Issue 966

K-STATE Research and Extension

Extension Agronomy

eUpdate

07/20/2023

These e-Updates are a regular weekly item from K-State Extension Agronomy and Kathy Gehl, Agronomy eUpdate Editor. All of the Research and Extension faculty in Agronomy will be involved as sources from time to time. If you have any questions or suggestions for topics you'd like to have us address in this weekly update, contact Kathy Gehl, 785-532-3354 kgehl@ksu.edu, or Dalas Peterson, Extension Agronomy State Leader and Weed Management Specialist 785-532-0405 dpeterso@ksu.edu.

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1. Estimating corn yield potential using the yield component method

Corn flowering

With most corn fields in Kansas already in reproductive stages (or close to flowering for late-planted fields), it is time to start assessing grain yield potential. Successful pollination is a critical aspect that farmers can evaluate by examining ear silks. Having conditions that favor the synchrony between the pollen shed by the tassels and the silks, the exposed silks should turn brown and easily separate from the ear when the husks are removed.

Water stress around flowering time (R1, http://www.bookstore.ksre.ksu.edu/pubs/MF3305.pdf) will negatively impact pollination due to a lack of synchrony between the pollen release and the emergence of the silks, which is a process that requires a lot of water. Heat stress around flowering will mainly impact the viability of the pollen. Normally, under dryland conditions in Kansas, water, and heat stress use to happen together. Silks that have not been successfully pollinated will stay green, possibly growing several inches in length (Figure 1). Unpollinated silks also will be connected securely to the ovaries (the undeveloped kernels) when the husks are removed.

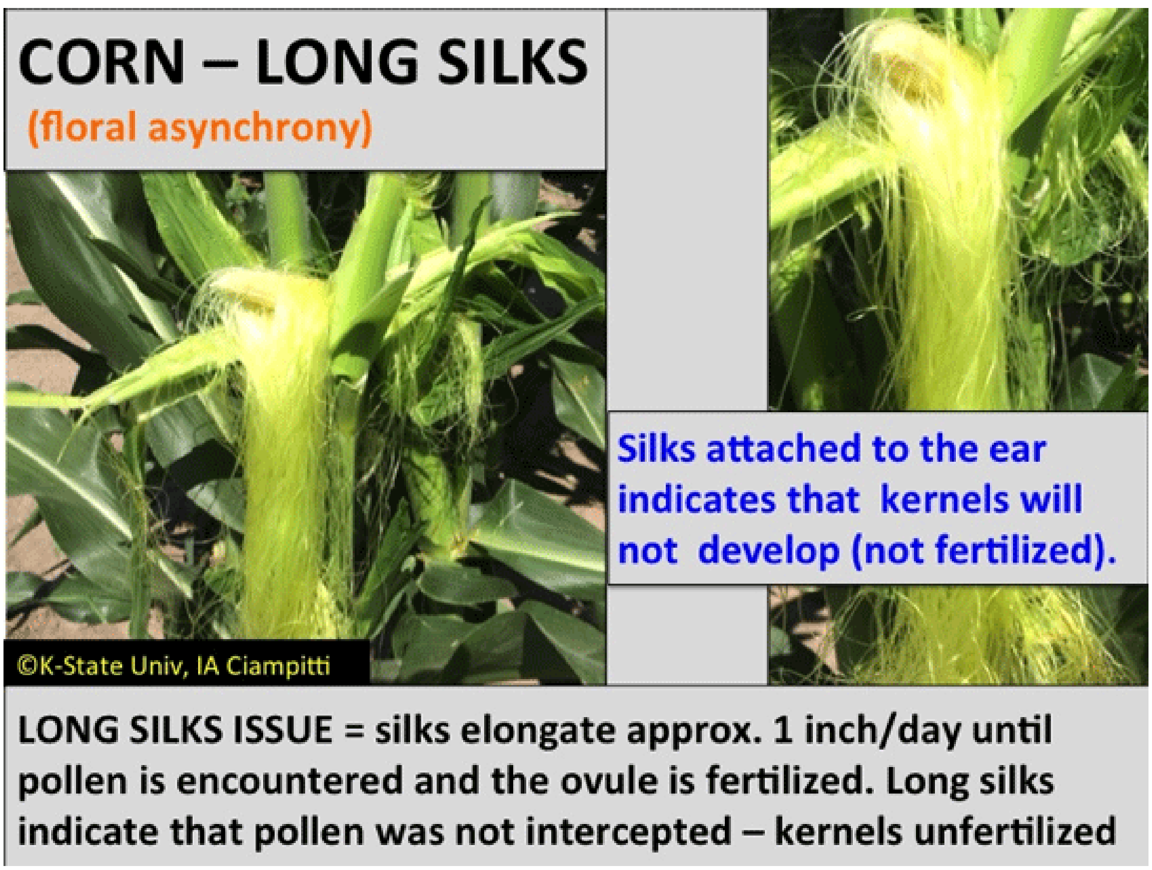

Figure 1. Long silks primarily reflecting floral asynchrony. Silks that have not been successfully pollinated will stay green. Infographic by Ignacio Ciampitti, K-State Research and Extension.

Corn yield potential estimation

Once pollination is complete or near completion, farmers could begin to estimate corn yield potential. To obtain a reasonable estimate, corn should be at least in the milk stage (R3). Before the milk stage, since grain abortion is still possible under stress conditions (mainly due to drought and/or heat stresses), it is difficult to tell which kernels will develop and which ones will abort.

To estimate yields, we can use the *yield component method* (Figure 2). This approach uses a combination of known and projected yield components. It is considered "potential" yield because one of the critical yield components, kernel size, remains unknown until physiological maturity. Therefore, we can only make an estimate of predicted yield based on expected conditions during the grain filling period (e.g. favorable, average, or poor).

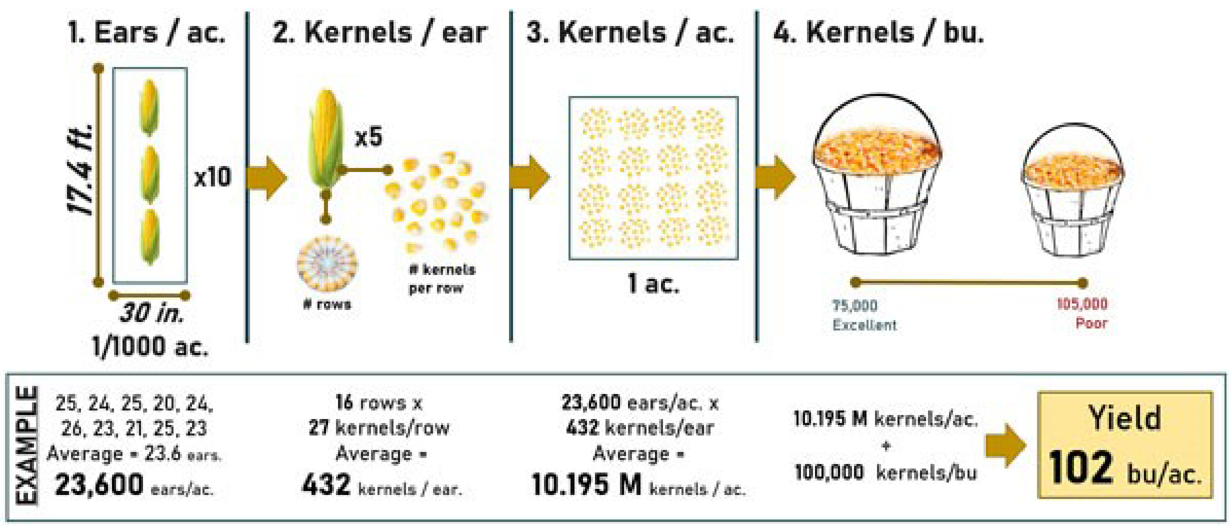

Figure 2. Example of corn yield estimation under the "yield components method".

Estimating potential corn yield using yield components uses the following elements:

Step 1. Ears per acre: This is determined by counting the number of ears in a known area. With 30-inch rows, 17.4 feet of row = 1,000th of an acre. This is probably the minimum area that should be used. The number of ears in 17.4 feet of row x 1,000 = the number of ears per acre. Counting a longer length of row is fine, just be sure to convert it to the correct portion of an acre when determining the number of ears per acre. Make ear counts in 10 to 15 representative parts of the field or management zones to get a good average estimate. The more ear counts you make (assuming they accurately represent the field or zone of interest), the more confidence you have in the yield estimate.

Example (Figure 2, step 1):

- Counting 10 times 17.4-foot sections: (25 + 24 + 25 + 21 + 24 + 26 + 23 + 21 + 25 + 23)
- 236/10 = 23.6 ears. Scaling up to an acre: 23.6 x 1,000 = **23,600 ears per acre.**

Step 2. Kernels per ear: There are two sub-components of kernels per ear: (i) the number of rows per year, and (ii) the number of kernels within each row. Most likely, the number of rows will be around 16, and ears always keep an even number of rows. The number of kernels per row depends on multiple factors, starting from the hybrid, but it mainly depends on the growing conditions around flowering. To arrive at kernels per ear, multiply the two sub-components (number of rows x kernels per row). *Note: do not count aborted kernels or the kernels on the butt of the ear; count only kernels that are in complete rings around the ear. Do this for every 5th or 6th plant in each of your ear count areas. Avoid odd, non-representative ears.*

Example (Figure 2, step 2):

- Counting 5 ears from each 17.4-foot area had an average of 16 rows and 27 kernels per row: 16 x 27 = **432 kernels per ear**

Step 3. Kernels per acre = Ears per acre x kernels per ear

Example (Figure 2, step 3):

- 23,600 ears per acre x 432 kernels per ear = **10,195,000 kernels per acre**

Step 4. Kernels per bushel: This will have to be estimated until the plants reach physiological maturity. Common values range from 75,000 to 80,000 for excellent, 85,000 to 90,000 for average, and 95,000 to 105,000 for poor grain filling conditions. The best you can do at this point is estimate a range of potential yields depending on expectations for the rest of the season.

Example: Under a scenario of temperatures above 100° F for the next 7-14 days and lack of rains (and if these conditions persist), it might be more than reasonable to assume below-average grain filling conditions producing overall medium to small kernels. Based on the projected weather, a reasonable value might be **100,000 kernels per bushel** (Figure 2, step 4).

Step 5. Bushels per acre:

- 10,195,000 kernels per acre ÷ 100,000 kernels per bushel ~ **102 bushels per acre**

Final considerations

If these estimates are close to correct, the field in this example is probably worth taking to grain harvest. Past experience indicates that this method of estimating yield usually provides fairly optimistic estimates. Please consider these points when doing these field estimations.

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2. Japanese beetles in eastern Kansas

Adult Japanese beetles (Figure 1) have been creating concern for corn producers in the eastern third of the state for the last couple of weeks. They are a concern, based upon timing, because they are strongly attracted to fresh corn silks. These beetles are relatively voracious feeders and can chew off silks almost as fast as they can grow out, especially if there are several beetles feeding/ear right at the critical time of pollination shed. However, they are often only on the side of the field closest to where the larvae were feeding. The larvae are white grubs (Figure 2) that feed on the roots of many different plants, often turf grass, or some other perennial.

Adult beetles have a wide host range and may feed on the nectar and pollen from many flowers, or fruits (pears, apples, grapes, etc.). However, they can also be attracted to young succulent soybean leaves and pods and therefore may cause concern because of the defoliation. Again, most of this defoliation is on one side of the field, or in small areas. However, soybeans are very resilient at compensating for defoliation up to about 50-60%, during vegetative stages.

Japanese beetles are migrating west across Kansas and caused concern in 2022 as far west as Saline and Republic counties. Westward migration is continuing. If you notice Japanese beetles in a field, please monitor the entire field for infestation as they do tend to aggregate on the side closest to where the grubs fed.

Figure 1. Adult Japanese beetle. Photo by K-State Entomology.

Figure 2. Japanese beetle larvae (white grubs). Photo by K-State Entomology.

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3. Identification of Chinch Bugs and False Chinch Bugs

With the elevated chinch bug activity in central Kansas right now, this is a good time to discuss some differences between chinch bugs (*Blissus leucopterus)* and false chinch bugs (*Nysius sp.*). In order to make proper management decisions, knowing how to correctly identify these insects is critical.

Adult bugs

Adult chinch bugs are 3-4mm long with black bodies and white wings that are kept folded over their backs. Two dark, triangular markings are present near the center of the wings creating a distinctive "X" mark (Figure 1).

Adult false chinch bugs are similar in appearance, but smaller. Instead of having black bodies, false chinch bugs are brownish-gray with clear wings that lack a distinct "X" mark (Figure 2).

Figure 1. Adult chinch bug. Photo by K-State Entomology.

Figure 2. Adult false chinch bug. Note the lack of a dark "X".

Immature bugs

Immature chinch bugs are bright red after hatching, darkening to black as they go through a series of 5 molts. A distinct white band will be visible across the nymphs' bodies until the wing buds become large enough to obscure it (Figure 3).

Figure 3. Immature chinch bugs. Photo by K-State Entomology.

Immature false chinch bugs are grayish-brown, never bright red, and lack the white band across their bodies (Figure 4).

Figure 4. Immature false chinch bugs. Photo by K-State Entomology.

Damage by bugs

Chinch bugs and false chinch bugs are true bugs in the order Hemiptera which means they both have piercing-sucking mouthparts that they use to puncture plant tissue to feed on plant juices. However, the symptoms of feeding appear differently for these two bugs. When chinch bugs feed, digestive enzymes are injected into the plant tissue causing it to break down and discolor (Figure 5). Reddish spots often are present at chinch bug feeding sites. Heavy chinch bug feeding can also cause stunting, wilting, and necrotic lesions on plants. False chinch bug feeding, on the other hand, usually has little effect on plants, but extreme numbers of the bugs on a plant can cause wilting and death (Figure 6).

Figure 5. Discoloration caused by chinch bug feeding. Photo Jeff Whitworth, K-State Research and Extension.

Figure 6. False chinch bug feeding damage to sorghum. Photo by K-State Entomology.

Additional details on life history and management recommendations for these two pests can be found in the following Kansas Crop Pest publications.

Chinch Bug: https://bookstore.ksre.ksu.edu/pubs/MF3107.pdf

False Chinch bug: https://bookstore.ksre.ksu.edu/pubs/MF3047.pdf

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4. Growing season weather summary: Evapotranspiration and growing degree days

Last week, we examined the 2023 growing season compared to 2022 in terms of temperature and precipitation differences. We also touched on how 2023 compares to normal. This week, we take a closer look at the growing season to date and consider additional variables such as evapotranspiration (ET) and degree days. While there are many ways to calculate degree days, for this report we consider the variant specific to corn, where the minimum and maximum temperature thresholds for accruing degree days are 50°F and 86°F, respectively. This version is commonly referred to as growing degree days (GDD).

Table 1. Average temperature, total growing degree days (GDD), total precipitation, total evapotranspiration for grass (ETg), and average 2-meter wind speed from April 1-July 13, 2023. The value in parentheses is the departure from normal for each metric. Temperature, precipitation, and GDD normals are 30-year averages based on 1991-2020 data sourced from the National Centers for Environmental Information (NCEI), while ETg and 2-meter wind speed normals are for the period 2013-2022 and based on hourly Kansas Mesonet observations.

Location	Average Temperature (Departure)	Growing Degree Days (Departure)	Total Precipitation (Departure)	ETg (Departure)	Average 2m Wind Speed (Departure)
West Divisions					
Colby	61.7° (-0.8°)	1512 (-13)	12.67″ (+3.66″)	18.41″ (-2.46″)	8.4 mph (+1.0 mph)
Tribune	61.2° (-1.2°)	1469 (-48)	11.85″ (+4.15″)	17.66″ (-3.49″)	7.0 mph (-0.4 mph)
Wallace	60.9° (-2.5°)	1462 (-106)	11.00″ (+2.35″)	18.57″ (-3.05″)	9.4 mph (+1.8 mph)
Garden City	64.1° (-1.1°)	1665 (-32)	13.43″ (+4.66″)	18.66″ (-3.75″)	7.7 mph (+0.2 mph)
Stanton	63.4° (-2.6°)	1623 (-105)	11.48″ (+4.81″)	18.48″ (-4.54″)	7.0 mph (-0.3 mph)
Meade	65.0° (-0.8°)	1698 (-31)	17.14″ (+7.43″)	18.67″ (-3.41″)	6.1 mph (-1.2 mph)
Central Divisions					
Scandia	65.7° (-1.0°)	1774 (-30)	7.51″ (-6.45″)	20.24″ (+1.56″)	6.8 mph (-0.4 mph)
Hays	65.2°	1774	8.06″	19.91″	8.2 mph

	(-0.5°)	(+56)	(-2.21")	(-1.41")	(+0.8 mph)

Hutchinson	66.9° (+0.8°)	1870 (+106)	12.21″ (-1.12″)	18.59″ (-1.04″)	6.3 mph (-1.1 mph)
St. John	66.0° (-1.4°)	1814 (-28)	13.35″ (+0.56″)	19.57″ (-0.61″)	6.9 mph (-0.6 mph)
East Divisions					
Manhattan	67.1° (+0.5°)	1876 (+62)	12.01″ (-4.09″)	18.73″ (+0.24″)	5.0 mph (-2.2 mph)
Rossville	65.7° (-1.6°)	1803 (-51)	12.01″ (-3.60″)	17.45″ (-0.14″)	4.9 mph (-2.4 mph)
Miami	67.6° (+1.1°)	1923 (+106)	7.32″ (-9.68″)	17.74″ (+1.54″)	3.6 mph (-3.6 mph)
Butler	67.4° (+0.1°)	1915 (+56)	8.56″ (-8.13″)	17.86″ (+1.33″)	4.4 mph (-2.8 mph)
Cherokee	68.3° (+1.0°)	1970 (+114)	9.80″ (-9.46″)	16.79″ (+0.34″)	3.9 mph (-2.9 mph)
Parsons	67.6° (+0.6°)	1902 (+67)	14.07″ (-5.07″)	16.73″ (-0.21″)	3.6 mph (-3.8 mph)
Sedan	68.1° (+0.6°)	1946 (+63)	9.47″ (-8.27″)	16.53″ (+0.17″)	3.5 mph (-3.8 mph)
Woodson	67.7° (+1.3°)	1932 (+138)	10.45″ (-7.37″)	18.23″ (+1.50″)	6.2 mph (-1.3 mph)

The math behind the measurements

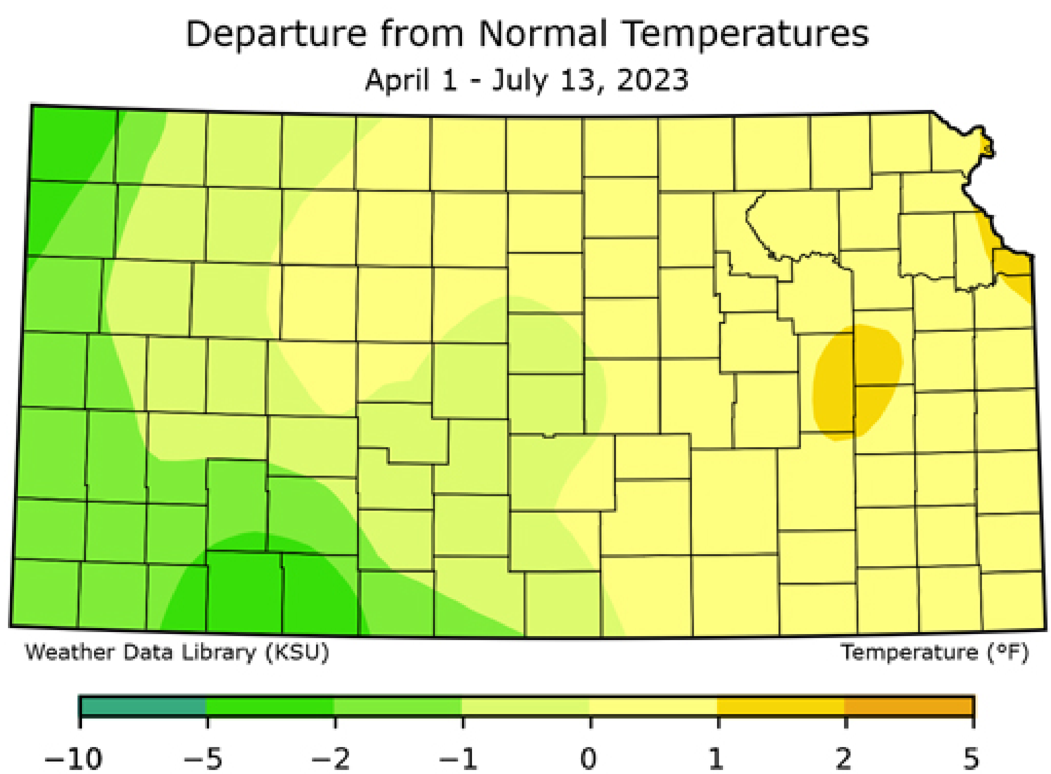
In order to make these additional comparisons, we need to look at sites where GDD and ET are measured or can be derived from available data. Growing degree days (GDD) are easily determined from maximum and minimum daily temperatures, so any site recording temperatures is also usable to determine GDD. Calculation of evapotranspiration (ET) is more complex and requires knowledge of five different variables: air temperature, barometric pressure, relative humidity, solar radiation, and 2-meter wind speed all available through the Kansas Mesonet. We also expand our range of dates slightly from last week to span the growing season to date: April 1st through July 13th.

An explanation of the normals used in this report is in order. The National Centers for Environmental Information (NCEI) calculated 30-year normals for 1991 to 2020 at over 160 locations across the state. Every Mesonet site has been paired up with its nearest NCEI location to obtain average temperature, total precipitation, and the total number of GDD for the April 1-July 13 period. NCEI does not calculate average ET, so it was necessary to calculate these based on Mesonet data. There are only 12

Mesonet sites with 30 years of data for the same 1991-2020 period, so building a 30-year climatology for ET wasn't possible for every site. Instead, a 10-year period from 2013 through 2022 was used to generate ET averages at 18 locations found in Table 1. Additional data for stations not listed can be found on the Mesonet's ET tool.

Growing degree day (GDD) summary

Eight of the 18 locations are currently running below normal for average temperature for the growing season. Since GDDs are a function of temperature, and warmer weather means more GDD, it should come as no surprise that the sign of the departures for average temperature and GDD are the same for all locations with the exception of Hays (Figure 1). With day-to-day variations and large swings in temperatures both within a single day and over longer periods, a difference in signs can occasionally occur. The lowest GDD values were focused in western Kansas which correlates well with above-normal moisture and resulting cooler weather. Of the stations sampled, Wallace had the last GDD in the state with 1462 GDD units (-106 from normal). Eastern Kansas was the opposite, with most stations observing warmer-than-normal temperatures and negative precipitation departures (Figure 1). This has resulted in above normal GDD values with Cherokee recording the least (1970 units, +116 from normal). In terms of the corn life cycle, we are at or beyond the silking stage in most areas, a critical time in the development of mature corn plants. A lack of moisture in this stage can reduce yields.



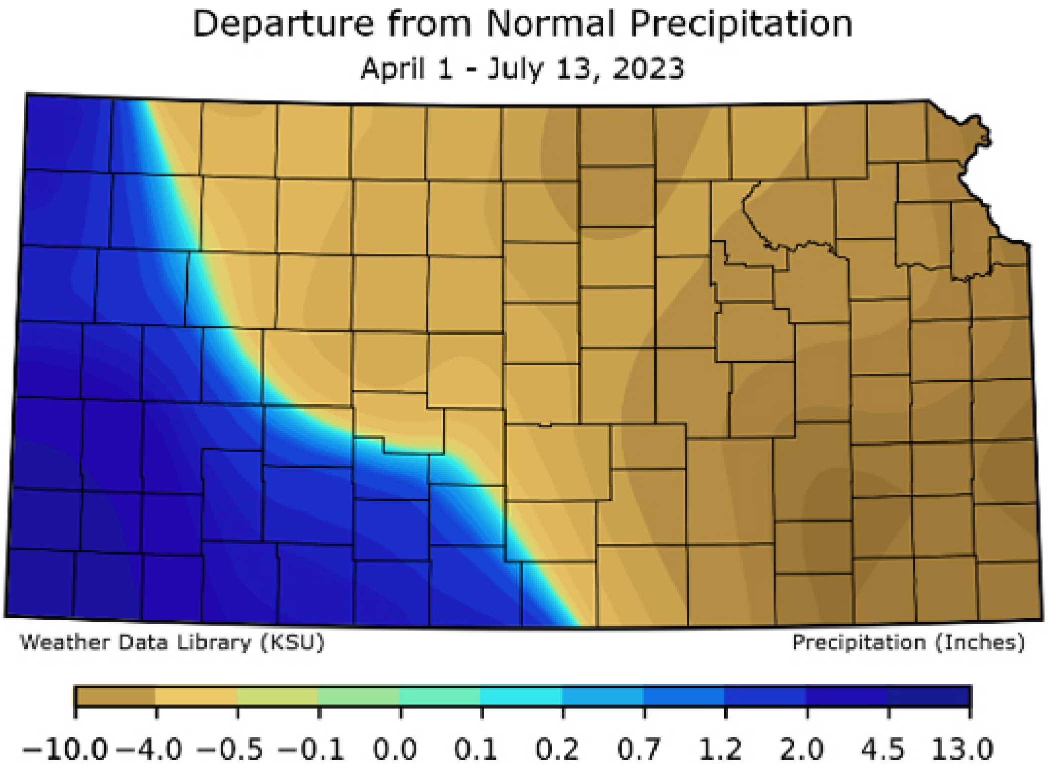


Figure 1. Temperature (top) and precipitation (bottom) departures from normal from April 1 – July 13, 202,3 across Kansas. Source: Kansas Climate Office.

Evapotranspiration (ET) summary

Similar to GDDs, temperature, and precipitation anomalies can greatly impact evapotranspiration (ET) – the movement of moisture from the surface to the atmosphere via vegetation transpiration and evaporation. Let's start by thinking about precipitation. Rainy days result in increased clouds which reduce solar radiation and temperature while keeping atmospheric moisture higher. This creates less ET demand by the atmosphere and reduces the overall moisture loss from vegetation and evaporation. While this can be good for crop development and reduce drought concerns, it can increase other stresses such as disease and pests. On the flip side, decreased precipitation results in more solar radiation, warmer temperatures, and less overall surface moisture/humidity. This increases atmospheric ET demand and can more readily result in moisture loss – not an anomaly we want to reduce drought or crop stress during critical stages of corn development. Ideally, we would want "normal" values to get the best of both worlds, however, this isn't a realistic expectation as our climate averages weather extremes.

Evapotranspiration is also dependent on the wind: the higher the wind speed, we would expect larger ET demands. *Has it been windier than usual in Kansas this growing season?* We calculated the average 2-meter wind speed for the same 2013-2022 period that we used for average ET, as well as for this year, to fill in the last column in Table 1. Only four of the 18 locations have above-average wind speeds this growing season. Three of these were in the West where ET was the lowest in the state, contradictory to what we would expect. Average winds are typically the weakest in the summer months (Figure 2). Major storm systems typically shift northward and periods of high pressure result in weaker overall winds. This year, the winds were cooler and associated with thunderstorm activity in the west. Additionally, eastern Kansas observed much less 2023 average wind with Manhattan, Parsons, and Sedan measuring their lowest in the 10-year period. This is the result of more dominant high pressure and less thunderstorm activity despite higher ET atmospheric demands.

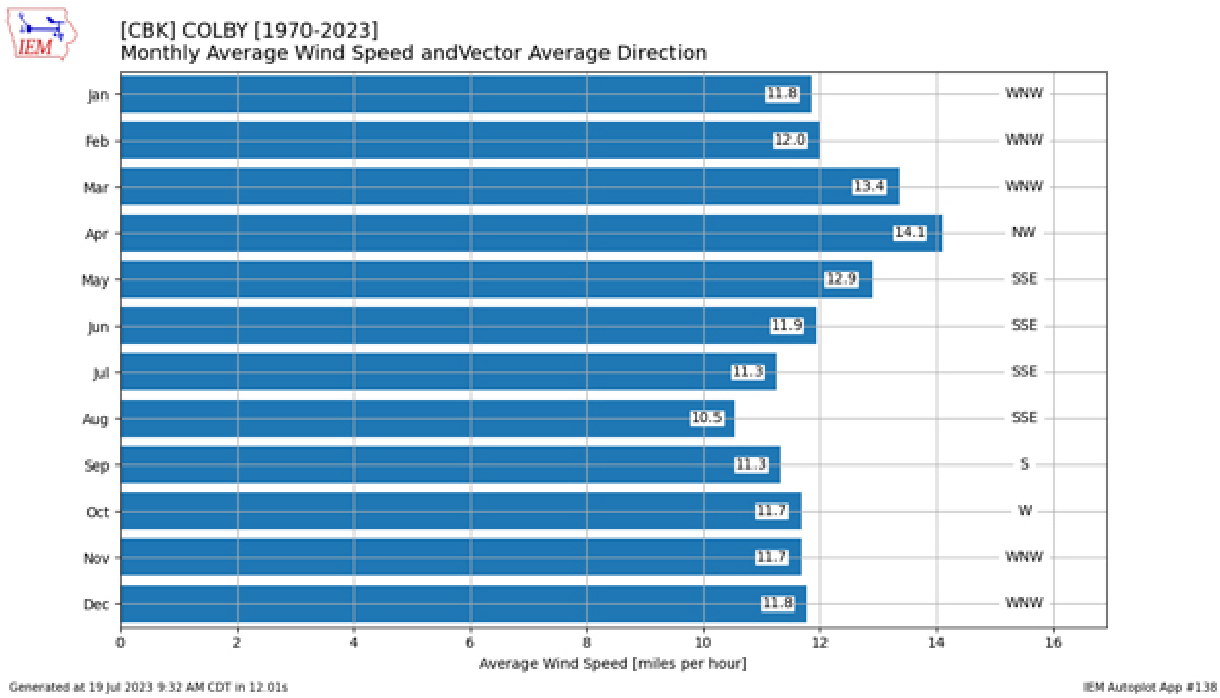


Figure 2. Average monthly wind speeds by month (at 10m which is typically higher than our average 2m winds on the Mesonet). Source: IEM.

Overall, ET is below normal at 11 of the 18 locations in Table 1. For 15 of the 18 locations, the sign of the temperature departure is the same as the ET departure (e.g., above/below normal temperatures paired with above/below normal ET). For 14 of the 18 locations, the sign of the precipitation departure is opposite that for ET (e.g., above/below normal precipitation paired with below/above normal ET). The areas of most concern are those where precipitation is below normal and ET is above normal. There are seven such locations, all in the eastern half of the state. Of these seven, the Miami County site is worst off, with a precipitation deficit of over 9.6 inches and ET running over 1.5 inches above normal. This is an area where drought conditions have worsened. Most of Miami County has fallen from D0 to D2 drought status in the past month (Source: US Drought Monitor).

Mid-July is when average high temperatures are near their maximum, and it's also the time of year when excessive heat and a lack of moisture can prove a devastating combination for crops. Precipitation is already lacking for many, let's hope extreme heat (which we really haven't seen this year) stays away and that precipitation is plentiful in drought-stricken areas in the coming weeks.

You can easily track growing degree days and evapotranspiration for your area by visiting the following links on the Kansas Mesonet webpage:

Growing Degree Days: http://mesonet.k-state.edu/agriculture/degreedays/

Evapotranspiration: http://mesonet.k-state.edu/agriculture/et/

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5. Kansas Ag-Climate Update for June 2023

The Kansas Ag-Climate Update is a joint effort between our climate and extension specialists. Every month the update includes a brief summary of that month, agronomic impacts, relevant maps and graphs, 1-month temperature, and precipitation outlooks, monthly extremes, and notable highlights.

June 2023: Significant rainfall in the west but not sufficient for drought conditions

The average temperature for June was 73.2°F, or 1.0°F below normal. This ranked as the 60th coolest June out of 129 years of records, dating back to 1895. The three eastern Kansas divisions were above normal; all other divisions were below normal. Anomalies ranged from -3.3°F (southwest) to +0.5°F (southeast).

The average precipitation for June was 4.06”, which was 0.01” above normal. This ranked as the 58th wettest June on record. The three eastern climate divisions and north central had below normal precipitation while the remaining divisions were above normal. South Central was the wettest division (6.21”) while East Central was the driest (2.25”). It was the 13th wettest June on record in southwest Kansas but the 11th driest on record in east central Kansas. Combined with April and May, it was the 9th driest second quarter on record in both east central and southeast Kansas.

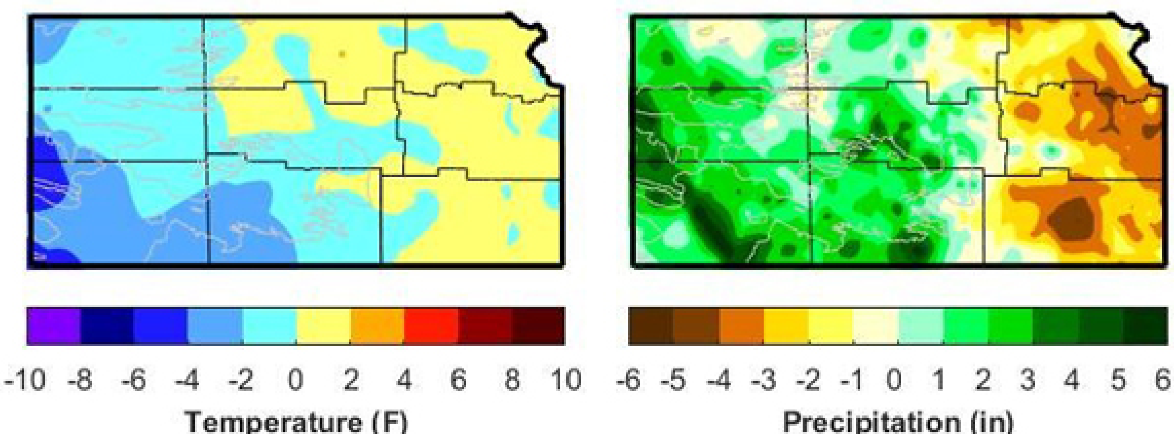

Figure 1. Departures from normal temperature (°F) and precipitation (inches) for June 2023.

View the entire June 2023 Ag-Climate Update, including the accompanying maps and graphics (not shown in this eUpdate article), at http://climate.k-state.edu/ag/updates/

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6. Informational meetings on canola set for August 9 in Kansas and Oklahoma

Kansas State University officials have announced a pair of meetings on August 9 to help farmers make fast-approaching decisions on growing winter canola. Interested growers in surrounding counties are encouraged to attend. The Great Plains Canola Association, Scoular, and Bayer Crop Science will sponsor the canola production meetings for new and experienced growers.

K-State canola breeder Mike Stamm said the meetings come "at a critical time" when producers have a renewed interest in growing winter canola, largely due to last spring's announcement by Scoular that it will be building an oilseed crush facility near Goodland.

Specialists from K-State Research and Extension and Oklahoma State University will share their experiences working with the crop. The agenda includes a refresher on common canola production practices and an update on variety development and availability. Scoular will provide information on canola marketing, share delivery points across the region, and discuss opportunities for Scoular to arrange freight off the farm.

The meetings are free to attend, but reservations are required because a meal will be provided. Location and contacts for each meeting include:

Wednesday, Aug. 9
Hoover Building
300 E Oxford Ave, Enid, Okla.

- 10 a.m., presentations and meal.

RSVP to Ron Sholar, 405-780-0113, jrsholar@aol.com, or Josh Bushong, 405-361-6941, josh.bushong@okstate.edu

Wednesday, Aug. 9
Sedgwick County extension office
Sunflower Room, 7001 W 21st St, Wichita, Kansas.

- 5:30 p.m., presentations and meal.

RSVP at the following link https://conta.cc/3rilSNy or to Nancy Richardson, Sedgwick County extension office, 316-660-0144, nancy77@ksu.edu.