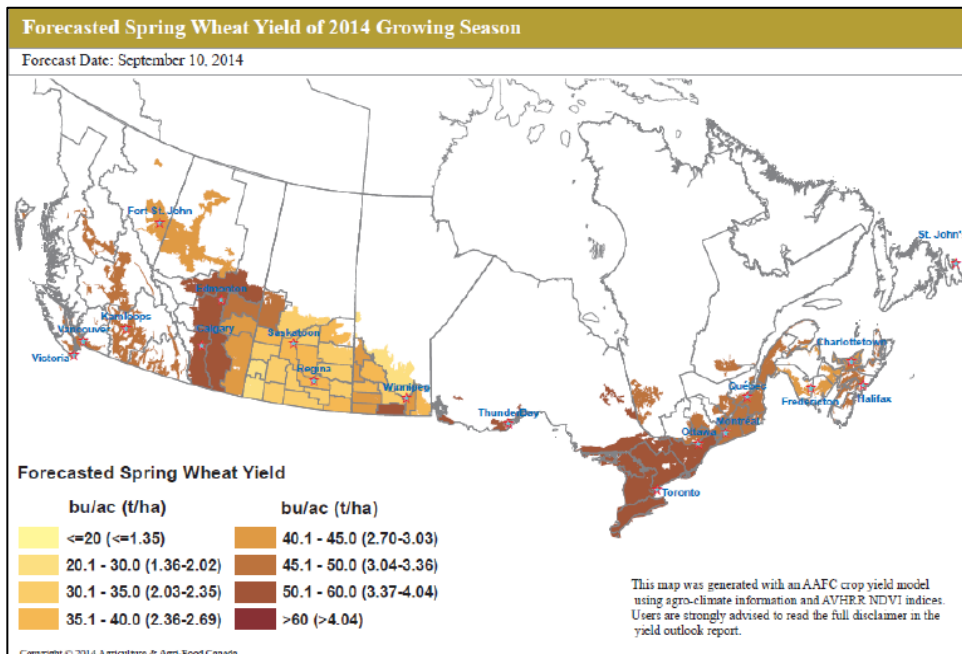




The Canadian Crop Yield Forecaster

The Canadian Crop Yield Forecaster (CCYF) is a geospatial modelling tool used by Agriculture and Agri-Food Canada (AAFC) to produce crop yield forecast maps during the growing season for major Canadian crops (e.g. spring wheat, durum wheat, canola, barley, corn and soybeans). By integrating climate, earth observation and statistical data within a Geographic Information System (GIS), the CCYF provides producers, traders and other decision-makers with regional crop yield outlooks for risk management decisions. Plans are currently underway to transition the CCYF from experimental to operational modelling and increase the online access to the yield forecast maps.

The yields of major Canadian crops vary considerably from year to year in response to the variability of weather and other environmental and economic factors. Early and accurate estimates of regional crop yields are very important in making risk management decisions. Current statistical survey methods to estimate yields at regional or national scales are resource-intensive and time-consuming, and reliable estimates are not normally available until long after



the growing season. The CCYF method, based on GIS and a range of geospatial and earth observation data, is a cost-effective, reliable and timely alternative to the traditional survey methods.

At the core of the CCYF model is a multivariate equation with yield predictors customized for each Census Agricultural Region.

The above map is one of many produced by the CCYF, using climate information to predict yields across the growing season. This map shows an experimental yield forecast for spring wheat produced September 2014.

The yield predictors, including agro-climatic indices and the Normalized Difference Vegetation Index (NDVI), are automatically selected within the model through a ranked weighting process. A linear trend is currently employed to account for the impacts of technological factors, such as seed improvements on yields, in addition to climate conditions. Outputs of the CCYF model are monthly forecasts of yield probabilities and averages which are presented as maps.

The forecasting skill of the CCYF varies spatially and temporally. Experimental work to date has shown that the earliest useful forecast the CCYF model can produce is around mid-July; earlier yield estimates have been shown not to be accurate. Errors of CCYF yield forecasts for July, August and September are within historic crop yields and work is ongoing to improve the prediction accuracy of the CCYF model.

Since the 2012 growing season, near real-time experimental yield forecasts have been delivered to a test group of selected users from industry and government. Forecasts are supplied in mid-July, mid-August and mid-September. Discussion with users has identified potential improvements and future activities, including:

- Integrating additional earth observation-derived variables such as the Enhanced Vegetation Index (EVI) which has improved sensitivity in high biomass regions compared to the currently utilized NDVI;
- Exploring more data sources to improve regional agro-climate indicators;
- Adding forecasts for more crops in addition to wheat, barley and canola;
- Making crop yield forecasts for other spatial resolutions (e.g. eco-region); and
- Providing online access to the yield forecast maps.

The ongoing development of the CCYF has been led by AAFC's National Agroclimate Information Service (NAIS) and others in AAFC's Agro-Climatic, Geomatics and Earth Observations (ACGEO) Division, Science and Technology Branch. Partners include the Environmental Health group at the Lethbridge Research Centre (LRC), the Agricultural Remote Sensing group at the Eastern Cereal and Oilseed Research Centre (ECORC) and the Crop Condition Assessment Program (CCAP) at Statistics Canada (StatsCan). Weather and climate data are provided by Environment Canada (EC) and provincial partners.

For more information please contact AAFC's **National Agroclimate Information Service** at nais-snia@agr.gc.ca or visit AAFC's **Drought Watch** website at www.agr.gc.ca/drought.

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