Issue 974

K-STATE
Research and Extension

Extension Agronomy

eUpdate

09/14/2023

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.

Subscribe to the eUpdate mailing list: https://listserv.ksu.edu/cgi-bin?SUBED1=EUPDATE&A=1

eUpdate Table of Contents | 09/14/2023 | Issue 974

1. In-furrow fertilizers for wheat

Wheat is considered a highly responsive crop to band-applied fertilizers, particularly phosphorus (P). Application of P as a starter fertilizer can be an effective method for part or all the P needs. Wheat plants typically show a significant increase in fall tillers (Figure 1) and better root development with the use of starter fertilizer (P and N). Winterkill can also be reduced with the use of starter fertilizers, particularly in low P testing soils.

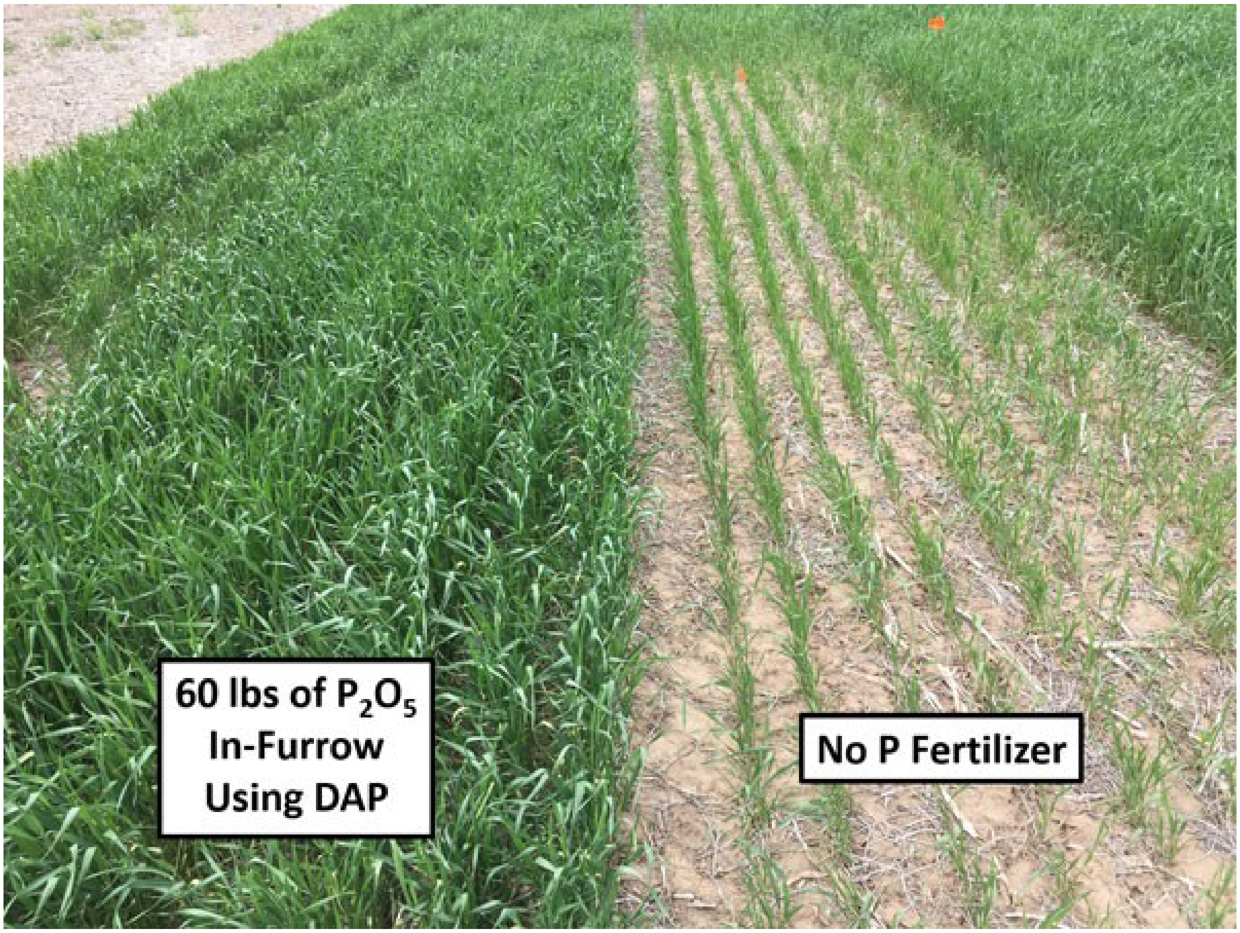


Figure 1. Effects on wheat tillering and early growth with in-furrow P fertilizer on soil testing low in P. Photo taken in 2020 in Manhattan, KS. Photo by Chris Weber, K-State Research and Extension.

In-furrow fertilizer application

Phosphorus fertilizer application can be done through the drill with the seed. In-furrow fertilizer can be applied, depending on the soil test and recommended application rate, either in addition to or instead of, any pre-plant P applications. The use of dry fertilizer sources with air seeders is a very popular and practical option. However, other P sources (including liquid) are agronomically equivalent and decisions should be based on cost and adaptability for each operation.

When applying fertilizer with the seed, rates should be limited to avoid potential toxicity to the seedling. When placing fertilizer in direct contact with wheat seed, producers should use the guidelines in Table 1.

Table 1. Suggested maximum rates of fertilizer to apply directly with the wheat seed

	Pounds N + K_2O (No urea containing fertilizers)	
Row spacing (inches)	Medium-to-fine soil textures	Course textures or dry soils
15	16	11
10	24	17
6-8	30	21

Air seeders that place the starter fertilizer and seed in a 1- to 2-inch band, rather than a narrow seed slot, provide some margin of safety because the concentration of the fertilizer and seed is lower in these diffuse bands. In this scenario, adding a little extra N fertilizer to the starter is less likely to injure the seed - but it is still a risk.

What about blending dry 18-46-0 (DAP) or 11-52-0 (MAP) directly with the seed in the hopper? Will the N in these products hurt the seed?

The N in these fertilizer products is in the ammonium-N form (NH_4^+), not the urea-N form, and is much less likely to injure the wheat seed, even though it is in direct seed contact. As for rates, the guidelines provided in the table above should be used. If DAP or MAP is mixed with the seed, the mixture can safely be left in the seed hopper overnight without injuring the seed or gumming up the works. However, it is important to keep the wheat mixed with MAP or DAP in a lower relative humidity. Humidity greater than 70% will result in the fertilizer taking up moisture and will cause gumming or caking within the mixture.

How long can you allow this mixture of seed and fertilizer to set together without seeing any negative effects on crop establishment and yield?

The effects of leaving DAP fertilizer left mixed with wheat seed for various amounts of time are shown in Figure 2. Little to no negative effect was observed (up to 12 days in the K-State study).

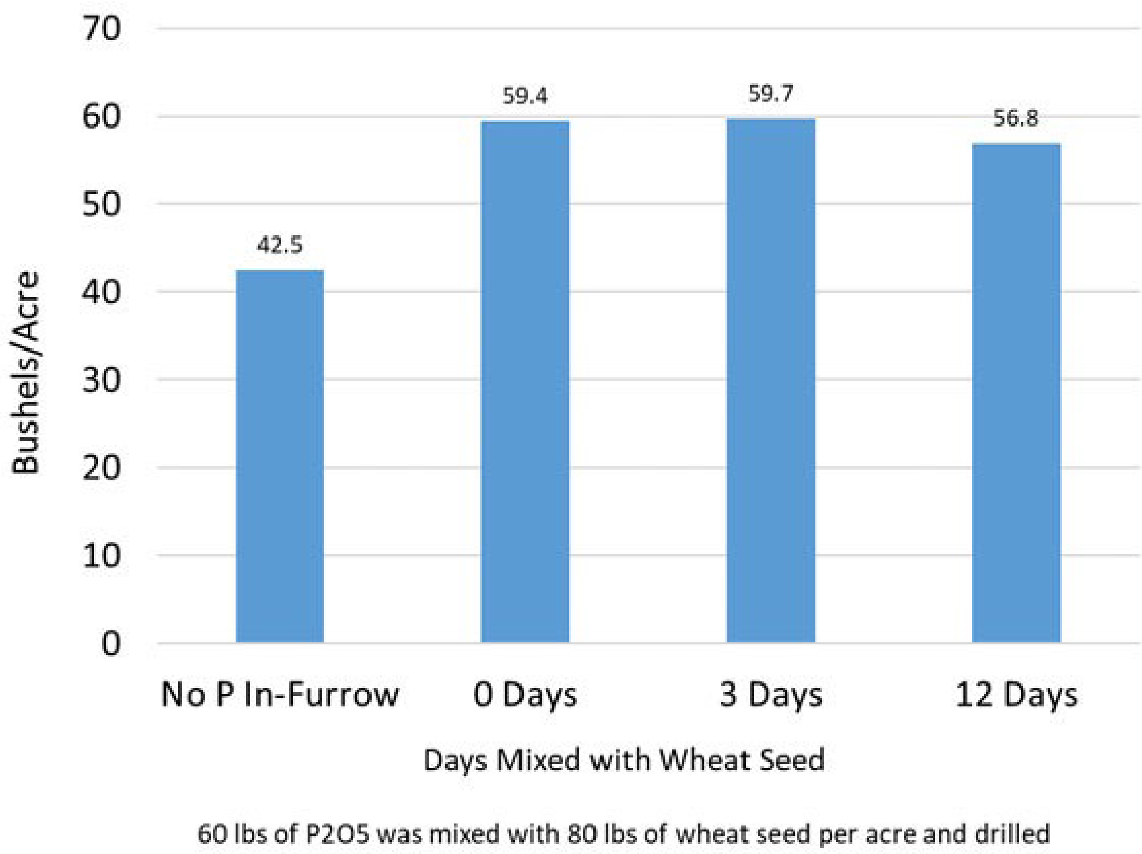


Figure 2. Effects on wheat yield from mixing P fertilizer with the seed. The study was conducted in 2019 and 2020 at four sites. Graph by Chris Weber, K-State Research and Extension.

Although the wheat response to these in-furrow fertilizer products is primarily from the P, the small amount of N that is present in DAP, MAP, or 10-34-0 may also be important in some cases. If no pre-plant N was applied, and the soil has little or no carryover N from the previous crop, the N from these fertilizer products could benefit the wheat.

Dorivar Ruiz Diaz, Nutrient Management Specialist
ruizdiaz@ksu.edu

Chris Weber, former Graduate Research Assistant, Soil Fertility

2. Soybean seed filling and dry down rate before harvest

The latest USDA-National Agricultural Statistics Service crop progress and condition report released September 10, 2023, classified 52% of the soybean crop to be in fair (32%) or good (20%) condition. Overall, 37% of all soybeans in Kansas are dropping leaves, ahead of 25% from last year and the 19% average.

Weather outlook

The weather conditions expected for the last portion of September will be critical for soybeans as related to seed filling and determining final seed weight.

Temperatures so far in September have averaged near normal across the state. Precipitation has been above normal in a few areas, particularly southwest and west central Kansas. Meanwhile, north central and northeast Kansas are much below normal for precipitation so far this month. The outlook for the next two weeks favors above-normal temperatures and elevated chances for above-normal precipitation. Seasonally, we continue the weekly decrease in normal precipitation as we head towards the driest season of the year (winter). As a result, below-average precipitation unfortunately means potentially very little, if any, moisture. Warm and dry conditions will favor overall low humidity, increasing drought, and wide day/night temperature swings.

Soybean seed-filling

Final maturity is defined as the formation of the black layer in the seeds. Soybeans will reach final maturity with high seed water content, moving from 75-80% (R6) to around 50% (R7) from the beginning of seed filling until final maturity (Figure 1). The process of seed dry matter accumulation and moisture changes will depend on the maturity group (affecting the length of the season), planting date, and weather conditions experienced during the latter part of the reproductive phase.

Soybean seed water loss can divided into two main phases: 1) before "black layer" or maturity, and 2) after black layer.

The overall contribution of seed weight to final yields can be studied by evaluating changes in seed weight during the seed-filling period (Figure 2). Overall, a seed-filling period of more than one month (37 days) duration until black layer was achieved (this is the reference for changes in seed weight). The graph of seed filling provides a visual of the overall rate, increase in seed weight per day, and the duration of the seed filling.

From this example, we could observe that when the duration is reduced by one week (from 37 to 30 days) the attainable yield went from 61 to roughly 50 bushels per acre. Potential factors impacting the duration (beyond the current heat/drought) of leaf green area imposed by insects, diseases, hailstorms, and any other abiotic stress conditions such as cloudy days and early frost impacting the crop during the coming weeks will negatively affect the seed filling conditions for soybeans.

For this current season, we can largely expect negative yield impacts due to the last heat wave combined with drought conditions, which resulted in poor seed weight, and potentially increasing late pods and seeds' abortion. Overall, seed weight contributes roughly 30-40% of the final total yield for this crop, emphasizing the impacts of the stress conditions on the attainable yields.

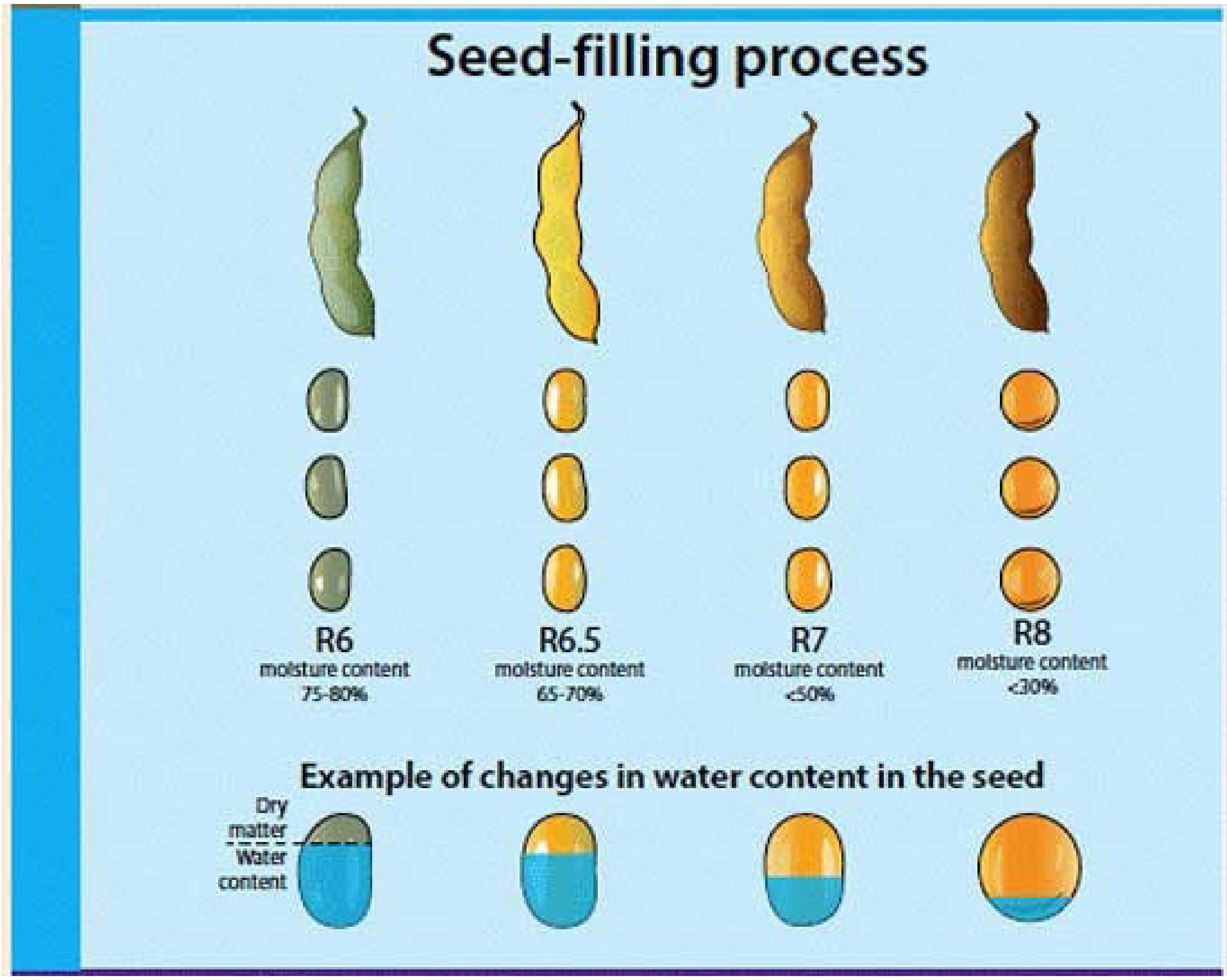


Figure 1. Soybean seed filling process from full seed to full maturity. Photo and infographic prepared by Ignacio Ciampitti, K-State Research and Extension. Taken from Soybean Growth and Development, MF3339.

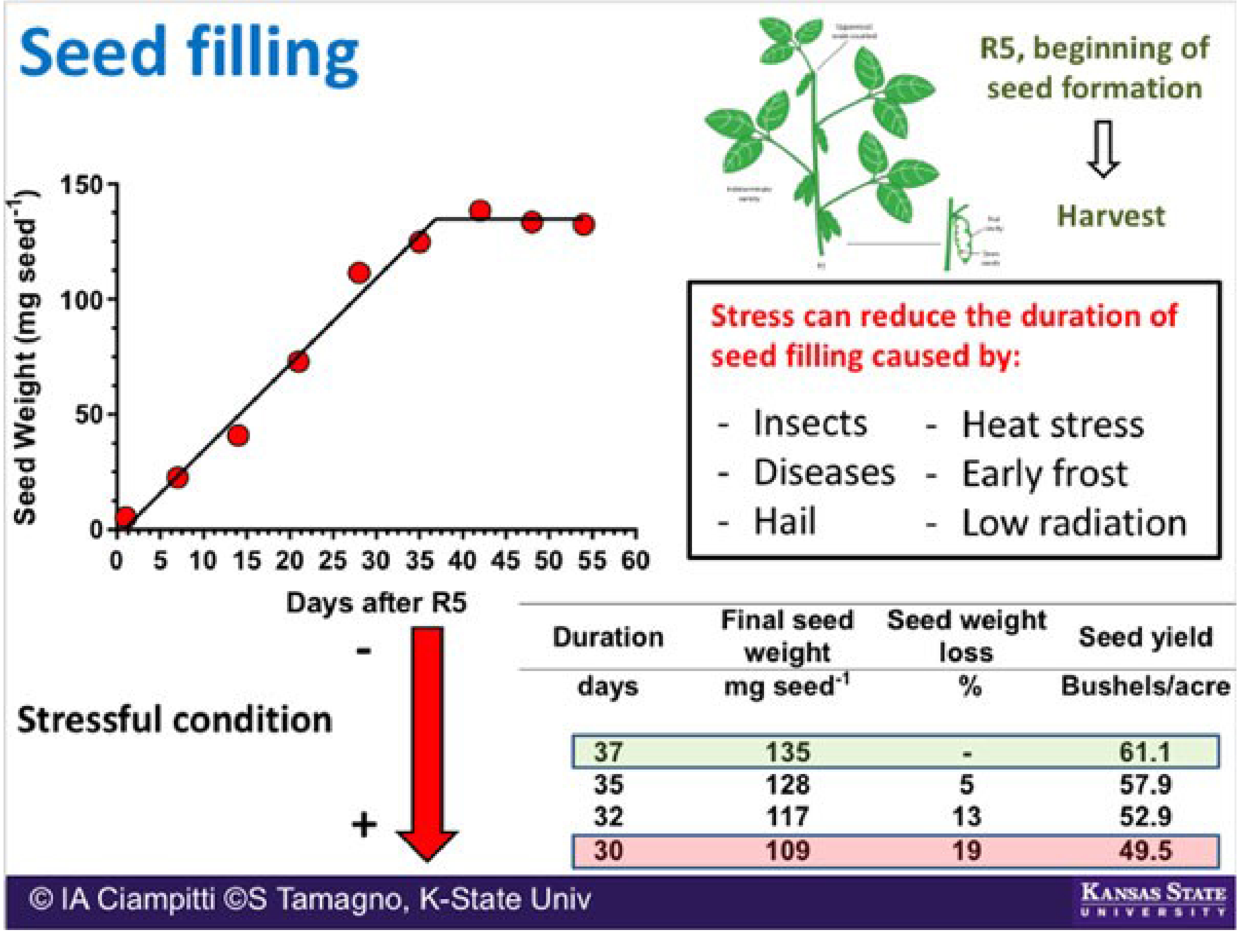


Figure 2. Soybean seed weight changes from the beginning of seed filling (R5) to full maturity. Photo and infographic prepared by Ignacio Ciampitti and Santiago Tamagno, K-State Research and Extension.

Soybean dry down

Soybeans reach final maturity with high seed water content, moving from 90% to around 60% from the beginning of seed filling until final maturity. Final maturity is defined as the formation of the black layer in the seeds. The dry-down rate will depend on the maturity group (affecting the length of the season), planting date, and weather conditions experienced during the latter part of the reproductive phase.

To address the question related to the dry down rate for soybeans, a study was conducted to investigate the changes in water content from black layer formation (maturity) until harvest time (Figure 3). During the last days of September and mid-October 2016, the overall dry-down rate was around 3% per day (from 58% to 12% seed moisture) – taking an overall period of 15 days.

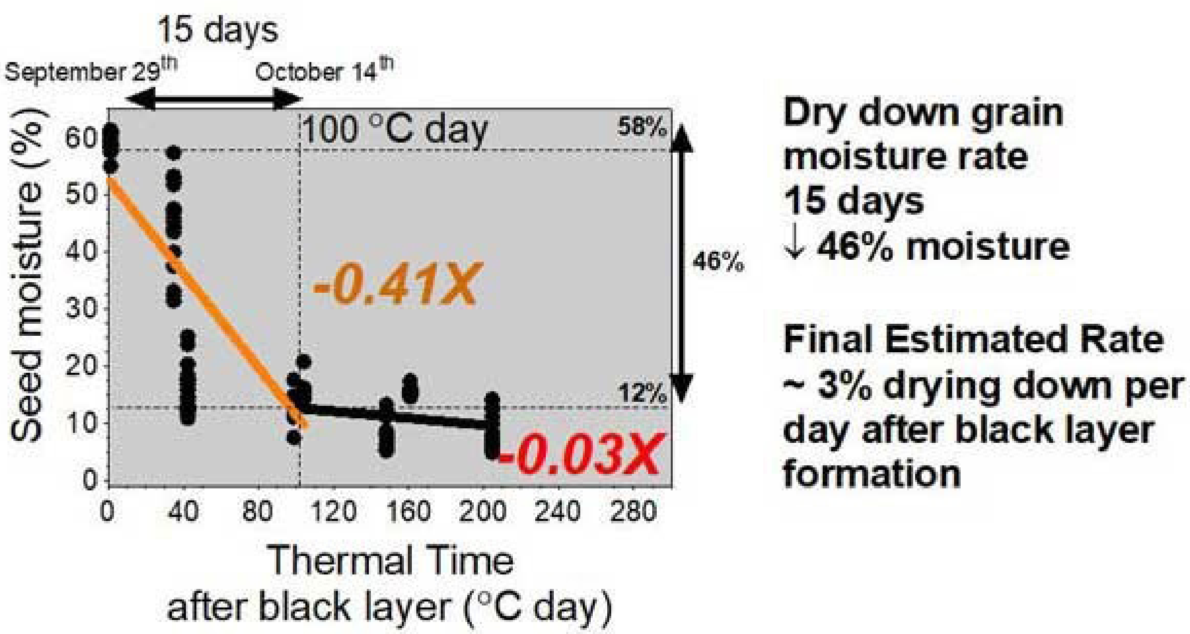


Figure 3. Grain moisture dry-down (orange line) across three hybrids and different N rates near Manhattan, KS. Horizontal dashed lines marked the 58% seed moisture at black layer formation. * Graph prepared by Ignacio Ciampitti, K-State Research and Extension.

**Note: It is desired to reach harvest with 13% seed moisture to maximize the final seed volume to be sold, thus the importance of timing harvest with the right seed moisture content.*

Soybean dry down rate was three times faster, at 3% per day, relative to corn at 1% per day. These dry-down rates for corn and soybeans are primarily affected by temperature, humidity, and overall water content at the point of black layer formation (maturity). These main factors should be considered when the time comes to schedule soybean harvest.

With the current weather conditions, soybeans entering to maturity could be ready to harvest in less than two weeks. Therefore, scout your fields to check for maturity and prioritize situations with lodging or other stress factor that could compromise plant standability, ultimately affecting seed quality.

Ignacio A. Ciampitti, Farming Systems
ciampitti@ksu.edu

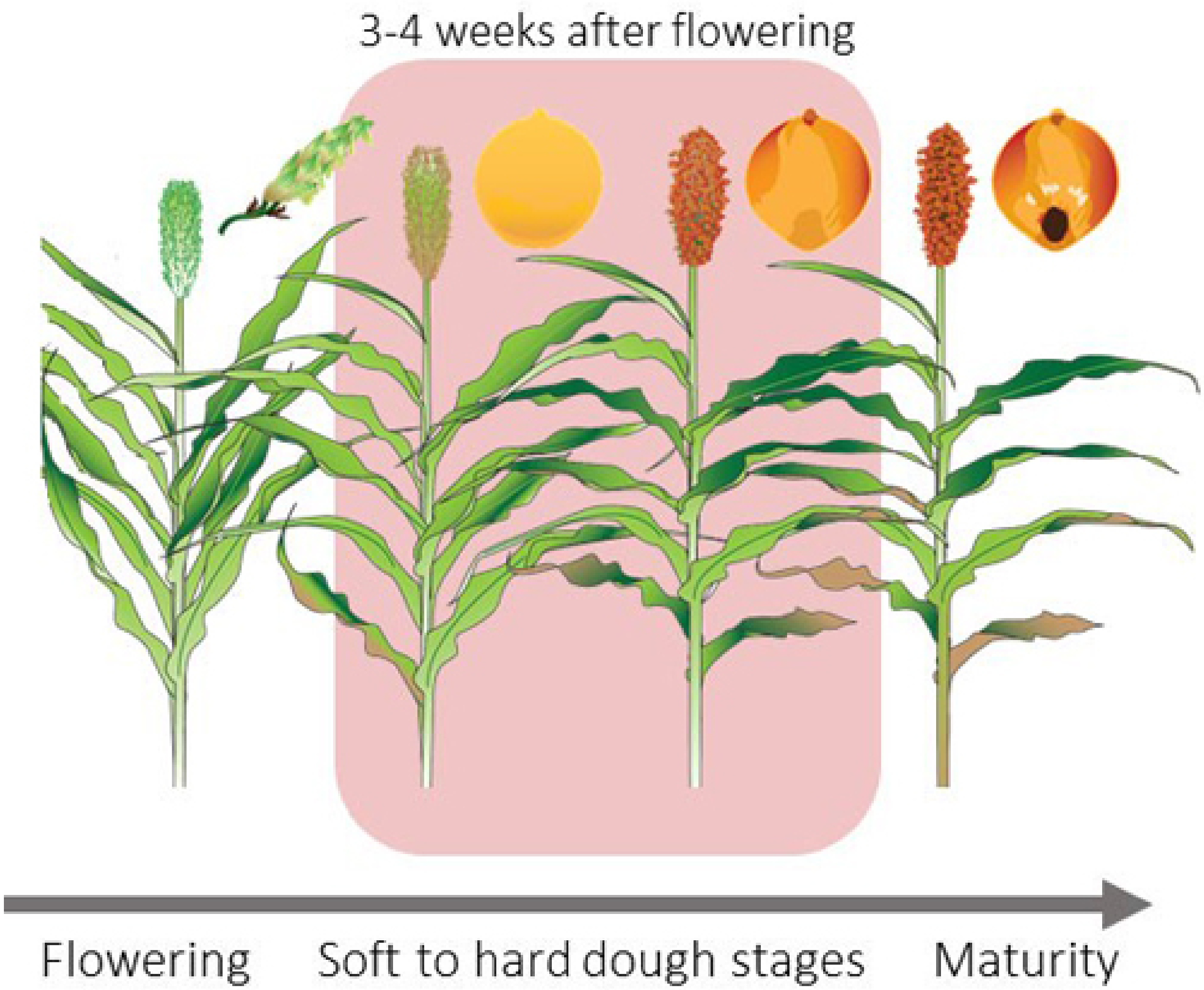
Adrian Correndo, Postdoctoral Fellow
correndo@ksu.edu

Matthew Sittel, Assistant State Climatologist
msittel@ksu.edu

3. Grain sorghum yield potential: An on-farm calculation

Even though estimating crop yields before harvest can be difficult, having these estimates is valuable information for producers as it helps them to make relevant decisions on inputs.

When can I start making sorghum yield estimates?



As the sorghum crop gets closer to maturity, yield estimates will be more accurate. Nonetheless, we can start taking yield estimations three to four weeks after flowering (from soft to hard dough stages). At these stages, the final seed number can still change. In addition to the seed number, the seed weight will be only partially determined – approximately 50 to 75% of dry mass accumulation as compared to the final weight attained at maturity.

Each of the main sorghum yield components is discussed in more detail in a companion article in this eUpdate issue, “Grain sorghum yield potential: Understanding the main yield components”.

Variability within the field

Variability between plants needs to be properly accounted for when estimating sorghum yields using the on-farm approach (see next section). Another important factor is the variation between different areas in the field. In general, it is recommended to perform yield estimations in at least 5 to 10 sections of the field to account for field variability.

On-farm approach for estimating sorghum yields

The estimation of sorghum yields should consider the main driving forces:

1. Total number of heads per unit area [number of plants per acre x heads per plant]
2. Total number of seeds per head
3. Number of seeds per pound
4. Pounds per bushel, or test weight, which for sorghum is **56 lbs/bushel**

The final equation for estimating sorghum yield in bu/acre is:

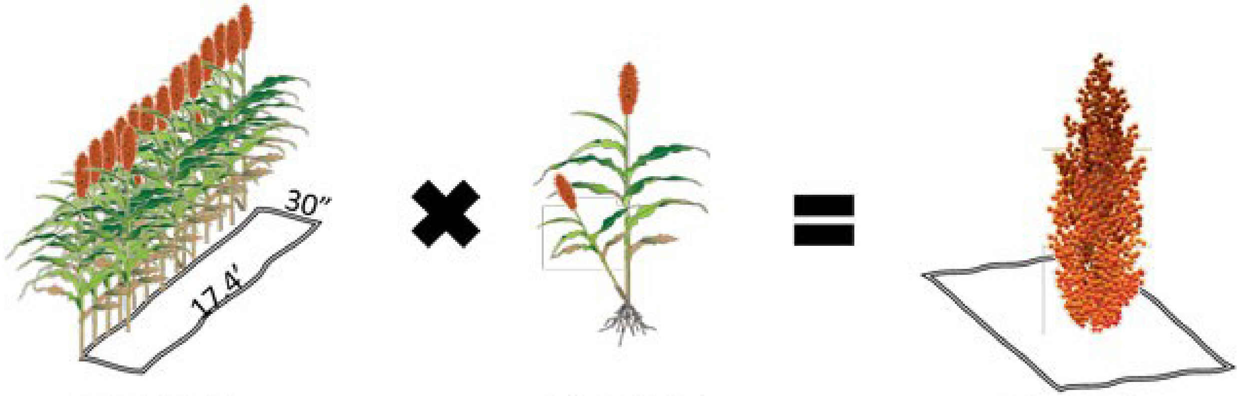
$$\frac{\text{Total number of heads per acre} \times \text{Total number of seeds per head} \div \text{Number of seeds per pound}}{\text{Pounds per bushel } \left(56\,\frac{\text{lbs}}{\text{bu}}\right)}$$

Take the following steps for making sorghum yield estimates:

Step 1. Number of heads per unit area:

For this on-farm approach, start by counting the number of heads from a 17.4-foot length of row when the sorghum is in 30-inch row spacing. This sample area represents 1/1000th the area of an acre. If the sorghum is in 15-inch row spacing, then count the number of heads in two rows. For a 7.5-inch spacing, take into account four rows. In all scenarios, the area counted will be equal to 1/1000th of an acre.

Take head counts in several different areas of the field to properly account for the potential yield variability. If the proportion of smaller heads (less than 3 inches in height) is very low (< 5%), those heads could be avoided due to the smaller proportion for determining the final yield estimation.



Step 2. Estimation of the number of seeds per head:

The seed number is, by far, one of the most complicated yield components that needs to be estimated. The total number of seeds per head can vary from 100 to 5,000 seeds per head, but almost ¾ of the seed number distribution is around 1,500 to 2,500 seeds per head.

A quick method uses an estimate of seed counts per head, we can utilize a very simple association between the yield level, conditions around pollination/grain set time, and the number of grains per heads (Figure 1). The number of seeds per pounds, or seed weight, is also a factor we need to estimate, but this factor is relevant for yield contribution, with a less clear relationship with yield (Figure 1).

This method of estimating seed counts is summarized in Table 1. If conditions were very poor during pollination and grain set and the general yield environment is low, the total number of seeds per head will average around 500-1,000 seeds per head (900; Table 1). If conditions around flowering were very favorable and the general yield environment is very high, then the number of seeds per head could be around 1,500 to 3,500 (2,500). Intermediate yield environment scenarios can occur if a portion of the three-to-four week period around flowering was favorable and part of it was unfavorable. In that case, the number of seeds per head could range from 1,000-3,500, with an average of 1,745 seeds per head.

This information is provided only for general guidance on estimating sorghum yield potential using the on-farm approach.

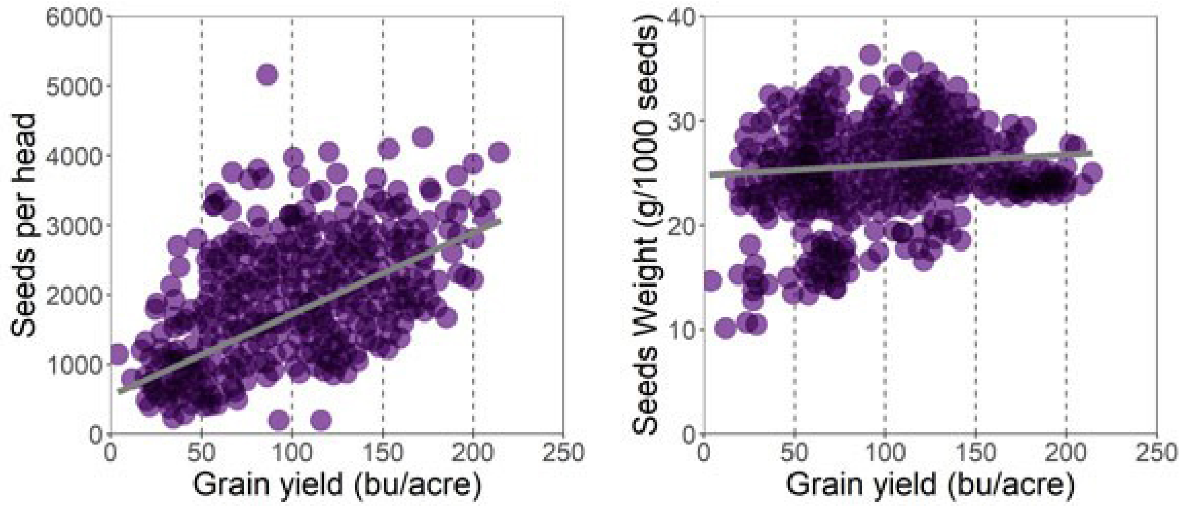


Figure 1. Relationship between grain yield and yield components, seeds per head (left panel) and seed weight (right panel). The number of seeds per head has the most direct relationship with yield.

Table 1. Total number of seeds per head and seed weight components.

Yield range (bu/acre)	Crop condition	Average Seeds per head	Average Seed weight (g/1000)	Number of observations
<50	Very poor	900	24.5	154
50-100	Poor	1500	25.5	391
100-150	Fair	2000	26.2	495
150-200	Good	2500	25.6	129
>200	Excellent	3330	25.5	5

Step 3. Estimation of the Seed Weight:

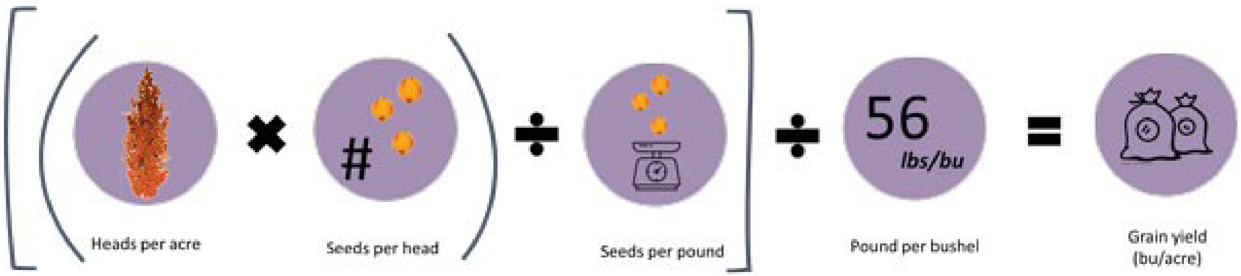
A similar procedure can be followed to estimate the seed weight (Table 1). For the seed weight component, the dataset showed a very narrow variation as compared with the variability in the seed number. In general, it seems that lower seed weight is expected at low yield, but the difference among yield levels is negligible. Table 2 shows the conversion from average seed weight to seeds per pound.

Table 2. Seed weight, seeds per pound.

Yield range (bu/acre)	Crop condition	Average Seed weight (g/1000)	Seeds per pound

<50	Very poor	24.5	18520
50-100	Poor	25.5	17793
100-150	Fair	26.2	17318
150-200	Good	25.6	17723
>200	Excellent	25.5	17793

Step 4. Final calculation using "On-Farm" Yield Estimation Approach:



Example A. Good Crop Condition:

Irrigated sorghum with adequate plant density (48,000 plants/acre), average number of tillers per plant of 1.3, and good yield environment with adequate flowering and grain filling:

(48 plants in 17.4 foot -1/1000th of an acre- x 1.3 fertile tillers per plant) = 62 heads/acre
Yield Estimation = [(62 x 2,500) x 1,000 ÷ 17,723] ÷ 56 = **156 bu/acre**

Example B. Poor to Fair Crop Condition:

Dryland sorghum with adequate plant density (40,000 plants/acre), average number of tillers per plant of 1.3, and poor flowering but fair grain filling:
Yield Estimation = [(52 x 1,500) x 1,000 ÷ 17,723] ÷ 56 = **79 bu/acre**

Example C. Very Poor Crop Condition:

Dryland sorghum with adequate plant density (40,000 plants/acre), average number of tillers per plant of 1.0, and poor yield environment and growing season (poor flowering and grain filling):
Yield Estimation = [(40 x 900) x 1,000 ÷ 18,520] ÷ 56 = **35 bu/acre**

Ignacio A. Ciampitti, Farming Systems
ciampitti@ksu.edu

Ana P. Carcedo, Postdoctoral Fellow
carcedo@ksu.edu

4. Grain sorghum yield potential: Understanding the main yield components

In order to best estimate the yield potential of grain sorghum, we need to understand the main plant components of yield. The main yield-driving factors are:

Figure 1. The four main components for sorghum yield are number of plants, tillers, seeds per head, and seed size. Graphic by Ana P. Carcedo, K-State Research and Extension.

The number of plants and the number of tillers per plant are two of the main components and are determined well before the end of the growing season. The initial plant density, planting date, and the environment, among other factors, influence those two yield components. To learn more about an on-farm approach for calculating sorghum grain yield potential before harvest, please see the companion eUpdate article in this issue, "Grain sorghum yield potential: An on-farm calculation".

Understanding sorghum yield components

Increasing the number of plants per acre potentially increases competition for resources, which can diminish the plant's capacity to produce tillers. In addition, the interaction of planting date with plant density can have a similar effect. As the planting date is delayed, the capacity of the plant to produce tillers will be reduced; thus, the plant population needs to be increased to compensate for the reduction in the number of tillers. Previous research at K-State showed sorghum produces more tillers when planted early (mid-to-late May) at lower plant populations as compared with late planting dates (mid-to-late June).

The environment also plays an important role in the final number of heads per unit area. Heat and drought stress will reduce the plant's ability to produce more tillers and could severely reduce the tiller survival rate. The total number of seeds per head will be determined within the one- or two-week period before flowering until milk to soft dough stages (approximately two to three weeks after flowering).

Seed size will be determined close to the end of the season. In the 15 to 25 days after flowering, during the soft dough stage, sorghum grains have already accumulated about 50% of the final dry mass. Thus, the period around flowering is critical for defining not only the final number of grains per head but also the potential maximum kernel size. The final seed weight will be determined when the grains reach physiological maturity (visualized as a "black layer" near the seed base). From this time until harvest, the grains will dry down from approximately 35% to 20% moisture content. The interaction among all four components will determine the final yield, but a wide range of variation can be expected in all these main yield-driving forces (Figure 2).

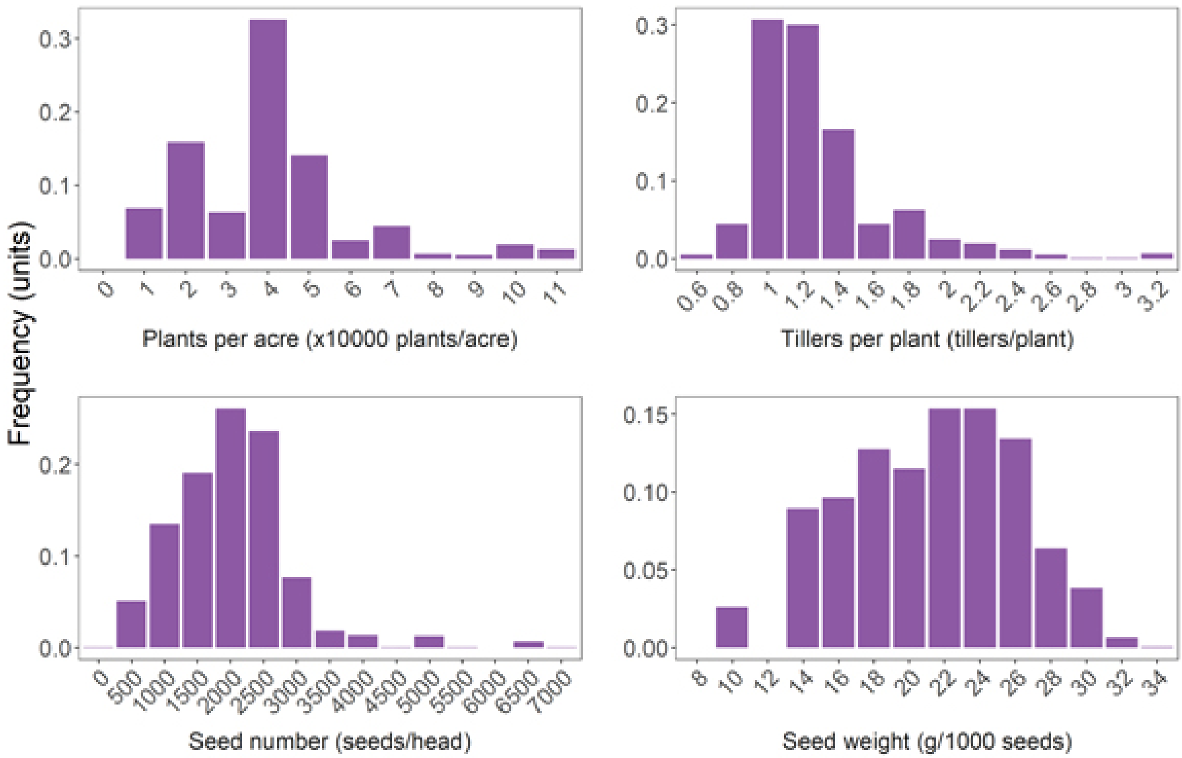


Figure 2. Example of the variation expected to be found in the main sorghum yield components. The number of tillers per plant can also be interpreted as the number of heads per plant, considering that all tillers have one fertile head.

Seed number is the main driving force of sorghum yield. Actual seed counts per head would make the estimates more accurate but require considerable time and effort.

Ignacio A. Ciampitti, Farming Systems
ciampitti@ksu.edu

Ana P. Carcedo, Postdoctoral Fellow
carcedo@ksu.edu

5. Fall soil sampling; Sample collection and submission to K-State Soil Testing Lab

Soil testing provides producers and homeowners with important information concerning the fertility status of the soil. This information can help produce better crops and reduce costs by guiding management decisions like the type and amount of fertilizers to apply. If you plan to do your own soil sampling and use the K-State Soil Testing Laboratory, the following outline provides specific information on methods for collecting soil samples and mailing instructions. A companion article in this eUpdate gives a more detailed discussion of collecting a representative soil sample.

Soil collection and submission guidelines

- To take a sample, you will need a probe, auger, or spade, and a clean pail. (If you're having the soil analyzed for zinc, be sure to use a plastic container to avoid contamination from galvanized buckets or material made of rubber.) You will also need soil sample containers and a soil information sheet from your local Extension office or fertilizer dealer. You can also order soil sample bags online from K-State Research and Extension by clicking here.

- Draw a map of the sample area on the information sheet and divide your fields into uniform areas. Each area should have the same soil texture, color, slope, and fertilization and cropping history.
- From each area, take a sample of 20-30 cores or slices for best results. At the very minimum, 12-15 cores should be taken per sample. Mix the cores thoroughly in a clean container and fill your soil sample container. For available nitrogen, chloride, or sulfur tests, a subsoil sample to 24 inches is necessary.
- Avoid sampling in old fencerows, dead furrows, low spots, feeding areas, or other areas that might give unusual results. If information is desired on these unusual areas, obtain a separate sample from the area.
- Be sure to label the soil container clearly and record the numbers on the soil container and the information sheet.
- Air-dry the samples as soon as possible for the available nitrogen test. (Air drying before shipment is recommended, but not essential, for all other tests.) Do not use heat for drying.

- If same-day submission is not possible, samples should be air-dried (see above) or placed in a refrigerator set at 40 degrees F or less. See the companion article in this eUpdate, "*Soil sample handling practices can affect soil nitrate test accuracy***".**
- Fill out the information sheet obtained from your Extension office, or download a sheet.
- Take the samples to your local Research and Extension office for shipping. Samples may also be sent directly to the lab by placing them in a shipping container. Information sheets should be included with the package. Shipping labels can be printed from the Soil Testing Lab website listed below. Mail the package to:

Soil Testing Laboratory
2308 Throckmorton PSC
1712 Claflin Road
Manhattan, KS 66506-5503

A listing of the types of soil analysis offered, and the costs are available on the Soil Testing Lab website, www.agronomy.k-state.edu/outreach-and-services/soil-testing-lab/. You can also contact the lab by email at soiltesting@ksu.edu and by phone at 785-532-7897.

Additional resources

For more information on the proper procedures for the Soil Testing Laboratory, see K-State publication MF-734 at: https://www.bookstore.ksre.k-state.edu/pubs/MF734.pdf.

Dorivar Ruiz Diaz, Nutrient Management Specialist
ruizdiaz@ksu.edu

Bryan Rutter, Soil Testing Lab Manager
rutter@ksu.edu

6. The challenge of collecting a representative soil sample

At first glance, soil sampling would seem to be a relatively easy task. However, when you consider the variability that likely exists within a field because of inherent soil formation factors and past production practices, the collection of a representative soil sample becomes more of a challenge.

Before heading to the field to take the sample, be sure to have your objective clearly in mind. For instance, if all you want to learn is the average fertility level of a field to make a uniform maintenance application of phosphorus (P) or potassium (K), then the sampling approach would be different than sampling for pH when establishing a new alfalfa seeding or sampling to develop a variable rate P application map.

In some cases, sampling procedures are predetermined and simply must be followed. For example, soil tests may be required for compliance with a nutrient management plan or environmental regulations associated with confined animal feeding operations. Sampling procedures for regulatory compliance are set by the regulatory agency and their sampling instructions must be followed exactly. Likewise, when collecting grid samples to use with a spatial statistics package for drawing nutrient maps, sampling procedures specific to that program should be followed.

Regardless of the sampling objectives or requirements, some sampling practices should be followed:

- A soil sample should be a composite of many cores to minimize the effects of soil variability. Take a minimum of 12 to 15 cores from a relatively small area (two to four acres). Taking 20-30 cores will provide results that are more accurate. Take a greater number of cores on larger fields than smaller fields, but not necessarily in direct proportion to the greater acreage. A single core is not an acceptable sample.

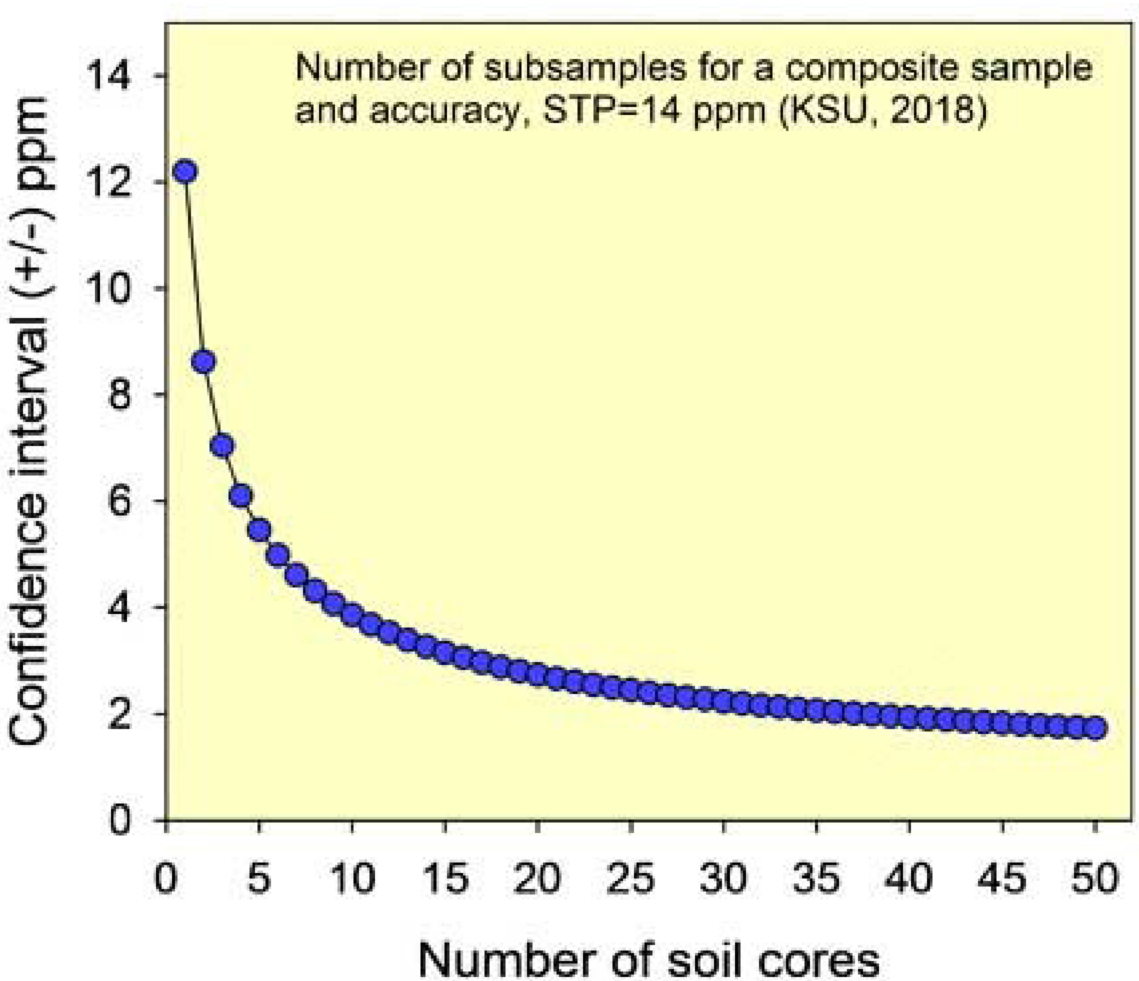


Figure 1. The level of accuracy of the results of a soil test will depend, in part, on how many subsamples were taken to create the composite sample. In general, a composite sample should consist of 15 or more subsamples. For better accuracy, 20-30 cores, or subsamples, should be taken and combined into a representative sample. Graph by Dorivar Ruiz Diaz, K-State Research and Extension.

- Use a consistent sampling depth for all cores because pH, organic matter, and nutrient levels often change with depth. Match sampling depth to sampling objectives. K-State recommendations call for a sampling depth of two feet for the mobile nutrients – nitrogen, sulfur, and chloride. A six-inch depth is suggested for routine tests of pH, organic matter, phosphorus, potassium, and zinc (Zn) (Figure 2).
- When sampling a specific area, a zigzag pattern across the field is better than following the planting/tillage pattern to minimize any past non-uniform fertilizer application/tillage effects. With a GPS system available, recording of core locations is possible. This allows future samples to be taken from the same areas in the field.
- When sampling grid points for making variable rate nutrient application maps, collecting cores in a 5-10 foot radius around the center point of the grid is preferred for many spatial statistical software packages.

- Avoid unusual spots obvious by plant growth and/or visual soil color/texture differences. If the information on these unusual areas is desired, collect a separate composite sample from these spots.

- If banded fertilizer has been used on the previous crop (such as strip tillage), then it is suggested that the number of cores taken should be increased to minimize the effect of an individual core on the composite sample results and to obtain a better estimate of the average fertility for the field.
- For permanent sod or long-term no-till fields where nitrogen fertilizer has been broadcast on the surface, a three- or four-inch sampling depth would be advisable to monitor surface soil pH.

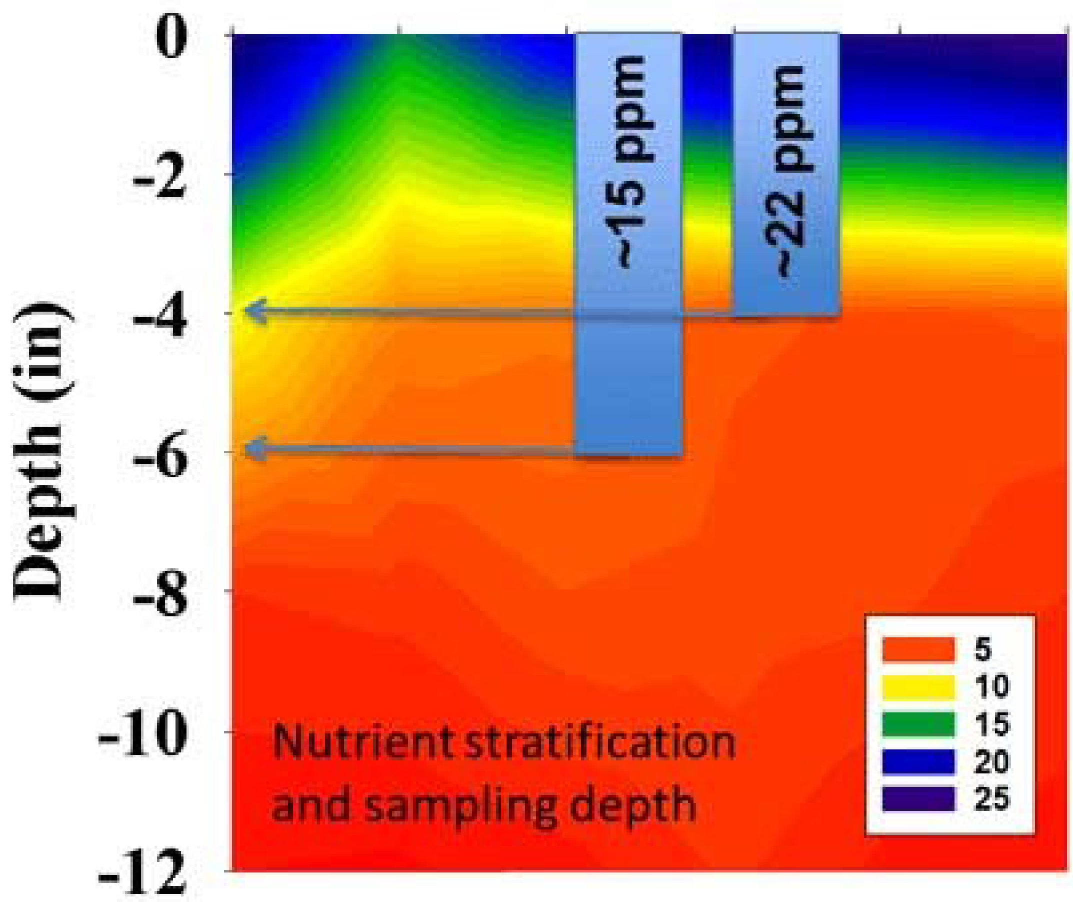


Figure 2. Consistency in sampling depth is particularly important for immobile nutrients like phosphorus. Stratification of nutrients and pH can be accentuated under reduced tillage. Image from Dorivar Ruiz Diaz, K-State Research and Extension.

Soil test results for organic matter, pH, and non-mobile nutrients (P, K, and Zn) change relatively slowly over time, making it possible to monitor changes if soil samples are collected from the same field following the same sampling procedures. However, there can be some seasonal variability and previous crop effects. Therefore, soil samples should be collected at the same time of year and after the same crop.

Soil testing should be the first step for a good nutrient management program, but it all starts with the proper sample collection procedure. After harvest in the fall is a good time to collect soil samples for the most limiting crop nutrients in Kansas.

Additional soil sampling resources

Accurate soil tests are dependent on more than proper sampling techniques. Care should be taken regarding the handling/storage of soil samples before submission to a testing facility. Please read this recent article "**Soil sample handling practices can affect soil nitrate test accuracy**".

For instructions on submitting soil samples to the K-State Soil Testing Lab, please see the accompanying article "**Fall soil sampling: Sample collection and submission to K-State Soil Testing Lab"** found in this eUpdate issue.

Dorivar Ruiz Diaz, Nutrient Management Specialist
ruizdiaz@ksu.edu

7. War Against Weeds podcast enters its sixth season this fall

Are you interested in keeping up with the latest weed management information? If so, you'll want to add the "**War Against Weeds**" podcast to your weed management toolbox. This podcast is an outreach effort from Sarah Lancaster, K-State Extension Weed Science Specialist, Mandy Bish, Extension Weed Scientist at the University of Missouri, and Joe Ikely, Extension Weed Scientist at North Dakota State.

There are currently about 90 full-length episodes available. Season six has officially started with episode one on September 6. Topics for season six include weed management on rangelands, harvest weed seed control practices, site-specific herbicide applications, and more.

Episodes are approximately 30 minutes long and free to access. They are posted at https://waragainstweeds.libsyn.com/ in addition to being available on Spotify, iTunes, and Google Podcasts.

If you have any suggestions for future episodes, please let us know!

Sarah Lancaster, Weed Management Specialist
slancaster@ksu.edu

8. Kansas Ag-Climate Update for August 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.

August 2023: Week-long heat waves across the Great Plains

The average statewide temperature for August was 78.8°F, or 1.7°F above normal. This ranked as the 33rd warmest August out of 129 years of records, dating back to 1895. All nine climate divisions were above normal. Anomalies ranged from +0.6°F (southwest) to +2.6°F (east central). It was the 19th warmest August on record in east central Kansas, the highest-ranking division.

Average statewide precipitation for August was 2.80", or 80% of normal. This amount was 0.71" below normal, and ranked as the 56th driest August on record. Only two divisions had above-normal precipitation: north central (+0.16") and northwest (+0.12") Kansas.

When combined with June and July, it was the 7th wettest meteorological summer on record in southwest Kansas. For April-August, the 2023 growing season in southwest Kansas was the 10th wettest on record.

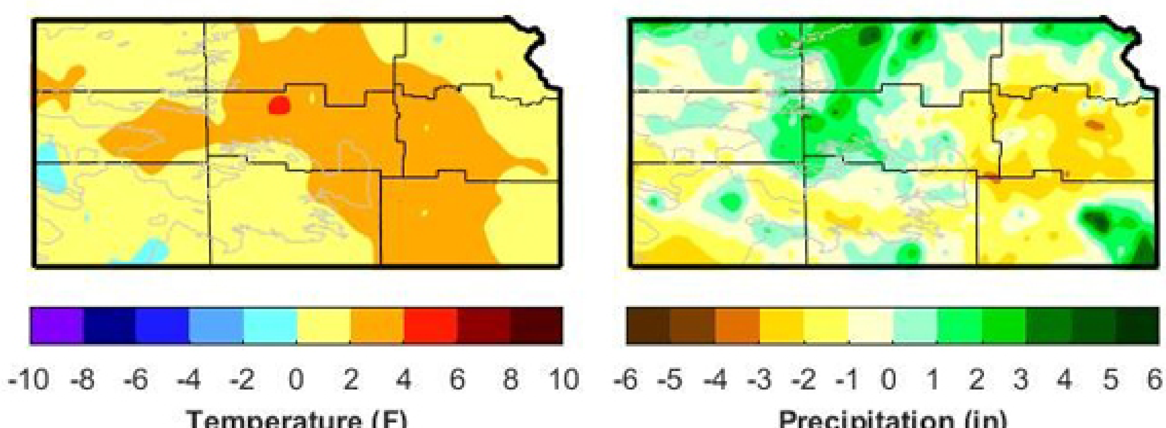


Figure 1. Departures from normal temperature (°F) and precipitation (inches) for August 2023.

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

Xiaomao Lin, State Climatologist
xlin@ksu.edu

Matthew Sittel, Assistant State Climatologist
msittel@ksu.edu