Issue 1054

K-STATE Research and Extension

Extension Agronomy

eUpdate

05/22/2025

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.

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1. Soybean response to standing water and saturated soils

Soybean planting is well underway in Kansas with 43% planted, based on the USDA-NASS Crop Progress and Condition Report from May 19, 2024. However, heavy rainfall has occurred in many locations across the eastern half of Kansas, with some fields underwater and others with completely saturated soil.

Figure 1. Soybean plants slowly emerging and showing a lack of uniformity. Photo by Ignacio Ciampitti.

Wet soil conditions will slow emergence, make the soil more susceptible to compaction (limiting root growth), and cause poor plant-to-plant uniformity after emergence. Sidewall compaction occurs when soybeans are planted when the soil is too wet, immediately followed by dry weather. Soil surface crusting is another potential challenge for soybean emergence.

After emergence, how will soybeans respond to standing water and saturated soil conditions?

If soybean plants are submerged for less than 48 hours, there is a good chance they will survive. Plants can survive underwater longer in cool temperatures than in warm temperatures. Submerged soybean plants can survive for up to 7 days when temperatures are less than 80 degrees F.

Figure 2. Soybean seedlings under water. Photo by D. Shoup, K-State Research and Extension.

To determine whether the soybeans are damaged after the water recedes, split the stem at the tip and examine the growing point. A healthy growing point will be firm and white or cream-colored. A soft, dark growing point indicates injury. In some cases, the silt coating the plant after short-term flooding can cause more injury than the water itself, possibly even plant death.

Even if the fields do not have standing water, and plants are not totally submerged, waterlogged soils can cause problems if the waterlogging lasts too long. When soils are saturated for a prolonged period, a lack of oxygen in the roots can lead to the accumulation of lactic acid and other products of anaerobic respiration. This is the underlying cause of damage to plants in waterlogged soils where only the roots are flooded.

Injury can depend on variety, growth stage, duration of waterlogging, soil texture, fertility levels, and diseases present. Interactions of these factors make it hard to predict how a given soybean field will react to waterlogged soils.

Figure 3. Soybean seedlings under full submersion. Photo by Ignacio Ciampitti.

Variety differences have been reported, and researchers have identified possible genes associated with tolerance to waterlogged conditions. Scientists in Missouri have screened a number of soybean varieties, subjecting them to two periods of flooding, each two weeks in duration. The average yield reduction for all varieties was 61%. Yields were reduced by 39% for the most tolerant varieties and 77% for the least tolerant. Producers should check with their seed supplier regarding information about a particular variety.

Growth stage factors

Research examining the influence of the growth stage on the degree of injury from waterlogged soils has provided mixed results.

- **Germination**. Saturated conditions during germination can reduce successful germination by up to 40% and can inhibit seedling growth. Seeds that are further along in the germination process at the time of saturation sustain more injury.
- **Vegetative growth stages**. Excess water during vegetative stages usually causes less injury than waterlogging during the reproductive and grain filling stages. Short-term waterlogging (2 to 3 days) at V2 to V4 can cause yield reductions of 0% to 50%, depending on soil texture, variety, and subsequent weather. Yield reductions from waterlogging during the early vegetative stages have been attributed to reduced plant population and shorter plants with reduced branching and fewer pods per plant.
- We are far from the **reproductive stages**, but for the record, waterlogging for 2 to 3 days at R2 usually causes greater yield reductions than if it occurs during the vegetative stages. Waterlogging at R1 reduced the number of pods per node. At R5, yield reductions have been attributed to reduced seed size.

Duration of soil saturation

The longer the soil is saturated, the greater the injury, mortality, and consequent yield reductions. During germination, saturated conditions for 48 hours can decrease germination by 30% to 70% depending on the timing of the saturation, nearly twice the yield decrease resulting from durations of 24 hours or less. For plants that have emerged, a waterlogged condition that lasts for less than two days often causes little or no noticeable yield reduction. Intolerant varieties begin to show yield reductions after 2 days of saturation, but tolerant varieties can withstand up to 4 days of waterlogging with little reduction in yield. As the duration of soil saturation increases, researchers have documented greater reductions in population, height, pods per plant, yield, and leaf tissue nitrogen.

Other factors

Soil conditions also play a role in the severity of injury from waterlogging. Coarser-textured soils drain more quickly, minimizing the duration of oxygen deprivation to the roots. Fine-textured soils maintain saturation longer, increasing the chances of injury.

Fields that are flooded or are at or above the soil's water-holding capacity will be more likely to develop root rot problems. Flooding accompanied by cooler temperatures favors Pythium root rot, whereas warmer temperatures favor *Phytophthora* and *Rhizoctonia* root rots. Whether *Phytophthora* root rot develops often depends on the tolerance or resistance of the variety used. If the flooding occurs beyond the first week or two after emergence, any seed treatment fungicides that may have been used will no longer be effective.

Figure 4. Stand loss in a wet area due to Phytophthora root rot. Photo by Doug Jardine, K-State Research and Extension.

Need help with a seedling problem?

Contact your local K-State Extension Office. They will work with you to send photos of the problem (close-up, seedling, field shot) and plant samples to the K-State Plant Disease Diagnostic Lab. Here are guidelines that can help get a good sample to the lab:

Use this link for the sample submission form:

https://www.plantpath.k-state.edu/extension/diagnostic-lab/documents/DiseaseLabChecksheet.pdf

- Fill out the accompanying Plant Diagnostic Lab Form (PDF) as completely as possible.
- Send a sample characteristic of the problem that exhibits a range of symptoms.
- Dig (do not pull) up the seedling so the roots remain intact.
- Send a plentiful amount (~10 seedlings) of fresh plant material (including roots). Shake off most of the soil.
- Seal the plant material in an appropriately sized plastic bag and pack it in a crush-proof container.
- **Do not add water or wet paper towels to the sample!**
- Put the accompanying information sheet in a separate plastic bag to keep it dry.
- Bring your sample to the local K-State Extension Office for overnight shipping early in the week.

Shipping address:

K-State Plant Disease Diagnostic Lab
4032 Throckmorton PSC
1712 Claflin Road
Manhattan, KS 66506

Phone Number: 785-532-6176
Email: clinic@ksu.edu

Tina Sullivan, Northeast Area Agronomist
tsullivan@ksu.edu

Rodrigo Onofre, Plant Pathology
onofre@ksu.edu

Chandler Day, Associate Diagnostician, Plant Pathology
chandlerday@ksu.edu

2. Diagnosing inoculation failure and poor nodulation in soybeans

Earlier this spring, the eUpdate featured an article about the importance of inoculating soybeans. Now that some soybean fields have been planted and emerged, if soybean plants are chlorotic (yellow) and nitrogen (N) deficient despite being inoculated, that probably indicates the inoculant has failed.

Assessing nodulation in the field

Assess for root nodules after the V2 stage (second trifoliate) when nodules are first initiated in the roots. Crush or slice nodules from several soybean plants to assess their condition. In general, a pink or reddish internal color indicates that the rhizobia are actively fixing N. On the other hand, a dark gray or whitish color indicates that the rhizobia are not effectively fixing N. This color will be difficult to see in very young or very old nodules. A few large nodules along the tap root are more effective at fixing N than small nodules along the lateral roots. Nitrogen fixation slows down, and nodules begin to senesce (deteriorate) during seed fill as the plant directs most of its resources to reproduction.

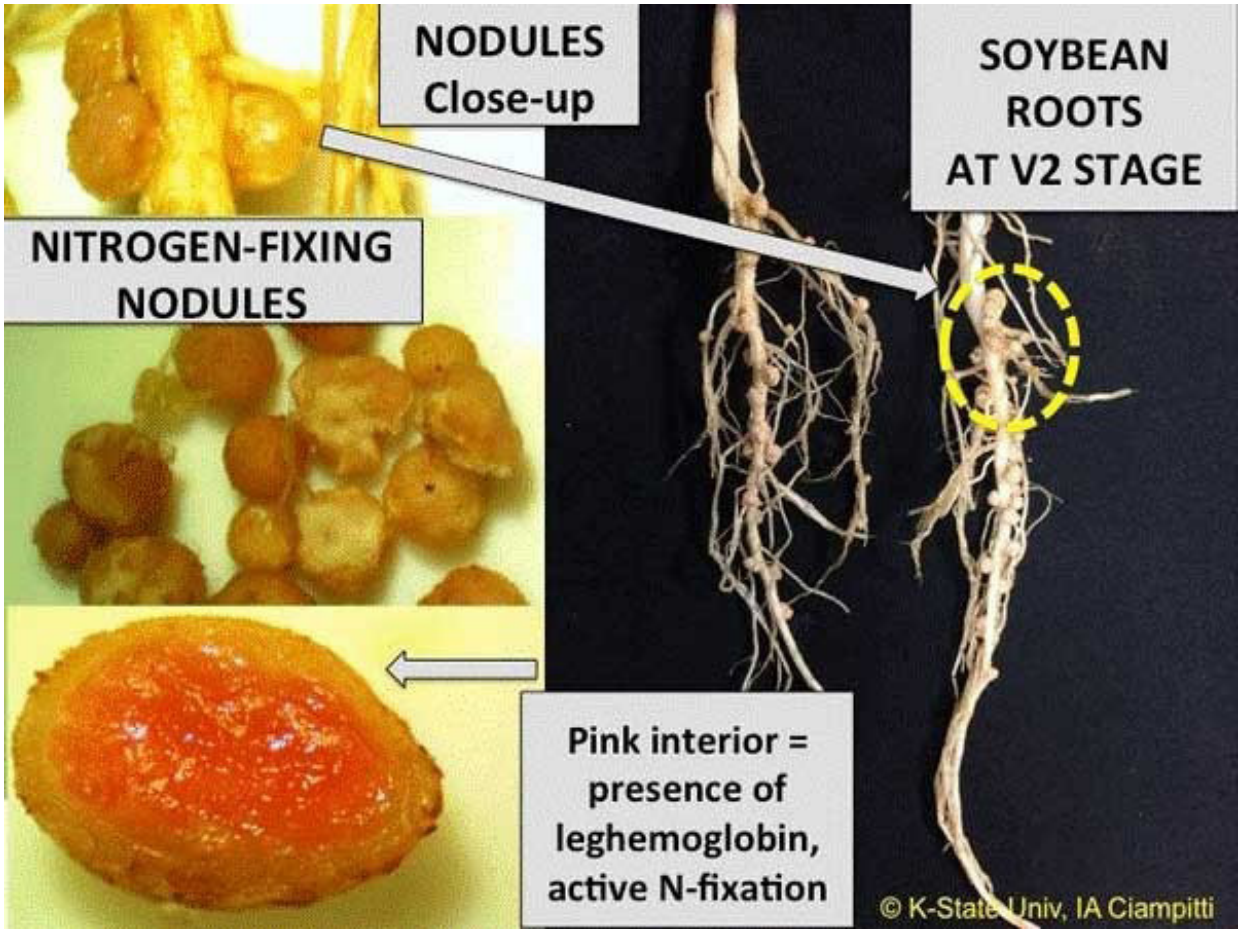


Figure 1. Close-up of soybean nitrogen-fixing nodules.

What factors affect inoculation response?

Several factors can result in poor nodulation or failure of inoculation:

1. Poor or inadequate coverage of the seeds by the inoculum during inoculation.
2. Contamination of inoculant with foreign materials.
3. Lack of competitiveness of the introduced *Bradyrhizobium* strain compared to the indigenous *Rhizobia strains*.
4. Lack of persistence in the soil: The introduced *Bradyrhizobium* should be able to grow and remain viable in the soil between soybean crops without undergoing mutation.
5. Low soil phosphorus (P): Legumes need adequate P for proper growth and development. Low P can result in poor nodulation and reduced N fixation. Phosphorus deficiency can negatively affect seed development and pod formation leading to low seed yield.
6. Soil pH: This is an important environmental factor. Most legumes grow and nodulate well at pH 5.6 to 6.7. The best soil pH for *Bradyrhizobium* lies between pH 6 to 7. Low pH soils require liming. In general, legume responds well to liming. Low pH (< 5) causes aluminum (Al) and manganese (Mn) toxicity and results in P deficiency.
7. Soil nitrate and ammonium levels: High inorganic N (ammonium and nitrate) levels in the soil inhibit nodulation and N fixation. The effectiveness and competitiveness of *Bradyrhizobium* are negatively affected by high inorganic nitrogen.
8. Molybdenum (Mo): Soils deficient in Mo can have reduced nitrogen fixation. Mo, an essential micronutrient, is needed for the formation and function of the nitrogenase enzymes. Legumes also need other micronutrients such as iron, boron, and copper.
9. Stresses such as drought, waterlogging, or heat can reduce nodulation.

If the inoculation has failed, producers may need to apply N to their soybean crop. Depending on the projected yield potential, producers may need to apply as much as 120-180 lbs. N/acre.

Tina Sullivan, Northeast Area Agronomist
tsullivan@ksu.edu

Kraig Roozeboom, Cropping Systems
kraig@ksu.edu

Chuck Rice, Soil Microbiologist
cwrice@ksu.edu

3. Corn rootworm egg hatch has begun in Kansas

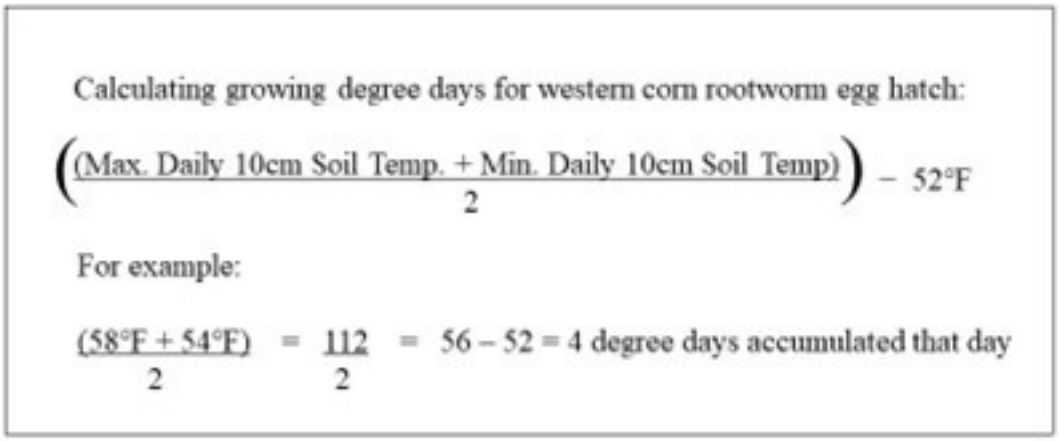
To date, corn rootworm degree day accumulation for the northern half of Kansas is not tremendously different compared to the same time last year, and egg hatching should begin in one to two weeks in most locations. In the southern portion of the state, degree day accumulation is slightly behind last year, but egg hatching is underway in most locations, and peak hatch is likely in two to three weeks (Table 1).

Table 1. 2025 corn rootworm degree day accumulation compared to 2024 during the same time period. Calculated using 10 cm max/min ground temperatures provided by K-State Mesonet.

CRW Degree Day Accumulation as of May 19			
Location	**2024**	**2025**	**Difference**
Colby	255	292	+37
Hays	332	377	+45
Manhattan	356	323	-33
Garden City	428	415	-13
Meade	560	475	-85
Parsons	373	361	-12

Calculating Corn Rootworm Degree Days

As with all degree-day models, the base temperature, or developmental threshold, will be important for predicting rootworm hatch and emergence. Western Corn Rootworm eggs are laid in summer and overwinter in the soil. The following spring, a threshold soil temperature of 52°F or higher will trigger eggs to develop. This base temperature and the daily 10-cm high and low soil temperatures are used to monitor egg hatch using the formula below. It is important to note that degree day calculations for egg hatch should begin starting January 1 of the current year.



Eggs should begin hatching after approximately 380 degree days have accumulated. Peak egg hatch occurs between 684 and 767 accumulated degree days. Examining corn roots for damage 10 to 14 days following peak hatch is recommended since feeding damage will be fresh and easier to detect.

Why is it important to scout for root damage?

Western corn rootworm resistance to Bt corn continues to be an issue in continuous corn in the United States. Field-evolved resistance was first detected in 2009, and, to date, resistance to every commercially available Bt trait package has been detected in corn-producing areas of the country. However, resistance is not uniform across all corn-growing regions, so be sure to check local conditions when making planting decisions. Given this, evaluating corn roots for rootworm damage during the growing season is highly recommended. Doing so lets you know how well your rootworm management practices are working and provides a way to detect the presence of potential resistance to the Bt hybrid planted.

Details for the process of evaluating corn root damage can be found in the K-State Research and Extension publication MF845, *Corn Rootworm Management in Kansas Field Corn*. In short, several plants should be dug up throughout the field, and their roots should be washed well for subsequent evaluation using the Iowa State University 1-3 Node Injury Scale. Digging roots will need to be timed after peak damage from rootworm larvae occurs, but before roots begin to regrow, typically late June to early July. Corn rootworm resistance to a Bt protein should be considered if the node injury rating is 1.0 in a field with at least 2 consecutive years use of the same single corn rootworm Bt toxin or if the node injury rating is greater than 0.5 in a field with at least 2 consecutive years use of the same pyramided corn rootworm Bt toxins.

It is important to remember that the best management tool for western corn rootworm is rotation. In continuous corn production, this includes rotating Bt traits annually to help slow the evolution of resistance. Rotation to a non-Bt hybrid combined with soil-applied insecticides would be another option for continuous corn. Both practices will be useful for prolonging the efficacy of currently available Bt traits.

Anthony Zukoff, Extension Entomology – Garden City
azukoff@ksu.edu

4. Alfalfa pest update: Weevil activity drops, beneficial insects on the rise

Alfalfa weevils cause much loss prior to the first cutting every year, whether from actual defoliation due to feeding, the cost of control to mitigate that feeding loss, or both. However, this voracious feeding period occurs only in the spring and, thankfully, seems pretty much done for this year. Figure 1 shows an alfalfa weevil pupa inside its little silken enclosure, which means larval feeding is finished for this weevil. The vast majority of weevils are pupating or are just emerging as adults.

Figure 2 shows two small lady beetle larvae, which are now very common throughout most alfalfa fields and should help control pea aphids and/or potato leafhoppers, hopefully until the alfalfa gets a little regrowth. No potato leafhoppers have been detected in North Central Kansas, yet, but they will soon be migrating back into the state.

Figure 1. Alfalfa weevil pupa inside silken enclosure. Photo by Cody Wyckoff, K-State Research and Extension.

Figure 2: Lady beetle larvae. Photo by Cody Wyckoff, K-State Research and Extension.

Jeff Whitworth, Extension Entomology Specialist
jwhitwor@ksu.edu

5. 2025 Kansas Wheat Plot Tours - Updated schedule

The Department of Agronomy and K-State Research and Extension will host several winter wheat variety plot tours in different regions of the state starting May 13, 2025. Please make plans to attend a plot tour near you to see and learn about the newest available and upcoming wheat varieties, their agronomics, and their disease reactions.

Below is a list of the remaining plot tour dates, times, and locations with directions. This list will be updated as details change or more plot tours are added.

May 22 – Thursday

Time	County	Location	Agent	Directions
10:30 AM	Smith		Sandra Wick	Turn south off of Highway 36 at Athol, Kansas. Go through town a couple of blocks, then turn west at Trinity Ag. Then south on the first road for about ¼ mile, the plot is on the west side.
1:30 PM	Jewell		Sandra Wick	Turn south off Highway 36 on 30th Road and go 3 miles. The plot is on the west side.
4:30 PM	Mitchell		Sandra Wick	South of Beloit on Hwy.14 to blacktop Hunter Road (X Road), then 4 miles west to 220 Road, then 1 mile south to Y Road, then east about ½ mile, on the south side.
6:00 PM	Sumner	Conway Springs	Randy Hein	Conway Springs- 922 W 140th Ave north of Conway Springs, 1 mile east on 140th, south on Springdale 0.01 mile, east side of road

May 23 – Friday

Time	County	Location	Agent	Directions
8:00 AM	Ottawa	Minneapolis	Jay Wisbey	1.5 miles west of K-106 Highway on Justice Road
11:00 AM	Saline	Solomon	Jay Wisbey	From Old 40 Highway West of Solomon. Go South on N Gypsum Valley Road 2.5 Miles and then West ½ mile on E Stimmel Road
5:00 PM	Edwards	Kinsley	Baley Doggett	Head West out of Kinsley on 1st Street (or L Road) ½ mile, the plot is on the North side of the blacktop—meal to follow tour.

May 27 – Tuesday

Time	County	Location	Agent	Directions
5:00 PM	Washington	Palmer	Luke Byers	2 mi. East of Hwy 15 in Palmer

May 28 – Wednesday

Time	County	Location	Agent	Directions
7:30 AM	Phillips	Phillipsburg	Cody Miller	Phillipsburg tour starts with Breakfast at 7:30 at the Fair building north of town. 8:30 move to the plot located ¾ miles south of Phillipsburg on Highway 183 (East Side of the Highway).
1:00 PM	Rooks	Plainville	Cody Miller	Rooks County plot starting at 1:00, location 5 miles East of Plainville on HWY K-18, turn south on 23 Road, ¼ mile south.
6:00 PM	Ellis	Hays	Stacy Campbell	From the Agricultural Research Center in Hays, south of town, go south on 240th Avenue, turn west on Bison Road, and keep driving until the road turns south. Field is about 1000 ft south, on the east side of the road.

May 29 – Thursday

Time	County	Location	Agent	Directions
9:30 AM	Rush	LaCrosse	Lacey Noterman	The plot is located 11 miles straight west of Casey's in LaCrosse on Hwy 4, turning into Avenue L. 1 Mile south on County Road 140, turn west on Avenue M for 1 and ½ miles. The plot is located on the South side.
2:00 PM	Ness	Ness City	Lacey Noterman	The plot is located at 17282 T Road. From Ness City, go north on Highway 283 for 4 miles and then turn east on road 170 for 1 mile, and then turn North on road 170 for 1 mile, and then turn North on Road T. The Plot is located north of Nichephor Farmhouse, approximately ½ mile.
6:00 PM	Lane	Dighton	Lacey Noterman	The plot is located 7 miles west of Dighton to Eagle Road, 2 miles south to west Road 130, then 200 yards west toward Ehmke's farmstead, east of the

				scale.

June 3 - Tuesday

Time	County	Location	Agent	Directions
7:30 AM (CT)	Thomas		Helen Geifer	From I-70 Levant Exit, go 10 miles south on County Road 11 (Levant-Winona Blacktop) to County Road G, then just over 1/2 mile west
5:30 PM (MT)	Sherman		Jeanne Falk Jones	Plot tour at F&J Farms: 7 miles north of Goodland on Hwy 27, east of the scale house. Supper to follow at 4-H Building.

June 4 - Wednesday

Time	County	Location	Agent	Directions
7:30 AM (MT)	Wallace		Jeanne Falk Jones	Plot tour at Mai Farms: 9 miles south of Sharon Springs on Hwy 25 to Field Road, 4 miles east and 3/8 mile south. 7:15 AM (MT): Breakfast at Mai Farms.
10:00 AM (MT)	Wallace		Jeanne Falk Jones	Plot tour at E&H Farms: 3 mi west of Weskan on Hwy 40 to Road 3 and south 5.5 mi (south of intersection of Gooseberry Rd and Rd 3)
5:30 PM (CT)	Cheyenne		Jeanne Falk Jones	Plot tour at Hingst Farm: 12 miles west of St. Francis to Road 2, 2 miles north to Road P, 1 mile east to Road 3, and ¾ miles north to the plot. Sandwiches after the tour.
10:00 AM (CT)	Republic	Polansky	Luke Byers	1 mile east of Belleville on U.S. 36 (1196 Co Rd 18, Belleville)

June 6 - Friday

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

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

6. Help improve irrigation management for Kansas soybeans - Take this survey

Much of the irrigation research in Kansas has focused on cropping systems in the western part of the state. However, as irrigated acres shift eastward, there is limited data on how irrigated soybeans are managed across Kansas, especially when it comes to yield and pest management. Even less is known about the practices farmers use on irrigated soybean fields.

We are conducting a survey targeting on-farm practices related to cropping, irrigation, and pest management. Your input will help guide future research and refine recommendations for more effective and sustainable soybean production.

This survey is part of a project supported by the Kansas Soybean Board.

Interested in sharing your experiences? Please follow the link or scan the QR code to access the questionnaire.

https://kstate.qualtrics.com/jfe/form/SV_eA7EnuS3HoLprYq

Tina Sullivan, Northeast Area Agronomist
tsullivan@ksu.edu

7. Help shape forage extension programs in eastern Kansas

Forages—both native and tame—cover approximately 40% of Kansas and are essential to the state's cattle industry. Yet, despite their widespread use and importance, forage systems receive relatively limited research funding, particularly when it comes to management practices.

To better understand current production methods and improve extension programming across eastern Kansas, a short survey is being conducted. The survey asks about location (county), forage type, and key management practices.

If you are involved in forage production, we encourage you to share your insights. Please follow the link or scan the QR code to participate.

https://kstate.qualtrics.com/jfe/form/SV_26qsL4E8Ov7EhhQ

Tina Sullivan, Northeast Area Agronomist
tsullivan@ksu.edu