Issue 1056

K-STATE Research and Extension

Extension Agronomy

eUpdate

06/05/2025

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 | 06/05/2025 | Issue 1056

1. Double crop options after wheat

Double cropping after wheat harvest can be a high-risk venture for grain crops. The remaining growing season is relatively short. Hot and/or dry conditions in July and August may cause problems with germination, emergence, seed set, or grain fill. Ample soil moisture this year can aid in establishing a successful crop after wheat harvest. Double-cropping forages after wheat works well even in drier regions of the state.

The most common double crop grain options are soybean, sorghum, and sunflower. Other possibilities include summer annual forages and specialized crops such as proso millet or other short-season summer crops, even corn. Cover crops are also an option for planting after wheat (see the companion eUpdate article "Cover crops grown post-wheat for forage").

Be aware of herbicide carryover potential

One major planting consideration after wheat is the potential for herbicide carryover. Many herbicides applied to wheat are Group 2 herbicides in the sulfonylurea family with the potential to remain in the soil after harvest. If a herbicide such as chlorsulfuron (Glean, Finesse, others) or metsulfuron (Ally) has been used, then the most tolerant double crop will be sulfonylurea-resistant varieties of soybean (STS, SR, Bolt) or other crops. When choosing to use herbicide-resistant varieties, be sure to match the resistance trait with the specific herbicide (not only the herbicide group) that you used. This is especially true when looking at sunflowers as a double crop. There are sunflowers with the Clearfield trait, which allows Beyond herbicide applications, and ExpressSun sunflowers, which allow an application of Express herbicide. While both of these herbicides are Group 2 (ALS-inhibiting herbicides), the Clearfield trait and Express*Sun* are not interchangeable, and plant damage can result from other Group 2 herbicides.

Less information is available regarding the herbicide carryover potential of wheat herbicides to cover crops. There is little or no mention of rotational restrictions for specific cover crops on the labels of most herbicides. However, this does not mean there are no restrictions. Generally, there will be a statement that indicates "no other crops" should be planted for a specified amount of time, or that a bioassay must be conducted prior to planting the crop.

Burndown of summer annual weeds present at planting is essential for successful double-cropping. Assuming glyphosate-resistant kochia and pigweeds are present, combinations of glyphosate with products such as saflufenacil (Sharpen) or tiafenacil (Reviton), or alternative treatments such as paraquat may be required. Dicamba or 2,4-D may also be considered if the soybean varieties with appropriate herbicide resistance traits are planted. In addition, residual herbicides for the double crop should be applied at this time.

Management, production costs, and yield outlooks for double crop options are discussed below.

Soybeans

Soybeans are likely the most commonly used crop for double cropping, especially in central and eastern Kansas (Figure 1). With glyphosate-resistant varieties, often the only production cost for planting double crop soybeans was the seed, an application of glyphosate, and the fuel and equipment costs associated with planting, spraying, and harvesting. However, the spread of

herbicide-resistant weeds means additional herbicides will be required to achieve acceptable control and minimize the risk of further development of resistant weeds.

Figure 1. Soybeans planted as a double crop following wheat at the Ashland Bottoms Research Farm in Manhattan. Photo by Kraig Roozeboom, K-State Research and Extension.

Weed control. The weed control cost cannot really be counted against the soybeans, since that cost should occur whether or not a soybean crop is present. In fact, having soybeans on the field may reduce herbicide costs compared to leaving the field fallow. Still, it is recommended to apply a pre-emergence residual herbicide before or at planting time. Later in the summer, a healthy soybean canopy may suppress weeds enough that a late-summer post-emergence application may not be needed.

Variety selection for double cropping is important. Soybeans flower in response to a combination of temperature and day length, so shifting to an earlier-maturing variety when planting late in a double crop situation will result in very short plants with pods that are close to the ground. Planting a variety with the same or perhaps even slightly later maturity rating (compared to soybeans planted at a typical planting date) will allow the plant to develop a larger canopy before flowering. Planting a variety that is too much later in maturity, however, increases the risk that the beans may not mature before frost, especially if long periods of drought slow growth. The goal is to maximize the length of the growing season of the crop, so prompt planting after wheat harvest time is critical. The earlier you can plant, the higher the yield potential of the crop if moisture is not a limiting factor.

Fertilizer considerations. Adding some nitrogen (N) to double-crop soybeans may be beneficial if the previous wheat yield was high and the soil N was depleted. A soil test before wheat harvest for N levels is recommended. Use no more than 30 lbs/acre of N. It would be ideal to knife-in the fertilizer. If that is not possible, banding it on the soil surface would be acceptable. Do not apply N in the furrow with soybean seed as severe stand loss can occur.

Seeding rates and row spacing. Seeding rate can be slightly increased if soybeans are planted too late in order to increase canopy development. Narrow row spacing (15-inch or less) has often resulted in a yield advantage compared to 30-inch rows in late plantings. Soybeans planted in narrow rows will canopy over more quickly than in wide rows, which is important when the length of the growing season is shortened. Narrow rows also offer the benefits of increasing early-season light capture, suppressing weeds, and reducing erosion. On the other hand, the advantage of planting in wide rows is that the bottom pods will usually be slightly higher off the soil surface to aid harvest. The other consideration is planting equipment. Often, no-till planters will handle wheat residue better and place seeds more precisely than drills, although the difference has narrowed in recent years.

What are typical yield expectations for double-crop soybeans? It varies considerably depending on moisture and temperature, but yields are usually several bushels less than full-season soybeans. A long-term average of 20 bushels per acre is often mentioned when discussing double-crop soybeans in central and northeast Kansas. Rainfall amount and distribution can cause a wide variation in yields from year to year. Double-crop soybean yields typically are much better as you move farther southeast in Kansas, often ranging from 20 to 40 bushels per acre.

A recent publication explores the potential yield of double-crop soybeans relative to full-season yield (Figure 2) and the most limiting factors affecting the yields for double-crop soybeans. The link to this article is: **https://bookstore.ksre.ksu.edu/pubs/MF3461.pdf**.

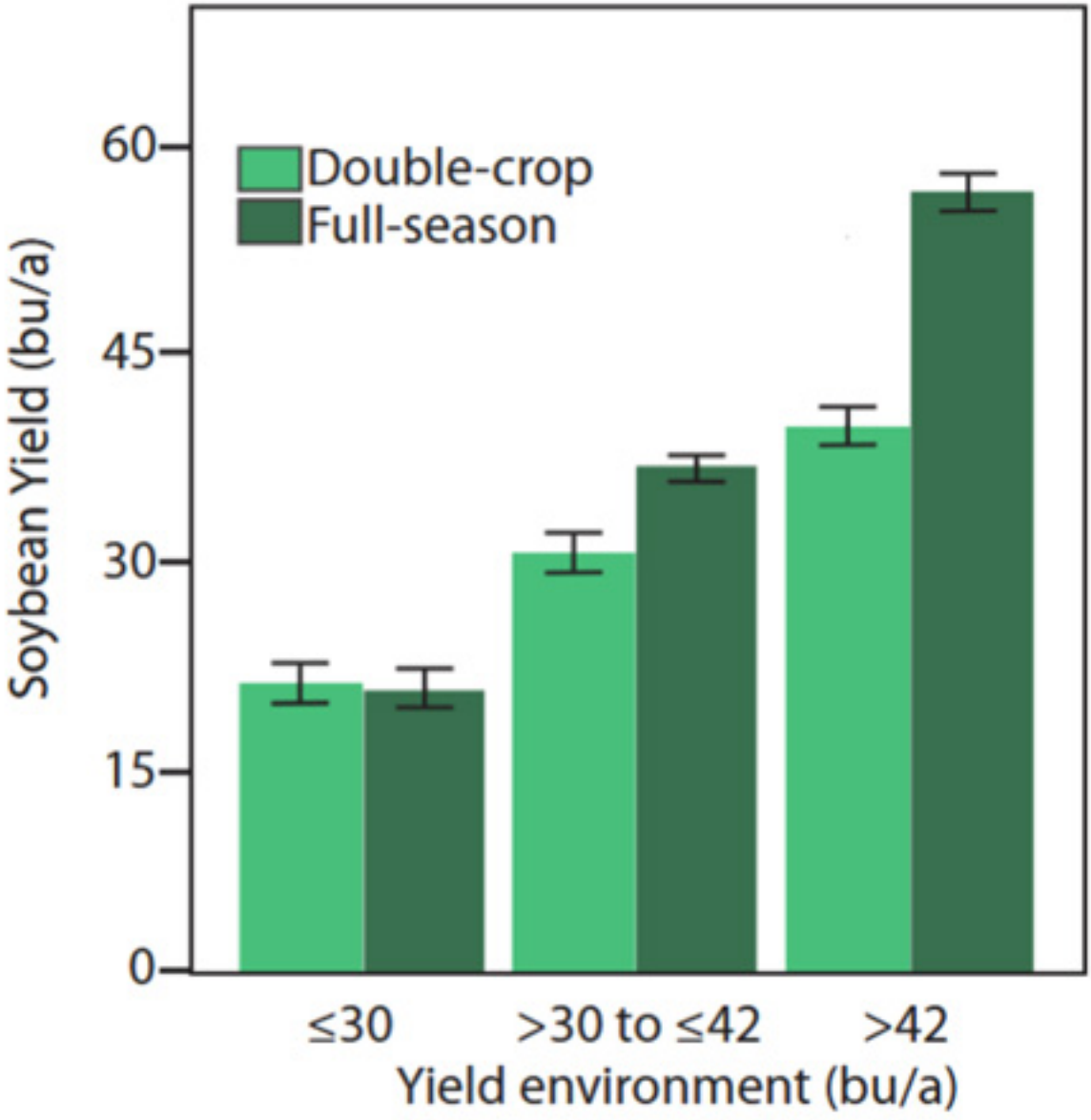


Figure 2. Double-crop compared to full-season soybean yields. Yield environments were divided into three ranges: ≤30 bu/a, >30 to ≤42 bu/a, and >42 bu/a.

Grain Sorghum

Grain sorghum is another double crop option. Unlike soybeans, sorghum hybrids for double cropping should be earlier maturing hybrids. Sorghum development is primarily driven by the accumulation of heat units, and the double crop growing season is too short to allow medium-late or late hybrids to mature before the first frost in most of Kansas.

Seeding rates and row spacing. Late-planted sorghum likely will not tiller as much as early plantings and can benefit from slightly higher seeding rates than would be used for sorghum planted at an earlier date. Narrow row spacing is advised, especially if the outlook for rainfall is good.

Fertilizer considerations. A key component for the estimation of N application rates is the yield

potential. This will largely determine the N needs. It is also important to consider potential residual N from the wheat crop. This can be particularly important when wheat yields are lower than expected. In that situation, additional available N may be present in the soil. Assess the amount of profile N by taking soil samples at a depth of 24 inches and submitting them for analysis at a soil testing laboratory.

Double crop sorghum planted into average or greater-than-average amounts of wheat residue can result in a challenging amount of residue to deal with when planting next year's crop. Nitrogen fertilizer can be tied up by wheat residue, so use application methods to minimize tie-up, such as knifing into the soil below the residue.

Weed control. Weed control can be important in double-crop sorghum. Warm-season annual grasses, such as crabgrass, can reduce double-crop sorghum yields. Using a chloroacetamide-and-atrazine pre-emergence product may be key to successful double-crop sorghum production. Herbicide-resistant grain sorghum varieties will allow the use of imazamox (Imiflex in igrowth sorghums) or quizalofop (FirstAct in DoubleTeam grain sorghum) that can control summer annual grasses.

No-till studies at Hesston documented 4-year average double crop sorghum yields of 75 bushels per acre compared to about 90 bushels per acre for full-season sorghum. A different 10-year study that did not have double crop planting but did compare early- and late-planting dates averaged 73 bushels per acre for May planting vs. 68 bushels per acre for June planting.

Sunflowers

Sunflowers can be a successful double crop option anywhere in the state, provided there is enough moisture at planting time to get a stand. Sunflowers need more moisture than any other crop to germinate and emerge because of the large seed. Therefore, stand establishment is important. Planting immediately after wheat harvest on a limited irrigation field can be a good fit to help with stand establishment.

Seeding rates and hybrid selection. When double-cropping sunflowers, producers should use similar seeding rates to what is typical for the area for full-season sunflowers. While full-season sunflowers can be successful in double-crop production, utilizing shorter-season hybrids can increase the likelihood of the sunflowers blooming and maturing before a killing frost.

Weed control. First, it is important to check the herbicide applications on the wheat. The rotation restriction to sunflowers after several commonly used wheat herbicides is 22-24 months.

Weed control can be an issue with double-crop sunflowers since herbicide options are limited, especially post-emergence. Thus, controlling weeds prior to sunflower planting is critical and may be complicated pre-plant restrictions for some herbicides. Planting Clearfield or Express*Sun* sunflowers will provide additional post-emergence herbicide options, but ALS-resistant kochia and pigweeds still won't be controlled. Imazamox (Beyond in Clearfield sunflower) has activity on small annual grasses as well as many broadleaf weeds, if they are not ALS-resistant.

Summer annual forages

With mid-July plantings, and where herbicide carryover issues are not a concern, summer annual

sorghum-type forages are also a good double crop option. A study planted July 21, 2008 near Holton, when summer rainfall was very favorable, provided yields of 2.5 to 3 tons dry matter/acre for hybrid pearl millet and sudangrass at the low end to 4 to 5 tons dry matter/acre for forage sorghum, BMR forage sorghum, photoperiod sensitive forage sorghum, and sorghum x sudangrass hybrids. Earlier plantings may produce even more tonnage, as long as there is adequate August rainfall.

One challenge with late-planted summer annual forages is getting them to dry down when harvest is delayed until mid- to late-September. Wrapping bales or bagging to make silage are good ways to deal with the higher moisture forage this late in the year.

Corn

Is double-crop corn a viable option? Corn is typically not recommended for late June or July plantings because yield is usually substantially less than when planted earlier.

Typically, mid-July planted corn struggles during pollination and seldom receives sufficient heat units to fill grain before frost. Very short-season corn hybrids (80 to 95 RM) have the greatest chance of maturing before frost in double crop plantings, but generally have less yield potential when compared to hybrids of 100 RM or more used for full-season plantings. Short-season hybrids often set the ear fairly close to the ground, increasing the harvest difficulty. Glyphosate-resistant hybrids will make weed control easier with double crop corn, but problems remain present with late-emerging summer weeds such as pigweeds, velvetleaf, and large crabgrass. Keep in mind, corn is very susceptible to carryover of most residual ALS herbicides used in wheat.

Considerations for altering seeding rates and variety/hybrid maturity for the crops discussed above are summarized in Table 1.

Table 1. Seeding rate and variety/hybrid relative maturity considerations for double crops compared to full-season.

Crop	Seeding rate	Relative maturity
	???????? Difference between double crop and full-season ????????	
Soybean	Increase	No change or longer
Sorghum	Increase	Shorter
Sunflower	No change	Shorter
Corn	No change	Shorter

Volunteer wheat control

One of the issues with double cropping that is often overlooked by producers is the potential for volunteer wheat in the crop following wheat. If volunteer wheat emerges and goes uncontrolled, it can cause serious problems for nearby wheat fields in the fall as a host for the wheat streak mosaic complex of viruses [wheat streak mosaic (WSMV), High Plains disease (HPD), and triticum mosaic (TriMV)] that are transmitted by the wheat curl mite (WCM).

Volunteer wheat can generally be controlled fairly well with glyphosate or Group 1 herbicides such as quizalofop (Assure II, others), clethodim (Select Max, others), or sethodydim (Poast Plus, others),

but control is reduced during times of drought stress. Atrazine can provide control of volunteer wheat in double-crop corn or sorghum, but control can be erratic depending on rainfall patterns.

For more detailed information about herbicides, see the "2025 Chemical Weed Control for Field Crops, Pastures, and Noncropland" guide available online at https://www.bookstore.ksre.ksu.edu/pubs/CHEMWEEDGUIDE.pdf or check with your local K-State Research and Extension office for a paper copy. The use of trade names is for clarity to readers and does not imply endorsement of a particular product, nor does exclusion imply non-approval. Always consult the herbicide label for the most current use requirements.

Sarah Lancaster, Weed Management Specialist
slancaster@ksu.edu

John Holman, Cropping Systems Agronomist
jholman@ksu.edu

Logan Simon, Southwest Area Agronomist
lsimon@ksu.edu

Tina Sullivan, Northeast Area Agronomist
tsullivan@ksu.edu

Jeanne Falk Jones, Multi-County Agronomist
jfalkjones@ksu.edu

2. Cover crops grown after wheat harvest for forage

The time following wheat harvest presents an opportunity to incorporate cover crops. Parts of Kansas have had enough moisture to grow a cover crop with substantial biomass production, which could also be a source of forage for livestock.

The following is a summary of "Cover Crops Grown Post-Wheat for Forage Under Dryland Conditions in the High Plains", a fact sheet produced in collaboration with extension specialists and research scientists at Kansas State University and Colorado State University. The entire fact sheet can be viewed and downloaded at https://bookstore.ksre.ksu.edu/pubs/MF3523.pdf.

Selection of Species

Determining what to plant can be difficult with all the varied species available for use as cover crops. For Kansas producers, local Land Grant Universities, including Kansas State University, and the Midwest Cover Crops Council, have developed a **decision tool** to help select species based on specified goals. When cover crops are grazed, one needs to choose species that are palatable and safe as forage for livestock and will benefit soil health . Fortunately, many species currently recommended for use as cover crops are also good for forage production. Factors such as nutritive content and potential toxicities must be considered.

While some potential risks (i.e., nitrates, prussic acid, alkaloids) exist, most can be managed. Members of the sorghum family (sorghum-sudan, sudangrass, grain sorghum, and forage sorghum) and millets are common nitrate accumulators. Environmental stress and excess nitrogen can increase nitrate levels in these plants. Producers should use caution when grazing forages with high nitrate potential and test before grazing. Although a hard freeze does not change nitrate content, prussic acid toxicity can occur when grazing sorghums, particularly young plants, and in the fall following a frost/freeze. For more information, see KSRE publications on **nitrate** and **prussic acid** toxicities or consult *Grazing Management: Toxic Plants* (MF3244).

Goals for the timing and length of grazing are considerations in species selection. For early to late summer planting, crops can be grazed late summer through early fall. Warm-season species such as millets, sorghum-sudangrass, sudangrass, forage sorghum, sunflowers, cowpeas, lablab, or sunn hemp should be considered potential species to grow. Sudangrass and sorghum-sudangrass have good regrowth potential and could be grazed a couple of times from summer through fall if ample moisture is available for regrowth and planted early enough in the year. Alternatively, biomass can be allowed to accumulate and grazed 7–10 days after a hard freeze to reduce prussic acid risk. Though cattle may trample significant biomass during late-season grazing, this strategy may support soil health goals by increasing soil cover.

Complex mixtures of 6 or more species, often called "cocktails," are commonly promoted. Research studies at Kansas State University and other universities have not found a benefit to cocktails compared to single species or simple mixtures of 2 to 4 species. Competitive warm-season grasses typically produce the most biomass, enhancing both forage yield and weed control. While mixtures may provide other benefits, such as nitrogen fixation from legumes or pest suppression from brassicas, measurable increases in soil nitrogen from legumes are rare in High Plains studies. From a grazing perspective, mixtures can produce forage with a range of palatability that can provide benefits and limitations. However, herbicide options are greatly limited when growing a mixture of grass and broadleaf species as a cover crop.

Variability in Forage Production

Under dryland conditions, forage productivity will vary from year to year, which makes this one of the biggest challenges facing producers who graze cover crops in the High Plains Region because stocking rates will need to be adjusted annually.

Producers have several options to manage this variability in forage production. A flexible herd size where animals can be added or subtracted based on a given year's productivity is the ideal situation. However, it is difficult for most to adjust herd size, so the number of days a field can be grazed will have to be shortened or lengthened to achieve residue goals. In reality, expect to graze cover crops planted post-wheat for about 30 days in most years. This resource should be considered supplemental forage during the late summer and early winter to help relieve dependence on other forage resources such as native rangeland and baled hay.

If excess forage is produced, putting some up as hay or silage to preserve forage for dry years may be a good option. However, removing hay and silage could reduce the amount of residue left in the field, negating soil health goals compared to grazing. Resting native pasture going into the fall is the most critical time for native species to store carbohydrates. This is always a good time to rest native pasture, especially following the drought years. By using summer annuals in the fall, native pasture can be stockpiled and grazed later in the winter after the grass is dormant, reducing winter feed expense.

As a final note, in years with minimal precipitation and forage productivity (i.e. ~1,000 lb/ac or less), the best choice might be not to graze at all if your primary goal is soil protection. Ideally, you want to maintain a minimum of 30% ground cover or approximately 1,000 lb/ac.

Figure 1. Top image was taken in mid-August during a field day at a study field north of Bird City, Kansas. Bottom image was taken at the end of the grazing period that started in January. The heifers are standing at the end of the grazing area. The previously grazed strip is to the right of the fence line.

Grazing Management

When managing grazing of cover crops, numerous options can be considered. The ultimate strategy chosen will be influenced by your overarching goal(s) for the cover crop. Cover crops are generally grown for more reasons than just achieving high levels of harvest efficiency (i.e., percent utilization of available forage), as you would if this were a dedicated forage crop. You want to leave enough residue to maintain most of the benefits associated with planting cover crops.

Grazing management options include:

- Continuous grazing: Calculate a stocking rate based on the estimated yield and put the whole herd in one large field. Advantages are that no fences are moved and only one water source is needed (i.e., labor and inputs are minimal). However, if the field is large, livestock will tend to overgraze the forage closest to the water source while underutilizing the forage farthest from the water, unless you can move the watering location. Harvest efficiency will generally be around 30%.
- Rotational grazing: A large field is divided into two or more smaller units, or paddocks, and the animals are rotated from one paddock to the next. This option has some advantages and disadvantages. The more paddocks the field is divided into, the higher the stocking density (i.e., the number of animals per acre). Key concerns include maintaining residue levels and minimizing soil compaction. Frequent fence movement and managing water access are two of the main challenges that discourage the use of rotational grazing.
- Strip grazing: This differs from rotational grazing in that there is no back fence, and animals can graze both fresh, residual, and regrowth forage. This is convenient for watering animals as

the fence can be set up so they have continuous access to a single water point. One drawback is increased compaction near the water source. Regrowth is limited since animals revisit previously grazed areas.

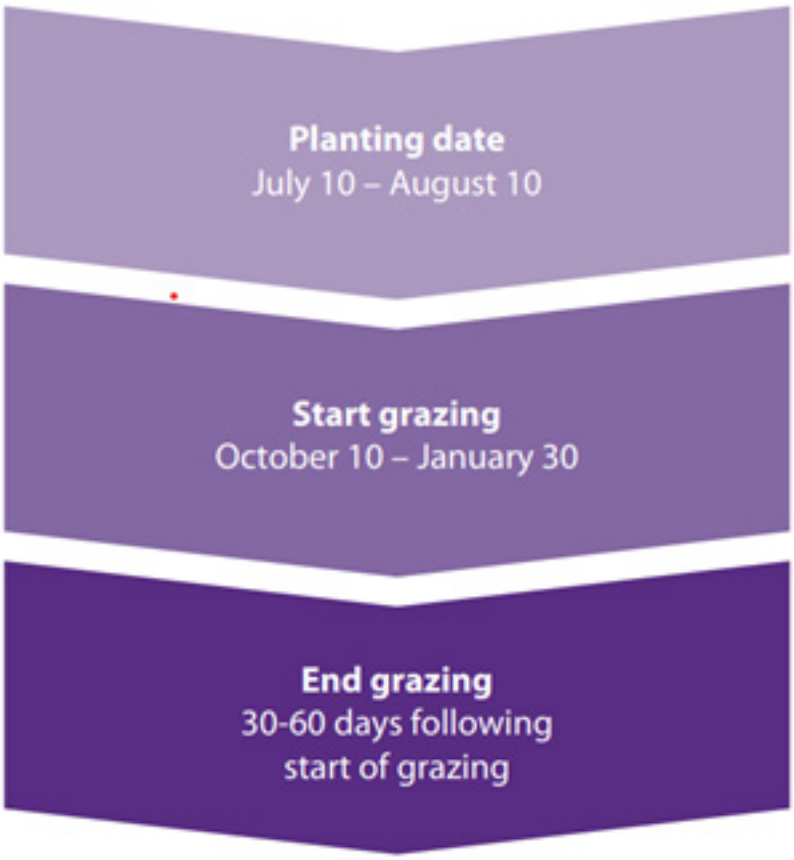
The next decision to make is when to start grazing your cover crop. The timing of grazing in relation to frost is an important consideration in post-wheat planted cover crops. The biggest concern is with plants in the sorghum family and the release of prussic acid after frost damages cell walls. A forage planted immediately after wheat harvest can provide 30 or more days of grazing before frost. In other cases, delaying grazing until after a hard frost may be easier, particularly when it may be time-consuming to move animals on and off the field and difficult to predict frost timing. Grazing should be suspended for 7 to 10 days after a frost to avoid prussic acid poisoning. For plants with prussic acid potential, delay grazing until plants achieve 18 to 24 inches of growth because prussic acid is highest in small plants or regrowth.

Determining Stocking Rates

Several key pieces of information are needed to estimate a stocking rate. The first is an estimate of the forage yield your field will produce during the period it will be grazed on a dry matter basis. How much forage will be consumed daily depends on animal body weight and forage quality. For green and growing forages, intake will run from 2.5 to 3% of body weight on a dry matter basis. Another key input is the percent utilization desired. In dryland systems, 30% is a conservative starting point unless it appears to be an excellent moisture year with above-average yields. Calculations can be made to estimate days of grazing for a given number of animals or the number of animals for a set grazing period. A **Carrying Capacity Calculator** is also available to help with these calculations. Example calculations to determine stocking rates are detailed in the full publication linked in the first paragraph of this article.

Example Timeline

Below is an example timeline with suggested planting, start grazing, and end grazing dates for cover crops planted post-wheat. In good moisture years, grazing could occur in September and October. Depending on the species planted, livestock removal before the first hard freeze is recommended. Others may prefer to delay grazing until a week or more after the first killing frost.



Key Points

- Post-wheat plantings would include warm-season species such as millets, sorghum-sudangrass, forage sorghum, sudangrass, cowpea, lablab, sunhemp, or sunflowers.
- Planting a cover crop for forage could be grazed late summer through fall.
- Warm-season grasses tend to dominate over broadleaf species when planting cover crop mixtures.
- Cover crops must be planted immediately after wheat harvest to ensure crop establishment before the soil dries out following harvest.
- Yield variability is high when growing cover crops post-wheat under dryland conditions, ranging from under 1,000 lb/ac in dry years to almost 9,000 lb/ac in wet years.
- Stocking rates must be flexible because of the large year-to-year variability in cover crop productivity.
- Cover crops planted post-wheat can provide an average of 30 to 45 days of grazing, but the timing of grazing in relation to frost is an important consideration.
- Take caution for prussic acid and nitrates when growing summer cover crops for forage.
- Be aware of volunteer wheat growing in summer cover crops and manage accordingly for risk of disease and insect pressure carrying over to wheat planted this fall.

Sandy Johnson, Extension Beef Specialist, Northwest Research-Extension Center
sandyj@ksu.edu

Augustine Obour, Soil Scientist, Agricultural Research Center-Hays
aobour@ksu.edu

John Holman, Cropping Systems Agronomist, Southwest Research-Extension Center
jholman@ksu.edu

Logan Simon, Extension Crops & Soils Specialist, Southwest Research-Extension Center
lsimon@ksu.edu

Kansas State University Department of Agronomy
2004 Throckmorton Plant Sciences Center | Manhattan, KS 66506
www.agronomy.ksu.edu | www.facebook.com/KState.Agron | www.twitter.com/KStateAgron

3. Rapid growth syndrome in corn: Causes, symptoms, and recovery

Some corn fields in Kansas have shown signs of abnormal growth, where the whorls of the affected corn plants are tightly twisted or even bent over. This is referred to as “rapid growth syndrome”, a physiological condition that typically occurs during periods of accelerated growth, particularly after a phase of cool, wet weather. The typical sequence includes:

1. **Cool, cloudy, and wet conditions**. These restrict plant development, photosynthesis, and nutrient uptake.
2. **Sudden onset of warm, sunny weather**. This triggers a burst of growth in the plant, leading to the physiological symptoms described above.

Rapid growth syndrome is most commonly observed between V5 and V8 growth stages, though it can occur as late as V12. Key symptoms include:

- **Twisted or buggy-whipped whorls**: New leaves may fail to unfurl properly and emerge in a tightly coiled form (Figure 1, left and center photo).
- **Wrinkled, crinkled, or translucent leaves**: As leaves eventually emerge, they may appear malformed or discolored (Figure 1, right). When leaves do eventually unfurl, they are often a pale green or yellowish (Figure 2), but will soon return to normal.
- **Purpling or yellowing**: Nutrient deficiencies can become more apparent due to the sudden demand during rapid growth.
- **Lodging**: In severe cases, weak stalks may bend or collapse under their own weight.

Figure 1. Twisted leaves or "buggy whipping" (left and center photos) and wrinkled leaves (right photo) are all examples of physiological responses to rapid growth in corn. Photos by Sarah Lancaster and David Hallauer, K-State Research and Extension.

Figure 2. Examples of corn leaves with yellow or pale green discoloration due to rapid growth syndrome. Photo by Sarah Lancaster, K-State Research and Extension.

This syndrome can resemble herbicide injury, particularly injury from group 4 herbicides like 2,4-D or group 15 herbicides such as *S*-metolachlor (Dual, others), acetochlor (Harness, others), and dimethenamid-P (Outlook, others). Rapid growth syndrome can often be distinguished by:

Timing of injury symptoms: Rapid growth syndrome occurs during periods of rapid growth following environmental stress, rather than during cool, wet conditions that keep the plant from metabolizing the herbicide.

Pattern of injury: Rapid growth syndrome injury will be more sporadic and not associated with application patterns or soil conditions than herbicide injury.

Recovery pattern: New leaves unfurl and eventually look 'normal' following rapid growth syndrome,

but plant parts affected by herbicides may retain injury symptoms, even if new growth is 'normal'. In addition, plants with foliar herbicide injury caused by group 4 herbicides may also have injury to brace root.

In summary

The good news is that affected plants usually recover within a week with minimal to no yield effects. The leaves affected may have a rippled appearance, while the inner leaves are yellow to pale yellow (Figure 2). The yellowing should darken back to green as photosynthesis occurs. Severe cases of rapid growth syndrome may lead to plant lodging, affecting harvest efficiency.

Sarah Lancaster, Extension Weed Science Specialist
slancaster@ksu.edu

Tina Sullivan, Northeast Area Agronomist
tsullivan@ksu.edu

4. Insect alert: Potato leafhoppers in alfalfa and burrowing bugs in soybeans

Potato leafhoppers can be found in soybean and alfalfa fields. Figure 1 shows an adult potato leafhopper (at the knifepoint) next to a pea aphid. They cause very little concern in soybeans but can be problematic in alfalfa. They do not overwinter in Kansas. Therefore, we are just finding the first migrants back into the state, and they are depositing eggs. These will produce nymphs within the next 7-10 days. Potato leafhoppers can stress alfalfa in two ways: by sucking limited moisture from the plants and at the same time introducing a toxin during this feeding. The few aphids that are also currently present in alfalfa are providing food for beneficials. Figure 2 shows an immature lacewing feeding on an aphid and a pirate bug (another beneficial) just in front of the larval lacewing. For alfalfa insect pest management, please refer to the 2025 K-State Alfalfa Insect Pest Management Guide.

Figure 1. At the end of the knifepoint is a potato leafhopper, and beside it a pea aphid. Photo by Cody Wyckoff, K-State Research and Extension.

Figure 2. Lacewing larva eating a pea aphid and a pirate bug just in front of the aphid that is being eaten by the lacewing. Photo by Cody Wyckoff, K-State Research and Extension.

Early-season soybean problem – Burrowing bugs

Soybean planting is well underway throughout the state. However, one problem that usually doesn't appear often-and hardly ever to this extent, is burrowing bugs. Figure 3 shows stand loss, and Figure 4 shows the actual burrowing bug nymphs that caused this stand loss. Burrowing bugs are very common across the state, but most often only build up populations sizeable enough to cause this type of damage under henbit. So, if you have substantial areas of henbit, be sure to kill it enough ahead of planting so that any burrowing bugs developing underneath will disperse or die prior to the germination of the crop. For soybean insect pest management problems, please refer to the 2025 K-State Insect Pest Management Guide.

Figure 3. Damage done by burrowing bugs to a soybean field in Greenwood County. Photo by Lucas Short.

Figure 4. Damage done by burrowing bugs in Greenwood County. Photo by Lucas Short.

Jeff Whitworth, Extension Entomology Specialist
jwhitwor@ksu.edu

5. Possible causes for white heads in wheat

White heads have been appearing in wheat fields around Kansas. There are many causes of white heads, which can sometimes be difficult to distinguish. Sometimes, the white heads are just single tillers scattered throughout part or all of a field, and sometimes, they occur in small-to-large patches. Heads might be completely white starting from the stem or have just partial bleaching, showing a few spikelets with discoloration.

There are many causes of white heads. Here are some of the most common causes and their diagnosis.

Freeze injury to the stem or crown. Depending on the growth stage at the time of a late spring freeze, parts of the head or all of the heads may die and turn white (Figure 1).

In years when the freeze occurs about the boot stage or a little earlier, there can be injury to the lower stem, which then cuts off water and nutrients to the developing head, and that stem simply does not develop. In years when the wheat is in the early heading stage at the time of the freeze, the freeze can damage the heads directly. This year, we did not have any one particular hard freeze that would have led to widespread appearances of white heads, but fields in south central Kansas seem to have more freeze damage than other parts of the state.

Often, wheat on north-facing slopes, ridge tops, or low-lying areas will be most affected by freeze injury. However, freeze injury can also be so severe that it occurs throughout the fields in no particular pattern. Crown rot is another potential problem that can be traced back to freeze injury.

When the crown is damaged by cold temperatures or a freeze, part or all of the tillers can die. If the tiller from a damaged crown forms a head, this head will almost always be white. The crown will have internal browning, and stands will usually be thinner than normal.

Figure 1. Freeze-damaged wheat heads. Photos by Romulo Lollato, K-State Research and Extension.

Hail. Hail can cause a white head to appear when it breaks the connection between the stem and the head (Figure 2). Occasionally, hail can also damage just a portion of a head, and cause that damaged portion to turn white. The hail impact on the heads may also remove spikelets and expose the rachis (Figure 3).

Figure 2. Wheat field in Sumner County showing a high incidence of white heads due to hail damage. Photo taken May 22, 2019, by Romulo Lollato, K-State Research and Extension.

Figure 3. The heads in this photo have had a few spikelets removed due to hail impact and have their rachis exposed. Photo by Romulo Lollato, K-State Research and Extension.

Heat stress can scorch wheat heads and turn them white, usually starting from the top and moving downwards (Figure 4). Depending on the level of heat stress, entire tillers may be scorched in a given plant. This growing season, we have not had severe heat stress to this point, but if we happen to have it in the near future, look for partial discoloration of the top third of wheat heads.

Figure 4. White wheat heads caused by heat stress. Notice the scorched appearance starting from the top of the head and moving downwards. Photo by Romulo Lollato, K-State Research and Extension.

Dryland root rot (also known as dryland foot rot or Fusarium foot rot). This disease, caused by the *Fusarium* fungus, causes white heads and often turns the base of the plants pinkish (Figure 5). As with take-all, dryland root rot causes affected tillers to turn completely white from the base of the stem. This disease is usually most common under drought stress conditions and is often mistaken for either drought stress or take-all. This growing season, many fields across Kansas are impacted by this dryland root rot.

Figure 5. White wheat head caused by Fusarium root rot. Detail on the right shows pink discoloration inside the stem typical of the Fusarium pathogen. Photo by Romulo Lollato, K-State Research and Extension.

Head scab (aka Fusarium head blight). Wheat is vulnerable to head scab during and after flowering. Rainfall during flowering favors scab development. Symptoms of head scab typically do not appear for 14-21 days after flowering. Symptoms can be restricted to one or few spikelets and can become progressively worse with time. Sometimes, the entire head might be affected (Figure 6). Head scab is most common when wheat is grown after corn or after a wheat crop that had head scab the previous year. Head scab can be identified by looking for pink spores of the Fusarium fungi and a darker discoloration to the rachis of the wheat head. Now is the time to be on the lookout for head scab across Kansas. In some years, the window when symptoms are visable is short as they are often masked when the plants reach maturity.

Figure 6. Wheat heads affected by head scab or Fusarium head blight. Symptoms range from one or few spikelets that turned white, to the upper half or entirety of the head. Photo by Romulo Lollato, K-State Research and Extension.

Take-all. This disease often causes patches of white heads scattered throughout the field. It occurs most frequently in continuous wheat, and where there is a moderate to high level of surface residue. Take-all is also favored by high pH soils, so a recently limed field might also show symptoms. To diagnose take-all, pull up a plant and scrape back the leaf sheaths at the base of a tiller. If the base of the tiller is shiny and either black or dark brown, it is take-all. All tillers on a plant infected with take-all will have white heads. Plants will pull up easily.

Sharp eyespot. This disease is common in Kansas but rarely causes significant yield loss. Sharp eyespot causes lesions with light tan centers and dark brown margins on the lower stems. The ends of the lesions are typically pointed. If the stems are girdled by the fungus, the tiller may be stunted with a white head. Each tiller on a plant may be affected differently.

Wheat stem maggot. Wheat stem maggot damage is common every year in Kansas, but rarely results in significant yield loss. It usually causes a single white head on a tiller, scattered more or less randomly through part or all of a field. One typical symptom of white heads caused by wheat stem maggot is that the flag leaf and lower stem are often green, and only the last internode (peduncle) and head are white. If you can grab the head and pull the stem up easily just above the uppermost node, the tiller has probably been infested with wheat stem maggot. Scout for symptoms of chewing close to the base of the plants, which could indicate that the head has died as function of wheat stem maggot (Figure 7).

Figure 7. White wheat head due to wheat stem maggot, characterized by a white head and peduncle but with a healthy and green lower stem. Detail on the right shows the chewing of the base of the peduncle by the maggot. Photo by Romulo Lollato, K-State Research and Extension.

Premature death. As wheat begins to mature, plants in some areas of the field may have an off-white color similar to take-all (Figure 8). This premature death could be due to drowning, hot dry winds, or other stress. The pattern of discolored heads will often follow soil types or topography and may occur in large patches. The grain will be shriveled and have a low test weight.

Kansas State University Department of Agronomy
2004 Throckmorton Plant Sciences Center | Manhattan, KS 66506
www.agronomy.ksu.edu | www.facebook.com/KState.Agron | www.twitter.com/KStateAgron

Figure 8. Large patches of drowned wheat in central Kansas (upper photo) and south central Kansas (lower photo). Photos were taken May 16 and 17, 2017, by Romulo Lollato, K-State Research and Extension.

Romulo Lollato, Wheat and Forages Specialist
lollato@ksu.edu

Kelsey Andersen Onofre, Extension Wheat Pathologist
andersenk@ksu.edu

6. Wheat variety development and management field day - June 12

K-State Research & Extension will be holding a Wheat Variety Development & Management Field Day on Thursday, June 12 to showcase the latest research advancing Kansas wheat production into the future. Come see the experimental wheat plots and discuss with K-State researchers Allan Fritz, Romulo Lollato, and Kelsey Onofre about some of the most pressing wheat research questions they're tackling. Some of these topics will include:

- Tailoring optimal nitrogen management by variety.
- Assessing head scab and wheat streak mosaic tolerance and performance by variety.
- Tracking rust distribution risk using predictive models.
- Incorporating value-added traits into new wheat variety releases.

The program will take place at the North Central Kansas Experiment Farm's Belleville Unit on US-36, 1 mile. W of Belleville. Presentations will kick off at 9 AM with refreshments and will be followed by lunch.

For more information, please contact Luke Byers, River Valley Extension District Agriculture & Natural Resources Agent, at 785-632-5335 or by email at lsbyers@ksu.edu.


Wheat Variety Development & Management
Field Day
LUNCH to Follow
Thursday, June 12th - 9am
North Central Kansas Experiment Farm
NW Corner of US-36 & 150 Rd
2 mi W of Belleville, KS
Dr. Romulo Lollato
Dr. Allan Fritz
Dr. Kelsey Onofre
-Targeted Management Strategies by Variety
-The Future of Scab & Wheat Streak Resistance
-Value-Added Properties to Boost Revenue Streams
-And Much More!
WHEAT ALLIANCE
K-STATE Research and Extension
River Valley District
Kansas State University is committed to making its services, activities and programs accessible to all participants. If you have special requirements due to a physical, vision, or hearing disability, contact Luke Byers, (785)632-5335.
Kansas State University Agricultural Experiment Station and Cooperative Extension Service
K-State Research and Extension is an equal opportunity provider and employer.

7. Two June dates remain for the 2025 Kansas Wheat Plot Tours

The last remaining 2025 K-State Wheat Plot tours are scheduled for June 6 and June 12. It's not too late to make plans to attend a plot tour and learn about the newest available and upcoming wheat varieties, their agronomics, and their disease reactions.

There is also a wheat variety and management field day scheduled for June 12 at the North Central Kansas Experiment Farm's Belleville location on US-36. More details about this field day are available in a separate article in this eUpdate issue.

June 6 - Friday

Time	County	Location	Agent	Directions
8:15 AM (MT)	Greeley	Tribune	Lucas Haag	SWREC-Tribune Headquarters, 1 mile west of Tribune on Highway 96.

June 12 - Thursday

Time	County	Location	Agent	Directions
6:30 PM	Decatur		Karlie Rumbeck	10 ¼ miles west of Oberlin on the south side of Hwy 36. Meal to follow at May Family Farms, 1896 100th Rd, Oberlin.

Romulo Lollato, Wheat and Forages Specialist
lollato@ksu.edu