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## Short Corn and Variable Growth—2013

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### **Abstract**

“Knee high by the fourth of July!” Some of us grew up with that old saying which either foreshadowed disaster or forecast bumper yields. If corn was knee high by the fourth, most thought it would mature before the first fall frost. That was good news! As we look back, the statement perhaps was valid back when the first target corn planting date was mid-May.

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## Integrated Crop Management NEWS

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### Short Corn and Variable Growth – 2013

By Roger Elmore, Mahdi Al-Kaisi and Elwynn Taylor, Department of Agronomy

“Knee high by the fourth of July!” Some of us grew up with that old saying which either foreshadowed disaster or forecast bumper yields. If corn was knee high by the fourth, most thought it would mature before the first fall frost. That was good news! As we look back, the statement perhaps was valid back when the first target corn planting date was mid-May.

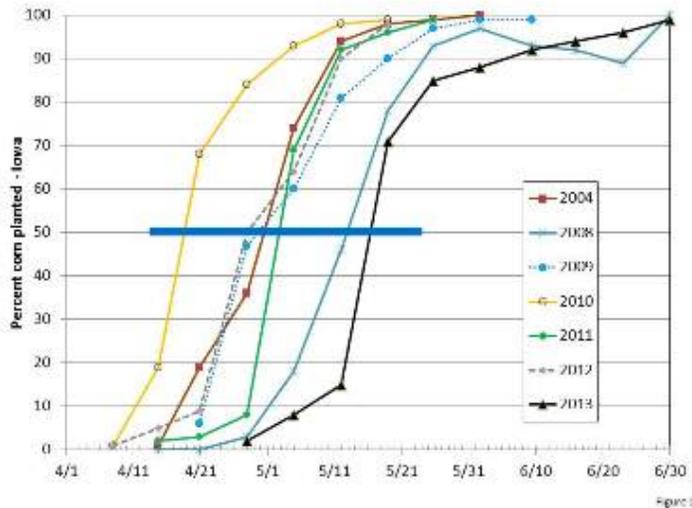
#### Conditions and responses change

Now farmers begin to plant in mid- to late- April and most wrap up planting by mid-May. These changes were driven by many factors including reduced tillage systems, better herbicides, more cold-tolerant hybrids, improved seed treatments, improved planter systems, larger farms, climate change ....and we’ve probably missed others. And now, we’re used to seeing corn “...as high as an elephant’s eye, An’ it looks like its climbin’ clear up to the sky” (Rodgers and Hammerstein, 1943, musical, Oklahoma) by the fourth of July. But that didn’t happen this year.

Many agronomists report not only shorter corn plants than normal this year - at least in some parts of Iowa – but also more variability across what usually appear as uniform fields. Why?

#### Late planting dates

Remember when 2013 first rolled in, the impact and lingering effects of the 2012 drought still haunted us. Several articles in this newsletter reflected our concerns. By April 28 only 2 percent of Iowa’s corn lay in seed furrows, soaking up water, and bracing for up to several inches of snow. Then, after the snow, wet conditions stymied planting. By May 12th, only 15 percent of Iowa’s corn had been planted ( USDA data). A week later though, another 56 percent was planted! We planted about 1.5 million acres per field work day the week of May 13th – probably the most we’ve ever accomplished in one ‘field work day’ (Figure 1).



**Figure 1. Corn planting progress in Iowa, 2004 and 2008 to 2013. Data compiled from USDA. The “blue bar” in the figure represents half (50 percent) of the acres planted. In 2010 (yellow) the crop was half planted April 18th; in 2013 the half-planted date was about May 15th. The very high yield year of 2004 was 50 percent planted by April 30th. [Full-size image](#)**

We finally reached 99 percent of Iowa’s corn planted on July 1st. That ranks 2013 alongside 2008 in recent history; two of the slowest and most drawn out planting seasons of modern times. Incidentally, 2010 reflects the earliest we’ve ever planted corn in Iowa, and 2004 and 2009 reflect years with the highest state-wide average yields recorded.

But later planting dates usually result in taller corn than earlier planting dates since plants develop during periods with long days. Plant height increases because of elongated internodes during such days. So, what happened this year?

## Soil temperature effect on corn height

We know that small differences in soil temperature and moisture affect both above- and below-ground corn growth. Root depth follows the downward progression of temperature increases. Generally, roots do not grow in soils much colder than 50°F.

Most reports dealing with corn height and development and correlations with soil temperatures are found in residue management research. More residue cover increases soil moisture content and decreases soil temperatures. Associated with the reduced soil temperatures is a decrease in plant height and decreased dry matter at specific calendar dates during vegetative development. However, corn grown with the same residue amounts had similar heights and dry matter when compared at the same vegetative development stages. Since seedling emergence is correlated with temperature, cold soils result in slow emergence.

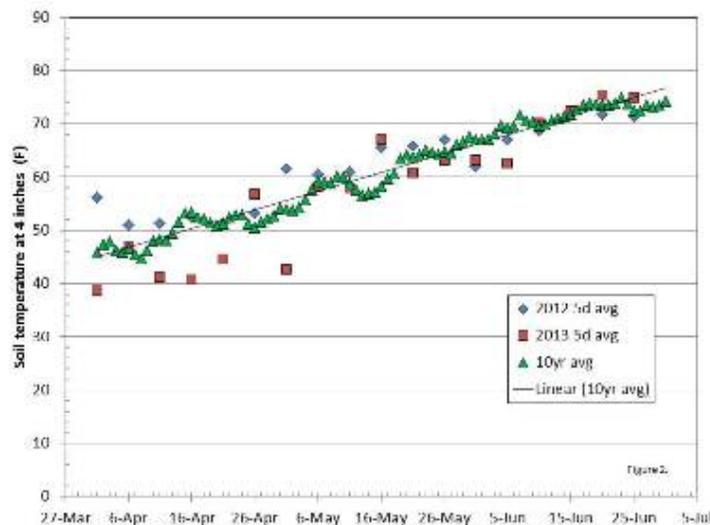
Illinois researchers compared corn growth and development by altering soil temperatures ( $\pm 9$  °F from ambient soil temperatures) with an underground heating system utilized through V5 - 5 collared leaves. In addition to delaying development in terms of calendar days, grain yield declined with the coldest soil temperatures. With these coldest soils, lower canopy leaves (leaves 1 to 13) had greater leaf area than upper canopy leaves (leaves 15-21). The opposite was true with the warm soil treatment. Upper canopy leaves contribute more to yield than lower canopy leaves.

All leaf development initiates while the growing point is still underground -

before V6; soil temperatures up to V6 thus affect early crop development. Noticeable stalk elongation begins at around V5. Root development and leaf initiation have priority before that time. Cell expansion occurs near the internode bases. This process of cell expansion is influenced not only by the amount of light and day length – the latter discussed above in relation to late planting – but also by temperature. Early-season cold temperatures increase internode rigidity and limit cell expansion and internode elongation.

## 2013 soil temperatures

Soil temperatures this year fell below normal during the five weeks when most of Iowa's corn was planted and considerably below what we experienced in 2012 (Figure 2). We speculate that abnormally cool 2013 soil temperatures affected corn internode elongation and thus resulted in shorter corn plants, especially those planted from April through mid- to late- May.



**Figure 2. Soil temperatures in 2013 compared to those of 2012 and the 10-year average at Gilbert Iowa, Central Iowa. Data compiled from [MESONET](#). Iowa soil temperature was 5 to 8°F colder than usual in the late April to May 5 period. Between May 6th and June 10th soils were again several degrees colder than usual. [Full-size image](#)**

In addition, within field variations in plant heights seen in fields this year may be due to uneven residue distribution across the field. Differing residue levels alters both soil temperatures and soil moisture affecting corn growth and development. Other factors may affect within-field plant height variations as well.

Plant height itself is not necessarily a good indicator of corn yields if light interception is near complete at silking. As mentioned above though, if upper canopy leaf areas are reduced by the cool temperatures this spring, grain yield will be reduced. However, yield potential in 2013 is likely compromised by the delayed planting and possibly cool and wet soil conditions experienced early in the growing season. An early frost will be detrimental.

Cool, wet weather this spring reduced corn plant heights and increased variability of plant heights across fields. Shorter plants are not necessarily lower yielding. Whether corn is knee-high or elephant-eye high by the 4th of July is less important than whether the crop intercepts near maximum light at silking and the timing of the first major fall frost.

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