Climate Change Adaptation and Canadian Agriculture: Impacts and Capacity

Managing Multiple Risks in Agriculture (i.e. climate change adaptation in a wider context)

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Acknowledgements: NRCan’s Climate Change Impacts and Adaptation Program
Nothing new to anyone here – e.g.

• National Farmers Union’s brief to the Standing Senate Committee on Agriculture and Forestry re: *Climate Change in Canada: Adaptation and Mitigation* (Ottawa, February 13, 2003):

Adaptation Action E: Prices

To adapt to any changes, farmers need prices high enough to give a farm family long-term stability and give it capital to invest. Fair and adequate commodity prices are essential if our farms are to adapt to climate change.
Conceptualizing Farm-Level Exposure and Adaptation to Multiple Risks

• Olmstead’s (1970) farming-systems model facilitates the identification of multiple external stimuli and internal attributes that influence farm-level decisions...
Source: Bradshaw and Smit (1997)
Conceptualizing Farm-Level Exposure and Adaptation to Multiple Risks

• Olmstead’s (1970) farming-systems model facilitates the identification of multiple external stimuli and internal attributes that influence farm-level decisions

• the vulnerability approach
  – reorganizes many of these same external stimuli and individual attributes as factors of ‘exposure’ and ‘adaptive capacity’…
Farm System Vulnerability

Exposure
- Government Regulations
- Market
- Environment
- Macroeconomics
- Technology

Land
- Location
- Farm type
- Env. Constraints

Human
- Age
- Family
- Perception

Capital
- Finance
- Technology
- Land Tenure

Adaptive Capacity
- Government Programs
- Technology
- Market
- Demand
- Institutions

Source: Belliveau (2005)
Conceptualizing Farm-Level Exposure and Adaptation to Multiple Risks

- Olmstead’s (1970) farming-systems model facilitates the identification of multiple external stimuli and internal attributes that influence farm-level decisions

- the vulnerability approach
  - reorganizes many of these same external stimuli and individual attributes as factors of ‘exposure’ and ‘adaptive capacity’
  - plus, adds an element of history through the concept of a ‘coping range’ (which reflects a farm system’s adaptive capacity over time)…
Values of Climatic Attribute

Time (years)

Frequency/Probability of Occurrences (e.g. years)

pre-climate change

changed climate (unchanged variance)

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trend (mean value of climatic attribute)
coping range
probability of "extreme" events

Source: Smit and Pilifosova (2001)
Expansion in Coping Range, Adaptive Capacity (related to economic growth, technology . . .)

Gradual Shift in Coping Range (related to targeted improvement in capacity to deal with known risks . . .)

Source: Smit and Pilifosova (2001)
Conceptualizing Farm-Level Exposure and Adaptation to Multiple Risks

- building on this element of history, and without denying the individuality that creates variable ‘exposures’ and ‘adaptive capacities’ among producers, it is insightful to recognize the historic evolution or trajectory of commercial agriculture…
The Trajectory of Commercial Agriculture (at least since 1945)

- increased productivity
- larger and fewer farms
- more specialized
- more intensive
- integration of farms into the agri-food system
- more ‘pluriactivity’

‘Post-productivist’?
Conceptualizing Farm-Level Exposure and Adaptation to Multiple Risks

• building on this element of history, and without denying the individuality that creates variable ‘exposures’ and ‘adaptive capacities’ among producers, it is insightful to recognize the historic evolution or trajectory of commercial agriculture

• Why insightful? Because this trajectory is a product of long term (strategic) adaptation by many thousands of producers to a variety of risks and opportunities (including climatic ones) within commercial agriculture, and especially systematic signals...
(Real) Price of Wheat, Canada (1914-98)

like market prices…

Source: Canadian Wheat Board
The Infamous ‘Cost-Price Squeeze’

Sources: Canadian Wheat Board, 1999; Statistics Canada, 1999
Conclusions and Questions

• farm-level climate change adaptations are undertaken in a multi-risk/-opportunity environment

• producers’ collective adaptation to multiple risks and opportunities has, over time, shaped commercial agriculture’s historic trajectory

• how does the recognition of this trajectory impact upon our conceptualization and empirical assessment of climate change adaptation in agriculture?
The historical trend in Canadian agriculture has been ever-increasing production.
Number and Average Size of Farms
Canada (1981-2001)

on larger but fewer farms
(peak year 1941: 732,832 farms)...

Source: Statistics Canada
Cattle Feedlot, Alberta

with increasing output specialization...

Typically 250 head per pen (i.e. approx 24,000 total here)

Source: MacLachlan, 2002
Fertilizer Use in Western Canada
(Expenses, Material Sold, and Nutrient Content)

and ever increasing production intensity...

Source: Statistics Canada
Canada’s Agri-Food System
The Value of Primary Production, 1998

14% of $201 B total

Farms are more integrated into the agri-food system...

Source: Agriculture and Agri-Food Canada
Total Farm Family Income, Canada (Average Farm Household, 1993-2000)

and operators are increasingly ‘pluriactive’...

Source: Statistics Canada