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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. Managing lodged wheat and harvest challenges after storm damage

Kansas is no stranger to the wind, but the wheat crop has taken a beating in many counties throughout the state with heavy rains and high winds. Wheat harvest has been quite slow with wet conditions (3% in 2025 compared to 25% at the same time for 2024). Some fields have portions of lodged wheat (Figure 1) while others have been unfortunate enough to be underwater from streams leaving their banks. In terms of lodging, extreme storm winds and torrential rains are the culprits for the damage compared to root/crown diseases, insect damage, or excess N applications, though these could all exacerbate the issue. Some varieties have been standing better than others as a factor of straw strength. See the 2024 Kansas Wheat Variety Guide for variety-specific ratings.

Figure 1. Wheat lodged following torrential storms near Garden City in 2025. Photo by Logan Simon, K-State Research and Extension.

Harvest concerns

Wheat harvest 2025 is likely to be slow for many as they work to harvest the downed crop as efficiently as possible. Lodged wheat that is at least partially lying on the ground will trap humidity,

preventing the grain and chaff from drying as quickly as normal. Giving the wheat time to dry down during the best windows will limit the amount of wet chaff going through the combine. In these situations, driving combines slower through the field and potentially perpendicular to the downed wheat could help pick.

Lodged wheat trapping humidity not only slows harvest with the soil and chaff not drying out, it can also lead to diminished grain quality, especially test weight. Additionally, grain and chaff molds may be a challenge. In fields that have been infected with scab (Fusarium head blight), high humidity and delayed harvest could also exacerbate mycotoxin accumulation. Producers should also be mindful of potential pre-harvest sprouting with excessive moisture around the mature heads.

From a machinery standpoint, harvesting lodged wheat can be quite challenging. Due to the trapped moisture discussed previously in the article, the straw will likely remain tougher later into the day, thus reducing hours available for efficient harvesting. If the lodging is in one predominant direction, it may be possible to harvest perpendicular or counter to the direction that the plants are lodged. Crop lifter attachments are available for conventional platform, flex, and flex-draper style headers. These lifters can be fixed or spring-loaded. Lifter attachments with an adjustable drop height can be useful as they can be adjusted downward for the nose of the lifter to more easily get underneath lodged plants and lift them up and over the cutterbar so that the stems can be cut by the sickles. Harvesting lodged wheat generally means a larger than normal amount of straw passing through the combine, which will result in decreased capacity to maintain acceptable levels of harvest loss. Combine kill-stop checks are always a useful tool to evaluate machine performance in non-standard operating conditions.

Stripper headers are a useful tool for harvesting lodged wheat. Operators will want to pay attention to the proper setting of the skid plates to prevent the stripping rotor from encountering the soil. Additionally, the crop deflector hood will need to be run in a higher-than-normal position. This allows the rotor to work on lifting up the entire plant while still maintaining adequate area to strip the grain. Operators should expect to use higher-than-normal stripping rotor speeds, especially if the stems are retaining dampness. While combines equipped with stripper headers are generally set for harvesting conditions where almost no straw enters the machine, when harvesting down wheat, it's likely that more material other than grain will be going through the combine than normally occurs with stripper header harvest. Operators will need to pay attention to chaffer, sieve, and fan settings for these conditions.

If the crop is ready, do not delay harvest, as delay will only exacerbate grain quality issues and potentially expose the crop to additional storms.

Post-harvest concerns with volunteer wheat

Because harvesting lodged wheat can be challenging, producers may see greater than average volunteer wheat this summer. If volunteer wheat goes uncontrolled, it can cause serious problems for nearby wheat fields in the fall. As a reminder, volunteer wheat harbors the wheat curl mite. The wheat curl mite is responsible for transmitting the wheat streak mosaic complex of viruses (wheat streak mosaic, High Plains wheat mosaic virus, and Triticum mosaic.

As mentioned in previous eUpdates and during the 2025 Kansas Wheat Plot Tours, the wheat streak mosaic complex impacted many fields in central and western Kansas this year. Even though we cannot eliminate all kernel losses, especially in areas of severe lodging, we should be mindful of

volunteer wheat control after harvest.

Key Points

- Lodging in wheat can be exacerbated by root/crown diseases, insect damage, or excess N applications, and variety-dependent straw strength.
- Wheat that is lodged and trapping humidity will slow harvest with the soil and chaff not drying out, and potentially lead to test weight reduction, grain/chaff mold, mycotoxin accumulation, and pre-harvest sprouting.
- If the crop is ready, do not delay harvest, as delay will only exacerbate grain quality issues and potentially expose the crop to additional storms.
- Even though we cannot eliminate all kernel losses during harvest, especially in areas of severe lodging, we must be mindful of volunteer wheat control after harvest.

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2. Wheat harvest: Identifying disease problems and setting harvest priorities

As the wheat harvest in Kansas is getting started, it's crucial to remember the diseases that can impact grain quality or seed viability. By now, most disease management decisions have been made, but it's not too late to implement strategies to mitigate losses on heavily infected fields. Moreover, it's the right time to consider variety selection and seed preparation for the next season, which can significantly influence the future of your crop.

Black point and sooty molds

With recent rains slowing the progress of wheat harvest, some areas of the state will begin to see sooty molds (Figure 1) and grain with a discoloration known as black point (Figure 2). Both of these problems are caused by molds that colonize mature wheat close to harvest.

These molds are normally not aggressive pathogens in wheat, but they can rapidly colonize mature plants. We see this issue most commonly when rain re-wets mature plants and causes harvest delays. Sooty molds are often a cosmetic problem because the mold growth is very superficial on the chaff and glumes (Figure 1). If the timing of the rain coincides with the late stages of kernel development, the molds can begin to colonize the outer layers of the wheat kernel, resulting in a gray-black discoloration called black point (Figure 2). Commonly, the embryo end of the kernel is most discolored, but entire kernels can become gray or black as a result of the black point. There is no way to manage this disease as all fungicides are long past their labeled application windows. Although not typically yield-limiting, the fungi that cause black point can cause problems with germination and may reduce seedling vigor. Seed lots with symptoms of black point should be tested for germination. If black point is causing germination problems, fungicide seed treatments can often improve the germination and ensure good stand establishment.

Figure 1. Wheat head with symptoms of sooty mold. Photo by Erick DeWolf, K-State Research and Extension.

Figure 2. Wheat kernels showing symptoms of black point. In severe cases, the entire kernel may appear darkened. Photo by Kelsey Andersen Onofre, K-State Research and Extension.

Fusarium head blight (scab)

Fusarium head blight (scab) has been reported in some Kansas counties where wet weather was present during and after flowering. This disease (Figure 3) can lead to lightweight, damaged, "scabby" kernels (Figure 4), which may contain the mycotoxin deoxynivalenol (DON). DON is sometimes referred to as "vomitoxin" because it can lead to vomiting and feed refusal in animals and is strictly regulated in finished products destined for human consumption.

Fields known to have high levels of Fusarium head blight should be harvested separately from unaffected fields when possible. It may be prudent to harvest infected fields as early as possible to avoid further accumulation of DON in grain. Producers should carefully consider whether they want to blend seed from infected and uninfected fields, as this may result in reduced quality of uninfected grain. Research has indicated that adjusting combine fan speeds may help 'blow out' lightweight Fusarium-damaged kernels. Fan speeds that are too high, however, may remove too much healthy grain. Additionally, blowing out scabby kernels may increase the abundance of volunteer wheat.

If you consider saving seed from affected fields, the seed should be professionally cleaned. The pathogen that causes Fusarium head blight can result in seedling disease and decreased emergence. If seed from fields with Fusarium head blight is saved, a seed treatment can improve emergence, as these scabby seeds can result in seedling blights. Planting infected seed will not result in head blight symptoms at heading in subsequent seasons.

Figure 3. Symptoms of Fusarium head blight (head scab) appear as bleached spikelets anywhere on the head and will spread through the head when conditions are favorable. When there is high humidity, orange-colored fungal structures can be seen in some infected heads. Photo by Kelsey Andersen Onofre, K-State Research and Extension.

Figure 4. Chalky wheat kernels resulting from a severe infection of Fusarium head blight. Photo by Erick DeWolf, K-State Research and Extension.

Common bunt (stinking smut)

Common bunt is typically only detected at harvest when grain appears to have a black, dusty appearance. Grain may also have a foul, "fishlike" odor. Infection actually occurs in the fall, when wheat seeds infested with spores germinate; however, symptoms are not present until the dough growth stages. Kernels infected by common bunt are dark and discolored and are filled with black spores called teliospores (Figure 5). Teliospores can be released when wheat is harvested and, in severe cases, may cause a black cloud behind the combine. Heavily infected fields can have reduced grain quality and yield. Very 'smutty' grain can be discounted. The best way to manage common bunt is to purchase certified, fungicide-treated seed or to have saved seed commercially cleaned and fungicide-treated.

Figure 5. Wheat infected with common bunt. Photo by Kelsey Andersen Onofre, K-State Research and Extension.

Loose smut

Loose smut can be easily identified after heading by masses of black spores that appear on heads in place of spikelets (Figure 6). By harvest, most of the black, powdery spores have been blown away by wind, leaving only the central stem of the head (rachis). Individual heads with loose smut will not produce any grain. Earlier in the growing season, spores from infected heads may have spread to neighboring plants and infected developing seeds. Cool, wet weather during the flowering period favors disease spread. Although this disease will not affect grain quality in the current season, the disease can persist within the infected kernels if the grain is saved for seed. The best option for controlling infected seeds is using a fungicide seed treatment. Coverage is key to ensuring the success of the treatment. More information about wheat seed treatment options can be found in this K-State wheat seed treatment publication: https://bookstore.ksre.ksu.edu/pubs/MF2955.pdf.

Figure 6. Loose smut symptoms caused by the fungus Ustilago tritici**. Photo by Kelsey Andersen Onofre, K-State Research and Extension.**

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3. Post-harvest weed control strategies for wheat stubble

The 2025 wheat harvest is just getting started, which means it is time to think about weed control in wheat stubble. When soil moisture conditions are favorable, weeds that have been suppressed by the canopy will grow rapidly once crop competition is removed. In addition, weeds that have emerged through the wheat canopy will be damaged during harvest and will quickly begin regrowth. Delaying control can result in lost soil moisture that could be used for crop production, as well as weed seed production, which will cause difficulties in the future.

When thinking about weed control in wheat stubble, there are two priorities – controlling already emerged weeds and preventing later flushes. Making applications before weeds exceed 4 to 6 inches is necessary for good control of already emerged weeds (Figure 1). Residual herbicides are necessary to reduce the number of herbicide applications required to control multiple flushes of weeds.

Figure 1. This large Palmer amaranth is regrowing after being sprayed with paraquat. Photo by Sarah Lancaster, K-State Research and Extension.

Despite a growing number of herbicide-resistant weeds, glyphosate plus 2,4-D LVE and/or dicamba continue to be important for weed control in wheat stubble. However, these herbicides alone are not likely to provide adequate control of pigweeds or kochia, especially when applied in the hot, dry conditions that are common after wheat harvest. Strategies for more successful herbicide applications in high temperatures were discussed in a previously published eUpdate article. The following paragraphs list some herbicide options commonly used to control weeds after wheat harvest.

Paraquat (Gramoxone, others) is a Group 22 herbicide that can work well in place of glyphosate for nonselective control of emerged pigweed and kochia. Paraquat is a contact herbicide, so spray coverage is critical. Spray volumes of 20 gallons/acre or higher are preferred, especially on larger weeds or denser stands. If sprayed at less than 20 GPA, flat fan nozzles are required to achieve smaller

droplet sizes. Paraquat needs to be applied with a non-ionic surfactant or oil concentrate to enhance the surface coverage of the plant foliage. Also, remember there is a requirement for handlers and applicators to complete training every three years to use paraquat.

If planning to plant corn or sorghum next spring, a tank mix of paraquat with **atrazine** (Group 5) will enhance the control of emerged weeds and provide some residual weed control. Atrazine labels have recently changed such that the only noncrop uses of atrazine permitted are for wheat stubble in wheat-fallow-wheat, wheat-corn-fallow, and wheat-sorghum-fallow rotations. In these rotations, it is still important to be aware of the total amount of atrazine you are applying to each field in a given year and stay below the maximum rate allowed for your field. **Metribuzin** is another Group 5 herbicide that can be used instead of atrazine to enhance control and provide some residual activity. There are three benefits of using metribuzin instead of atrazine.

- First, there are more options for crop rotation. Atrazine limits crop options to corn or sorghum in the next season, whereas metribuzin can be applied as a pre-emergence herbicide for soybeans or field peas.
- Second, post-emergence applications of metribuzin will have some activity on atrazine-resistant weed populations.
- Third, the residual weed control provided by metribuzin is likely not affected by enhanced degradation associated with extensive atrazine use.

One final note regarding paraquat. Limited research out of Australia suggests applying paraquat 2 weeks after a glyphosate application will increase weed control. This is called a 'double knock' strategy. This information is included here not as a recommendation per se, but to encourage careful thought about when you want to utilize contact herbicides in your fallow weed management system. If paraquat were sprayed with or before glyphosate, the rapid damage to leaf tissue with prevent uptake and translocation of glyphosate. However, if a glyphosate application partially controls weeds, there will be sufficient leaf area 2 weeks after application for paraquat to be effective.

Saflufenacil (Sharpen), a Group 14 herbicide applied at one to two fluid ounces per acre, is an option to provide postemergence and short-term residual control of Palmer amaranth, kochia, and other broadleaf weeds. Sharpen should be applied with glyphosate for grass control, and can be applied with other products labeled for use in wheat stubble, but do not apply Sharpen with Valor. Sharpen works best with the addition of methylated seed oil *and* ammonium sulfate. Good spray coverage is needed, so using 15 to 20 gallons/acre spray solution is important. Be sure to note crop rotation intervals for your situation, especially if using more than one fluid ounce per acre or applying to sandy or low organic matter soils. **Tiafenacil (Reviton)** is a Group 14 very similar to Sharpen in terms of weed control and adjuvant use.

Flumioxazin (Valor, others) is a Group 14 herbicide that can be added to burndown treatments at rates of one to four fluid ounces per acre for activity on emerged broadleaf weeds and some residual activity on broadleaf and grass weeds in wheat stubble. Flumioxazin can be mixed with glyphosate or clethodim (Select Max) for enhanced grass control. It can also be mixed with 2,4-D, atrazine, metribuzin, or paraquat.

- Wheat can be planted 30 days after two fluid ounces per acre, or 60 days after three fluid ounces per acre if at least one inch of rain occurs between application and planting.
- Soybeans can be planted immediately after an application of three fluid ounces per acre.
- Corn, sorghum, cotton, sunflowers, or soybeans can be planted in the spring following the

application of four fluid ounces per acre.

Residual weed control with flumioxazin will depend on rainfall (0.25 inch) for activation, just as with pre-plant treatment in soybeans.

Another group 14 herbicide that can be considered is **sulfentrazone (Spartan, others)**. Sulfentrazone can be applied to stubble and will control Palmer amaranth and kochia as well as other broadleaf weeds and some grasses. However, sulfentrazone can limit crop rotation options. Specifically, if rates greater than 8.0 fl oz of a 4L formulation are used, the rotation to sorghum is 18 months, while it is 10 months for lower rates.

Of the Group 14 herbicides discussed, flumioxazin and sulfentrazone provide the greatest residual activity; however, saflufenacil provides greater postemergence kochia control than flumioxazin.

Research to evaluate Palmer amaranth control in wheat stubble was conducted in Hays during 2019 and 2020. Herbicides were applied approximately 3 weeks after harvest to Palmer amaranth that was two to three feet tall. Palmer amaranth control 4 weeks after application is summarized in Figure 2. In general, treatments that included paraquat (Gramoxone) resulted in the greatest Palmer amaranth control.

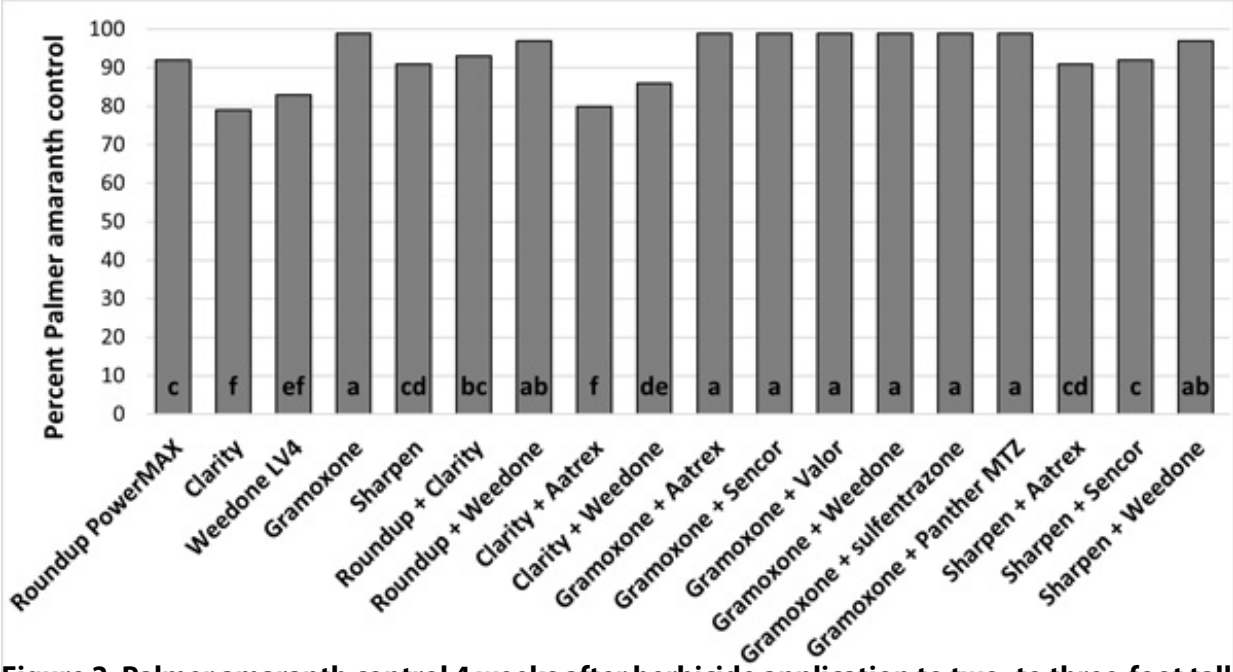

Figure 2. Palmer amaranth control 4 weeks after herbicide application to two- to three-foot tall Palmer amaranth in wheat stubble. Treatments with the same letter are not significantly different from each other. Data from Kumar et al. 2021.

For more detailed information, 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. Users should read and follow all label directions.

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4. Root lodging and green snap in corn

Some of the storms and extremely high winds this week have caused leaning and significant stalk breakage in corn fields in some areas of the state. In these kinds of storms, it is not unusual to have a significant portion of plants leaning over or broken off somewhere along the stalk in some fields.

When corn leans over or is flattened without stalk breakage, we refer to it as "**root lodging**". When stalks are broken, we usually refer to it as "**green snap**".

Root lodging (Figure 1): This typically occurs when strong winds pull the roots on one side partway out of the soil, and most often occurs when the soil is saturated and soft. If root lodging occurs early, plants usually recover or stand back up at least partly. This will usually appear as a response and results in the characteristic gooseneck bend in the lower stalk with new brace roots providing above-ground support.

Figure 1. Root lodging due to the high winds. Photo by Tina Sullivan, K-State Research and Extension.

Green snap (Figure 2): This typically occurs when high winds cause stalks to break or snap as corn is rapidly growing (V8 to tassel) in the two- or three-week period from late vegetative until silking. In this case, the stalks have enough height to catch more wind and are also typically more brittle and susceptible to breakage during this period.

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Figure 2. High wind during V8 to tassel can result in green snap. These photos were taken in south central Kansas around mid-June 2025. Photos courtesy of Tina Sullivan and Sarah Lancaster, K-State Research and Extension.

Factors influencing root lodging and green snap

A number of factors can affect the severity of root lodging and green snap. Anything that contributes to rapid, vigorous growth may make corn more susceptible to this problem. Often, our best management practices for corn (i.e., high N fertilizer rates, rotation after soybeans, higher plant density promoting early competition with faster elongation and thinner stalks) can contribute to the severity of damage. Although no hybrid is immune to the problem, some hybrids are more susceptible to root lodging or green snap than others. Timing also has a huge impact on the severity of damage, with much less damage in younger corn or in fields that have tasseled and flowered. Fields with younger, shorter corn are more likely to see root lodging than green snap.

What are the implications?

When **root lodging** occurs early, there may be little or no impact on yield. However, when corn is leaned over later in the season, some yield decrease should be expected due to partial loss of root activity and reduced light interception. Lodging during pollination may severely interfere with fertilization and significantly reduce kernel set. While corn may recover from early root lodging, though with a characteristic goose-necked stalk, it may be more susceptible to lodging at maturity.

In the case of **green snap**, there is no hope for recovery. However, the corn ear may develop normally if the stalk breaks above the primary ear node. Even with stand loss from green snap, the yield loss may not be proportional to the stand loss. When green snap occurs before tasseling, surviving plants could respond by increasing ear size, final kernel weight, or even by setting additional ears. With 10% or fewer broken stalks, it may be hard to detect a significant yield loss if stands were adequate before the storm.

Research conducted in Minnesota, Nebraska, and Iowa shows that yield loss due to green snap ranged from 0.5 to 1.0% for every 1% stand loss. Yield loss was least severe when stalks broke above the primary ear and greatest when stalks broke below the ear from V12 to the tassel. Research conducted by North Dakota State University further showed the response of corn yields to green snap at V12, V15, and V18 (Table 1). If stalks are broken off below the primary ear, the lower the break, the better. This will allow neighboring plants to take advantage of increased light resources to flex their yield components upwards and partially compensate for the lost plant.

In a 4-year study at Garden City, Kansas, irrigated corn stands were thinned 0, 25, 50, and 75% at V5, V8, V11, and V14 to simulate plant removal by hail. A 25% reduction in stand did not reduce yield when conducted even as late as V11. This was due to the remaining plants having a combination of increased ears per plant, increased kernel number, and increased kernel weight. Observed yield losses across all treatments in the study were always less than a 1:1 relationship with plant removal, thus highlighting the yield plasticity that does exist in corn.

Table 1. Corn yield reduction (%) from three levels of green snap occurrence at three growth stages. Data courtesy of North Dakota State University Extension.

Green snap	Growth stage when damage occurred		
	V12	V15	V18
occurrence (%)	---------- Yield reduction ----------		
25	11%	10%	14%
50	14%	23%	30%
75	27%	37%	48%

Action plans

1. Significant root lodging or green snap may reduce canopy cover and the capacity of the crop to suppress weeds. It is important to consider what herbicides have been applied, especially residual products, and consider the need for follow-up applications to control weeds in the absence of crop canopy.
2. If stand losses are very severe, there may still be an opportunity to harvest the worst areas for forage. It is also not too late to terminate stands to plant sunflower, soybeans, or grain or

forage sorghum. However, these options may be limited by the herbicide program used on the damaged corn crop.

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5. Plant analysis for testing nutrient levels in corn

Plant analysis is an excellent in-season "quality control" tool. It can be especially valuable for managing secondary and micronutrients that do not have high-quality, reliable soil tests available and for providing insight into how efficiently you are using applied nutrients.

Kansas farmers can use plant analysis in two basic ways: for **diagnostic** purposes and for **monitoring** nutrient levels at a common growth stage. Diagnostics can be done at any time, but are especially valuable early in the season when corrective actions can easily be taken. Monitoring is generally done at the beginning of reproductive growth.

General sampling guidelines:

- Plants are less than 12 inches tall: Collect the whole plant; cut the plant off at ground level.
- Plants more than 12 inches tall and until reproductive growth begins: Collect the top fully developed leaves (those which show leaf collars).
- After reproductive growth starts, collect the ear leaves (below the uppermost developing ear). Samples should be collected at random from the field at silk emergence.

Figure 1. Corn sampling during different growth stages. Photos by Dorivar Ruiz Diaz, K-State Research and Extension.

Plant analysis for diagnostic sampling

When diagnosing field problems, the comparison of good and poor areas is more important than collecting specific plant parts. Plant tissue analysis is a valuable diagnostic tool to help explain variability in corn growth across a field.

For best results:

- Collect samples from both healthy and affected areas, at any growth stage.

- Take both plant tissue and soil samples from each area to better understand potential causes.

Soil samples may reveal low nutrient levels that explain deficiencies, but physical conditions, like soil compaction or saturation, can also restrict nutrient uptake, especially for potassium, even when soil levels are adequate.

Plant analysis for nutrient monitoring

Plant leaves should be collected as the plant enters reproductive growth for general monitoring or quality control purposes. Sampling under stress conditions for monitoring purposes can give misleading results and is not recommended. Stresses such as drought or saturated soils will generally limit nutrient uptake and result in a general reduction in nutrient content in the plant.

How should you handle collected samples, and where should you send the samples?

The collected leaves should be allowed to wilt overnight to remove excess moisture, placed in a paper bag or mailing envelope, and shipped to a lab for analysis. Do not place the leaves in a plastic bag or other tightly sealed container, as the leaves will begin to rot and decompose during transport, and the sample won't be usable. Most soil testing labs in the region provide plant analysis services, including the K-State Testing Lab. For questions about the plant tissue testing services at the K-State Testing Lab, email soiltesting@ksu.edu or call 785-532-7897.

What nutrients should be included in the plant analysis?

In Kansas, nitrogen (N), phosphorus (P), potassium (K), sulfur (S), zinc (Zn), chloride (Cl), and iron (Fe) are the nutrients most likely to be found deficient. Recently, questions have been raised concerning copper (Cu), manganese (Mn), and molybdenum (Mo), though widespread deficiencies of those micronutrients have not been found in the state.

Normally, the best values are the "bundles" or "packages" of tests offered by many labs. They can be as simple as N, P, and K, or they can be all the mineral elements considered essential to plants. K-State offers a package that includes N, P, K, Ca, Mg, S, Fe, Cu, Zn, and Mn.

What will you get back from the lab?

Laboratories typically report plant tissue analysis results as the concentration of nutrient (or potentially toxic) elements in plant tissue. Results are expressed in:

- **Percent (%)** for primary and secondary nutrients: nitrogen (N), phosphorus (P), potassium (K), calcium (Ca), magnesium (Mg), sulfur (S), and chlorine (Cl).
- **Parts per million (ppm)** for most micronutrients: zinc (Zn), copper (Cu), iron (Fe), manganese (Mn), boron (B), molybdenum (Mo), and aluminum (Al).

These nutrient concentrations are usually compared to **published sufficiency ranges**, reference values based on surveys of healthy, high-yielding crops. Sufficiency ranges represent the concentrations considered optimal for plant growth. Much like how doctors interpret blood test results using standard reference values, agronomists use these ranges to assess crop nutrition.

Important points to consider:

- Sufficiency ranges vary by plant age, plant part, and even hybrid. Younger plants generally have higher concentrations.
- A value slightly below the sufficiency range doesn't necessarily indicate a deficiency—it may simply reflect dilution from vigorous growth. In fact, very high-yielding crops often test at the lower end of the sufficiency range.
- Significantly low values, on the other hand, may warrant closer investigation into nutrient supply and availability.

Remember that any plant stress conditions (e.g., drought, heat, soil compaction, or saturated soils) can seriously reduce nutrient uptake and plant tissue nutrient concentrations, even if soil nutrient levels are adequate. For example, drought can inhibit nutrient transport to roots, and high soil pH can limit micronutrient availability, especially iron.

Conversely, levels above "sufficiency" can also indicate problems. High concentrations can indicate over-fertilization or luxury uptake. In some cases, plants may accumulate excess amounts of one nutrient to compensate for a deficiency of another—for example, interactions among iron, zinc, and manganese.

Table 1 gives the range of nutrient contents considered normal or "sufficient" for corn seedlings below 12 inches tall and for the ear leaf of corn at silking. Remember, these are the ranges normally found in healthy, productive crops.

Table 1. The range of nutrient contents considered "normal" or "sufficient" at two growth stages in corn.

Nutrient	Unit	Whole Plant (<12 inches tall)	Corn Ear Leaf at Green Silk
Nitrogen (N)	%	3.5-5.0	2.75-3.50
Phosphorus (P)	%	0.3-0.5	0.25-0.45
Potassium (K)	%	2.5-4.0	1.75-2.25
Calcium (Ca)	%	0.3-0.7	0.25-0.50
Magnesium (Mg)	%	0.15-0.45	0.16-0.60
Sulfur (S)	%	0.20-0.50	0.15-0.50
Chloride (Cl)	%	Not established	0.18-0.60
Copper (Cu)	ppm	5-20	5-25
Iron (Fe)	ppm	50-250	20-200
Manganese (Mn)	ppm	20-150	20-150
Zinc (Zn)	ppm	20-60	15-70
Boron (B)	ppm	5-25	4-25
Molybdenum (Mo)	ppm	0.1-10	0.1-3.0
Aluminum (Al)	ppm	<400	<200

Summary

Plant analysis is a good tool for monitoring the effectiveness of your fertilizer and lime program and a very effective diagnostic tool. Pairing tissue tests with soil samples and considering factors like

drought or soil pH can provide a clearer picture of nutrient availability and uptake. Consider adding this agronomic practice to your toolbox.

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6. Fungicide considerations for corn: Scouting, timing, and disease risk

We are entering the time window in Kansas when corn producers should be scouting fields and assessing the need for a foliar fungicide application. In cooperation with the K-State Plant Pathology Department, the Kansas Corn Commission has launched an online **Corn Disease Resource Center** (https://kscorn.com/corndisease/) to help corn growers identify what diseases to watch for in their geographic area. Several fields in Kansas are approaching the V10-VT (tassel) development stage. Now is the time to be out scouting for the following fungal diseases of corn:

- **Southern Rust (Figure 1, left)**
- **Common Rust (Figure 1, right)**
- **Gray Leaf Spot (Figure 2)**
- **Tar Spot (Figure 3)**

Southern rust scouting. Southern rust is typically first reported in Kansas in mid-July. Pustules appear on the upper leaf surface, unlike common rust, which can be found on either side of the leaf (Figure 1). The pustules are scattered on the leaf surface, and spores appear orange and rub off on fingers (and clothes!). Severe infections can be seen on the leaf sheaths.

Figure 1. Typical symptoms of southern rust (left) and common rust (right). Photo courtesy of Rodrigo Borba Onofre, Department of Plant Pathology, K-State Research and Extension.

Gray leaf spot scouting. Begin scouting for gray leaf spot in corn about two weeks before expected tassel emergence. Gray leaf spot is characterized by rectangular lesions that are 1-2 inches long and cover the entire area between the leaf veins (Figure 2). Early lesions are small, necrotic spots with

yellow halos that gradually expand to full-sized lesions. Lesions are usually tan in color but may turn gray during foggy or rainy conditions. The key diagnostic feature is that the lesions are usually very rectangular in shape.

Figure 2. Gray leaf spot lesions are rectangular in shape and delimited by leaf veins. Photo courtesy of Rodrigo Onofre, Department of Plant Pathology, K-State Research and Extension.

Tar spot scouting. Tar spot is now active in several corn fields in the northeast corner of Kansas. To date, it has been reported in Doniphan and Brown Counties. Tar spot lesions are black, raised, and have a round/elliptical shape (Figure 3). Susceptible corn hybrids may be at particularly high risk for yield or silage loss.

More information on tar spot is available in the recent eUpdate article from June 12, 2025: https://eupdate.agronomy.ksu.edu/article/low-levels-of-tar-spot-have-been-confirmed-in-kansas-646-1.

Figure 3. Tar spot of corn. Purple arrows are indicating a few of the tar spot lesions. Photo courtesy of Rodrigo Onofre, Department of Plant Pathology, K-State Research and Extension.

For confirmation of tar spot, please submit samples to the K-State Plant Pathology Diagnostic Clinic at https://www.plantpath.k-state.edu/extension/plant-disease-diagnostic-lab/

Factors that influence corn yield response to fungicide applications

Research clearly demonstrates that the single best time to apply a fungicide to corn for gray leaf spot control is from VT to R1. First applications for tar spot disease management should be between V10 to VT growth stages, and, if needed, a second fungicide application should be between R1 to R3 growth stages. A single application at V6 – V8 will not hold up against late-season pressure. A VT to R3 growth stage fungicide application may also provide suppression of southern rust. Some fungicides that are good to excellent for gray leaf spot are also very good for tar spot and southern rust control. Summaries of multi-year university research about fungicide efficacy can be found here:
https://cropprotectionnetwork.s3.amazonaws.com/CPN2011_FungicideEfficacyControlCornDiseases_04_2022-1650470887.pdf

Disease risk factors to consider when weighing the benefits of a fungicide application

Susceptibility level of corn hybrid. Seed companies typically provide information on the susceptibility of their hybrids to tar spot, gray leaf spot, and southern rust. In general, hybrids that are more susceptible to fungal foliar diseases will have a greater response to a foliar fungicide (if disease pressure is high enough).

Previous crop. Because tar spot and gray leaf spot survive in corn residue, the risk of disease increases when corn is planted back into a field that was in corn the previous year. Fields with a history of gray

leaf spot and tar spot should be closely scouted. Southern rust, on the other hand, blows in from the south each year. It is important to watch regional updates about southern rust pressure in the state.

Weather. Rainy and/or humid weather is generally most favorable to gray leaf spot. In growing seasons, when these conditions prevail, the risk for disease development increases. Southern rust is favored by warm days and nights (> 80 degrees) and high humidity. Tar spot is favored by mild temperatures (60°F to 73°F), high relative humidity (>75%), and a prolonged leaf wetness period (>7h).

Field history. Some field locations may have a history of high foliar disease severity. Fields in river bottoms or low areas, or surrounded by trees, may be more prone to having gray leaf spot.

If no disease is present or pressure is low, I recommend holding off on the VT-R1 application since efficacy will begin to wane in three to four weeks, just as late-season pressure may begin to develop. Data suggests that if disease pressure begins to develop later, an R2 application can be economical and will provide protection later into the grain fill period. This later application could also protect against any late-season southern rust pressure.

Distinguishing between gray leaf spot and bacterial streak

Bacterial streak, identified as a new corn disease in the U.S. in 2016, is now active in most of western Kansas. While yield loss potential for this disease remains unknown, we do know that it can be misidentified as gray leaf spot, resulting in unwarranted fungicide applications. Fungicides will not have any effect on bacterial streak. Remember that gray leaf spot typically has very sharp edges defined by the leaf veins, whereas bacterial streak will have a wavy edge that can cross the leaf vein (Figure 4). Also, when backlit with light, gray leaf spot lesions will have an opaque appearance, while bacterial streak lesions are more translucent (Figure 4).

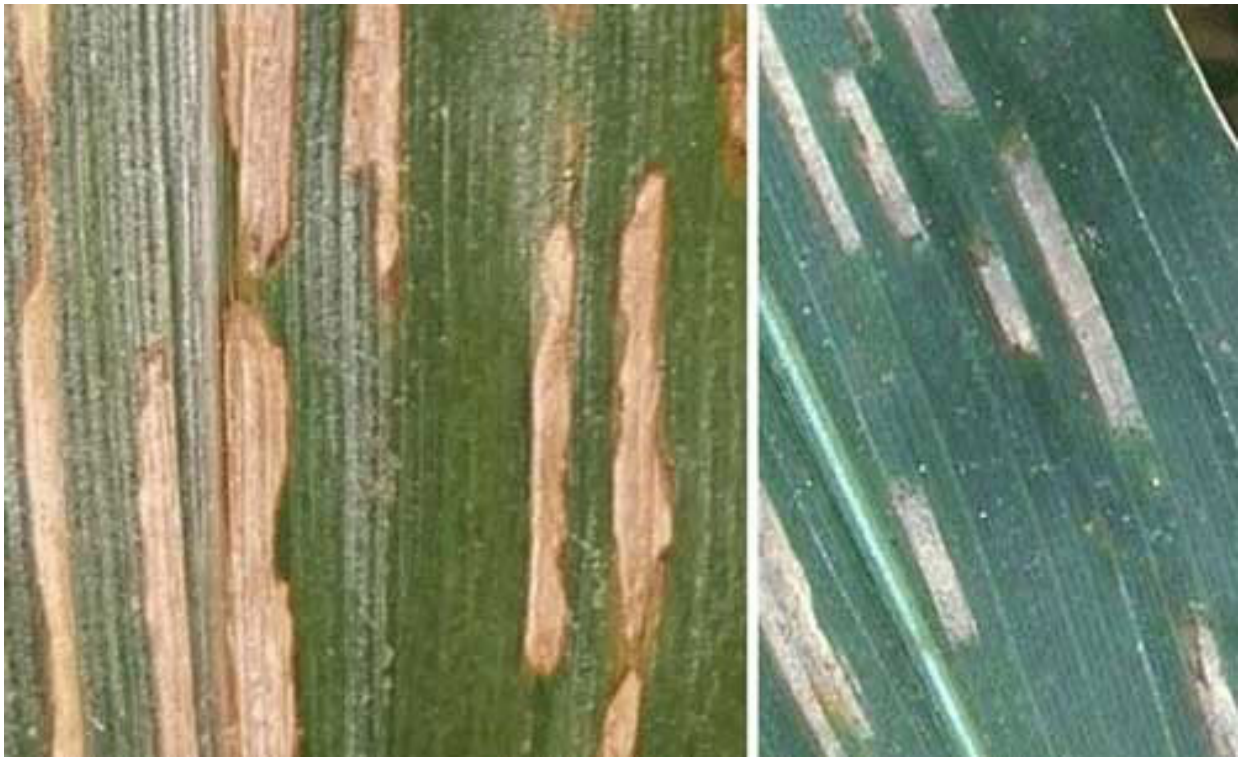

Figure 4. Comparison of sharp-edged gray leaf spot lesions (right) with wavy-edged bacterial streak lesions (left). Photo courtesy of the University of Nebraska.

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7. Fall armyworm season approaches - Get ready to scout fields

Fall Armyworm, *Spodoptera frugiperda*, can damage several key Kansas crops as well as pasture, turf, and home landscaping. This insect does not overwinter in Kansas. Rather, it is native to the tropical regions of the western hemisphere and is active year-round along the Gulf Coast and southern Florida, migrating in from these locations each year. Two full generations are possible in Kansas, with defoliation and grain damage being the biggest concerns. Each generation's abundance and distribution across the landscape are usually different; the first generation does not necessarily impact the abundance of the second generation. Feeding damage from fall armyworm during the vegetative stage in corn and sorghum causes chewed-up and ragged-looking leaves. In fact, one of the common names used for fall armyworm during this stage is "ragworm". Sorghum is particularly at risk during grain fill, as fall armyworm will completely consume berries as they develop. This caterpillar has been causing increased concern in eastern Kansas brome fields over the last couple of seasons. Brome fields can rapidly decline from fall armyworm feeding (Figure 1) as large numbers of caterpillars can be present, consuming leaf material. Often, larger caterpillars are found along with younger ones.

Figure 1. Brome field damaged by fall armyworm caterpillars. Photo by Tina Sullivan, K-State Research and Extension.

Fall armyworm tends to begin arriving in Kansas towards the end of June, so scouting should start for

this pest in at-risk crops and on a weekly basis for the remainder of the growing season. Caterpillars increase in size at an exponential rate, and most of the feeding occurs during the later stage of development. It is critical to scout early and treat, if needed, when the caterpillars are less than an inch long. Larger caterpillars are harder to control and do the most damage. Often, infestations are discovered after it is too late to treat. Recommended thresholds can be found below.

Fall Armyworm Thresholds

- **Alfalfa**: 1-2 caterpillars per square foot can destroy seedling alfalfa. 10-15 per square foot can destroy 12" tall plants.
- **Corn**: Damage to the whorl stage in early summer is typically not a concern and will not impact yield. Bt corn may prevent ear damage.
- **Sorghum**: Damage to the whorl stage in early summer is typically not a concern. 1-2 larvae/head during flowering to soft dough reduces yield by 5-10%.
- **Wheat**: Larval "window-paning" in early planted wheat can be a concern. Very late second-generation fall armyworm will be the biggest concern for wheat. If 25-30% of plants show damage, examine the field frequently. Treat at 2-3 active larvae/ft.
- **Pasture/Brome**: If damage is notable or there is window-paning, treatment may be warranted with 4 to 5 caterpillars per square foot.

Since fall armyworm is present for several months of the growing season, it is possible that sometimes mixed infestations of different caterpillar species can occur (Figure 2). As with any pest, proper identification is important to ensure that the right control recommendations are followed. A species often confused with fall armyworm is true armyworm, *Pseudaletia unipuncta*. The two species can be told apart with a couple of easily seen characteristics. Fall armyworm has a noticeable inverted "Y" on its head (Figure 3), while true armyworm does not. Additionally, the thickest stripe on the side of the fall armyworm caterpillar will be dark, while on true armyworm the thickest stripe is tan to orange (Figure 4).

Figure 2. Caterpillars were found damaging a brome field. Infestations can often include multiple species and multiple life stages. Photo by Tina Sullivan, K-State Research and Extension.

Figure 3. Fall armyworm, notice the thickest stripe is black. Photo courtesy K-State Entomology Department.

Figure 4. True armyworm, notice the thickest stripe is a light color. Photo courtesy K-State Entomology Department.

For more information regarding fall armyworm management, take a look at the following Insect Pest Management Guides:

Corn Insect Pest Management - https://bookstore.ksre.ksu.edu/pubs/corn-insect-pest-management-2025_MF810.pdf

Sorghum Insect Pest Management - https://bookstore.ksre.ksu.edu/pubs/sorghum-insect-pest-management-2025_MF742.pdf

Wheat Insect Pest Management - https://bookstore.ksre.ksu.edu/pubs/wheat-insect-pest-management-2025_MF745.pdf

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8. Annual forage insurance: Policy basics and examples for water-limited operations

The deadline to purchase Annual Forage Insurance (AFI) is July 15 for any annual forage crop planted from August 2025 to July 2026, which is recognized as the 2026 commodity year. Producers who buy coverage will have premiums billed on Aug. 30, 2026. You are not required to secure AFI coverage for all annual forage acres planted.

This article covers key AFI policy characteristics and provides examples relevant to producers who grow annual forage crops as a tool to manage water shortages. Additionally, refer to this 2023 article, which discusses several AFI advantages and disadvantages. This 2024 AgManager.info article provides more details about interval selection.

What is Annual Forage Insurance?

An insurance product based on a precipitation (rainfall) index, AFI intends to protect policyholders if annual forage crops yield poorly due to insufficient rain. This includes annual crops used for grazing, haying, grazing/haying, grain/grazing, green chop, grazing/green chop, or silage. When precipitation falls below a set amount, a policy provides a payout.

Precipitation is measured locally in a "grid" that roughly covers a 14- by 16-mile area. As such, a policyholder may not receive a payout for an insured field that records low rainfall if the grid has above-average rainfall. Likewise, if all of a policyholder's insured fields have sufficient rainfall but the grid has below-average rainfall, then the policy still could yield a payment. Such variation is less likely during severe droughts when rainfall shortages tend to be widespread.

Like other federal crop insurance products, the government shares the AFI premium cost with policyholders.

Who may want to consider purchasing Annual Forage Insurance?

Nearly anyone in Kansas or other select states who produces an annual crop and feeds it to livestock as a grazing forage, grain, silage, or other feedstock can use AFI. Coverage may be of interest to producers who (1) want to manage drought or rainfall risk or (2) cannot use regular multi-peril crop insurance or are looking for alternatives.

What major decisions must you make to use Annual Forage Insurance?

1. A producer must make three major choices: *Coverage level:* The coverage level determines the local precipitation necessary to trigger a payout. The higher the coverage level, the higher the premium and the higher the likelihood and size of a payout. You may select a coverage level from 70% to 90%. A 90% coverage level will trigger a payout when precipitation within a grid is less than 90% of the historical average. A policy with a 90% coverage level would trigger a payout if precipitation is 80% of the historical average. If a policy had a 75% coverage level, then it would *not* pay out.

2. *Productivity factor:* A producer must select a productivity factor, which ranges from 60% to 150%. The productivity figures effectively scale AFI premiums and potential indemnities down or up — in effect decreasing or increasing the AFI guarantee, or the value of the forage

crop that is insured. The highest productivity factor has the highest premium and the most potential payout when precipitation is lower than normal. Producers growing a high-value forage crop may want to select a higher productivity factor that will more likely match the value of their crop. For lower-value forage crops, a lower productivity factor may be preferred.

3. *Growing season and intervals:* Producers must select what months to use AFI. The "growing season" extends for seven months beginning in the month after a forage crop's planting date. For example, a crop planted in June would have a growing season from July through January. Within a growing season, the producer must select four months to six months to be covered by AFI. Known as intervals, the coverage periods can be structured as three 2-month intervals, or for select growing seasons, two 2-month intervals may be an option. Read more about interval selection later in this article.

Where is Annual Forage insurance used in Kansas?

For 2025 (commodity year)*, nearly 435,000 acres in Kansas have AFI coverage to date — up from more than 408,000 acres in 2024 (commodity year) and more than 323,000 acres in 2023 (commodity year). The value of annual forage crop production insured (insurance liabilities or guarantee) totals nearly $103.7 million in 2025 (commodity year). Figures 1 and 2 (see article on AgManager) show relatively high AFI participation in several western and south-central Kansas counties during 2025 and 2024, respectively, and limited participation in the eastern third of the state. AFI has only been used in Kansas since 2014. Producers more commonly grow annual forages in western Kansas than eastern Kansas, and western Kansas is more susceptible to drought than eastern Kansas.

**The 2025 commodity year is still in progress. It refers to AFI policies purchased by the July 15, 2024, deadline with growing seasons that began in September 2024 and will extend through August 2025. Because the 2025 commodity year is in progress, any statistics reported here are subject to change.*

Does it pay?

To date, commodity year 2025 AFI payouts in Kansas total more than $29 million compared with more than $12 million in producer-paid premiums. Thus far, 2025 payouts are higher than payouts in any other year on record. Current 2025 loss ratios are reported in Figure 3.

In 2024 (commodity year), *$21.1 million in indemnities*, averaging about $52 per insured acre, were paid to Kansas producers using AFI. Kansas producers paid nearly *$9.6 million in premiums*. Figure 4 shows 2024 county-level loss ratios, which represent the ratio of total indemnities to total premiums including the government-paid portion. Loss ratios were highest in far northwest, southwest, and select central Kansas counties; this reflects rainfall outcomes as well as producer-selected coverage ratios and intervals. Of the 72 counties with some acreage enrolled in AFI, 44 counties received more indemnities than they paid in premiums. However, individual policy performance may differ from county averages or totals.

A producer who consistently uses AFI year over year is likely to receive more indemnities than what's paid in premiums because the federal government pays at least half of the premium; the subsidy amount varies based on coverage level. That said, producers are not guaranteed an indemnity, and several years can pass without indemnities.

How does selecting a growing season work?

The AFI growing season refers to the seven months following the month when the forage crop is planted. Like with other crop insurance programs, an AFI-covered forage crop must be planted between early and final planting dates stipulated by a policy. Acreage reporting must take place by the fifth day of a growing season's first month. Take the following scenarios as examples.

- Growing season 1 for commodity year 2026 begins in September 2025 and ends in March 2026. For growing season 1, the earliest planting date is Aug. 1, 2025, and the final planting date is Aug. 31, 2025. Acreage reports are due on Sept. 5, 2025.
- Growing seasons 5 and 6 — those beginning in January and February with planting dates in December and January, respectively — are **not** allowed in Kansas. Any forage crops planted in December or January would be reported in growing season 7, which begins in March.
- The final (12th) growing season for commodity year 2026 begins in August 2026 and ends in February 2027. The earliest planting date for this growing season is July 1, 2026, and the final planting date is July 31, 2026. Acreage reports are due on Aug. 5, 2026.

How does interval selection work?

Interval selection has some rules. Either two or three 2-month intervals must be selected.

- For growing seasons 1-4 and 7-9, three 2-month intervals within the growing season must be selected and assigned weights that add to 100% — for example, 30%, 30%, and 40%. These weights scale up or down the protection — both premium and potential indemnities — provided in each interval. No single month can be insured twice within a growing season, so the producer must insure six of a growing season's seven months. For a single interval, the highest weight is 40%, and the lowest is 20%.
- For growing seasons 10, 11, and 12, which begin in June, July, and August, respectively, two or three intervals are allowed. The highest single interval weight allowed is 50%.

Examples and strategies for interval selection are available in this 2024 AgManager.info article.

Below are two examples of using Annual Forage Insurance when producers regularly face water shortages or drought.

Example 1: Triticale Production for Silage in Scott County

Context: Producers facing limited irrigation water availability — due to declining well yields or groundwater use restrictions — may consider switching to crop rotations that require less irrigation. For instance, instead of planting continuous corn, a producer could rotate between corn and triticale. Triticale typically requires at least one-third less water than corn, so it is a more drought-resilient option. Depending on how it's managed, triticale can be insured through AFI or Triticale APH (yield-based) insurance. This example highlights how AFI insurance works.

Scenario: A producer in Scott County (grid 22016) planted winter triticale in early September 2024 and used AFI in growing season 2, which extends from October (**2024**) to April (**2025)**. The grower selected a **90%** coverage level and **100** productivity factor. The farm insured the following intervals: October to November at a **40%** weight, January to February at **20%**, and March to April at **40%**. For protection (guarantee/liability) of **$296**, the producer would have paid a **$41** premium per acre. The producer would have received a **$53** indemnity per acre for very low rainfall during the January to February interval. Rainfall during the October to November interval was double the historical average

(no indemnity), and the March to April interval has not yet been reported.

Example 2: Dual-Purpose Wheat in Ford County

Context: Grazing wheat or other small grains during the fall can extend the typical grazing season, provide a very high-quality forage, and have little to no effect on subsequent grain yield if managed correctly. The AFI "dual-use option" or "graze and grain" practice can help producers make full use of limited moisture by capturing forage and grain value from a single planting. To avoid negative effects on grain yield, livestock must be removed prior to first hollow stem or the insurance cutoff date — whichever comes first. This approach can be especially useful when water availability or irrigation capacity is constrained, and it provides flexibility in maximizing economic returns based on grain and livestock prices.

Scenario: A producer planted winter wheat for dual-purpose use (graze plus grain) in late September 2024 in Ford County (grid 20820) and used AFI in growing season 2: October (**2024**) to April (**2025**). Dual-purpose wheat is insurable under the AFI dual-use option but at a **40%** lower county base value; note, if grown strictly for forage, then the base value is 100%. The grower selected a **90%** coverage level and **100%** productivity factor. Since fall growth is most important for dual-purpose wheat, the producer selected the October to November interval at the highest rate possible (i.e., **40%** weight) and chose a **40%** weight for the December to January interval and **20%** weight for the February to March interval. The producer would have paid a premium of **$15** per acre for protection of **$104** per acre and received indemnities of **$49** for very low rainfall during the December-January and February-March intervals.

What else should be considered?

- For the 2026 commodity year, the **AFI sign-up deadline is July 15, 2025,** and Aug. 30, 2026, is the premium billing date. You may purchase AFI coverage from a local crop or livestock insurance agent. Find one at https://www.rma.usda.gov/tools-reports/agent-locator.
- As of commodity year 2024, producers are **not** required to purchase an AFI policy for all annual forage crops they produce.
- Premiums vary based on location, growing season, coverage leverage, and productivity factor. For commodity year 2025, premiums typically ranged from $10 to $60 per acre. On average, the producer-paid premium per acre in commodity year 2024 was about $23. Higher premiums reflect a higher likelihood and value of a payout.
- The acreage reporting deadline — the fifth day of the month following the planting period — is important to note. If the acreage isn't used for annual forage or other conditions are not met, then the policy may not "attach," meaning no payouts are made and the producer doesn't pay a premium. Producers using AFI should discuss acreage reporting deadlines with their insurance agents.
- Small grains used for *both* grazing and grain production have a "dual-use option." See the RMA FAQs for more information. This option is available for growing seasons 1-3 only, and the county base value is adjusted to be 40% of the full county base value. This lowers the AFI guarantee in terms of the premium and potential payouts. The dual-use option would be used when grazing a crop through the winter and harvesting it for grain in the summer. The producer would also purchase a separate multi-peril crop insurance policy for grain yield (i.e., a revenue protection policy for wheat).
    - Separately, multi-peril crop insurance for wheat (small grains) could be "short-rated" or fully grazed out instead of harvested for grain. If this "short-rated" practice is

reported before the insurance cutoff date (March 15), it allows for reducing the grain coverage premium. However, no coverage would be applied for grain production. Based on the price of grain and livestock gain, this may be beneficial. *This option applies to the multi-peril policy only, regardless of AFI* coverage.

- Indemnities are based on deviations from normal or average precipitation. If certain months are typically dry, then they would have to be *even drier* to trigger an AFI indemnity.

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9. Registration is open for the 2025 K-State/KARA Summer Field School

Kansas State University and the Kansas Agribusiness Retailers Association (KARA) are hosting two 2-day Summer Field School sessions on July 8–9 and July 10–11, 2025, at the K-State Agronomy Education Center (2213 Agronomy Farm Road), located just north of the K-State football stadium in Manhattan.

This year's program will spotlight soybean and cotton production, with comprehensive, hands-on sessions covering:

- Crop growth and soil fertility for soybeans and cotton production
- Herbicide symptomology and glufosinate optimization
- Weed identification
- Precision agriculture
- Soil health
- Crop diseases and insect management

Agendas for both sessions are included at the end of this article.

Registration Information

- **2-day program:** $220 (includes lunch both days)
- **1-day option:** $135 (includes lunch for that day)
- Earn multiple CCA and 1A credits (exact credit total forthcoming)

The complete program overview and registration link are available at the K?State Agribusiness Retailers site: https://www.ksagretailers.org/events-training/ksu-field-days/

Lodging & Details

Lodging options and additional information are listed on the registration page.

Note for KSRE agents: A special registration link will be shared via the Ag Agent email listserv shortly - please wait for that link before registering.

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Kansas State University/KARA Summer Field School (Session 1)

North Agronomy Farm, Manhattan, July 8-9, 2025

K-STATE Research and Extension

	Tuesday 7/8/2023		
7:45 AM	Registration – **North Agronomy Farm**		
8:20 AM	Welcome, Instructions		
	Group A	**Group B**	**Group C**
8:45 AM	**Crop Insect Pests** (Whitworth)	**Weed ID** (Dille & Cott)	**Cotton/Soybean Growth & Development** (Simon & Sullivan)
9:35 AM	**Crop Diseases** (Onofre)		
10:25 AM	**Break**		
10:40 AM	**Weed ID** (Dille & Cott)	**Cotton/Soybean Growth & Development** (Simon & Sullivan)	**Crop Insect Pests** (Whitworth)
11:30 AM			**Crop Diseases** (Onofre)
12:20 PM	**Lunch – North Agronomy Farm**		
1:10 PM	**Cotton/Soybean Growth & Development** (Simon & Sullivan)	**Crop Insect Pests** (Whitworth)	**Weed ID** (Dille & Cott)
2:00 PM		**Crop Diseases** (Onofre)	
2:50 PM	**Adjourn**		
	Wednesday 7/9/2023		
7:00 AM	Registration – **North Agronomy Farm**		
	Group A	**Group B**	**Group C**
7:30 AM	**Cotton/Soybean Fertility and Production** (Ruiz Diaz, Simon & Sullivan)	**Herbicide Symptomology** (Lancaster)	**Precision Ag** (Joshi)
8:20 AM		**Optimizing Glufosinate** (Lancaster)	**Soil Health** (Obour)
9:10 AM	**Break**		
9:25 AM	**Precision Ag** (Joshi)	**Cotton/Soybean Fertility and Production** (Ruiz Diaz, Simon & Sullivan)	**Herbicide Symptomology** (Lancaster)
10:15 AM	**Soil Health** (Obour)		**Optimizing Glufosinate** (Lancaster)
11:05 AM	**Lunch – North Agronomy Farm**		
11:55 AM	**Herbicide Symptomology** (Lancaster)	**Soil Health** (Obour)	**Cotton/Soybean Fertility and Production** (Ruiz Diaz, Simon & Sullivan)
12:45 PM	**Optimizing Glufosinate** (Lancaster)	**Precision Ag** (Joshi)	
1:35 PM	**Break**		
1:50 PM	**Core Hour**		
2:40 PM	**Adjourn**		

Kansas State University/KARA Summer Field School (Session 2)

North Agronomy Farm, Manhattan, July 10-11, 2025

K-STATE Research and Extension

	Thursday 7/10/2023		
7:45 AM	Registration – **North Agronomy Farm**		
8:20 AM	Welcome, Instructions		
	Group A	**Group B**	**Group C**
8:45 AM	**Cotton/Soybean Fertility and Production** (Ruiz Diaz, Simon & Sullivan)	**Herbicide Symptomology** (Lancaster)	**Precision Ag** (Joshi)
9:35 AM		**Optimizing Glufosinate** (Lancaster)	**Soil Health (Obour)**
10:25 AM	**Break**		
10:40 AM	**Precision Ag** (Joshi)	**Cotton/Soybean Fertility and Production** (Ruiz Diaz, Simon & Sullivan)	**Herbicide Symptomology** (Lancaster)
11:30 AM	**Soil Health** (Obour)		**Optimizing Glufosinate** (Lancaster)
12:20 PM	**Lunch – North Agronomy Farm**		
1:10 PM	**Herbicide Symptomology** (Lancaster)	**Precision Ag** (Joshi)	**Cotton/Soybean Fertility and Production** (Ruiz Diaz, Simon & Sullivan)
2:00 PM	**Optimizing Glufosinate** (Lancaster)	**Soil Health** (Obour)	
2:50 PM	**Adjourn**		
	Friday 7/11/2023		
7:00 AM	Registration – **North Agronomy Farm**		
	Group A	**Group B**	**Group C**
7:30 AM	**Crop Insect Pests** (Whitworth)	**Weed ID** (Dille & Cott)	**Cotton/Soybean Growth & Development** (Simon & Sullivan)
8:20 AM	**Crop Diseases** (Onofre)		
9:10 AM	**Break**		
9:25 AM	**Weed ID** (Dille & Cott)	**Cotton/Soybean Growth & Development** (Simon & Sullivan)	**Crop Insect Pests** (Whitworth)
10:15 AM			**Crop Diseases** (Onofre)
11:05 AM	**Lunch – North Agronomy Farm**		
11:55 AM	**Cotton/Soybean Growth & Development** (Simon & Sullivan)	**Crop Insect Pests** (Whitworth)	**Weed ID** (Dille & Cott)
12:45 PM		**Crop Diseases** (Onofre)	
1:35 PM	**Break**		
1:50 PM	**Core Hour**		
2:40 PM	**Adjourn**		