



Quantifying growing season moisture impacts on western Canadian spring wheat

P. Bullock (1), G. Finlay (1), H. Sapirstein (2)

(1) Department of Soil Science, University of Manitoba, Canada, (2) Department of Food Science, University of Manitoba, Canada (Paul_Bullock@umanitoba.ca)

A multi-year drought began in 1999 in western Canada and continued over the succeeding four years with varying levels of intensity. Subsequently, the region has entered a pluvial cycle. In western Canada, fluctuations in moisture availability have a significant impact on crop yields and quality, especially for spring wheat, which derives a significant part of its economic value in the high-quality wheat markets around the globe. Therefore, knowledge of the variation and distribution of spring wheat quality in any given growing season has value in terms of sourcing and delivery of wheat with the appropriate quality specified by international wheat customers.

A moisture index is a means to condense often thousands of weather, streamflow and other moisture-related observations into a single value that reflects the availability of moisture at a specified location and time period. The index value assists in decision making by integrating a complex set of raw data into a single number. There are several moisture indices that have been developed. All have the same purpose of simplifying a complex time series of data, therefore, none will be perfect for all purposes. The more accurately that a moisture index can reflect the actual response of a particular element of the environment, the better the index will portray that particular reality and the higher the potential for sound decisions.

This study spanned three growing seasons (2003-2005) at monitoring sites in western Canada separated by hundreds of kilometres. Detailed weather and soil conditions were recorded throughout the growing season at five different locations where double-sized plots of several spring wheat cultivars were grown in a randomized complete block design with three replicates. Yield and technical quality characteristics were measured on each replicate individually. A range of moisture indices calculated from

the measurements at each site were statistically analyzed against yield and quality characteristics of the various wheat cultivars. The indices included simple precipitation totals, percent of normal and standardized precipitation index for various monthly combinations of precipitation through the growing season as well as precipitation, evapotranspiration, water demand, water deficit and crop water use defined by the physiological growing season of each cultivar and progressively more sophisticated models to estimate evapotranspiration and crop water use. The purpose was to test the ability of each index to explain the variation in observed wheat yield and quality measures. The ultimate goal is to determine the minimum data requirements required to provide reliable estimates of wheat yield and quality variation in western Canada. This information will help to determine how the extent and frequency of moisture-induced wheat quality impacts has changed historically and how climate change may affect it in the future.