Dec 1st, 12:00 AM

Crop weather outlook 2017 and beyond

Elwynn Taylor

Iowa State University, setaylor@iastate.edu

Follow this and additional works at: https://lib.dr.iastate.edu/icm

Part of the Agriculture Commons, Agronomy and Crop Sciences Commons, and the Climate Commons

https://lib.dr.iastate.edu/icm/2016/proceedings/1

This Event is brought to you for free and open access by the Conferences and Symposia at Iowa State University Digital Repository. It has been accepted for inclusion in Proceedings of the Integrated Crop Management Conference by an authorized administrator of Iowa State University Digital Repository. For more information, please contact digirep@iastate.edu.
Crop weather outlook 2017 and beyond
Elwynn Taylor, professor and Extension climatologist, Agronomy, Iowa State University

The 2017 crop year follows two years of the 3rd strongest El Niño event since 1950. Historically, very strong El Niño events have only a 25% chance of being followed by a poor crop year. However, there are other factors in play that point to an increasing risk of adverse crop weather during the coming eight years.

Yield trend
The USDA uses a 30-year period of records to establish yield trends. The National Weather Service uses a 30-year period to establish climatic normal. In both cases the period of record was selected to give a reasonable picture of conditions and trends for both crop production and for climate. The period of record is defined such that an anomaly of yield (or of weather during a single year or even of a short run of years) does not have an inordinately strong influence on the “trend” as depicted by a straight line representation.

In the case of yield, the trend is considered to represent the technological shifts in crop production. This would include the influence of crop breeding on potential yields and crop adaptation to climate, soils and to crop-pest interactions. Barring long-term gradual shifts in climate, the 30-year trend may be treated as the “technology trend” of crop production. The US corn trend and annual yield history are shown graphically in Figure 1.

Where the technology trend is substantial the annual yield may increase at a rate that masks the impacts of pests (insect, weed, disease, etc.) and weather. For example, a corn yield of 140 bushels per acre (called a disaster in the year 2016) may have been the “all-time record” for an Iowa farm in 1980. Accordingly, it is best to consider the “percent of trend” yields when comparing crops over a period of years or even for comparing crops between individual farms. It is in your interest to compare the harvest yield per acre with the historical yield trend as a tool for success in operating a farm, buying a farm, or attempting to anticipate the grain market (even if you do not have a full thirty years of yield records).

Finding the yield trend for your farm(s) will be up to you. The trend for the official yield of your county comes with the graph of county yield over the past thirty years. Yields and trend yields year by year are available for most counties of the Corn Belt states and are provided on the internet at no cost to the user (http://www.mygeohub.org/groups/ut2u/tools click on AgClimate View). Crop reporting district, state, and national yield data are available from the USDA at “http://www.nass.usda.gov “. 
Figure 1. The USDA estimate of the United States Corn yield was 173.4 BPA as of October 2016. Although above the 30-year trend by some 4% the estimate was shy of the “trend+10%” yield seen in 2004. However the estimate was in line with the previous two years.

**El Niño**

The El Niño originates in the Pacific Ocean at the west coast of South America. The land near the coast is considered arid. Periodic shifts of sea temperature (temperature near the surface of the sea) are known to bring torrential storms to the otherwise arid land and are referred to as an El Niño event (supposedly because of the tendency for the anomalous sea and weather conditions to develop at or near the Christmas season). During years with substantial El Niño events the weather is often impacted in regions far-flung from the Tropical Pacific. The El Niño of the past two years was considered to be the third strongest such event in the past 60 years (Figure 2).

The strong effect of altered regions of high and of low atmospheric pressure associated with the El Niño not only impacts the weather in the tropical areas but has impacts over much of the temperate latitudes as well. Shifting of regions of persistently high or low atmospheric pressure is often a direct result of an El Niño event (the same is true of the opposing condition termed La Niña).

During the past 50 years the occurrence of widespread diminished yield of crops in the Corn Belt tends to be in the season following the termination of an El Niño. The drought of 2011-2013 in the U.S. fell at the end of the 2010 El Niño event. There is a statistical relationship between the diminished El Niño and occurrence of significant Corn Belt drought, albeit the relationship is not of a highly consistent nature.
Figure 2. The occurrence of La Niña appears to be dominant from 1950 to 1977. Although major drought was present in both the mid 1950s and the 1980s, the El Niño was a dominate feature of the history. The 2015-2016 event was clearly one of the strongest since 1950.

**Analogous years**

Farmers have recognized the predictive value of analogous years for anticipation crop yields that have differed significantly from the general trend. The reality of an increased risk to crop yields related to the existence of one condition or the other of El Niño and La Niña is significant, but the use of analogous patterns of crop development and weather parameters is an important consideration in the management of risk associated crop response to the pattern and magnitude of growing degree day accumulation, precipitation, and crop heat stress.

The producer gains important insight to the pending crop yield when current weather trends are related to other years according to the observed deviations from yield trend that resulted in specific years. The Iowa Mesonet tool that provides a visual indication of differences and similarities includes a plotting function. The plot of growing degree days at Mount Pleasant in 1915 approached the pattern of the high yield years of 1994 and 2004 and differed significantly from the pattern depicted for the lower yielding year of 2010. The precipitation pattern was mid-way between the high yield and low yield year(s) and the “stress” pattern was below the normal as were the years of 1994 and 2004. A visual inspection would hint that the Mount Pleasant corn yield in 2015 would be better (as a percent of trend) than 2010 but not as high as in 2004 or 1994 (Figure 3).

The farmer wondering about the “analog” year can benefit from the visual analysis provided by the Iowa Mesonet project.
Figure 3. Three principal weather elements impacting yield may be displayed graphically and compared with any other 3 years. A farmer may choose a “good” year, a “bad” year, and a “so-so” year or any other combination to identify the year most analogous to the current year. The crop yield deviation from the historical trend is likely to be much like that of the “analogous” year identified by use of this tool.
http://www.mesonet.agron.iastate.edu/plotting/auto/?q=108