Dec 2nd, 12:00 AM

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CROP YIELDS AND WEATHER:
EVENTS, SEASONAL TRENDS, LONG RANGE INDICATORS, AND VARIABILITY

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Crop yield is ultimately dependent upon weather events. Soil moisture, soil temperature, insect damage, disease development, and weed competition are each directly influenced by the meteorological environment. Crops are directly impacted by freezing events, which may have wide area impact, and by localized events such as hail storms. The weekly monitoring of meteorological events is crucial to evaluation of crop condition and development. To the extent that events may be anticipated, production and marketing strategies may be adjusted to manage the risk associated with an agronomic system.

Extremes of weather events appear to be associated with global warming or cooling. The warming and cooling events that have been identified by observation seem to be associated with the 90 +/- year sunspot cycle. During the period of global warming from 1900 to 1940, large year-to-year variability of crop yields were noted in the Corn Belt. Yields were much less variable during the period of global temperature stability or decrease from 1940 to 1972 (as were summer and winter temperature extremes). Global warming resumed after 1972 and variability of crop yield has increased. It remains to be seen whether the global warming is being caused by human activity or natural cycling. Should the cause be natural, it may be anticipated that stable yields will become more likely by the year 2015. If warming is caused by human activity stability is not to be expected until human activity is substantially modified.

During the instable periods of global warming, crop yields in the Corn Belt are significantly influenced by the El Niño event and by an 18.6 year cycle. Generally, high yields occur during an El Niño and poor yields in the season following the termination of an El Niño. Poor yields are more likely during the "high risk" six years of the 18.6 year cycle. Historically, the chance of a significant Corn Belt drought is one in six (one year in six). During the high risk years, the chance is one in three with the droughts normally following the termination of an El Niño. During the 12.6 year lower-risk portion of the cycle, the risk of widespread drought becomes 1 in 12 with droughts tending to be associated with strong "anti-El Niños."

There does not seem to be any reliable seasonal indicator of developing drought. Seasonal forecasting has been most successful when based on hemi-spherical weather pattern development. Locations of jet streams and of persistent high and low pressure areas varies with season. If anomalous configurations exist, there will be predictable effects on weather patterns. The Bermuda High is especially important to the growing season precipitation in the central United States. Weather events and crop conditions at the time of the events determine the effect on yields, i.e., mid-winter drought has less effect than drought at time of pollination of grain.