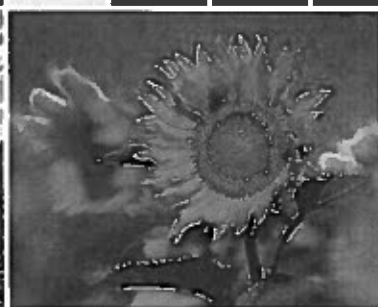
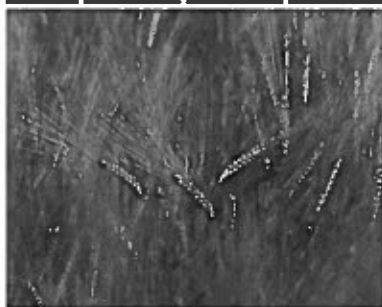


Adapting Agriculture to **CLIMATE VARIABILITY**

Executive Summary



March 4, 2010

Winnipeg, Manitoba
Canada

March 9, 2010

Kansas City, Missouri
United States of America

Summarized by

Gary Lemme, David McInnes, and Tony Szumigalski²



BACKGROUND

These paired conferences were an outgrowth of a joint meeting of Canadian and American agricultural leaders at Fargo, N.D., on Sept. 30, 2009, to explore the potential impacts of increased climatic variability on agriculture. A committee was formed to bring together agricultural leaders from the prairie provinces of Canada and the Northern Central Region of the United States of America to increase awareness of the importance of a proactive approach by the agricultural sectors in addressing the research, education, public policy, and technology transfer challenges associated with climate variability on the long-term sustainability of agriculture. Paired conferences were conducted in Winnipeg and Kansas City in March 2010. A key outcome of these meetings was the recognition that a collaborative effort is required for agriculture to respond to weather variability. The implications to regional economic sustainability, national food security, and the viability of the bio-fuel industry motivated participants to support immediate action.

STATEMENT OF CHALLENGE

A changing climate (natural and/or human-induced) presents both threats and opportunities to prairie agriculture. Generally, climatic models predict increasing climatic variability and increased seasonal aridity on the central prairies of North America (Great Plains of the USA and the prairie provinces of Canada). Increased seasonal temperatures, higher levels of atmospheric carbon dioxide, increased frost-free days, increased rainfall variability, increased number of high-rainfall-intensity events, increased nighttime temperatures, and higher CO₂ levels will have an impact on crops, livestock, and biotic pests. Climatic variability has always been associated with agriculture in this region of North America. Climatic variability is an issue regardless of the current understanding of global temperature trends. The failure of agriculture to adapt to climatic variability will impact global food (particularly wheat and beef production), fiber, and bio-product security, plus regional economies. A holistic approach will be paramount to sustaining agriculture and the vitality of the region in the face of climate change.

WHY A REGIONAL COLLABORATIVE INITIATIVE?

- The region significantly impacts global food security. The Great Plains of the USA and the prairie provinces of Canada represent a center of global wheat and beef cattle production.
- Drought/heat stress is a common challenge throughout the region. (The drought of 2001–02 cost the national and provincial governments of Canada \$5 B – *The Western Producer*; Dec. 31, 2009.)
- The regional economy is rooted in agriculture (e.g., 12% of Manitoba's employment and 40% of South Dakota's workforce are directly linked to agriculture).
- This Canada/USA area is in the same broad agricultural-ecologic region and share similar economies and culture. Author Joel Garreau, in his book *Nine Nations of North America*, identifies the "Great Plains Breadbasket" as one of nine "cultural nations" of North America.
- Appropriate shifts in agriculture will be regionally specific based upon agricultural-ecosystems.
- Climate variability is independent of geo-political boundaries, both international and intra-country.

Cover footnotes

¹This is a general conference summary only and designed to promote further discussion. Copies of the presentations are available on CAPI's website (<http://www.capi-icpa.ca>) and the South Dakota Agricultural Experiment Station website (<http://sdaes.sdstate.edu>).

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KEY CONCEPTS AND OBSERVATIONS

The following are some of the common themes that emerged from of the Winnipeg and Kansas City meetings^{3,4} (note: this does not imply there was unanimous agreement among participants on these ideas).

Adopt a Systematic Strategy: Clearly, the overarching theme accepted by participants was that a coordinated approach is required to adapt to climate variability. A timely response is required.

Genetic Diversity: Our current cropping systems have minimized the genetic diversity of crops, both in the number of crops grown and the genetic foundation of cultivars utilized, resulting in increased regional vulnerability to biotic stresses associated with plant diseases and insects and abiotic stress associated with climatic variability.

Integration of Fundamental and Adaptive Sciences: Gene discoveries should be coupled with an understanding of biological systems. In the absence of any new genetic breakthroughs, a lot can be accomplished by adoption of agronomic best practices, such as improved stubble/residue management, fertilizer management, zero/reduced tillage, use of winter crops, etc. It is also clear that “natural” ecosystems such as native prairie grasslands are highly efficient and productive systems that can provide lessons to modern agriculture.

Governmental and Public Institutional Integration: Increased collaboration between federal, provincial/state departments (intra-governmental and inter-governmental) in both Canada and the USA will be necessary to address the challenge of sustaining agriculture. Collaboration will require the “breaking down of silos” for various government departments, including:

- agriculture departments
- environment and natural resource departments
- transportation and infrastructure departments
- science and technology departments
- trade and industry departments
- foreign affairs and inter-governmental departments

Integration of the Food System: Integration is not only necessary for governments but also the responsibility of all public and private stakeholders throughout the food-system value-chain. In order to address the issue, collaboration will need to be systematic and strategic at leveraging science and technology across the agricultural sciences plus the disciplines of ecology, engineering, nutrition, economics, public policy, and sociology by utilizing a holistic approach.

Public Education: The transformation of agriculture will require full engagement of agricultural-producer organizations and agribusiness. Rapid technology transfer will require coordinated producer educational programs by Cooperative Extension educators and agribusiness professionals to ensure a consistent and accurate message. A companion educational program will need to be targeted to elected governmental officials and the general public to raise awareness of the importance of the issue to all citizens, urban and rural alike, and the need for facilitating public policy changes.

³Audience: Over 100 attendees, representing producers/producer groups, governments, academics, agricultural-industry, and non-government organizations at each conference.

⁴Topics: Background on climate change scenarios and predicted impacts on prairie agriculture were presented by researchers. Options for adaptation—including R&D, breeding, technology transfer, agronomic best practices and risk management—were presented by producers, research institutions, and governments. A broader discussion on important research efforts, directions, and collaborations was undertaken.

Barriers to Agricultural Adaption: Agricultural systems have adapted to changes in markets, technology and public policy in the past. However, the magnitude of adaptation required, combined with the short time frame and global impact on food systems, makes the upcoming challenge facing the Great Plains of North America particularly crucial. An integrated approach to address the barriers and opportunities will be necessary. In doing so, we need to understand how to move forward with respect to policies and programs regarding the following:

- research and development
- commercialization of new crops and products
- technology and knowledge transfer (including intellectual property)
- public policy addressing regulatory issues, trade barriers, carbon sequestration, and the implications for the structure of agricultural support programs

Enabling Public Policy: There is an enhanced awareness of the need for a policy discussion and the development of a framework around the issue of climate change and agriculture. International cooperation between Canada and the USA will be necessary to facilitate a regional approach to agricultural adaption. These discussions will require a comprehensive review of national trade policies, farm support programs, and agricultural risk management mechanisms both within each country and between the two countries. A participant's statement sums up this important objective: "How do we use public funds to put us in the best possible position?"

The challenges confronting agricultural and public leaders include the following:

- Developing strategies for adapting crop and livestock agriculture on a regional basis across geopolitical boundaries.
- Fostering the development of public policy to facilitate adapting agricultural systems.
- Developing an awareness of the need to adapt agriculture to climatic variability among agricultural communities, elected leaders, and the general public.
- Fostering a working culture of synergy between the USA and Canada in addressing the food and biofuel security challenge facing both countries due to climate variability.
- Leadership coming from within agriculture to help accomplish the task required to sustain the food and bio-product system of the prairie regions of North America.

Adaptation to climate change in the prairie zone of North America is a means to three goals:

- Agriculture remains a major producer within the global food system.
- Agriculture remains an economic engine for producers through technology transfer and new opportunities.
- Agriculture remains a collaborative engine across the value-chain, (input providers, producers, processors, exporters, etc.), governments, academia, and rural communities.

NEXT STEPS

- Develop a strategy for adapting Great Plains crop and livestock agriculture to a rapidly changing climate.
- Take advantage of the windows of opportunity to participate in policy development.
- Explore the establishment of a bilateral commission focused on adapting agriculture to climate variability.
- Foster an accurate, positive, and constructive dialogue to facilitate the adaption of agriculture to climate variability.
- Prioritize knowledge gaps to strategically develop required technology (research required based upon current knowledge).
- Define a clear strategy to guide future efforts in both Canada and the USA.
- Identify the policies and actions needed to make this initiative a working model for a Canada/USA climate-change response.

PROGRAM SPONSORS

The governments of Canada and Manitoba through
Growing Forward
The Canadian Agri-Food Policy Institute (CAPI)
North Central Research Association
North Central Cooperative Extension Association
South Dakota State University; South Dakota
Agricultural Experiment Station
National Center for Food and Agricultural Policy

CONFERENCE STEERING COMMITTEES

WINNIPEG MEETING

Dr. Mary Buhr, University of Saskatchewan
Dr. Daryl Domitruk, Manitoba Agriculture,
Food and Rural Initiatives
Dr. Yafan Huang, Performance Plants
Dr. John Kennelly, University of Alberta
Mr. David McInnes, Canadian Agri-Food Policy Institute
Mr. John Oliver, Maple Leaf Bio-Concepts
Mr. Barry Routledge, Manitoba Rural Adaption Council
Dr. Karin Wittenberg, University of Manitoba

KANSAS CITY MEETING

Dr. Arlen Leholm, North Central Research Association,
Madison, WI
Dr. Robin Shepard, North Central Cooperative Extension
Assoc., Madison, WI
Dr. Gary Lemme, South Dakota State University
Dr. David Clay, South Dakota State University
Dr. Joe Dunn, National Center for Food and Agricultural
Policy, Washington DC
Dr. Drew Lyon, University of Nebraska, Scottsbluff, NE

CONFERENCE SPEAKERS

WINNIPEG MEETING

Mr. John Oliver, Maple Leaf Bio-Concepts
Dr. David Skole, Michigan State University
Dr. Danny Blair, University of Winnipeg
Dr. Paul Bullock, University of Manitoba
Mr. Barry Routledge, Manitoba Rural Adaption Council
Dr. Daryl Domitruk, Manitoba Agriculture, Food and Rural
Initiatives
Dr. John Kennelly, University of Alberta
Honourable Stan Struthers, Manitoba Agriculture,
Food and Rural Initiatives
Dr. Joseph Dunn, National Center for Agriculture and
Food Policy
Dr. David Clay, South Dakota State University
Dr. Guy Lafond, Agriculture and Agri-Food Canada
Mr. Leo Meyer, Leo Meyer Grain Production
Mr. Owen McAuley, Double M
Mr. David Rourke, Agriculture-Quest, Inc.
Mr. Edgar Hammerseister, Producer
Mr. David McInnes, Canadian Agri-Food Policy Institute

KANSAS CITY MEETING

Dr. Gary Lemme, South Dakota State University
Dr. Paul Fixen, International Plant Nutrition Institute
Dr. David Skole, Michigan State University
Mr. Neal Fisher, North Dakota Wheat Commission
Mr. Bill Ferguson, South Dakota grain producer
Mr. Terry Handke, Kansas grain farmer/livestock feeder
Dr. Luther Talbert, Montana State University
Dr. David Clay, South Dakota State University
Mr. Brent Carpenter, University of Missouri
Mr. David McInnes, Canadian Agri-Food Policy Institute
Dr. Arlen Leholm, North Central Research Association

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