

# **Report on the Workshop on Applications of Climate Statistics in Agriculture**

**Regina, Sask., June 6-7, 2007**

## ***Principal organizers:***

- Aston Chipanshi, Agriculture and Agri-Food Canada (AAFC), Regina, Sask.
- Harvey Hill, AAFC, Saskatoon, Sask.
- James Ramsay, Dept. of Psychology, McGill University
- James Zidek, Dept. of Statistics, University of British Columbia

## ***Workshop summary:***

The conference brought together about three dozen participants from three communities in roughly equal numbers:

- Members of the government agencies providing climate information, risk management and other services to producers in the prairie provinces.
- Experts on prairie climate, climate modeling, climate data and communicating climate information to client communities.
- Statisticians interested in opportunities for climate modeling.

The participants and their email addresses are provided on an attached list, and further information is available on the web site for the workshop. The presence of several graduate students from each of these three areas was considered to be especially valuable.

The workshop began at 1:00 PM on July 6<sup>th</sup>, continued through that evening, and occupied the entire day of July 7<sup>th</sup>. Conference facilities, lunch, coffee break supplies and a conference dinner were provided at the hotel housing participants, so that participants were together for the entire time, and had more than ample occasion for informal communications.

The goal of the workshop was to provide an opportunity for each of these communities to inform the others about problems, needs and possibilities for future research on climate within the framework of aiding prairie agriculture. It was recognized that there had been substantial challenges in understanding each other on previous encounters, and that moving forward towards fruitful new collaborations would require an extended occasion for informing one another on many issues. It was expected that an outcome of the workshop would be a proposal to NPCDS and other agencies for seed funding for collaborative research involving substantial statistical research input.

The carefully crafted program (attached) and the happy choice of participants resulted in a level of discussion, collegiality and excitement about new collaborations that exceeded the expectations of the organizers.

It was resolved that some version of the workshop should be repeated each year, and that the development of a research proposal should begin at once. To the latter end, three break-out groups met to discuss possible projects, and outlined nine pressing projects achievable within a two-year time frame.

### ***Data sharing:***

An immediate outcome of the workshop was the sharing of several interesting datasets, papers and information about issues that arose during the meeting, among those interested in working with them:

- 800 years of climate information reflected in tree-ring measurements collected by Prof. D. Sauchyn, Dept. of Geography, University of Regina.
- Geographical information systems polygon data on boundaries of the prairie growing regions along with internal geographical features such as lakes and rivers made available by Richard Warren of Agriculture and Agri-Food Canada (AAFC), Regina.
- Results from two attempts to grid prairie precipitation data provided by Dr. Nathaniel Newlands, AAFC, Lethbridge, Alta, along with the data used in the project.
- A list of important references from Doug Wilcox, Manager, Program Development – Insurance Research Division, Manitoba Agriculture Services Corporation, Portage La Prairie.
- Clarifications on the nature of Environment Canada climate data from William Richards, Environment Canada, Fredericton.

### ***Some problems identified for immediate statistical input:***

The Workshop was effective at focussing attention on many problems where statistical methodology was sure to contribute something of value. However, a remarkable amount of consensus during informal discussion and between the three breakout groups was concentrated on these issues:

- Better methods for estimating weather characteristics at a specified location within the prairie agricultural region, both for the present and the future, from current data and historical records at neighboring weather stations. While efforts have been made over the past year to solve this problem by estimating temperature and precipitation on a ten kilometre grid using two different interpolation methods, it was acknowledged that: (1) the accuracy of these interpolations is well below what is needed, (2) estimates of expected levels must be supplemented by credible statements of uncertainty that take into account the non-Gaussian distribution of many of these characteristics. The need for better local estimation arises especially from the fact that popular insurance schemes are based on weather data from a single pre-specified weather monitoring site that may, for various reasons, have only limited relevance to conditions at the desired location.
- Description and prediction of extreme events, especially for precipitation. Precipitation records have at least a bivariate structure in that, with a certain probability, no precipitation whatever will occur, but that given precipitation can occur, one needs to describe the entire distribution of possible levels, including some statement of the probability of an extreme event. Consequently, two types of extremes are of particular interest: (1) conditional on rain being possible, the probability of an extreme level, and (2) an extreme number of days with no rain. For example, Jim Ramsay showed by means of quantile function estimates that, for Regina, both types of extremes are much more likely in the critical month of June than in August.
- Locally specific hindcasting of historical weather characteristics based on data following the specified target date. This complement to the better-known forecasting problem is also important for crop insurance payouts as well as for reviews of crop management practices and crop choices.
- Better use of collateral information. Each of these above objectives as well as others must make more use of existing and emergent information, including elevation, South Pacific oscillations, tree rings and other biological proxies for historical weather, and ice and seabed core samples.

### ***Workshop support:***

- National Program for Complex Data Structures: travel, accommodation, coffee breaks and dinner, and audio-visual expenses
- Agriculture and Agri-Food Canada: web site support, rental of conference room for two days, travel and accommodation expenses

**Conference web site:**

- [http://www.agr.gc.ca/pfra/drought/Regina\\_workshop/climstat\\_index\\_e.html](http://www.agr.gc.ca/pfra/drought/Regina_workshop/climstat_index_e.html)
- The web site provides access to most of the talks that were presented at the workshop.

**Attendees along with email addresses:**

Statistics and other academic disciplines

Qingfang Dai	qdai@math.ualberta.ca
Sylvia Esterby	sylvia.esterby@ubc.ca
Nancy Heckman	nancy@stat.ubc.ca
Reza Hosseini	m.hossei@stat.ubc.ca
Suzan Lapp	lapp200s@uregina.ca
Jason Loepky	jason.loepky@ubc.ca
Jim Ramsay	ramsay@psych.mcgill.ca
David Sauchyn	sauchyn@uregina.ca
Bruce Smith	bsmith@mathstat.dal.ca
Carolyn Taylor	cgtaylor@stat.ubc.ca
Hao Zhang	zhanghao@wsu.edu
Jim Zidek	jim@stat.ubc.ca

Agriculture and Agri-Food Canada

Aston Chipanshi	chipanshia@agr.gc.ca
Ryan Cossitt	rcossitt@agr.gov.sk.ca
Herb Cutforth	cutforthh@agr.gc.ca
Andrew Davidson	Davidsona@agr.gc.ca
Harvey Hill	hillh@agr.gc.ca
Allan Howard	howarda@agr.gc.ca
Nancy Lee	leen@agr.gc.ca
Nathanial Newlands	newlandsn@agr.gc.ca
Trevor Proskiet	proskiet@agr.gc.ca
Budong Qian	qianb@agr.gc.ca
Lawrence Townley-Smith	townleysmithl@agr.gc.ca
Richard Warren	warrenr@agr.gc.ca
Ross Weiss	weissr@agr.gc.ca
Mei Yin	yinh@agr.gc.ca

Environment Canada and other government agencies

Richard Carr	rcarr@nrcan.gc.ca
Kai Chen	kai.chen@ec.gc.ca
Dr. Wenjie Dong	Wenjie.Dong@ec.gc.ca
Daniel Intenfis	daniel.intenfis@gov.ab.ca
Ken Kwok	ken.kwok@ec.gc.ca
William Richards	william.richards@ec.gc.ca
Paul Screpnek	paul.screpnek@scic.gov.sk.ca
Dale Wotherspoon	dale.wotherspoon@scic.gov.sk.ca
Doug Wilcox	dwilcox@masc.mb.ca
Ralph Wright	ralph.wright@gov.ab.ca
Xuebin, Zhang	Xuebin.Zhang@ec.gc.ca

Other participants

Holly Hartmann                   hollyoregon@juno.com  
Kevin Hursh                       kevin@hursh.ca  
Larry Weber                       larry@webercommodities.com

**Program:**

<b>June 6th Afternoon</b>	
<b>Session 1: Progress in Statistical Analysis</b>	
1:45-2:00	<b>Chair: Jim Ramsay</b> Welcome and Introduction to the Workshop  <b>Stephen Locke (Director, Ag Water, PFRA, Agriculture and Agri-Food Canada)</b>
2:00-2:35	<b>Ashley Steele</b> , National Oceanographic and Atmospheric Agency Title: Mind the Gap: Communicating quantitative information for use in decision-making
2:35-3:10	<b>Hao Zhang</b> , Washington State University "A Public Agricultural Weather Network in Washington"
3:10-3:25	<i>Break / refreshments</i>
3:25-4:00	<b>Chair: Hao Zhang</b> <b>Jim Ramsay</b> , McGill University "Risk estimation over space and time"
4:00-4:20	<b>Carolyn Taylor</b> , University of British Columbia "SCARL: A Consultation & Collaborative Research Support Senter"
4:20-4:55	<b>Jim Zidek</b> , University of British Columbia "Modelling climate fields for agroclimate risk management"
4:55-5:15	<b>Discussion, Day 1 recap and close</b>
5:30-6:30	<i>Cash Bar</i>
6:30-8:00	<b>Banquet Speaker - Kevin Hursh (Broadcaster/Farmer)</b>

**June 7th - Morning**

**Session 2: Application of Statistics for Risk Abatement**

8:30-9:00	<b>Chair: Aston Chipanshi</b> <b>Holly Hartmann</b> , CLIMAS, University of Arizona The use of climate information for decision making
9:00-9:30	<b>Harvey Hill</b> , Agriculture and Agri-Food Canada Exploring the benefits of linking statistical/biophysical tools to agricultural systems
9:30-10:00	<b>Larry Weber</b> , Weber Commodities Ltd, Saskatoon "Climate information needs for the agri-business"
10:00-10:30	<b>Dale Wotherspoon</b> , Saskatchewan Crop Insurance "Weather based insurance programs in Saskatchewan"
10:30-10:45	<i>Break / Refreshments</i>
10:45-11:15	<b>Chair: Andrew Davidson</b> <b>Open Microphone (a chance to let non scheduled presenters to make statements)</b>
11:15-12:15	<b>Panel Discussion</b> Scientist/User Dialogue Panelists: 2 scientists and 2 users A forum for information exchange on the science and user needs
12:15-1:30	Lunch - <i>Supplied on site</i>

June 7th - Afternoon	
Session 3: Project(s) Definition	
1:30-3:00	<b>Chair: Harvey Hill</b> <b>What we heard loudest</b> - Breakout groups and reports Focus on urgent issues that require immediate or future action
3:00-3:15	<i>Break / Refreshments</i>
3:15-4:15	<b>Priority setting and the next steps</b> Focusing on what we do next
4:15-4:30	<b>Wrap up</b> Closing remarks by STATS/USER representatives <b>Allan Howard</b> - NAIS <b>Jamie Stafford</b> - NPCDS

***Report prepared by:***

Jim Ramsay, McGill University  
 Jim Zidek, University of British Columbia

28 June 2007