Climate Change PBL #5: Adaptation for Small-Scale BC Farmers

Problem

Historical data analysis and climate indicators show that there has been a change in the properties of BC's climate including increased temperatures and precipitations, earlier ice and snow melting, increased sea-surface temperatures and rise in sea-levels. These changes directly affect the production of farms across BC. Focusing on the small-scale farms of either the Okanagan or the Fraser Valley (respectively the Southern Interior and the Coastal region in eco-province terms) determine what could be done to help the farmers adapt to climate change.

Background

There has been much research on ways in which agriculture can reduce its GHG emissions, which comprise 10% of Canada's total GHG emissions[1]. However, agriculture, unlike other emissions-intensive industries, will be affected directly by climate change. Currently, only 10% of Canada's land is suited for agricultural production due to the temperature, soil moisture, length of growing season (expressed in growing degree days, or GDD) and severity of winter season characterizing the different regions of the country[2]. In B.C. farming is an important activity that directly employs 1.5% of the workforce not including spin-off in food processing, retail and service sectors. In 2011, B.C. farmers sold products for over 2.6 billion dollars[3].

Climate change could impact BC's agriculture positively or negatively depending on the type and scope of the change. Rising temperatures can directly or indirectly affect agricultural output. Changes in temperatures influence the duration of ice plates on rivers and lakes, the proportion of snow to total precipitation, and freshwater temperatures. In the coastal area, spring temperatures have increased by 0.8°C and by 1.2°C in the Southern Interior. Warmer temperatures year-round could create conditions where pest plants and insects proliferate becoming a danger for crops. On a seasonal basis, warmer springs mean earlier break-up of ice, resulting in hydrology changes. For instance, the timing and the volume of the Fraser River flow has advanced by 11 days since 1912 creating water shortages in the height of the summer. Warmer summers themselves could deplete ground-water supplies and contribute to soil erosion, increasing the farmers' demands for irrigation systems. On the other hand, in the Southern Interior, precipitation has increased by 3% between 1929 and 1998. This trend could potentially offset that of rising temperatures by replenishing groundwater aquifers and soil moisture thereby supporting plant growth. However, increased precipitation also causes increased leaching of nutrients, decreasing soil fertility. Another positive trend could be the rise in GDD,

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[1] MacGregor, Robert J., and Boehm, Marie. (June 2004) *Climate Change Mitigation Policy for Agriculture in Canada: horizontal policy integration*. Produced for Agriculture and Agri-food Canada. Retrieved Jan 5th, 2008 from **http://tinyurl.com/3amwdj**

[2] Hauer, grant and Mariam Weber (June 2003). "A Regional Analysis of Climate Change Impacts on Canadian Agriculture" *Canadian Public Policy*. Vol. 29 No. 2, pp. 163-180. Available on JSTOR

[3] Industry Profile and Significance http://www.agf.gov.bc.ca/aboutind/profile.htm

which is a measure of the heat energy available for plant growth. Alone, an increase in GDD would mean that farmers could diversify their crops. However, doing so requires adequate soil moisture and soil fertility, both of which are increasingly threatened by current climate change trends. Soil fertility is affected by the rising sea level as well as rainwater leaching. From 1909 to 1999, sea levels have risen by 4cm in the Coastal region contributing to increase flooding in the region and salt levels in groundwater aquifers[4].

Example

Adaptation options range from technological developments to government programs and insurance to changes in farm production practices and financial management. The decision on which ones to adopt depends on the vulnerability assessment and on the interests of the different stakeholders of each region.

In December 2004, the British Columbia government, after having identified the potential impacts of climate change on land, water resources and agriculture, drafted an Action plan suggesting avenues for adaptation. In order to prevent soil erosion that could come with rising sea level and changes in hydrology, the government encourages farmers to practice conservation, zero tillage[5], winter cover crops[6] and improve their grazing practices. Water availability and quality is another concern for farmers. Currently, the BC government and the BC Agricultural Council are analyzing ways to improve irrigation system such as nutrient management and off-stream stock watering facilities. Moreover, the BC government is implementing a "drought action plan" which monitors water supplies, develops watershed management programs and provides support for communities facing water stress. Finally, that report identifies agriculture as a potential carbon sink. Encouraging practices such as riparian planting and manure management can enhance the carbon sink potential of soils and reduce agricultural GHGs emissions[7].

More recently, in 2008, the BC Agriculture and Food Climate Action Initiative was developed by the BC Agriculture Council "to identify and analyze the impacts of climate change and climate action public policy on the agriculture and food processing sectors." In 2010 the initiative released the *BC Agriculture Climate Change Action Plan*. The Plan "provides strategic direction for action in the areas of both climate change mitigation (reducing greenhouse gas emissions) and climate change adaptation (increasing sector resilience to the potential impacts of climate change)."

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[4] BC Ministry of Water, Land and Air Protection (2002). *Indicators of Climate Change for British Columbia 2002*. Retrieved July 31, 2007 from http://www.env.gov.bc.ca/air/climate/indicat/pdf/indcc.pdf

[5] "By definition, zero tillage seeding is a one pass operation which places seed and fertilizer into an undisturbed seedbed, packs the furrow and retains adequate surface residues to prevent soil erosion." From Agriculture and Agri-Food Canada. *The Economics of Zero Tillage*. Retrieved August 1, 2007 from http://www.agr.gc.ca/pfra/soil/swork1.htm

[6] An unharvested crop planted between period of regular crop to prevent soil erosion and provide nutrients to the soil.

[7] Government of British Columbia (December 2004). *Weather, Climate and the Future: BC's Plan*. Retrieved August 1, 2007 from http://www.env.gov.bc.ca/air/climate/cc_plan/pdfs/bc_climatechange_plan.pdf

Currently, many regional researcher are being funded to establish the potential impacts of climate change and design adaptation measures. A recent report on the impact of climate change on the crop suitability in the Okanagan Valley suggests that apple varieties with a longer growing season be planted and that other crops such as soft fruits, vine and nuts would become a better investment for Okanagan farmers.[8]

Guiding questions

- What are the current crops and farming practices of the Okanagan or the Fraser Valley?
- Why are those crops favored? What type of conditions do they require for optimal growth?
- What would be the impact of climate change on soil moisture, soil erosion, precipitations, hydrology, temperature and length of growing season in the Okanagan or the Fraser Valley? How would these changes impact the growth of current crops harvested?
- Is there enough information for the government to design a concrete action plan and for farmers to implement appropriate adaptation measures?
- What are the adaptation options?
- How effectively does each option respond to the needs of the farmers in a changing climate?
- What are the costs of each option?
- What is the government's responsibility towards farmers? Who should incur the costs of adaptation: the government or the farmers?

Resources (Do NOT directly contact individuals in these organizations).

1. BC Climate Change Impacts and Adaptation Research Network (BC-C-CIARN) - http://cciarnbc.ubc.ca/
2. Natural Resource Canada - http://adaptation.nrcan.gc.ca/perspective/agri_4_e.php
3. Government of British Columbia, *Weather, Climate and the Future: B.C.'s Plan* -
Great Lakes Regional Assessment, agriculture –
http://www.geo.msu.edu/glra/assessment/agric.html
5. Climate Action Initiative-http://www.bcagclimateaction.ca/
6.Natural Resources Canada- http://www.nrcan.gc.ca/earth-sciences/products-services/publications/climate-change/climate-change-impacts-adaptation/356

Potential Community Engagement
UBC Farm –
http://ubcfarm.ca/
BC Agriculture Council - http://www.bcac.bc.ca/
Small Farm Canada magazine - http://www.smallfarmcanada.ca/
BC association of farmers' markets - http://www.bcfarmersmarket.org

[8] Neilsen, Denise et al. *Impact of Climate Change in the Okanagan Valley – Agriculture (Irrigated Crops)*. Retrieved August 1, 2007 from http://adaptation.nrcan.gc.ca/projdb/pdf/4_e.pdf