberta, and the second highest rate of growth for farm debt (CANSIM 20009, 20008). In 2007, off-farm income accounted for 74% of average total income for BC farmers (Statistics Canada, 2007). Farms in BC face financial challenges as evidenced by a decline in farm numbers, increasing farm debt and low profitability. The largest decline in farm numbers between 1996 and 2001 was among those with sales of $50,000 or less (BCMAL, 2006b).
3.2 Small-Scale / Small-lot Farms in BC

The BC Ministry of Agriculture, Food and Fisheries (BCMAFF) defines small-scale farms as those that generate $50,000 or less in farm receipts and small-lot farms as those that are under 10 acres (BCMAFF, 2000). In 1999, small-scale farms accounted for 77% of farms and small-lot farms accounted for 75% of farms. Although there is considerable overlap, some small-lot farms earn above the $50,000 threshold and some larger than 10 acre farms fall into the small-scale classification. Many small-lot farms, in the South Coastal Region, increase output by making more efficient use of land rather than expanding in acreage (BCMAFF, n.d.).

Although small-scale farms account for only a small proportion of provincial sales they make an important contribution to local food security. For instance, many small-scale farms in the South Cowichan Valley produce for family and friends indicating that a larger portion of the food supply may depend on small farms than can be captured purely in sales data (BCMAFF 2000). The demand for local food has been growing, as indicated in the expansion of farmers’ markets in BC. Many small farms have compensated for size by growing high value ‘boutique’ crops in order to distinguish their product against an influx of cheap imported food (Hild, 2009). Small farmers often rely on distinctive growing methods (e.g. organic, permaculture, low-tillage), processing, and crop varieties (e.g. heirloom, or exotic crop varieties) and this makes up a big part of their marketing (BCMAFF, 1999).

The farming population of BC is ageing. In 2006, the median age for farmers was 53, up from 52 in 2001, and 13.4% of the farm population is over the age of 65 (Statistic Canada, 2008). The ageing demographic is a reasonable explanation for the disappearance of some small farms; as farmers retire they are not being replaced as there are too few entrants willing to take on

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4 The BC Ministry of Agriculture, Food and Fisheries, BCMAFF, is now the BC Ministry of Agriculture and Land, BCMAL.
5 The number of markets participating as members of the BC Association of Farmers’ Market, BCAFM, has grown from 30 markets in 2000, to 100 in 2010 (BCAFM, 2010).
6 Similar to the trend for the general population.
the risks associated with farming. Although expanding farm size is often taken as an indication of small farm displacement, there are numerous reasons that small farmers leave the market such as the labour-intensive work and the difficulty in gaining a significant income solely on farm sales (Maynard & Nault, 2005).

3.3 Barriers to Financial Sustainability for Small-Scale Farms

The BCMAFF (2000) survey of small-scale farmers in the Cowichan, serves as an illustration of the challenges small-scale farmers face in BC. The survey reveals that the most frequently listed barriers to success are regulation, low profitability, time, capital, and the availability of processing facilities. The first three will be discussed in more detail here.

3.3.1 Regulation

The BCMAFF (2000) identifies that there is an opportunity to increase the success of small-scale farms by considering the regulatory burden placed on them, particularly when designing environmental and marketing regulation. In a previous report the BCAFF (1999) indicates the importance of reducing the regulatory cost on small farms, stating that regulatory agencies typically do not understand the needs of small-scale farmers, and they do not have the resources to respond to them. The cost of complying with regulation is a common complaint among businesses both big and small, but small businesses typically face higher compliance costs due to the lack of staff, time, and resources (Jones et al., 2005). In a survey of Canadian industry, Jones et al. (2005) find that the agricultural industry is the most likely to feel that governments do not understand the impact of regulation on their business.

Agricultural regulation in Canada is a shared federal and provincial power under section 95 of the Constitution Act. The federal government is responsible for matters related to cross-border trade, farm financial safety nets, agricultural research and development, food safety, food standards, labelling and nutrition. The federal and provincial governments work collaboratively in
these areas and provinces are generally responsible for program delivery. Provinces are responsible for food safety when food is sold within their borders and are responsible for land management, taxation, protection, and, agricultural extension\(^7\) (MacRae, 2009). The production of food is solely a provincial responsibility, but the trade of products both inter-provincially and internationally is exclusively under federal jurisdiction (Milne, 2007). Three types of regulation that affect small farms are discussed here: health, supply management, and land regulation.

Health regulation can limit the ability of small farmers to sell their products locally. One BC example is provincial meat regulation passed in 2004, which requires that all slaughter facilities meet federal standards\(^8\). Previously, there was separate licensing for meat sold within provincial borders and the change has meant that only a few large processing plants are eligible for animal slaughter. Hence many small farmers lost the ability to slaughter their own animals and instead have to send them to a slaughter house, which may not be available nearby (Government of BC, 2010; Johnson, 2008).

In BC many products are regulated by supply management boards including dairy, some meat, and certain vegetables. There are eight marketing boards in BC that manage quotas, which are established to keep prices high and prevent the market from overflowing with a particular good\(^9\). Some products are regulated nationally and production level is allotted by province\(^10\). Provincial marketing boards then determine the distribution of national limits into quotas (Milne, 2007). This creates a barrier for small-scale producers. Although a small amount of production is allowed without holding a quota, the amounts are generally not enough for farms to be financially viable. Small farms can overcome this barrier by growing a diversity of products at levels under the quota exemption, but expanding production of a regulated product is difficult. Farms wishing to increase production of regulated products need to obtain quotas, which do not often become

\(^7\) See Section 5.1.1  
\(^8\) Previously this was only required for meat being sold outside of BC.  
\(^9\) Section 2(2) of the Natural Products Marketing BC Act  
\(^10\) Under the Farm Products Agencies Act
available. Quotas typically are only available from the farms already in possession of them, meaning that small farms must compete with quota purchases by midsized and large farms. The marketing board quotas system does not distinguish organically grown products. Organic producers must pay to be certified provincially, but then organic products are cast under quotas along with the conventionally grown varieties (Milne, 2007).

Land regulation is a provincial matter and in 1973 BC established the Agricultural Land Reserve (ALR). The ALR covers approximately 11.8 million acres (or about 4.8 million hectares). Since its establishment almost 15,000 acres of some of the most productive land has been removed from the ALR, contributing to land speculation and price increases (Campbell, 2006). Between 2005 and 2006 the value of farm land in BC increased by 14.5% compared to a national average of 7.7 percent (Perrin, 2008). Higher land value creates a barrier for new entrants and makes it difficult for existing small-scale farms to refinance, or expand.

Farm land in BC receives favourable tax status, which represents significant savings. For instance, farmland valued at $100,000 would be taxed $805 a year as a farm, but that same land would be assessed at $700,000 as residential property and be taxed $2,268 per year (Moneo, 2007). To maintain farm status, farms must produce a minimum threshold of sales depending on their size: farms that are between 2 and 10 acres must maintain sales of $2500; farms greater than 10 acres must sell $25,000 plus 5% of the land value for every acre exceeding 10 acres; and farms that are less than 2 acres in size require $10,000 in sales (British Columbia's Farm Assessment Review 2010).

### 3.3.2 Impacts on Net Income

The BCMAFF (2000) finds that there is significant opportunity to help small farmers expand annual sales by encouraging more value added production, emphasising the importance of better marketing, and creating brand loyalty. However, these opportunities are constrained by a market inundated with cheap conventionally grown products from abroad (Milne, 2007). BC
imports roughly half of its food requirements. A reliance on imports weakens the local agricultural sector when the same product can be grown locally (Provincial Health Office, 2005). The federal government is responsible for international trade agreements such as the World Trade Organization, Agreement on Agriculture, and the North American Free Trade Agreement, which have had the greatest impact on local food production. These agreements eliminate quotas on imported goods and reduce tariffs on imports (Milne, 2007). Local, small-scale producers can compete by establishing themselves as unique i.e. more sustainable, organic, or a niche crop. A movement to eat locally has been growing in BC, but the fact remains that local food is often more expensive, and for low income individuals, may not be an option.

Farm net income depends on the price of inputs such as feed, fertilizer, and fuel. The farm input price index (FIPI) and the farm product price index (FPPI) show that, in BC inflation on farm inputs has risen faster than the inflation on the farm products sold (Statistics Canada, 2009). Bulk purchasing reduces cost, but requires more money up front and storage, which means it is not an option for small-scale farms. The net income of ranchers is affect if they are required to ship animals long-distances for slaughter and the shipping stress to the animal can lower the value of the meat (BCAFF, 2002).

3.3.3 Time

Maynard and Nault (2005) find that small-scale farmers have no free time to seek out new sustainable practices, work on marketing, or ensure compliance with regulations. In a survey by the BCAFF (1999) many farmers explained that they simply do not have the time to expand their operations and that while large farms are capital intensive, small-scale farms are labour intensive. Small-scale farm also use computers for business less frequently for larger operations and many small-scale farmers earn off farm income in order to make ends meet. However, small-scale farms can be stable operations. For instance in the South Cowichan Valley small-scale farms have a higher survival rate than other small businesses, but average sales tend to increase
more slowly over time than for other successful small businesses and typically exceed $50,000 in annual sales after 10 to 20 years in operation (BCMAFF, 2000).
4: Climate Change and Agriculture

The International Panel on Climate Change (IPCC) has stated that climate change is now ‘unequivocal’, and that there is evidence of this in observable rises in global air and ocean temperatures, melting snow and ice, and rising sea level (IPCC, 2007). Temperature changes have not been increasing uniformly across the globe and some regions experienced cooling trends initially over the last century, but in the past 50 years these areas have been warming (Niitsoo, et al., 2000). Climatic variability and precipitation changes have increased in the past century and vary greatly across regions.

Adapting to changing weather patterns is part of farming; however, the magnitude of the change under climate projections is much greater than previously experienced by farmers (Baier, et al., 2005). Despite research to determine the impact of climate change on agriculture, measuring the extent of the impact and adaptation is still extremely difficult (Antle, 2009). The following section outlines the approaches to understanding the impact of climate change on the agricultural sector.

4.1 Approaches to Understanding Climate Change Impacts on Agriculture

The three main approaches for studying climate change and agriculture are: impacts-based, context-based, and process-based. The impacts-based approach uses Global Circulation Models (GCM) to predict climate impacts and to understand the implications for agriculture. This approach seeks to determine the gravity of regional climate change projections and the extent that adaptation may mitigate negative impacts (Wall, et al.2007). This is done by building models of the potential impacts on agricultural yields and growing conditions. The effects vary according to
crop type and much of the research focuses on cash crops – such as corn, wheat, and soybeans. It generally assumes that overall adaptation will occur at the producer level by: adjusting seeding dates, switching to genetically modified crops, or reallocating land according to suitability and profitability of crops. This overlooks changes in capital stock; impacts on production value and farm income; and political, cultural, and regulatory influences on adaptation. Some models have attempted to compensate for this by making two assessments one with some aspect of adaptation taking place and one without any changes to current practices (Antle, 2009). A limitation to this approach is that GCMs, rely on temporal and spatial scales that are much broader than the site specific information that affects agriculture (Antle, 2009; Wall, et al. 2007).

More recent studies use a context-based approach and consider the many conditions that affect farm-level decision making and how farmers are likely to deal with them. This approach looks at the factors that are necessary for adaptation to occur and identifies multiple determinants of adaptation including: climate, economic, social, and political conditions (Wall, et al. 2007).

The third, processed-based, approach also considers socio-economic factors, but attempts to better define the process under which adaptation occurs by asking what type of adaptation can be expected, how viable is the adaptation likely to be under future conditions and how can adaptation be facilitated by government (Wall, et al. 2007). The background in this next section is drawn from impacts-based research on climate change in BC.

4.2 Climate Change and Agriculture in British Columbia

There is no consensus on the extent of climate change that will occur in BC. A general warming trend has been most apparent in western parts of Canada over the past 50 years (Zhang, et al., 2001). This warming has made BC considerably less cold, but only mildly hotter, as the daily minimum temperature has increased more than the maximum temperature (Niitssoo et al, 2000). By 2050 the average annual temperature in BC is expected to increase by 1.7°C, which is more than the global average. Average annual precipitation is expected to increase; primarily in
the winter with potential for a decrease in the summer. Higher temperatures, more rain, and less snow in BC will mean a decline in snow pack by -55% particularly in the Coast Mountain Areas (Rodenhuis et al, 2007).

Table 2: Precipitation and Snowpack in BC

<table>
<thead>
<tr>
<th>Precipitation and Snowpack</th>
<th>Average change</th>
</tr>
</thead>
<tbody>
<tr>
<td>Precipitation change the last 100 years</td>
<td>+22%</td>
</tr>
<tr>
<td>Change in April 1st snowpack over the last 50 years</td>
<td>-25%</td>
</tr>
<tr>
<td>Projected change in precipitation by 2050</td>
<td>+6%</td>
</tr>
</tbody>
</table>

Source: Rodenhuis et al, 2007

Four regions in BC are identified by Hamann and Wang (2006) based on biogeoclimatic shifts: the southern interior, the coast, the central interior, and the northern region. Climate change impacts are expected to vary by region and to some extent within each region\(^\text{11}\). I will focus on the impacts in the first two regions as they account for the majority of agricultural output and small farms. However, it should be noted that the latter two regions may become more favourable for agricultural production\(^\text{12}\).

\(^{11}\) Regional impact maps, trend data, and scatter plots are available from the Pacific Climate Impacts Consortium: http://tools.pacificclimate.org/select

\(^{12}\) Temperature and precipitation increases, particularly in the winter, are projected to be higher in the northern region than elsewhere in BC. The spring thaw is expected to occur earlier and permafrost to melt, impacting on soil and hydrology. There will likely be an expansion of grassland in the southern part of the central region (Utzig & Holt, 2009). This means a longer growing season and a potential that new areas will become more favourable for production. As in the other regions of BC natural disturbances such as forest fires and pests will be problematic for agriculture.
4.2.1 Southern Interior Region Impacts

The Southern Interior region is predicted to experience warmer and drier conditions in the spring and summer contributing to a considerable shift in ecosystems and an extended and more severe forest fire season (Utzig & Holt, 2009; Nitschke & Innes, 2008). Invasive species will present likely challenges as non-native species are expected to migrate and thrive (Utzig, & Holt, 2009). Reduced snowpack is expected to result in less spring runoff and lower summer flows in rivers across the region.
The Columbia Basin area of the southern interior is expected to experience a reduction in soil moisture during summer and fall (Rodenhuis, et al. 2007). The Okanagan area of the southern interior region is the driest area of BC and agriculture there is particularly dependent on irrigation. There is general consensus that the Okanagan area will experience water shortages, particularly due to increased competition for water resources from agriculture, residential uses, recreation, fisheries and hydro producers (Cohen & Kulkarni, n.d.; Langsdale, et al, 2007). Throughout the southern interior region, rising temperature could increase production potential due to longer growing seasons, but other factors such as the loss of moisture during the growing season will detract from this gain and drought is a major concern for agriculture in this region (Spittlehouse, 2008).

4.2.2 Coastal Region Impacts

The coastal region includes the Fraser Valley, which encompasses the Greater Vancouver Regional District and is one of the most important agricultural areas in BC. In this region average freshwater and air temperatures have increased over the past century and peak flows in the Fraser River are occurring earlier than they have in the past 85 years and contributing to floods. Fraser Valley and Greater Vancouver Sea-to Sky region are at the most risk from flooding. In 2003 and 2004 flooding occurred in Squamish, Pemberton, Mount Currie, Hatzic Prairie and Chilliwack River Valley (Fraser Basin Council, 2006). Table 3 summarizes the climate change forecasts for the Greater Vancouver region.
Table 3: Climate Variability Greater Vancouver Region

<table>
<thead>
<tr>
<th>Climate Variable</th>
<th>Expected Change</th>
<th>2020</th>
<th>2050</th>
</tr>
</thead>
<tbody>
<tr>
<td>Intense Rain Amount (1 day)</td>
<td>Increase</td>
<td>7 to 9 % change</td>
<td>17 to 18 % change</td>
</tr>
<tr>
<td>Intense Rain (Frequency)</td>
<td>Increase</td>
<td>16 to 25 % change</td>
<td>31 to 36 % change</td>
</tr>
<tr>
<td>Days of Consecutive Rainfall</td>
<td>Increase</td>
<td>2.5 more days/year</td>
<td>2.4 to 4.3 more days/year</td>
</tr>
<tr>
<td>Annual Precipitation</td>
<td>Increase</td>
<td>4 to 3 % change</td>
<td>4.3 to 2.4 % change</td>
</tr>
<tr>
<td>Annual Snowfall</td>
<td>Decrease</td>
<td>-13 to -36 % change</td>
<td>-35 to -45 % change</td>
</tr>
</tbody>
</table>

Adapted from (Beck & Crowe, 2008)

Other parts of the coastal region that currently have dry ecosystems are expected to become drier due to an increase in temperature. Throughout the area, forest fires and invasive species also pose a risk. In the exposed region of the coast the temperature increase may be less severe due to the proximity to the ocean, however precipitation is harder to predict accurately, and an increase in severe storms has been observed (Utzig & Holt 2009). In the coastal region flooding and an increase in the frequency of severe storms are the two biggest threats to agriculture. Excessive water may erode top soil, cause rot, and mould, or simply wipe out an entire crop, and potentially cause damage to farm equipment. In 2010, small farmers in Bella Coola (on the northern coast) experience severe flooding. Agricultural producers there suffered damages to fencing, animal shelters, pastures, padlocks, feed, livestock, and gardens (Luk, 2010).

Overall, impacts-based assessments predict a net benefit to agriculture in BC. This outcome is based on the assumption that in aggregate adaptation will take place and that the increase in atmospheric carbon dioxide (CO₂) levels will have a positive impacts for many crops. Baier et al. (2005) find that climate variability is the largest concern for agricultural producers. Extreme weather events are highly problematic and can place significant cost on producers and
government crop insurance programs. Aside from the direct impact of extreme weather conditions these may also lead to soil related problems such as topsoil erosion from floods and severe wind storms, desert like conditions from severe drought, increasing soil salinity from flooding in coastal areas, alkalization, water logging and silting (Baier, et al., 2005). Zebarth, et al. (1997) estimate that crop yields will increase in BC due to an extended growing season and that new, high value crops will be introduced. This positive outcome relies on adequate water supply for crop irrigation. Higher temperature means more suitable conditions for pests and disease, but few studies have focused specifically on the extent that these might pose a problem for agricultural producers (Wall, et al. 2007).

4.3 Small-farms impacts

Studies that suggest an aggregate positive outcome for agriculture in BC do not capture how likely adaptation is to occur, what type of farm is likely to adapt, the impact on communities where farms fail to adapt, or in the turbulence of the interim period before adaptation occurs. In a study of adaptation and US farms, Antle (2009), determines that small and large farms may be resilient to climate changes for different reasons\textsuperscript{13}. Small farms in the US are considered resilient as they generally produce a greater diversity of crops and livestock and typically depend on off-farm income. Large farms (more specialized) are more vulnerable to direct climate impacts on their main crop, but have more financial resources to recover and adapt, and are more likely to use government services.

There are few academic studies focusing on small farm resilience to climate change in North America. Food First, a research center for alternative agriculture in the US, claims that small-scale agriculture is a solution to climate change because it has more carbon storage in soil per hectare, and growing a diversity of crops generates more top-soil and better soil moisture, resulting in less erosion (Food First, 2008). However, the definition of small-scale farm by Food

\textsuperscript{13} In the US small farm is defined as those that earn under $250,000.
First is unclear and the terms small-scale, small-scale organic, and sustainable small-scale farming, are used interchangeably. It is not clear whether designation as a small farm is based on being small in acreage, being organic, having a particular level of farm sales, or some or all of the above.

A clear definition of small farms would make it much easier to discuss their resilience to climate change. However, small and medium (in size) farms that are organic, grow a diversity of crops and use minimum tillage are desirable for their resilience to climate change and carbon sequestration. The USDA is currently conducting research into the extent of this resilience and Wal-Mart is endeavouring to ‘climate proof’ its supply chain of food: by investing in small and medium sized farms; by providing them with training to increase production while remaining sustainable and by asking its suppliers questions related to water, energy, fertilizer and pesticide use per unit of food (Figuere, 2010; Walmart, 2010a; Walmart, 2010b).
5: Government Policies

This section outlines current policies in BC relating to climate change and small-scale farms.

5.1 BC Initiatives to Support Small-scale Agriculture

The Ministry of Agriculture and Land (BCMAL) is responsible for legislation and regulation of agricultural activities in BC along with the federal agriculture agency, Agriculture and Agri-food Canada. The BCMAL works closely with the BC Agricultural Council (BCAC) an umbrella organization that represents all the major commodity association and marketing boards in the province. The BCAC advocates for programs that would benefit small and large farms alike. Some small-scale farmers are represented under the Small-scale Food Processors Association if they are food processors. Agriculture Advisory Committees are groups of farmers appointed by local governments to offer insight on the impact of decisions on local agriculture although not every community has one.\(^1\)

The 2005 BCMAL policy framework for agriculture in BC includes five broad goals. Of these, three relate to small-scale farming: promoting and supporting local food production, increasing the profitability of family farms and bridging the urban/rural divide. The first two are discussed here.\(^2\) Strategies to increase local food production include pledges to introduce a new

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\(^1\) Presently, there are 28 in the province, while there are over a hundred communities in BC.  
\(^2\) The British Columbia Agriculture Plan: Growing a Healthy Future for B.C. Families
industry led marketing program and to develop a food miles awareness program (BCMAL, n.d). Since the 2005 framework, a school fruit and vegetable nutrition program has been created and delivered in partnership between the BCMAL, the Ministry of Education, and ACTNow BC (BC Agriculture in the Classroom Foundation, 2008). Strategies to enhance family farms include a business risk management program (section 5.2), recent amendments to the land classification system (section 3.3.1), and a pledge to increase extension services (section 5.1.1). A relevant Government of BC initiative is the creation of a ‘small business lens’, to be used by all ministries, through which new regulations are to be examined to ensure that any burden on small business is known and addressed (BCMAL, n.d.).

5.1.1 Agricultural Extension in BC

Established in 1893 the British Columbia Department of Agriculture’s mandate was to determine the needs of the farming population and advise them. This was accomplished through agricultural extension officers (agriculturalist) who would consult with farmers and provide education on profitability and new technological developments. Extension officers organize meetings, workshops, newsletters, and bulletins. Later the role of extension was transformed to that of both regulatory enforcement and education. In the 1980s, extension services in BC were restructured to a regional level, which meant fewer staff covering larger areas (Yeshewalul, 1982). Today in BC there is no mention of ‘extension’ on any BCMAL webpage, but extension services are carried out under other names. Primarily extension is provided online and by the Sustainable Agricultural Management branch (SAM). SAM has regional offices in 15 areas of BC.

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16 In 1993, the BCMAL launched a local food promotional initiative; buyBC. The BCAC claims it is the most successful collaboration between industry and the BC government ever and the buyBC logo achieved 75% consumer recognition. Government funding for the program was cut in 2001 and the BCAC has taken it over, but without funding there is now a fee to use the Buy BC label (BCAC, n.d.).

17 ActNowBC is an initiative by the BC Government aimed at coordinating actions to support healthy lifestyle choices across Ministries and levels of government i.e. municipal programs and services as well as provincial (The World Health Organization, January 2010)

18 The term is used by the BCMAL in the 2005 agricultural policy framework and is still used by farmers in BC. It is also used in many other jurisdictions and particularly in the US where the term was first used for agricultural purposes.
and acts as the first contact between the farming population and the ministry. Their mandate is to provide specialized knowledge, management advice, promote economic development, deliver environmental program services, enhance the understanding of the agricultural sector within the ministry, and to increase self reliance within the agri-food sector (BCMAL, (n.d.) b). A new online ‘extension’ service called Infobasket is meant to be a one-stop-shop for agri-food information. The site has a calendar of events (organized by SAM), webinars, and other information. One form of environmental extension service is the Environmental Farm Plan program, discussed in the next section.

5.2 Government Climate Polices

Growing Forward is a federal, provincial, and territorial agriculture policy framework with five target areas: Business Risk Management (BRM); Food Safety and Food Quality; Science and Innovation; and Environment Renewal. Only BRM initiatives have been launched and include: Agristability, Agriinvest, Agrirecover, and Agriinsurance. Together these four programs are designed to help farmers manage droughts, flooding, low prices, and increasing costs (Agriculture and Agri-Food Canada, 2008).

Agristability was introduced in 2008, as a federally administered, horizontal program designed to provide more security for farmers against large income fluctuations due to unavoidable events. The program is based on profit margins (allowable farm income – eligible farm expenses) from previous years. When income falls by 15% of a reference margin, payment is administered to farmers. Farmers must be enrolled in the program and complete an additional form in their income tax. Agriinsurance is a revised crop insurance program that now covers more commodities including horticulture and livestock (Agriculture and Agri-Food Canada, 2008).

Agriinvest is designed to help farmers with minor income declines. In BC, the program is harmonized with the regular income tax form, but requires a special bank account. The program requires annual deposits of a percentage of net sales and these deposits are then matched. The
maximum net sale amount is limited to $1,500,000 and 15% is the eligible percentage, hence $225,000 is the max government contribution. Only 25% of the individual’s average net sales income is allowed to be held in the account (Agriculture and Agri-Food Canada, 2008). In 2008, only 18.5% of farms were enrolled in Agriinvest and the number of payments issued to farms amounts to only 14% of the total number of farms in BC (Statistics Canada, 2010).

Agrirecovery is designed to compensate for damages from natural disaster. If disaster strikes, a province can ask the federal government to assess the situation and determine if additional assistance beyond Agristability and Agriinvest is needed. If further assistance is justified then a program response is developed in consultation with stakeholders and an announcement is made that affected producers can apply for assistance. The request to the province generally begins with industry pressure and past funding has gone to specific industries for example potato farmers, or cattle ranchers (Agriculture and Agri-Food Canada, 2008). Therefore individual small farms, growing a diversity of crops and selling under the quota limit may not receive assistance. For example, small-scale farmers in Bella Coola suffered losses due to flooding, but the event was not sufficient to prompt the province to apply for Agrirecovery.

In 2009, farmers in BC received payments from twelve programs between the provincial and federal governments, but 90% of the total payments to farmers came from four programs Agriinvest, crop insurance, Canadian Agricultural Income Stabilization program, and Agristability. Agristability accounted for 49% of all payments to farmers in 2009 (Statistics Canada, 2010). Although a study of income stabilization payments and farm size could not be found, the new Agristability program is likely to attract larger farms that have time and resources to complete the paperwork. Lazurko (2010) conducted a series of interviews with Saskatchewan farmers and finds that most have a vague understanding of the program and the majority of those who participate spend up to $800 for assistance from professional accountants. As one farmer states in the report;
• Still, there’s the opportunity cost. Is wrestling with the form really the best use of your time? (Lazurk, 2010 no page number).

In January 2011, the government of BC took emergency action to help farmers in the Peace River region who experienced drought three seasons in a row. Specifically the province has waived the sales requirements to qualify for farm status in this region for farms that have qualified in the past. This is a temporary measure and was implemented through the Ministry of Community, Sport and Cultural Development, but it does set a precedent for use in the future to assist with climate change related disasters (BC Ministry of Community, Sport and Cultural Development, 2011).

When a natural disaster occurs, businesses, residences, and farms can turn to the Provincial Emergency Program (PEP) if they qualify for relief under the Emergency Program Act. A farm may apply for financial assistance to repair or replace farm equipment or structures if the farm: has current farm tax status, is owned by a person who farms as their full-time employment, and the farm is the primary source of income (Government of BC, 1996). Considering that 74% of farms in BC earn off-farm income to a varying degree these criteria effectively limit many farms from seeking assistance.

Farmers can apply for assistance to upgrade certain farm equipment and practices through the Canada-BC Best Management Practices program (BMP). Areas that qualify for improvement assistance are: nutrient, riparian, grazing, irrigation, wildlife, pest, and biodiversity management. In order to apply a farm must first complete an Environmental Farm Plan (EFP) a voluntary program under which a planning advisor from BC Agriculture Research and Development Corporation (ARDCorp) consults with participating farms and helps them to develop a plan to enhance environmental farm management. Once the farm EFP is approved they may then apply for financial assistance for qualifying upgrades under the BMP (BCAC, 2011).
6: Framework and Methodology

This section provides a framework for analysing the adaptive capacity of small-scale farms in BC, outlines the research methodology, and describes the characteristics of study participants.

6.1 Adaptive Capacity Framework

In this capstone I consider how farmers threatened by financial uncertainty adapt to climate pressures. I assess their perception of the risk posed by climate change relative to other risks, and their history of adaptive behaviour. This fits under the process-based approach to climate change and agriculture, which incorporates direct input from stakeholders into analysis, considers the interaction of multiple risks, and assesses capacity to adapt. This approach is not common in climate change research, but is often used in other kinds of risk management research. It is stakeholder-driven and it aims to generate practical applications for findings (Wall, et al. 2007).

To assess vulnerability, it begins by designing methods to discover conditions which have been problematic for a particular group in the past, how they have dealt with them, how effective this has been, and barriers to coping with the problem. This approach may also consider regions where a similar issue has been dealt with to identify what policies were in place and under what conditions the problem can successfully be addressed by a particular adaptive strategy (Moss et al. 2001; Pahl-Wostl, 2002)\(^{19}\). Figure 7 illustrates how the process-based approach is applied in this research. Total vulnerability is a sum of present risk and ability to adapt, plus

\(^{19}\) This kind of framework has been developed and applied in several vulnerability assessments (Jones, 2001; Lim & Spanger-Siegfried 2004; Schroter et al 2005)
future risk and future ability to adapt. The risks are climate factors and socio-economic factors. The risks faced by a farm and its ability to adapt to those risks today constitutes its vulnerability today, but it may not be able to continue to adapt in the future, or the risks may become more severe, hence the overall vulnerability must take this into account.

Figure 4: Adaptive Capacity Framework

Adapted from Wall, et al, 2007

6.2 Study Details

I conduct semi-structured interviews with small-scale farmers to identify how climate change has affected them in the past, how they have dealt with it, and what barriers exist to adaptation. I also have them rank climate change concerns in relation to other socio-economic concerns. I use thematic and content analysis and organize data according to the framework set out above. First I look at the risks posed by climate factors and adaptive capacity, followed by the risks posed by socio-economic factors and adaptive capacity, and then discuss the overall vulnerability. I employ case studies from areas that have dealt with the problem of declining farms and determine if the vulnerabilities identified in the interviews have been addressed.

Interviews are semi structured to gain a richer understanding of the context in which actions are taken. Questions are kept within five main theme areas: 1) background information 2)
participation in the local economy 3) perceptions of climate change 4) factors influencing on farm decisions 5) government programs and services, information access, and policy.

6.3 Interview Participant Characteristics

I conduct fourteen semi-structured interviews arranged through advertisements sent out via public listserves and by approaching farmers directly at Vancouver farmers’ markets. The recruitment was convenience based, but an effort was made to speak with farmers from a variety of locations in BC and producers of a wide selection of goods. Participants volunteered to take part and most are extremely involved in advocating for change in agricultural groups, organizations, or through research. The majority of farmers interviewed are from Vancouver Island and the Lower Mainland, where small-scale farms are more abundant, but there are some from the Thompson-Okanagan, Kootenay, and Cariboo regions – i.e. 5 out of 7 agricultural regions. The map below shows the general location of the interview participants.
The characteristics of the farms in this study are shown in Table 5. Various types of farmers are included such as fruit, vegetable, poultry, and livestock operators. The majority produce a mixture of crops and goods, but a few rely mainly on one or two products. Most do not do secondary processing. Although the focus of this study is on small-scale farms, a midsized farmer is included as he has land in three different areas, provides insight into the climate risks, and makes a useful comparison. Two farms in this sample are not driven by profit, one is a not-for-profit operating on public land and the other is a social enterprise that operates on private residential land, however, both must sell enough to cover expenses.

The farmers participate in the local economy in a variety of ways. Eight of the farms sell at various farmers’ markets, two have recently started their own farmers’ market, two sell directly to restaurants and two participate in home box delivery programs. Three small farms and the
midsized farm sell directly to grocers, and two farms sell at the farm gate to established customers. One farm sells breeding stock and wool products internationally in addition to local meat and poultry sales. Most participants were farm owners, but one was the full time manager of a farm. Almost all the farms say they use organic methods, but only three are fully certified. In Table 5 each participant is given a number which is used to make reference to the participant in the findings and analysis.

**Table 4: Characteristics of Interview Participants**

<table>
<thead>
<tr>
<th>Interview #</th>
<th>Location</th>
<th>Years of Operation Present Farm</th>
<th>Experience Farming</th>
<th>Acres</th>
<th>Production</th>
<th>Employees</th>
<th>Organic</th>
<th>Small-scale</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Port Alberni</td>
<td>5</td>
<td>30</td>
<td>1 acre</td>
<td>various veg</td>
<td>volunteers</td>
<td>method</td>
<td>yes</td>
</tr>
<tr>
<td>2</td>
<td>Metchosin</td>
<td>50</td>
<td>4</td>
<td>4 acres cultivation 10 acres total</td>
<td>various veg</td>
<td>1 FT</td>
<td>method</td>
<td>yes</td>
</tr>
<tr>
<td>3</td>
<td>Metchosin</td>
<td>2.5</td>
<td>3</td>
<td>1 acre cultivation 10 acres total</td>
<td>mainly veg, some fruit</td>
<td>no</td>
<td>method</td>
<td>yes</td>
</tr>
<tr>
<td>4</td>
<td>Saanich</td>
<td>7</td>
<td>7+</td>
<td>38 acres total 9 forested and 9 in production</td>
<td>various fruits, various veg, sheep, chickens, maple syrup, forage crops, value added production</td>
<td>no</td>
<td>certified</td>
<td>yes</td>
</tr>
<tr>
<td>5</td>
<td>Lantzville</td>
<td>10</td>
<td>10+</td>
<td>1.5 acres</td>
<td>various veg</td>
<td>no</td>
<td>method</td>
<td>yes</td>
</tr>
<tr>
<td>6</td>
<td>Vancouver</td>
<td>3</td>
<td>6</td>
<td>0.05 of an acre</td>
<td>mainly sprouts, peas, wheatgrass</td>
<td>1 PT</td>
<td>no</td>
<td>yes</td>
</tr>
<tr>
<td>7</td>
<td>Richmond</td>
<td>5</td>
<td>10</td>
<td>3 acres of public land</td>
<td>various veg, apples, hazelnuts</td>
<td>volunteers</td>
<td>method</td>
<td>yes</td>
</tr>
<tr>
<td>8</td>
<td>Richmond, Delta, Fraser Valley</td>
<td>62</td>
<td>50</td>
<td>450 acres</td>
<td>various veg, berries, cattle, hay</td>
<td>many</td>
<td>no</td>
<td>no</td>
</tr>
<tr>
<td>9</td>
<td>Cawston</td>
<td>26</td>
<td>26+</td>
<td>25 acres</td>
<td>various veg, various fruit</td>
<td>no</td>
<td>certified</td>
<td>yes</td>
</tr>
<tr>
<td>10</td>
<td>Fort St. John</td>
<td>31</td>
<td>31</td>
<td>160 acres - 5 under production</td>
<td>honey</td>
<td>no</td>
<td>method</td>
<td>yes</td>
</tr>
<tr>
<td>11</td>
<td>Falkland BC</td>
<td>18</td>
<td>5</td>
<td>45 acres under production 155 total</td>
<td>sheep, chickens</td>
<td>no</td>
<td>method</td>
<td>yes</td>
</tr>
<tr>
<td>12</td>
<td>Spallumcheen</td>
<td>19</td>
<td>22</td>
<td>9 acres</td>
<td>turkeys, chickens</td>
<td>2 PT</td>
<td>method</td>
<td>yes</td>
</tr>
<tr>
<td>13</td>
<td>Cranbrook</td>
<td>2</td>
<td>2</td>
<td>5 acres</td>
<td>mainly garlic</td>
<td>volunteers</td>
<td>certified</td>
<td>yes</td>
</tr>
<tr>
<td>14</td>
<td>Columbia River Valley</td>
<td>30</td>
<td>30</td>
<td>10 acres</td>
<td>hay, heifers, some veg</td>
<td>no</td>
<td>method</td>
<td>yes</td>
</tr>
</tbody>
</table>

*PT: Part time, FT: Full time, ‘Method’ refers to farms that use the organic method of growing but have not sought certification.*
7: Interview Findings

This section presents interview findings according to the framework outlined in section 7. It is organized into three parts: present vulnerability, overall vulnerability, and use of government programs.

7.1 Present Vulnerability

The present level of risk for small-scale farmers depends on: direct climate impacts, present adaptive capacity, and other socioeconomic concerns. Each of these is discussed in turn.

7.1.1 Climate Impacts

Participants were asked to describe any changes to local climate, or growing conditions since farming in that area and how it has impacted their business. All participants have noticed changes to local weather patterns, which have impacted their production (but not all attribute these changes to climate change). Table 5 lists the top two weather concerns in order of frequency by region. The coast and the southern interior have two common problems: unpredictable weather and more extreme seasons. The regions differ in the emphasis placed on each concern and the type of seasonal extreme. The problems are discussed by region to highlight how these common problems affect them differently (for a full discussion on impacts see appendix I).
Table 5: Top Two Concerns Listed by Region

<table>
<thead>
<tr>
<th>Rank</th>
<th>The Coast</th>
<th>The Southern Interior</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Unpredictable Weather</td>
<td>More extreme seasons: heat in the Summer</td>
</tr>
<tr>
<td>2</td>
<td>More extreme seasons: precipitation in fall,</td>
<td>Unpredictable Weather</td>
</tr>
<tr>
<td></td>
<td>winter, and spring</td>
<td></td>
</tr>
</tbody>
</table>

In the coastal region, participants spoke of unexpected severe weather and unpredictable seasons, which impact business in a variety of ways. Direct impacts from unpredictable weather have resulted in lost crops, lower quality, and loss of growing capacity for certain crops. Indirect impacts include an increase in pests and additional labour. Figure 10 summarizes the impacts from unpredictable weather.

Figure 6: Result of More Unpredictable Weather in Coastal Region

• It’s hard to distinguish between a naturally different season and climate change but the biggest concern is the inability to predict weather (Int 2).

• The previous winter we had almost no significant cold in January and the result was bugs survived and the eggs were not killed and then as a result they were eating things that normally they wouldn’t (Int 5).

The second problem, of precipitation increases in the coastal area, is related to unpredictable severe storms, but was discussed as being the new trend. The main problem is flooding occurring in the spring and fall, which has resulted in direct losses to field crops. Excessive precipitation
directly impacts crops by lowering quality, and indirectly by increasing pests and moulds. Figure 11 summarizes the impacts from more extreme seasons.

Figure 7: Result of More Extreme Seasons in Coastal Region

- There was a potato disaster in 2010 and we lost half a million dollars in September and October due to weather […] the fall stuff got hampered [from rain] - used to be that there was significant regional variation between Delta, Richmond and Fraser Valley […] now everyone is getting effected –there’s a lot wider spread events and extremes in heat and moisture (Int 8 Midsized farmer).

For farmers in the southern interior, the greatest concern is hot summers, which contribute to drought and forest fires. The impacts from extreme summer heat are primarily direct losses to production. Figure 12 summarizes the impacts from more extreme seasons in the southern interior.

Figure 8: Result of More Extreme Seasons in Southern Interior

- I’ve lost a lot of birds from heat some summers (Int 11).
- […] in the 2009 dry season we lost all our corn, carrots, and beans because water had to go to other crops (Int 14).
Erratic weather patterns compound this issue. For instance, Cranbrook farmers growing dry weather crops suffered from an unexpected wet season in 2010. Unpredictable, extreme weather has directly impacted crops by reducing yields and quality; and indirectly by lowering soil quality. Figure 13 summarizes the impacts from unpredictable weather in the southern interior.

Figure 9: Result of More Unpredictable Weather in Southern Interior

[...] typical winters and summers aren't typical any more - there aren't typical patterns there is no consistency (Int 12).

Seasonal extremes are impacting farmers throughout BC. Farmers in the southern interior reported direct losses to crops from extreme summers, while precipitation increases on the coast have been attributed to outbreaks of pests and mould, reduced yields, and reduced quality. Unpredictable weather has resulted in extra labour, more pests, inability to predict yields, and loss of growing capacity for certain crops. Smaller yields and lower quality crops means that farmers receive less revenue from each affected crop, while extra labour requires more time.

7.1.1.1 Opportunity

Fruit and vegetable growers across all regions are predicting future opportunities arising from changing climate conditions, yet the majority do not report currently benefiting. Opportunities
are expected due to projections of an increasingly longer growing season and warmer temperatures. In the southern interior, one farmer claims he is already benefiting as the extra CO$_2$ from forest fires is contributing to stronger fruit trees. In the coastal region three out of eight participants expect there to be net benefits from climate change and seven out of eight could mention at least some anticipated opportunity. The most notable benefit mentioned is the expectation of being able to grow a larger variety of food. Many participants are already experimenting by introducing new crops with some encouraging results. The urban farmer considers climate change an advantage and expects to see growing demand for local food delivered sustainably by bicycle. A few other farmers also mentioned anticipating a potential increase in demand resulting from climate impacts on production elsewhere and the resulting impact on import prices.

- *Forest fires are great for me I grow better fruit in forest fires (Int.9).*

- *3 out of 4 of the longest frost free seasons in 30 years have been in the last ten years (Int. 14).*

- *Persimmons are now growing better & we are testing other crops […] there are other people I hear about growing oranges and bananas and things but I think it’s more of a hobby to experiment rather than to test what they can grow and market in the future (Int 4).*

Farmers mainly raising animals did not list any expected benefits. The majority who grow fruits or vegetable are anticipating better growing conditions and one farmer mentioned that he is currently benefiting. None of the others mentioned benefiting from climate change at present, but some are experimenting with new crops. In contrast, climate change is presently having negative impacts on production, to a varying degree, for all participants.

### 7.1.2 Adaptive capacity

After describing climate impacts, participants were asked to describe actions they have taken to address these concerns. They have made a variety of changes based on changing climate
conditions and changes are grouped into four categories: farm management, growing method, capital expenditure, and experimentation (discussed under opportunities above).

The most prominent adaptation has been changes in farm management practices such as crop selection and herd size. Diversified production is one strategy to deal with poor seasons in order to spread risks. Participants in all regions have tried switching crops, for example, recognizing that shoulder season crops are no longer growing well, and trying out alternatives\(^{20}\). For those that rely on grazing grasses, an adaptation to dry summers has been to raise smaller flocks.

Solutions to one problem are frequently foiled by another. Crop selection can be difficult and in the coastal region, crops that require little water such as wheat are good for the dry summers, but do not fare well in the rainy seasons. One of the chicken farmers would like to plant nut trees in order to diversify and provide more shade for the chickens to counter the heat, but this has not been possible due to water shortages.

- ...maybe it’s not wheat that’s our answer maybe it's quinoa or amaranth and you know what I mean, these are the questions that need to be asked (Int 1).
- You must account for the worst experience that you’ve already been through in your farm management (Int 11) [on why he now raises fewer sheep].

Another way of adapting is by changing growing methods. One participant is considering switching to xeriscaping, a labour-intensive method that reduces the need for irrigation. Another is mulching large areas of land to provide nutrients and water retention, which requires an investment of both labour and materials upfront. One Island farmer is using a bio-intensive method, meaning plants are grown closer together using less land, soil and water, but it is more labour intensive. Extra labour is one of the challenges of being small, and requires more time. Each of these methods also involves more time spent acquiring knowledge, skills and planning.

- It’s much more challenging to work with things like bugs and mould when you have less land to work with because you can’t just leave an infested area fallow for a season and you need to be a lot more skilled and technical about it (Int 5)\(^{21}\).

\(^{20}\) Shoulder season refers to the transition between seasons – winter to spring or spring to summer.

\(^{21}\) Fallow refers to land that is not planted and is left barren.
Other solutions involve the purchase of new equipment, and infrastructure. Participants have invested in greenhouses, tunnels, row covers, and for one participant, a solar-heating system. Some are switching to more efficient watering systems such as drip irrigation and one participant has invested in a water catchment system to deal with water shortages. A change in equipment is often required such as switching from tractors to handheld. One farmer made this change and is now switching again to a walk behind tiller. Some adaptation is undertaken on a trial and error basis. One chicken farmer is innovating with ways of coping with summer heat by installing trees for shade and allowing grasses to grow longer. In deeper grass, the chickens can keep cooler, but have a harder time scratching for food and there is an additional cost in supplementing their diet. Structural adaptation can be even more costly for those that are certified organic, for example, to install new fencing a certified organic producer must use a specific fencing material, which is more expensive.

When asked how they have adapted to changing climate, all had something to relate and all are pro-actively attempting to find solutions. Most spoke of what they had done successfully. A few mentioned future plans and a couple mentioned failed attempts. Some indicated forgone improvements, or a limit to the number of enhancements that can be made in a year due to financial constraints. All stressed that the improvements they did make were not easily financed. Obvious financial costs for adaptation include equipment upgrades and structural improvement and less intuitive expenses include purchasing more feed for chickens and mulching materials. Other than the capital cost, adaptive methods require more labour, i.e., more time spent farming. Less obvious time expenditures include finding information on new growing methods, or pest management for small acreage growing. Changes in farm management practices may not require as much time or money, but may involve downsizing i.e. no longer growing shoulder season crops, or reducing herd size. Farmers are still searching for alternative crops, but have not yet found ideal replacements. In attempting to counter one issue (e.g. dry summers) they are being
challenged by another (e.g. wet falls). These farms managed to stay afloat and make some changes to the farm this year, and this required additional time, money, and knowledge.

- *We can do one large expenditure per year so if plans are made a year in advance then our watering system could be changed (Int 4).*

- *We would never be able to afford to make improvements on farm sales alone and we try to make improvements every year (Int 12).*

Participants were asked if the changes they made were common and if other local producers were also taking similar steps. Most appear to be ahead of others in their area in trying out new techniques. Although they could only speculate, most indicated that this was due to lack of information, time, or finances. Most indicated that their successes were due to unique circumstance, which allowed them to make expenditures.

- *We are a social enterprise and we try to earn as we go but we also donate money to the organization when we need it [...] but we totally understand why people rely on off-farm incomes (Int 1).*

- *Our farm is a retirement project so we’re running a deficit of $30,000 but that’s because of major infrastructure investments - if we took a salary out we couldn’t afford it (Int 4).*

- *[Mulching] not many people are doing it - maybe due to time and labour or maybe they are not familiar with it. [...] Poly-tunnel and greenhouse materials and irrigation system were all bought used to reduce cost but a lot of time was invested in finding inputs. It is difficult to cover costs from returns and doubtful that it could be [better] in the future the goal is supplying local food (Int 3).*

- *Covered row houses or plastic cover would protect from some of the extremes - but many neighbouring growers do not seem to be doing this (Int 7).*

In summary, adaptation is occurring, but imposes a cost in terms of time and money. Time is spent in extra labour and acquiring information. Investments are made in new capital, or new crops, but these do not always pan out. Despite making changes, climate related impacts on production were still reported, therefore adaptation is never complete, and it will always be an ongoing process. Some successful approaches do not appear to be taken up by neighbours and information does not appear to be widely disseminated. Although opportunities are anticipated benefits are not yet being captured.
7.1.3 Socio-Economic Concerns

Participants were asked to rank their concerns in order of priority and were given four options with the possibility of adding a fifth. Options provided were: financial viability; government regulation; market factors, such as competition and available markets; and climate change. In answering the question some participants gave an actual ranking and some chose to talk about their top few concerns without ranking. In this section, I use content analysis and have added the number of times an option was listed, or if options were not ranked, I identified the number of times each was mentioned in the discussion and ranked them from most to least mentioned.

Table 6: Priority of Concerns for Interview Participants

<table>
<thead>
<tr>
<th></th>
<th>Financial</th>
<th>Regulation</th>
<th>Market</th>
<th>Climate</th>
</tr>
</thead>
<tbody>
<tr>
<td>Top Concern</td>
<td>12</td>
<td>2</td>
<td>2</td>
<td>3</td>
</tr>
<tr>
<td>Second Place Concern</td>
<td>1</td>
<td>9</td>
<td>2</td>
<td>1</td>
</tr>
<tr>
<td>Third Place Concern</td>
<td></td>
<td></td>
<td></td>
<td>2</td>
</tr>
<tr>
<td>Fourth Place Concern</td>
<td></td>
<td></td>
<td></td>
<td>2</td>
</tr>
</tbody>
</table>

Financial viability was most frequently listed as a top concern. When explaining this concern, many mentioned that without off-farm income, farming would not be possible. Even with off-farm income some stated that they still struggle. The two newest farmers have difficulty making enough to qualify for farm tax status\(^{22}\). Even the midsized farm listed economic concerns as number one. He also expressed concern that those raised on farms do not want to take over because it is not profitable. A concern that those interested in farming do not see it as a viable option was echoed by many others when discussing financial stability.

\(^{22}\) See section 3 for more on off-farm incomes and farm tax status.
• The most important thing for me is that I have a chance to be profitable - not make tons of money it is not my principal source of income and if you can’t afford to farm there is no point in doing it no matter how much you like it (Int 11).

• ...not knowing that anyone out there would want to take up the farm when we retire, internal finances and maintaining funds in the farm is number one(Int 2).

Regulation was the top concern for two participants, and was the second most concern for nearly all others. Participants mentioned the cost of complying with environmental and health regulations. For instance the meat processing regulation was raised by a few participants and was blamed for lost customers because the regulation has increased production cost and consequently the price of meat.

• Rules and regulations are to accommodate international trade issues but my sheep do not go into the global market (Int 11).

Two groups of participants have particular regulation concerns: those who produce products controlled by a marketing board, and those who are certified organic. To be certified organic there are additional costs for inputs and certification. The time and cost spent complying with organic regulation was listed as the reason that those who use organic methods have not sought certification. Certified organic producers mentioned of a lack of consumer awareness regarding standards. In addition organics are not recognized by the marketing boards. Boards provide a standard price for non-organic products which is less than organic per unit cost for production. Therefore, without knowing the best price to charge some organic producers have been undercut by organic competitors.

• Many farmers don't even know what we should be charging for our product so we were selling to a local store and we were undercut by 50 cents (Int 4).

Complying with marketing board regulations is a problem for some, whether certified organic or not. One participant described a lack of information on the part of the marketing

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23 See section 3.3.1
boards regarding the production of small-scale farmers. Explaining that, most small chicken farmers were raising 3000 birds on average before the limit was lowered to 1000. The participant enquired how the board determined the limit and was told that the board had not realised that most small farms had been producing over this limit\textsuperscript{24}. Even joining a marketing board in order to legally increase production can be burdensome, according to another participant who would like to increase egg production. However, as a member of the marketing board, the participant would have to pay to ship their eggs over 400 miles to have them appraised and then shipped back. As an organic producer, this participant objected to the financial cost and the additional carbon footprint of shipping eggs back and forth.

- \textit{I have an Environmental Farm Plan, I have to have a food safety audit, have to make sure not to spray crop within 6 meters of a ditch - so there are just so many rules to follow that it takes away from the ability to market your crop [...]It take an extra person to look after all the forms, food safety audits and everything so an extra $35,00 per year (Int 8, i.e. midsize farmer).}

Climate change was listed as the top concern by three participants, due specifically to uncertainty over how it will impact the price of inputs, and the local consumers’ ability to purchase – rather than concern over dealing with the direct impacts. Most ranked climate third and some were not at all concerned. Generally because many felt that there could be positive as well as negative consequences to climate change. Most felt that longer growing seasons and a milder climate will result in opportunities and that climate impacts elsewhere may create more demand for local food.

- \textit{Input prices are of concern and related to climate change - the impact of climate change could cause input prices to go up (Int 6).}

- \textit{Climate and market are pretty intertwined so if there are food shortages this would increase the market of local food (Int 2).}

\textsuperscript{24} Since this interview took place (in October, 2010) the limit has been increased to 2000 birds after a meeting organized with processors and producers in December, 2010.
Market concerns were generally ranked last although two people listed markets as their top concern, and two as their second concern. Three participants were particularly concerned about competition from imports. They feel they do not have the capacity to compete with the products coming in from Mexico and California where the environmental costs are not reflected in the price.

- *...they can bring up [produce] from over 1000 km away and on three different trucks and still sell it for cheaper than we can at the farmers’ market (Int 5).*

Participants did not directly list additional concerns; however, three distinct information problems can be identified: consumer awareness, government knowledge, and trade information. Consumer awareness is a concern in terms of: the public awareness of organic standards, import pricing not reflecting environmental externalities, and lower demand for local versus imported food. Lack of government knowledge is reflected in the new meat regulations and marketing board regulations, which illustrate a lack of understanding of the impact on small farms. Producers mentioned lacking trade information such as: appropriate pricing (to avoid being undercut), climate change impacts (direct impact, input prices and sales in the future), and start-up information. One beginning farmer reported difficulty in knowing what to grow.

The main problems identified in this section are direct financial costs, costs incurred from regulations, and lack of information. Both financial and time expenditures are required for successful climate change adaptation. However, climate change is not as important for this group as addressing the issue of overall profitability. Unlike with climate change such socio-economic concerns do not have adaptation strategies other than earning off farm income, working harder, and voicing concerns.
7.1.4 Overall Vulnerability

This subsection assesses overall vulnerability based on present risk, present adaptive capacity, and future expectations for climate change. The type of adaptation that can be expected is also summarized in this section.

Small-scale farms in BC are vulnerable to climate change, although some adaptation does occur. Most adapt to climate change by employing more labour intensive methods, diversifying crops, and investing in technology and infrastructure. The vulnerability of small-scale farmers is hinged on their future financial stability and time and the more they must rely on off-farm income to support their efforts, the less time they will have for farming.

The participants in this study are very engaged in agricultural groups and appear to be ahead of their neighbours. It is anticipated that the adaptation by these participants will become more prevalent in the future. Thus, future adaptation can be expected to include: exploration of new crop varieties and loss of others, a reduction in herd sizes (for grass-fed animals), and an increased reliance on some inputs (e.g. feed, mulching materials). A move towards more sustainable techniques can also be expected\(^25\). Other adaptation will include changes in irrigation systems, the installation of more row tunnels and greenhouses, and changes in equipment.

The farmers in this study have been investing time and resources into adaptation, but their ability to do so in the future is not certain. Changes in precipitation, temperature, and extreme weather are expected to increase in magnitude. In addition, there is no sign that net incomes in BC will necessarily increase in the future. A movement to buy local food has been growing in BC, but many other factors are impacting income such as: increasing input prices, adaptation costs, regulatory costs, and information costs. In the short term, the impact from extreme weather events and the cost in time and finances for adaptation may cause more farms to fail and low profitability will likely continue to deter the entrance of new farmers. The

\(^{25}\) i.e. soil moisture preservation methods such as mulching, zero tillage, permaculture, xeriscaping and bio-intensive methods.
vulnerability of small farms in general is in their financial vulnerability; however some adaptation
may be beyond the ability of an individual farm to finance; for instance in the case of drainage
problems in Richmond (Appendix I). Therefore, certain areas of BC may require more assistance
than others to deal with direct impacts such as areas that are frequently flooded and farming
should be encouraged in areas that become more favourable for agriculture.

7.2 Current Use of Government Programs

Before considering policy options it is important to understand how current programs and
services are used. Participants were asked to list any government programs they use and those
described in section 5 were given as examples. They were also asked to list their top sources for
information related to farming. The majority said that they do not currently use any government
programs – those mentioned in section 5, nor any other. A few participants have used the services
listed in table 8.

Table 7: Use of Government Programs

<table>
<thead>
<tr>
<th>Program or Service Used</th>
<th>Number of Participants</th>
</tr>
</thead>
<tbody>
<tr>
<td>Environmental Farm Plan(^\text{26})</td>
<td>2</td>
</tr>
<tr>
<td>Best Management Practices (irrigation and waste management upgrade funding)</td>
<td>1</td>
</tr>
<tr>
<td>Meat Transition Assistance Program(^\text{27})</td>
<td>1</td>
</tr>
<tr>
<td>Workshop/seminar</td>
<td>3</td>
</tr>
</tbody>
</table>

\(^\text{26}\) See Section 5.2

\(^\text{27}\) The Meat Transition Assistance Program was created to assist those who no longer qualify for meat slaughter licenses under the meat regulations to upgrade their facilities and to encourage the construction of new facilities
• *I'm too small for crop insurance that is for larger monocrop farms - I would take it if it was offered but it would probably cost me in the paper work and I wouldn’t want to do it (Int 14).*

The sources are sorted according to BC, Canada, local, US, and other, and are listed in table 7 along with the number of responses. The majority get their information locally and in particular from other growers. However, US based sources are listed almost as frequently. Information provided by the provincial or federal government was listed least frequently.

• *I would rather listen to a grower than a bureaucrat (Int 14).*

**Table 8: Primary Sources of Farming Information**

<table>
<thead>
<tr>
<th>Information source</th>
<th>Times Mentioned</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>BC:</strong> Infobasket, BC Farm Knowledge Network, BCAC</td>
<td>3</td>
</tr>
<tr>
<td><strong>Canada:</strong> Canadian Federation of Agriculture, Canadian on Farm Food Safety, Canadian Food Inspection Agency</td>
<td>3</td>
</tr>
<tr>
<td><strong>Local:</strong> grower’s organizations, other farmers, the community restaurants, stores, nurseries</td>
<td>10</td>
</tr>
<tr>
<td><strong>US:</strong> ATTRA, Purdue University, producers associations and forums, US Organic Association, seed companies, American farmers</td>
<td>8</td>
</tr>
<tr>
<td><strong>Other:</strong> Alberta Government, International</td>
<td>2</td>
</tr>
</tbody>
</table>

The main problem with seeking information from abroad when it comes to climate change is that BC specific impacts and information on BC programs and services may be missed. Talking to other farmers is helpful to find out about impacts and adaptation, but good ideas may not be widely dispersed and again information regarding programs and services may be overlooked. The low usage of government programs among participants suggests that information regarding programs may not be reaching them. As the participants in this study are very active members of
the agricultural community the fact that they are not using more government programs and information is indicative that the level of usage by other small-scale farmers may be even lower.

7.3 Summary of Results

The problems identified throughout the interviews include climate impacts on production (lower yields, lower quality) resulting in lower revenue and requiring adaptation, which involves additional time and finances. Finances and regulation are the top socio-economic concerns and this is consistent with the literature review. The burden of regulation was specifically related to the additional direct financial costs, lost revenue and the impact of information gaps. Importantly most mentioned that adaptations they considered successful did not appear to be taken up by many in their area indicating that information dissemination is an issue. This is particularly relevant considering the low usage of BC based information. The marketing of new experimental crops would require time and information, which both appear to be lacking and presently farmers are not capturing advantages from climate change.

Although the interviews show that climate change is just one of many other socio-economic concerns for small farms this may indicate that information on the implications of climate change for their area is not reaching them – particularly considering their sources of information. Small farms will adapt to climate change given enough resource to do so and the success of the adaptation depends on information available. The next section looks at case studies to determine whether other jurisdictions have addressed the issues of information, direct financial cost, or long term viability identified in the interviews.
8: Case Study Policy Analysis

This section presents policies from jurisdictions facing similar climate change impacts. The policies in this section are those that focus on issues immergeing from the interviews: information, financial cost, and long term small farm viability. The three cases examined are: Florida, Colorado and the US federal government.

The reason for selecting US cases is that, as in Canada, agricultural policy is a shared jurisdiction and culture, agricultural production, and climate are comparable. As the US Department of Agriculture, USDA, is responsible for the majority of agricultural policy, federal level initiatives are examined. Colorado and Florida are included based on having similar climate change implications for agriculture and because both have a large proportion of small farms.

The USDA (2008) finds that climate change impacts in south-western states, including Colorado, may be particularly severe with temperature increases higher than the national average. Climatic variability and drought pose the biggest threat (Backlund, et al., 2008). These problems are similar to those predicted for the southern interior. In Florida, climate forecasts are for higher temperatures, an increase in precipitation, more floods, droughts and a rise in sea level. Climate variation, increased precipitation, and evapotranspiration are the principal threats to agriculture – similar to the coastal area of BC (EPA, 1997).

There is no direct evidence illustrating the effectiveness of climate adaptation policy in these jurisdictions, but based on the similarities outlined above these case studies are used to

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28 In 2007, in Colorado 48.5% of farms were less than 100 acres and 79% of farms were small-scale according to the BC definition. In Florida 79% of farms were under 100 acres and 83% were small-scale by the BC definition. (USDA Economic Research Service, 2010a; USDA Economic Research Service, 2010b)
determine if the issues of BC farmers are being addressed in these jurisdictions. The issues in table 9 are those identified in the interviews.

Table 9: Case Studies: Issues from Interviews and Measures

<table>
<thead>
<tr>
<th>Issue</th>
<th>Measure</th>
</tr>
</thead>
<tbody>
<tr>
<td>Financial costs</td>
<td>Does the program or policy address a direct financial cost associated with climate change?</td>
</tr>
<tr>
<td>Information</td>
<td>Does the program or policy provide information to assist with climate change, or save time?</td>
</tr>
<tr>
<td>Small farm viability</td>
<td>Does the program of policy increase long term small farm viability?</td>
</tr>
</tbody>
</table>

Policies in the first two issue areas directly address adaptation. The third issue area focuses on promotion because this type of initiative has the potential to assist farms in capturing the benefits of climate change (by marketing crops that become more suitable due to climate changes).

8.1 Small farms in the US

In 1997, in response to a continuing decline in farm numbers the US Secretary of Agriculture established a national commission on small farms. Its mandate was to examine the state of small-scale agriculture in the US, determine the needs of small farmers, and make policy recommendations. Their report, “A Time to Act”, made 146 recommendations (National Commission on Small Farms, 1998). Another report, “Meeting the Challenge of a Time to Act”, (2002) finds that 80% of the original 146 recommendations had either been partially or fully implemented. The USDA acknowledged the value of small farms by requiring all branches to make them a priority, establishing a Small Farms Advisory Council, and assisting beginning farmers (USDA, 2006). Therefore, policies that are targeted specifically at small farms and which facilitate farm level adaptation are the discussed.
**Financial Costs - Federal:** In 2000, the Agricultural Risk Protection Act (ARPA) was passed requiring that federal crop insurance to be more affordable, organic farming be recognized separately in crop insurance plans, and the Disaster Assistance Program (DAP) be improved to cover non-insured crops. In order to protect farm income against lost crops, the USDA provides funding for state projects that help small farms add new crops, particularly non-mainstream crops (USDA, 2002).

**Information - Federal:** The Agricultural Research Service (ARS) conducts research into soil, water, and air improvements. In 1998, ARS shifted its focus to enhancing the sustainability of small farms by applying a small farm lens to project selection. Projects with direct relevance to small farms were identified and then evaluated to determine their impact on small farms. Since many disadvantaged farmers do not use government risk programs a Risk Management Education (RME) program was launched. The RME educates producers about risk management, encourages diversification, provides assistance to locate primary and secondary markets for new crops, and is used to gather feedback on new programs (USDA, 2002).

**Small Farm Viability - Federal:** The USDA’s Animal and Plant Health Inspection Service (APHIS) completed an extensive analysis of programs that positively impact small farms to ensure these elements are maintained (USDA, 2002). APHIS then organized town hall meetings across the country to explain regulations for poultry, beef, and pork (USDA, 2002).

### 8.2 Colorado

**Financial Costs - Colorado:** Environmental Quality Incentives (EQIP) is a joint federal-state program designed to encourage environmental stewardship. EQIP provides financial assistance to implement structural, or management changes to improve the environment such as: irrigation, erosion control, wildlife enhancement, or grassland, nutrient and pest management. The EQIP program in Colorado also encourages farmers to install high tunnels and provides
subsidies for transitioning to organic. The program offers 30% funding up front for limited resource farmers and a Conservation Innovation Grant (CIG) provides funding for innovative conservation methods not already listed under EQIP (NRCS, 2010, a). The Colorado Department of Agriculture (CDA) offers grants for introducing fruits, vegetables, nuts, or nursery crops (Colorado Department of Agriculture, n.d.).

**Information - Colorado:** In 2001, the national Cooperative State Research, Education, and Extension Service (CSREES) held professional training for Colorado field staff on how to assist small producers (USDA, 2002). Subsequently, the Colorado Farm Service agency (FSA) held a number of forums to promote available government assistance programs. The Colorado University Extension Service produces a local food newsletter providing the latest information on workshops, organic growing, webinars, new practices, and more. They also produce a guide to small acreage management, and a flood response plan (Colorado State University Extension, 2011).

**Small farm viability - Colorado:** The CDA has a free marketing logo for all producers called Colorado Proud and their website provides a listing of farmers’ markets, restaurants that serve Colorado Proud products, a directory of local growers, and recipes for local produce (Colorado Department of Agriculture, n.d.).

### 8.3 Florida

**Financial costs – Florida:** The Florida EQIP program has cost sharing for limited-resource farmers, and assistance for farmers who are transitioning to organic. In addition, the EQIP Conservation Stewardship Program, (CSP) makes grants available for farms undertaking additional conservation not listed elsewhere in EQIP (NRCS, 2010b). The USDA Farm Service Agency (FSA) has a guaranteed loan program for farms that wish to expand, make capital improvements, or enhance soil or water management (FSA, 08). Florida Department of

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29 A high tunnel is a type of tall, industrial greenhouse.
Agriculture and Consumer Services, offers an emergency farm loan program to farms that incur losses from natural disasters and an emergency conservation program to fund rehabilitation and conservation required as a result of natural disasters (Florida Department of Agriculture and Consumer, n.d.). The federal Risk Management Agency (RMA) started a specialty crop insurance program in 2002, targeting small and medium sized farms (USDA, 2002).

**Information - Florida** In 2001, CSREES conducted a professional development program for Florida extension staff. The purpose was to make staff aware of the needs of small farms. Under the Agricultural Risk Protection Act, the Florida RMA introduced a program to train agricultural producers in risk management, prioritising specialty crop producers and cooperatives (USDA, 2002). There are 68 county extension offices including a team of 50 employees dedicated to small farm research. The team maintains a small farm informational website and organizes conferences throughout the year (Small Farms and Alternative Enterprises, 2006). The FDACS site provides current pricing by product and other information for producers.

**Small farm viability – Florida:** In 1990, Florida was one of the first states to develop a branding logo for state agricultural products. Unlike the Colorado this program charges a $50 annual fee and provides radio, TV and billboard advertising (Patterson, 2006). The FDACS has a widely used farm to school program and offers a cooking class for preteens using local products and features recipes on their website for local, in season food. The FDACS produces a wide variety of marketing pamphlets, brochures, and cookbooks to promote Florida product. Table 9 provides a summary of the programs offered in each of the case studies.
<table>
<thead>
<tr>
<th>Characteristic</th>
<th>Definition</th>
<th>Federal</th>
<th>Colorado</th>
<th>Florida</th>
</tr>
</thead>
<tbody>
<tr>
<td>Financial Costs</td>
<td>Does the program or policy address a direct financial cost to small farms?</td>
<td>ARPA Affordable crop insurance</td>
<td>EQIP:</td>
<td>EQIP:</td>
</tr>
<tr>
<td></td>
<td></td>
<td>DAP for non-insured crops</td>
<td>o Funding for adaptive structures,</td>
<td>o Cost sharing program</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Funding for state programs that</td>
<td>o Transitioning to organic,</td>
<td>o Organic transition fund</td>
</tr>
<tr>
<td></td>
<td></td>
<td>help farms introduce new crops</td>
<td>o 30% up front, limit on max income eligible</td>
<td>CSP funds for additional conservation</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>Conservation Innovation Grant</td>
<td>RMA specialty crops program</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>CDA funds to introduce crops</td>
<td>EFL natural disaster emergency funds</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td>ECP natural disaster emergency conservation funds</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td>State specialty crop program</td>
</tr>
<tr>
<td>Information/time</td>
<td>Does the program or policy provide information to assist with climate</td>
<td>ARS SF research lens</td>
<td>Professional development</td>
<td>Professional development SF training</td>
</tr>
<tr>
<td></td>
<td>change, or save time?</td>
<td>ARPA SF education</td>
<td>SF training</td>
<td>50 staff dedicated to SFs</td>
</tr>
<tr>
<td></td>
<td></td>
<td>RME finds primary &amp; secondary</td>
<td>Outreach goy, programs</td>
<td>RMA specialty crops/program review</td>
</tr>
<tr>
<td></td>
<td></td>
<td>markets</td>
<td>Newsletters, Workshops/webinars</td>
<td>Website/workshops conferences 65 extension</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td>offices – staff unknown</td>
</tr>
<tr>
<td>Small Farm Viability</td>
<td>Does the program of policy increase small farm viability?</td>
<td>APHIS regulatory review</td>
<td>Colorado proud (free logo)</td>
<td>Florida Fresh (logo 50$ annual fee) included</td>
</tr>
<tr>
<td></td>
<td></td>
<td>APHIS regulatory education</td>
<td>Advertise FM, promote restaurant using</td>
<td>TV, radio billboard advertising</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>local food Recipes for seasonal local food</td>
<td>Farm to school program</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td>Cooking program for kids featuring local</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td>food</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td>Promote recipes for local and seasonal food</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td>Promote farmers’ market community supported agriculture</td>
</tr>
</tbody>
</table>

*ARPA Agricultural Risk Protection Act • ARS Agricultural Research Service • APHIS Animal and Plant Health Inspection Service • CDA Colorado Department of Agriculture • CSP Conservation Stewardship Program • DAP Disaster Assistance Program • ECP Emergency Conservation Program • EFL Emergency Farm Loan • EQIP Environmental Quality Incentive Program • RMA Risk Management Agency • RME Risk Management Education • SF Small Farms
8.5 Case Study Findings

The case studies reveal that all three issues identified in the interviews programs are addressed at both levels of government. In addition, program design and education efforts have targeted small farms.

The sequence of events resulting in the small farm focus is important. The USDA put small farms on the agenda, which resulted in program delivery at the state level. After prioritizing small farms, the first step, was to improve government knowledge of small farm needs. More was done at the federal level to improve government knowledge, than at the state level. In part, this is because the US agricultural system is highly centralized in comparison to Canada. After gaining an understanding of small farm needs, professional training programs were carried out at the state level in both Colorado and Florida.

After improving government knowledge, policies were either developed or amended to better service the small farm population - this included insurance and conservation programs. Insurance programs are generally offered at the federal level and these were made more affordable and were extended to specialty crops and organics. Florida, which is well known for hurricanes and other storms, has additional insurance and recovery programs. Federal risk management programs in each state encourage and assist farms to diversify. Funding is also available through EQIP to transition to organic, or high tunnels and different options are available for small-scale farms such as up front funding and cost sharing, and innovation is encouraged.

A great deal of outreach occurred to ensure small farms are aware of programs and use them. At the federal level, there has been targeted education and consultation regarding existing regulations. Diversification and risk management have been common themes in education programs and marketing assistance has also been included. At the state level, information provided includes small acreage and sustainable growing methods, and business development.
Each state has a large extension staff and information is available online, and through meetings, conferences, and workshops.

Each state’s departments of agriculture promote local seasonal food on their websites, provide recipes, and help consumers connect with restaurants or community supported agriculture programs, although Florida does more of this. The focus of consumer awareness is simply to clarify what food is grown locally and where to get it.

8.6 The Lesson for BC from Case Studies and Interviews

In all the case studies, outreach was carried out to ensure government understanding of small farm needs and small farm awareness of government programs. Conservation and insurance programs were created or expanded to include small farm. In BC the joint federal-provincial BRM programs (Agriinsurance, Agristability, etc) do not specifically target small farm, but Agriinsurance does boast its affordability; is continually updating crops covered; offers ‘by acreage’, or ‘by quantity’ coverage; and has winterkill protection. Despite these positive aspects it is likely that many farms are unaware of the program details and that programs could still be made more accessible to small farms if consultation were undertaken. Another BC, joint federal-provincial program, BMP, provides grants for conservation projects, and is similar to the EQIP program. However, the application process requires getting an environmental farm plan first and then applying for funding once the EFP is approved. The expertise provided in an environmental farm plan is beneficial and free for farms, but a small farm may not have time to participate, or the resources to meet all the requirements of the plan before being able to apply for funding. With small adjustments this program could be improved for small farms, which again may not be aware of its details.

Although BC has not made small farms a priority, some of goals in its 2005 agricultural plan do aim to encourage local food production. Many of the initiatives associated with the plan have not yet been implemented including adding more extension services, and creating an
industry led marketing program. Both state level cases have these sorts of programs and not only are there more extension services, but the information provided is relevant to small farms, in terms of acreage, and resources. One interviewee stated that she would like more extension services if the information was tailored towards her needs, but she doubted whether this would result from an increase in service (Int 9). The BC government Infobasket, does not provide targeted information, and based on the interviews, no one uses it. Extension agents in BC, working for SAM, are extremely limited in comparison to Florida and Colorado. BC does not provide nearly the level of promotion found in the Colorado and Florida such as proving information on local and seasonal food and recipe ideas. BC has a small business lens for new regulation in place but this has yet to be applied in agricultural regulation. From the interviews, one of the biggest concerns for small farms is regulation and in the case studies the understanding of regulatory impact on small farms was improved and outreach facilitated compliance.
9: Policy Objective, Criteria and Measures

This section outlines broad policy objectives to address the issues emerging from this study. It also presents criteria and measures to assess policy alternatives.

9.1 Policy Objective

The overall policy objective is to ensure that small farms in BC are sustainable in the long run. Long term sustainability depends on small farms being able to adapt to negative climate changes and capture potential benefits. To achieve this, short term goals are:

1. Ensure small-scale farms have the knowledge to adapt to positive and negative climate changes (e.g. through outreach, workshops and online content targeting small farms).
2. Ensure small-scale farms have the resources to adapt to positive and negative climate changes (Increase participation in programs such as: BMP, EFP, and BRM).

Here the short term is defined as five years. Benchmarks to indicate progress include the number of small farm participating in Environmental Farm Plans and BRM and BMP, as well as, the amount of outreach and the number of farm participants. The short term goals are particularly important considering the low usage government programs and information among this group of participants, who are very involved in agricultural groups. This indicates that many others may be even more disengaged.

9.2 Criteria and Measures

A set of four criteria are used to evaluate each policy alternative. They are: effectiveness, equity, administrative complexity, and cost. I establish benchmarks for each that correspond to a
rating of high (3), medium (2), and low (1). The effectiveness measure has two sub-criteria. One is used to determine what aspects of climate change are being addressed – i.e. negative impact, pre-emptive action, or opportunity. The other is based on the barriers identified in the interviews. The overall score for effectiveness is based on the average of these two sub-criteria and thus can fall between categories, e.g., medium-high is a 2.5. Table 11 summarizes the criteria and measures used. Note that ‘high’ signifies that the criterion is met in the most positive way. So a high ranking of high, for cost means it is in the low cost range.

Table 11: Criteria and Measures

<table>
<thead>
<tr>
<th>Criterion</th>
<th>Definition</th>
<th>Measure</th>
<th>Metric</th>
</tr>
</thead>
<tbody>
<tr>
<td>Effectiveness:</td>
<td></td>
<td></td>
<td>Average of 1 &amp; 2</td>
</tr>
<tr>
<td>1. Number of climate change components addressed</td>
<td>The extent that a policy encourages: pre-emptive adaptation, better risk management, and the capture of opportunity.</td>
<td>• Encourages all three&lt;br&gt;• Encourages only two of the three&lt;br&gt;• Encourages only one of the three</td>
<td>• High (3)&lt;br&gt;• Medium (2)&lt;br&gt;• Low (1)</td>
</tr>
<tr>
<td>2. Barrier to Adaptation</td>
<td>What barriers to adaptation are addressed: direct financial cost, information, future viability</td>
<td>• Addresses all three&lt;br&gt;• Address only two of the three&lt;br&gt;• Address only one of the three</td>
<td>• High (3)&lt;br&gt;• Medium (2)&lt;br&gt;• Low (1)</td>
</tr>
<tr>
<td>Horizontal Equity</td>
<td>Measures the accessibility of each alternative for small farms throughout BC</td>
<td>• All small farms across BC can access benefits provided by alternative&lt;br&gt;• Some small farms may not be able to access benefits&lt;br&gt;• Uncertain amount of small farms able to access benefits</td>
<td>• High (3)&lt;br&gt;• Medium (2)&lt;br&gt;• Low (1)</td>
</tr>
</tbody>
</table>
Effectiveness: This criterion is used to evaluate the ability of each alternative to address climate change. A score is provided based on the average score of two sub-criteria. Number of climate change components addressed: In coping with climate change there are direct financial costs incurred from unexpected extreme weather, there are costs involved in adapting pre-emptively and there are opportunities to be had. Thus, climate change effectiveness measures how many of its implications are addressed – i.e. negative impacts, opportunity, or pre-emptive behaviour.

Barrier to Adaptation: There are three barriers to adaptation identified in the interviews: direct financial cost, information, and future viability. The first sub-criterion measures how many of these are addressed and a point is added for each type – the more barriers the higher the effectiveness score.

Horizontal Equity: Equity is evaluated in terms of accessibility. This criterion assesses whether all farms are able to benefit from an alternative regardless of region, internet usage, and time constraints. The more farms that are expected to benefit the higher the rating. If the number of farms expected to benefit cannot be estimated it receives the lowest score.
**Administrative complexity:** This criterion is measured according to the level of coordination required with an organization outside of the BCMAL. An alternative that requires the collaboration of the federal government is considered the most difficult and therefore receives the lowest score; collaboration with another ministry is given a score of medium and an alternative that does not require coordination with an outside agency is given a high score.

**Cost:** The cost criterion considers the level of spending required by the BCMAL and the least expensive alternative receives the highest score. The BCMAL has pledged to increase spending in areas relevant to small-scale farms, but thus far has not followed through. The 2005 BC Agricultural plan committed $2 million over 3 years in spending to re-establish an industry led marketing program and to develop a food miles rating system. It also pledged $500,000 in additional spending on extension services per year. All costs are calculated for a 5 year period and the amount pledged to extension and supporting local agriculture over 5 years totals $4.5 million. Thus, a high rating for costs signifies low spending between 0 and $4.5 million; a medium score spending between $4.5 and $9 million, and a low score high spending of $9 million or more.
10: Policy Alternatives and Analysis

This section describes three policy alternatives for achieving the stated policy goals. Each alternative is discussed in turn and then is evaluated based on the four criteria. Each alternative involves additional actions over the status quo. These options represent different approaches that can be taken in order to illustrate the trades off associated with each.

10.1 Policy Alternative 1: Climate Adaptation Assistance

In this option changes, based on the EQIP program in Colorado and Florida, are made to the joint federal-provincial BMP program in BC. In Colorado different conservation management improvements are given priority depending on the region. Applications are ranked according to the number and level of national, state, and regional priorities addressed. For instance in some areas improvements addressing soil erosion, agro forestry, or salinity, are listed as priorities and thus a plan including one of more of these is ranked higher than other applications. Not all applications are accepted for funding, but a NRSC staff member is available to assist throughout the application process. Both states provide payments for a wider selection of improvements than the BMP program – some examples include organic transition funding, cover cropping, crop rotation, and high tunnel incentive payments (NRCS, 2010).

Environmental Farm Plan and Best Management Practices: Under this alternative, the province finances additions to the federal-provincial Growing Forward, EFP and BMP program to cover climate change related farm improvements, and to make the program more accessible to small farms. Under the revised plan, farms eligible for BMP climate adaptation funding must have qualified for provincial farm tax status for the previous 5 years and have a valid HST
number\textsuperscript{30}. All farms wishing to apply for a grant still must complete an EFP with ministry staff, but small-scale farms that create an EFP are eligible to apply for 30% upfront assistance for adaptation priorities based on their area, prior to the completion of the farm plan. The farm must agree to complete the plan over the next year and is not eligible for further funding if this agreement is broken. The list of qualified improvements and priorities is revised on a continual basis as more information becomes available on regional impacts and successful adaptation. When a participant completes an EFP, adaptation recommendations are made based on their area. For instance in the southern interior, irrigation upgrades, (currently on the list), or installing a water catchment system (not currently on the list) might be recommended. An innovative funding program is available for improvements not prescribed on the list so long as a strong case is made for how it contributes to adaptation. Anything approved under the innovative grant program is then considered for inclusion on the regular BMP funding list. Currently the list is subject to annual revision; therefore ongoing revision is not new, but a region specific priority ranking with a greater focus on climate adaptation is new. One additional staff member is hired and is responsible for ongoing research into area specific climate change challenges and adaptation throughout BC and makes recommendations for additions to the list.

10.2 Analysis 1: Climate Adaptation Assistance

Effectiveness: This criterion receives an average score of 2 (medium)

Number of climate change components addressed: The first alternative encourages preemptive adaptation by providing financial resources to make changes, by encouraging innovation, research, and through recommendations made in environmental farm plans. It does not contribute to the financial impact of climate related production losses, but it could include funding to help transition to crops, which are becoming more favourable to particular areas of BC. It can

\textsuperscript{30}Currently eligible farms must have been in operations since 2004, or prior. This allows more beginning farms to participate, but still requires some experience before becoming eligible for the program.
encourage farms to capture new growing opportunities if this kind of action is added to the list of eligible funding opportunities. Alternative 1 receives a score of 2 (medium) in this sub-criterion.

**Barrier to Adaptation:** The BMP assists farmers with the financial costs associated with adaptation. The Environmental Farm Plan provides producers with information and assistance in forming emergency contingency plans and developing an environmental management plan. With the new amendment it also provides adaptation information, ongoing research and the innovative grant program contribute to this process. The program does not contribute to the ongoing viability of small farms. It receives a 2 (medium) in this sub-criterion.

**Horizontal Equity:** The number of small farms that use the BMP or EFP is not known, but in the interviews only 2 out of 13 reported having one. Without additional promotion the details of the program may not reach some small farms. However, as some are sure to find out and make use of the program, information on what is covered is likely to spread by word of mouth. Although the full program details are available online some rural areas of BC have poor internet coverage. This program also requires that small farms contact a planning advisor, complete a farm plan workbook, and have it approved before they can apply to regular BMP funding and even with the 30% up front funding for adaptation priorities the EFP must be completed within a year. Some farms may not benefit from this option due to time constraints, lack of internet, or their remote location. In addition, some farms may not benefit from the funding opportunities offered; alternative 1 scores a 2 (medium) in this criterion.

**Administrative complexity:** The BMP and EFP are joint federal-provincial programs. Although the province would fund the additional adaptation improvements for the first five years, at least, federal cooperation is still needed for this alternative. Generally, in this program cost is split three ways by the federal government, the Government of BC and the BC Investment Agriculture Foundation. Thus coordination with the BCIAF is also required. Alternative one receives a 1 (low) for administrative complexity.

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31 There are thirteen small farms and one mid-sized farm.
Cost: In 2009, there were 550 BMPs approved and a total of $3.5 million was paid out—an average of $6363 per farm. Only funding for additional climate change adaptation is covered by the province in this option and the regular program funding is not included here as it is part of status quo spending. For the purpose of this estimate an assumption is made that with the additional funding announcements the same number of farms as the 2009 year apply in the climate adaptation category, but that this number grows as word spreads and more options become available. It is also assumed that, as 30% is slightly less than the cost share available under the current program and that the cost per farm is less at around $5000. Therefore in the first year the cost for program payments would amount to $2.75 million. In addition there is an additional expense in program administration. One new staff person is hired to research and the rate of pay is the $50,000. A rough estimate of the program cost in the first year is $2.8 million and over 5 years is over $14 million (not including an annual increase in recipients). The alternative receives a 1 (low) due to its high cost.

10.3 Policy Alternative 2: Extension for Small Farms

This alternative encourages climate change adaptation, opportunity, and better risk management through outreach and information provision. None of the interview participants use the set of programs available under the joint federal and provincial Business Risk Management (BRM) programs i.e. Agristability, Agriinvest, Agrirecovery, and Agriinsurance and most were not very familiar with them. Interviews from Saskatchewan farmers, discussed in section 5.2, support the idea that these programs are not benefiting small-scale farms and that many farmers do not fully understand them. Therefore, this alternative seeks to inform small-scale producers about currently available programs and to get feedback on how these programs can be better tailored to them. Outreach regarding government programs was found in each of the case studies.

32 Between 2001 and 2003 per farm payment in Colorado and Florida was $4635 and $4032 respectively.
33 The standard starting salary for a researcher in BC in 2009 (BCMAELMD, 2009)
particularly related to business risk management. Interviews indicate that farmers prefer to receive information from other farmers rather than government. Therefore, outreach is conducted by BCMAL staff, but over the short term period an effort is made to involve volunteers and part time employees from the agricultural community e.g. retired farmers, or agricultural teachers.

**Extension and Business Risk Management:** For this alternative, three additional extension agents are hired who organize workshops throughout BC. Many small producers do not have time to travel far to attend a workshop therefore the aim would be to conduct multiple workshops across each agricultural zone. Part of the outreach effort would be to recruit local experienced farmers, or agriculturalists to assist in engaging the farm population. The local recruits could be hired on a part time basis to help promote meetings, or assist with environmental farm plans. The new extension agents are also required to provide small farms with information on currently available programs and to encourage farmers to diversify. They are responsible to create a forum for producers to discuss successful and innovative adaptation. Based on further research, outreach extension staff members are responsible to hold workshops on climate change - highlighting positive and negative consequences, as well as, adaptation options and encouraging more farming in areas that become more suitable for farming. Throughout the process staff members not only inform producers about programs, but also collect feedback on them.

**Production information:** For this alternative a small acreage specialist, an organic specialist, and an urban farm specialist are hired to connect with growers throughout the province. The three new staff members organize workshops on various growing methods and provide online content. These staff could also work with community colleges to organize more workshops and more relevant course content.

**Marketing extension:** Two additional extension agents are hired, but rather than agriculturists, they are small farm marketing specialist. Their job would entail organizing marketing workshops and webinars across the province to help producers develop a marketing plan and provide information about various models for marketing and distribution; for example
alternative distribution models such as community supported agriculture and delivery box programs, as well as, information regarding the mainstream and Asian distribution networks\textsuperscript{34}. With the help of other extension agents they also provide information on new growing opportunities given changing climate conditions and help develop marketing strategies for new products.

Altogether eight new staff members are hired under this option and together they are considered the small farm team. Part of their position in the first two years is to research and develop a training program for other extension staff to provide basic information about their area of expertise. A big part of their position is outreach, but they also provide online content particularly the three small farm specialists. Local recruitment of retired farmers and enthusiasts is essential in this option in order to establish trust and to improve communication with the farming population.

10.4 Analysis 2: Extension for Small Farms

Effectiveness: This criterion receives an average score of 2.5 (medium-high).

Number of climate change components addressed: This option provides small farms with information relating to climate change adaptation and encourages the dissemination of information regarding successful adaptation between farmers. It promotes currently available programs in business risk managements and information is also provided to farmers about new growing opportunities. Finally, it provides marketing information and assistance particularly for new products that have become more suitable to the changing BC climate. The current BRM programs include Agriinvest, which provides producers with additional finances based on deposits of an allowable proportion of net sales. This is intended to act as a support in years where there is a decline in income and to support investment in mitigation, or adaptation. In

\textsuperscript{34} There is a large ethnic supply chain that thrives in Vancouver and this is dominated by Asian Wholesalers and producers who often lack strong skills in English (Hild, 2009).
addition, if marketing assistance is well delivered, than an increase in revenue can be expected for some farms. Additional financial resources from Agriinvest and/or more sales coupled with information regarding climate impacts and adaptation should lead to an increase in adaptive behaviour. It has been shown in the interviews that small farmers are likely to adapt given the resources and in addition it can be expected because it is in their best interest to do so. Therefore this option receives a score of 3 (high) in this sub-criterion.

**Barrier to Adaptation:** Two barriers are addressed by this alternative: information and small farm viability. The alternative is based on providing information and clearly surmounts this barrier. It also provides assistance with marketing and some information to consumers and producers regarding BC grown crops in a changing climate and in this respect assists with small farm viability. A score of 2 (medium) is assigned for this sub-criterion.

**Horizontal Equity:** An important point in this option is that a great deal of outreach is carried out all over BC, rather than relying solely on the internet. Small farmers in this study suggested they do not get their information from a current BC government source and organizing local meetings and involving local staff and volunteers attempts to overcome this problem. Information is still available online (e.g., webinars) for those who do not have the time to attend a workshop even when it is in their area. Despite an effort to organize conferences and workshops throughout BC, it will not be feasible to hold meetings in every possible area and thus some small farms may not be able to attend, or even hear about the meetings. As there are only 8 new staff-members assisting over 15,000 small farms they will be used disproportionately and there will be some farms that do not benefit. This option receives a score of 2 (medium) in this criterion.

**Administrative complexity:** No coordination is required with outside ministries or other governments. Therefore this alternative receives a 3 (high) in administrative complexity.

**Cost:** The starting salary for each of the eight positions is $50,000, or $400,000 in total in the first year for salaries. In addition, an operating budget to organize meetings and workshops is required. Assuming, a minimum of 24 meetings are organized in the first year the cost is
roughly $55,000 in the first year ($275,000 over 5 years). Another $55,000 per year is provided to cover additional expenses unrelated to workshops. Therefore total cost for extension in the first year is estimated at $510,000 – this is just slightly over the $500,000 pledge for extension in the 2005 BC agricultural plan. Over 5 years this cost would equal just over $2.5 million. The more successful this program is at encouraging small farms to use current government programs the more expensive these programs will be, but that is considered part of the status quo expenses. A score of 3 (high) is given for this criterion.

10.5 Policy Alternative 3: Small Farm Lens

This alternative focuses on reducing the cost on small-scale producers in complying with regulations and acquiring information and seeks to include small farms more in program planning. Therefore, it contributes to profit margins and adaptation indirectly by freeing up time and money and in making programs more beneficial to small farms. Currently, BC has a set of 11 criteria that must be used to assess all new legislation and regulation, including a small business lens. All ministers must certify that the criteria have been used, or submit a rationale as to why one is omitted. In the cases studies the first step to assisting small farms was to improve government knowledge of the needs of small-scale producers. New and revised programs tailored to these needs followed. In BC, the BCMAL, the ministries of health, federal ministries, and arms-length organizations such as provincial marketing boards, and Certified Organic Associations should be more aware of the needs of small farms and apply a small farm lens to changes in regulation.

A small farm lens: In this alternative a review of existing regulation in the agricultural sector is carried out using a small business lens. All branches of the BCMAL are to conduct a program
and regulatory review and identify programs and regulations that have positive, negative, or neutral impacts on small farms. Two additional staff members are hired to coordinate this process and work which each branch individually. The new staff members also coordinate with other ministries such as the Ministry of Environment, Ministry of Health and marketing boards to review programs and regulations that impact agriculture. Once government knowledge is improved programs that have negative impacts on small farms are assessed to determine whether improvements can be made while still meeting the policy goal.

10.6 Analysis 3 Small Farm Lens Extension and Production

**Effectiveness:** This alternative receives an average score of 2 (medium) for effectiveness.

*Number of climate change components addressed:* This alternative does not directly influence climate adaptation, risk management, or opportunity, but it may have an indirect affect on the former two. As programs are reviewed it might be determined that there is a barrier to small farm participation in EFP, BMP, and BRM program in their current form. If small adjustments are made based on these findings then more small farms would take advantage of them. In addition current extension services may include more, small farm relevant content both online and in other programming relating to growing methods and adaptation. This program receives a 2 (medium) for its potential to increase participation in the above programs and to increase extension services targeting small farms (though minor in comparison to the above options).

*Barrier to Adaptation:* If this option reduces the regulatory burden on small farms it reduces the financial cost of compliance. This creates more available financial resources for adaptation although it cannot be assumed that all savings would go towards this, or that savings would be that substantial. It receives a half point in addressing the financial cost of adaptation. Although a great deal of government information is gained in this option is does not directly contribute to small farm knowledge regarding climate change adaptation. Indirectly it may result in some additional information getting to small farms via existing extension and by ensuring
small farms are priorities in any future programs seeking to spread information related to climate change. It receives a half point for addressing the information barrier. This option addresses small farm viability in a couple of ways. For one, as mentioned above, by reducing the regulatory burden on small farms some financial costs are reduced. If for example the present meat regulation, or marketing board regulations were adjusted this could have a significant impact on the ability of small farms to increase the quantity of food they can sell (if there is demand). A review of programs would also mean that any existing marking programs such as the current farm-to-school program, (which benefits large companies at present), would seek to include more small farms. Therefore this option receives a 1 for small farm viability and 2 (medium) score overall.

**Horizontal Equity:** As this alternative aims to reduce regulatory burden and improve current programming it benefits all small farms in some way regardless of location, internet use, or time constraints.

**Administrative complexity:** Although some regulations and program can be reviewed and adjusted without any outside coordination many programs involve partnerships with the federal government, or other ministries and some regulations and programs relevant to small farms are entirely outside of the ministry’s jurisdiction. Therefore, this alternative scores 1 (low) for administrative complexity as it requires an extensive amount of outside cooperation.

**Cost:** In this alternative two additional staff members are hired. They are paid a starting salary of $50,000 per year and over 5 years this amounts to $500,000. As additional work is required of other ministry staff; it is possible overtime hours may be required. An additional million is included to cover 5 years of other administrative expenses that may be incurred and any overtime by other ministry staff. The total for this alternative is $1.5 million and the score is 3 (high). The scores for all three alternatives in each criterion are listed in table 12.
### 10.7 Evaluation Matrix

*Table 12: Policy Option Evaluation Matrix*

<table>
<thead>
<tr>
<th>Criterion</th>
<th>Alternative 1: Climate Adaptation Assistance</th>
<th>Alternative 2: Extension for Small Farms</th>
<th>Alternative 3: Small Farm Lens</th>
</tr>
</thead>
<tbody>
<tr>
<td>Effectiveness</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>1. Number of climate change components addressed</td>
<td>2 Medium (2)</td>
<td>2.5 Medium-high (3)</td>
<td>2 Medium (2)</td>
</tr>
<tr>
<td>2. Barrier to Adaptation</td>
<td>(2)</td>
<td>(2)</td>
<td>(2)</td>
</tr>
<tr>
<td>Horizontal Equity</td>
<td>2 Medium</td>
<td>2 Medium</td>
<td>3 High</td>
</tr>
<tr>
<td>Administrative Complexity</td>
<td>1 Low</td>
<td>3 High</td>
<td>1 Low</td>
</tr>
<tr>
<td>Cost</td>
<td>1 Low</td>
<td>3 High</td>
<td>3 High</td>
</tr>
<tr>
<td>Total (Max 12)</td>
<td>6 Medium</td>
<td>10.5 High</td>
<td>9 Medium</td>
</tr>
</tbody>
</table>
11: Recommendation

Policy recommendations are based on how well alternatives meet the policy objectives and their overall score in the criteria measures. The second alternative, Extension for Small Farms, scored the highest at 10.5 points – a ‘high’ overall rating. Alternative 2 closely matches the overarching policy goal of ensuring small farms have the capacity to adapt to climate change in the long term. It accomplished the short term goals of increasing participation in current programming and increasing climate change information and it does so relatively easily and for a fairly low price. It can also be noted however that the option with the second highest rating, Small Farm Lens, is also the least expensive and that both alternatives 2 and 3 could be implemented for slightly less the $4.5 million benchmark for staying within current pledges to build local food capacity. The second option indirectly supports the main goals of this research, and it directly increases small farm viability. My analysis found that financial vulnerability and information are the two biggest barriers that small farms face in adapting to climate change. Therefore, I recommend that Alternative 3 (Small Farms Lens) be adjusted to account for areas where it scored low and that it be implemented along with Alternative 2. The easiest way to adjust Alternative 3 is to require that only BCMAL program and regulations are reviewed with a small farm lens and thus outside coordination is not required. The trade off is in terms of effectiveness as some regulations that impact on small farms are outside of the BCMAL jurisdiction.

Although the revised BMP option (Climate Adaptation Assistance) addresses information and financial cost, it requires a high level of provincial expenditure and federal-provincial cooperation, which makes this option less than optimal at present. It is the most expensive and ideally federal agreement to adaptation funding would be sought first as this would reduce the cost to the province. If this alternative was chosen, some level of outreach would still be required
to ensure use by small farms and it could be better revised, in a manner other than suggested here, through consultation with a larger number of farms (as only a small sample is used in this study). Therefore, it would be best suited to follow options 2 and 3 – once better communication and information is established. A review of the BMP based on input from farms of all sizes and revisions that incorporate more climate change adaptation funding and more, small farm usage is recommended in the future. More research is required to determine what kinds of adaptation should be included and if some should be considered regional priorities. Although the Environmental Farm Plan provides a great deal of information and assistance to farmers it does require time and possibly resources to complete. For this reason depending on how problematic a climate impact is expected to be in a particular region, or how urgently adaptation needs to be encouraged, a system of regional priorities is recommended where any possible barrier to participation is removed for high priorities. This option is not recommend at present because of the current financial situation in the province and because more information and federal agreement should be acquired first.

Recommendation Summary:

- In the first 5 years
  - Implement targeted extension and outreach
  - Increase region specific climate change research
  - Implement a small farm business lens to review BCMAL programs and regulation
  - Open a discussion on climate adaptation funding with Agriculture and Agri-food Canada

- In 5 to 8 years
  - Implement a regional adaptation funding program
  - Provide more adaptation information and recommendations in EFPs
12: Conclusion

Climate change predictions in BC are for more extreme seasons and more variable weather patterns and these are the main threats to agricultural production in BC. Two main barriers to adaptation for small farms are identified in this study. One is having the right information and knowing what kind of opportunities, impacts, and adaptation to expect. The other barrier is having the resources in terms of time and money to take action. The biggest threat to small-scale farms in BC, other than climate change, is profitability, which may deter new farmers taking over from existing ones in the future. Small-scale farmers in BC are much more concerned with maintaining financial viability than with climate change, but it is likely that the full implications and full financial cost of adapting to climate change are not being considered in this assessment.

Case studies analysis reveals that action is being taken at both the federal and state level in the US to ensure small farms have the financial capacity and guidance to cope with climate change. A great deal of work has already been done to ensure small farms make use of insurance programs, conservation programs (which are increasingly including climate adaptation measures), and to ensure small farms are financially viable and that new products introduced with climate change have available markets.

As climate change is now recognised as irrevocable, and as the importance of small farms is increasingly being recognized by both advocacy groups and huge forces in global agriculture such as the USDA and Wal-Mart, now is the time to start considering the sustainability and value of small farm in BC. Uncertainty over climate impacts on production outside of BC and the resulting impact price and availability of imported food means that protecting local food security is even more essential. Although small farm might be viewed as an unimportant or declining
industry at present, dismissing them may result in a lost opportunity as climate predictions point to potential advantages for BC agriculture and small farm have potential resilience to some climate impacts. This paper recommends two policies that address the information and viability barriers to adaptation identified in this research. Along with the recommendations made here to assist small farms, ongoing research is essential and needs to be undertaken to understand the extent of climate impacts in major agricultural areas. Strategies need to be developed to assist farms in the hardest hit areas and for increasing farming in areas that become more favourable to agriculture with climate change.

A limitation of this study is that only a small sample of farmers where interviewed and those who participated may not be an accurate reflection of the small farm community given that they had time to participate, appear ahead of neighbours in adapting, and are very involved in agricultural advocacy. In addition some farms where included, such as the not for profit and the social enterprise, in order to gain more insight into the risk of climate factors for small farms, but their needs and adaptive capacity may not be the same as a regular business. Finally, given more time, other case studies could have been included such as the Netherlands where flooding has been posing a huge problem.

Despite the limitation of bias in the interviews in terms of a potential exaggeration of the plight of small farms, the low level of participation in government programs and usage of information services may be more indicative of an issue for many other small farms in the larger population. Some work is already taking place to prepare farms for climate change and the BRM programs have some useful aspects, but communication must be improved to ensure they benefit small farms. Recent amendments to the farm tax status regulation means that farms within the ALR can now receive farm tax status on land that is forested and contributing to carbon sequestration\(^\text{36}\). The amendment does not provide this benefit to farms outside of the ALR, but it

\(^{36}\text{See BC Farm Assessment Review Panel, http://www.farmassessmentreview.ca/}.$
is a positive step in the right direction. No doubt other programs and regulation will need revision to encourage climate change mitigation and adaptation.
13: Bibliography


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BC Small-scale Food Processors Association http://www.ssfpa.net/


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Figuere, C. (September 20, 2010). Address by Christiana Figure, Executive Secretary United Nations Framework Convention on Climate Change. Swiss re high-level adaptation event on risk and resiliency. UFCCC.


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14: Appendix I

14.1 Climate Impacts

Participants were asked to describe any changes to the local climate, or growing conditions since they began farming in that area and how it has impacted their business. All participants have noticed changes to local weather patterns, which have impacted their production (but not all attribute these changes to climate change). Table 5 lists the top two weather concerns in order of frequency by region. The coast and the southern interior have two common problems: unpredictable weather and more extreme seasons. The regions differ in the emphasis placed on each concern and the type of seasonal extreme. The problems are discussed by region to highlight how these common problems are impacting them differently.

<table>
<thead>
<tr>
<th>Rank</th>
<th>The Coast</th>
<th>The Southern Interior</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Unpredictable Weather</td>
<td>More extreme seasons: heat in the Summer</td>
</tr>
<tr>
<td>2</td>
<td>More extreme seasons: precipitation in fall, winter, and spring</td>
<td>Unpredictable Weather</td>
</tr>
</tbody>
</table>

In the coastal region, participants spoke of unexpected severe weather and unpredictable seasons, which impact business in a variety of ways. Direct impacts from unpredictable weather have resulted in lost crops, lower quality, and loss of growing capacity for certain crops. Indirect impacts include an increase in pests and additional labour. A shift between hot and cold within one season is stressful for plants and has meant that growing certain crops is no longer possible. Unexpected cold snaps in the summer and spring have resulted in poor quality crops and lower yields. Warm spells in the winter has meant that cover crops and pests survive and need to be
ploughed down, or dealt with in the spring and unexpected snow in the winter has also meant extra labour\textsuperscript{37}. The urban farm is protected from extreme weather (on a sprouting bench), but is still affected by unpredictable rain as it makes yields harder to predict.

- It’s hard to distinguish between a naturally different season and climate change but the biggest concern is the inability to predict weather (Int 2).
- The previous winter we had almost no significant cold in January and the result was bugs survived and the eggs were not killed and then as a result they were eating things that normally they wouldn’t (Int 5).

The second problem, of precipitation increases in the coastal area, is related to unpredictable severe storms, but was discussed as being the new trend. The main problem is flooding occurring in the spring and fall, which has resulted in direct losses to field crops. Excessive precipitation directly impacts crops by lowering quality, and indirectly by increasing pests and moulds. Early rain in the fall interferes with the ripening of seeds, causes sprouting to occur in the ground, spoils the outer skin of crops, and leads to mould or rot. Cold, wet springs were linked to a loss of bees one season and more infections and scabs on fruit. One farmer recalled how his neighbours lost 75\% of their fruit trees due to a mould, previously unknown on Vancouver Island. In Richmond a cold, wet spring in 2009 resulted in low quality blueberries (too small to be picked by a harvester) and these were left in the field. This resulted in an infestation of spotted fruit flies, which are new to this area and affected surrounding farms. The farmers in Richmond have been having a particularly tough time with flooding, due to poor drainage in ditches and salt water from the Fraser River has started to make its way up into the ditch water making it unsuitable for summer irrigation.

- There was a potato disaster in 2010 and we lost half a million dollars in September and October due to weather […] the fall stuff got hampered [from rain] - used to be that there was significant regional variation between Delta, Richmond and Fraser Valley […] now everyone is getting

\textsuperscript{37} Farmers using cover crops to help enhance soil conditions can rely on cold winter temperatures to kill the crop so that the land may be planted with market crops in the spring i.e. ‘winter kill’. When winter kill does not happen it results in more work to prepare land for spring planting. Participants from both areas had issues with warm winters and no winter kill, but in the coastal area the solution of putting in extra work in the spring, was hampered by flooding, which made it too difficult to get into the field on time. This resulted in a late start to the season and slightly lowered yields overall.
For farmers in the southern interior, the greatest concern is hot summers, which contribute to drought and forest fires. Farmers reported grazing grasses turning brown from drought, chickens dying from heat stroke (especially when there is added heat from forest fires), and the loss of horticultural crops particularly when the dry season extends into the fall. The loss in crops is can be from water conservation choices. When water is scarce a decision is made to stop watering lower value crops. The impacts from extreme summer heat are primarily direct losses to production.

- *I've lost a lot of birds from heat some summers (Int 11).*
- *[…] in the 2009 dry season we lost all our corn, carrots, and beans because water had to go to other crops (Int 14).*

Erratic weather patterns compound this issue. For instance, Cranbrook farmers growing dry weather crops suffered from an unexpected wet season in 2010. Unpredictable, extreme weather has directly impacted crops by reducing yields and quality; and indirectly by lowering soil quality. Severe weather such as wind storms, warm spells in the winter, cold snaps in the summer, and drastic temperature shifts during a one day cycle were reported. This kind of weather has caused erosion, affected winter kill of cover crops and insects, and resulted in reduced yields.

- *[…] typical winters and summers aren't typical any more - there aren't typical patterns there is no consistency (Int 12).*

The farmer from the central interior identified unpredictable weather as his primary climate concern. In particular, he noted two unusually hot summers, which led to a grasshopper outbreak that was damaging for some neighbouring farmers. Honey is his primary product and the impact of weather on wild flowers affects bee foraging. Unpredictable weather means difficulty in predicting honey output. He also noted that early frost is a frequent and unpredictable event in this region.
Seasonal extremes are impacting farmers throughout BC. Farmers in the southern interior reported direct losses to crops from extreme summers, while precipitation increases on the coast have been attributed to outbreaks of pests and mould, reduced yields, and reduced quality. Unpredictable weather has resulted in extra labour, more pests, inability to predict yields, and loss of growing capacity for certain crops. Smaller yields and lower quality crops means that farmers receive less revenue from each affected crop, while extra labour requires more time.

14.2 Opportunity

Fruit and vegetable growers across all regions are predicting future opportunities arising from changing climate conditions, yet most do not report experiencing benefits right now. Opportunities are expected due to projections of an increasingly longer growing season and warmer temperatures. In the southern interior, one farmer claims he is already benefiting as the extra CO$_2$ from forest fires is contributing to stronger fruit trees. In the coastal region three out of eight participants expect there to be net benefits from climate change and seven out of eight could mention at least some anticipated opportunity. The most notable benefit mentioned is the expectation of being able to grow a larger variety of food. Many participants are already experimenting by introducing new crops with some encouraging results. The urban farmer considers climate change an advantage and expects to see growing demand for local food delivered sustainably by bicycle. A few other farmers also mentioned anticipating a potential increase in demand resulting from climate impacts on production and prices on imports.

- *Forest fires are great for me I grow better fruit in forest fires (Int.9).*
- *3 out of 4 of the longest frost free seasons in 30 years have been in the last ten years (Int. 14).*
- *Persimmons are now growing better & we are testing other crops […] there are other people I hear about growing oranges and bananas and things but I think it’s more of a hobby to experiment rather than to test what they can grow and market in the future (Int 4).*
Farmers mainly raising animals did not list any expected benefits. The majority who grow fruits or vegetable are anticipating better growing conditions and one farmer mentioned that he is currently benefiting. None of the others mentioned benefiting from climate change at present, but some are experimenting with new crops. In contrast climate change is presently having negative impacts on production to a varying degree for all.
15: Appendix II Policy Recommendations from Interviewees

When asked what the government could do to assist small farms with adaptation and financial viability in the future all participants had more than one suggestion. Below in Table 12 responses are categorized and listed along with the number of times a response falls into each category. The categories are fairly straightforward and extension services, for example, were only directly referred to 4 times, but, other responses indicate a need for the kind of information that would traditionally be provided through extension services such as: the new reality of climate conditions and what crops are going to grow best, information encouraging farmers to diversify, and information on organic, permaculture and small lot growing methods. A variety of subsidies and credits were also mentioned these were all grouped together, but generally the suggestion is that any infrastructure which helps farmers adapt to climate change such as greenhouses and high tunnels should qualify for subsidies. Other subsidies included in this category are those that would help expand the market for small farm products such as subsidizing the cost of starting a collective processing center. These kinds of subsidies and credits were mentioned most often. The next most frequent suggestion is a need to address the pricing gap between imports and local food through local marketing, institutional buying requirements, or other means. Assistance for new farmers tied for second place and there are many mentions of both start up funding for new farmers and actions to bring down, or assist with the high price of land. These are listed separately from extension services although suggestions included training and education for new farmers it also includes loans and financing. Therefore extension and changes to regulation are tied for the number of times they were recommended. As shown in section 8.1.3 many participants are concerned for both their own financial security, and the declining interest in farming due to the difficulty in making a profit.
<table>
<thead>
<tr>
<th>Desired Policy</th>
<th># of mentions</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Amendment to regulation</strong> (PEP Provincial Emergency Program, meat regulation, HST, marketing board regulations, organic certification changes, etc)</td>
<td>8</td>
</tr>
<tr>
<td><strong>More extension services</strong></td>
<td>8</td>
</tr>
<tr>
<td><strong>Action to counteract cheap imports</strong> (require store to sell a percentage of local food, tariffs, institution buying, local food marketing, etc)</td>
<td>9</td>
</tr>
<tr>
<td><strong>Subsidy</strong> (funding for structural adaptation, financial credits for climate mitigation measures, start up funds for collective processing, and distribution, etc)</td>
<td>10</td>
</tr>
<tr>
<td><strong>Beginning Farmers</strong> (start up loans, information and training for new farmers, mortgage assistance, price of land, etc)</td>
<td>9</td>
</tr>
</tbody>
</table>