

Seeing What You Cannot See

Doug Wilcox,
Manitoba Crop Insurance Corp.

Agriculture has been described in simplistic terms as “a specialty technology designed to harvest climate”. Climate and soil have much to do with what crops and varieties are grown and where. It is easy to see soil, but not so easy to climate! This is where agroclimatic maps fit in – they allow you to “see what you cannot see”. Combined with other relevant information, agroclimatic maps can assist you with decisions on where, when and how to manage your farm.

Using Agroclimatic Maps

Yield Manitoba contains a series of agroclimatic maps provided by the Agrometeorological Center of Excellence (ACE) in Carman (www.aceweather.ca). These maps can be broadly be classified into two groups (1) those representing climatic parameters during 2001 alone and (2) maps illustrating long-term average climatic parameters (usually over the period 1960 to 1990). The parameters on these maps are largely self-explanatory through a combination of the title, legend and comments. Further information on these parameters can be obtained from the “Maps and Interpretation” section on the ACE website.

Agroclimatic maps are valuable reference tools for Manitoba farmers. The 2001 maps are useful for explaining regional yield differences in 2001, including those reported in this issue of *Yield Manitoba*. The long-term maps are useful for benchmarking and appreciating regional production limitations during crop planning.

Interpreting the contour coloring used on the agroclimatic maps and visualizing the three dimensional information provided can be difficult. Each color on the map represents an area where the value of a climatic parameter falls within a certain range. The boundary line marking the transition from one color to another is called a contour line. On the contour line, values don't vary at all. Immediately to one side of the contour line, values are higher than they are on the line itself; on the other side, values are always lower. You can determine which is which by consulting the legend. Each colored area actually represents a range of values that are described in the legend – often occurring as a gradient perpendicular to the contour lines. Closely spaced contour lines (narrow color

bands) indicate regions where there is a more rapid change compared to regions where contour lines are widely spaced. It may help to imagine these maps and contours as illustrating some 3-D surface containing rolling hills and valleys.

For example look at the map illustrating “Normal Accumulation of Rainfall from April 1 to September 1” on page 8. Note that the zone in which Carman is located is colored medium green. Therefore, according to the map legend, that average seasonal rainfall amount there is 325 to 350 mm.

For another example, review the agroclimatic map “Normal Accumulation of Growing Degree Days above 5 C from April 1 to Sept 1” on page 12. The zone surrounding Altona and Morden is colored dark orange. According to the legend this zone of the province normally receives 1700 to 1750 GDD.

Limitations To Agroclimatic Maps

It is human nature to consider these colorful glossy maps as “true representations” of the climatic data. The reality is that they are simply the visual representations of mathematical models fit to a limited number of climate stations. The carefully drawn boundaries and contours illustrated on these maps are generalized representations of climatic parameter changes that in reality are often gradual, vague or fuzzy. Often data gaps exist. Caution should always be used in interpreting these maps – at a large scale these maps are only approximate, and at smaller scales they can be unreliable. Additionally, regions with tightly spaced contours are not necessarily more accurate than regions with broadly spaced contours.

When using any agroclimatic map, knowledge of the location of the stations from which the information was obtained is essential to assist with accurate interpretation. In order to maximize the potential accuracy of the long term agroclimatic maps the majority of information came from 42 weather stations with 30-year normals. Accuracy is less of an issue with the 2001 agroclimatic maps because the data used to generate these maps came from 185 sites. Large regions of the province contain “holes” that are not represented by a single weather station. The accuracy of the information displayed in these regions is lower than areas with higher weather station densities. You should also be aware that the

closer your field is to one of these stations, the more reliable is the agroclimatic map information for that field. The ACE website (www.aceweather.ca) provides weather station location maps for your reference.

All the data used for generating the agroclimatic maps came from meteorological instruments located in standard weather shelters. This approach has its own limitations for agricultural application. For example, temperature readings are taken at a standard height of five feet above ground and may not truly represent what crops experience closer to the ground. Similar issues exist for other measured climatic parameters. This meteorological instrument limitation is a concern that applies to every weather reading, not just agroclimatic maps.

Another concern is that some weather stations do not accurately represent the agricultural region in which they are located. For example, some weather stations are located next to bodies of water or within an urban area. This may not accurately reflect what has occurred on nearby farmland. Another limitation is that the period of records can vary from station to station.

The reliability of agroclimatic map information is also dependent on the climatic parameter measured. For example, on a regional basis it is well established that climatic parameters such as temperature and humidity do not vary much, whereas rainfall can vary widely. As a result, maps created from rainfall information can be less reliable than those based on temperature data.

Since it is impossible to collect climatic information such as rainfall from every location in the province, every agroclimatic map is a generalization. Each surface value you see on an agroclimatic map has been estimated or interpolated based on the known values at neighboring stations. The quality of this interpolation is dependent on the accuracy, number and distribution of known points in the calculation and on the accuracy of the model.

These limitations do not mean the maps are not useful tools. ACE has done the best job possible to provide *Yield Manitoba* with agroclimatic maps that balance accuracy with utility. If you understand their limitations enough to add your own reasonable interpretations, then you truly have a useful tool for planning and profit on your farm.