Issue 1072

K-STATE Research and Extension

Extension Agronomy

eUpdate

09/18/2025

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 | 09/18/2025 | Issue 1072

1. Wheat planting: Tips for good stand establishment

Each fall, wheat producers face the challenge of planting wheat under a wide range of field and weather conditions. While soil moisture and timing are key considerations, stand establishment is also influenced by seeding practices, soil fertility, and residue management. Paying close attention to these factors can help ensure the crop has the best possible start.

Proper tractor speed. It is best to use a tractor speed of between 5 and 6 miles per hour in most cases when drilling wheat, depending on the amount of down pressure on the openers. If higher speeds are used, the openers can tend to "ride up" in the soil now and then if down pressure is insufficient.

Proper, uniform seeding depth. In most cases, the ideal planting depth for wheat is about 1.5 inches. When planting early into very warm soils, it is especially important not to plant too deep since coleoptile lengths are shortened when planting into warm soil. On the other extreme, producers should also be careful not to plant too deeply when planting later than the recommended planting date into very cool soils. Ensuring a uniform seeding depth will help with stand establishment. Planting into fields with heavy residue or uneven chaff distribution from the previous crop can make uneven planting depth and furrow closure a serious problem. In those situations, it is common to end up with poor stand establishment in field areas where the drill opener rode up over the residue or chaff and could not penetrate the soil to the same depth as in other field areas. These areas may also be more prone to damage from early spring freeze events since the crown will be formed close to the soil surface under heavy residue.

Firm seedbed. Planting into loose, fluffy soils after repeated tillage operations during the summer can be a problem. When seeds are planted into loose soil, rain in the fall will settle the soil and leave the crowns of the seedlings too close to the soil surface. A good closing system behind the drill openers, with adequate down pressure, should help. Avoiding tillage for 30 days prior to planting will increase the likelihood of rain settling the soil between the last tillage pass and planting.

Plant during the optimum window. In general, wheat should be planted somewhere around the Hessian fly-free date. There may be good reasons to plant some wheat before the fly-free date, such as planting for pasture or time pressures from having considerable acreage to plant. However, it's important to be aware that stand establishment and ultimate grain yields are usually best when wheat is planted after the best pest management planting date (BPMP, former Hessian fly-free date) and before deadlines set by crop insurance. Planting more than three weeks after the BPMP can be risky. Late-planted wheat often does not develop an adequate root system before winter, forming fewer productive fall tillers. Seeding rates should be increased by 25 to 50 percent when planting late to help ensure an adequate stand and compensate for the lack of tillering. See this recent eUpdate article about the risks of planting wheat too early https://eupdate.agronomy.ksu.edu/article/wheat-planting-be-cautious-of-planting-too-early-661-2

Adequate soil fertility. In general, producers should apply at least part of their nitrogen before or at planting time to get the plants off to a strong start. Nitrogen rates of 20-30 lbs can help with fall establishment and tillering. If the soil is low or very low in phosphorus or potassium, these nutrients should also be applied at planting time so that the plants benefit early in their development. Starter fertilizer with the seed or band-applied close to the seed can also help with fall early growth and establishment, particularly in low-testing soils. Low soil pH can be a concern, particularly early in the season when root systems are mostly near the surface, which is often an area of lower pH. Soil tests will determine the need for pH adjustment and the potential for aluminum toxicity. Variety selection and phosphorus application with the seed are potential management strategies for low pH and aluminum toxicity issues if it is too late to apply lime before seeding.

Make adjustments for planting into row crop stubble. When planting wheat into heavy grain sorghum stubble, producers will need an extra 30 lbs N per acre over their normal N rate. Also, it is important to ensure the sorghum is dead before planting wheat. When planting wheat into soybean stubble, producers should not reduce their N rates since the N credit from soybeans – when applicable - doesn't take effect until the following spring. If the wheat is planted no-till after row crop harvest, N rates should be increased by 20 lbs N per acre over the normal N rate. Seeding rates should be increased when planting wheat late after row crop harvest. It's best to use a seeding rate of 90 to 120 lbs per acre in central and eastern Kansas and 75 to 100 lbs per acre in western Kansas. When planting more than three weeks after the BPMP date, producers should use a seeding rate of 120 lbs per acre.

Watch out for potential disease issues when planting into corn residue. The risk of some diseases may be higher when wheat is planted in fields with large amounts of corn residue left on the soil surface. Fusarium head blight (scab) of wheat, for example, is caused by a fungus known to cause stalk rot in corn.

Using a seed treatment. Seed treatments can sometimes act as insurance, helping avoid seed-borne and early-season fungal diseases. Check out a previous eUpdate article on seed treatments for wheat disease management at https://eupdate.agronomy.ksu.edu/article/seed-treatments-for-wheat-663-3.

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

John Holman, Cropping Systems Agronomist – Garden City
jholman@ksu.edu

2. Wheat streak mosaic virus active in volunteer wheat in Kansas - Free testing available

Volunteer wheat has tested positive for wheat streak mosaic virus in Hodgeman, Mitchell, Republic, and Smith counties. These samples were collected as part of a statewide volunteer wheat (and other grass host) survey we have been conducting in response to the wheat streak complex outbreak in 2025. Although testing for other counties is still in progress, this is an important reminder that volunteer wheat control is the most important defense against wheat streak mosaic as we head into wheat planting this fall (Figure 1).

Figure 1. Volunteer wheat images from September 2025 in Kansas. Photos by Kelsey Andersen Onofre, K-State Research and Extension.

Free lab testing for the Wheat Streak Mosaic Virus Complex

Would you like to test your volunteer wheat or other grasses for the wheat streak mosaic virus complex? The Plant Pathology Department is offering **free testing** over the next several weeks. This will help us understand where these viruses survive over the summer and the risk going into fall wheat planting. Here are some reminders for collecting a good sample:

1. Each sample should consist of at least 5 entire plants/field, including roots. Plants should be green and in good condition for virus testing.
2. Carefully remove excess soil from the roots (no soil is preferred) to avoid damaging the plants.
3. Place each sample in a plastic bag for storage and transport. Keep cool until shipping.
4. Label the sample bag with the sample field ID
5. Fill out the submission form with as much information as possible. Include variety/hybrid info (especially for wheat). Attach it to the outside of the sample bag.
6. Ship samples overnight to the Diagnostic Laboratory (address is located on the submission form linked above) to ensure freshness and avoid deterioration during transit. Use FedEx or UPS, not USPS.

Additional shipping information can be found here: https://www.plantpath.k-state.edu/extension/plant-disease-diagnostic-lab/

As a reminder, we took a deep dive into wheat streak mosaic biology and management in this past eUpdate issue: https://eupdate.agronomy.ksu.edu/article/wheat-streak-mosaic-complex-webinar-and-management-resources-now-available-654-8

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

3. Small grain forage options for this fall

Planting annual forages in the fall can help alleviate a lack of forage in dry years, rest perennial pastures, and provide high-quality forage during a time of the year when forage amount is limited and forage quality is very low in perennial pastures. In 2025, 80% of the state is drought-free, with only about 18% of the state listed as abnormally dry. Some regions of the state have had two years of very dry conditions. Filling the forage needs outside of summer grazing can be challenging even in normal years. This challenge is even greater when summer pasture productivity is reduced and forage supplies are low. Currently, forage supplies are adequate. Small grain forages planted in the fall or spring can provide a profitable forage option for producers. Cool-season forages, especially in the vegetative stage, are high in crude protein and energy. Forages can be terminated in early spring, allowing time to plant a summer row crop if soil moisture is adequate.

There are six common small grain options for forage: spring oats, spring triticale, winter wheat, winter barley, winter cereal rye, and winter triticale. Each option has strengths and weaknesses.

Spring oats. Spring oats are usually planted in late February or March in Kansas. However, spring oats can also be planted in late August through late September and will produce much more fall forage compared to other fall-planted small-grain forages before a killing freeze. Spring oats do not need to vernalize before heading, so they will develop rapidly in the fall if they have enough moisture and fertility and may even head out before termination by the first hard freeze in the mid-20 degree F range. In most years, however, spring oats will not have time to produce viable grain. In very mild winters, much of the fall-planted spring oats might survive the winter in southern Kansas.

Spring oats can be utilized in the fall for either hay or grazing. Spring oats can be ready to graze 6 to 8 weeks after planting with adequate moisture and after a good crown root system has developed. Under good conditions, spring oats can produce up to 1 to 2 tons of forage per acre, but as planting is delayed past mid-September, expect less tonnage. Spring oats are not very drought-tolerant and will not establish well nor grow well if the soil is very dry. Rye, triticale, or barley are more drought-tolerant than spring oats.

Spring oats can also be planted in a mixture with a winter small grain. The spring small grain can increase fall biomass, and the winter small grain will overwinter and produce forage in the spring. Winter small grain biomass production might be less than if planted alone, but the combination of oat and winter small grain biomass will likely be higher than winter small grain planted alone. If a mixture is used, plant oats at a 50% seeding rate and the winter small grain at a 100% seeding rate.

Spring triticale. Like oats, spring triticale can be planted in the fall or spring. Spring triticale tends to have better heat and drought tolerance than oats. A drawback of triticale is that many varieties have awns, which, if fed as baled feed, can result in lump jaw in cattle. The risk of nitrates is slightly less in triticale than in spring oats.

Winter wheat. Wheat is often used for grazing and grain in so-called “dual-purpose” systems (Figure 1). These systems are usually balanced between getting good forage and good grain yields without maximizing yields on either side. Dual-purpose wheat is typically planted at least two to three weeks earlier than wheat planted for grain only to maximize forage production in winter wheat. In addition, producers wanting both grazing and grain should use a higher-than-normal seeding rate (90-120 pounds of seed per acre) and increase the N rate by 30 pounds per acre for every 1,000 pounds per acre of dry matter forage yield.

Figure 1. Cattle grazing on a wheat field. Photo courtesy of Great Plains Grazing.

Producers who need more pasture than normal can plant even earlier, at the likely expense of lower grain yields. Planting very early opens wheat to many risks, such as wheat streak mosaic, barley yellow dwarf, Hessian fly, grasshopper damage, fall armyworm, planting into hot soils (and consequent shortened coleoptile length), and common root rot. If beef prices are more favorable in the spring, wheat can also be grazed out, foregoing grain yield altogether. Wheat usually produces most of its forage in late fall and early winter and again in the spring. There are differences among varieties in how much fall forage is produced. Grow an awnless variety if planning on grazing the wheat out.

For more information on dual-purpose wheat, please refer to the KSRE publication, "Managing wheat for forage and grain: the dual-purpose system." Please refer to the publication "Dual-Purpose Wheat Variety Performance 2025" (https://bookstore.ksre.ksu.edu/item/dual-purpose-wheat-variety-performance-2025_MF3312) to compare wheat variety performance under grain-only versus dual-purpose systems.

Winter barley. New, improved varieties of winter barley are available with better winterhardiness, especially under grazing. Many of the newer varieties also produce more forage than older varieties. Barley produces palatable growth rapidly in the fall under favorable conditions. It is considered superior to other cereals for fall and early winter pasture, but wheat, triticale, and rye provide better late winter and spring grazing. Barley has excellent drought and heat tolerance. Winter barley forage is typically the most palatable of the small grain cereals, and feed quality is the highest, although tonnage of barley is usually less than triticale or rye.

Winter rye. Rye establishes fall pasture quickly. It also regrows rapidly in late winter and early spring. However, rye becomes “stemmy” and unpalatable earlier in the spring than other cereals. Since rye is less palatable and higher in fiber than wheat or barley, cattle gains during grazing are normally greater on oat, wheat, triticale, and barley pasture than on rye pasture. Rye is the hardiest of the small grain cereals for overall tolerance to drought, heat, winterkill, and poor soil conditions. Rye has greater regrowth potential than other cool-season crop options. Prevent rye from going to seed to avoid potential volunteer issues in winter wheat.

Winter triticale. Triticale, a cross between wheat and rye, possesses the toughness of rye and the quality closer to that of wheat, although some dairy operations also disfavor triticale due to greater “steammyness”. It can be grazed much harder than wheat and still recover to produce grain. Triticale and rye are not susceptible to wheat streak mosaic and are not as much of a host for the wheat curl mite as volunteer wheat, but can still serve as a host for the mite to infest neighboring wheat fields. Planting too early in the fall increases the risk of triticale acting as a green bridge for wheat streak mosaic virus, and of infestations of grasshopper and fall armyworm feeding in the fall, hessian fly, barley yellow dwarf, and root rot. Planting triticale (Figure 2) or rye earlier in the fall increases the amount of fall forage available compared to winter wheat. Triticale has longer effective spring grazing than rye but not as long as wheat. Depending on the variety, winter triticale will head later than rye, so that the forage can remain higher in quality later into the spring. Heading date on all winter cereals should be a consideration if spring grazing is the goal.

Figure 2. Cattle grazing on a triticale research field. Photo courtesy of John Holman, K-State Research and Extension.

Small grain pasture management

As planting dates get later, producers will get more fall forage production from triticale and rye than from wheat. The later it gets, the more rye becomes the best option for fall forage needs. More information on the relative pasture production of small grain cereals can be found in this K-State Research and Extension publication: https://bookstore.ksre.ksu.edu/pubs/mf1072.pdf. It may help to identify the right forage or complementary forages to fill the gap in the system.

Cool-season forages are fairly susceptible to atrazine, so if producers plan on planting forages this fall after corn or sorghum, there is a risk of herbicide carryover that can kill seedlings.

When planting a small grain cereal primarily for forage, use a seeding rate about 50-100 percent higher than if the crop were grown for grain. In western Kansas and under dry soil conditions, a seeding rate of 1.5 bushels per acre is recommended. In eastern Kansas or under irrigation, a seeding rate near 2 bushels per acre is recommended. The planting depth for these grains should still be between 1.5 to 2 inches. Spring oats and spring triticale should be seeded at the rate of 2 to 3 bushels (64 to 96 pounds) per acre. When planting a small grain cereal for grazing purposes, increase N rates by about 30 to 50 pounds per acre. To determine the actual amount of additional N needed, the following formula can be used:

Additional lbs N/acre = (Number of animals/acre) x (lbs of weight gain/animal) x 0.4

In a graze-out program, all the N may be applied in the fall. However, split applications will reduce the chances of having a problem with nitrate toxicity. In addition, there may be excess N in the fall from failed summer crops, so producers should use caution when applying N without a profile N soil test.

Of the cool-season crop options, oats have the most risk for high nitrates. Depending on the forage potential and if no excess nitrogen is available in the soil, about 30 to 70 pounds of nitrogen (N) per acre will be adequate. Avoid overapplying N and make sure soils are adequate in sulfur (S) and phosphorus (P) to reduce the risk of high nitrates.

Under good growing conditions, a well-fertilized small grain dryland pasture can carry about 500 pounds of cattle per acre. Under poor growing conditions, stocking rates should be reduced considerably. Cattle gains of 1.5 to 2.5 or more pounds per acre per day are possible during periods of good pasture production. Under irrigation, with intensive management, much higher stocking rates can be attained.

Grazing management

Fall grazing management is critical to the success of small grain pastures. Begin grazing when the plants are well rooted and tillered, usually about 6 to 8 weeks after planting. If the foliage is too tall when the animals are introduced, or if the crop is overgrazed, the plants will be more susceptible to winterkill. Make sure some green leaves remain below the grazing level. The minimum stubble height should be about 3 to 4 inches. Rye has a more upright growth pattern than most wheat varieties, so it should not be grazed as low. Winter barley is more susceptible to winterkill than rye or wheat. However, newer varieties of barley are exhibiting increased winter hardiness.

Forage quality considerations

Overall, forage quality of hay, barley is the highest, followed by oats, wheat, triticale, and rye. Regardless, the forage quality of all small grains in the vegetative stage is more than sufficient for any grazing animal. During the fall and early spring periods of peak production, the crude protein content of small grain pasture is normally about 20-25 percent. Growing cattle requires about 12 percent crude protein; thus, no protein supplements are necessary.

Small grain pastures can cause bloat. Daily supplementation with poloxalene (Bloat Guard) is highly effective in reducing bloat and is available in many different feeding forms. Feeding high-quality grass hay, silage, and/or an ionophore such as Rumensin or Bovatec can also protect against bloat. Rumensin and Bovatec have also been shown to increase stocker cattle weight gains on wheat pasture.

Cows with high milk production grazing in small grain pastures in the spring can experience grass tetany. To prevent this, provide a mineral supplement containing magnesium. Cattle should be started on the mineral two weeks before to mitigate the risk of grass tetany.

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

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

Tina Sullivan, Northeast Area Agronomist
tsullivan@ksu.edu

4. Soybean seed filling and dry down rate before harvest

The latest USDA-National Agricultural Statistics Service crop progress and condition report, released September 14, 2025, classified 79% of the soybean crop as being in fair (24%) or good (55%) condition. Overall, 24% of all soybeans in Kansas are dropping leaves, behind both last year and the 5-year average of 35%.

Weather outlook

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

Despite temperatures averaging 6.5°F below normal for the first week of September, above normal readings since that time have raised the departure from normal for the first half of September to 1.4°F below normal, based on data from the Kansas Mesonet. The 8 to 14-day outlook strongly favors above-normal temperatures, and the month is likely to finish above normal. There are no immediate threats of frost or freezing conditions in the forecast anywhere in the state.

Precipitation has been quite variable around the state in September. Parts of Lincoln and Ellsworth County have received over 9 inches of rain this month, and central Kansas has been the wettest division so far this month. Meanwhile, parts of northwest Kansas have had little precipitation. Towns like Atwood and Oberlin have received less than one-quarter inch of rain this month. Precipitation is likely statewide in the next few days, with amounts over one inch possible in eastern Kansas. The precise location of the heaviest rainfall is still uncertain, as recent forecast model runs have not been consistent with respect to the placement of the heaviest precipitation. Below-normal precipitation is slightly favored in western Kansas for the last week of September, with equal chances of above, below, and near normal precipitation in eastern Kansas. Seasonally, we continue the weekly decrease in normal precipitation as we head towards the driest season of the year (winter). As a result, below-average precipitation means potentially very little, if any, moisture. Warm and dry conditions will favor overall low humidity, increasing drought, and wide day/night temperature swings.

Soybean seed-filling

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

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

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

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

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

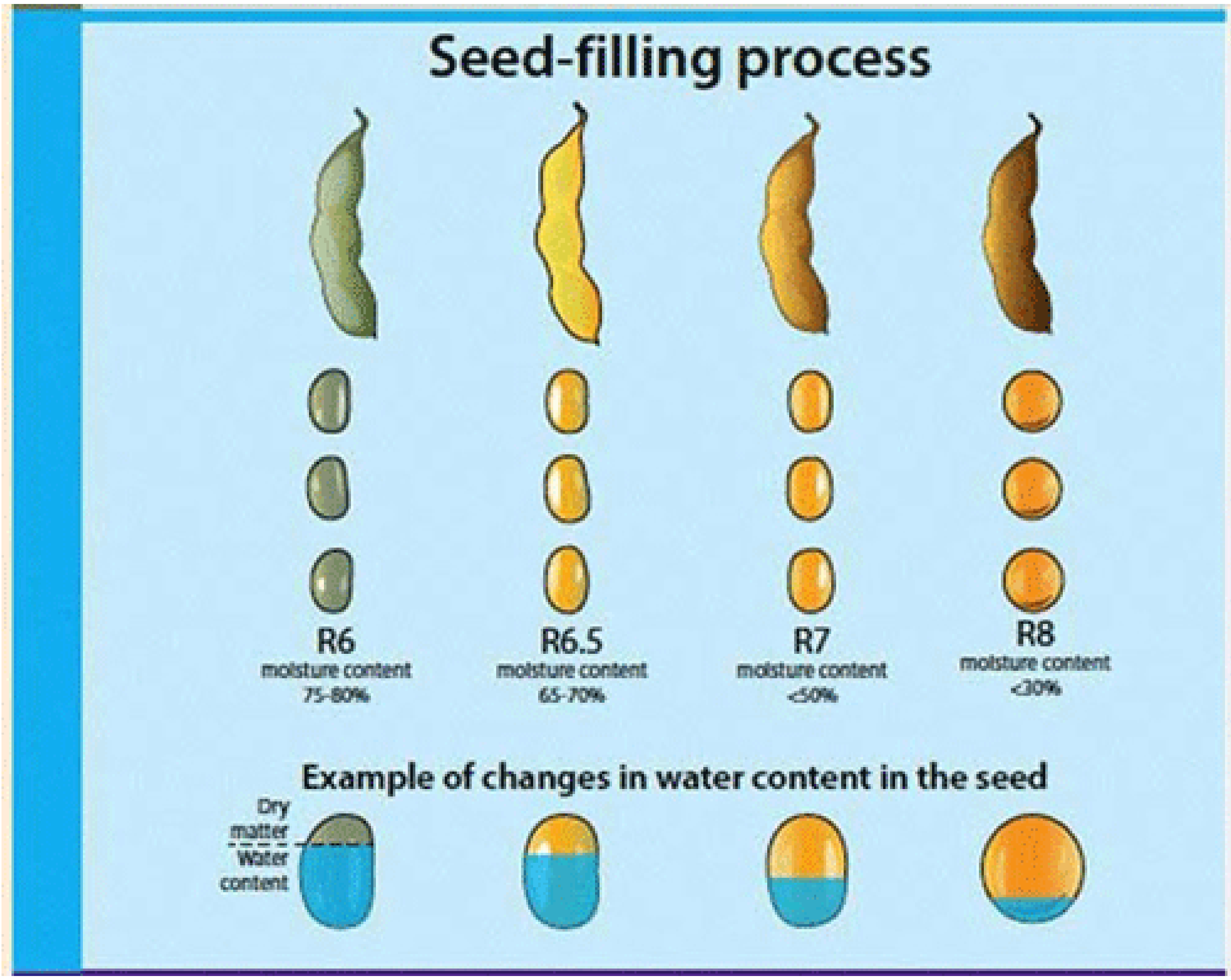

Figure 1. The soybean seed filling process from full seed to full maturity. Graphic from the K-State Research and Extension Soybean Growth and Development poster, MF3339.

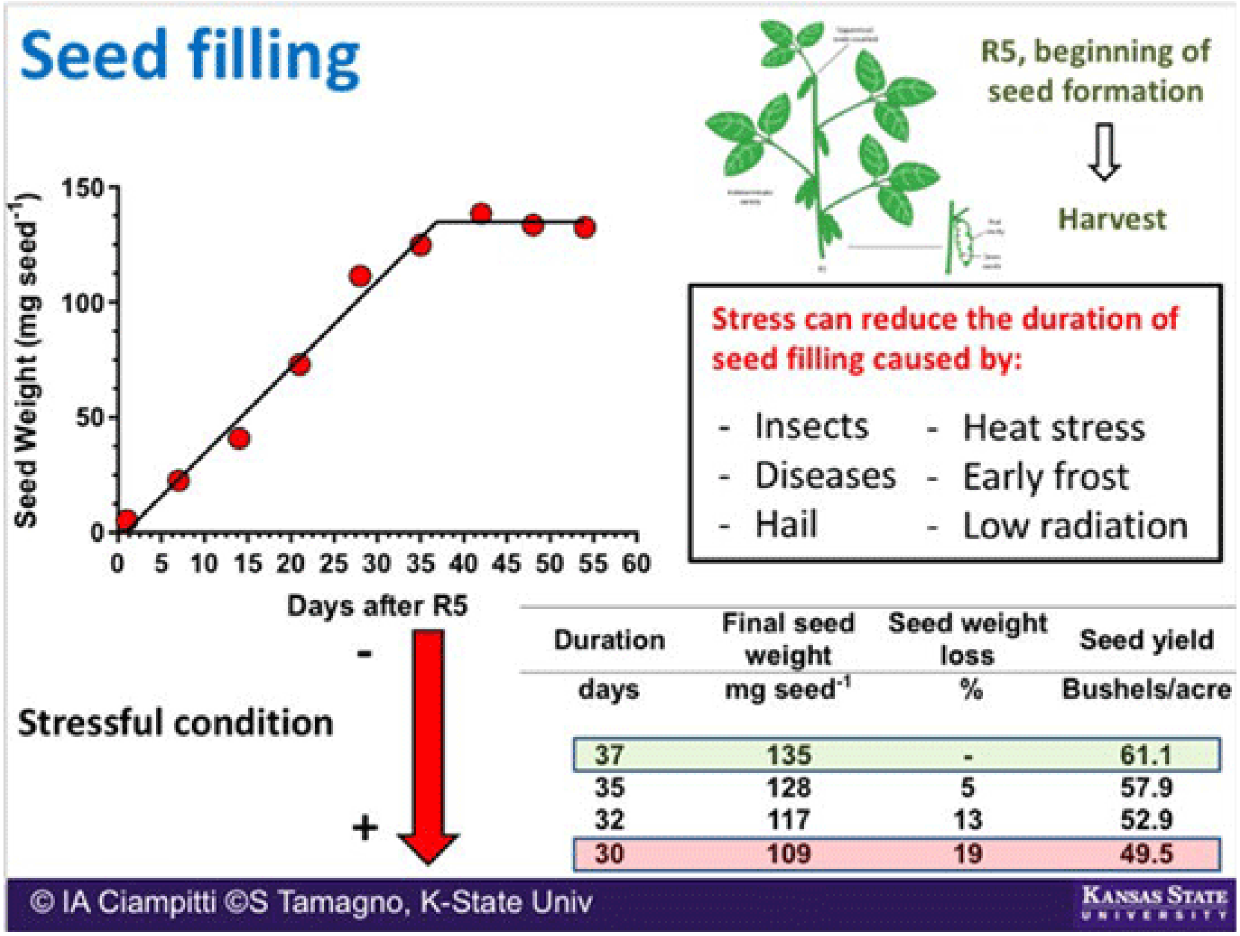

Figure 2. Soybean seed weight changes from the beginning of seed filling (R5) to full maturity.

Soybean dry down rate

Soybeans reach final maturity with high seed water content, moving from 90% to around 60% from the beginning of seed filling until final maturity. The dry down rate will depend on the maturity group (affecting the length of the season), planting date, and weather conditions experienced during pod and seed set phases.

K-State researchers conducted a trial in 2016 investigating the water content changes from black layer formation until harvest time. The overall dry down rate was 3% per day over a 15-day period (late September to mid-October). The trial started with soybeans at 58% and ended at 12% to find the 3% per day. The 3% per day is three times faster compared to corn's 1% moisture daily loss. However, corn and soybean dry down rates are primarily driven by temperature, humidity, and overall water content at the point of black layer formation. These main factors should be considered when scheduling the soybean harvest, where we are aiming for 13% moisture.

Some areas of soybean production have been faced with droughty conditions, while others have been consistently hit with rain. Scouting your fields for maturity and prioritizing situations with lodging or other stress factors should be considered for harvestability. Some soybeans entering maturity could be harvestable in two weeks due to the dry down speed.

Tina Sullivan, Northeast Area Agronomist
tsullivan@ksu.edu

Matthew Sittel, Assistant State Climatologist
msittel@ksu.edu

5. Check emerging winter canola for fall armyworms

Infestations of fall armyworm are causing problems in turfgrass, pastures, and other crops this year (Figure 1). Last fall, fall armyworm feeding caused patchy losses in newly emerged winter canola fields across central and southern Kansas. Thus, it is important to frequently scout canola in the seedling stage, especially if fall armyworms are active in your area. Early detection is important because larvae can quickly overtake emerging plants. Fall armyworms often move in from road ditches or weedy areas, so begin on the field edges and work your way to the interior. Look for windowpanes on leaves, stripped plants, cut plants, and areas where plant stands appear to be thinning. Once the growing point of canola is removed, the plant is lost and will not recover.

Figure 1. Fall armyworm feeding on volunteer wheat in a fallow field. Photo by Cody Swinehart, Kingman County.

The current crop of larvae is the second generation, and historically, there have been only two generations per year in Kansas. These larvae are close to maturity and approaching pupation, so they should be about finished feeding. The second-generation moths that emerge from these larvae will return south for the winter. However, the first generation occurred very early in a warm spring, so the second generation, which is less synchronous in development, also began earlier. If some of the early-matured second-generation moths start laying eggs, a partial third generation may be possible this year. It is unlikely any of these larvae would get large enough to mature, but they could still cause localized damage. The cue for southerly migration is shorter day length, with some interaction with temperature, and these conditions may not have been experienced by second-generation moths that emerged in August.

One way to minimize this risk would be to plant later, toward the end of the planting window. However, this risk assessment is based on our knowledge of fall armyworm biology and behavior and is entirely speculative - there is no historical reference. Delayed planting of winter canola has other risks, including the inability to develop the necessary top growth for overwintering.

Although no efficacy data exist for winter canola, seed treatments with chlorantraniliprole, cyantraniliprole, or imidacloprid have provided up to two weeks of control of fall armyworm on emerging corn. However, if feeding pressure is heavy on small seedlings, seed treatments may not prevent stand losses. Several common insecticides are labelled for fall armyworm control if needed before or after canola emergence (Table 1).

Table 1. Insecticide options for controlling fall armyworm in winter canola.

Chemical Name	Trade Name	Class	Rate (fl oz/a)
Bifenthrin (numerous products)	Brigade 2EC	3a	2.1-2.6
Bifenthrin plus zeta-cy	Steed	3a	2.5-3.5
Bifenthrin plus zeta-cy	Hero	3a	2.6-5.5
Gamma-cyhalothrin	Proaxis	3a	1.92-3.84
Gamma-cyhalothrin	Declare	3a	0.77-1.54
Lambda-cyhalothrin	Warrior II w/Zeon Tech	3a	0.96-1.92
Lambda-cyhalothrin plus chlorantraniliprole	Besiege	3a+28	5.0-10.0
Zeta-cypermethrin	Mustang Maxx	3a	4.0

For more information on insects important to canola, see the "Great Plains Canola Production Handbook" available at https://www.bookstore.ksre.ksu.edu/pubs/mf2734.pdf.

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.

Mike Stamm, Canola Breeder
mjstamm@ksu.edu

J.P. Michaud, Entomologist, Agricultural Research Center - Hays
jpmi@ksu.edu

Anthony Zukoff, Instructor of Entomology, Southwest Research-Extension Center - Garden City
azukoff@ksu.edu

6. Estimating cotton lint yield from boll counts

It has certainly been a rollercoaster of a year for the 140,000 acres of cotton planted in Kansas in 2025. As we reach the end of the season, many look to estimate the potential yield of their crops, including cotton (Figure 1). Cotton yield estimation is similar to estimations made in corn and sorghum, but with a few significant differences. Cotton lint yield is a product of three primary factors: 1) bolls/acre, 2) boll weight, and 3) turnout (or lint percent). These vary by year, variety, node, and fruiting position. Two approaches can be used for cotton yield estimation: the quick estimate and the detailed estimate.

Figure 1. Bolls are opening in a cotton field in Seward County, Kansas, in early October, nearing the time for harvest aid application and harvest. Photo courtesy of Logan Simon, K-State Research and Extension.

The Quick Estimate

For many crop consultants and producers, the quick procedure for cotton yield estimation will give us an adequate idea of the crop's yield potential.

Step 1: Count Bolls

Identify five to ten representative areas in the field. Mark a 3-foot section of row and count each harvestable boll or those from blooms that developed before the last effective bloom date, generally between August 20 and 25 in Kansas (Figure 2). Do not count bolls smaller than the diameter of a quarter. Divide this number by 3 to get bolls/row foot.

Figure 2. Cotton fruiting branch with four unopened bolls from positions that developed before and one (far right) that developed after the last effective bloom date. Photo courtesy of Logan Simon, K-State Research and Extension.

Step 2: Convert to pounds/acre

A general assumption can be made that every 10 bolls/row foot equates to one 480 lb bale. To convert from bolls/row-foot, multiply by a factor of 48.

Example of the quick estimate:

The factors that go into this calculation include:

1. Number of bolls/row-foot (example: 18 bolls/row-foot)
2. Conversion factor of 48

An optional step (shown below) is to convert lint yield (lbs/ac) to (bale/ac) using the conversion factor of 1 bale=480 lbs lint.

$$Lint\ yield\ \left(\frac{lb}{ac}\right) = \frac{bolls}{row - foot} \times 48$$

Example calculation:

$$18\frac{bolls}{row\text{-}foot} \times 48 = \mathbf{864}\frac{\mathbf{lb\ lint}}{\mathbf{ac}} \times \frac{1\ bale}{480\ lb\ lint} = \mathbf{1.8}\frac{\mathbf{bale}}{\mathbf{ac}}$$

The Detailed Estimate

This more precise procedure may be favored by crop insurance adjustors. This approach requires more time and attention to detail to refine estimates beyond the assumptions made in the quick estimate.

Step 1: Determine Row Spacing

The row spacing is as simple as measuring the distance between rows, in inches.

Step 2: Count Bolls

Follow a similar approach as outlined above, but use a **10-foot section of row** (Table 1). Divide this number by 10 and multiply by 17,424 to get bolls/acre for cotton planted on 30-inch spaced rows.

Table 1. Conversion of the number of cotton bolls in 10 feet of row to the number of bolls/acre at various row spacings.

Row spacing (in)	Number of bolls in 10 feet of row						
	100	150	200	250	300	350	400
	Number of bolls/acre						
40	130,680	196,020	261,360	326,700	392,040	457,380	522,720
38	137,558	206,337	275,116	343,895	412,674	481,453	550,232
30	174,240	261,360	348,480	435,600	522,720	609,840	696,960
15	348,480	522,720	696,960	871,200	1,045,440	1,219,680	1,393,920

Step 3: Estimate Boll Weight

Boll weight can be estimated by hand-picking a representative number of harvestable bolls in various parts of the field, counting them, weighing them, and then dividing the weight by the number of bolls (Figure 3). This will give a relatively accurate average boll weight for the yield estimate (Table 2).

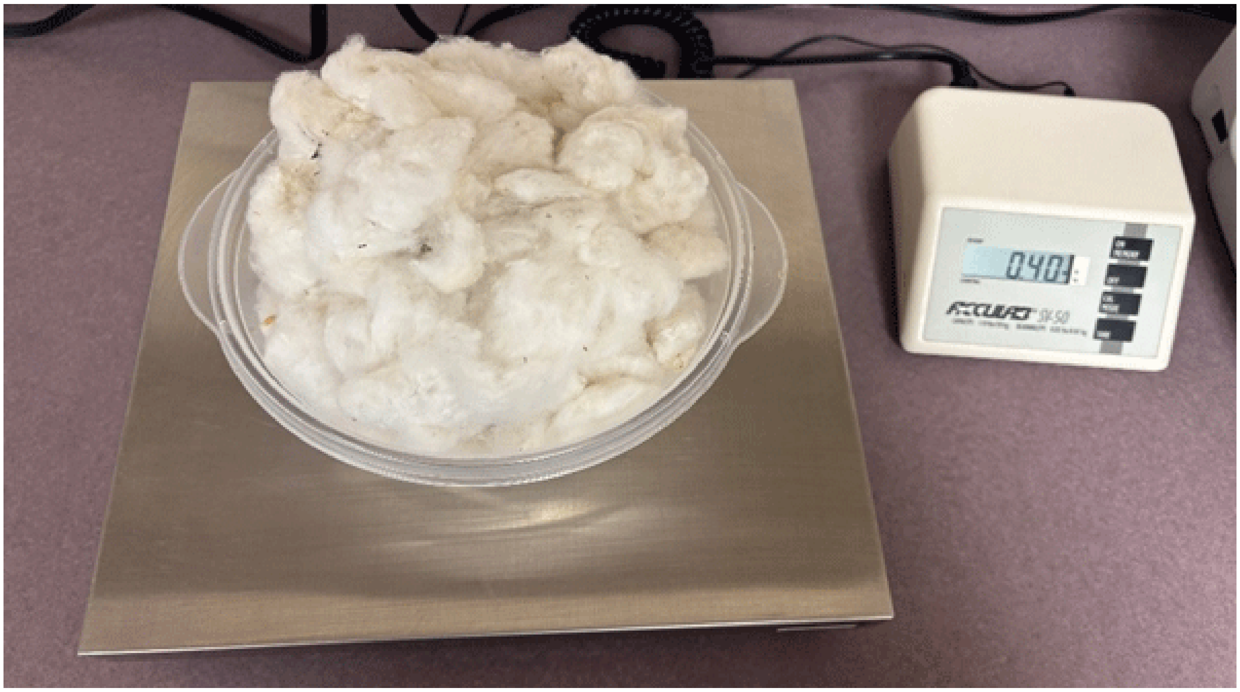

Figure 3. Hand-pick a representative number of harvestable bolls in various parts of the field, count them, weigh them, and then divide the weight by the number of bolls. Photo courtesy of Logan Simon, K-State Research and Extension.

Table 2. Lint yields across a range of boll weights and number of bolls in 10 feet of row, assuming a harvest efficiency of 99% and 32% turnout.

Bolls in 10	Boll weight (pounds/boll)						
feet of row	0.006	0.007	0.008	0.009	0.010	0.011	0.012
	Lint yield (pounds/acre)						
100	331	386	442	497	552	607	662
200	662	773	883	994	1,104	1,214	1,325
300	994	1,159	1,325	1,490	1,656	1,822	1,987
400	1,325	1,546	1,766	1,987	2,208	2,429	2,650

Step 4: *Estimate Harvest Efficiency*

Most Kansas cotton will be harvested with a brush-roll cotton stripper with a 99% harvest efficiency. This allows producers to maximize lint yield. This is highly affected by weather conditions and disease presence, which could result in lodging or excessive growth.

Step 5: Estimate Turnout

Turnout is determined at the gin as the proportion of lint in seed cotton (Figure 4) and is generally around 32% for stripper harvested cotton. Turnout can be affected by various factors, including weather conditions, variety, and overall crop health. An average value of 32% turnout can be used for stripper-harvested cotton in Kansas until data from previous harvests of the same cultivar at the same gin are available.

Figure 4. Turnout is determined at the gin as the proportion of lint in seed cotton. Photo courtesy of Logan Simon, K-State Research and Extension.

Example of the detailed estimate:

The factors that go into this calculation include:

1. Number of bolls/acre (ex: **313,632**)
2. Weight per boll (ex: **0.009**)
3. Harvest efficiency (percentage; as a decimal for calculation) (ex: **0.99**)
4. Lint turnout (percentage; as a decimal for calculation) (ex: **0.32**)

$$\textbf{\textit{Lint yield}} \left(\frac{\textbf{\textit{lb}}}{\textbf{\textit{ac}}}\right) = \frac{bolls}{acre} \times boll\ weight \times harvest\ efficiency\ \times turnout$$

Example calculation:

$$313{,}632\,\frac{boll}{ac} \times 0.009\,\frac{lb}{boll} \times 0.99 \times 0.32\ = \mathbf{894}\,\frac{\textbf{\textit{lb lint}}}{\textbf{\textit{ac}}} \times \frac{1\ bale}{480\ lb\ lint} = \mathbf{1.9}\,\frac{\textbf{\textit{bale}}}{\textbf{\textit{ac}}}$$

Key considerations

- Accurate yield estimates, whether by the quick or detailed approach, start with identifying five to ten representative areas in the field.
- Quality estimates of harvestable bolls are essential for accurate yield estimation. Do not count bolls smaller than the diameter of a quarter.
- Harvest efficiency and turnout can be affected by various factors, including year (weather),

variety, and overall crop health.

Logan Simon, Southwest Area Agronomist
lsimon@ksu.edu

Tina Sullivan, Northeast Area Agronomist
tsullivan@ksu.edu

7. The basics of remote sensing in precision agriculture

Modern-day precision agriculture relies heavily on sensor technology, and among these, remote sensing is the most widely used tool. The term remote sensing consists of two words, "**remote**", which means from a distance, and "**sensing**", which means the collection of information or data. Therefore, remote sensing refers to studying or collecting information about objects such as crops, soil, water, or the surrounding environment from a distance, without direct contact.

Common examples of remote sensing are drone and satellite imagery, as well as handheld devices or sensors mounted on any of our farm equipment, such as tractors. These technologies use sensors to measure sunlight reflected by the crops and soil to create a map that can be used to understand the crop health, soil condition, and water stress, which our eyes usually cannot see (Figure 1).

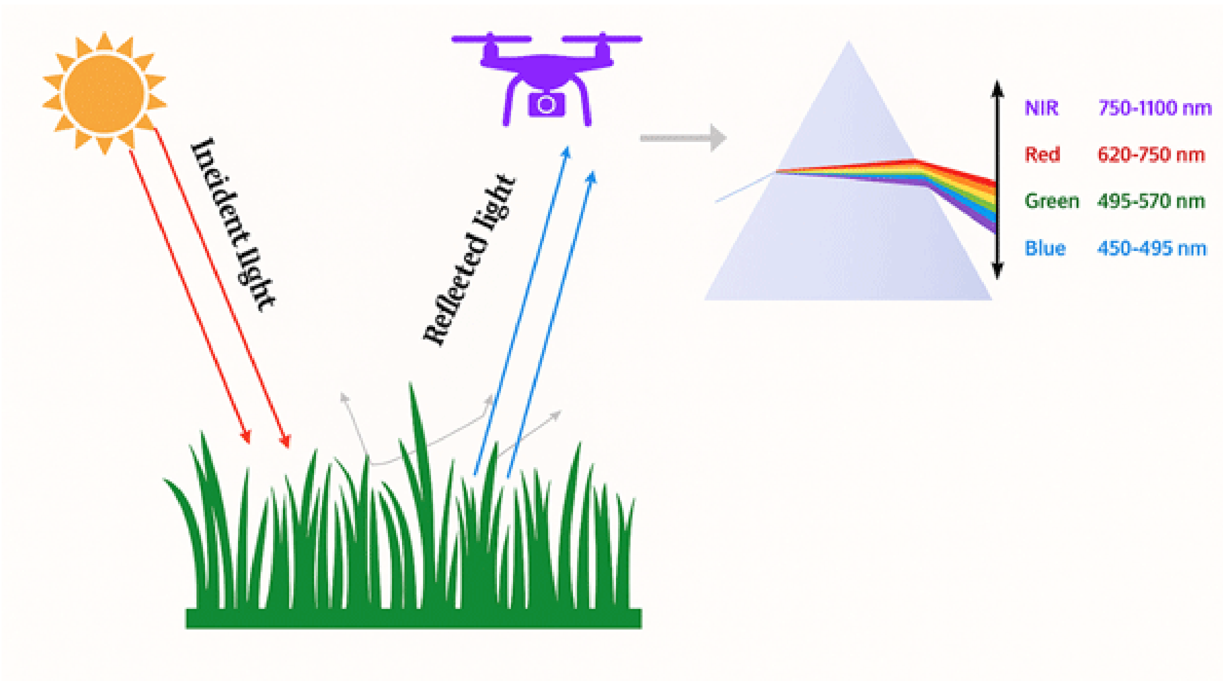

Figure 1. Illustration of the principle of drone-based remote sensing: Sunlight travels to the Earth, reflects off crop canopies or soil, and is captured by drone-mounted sensors in different spectral bands (blue, green, red, NIR, etc) to monitor and assess crop and soil conditions. Image credit: Deepak Joshi, K-State Research and Extension.

Application of Remote Sensing in Agriculture

Understanding field variability: Each field is unique and consists of different soil types, soil nutrients, moisture levels, disease, and pest pressure. Due to these reasons, crop growth is not uniform throughout the same field. Therefore, remote sensing can help farmers to understand such variability of crop growth by creating maps of the fields (Figure 2).

For example, a drone was flown to collect field variability information at the Flickner Innovation farm in McPherson County. In such collected drone imagery, green areas represent higher canopy cover, healthier crops, and better growth. Yellow areas indicate moderate crop vigor, while red areas show little to no canopy cover, corresponding to reduced growth, bare soil, and equipment tracks, particularly caused by pivot irrigation. Such maps provide valuable insights for monitoring and managing field variability using drone-based remote sensing.

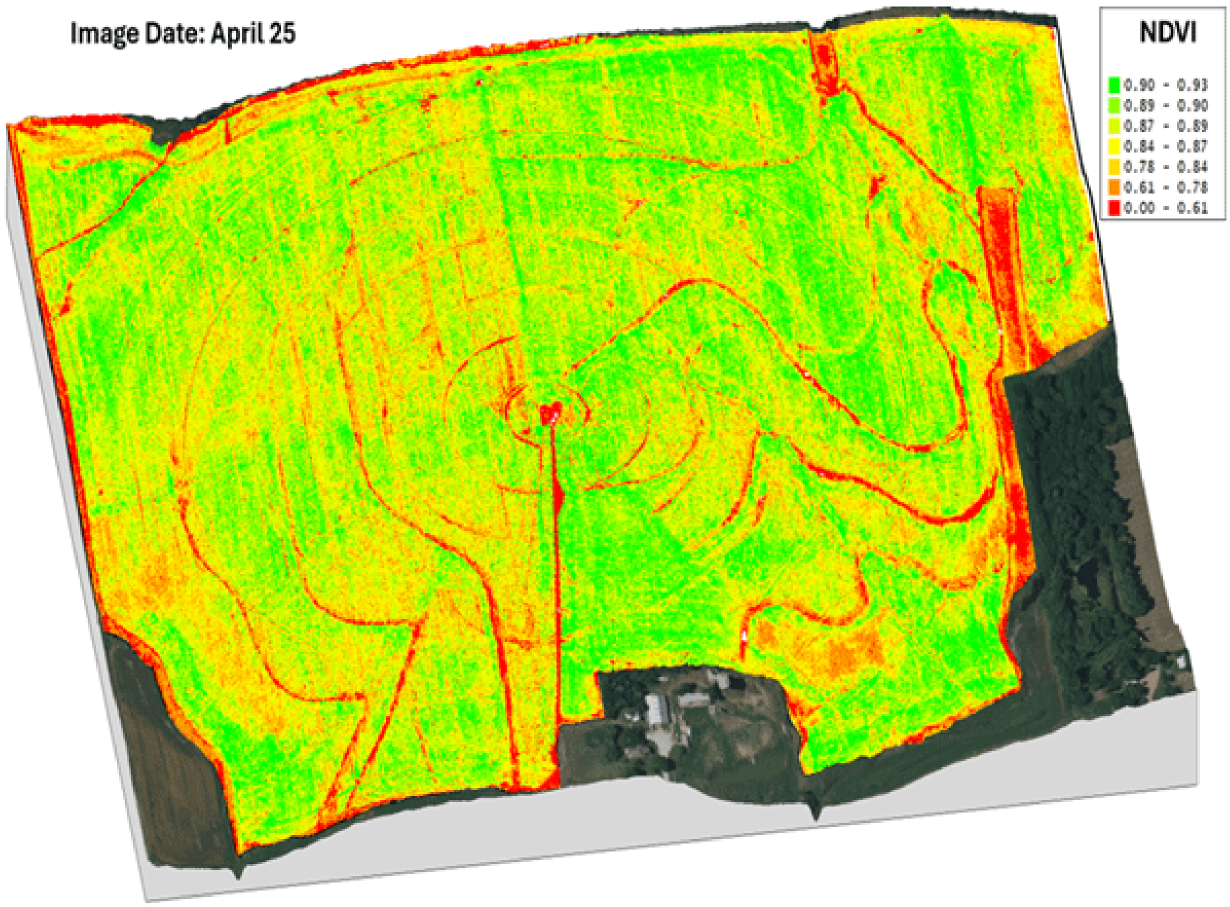

Figure 2. Crop growth variability within the same field based on NDVI derived from drone imagery. Image credit: Deepak Joshi/Flickner Innovation Farm.

Crop stress detection: Remote sensing can help farmers by detecting the early signs of crop stresses such as nutrient deficiency, moisture issues, disease, and pests that may not be seen early enough with the naked eye. Such information can be used as a guide for site-specific nitrogen, irrigation, or pesticide applications by applying inputs only in the areas where it is needed.

Weed identification: High-resolution remote sensing images, especially using drones, can help identify the weeds in the fields. As the weeds have different colors, leaf structure, shape, or growth patterns compared to the crops, using remote sensing, we can identify them to create a weed map of the field. These weed maps can be used for site-specific herbicide application using spray drones or any other farm applicators.

Different types of remote sensing tools

1. **Satellite**: Satellite images are now used for various on-farm decisions, including variable-rate technology. Satellites provide large-scale imagery that can cover an entire farm, county, state,

or even the whole earth. Many satellite datasets, such as Sentinel-2 and Landsat, are freely available at no cost, which can be used by growers for various on-farm decisions. However, weather conditions, especially cloud cover, can affect the availability and quality of these images.

2. **Drones**: Drones provide high-resolution images and can capture crop and soil information at the centimeter level. They can also be flown as needed, offering greater flexibility. Drone imagery is commonly used for early-season scouting, detecting crop stress, and identifying weeds.
3. **Handheld sensors**: Some sensors can be handheld or mounted on farm equipment to collect information about soil and crops. Common handheld sensors used in agriculture include CropScan, GreenSeeker, fluorometers, and chlorophyll meters.

Conclusion

Remote sensing has become very popular and is accessible to farmers to make more informed and smarter decisions. This technology can help farmers to "see" crops and soil conditions that are not visible to the naked eye, thus allowing for more timely and precise decisions on their farms.

Deepak Joshi, Precision Ag Specialist
drjoshi@ksu.edu

Matias Lucero, Research Scholar

Sangam Bishwakarma, Graduate Student

Kaden Spencer, Graduate Student

8. World of Weeds: Venice Mallow

This World of Weeds article features Venice mallow (*Hibiscus trionum*). This attractive annual species is also called "flower-of-an-hour" because each flower remains open for just a few hours before being shed. Venice mallow is in the Malvaceae family, and is related to velvetleaf and common mallow, as well as cotton. The species name *trionum* refers to the normally three-lobed appearance of the leaves.

Ecology

Venice mallow is an introduced plant that has become naturalized in much of the United States. A native of southern Europe, the plant was introduced as an ornamental before escaping cultivation to become a weed. The species is most prevalent in the eastern part of Kansas, but can occur anywhere within the state. It can be found in gardens, cultivated fields, waste areas, pastures, and roadways.

Identification

Venice mallow is an annual species reproducing by seeds. It normally grows 0.5 to 2 feet tall, with its many branches often spreading out from the base prior to curving upward. The stems are covered with stiff, short hairs. Leaves are alternate and borne on stalks (petioles), with hairs on the lower surfaces but generally smooth on the top surfaces. The cotyledon (seed) leaves are heart-shaped, and the first true leaves are rounded with gently lobed edges (Figure 1). Subsequent true leaves are normally deeply divided into three lobes, but may have as many as seven lobes (Figure 2). The center lobe is longer than the side lobes, but all are gently lobed to toothed along the edges.

Figure 1. Venice mallow seedlings with cotyledons and first true leaves. Photo by Patrick Geier, K-State Research and Extension.

Figure 2. Venice mallow plant growing in a soybean field. Note the papery calyx near the center of the photo. Photo by Sarah Lancaster, K-State Research and Extension.

Flowers are up to 2.5 inches wide, are short-lived, and originate from petioles arising from the junction of the stem and leaf petioles. The flowers have five petals, are white to pale yellow, and have a reddish to dark purple center (Figure 3). Seeds are produced in a globe-shaped capsule surrounded by a papery husk called a calyx (Figure 2). At maturity, the calyx and capsule dry and rupture, exposing the small (0.1 inch) seeds, which are kidney-shaped, dark brown, and rough.

Because Venice mallow is an indeterminate plant, flowers and seeds are produced throughout the growing season until a killing frost in the fall. Like its close relative, velvetleaf, Venice mallow seeds have an extremely hard seed coat. Consequently, seeds may lie dormant for many years, even decades, before emerging.

Figure 3. Flower of Venice mallow with a reddish center and bright yellow anthers (pollen sacs). Photo by Patrick Geier, K-State Research and Extension.

Management

Historically, Venice mallow was most often problematic in soybean production areas in Kansas. In recent years, newer herbicides and herbicide-resistant soybean varieties have reduced its prevalence in the crop. Herbicides which effectively control Venice mallow in soybean include 2,4-D (Group 4), glyphosate (Group 9), and glufosinate (Group 10) in herbicide-resistant varieties, as well as Group 14 herbicides (sulfentrazone, saflufenacil, flumioxazin) and Group 15 herbicides (pyroxasulfone) in conventional soybean. Group 4 herbicides (2,4-D, dicamba, fluroxypyr) can be used if Venice mallow occurs in corn or sorghum.

Integrated weed management techniques should be the first line of defense when dealing with any weed situation, and this is particularly true in crops such as sunflowers, cotton, or dry beans. With fewer herbicides available to control Venice mallow and other weeds in these crops, prevention as well as mechanical and cultural control practices are even more important. With the longevity of Venice mallow seed viability, attention should be given to the prevention of seedset and movement of seed from infested fields to clean fields.

For more information, see the "2025 Chemical Weed Control for Field Crops, Pastures, and Noncropland" guide available online at https://bookstore.ksre.ksu.edu/pubs/SRP1190.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.

Patrick Geier, Weed Scientist, Garden City
pgeier@ksu.edu

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