Issue 982

K-STATE Research and Extension

Extension Agronomy

eUpdate

11/09/2023

These e-Updates are a regular weekly item from K-State Extension Agronomy and Kathy Gehl, Agronomy eUpdate Editor. All of the Research and Extension faculty in Agronomy will be involved as sources from time to time. If you have any questions or suggestions for topics you'd like to have us address in this weekly update, contact Kathy Gehl, 785-532-3354 kgehl@ksu.edu, or Dalas Peterson, Extension Agronomy State Leader and Weed Management Specialist 785-532-0405 dpeterso@ksu.edu.

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1. Check terraces now for needed repairs and maintenance

The weeks between harvest and when snow flies can be a good time to evaluate and perform maintenance on terraces. Over 9 million acres of land in Kansas is protected by more than 290,000 miles of terraces, making Kansas #2 in the U.S. for this soil and water conservation practice. To accomplish the goal of erosion control and water savings, terraces must have adequate capacity, ridge height, and channel width.

Without adequate capacity to carry water, terraces will be overtopped by runoff in a heavy storm. Overtopping causes erosion of the terrace ridge, terrace back slope, and lower terraces and may result in severe gullies. Terraces are typically designed to handle runoff from a 1-in-10-year storm. The rainfall amounts for such a storm are approximately five inches for eastern Kansas, four inches for central, and three inches for western Kansas over a 24-hour period.

Terraces need regular maintenance to function for a long life. Erosion by water, wind, and tillage wears the ridge down and deposits sediment in the channel, decreasing the effective ridge height and channel capacity. The amount of capacity loss depends on the type and number of tillage operations, topography, soil properties, crop residue, and precipitation. Terrace maintenance restores capacity by removing sediment from the channel and rebuilding ridge height.

Frequent maintenance is typically required for steep slopes and/or highly erodible soils. Annual maintenance is necessary for intense tillage operations and heavy rainfall runoff. Less frequent maintenance is often adequate with high residue levels or where lower rainfall occurs, and runoff intensity is low.

Check for needed repairs

Terraces degrade naturally by erosion and sediment and can be damaged by machinery, animals, settling, and erosion. Check terraces and terrace outlets regularly (at least annually) for needed repairs. The best time to check is after rains when erosion, sedimentation, and unevenness in elevation are easiest to spot. Specific items to note are overtopping, low or narrow terrace ridges, water ponding in the channel, terrace outlets, erosion, and sediment clogging near waterways or pipe outlets.

Reshaping the terrace

Terrace maintenance can be done with virtually any equipment that efficiently moves soil. Common tools include those that turn soil laterally, such as a moldboard plow, disk plow, one-way, terracing blade (pull-type grader), or 3-point ridging disk (terracing disk, etc.); those that convey or throw soil (belt terracer, scraper, whirlwind terracer, etc.); and those that push or drag soil (dozer blade, straight-wheeled blade, 3-point blade, etc.).

This article discusses procedures for the common plow. For other equipment, get advice from manufacturers and other users (contractors) or experiment to find what works best.

The primary objective in reshaping the terrace is to move soil from the channel to the ridge. Work done on the terrace back slope or cut slope above the channel may help maintain or improve shape but does little to add significant ridge height or channel capacity. Because of improved efficiency, a

two-way (rollover) plow is ideal for terrace maintenance. It can usually achieve the desired shape with fewer passes than the conventional plow. Turn the soil in one direction to counteract erosion or turn it in either direction to clear the channel or raise and widen the terrace ridge.

The number of passes required for maintenance depends on the size of the tool, the depth of operation, travel speed (which controls distance of throw), and the amount of soil moved. The plow throws soil further at higher speeds, so a minimum ground speed of 5 mph in loose soil is suggested, but 6 mph or more is better.

Maintenance controls terrace shape. Assess what needs to be done before beginning maintenance. Compare the existing cross-section shape with the desired shape and size and determine where soil should be removed and where it should be placed for the desired result. Back furrows are placed where more soil is needed, while dead furrows are located where soil needs to be removed. This way, passes or sets of passes with the equipment are located to achieve the desired results.

Terrace dimensions can be changed by carefully planned placement of back furrows and dead furrows. Large changes in dimension and shape require several sets of passes with the tools or earthmoving equipment. Plan the terrace cross-section shape and size and terrace slope segment length to fit current and future tillage, planting, and harvesting equipment size.

The number of rounds or passes with maintenance equipment depends on the beginning shape of the terrace, the size of the equipment, and the desired size and shape. If in doubt, make more passes rather than stop too soon. Remember, the loose soil will settle a lot.

Plowing the ridge. The terrace ridge is raised and widened by plowing up from both sides, as shown in Figure 1. When a 2-way plow is used, plow just the front slope from the channel to the ridge. Plowing the backslope makes it steeper.

Figure 1. Double back furrow. The arrow indicates the back furrows meeting on the top of the ridge. Image from K-State Research and Extension.

The back furrows are placed on top of the ridge, and the dead furrows are placed at the desired center of the channel and at the toe or beyond on the backslope. Avoid making a depression on the backslope by varying where the dead furrow is placed. Plowing the ridge is recommended for maintaining or adding ridge height. The back furrows should come together to make the ridge wider and not so sharply peaked, but not overlap and make additional rounds. Correct a narrow-peaked

ridge resulting from too few passes by moving the plow over only one or two bottom widths with each pass. This process requires many more rounds.

To make the terrace slopes long enough to fit equipment, always leave dead furrow the desired distance from the ridge. For the three-segment shape, locate the back and dead furrows in the same place each year, keeping the cross-section uniform in size and shape. Vary the back furrow and dead furrow locations each time to maintain the rounded shape of the channel and ridge for the large smooth section.

Plowing the channel. Sometimes, even when the ridge is large enough, the channel can have inadequate capacity. To enlarge and widen the terrace channel, plow out to both sides, as shown in Figure 2.

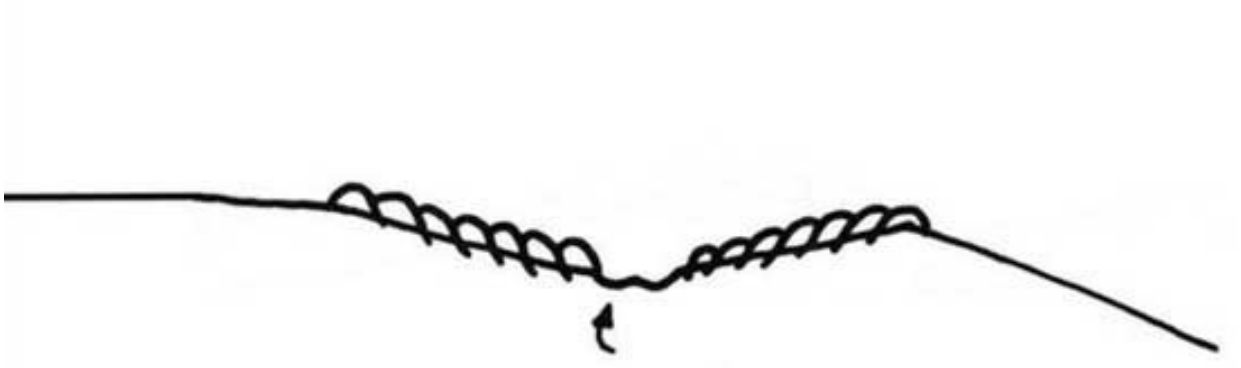

Figure 2. Enlarging and widening the terrace channel. The arrow indicates the two dead furrows meeting at the center of the channel. Image from K-State Research and Extension.

Back furrows are placed on the ridge and the uphill cut-slope side the same distance from the desired center of the channel. Begin at a distance equal to that from the ridge to the desired channel center. A double side-by-side dead furrow should result at the desired channel center. Locate the plow back furrow on the ridge and the dead furrows in the desired channel bottom to achieve and maintain the desired shape. Vary the back furrow location to avoid leaving a large ridge on the cut slope.

Plowing out the channel periodically is recommended for steeper slopes to help maintain adequate channel capacity. Alternating between plowing the channel out and plowing it up from one time to the next is a good practice.

Consider conservation agriculture practices to increase terrace life

When silt bars and sediment deposits accumulate frequently in a terrace channel, excessive erosion is the cause. A change in tillage and cropping practices is needed to correct this cause. Adding cover crops to a system, switching to no-till or conservation tillage, and using crop rotations that retain crop residue will reduce erosion substantially. This will reduce the frequency of terrace maintenance needs. Many no-till producers find terrace systems require little maintenance. Although runoff still occurs, there is very little soil movement in a no-till system. Remember, terraces help in extreme weather events. They prevent gullies and are only a part of an overall erosion control plan. Conservation farming methods, especially retaining crop residue or using cover crops, complement erosion control structures and have been shown to be both economically and environmentally

sound.

For more information, refer to the publication Terrace Maintenance, C-709, available online at:
http://www.ksre.ksu.edu/bookstore/pubs/C709.pdf

Another great resource is this KSRE YouTube video: Basics of Terrace Maintenance:
http://youtu.be/CcolTeP9QRA

Additional sources for technical information include your local USDA-Natural Resources Conservation Service and County Conservation District offices.

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2. Nutrient availability in poultry manure

Poultry litter can provide a significant supply of nutrients for crop production in areas of Kansas where a supply of litter is available (Figure 1). Although Kansas is not a major producer of poultry, there is an abundant supply of litter from the nearby states of Arkansas, Missouri, and Oklahoma, which rank among the largest producers of poultry in the U.S. The acreage available to receive poultry litter has been declining in Arkansas, Missouri, and Oklahoma in recent years because of environmental concerns and nutrient management regulations. Thus, litter availability in areas such as southeast Kansas has been on the rise.

Figure 1. Poultry litter. Photo by Dan Donnert, K-State Research and Extension.

Poultry litter should serve as an excellent complement to commercial nitrogen (N) fertilizers. Phosphorus (P) content in poultry litter is usually high, and application rates should be based on P levels to avoid potential surface water contamination.

Moisture content and nutrient concentration in poultry litter can be highly variable and depend mainly upon production conditions, storage, and handling methods. Therefore, laboratory analysis is the best way to determine the level of N and P in the material to be applied. Average values for the different types of poultry manure collected over a period of time are shown in Table 1. Actual laboratory analysis of 213 poultry manure samples from southeast Kansas is shown in Figure 2. There is a large range in nutrient values, likely due to the source of the litter. However, a good sample average to expect would be 56-53-46 (N-P-K).

Table 1. Types and nutrient content of poultry litter

Litter Source	Typical moisture content	Typical nutrient content (lbs/ton)		
		N	P_2O_5	K_2O
Layer	High	35	40	20
Pullet	Low	40	45	40
Breeder	High	40	60	40
Turkey	Low	60	60	55
Broiler	Low	60	60	55

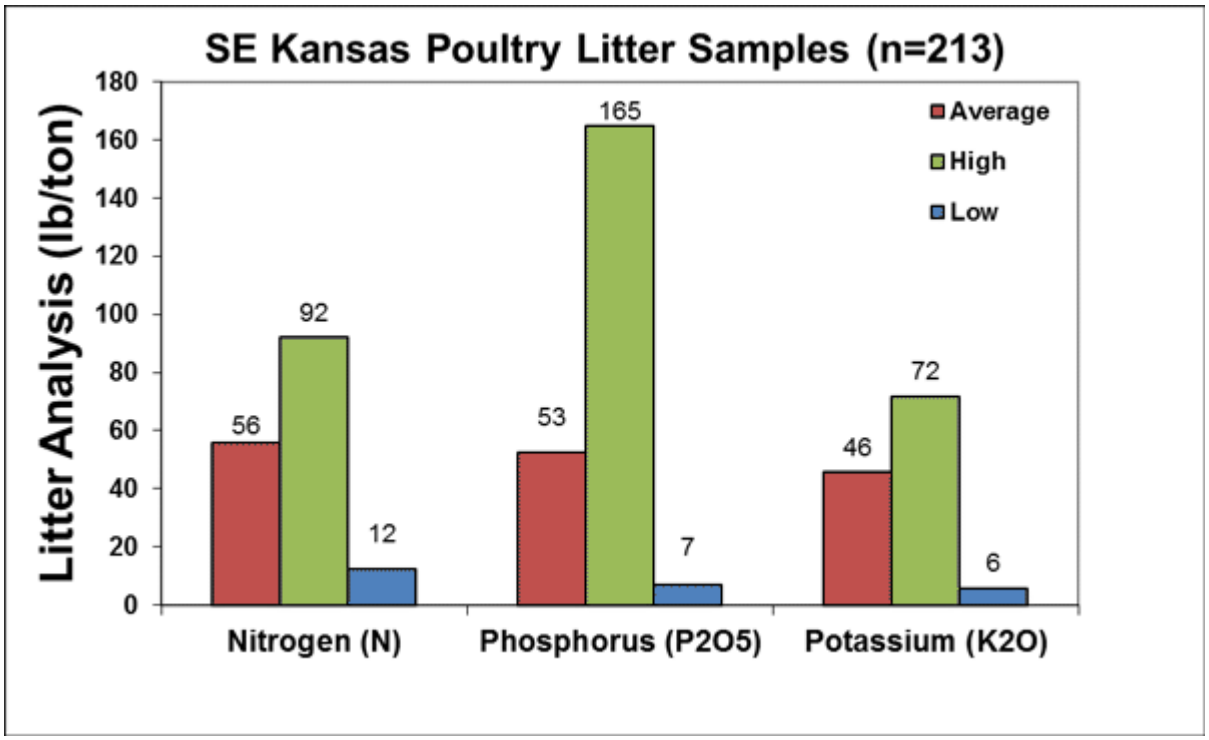

Figure 2. Results of analysis of 213 samples of poultry manure from southeast Kansas. Sources: K-State Research and Extension.

For maximum efficiency of manure use, it is essential to know the nutrient content of the manure. A laboratory analysis should be done on the poultry litter before applying it to land. A laboratory analysis provides information regarding nutrient levels, as well as the chemical forms of these nutrients. This information is necessary for an adequate estimation of nutrient availability and application rates.

For more information, see K State Extension publication MF-2562, "Estimating Manure Nutrient Availability," at: http://www.ksre.ksu.edu/bookstore/pubs/MF2562.pdf

Nitrogen availability

What is the crop availability of N shortly following poultry litter application?

In the case of N, it is important to consider that this nutrient is primarily in the organic form in poultry litter (up to 75-80% organic N). Organic N needs to be mineralized before becoming available to crops. A fraction of this organic N may become part of the soil organic matter pool and unavailable to crops in the short term.

Field and laboratory studies suggest the fraction of total nitrogen that becomes plant available the first year of application is approximately 45-55%, which includes both the inorganic N in the manure and a percentage of the organic N. This value varies depending upon components in the litter and the method of handling and application. For example, poultry litter that contains a large fraction of bedding material will tend to have lower N availability in the year of application. Reduction in N availability may also occur when litter is aged and has undergone some composting. Nitrogen lost from the volatile ammonium fraction at the time of application on the soil surface can also reduce plant available N. Ammonium volatilization is typically higher during windy and warm days. Incorporation of litter immediately after application will reduce volatilization and potential nutrient loss by water runoff in case of a rainfall event, in addition to reducing the odor of the litter.

If the manure is applied to pastures, the percentage of N utilized by the forage in the first year will depend on whether the pasture consists of cool-season or warm-season grasses. For cool-season grasses, such as fescue pasture, N utilization will likely be less than 50% in the first year. Most of the growth in cool-season pasture occurs early in the year. The microbial community will not mineralize as much N early in the spring as later in the summer. Fall applications may result in better N utilization for fescue than winter or spring applications. For warm-season grasses, such as bermudagrass pasture, nitrogen utilization from manure will likely be close to 50%. In both cases, producers should base application rates on the P and K needs of the grass and supplement additional N fertilizer to meet the N needs of the grass.

Phosphorus and potassium availability

When manure is applied to the soil, what percentage of the phosphorus and potassium is available to the crop during the first year?

A large fraction of the P in manure is considered to be plant-available immediately after application. The fraction that is not plant available shortly after application will become available over time.

Estimated values of P availability are from 50 to 100%. This range accounts for variation in sampling and analysis and for P requirements with different soil test levels. Use the lower end of the range of P availability values (50%) for soils testing "Very Low" and "Low" (below 20 ppm). In these situations, large yield loss could occur if insufficient P is applied and soil P buildup is desirable.

On the other hand, use 100% availability when manure is applied to maintain soil test P in the "Optimum" soil test category and when the probability of a yield response is small.

Several studies have shown that manure P is a valuable resource that is comparable to inorganic fertilizer P for crop production. These two P sources are similarly effective when the manure P concentration is known, and the manure is applied properly. Nevertheless, excessive application of manure P (e.g., at rates sufficient to meet the crop's N needs) often results in excessive soil P buildup, resulting in a higher risk of surface water contamination.

This problem of excessive P buildup in the long term can be minimized by:

- Applying manure to meet the P needs of the crop and using inorganic sources of fertilizer to complement nitrogen needs,
- Constantly monitoring soil test P levels, and
- Using the P-index to assess the potential impact of P buildup on water quality.

Producers should consider actual P application rates and not just tons per acre of manure being applied. Uniform application of manure at precise rates can also be difficult. Careful calibration of manure applicators is needed. If these aspects are not considered, the efficiency of manure P compared with inorganic fertilizer P may be reduced. Careful management pays off.

Availability of potassium is usually near 100% with proper application. Poultry litter can also provide significant amounts of secondary and micronutrients.

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3. Reminder - after harvest is the optimal time for Soybean Cyst Nematode sampling

Soybean cyst nematode (SCN) is a major problem in soybean fields throughout eastern and central Kansas (Figure 1). Severe infestations may result in stunted and yellow plants with reduced nodulation. In these instances, symptoms are easily confused with drought, flooding, herbicide injury, compaction, or nutrient deficiency. In most fields, however, the only symptoms present may be some uneven growth and a gradual production decline over time. It is important to identify the presence of SCN and monitor levels regularly to determine if management strategies, such as variety resistance and crop rotation, have been successful.

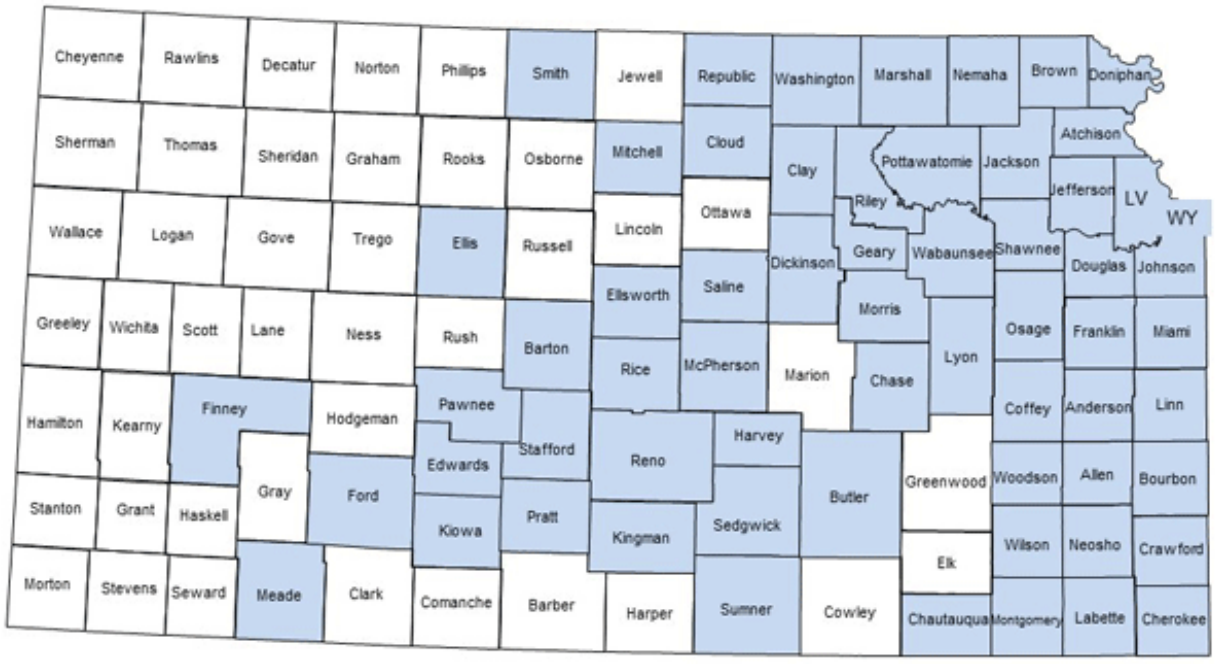

Figure 1. As of October 1, 2023, SCN was identified in 62 Kansas counties that produce >85% of Kansas soybeans. Graphic by Timothy Todd and Chandler Day.

Immediately following harvest is the best time to check fields for SCN and start planning for next season. Confirming the presence of SCN, determining population levels, and monitoring the effectiveness of resistant varieties are the basis for a successful integrated management program.

To collect a SCN sample, you will need:

1. A soil probe (or sharpshooter spade)
2. A bucket
3. A labeled bag. The label should include the following information:
    a. Field identification (*i.e.,* Field ID: North Farm, near Doe Creek)
    b. Size of the area being sampled (*i.e.,* 20 acres)
    c. Crop rotation history (*i.e.,* soybean, corn, and soybean)

Recommended field pattern for sample collection:

If your field is fairly uniform, divide it into quadrants for your SCN sample collection. Sections of the field that have had different cropping histories or have different soil types should be sampled separately. **For each quadrant or area of the field, you will collect 10 to 20 cores to a depth of 6 to 8 inches.**

It is important that when collecting soil cores, you walk in a systematic pattern, such as a "Z" pattern (Figure 2). Collect a total of 10 to 20 soil cores, emptying each into the bucket after collection. All core samples should be mixed well to account for minor variation between cores. After mixing, collect 1 pint of soil, approximately 2 cups, in a labeled plastic bag and seal.

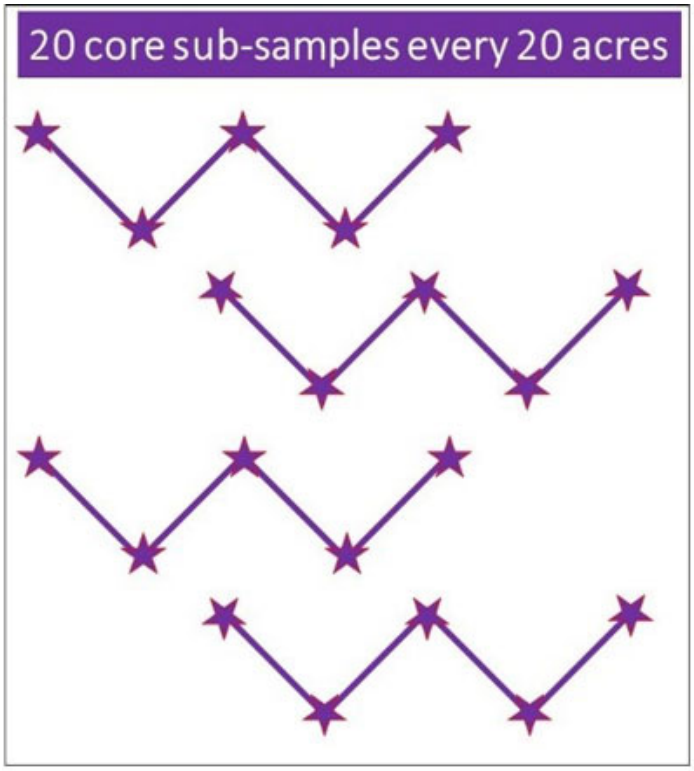

Figure 2. Example of a good sampling pattern for collecting soil to test for SCN.

When sending your samples to the diagnostic lab, make sure to:

1. Ship overnight or as fast as possible
2. Avoid leaving bags in the sun
3. Send the samples to the Plant Disease Diagnostic Lab in the K-State Plant Pathology Department.
4. Fill out the **Plant Disease Diagnostic Check sheet** at https://www.plantpath.k-state.edu/extension/diagnostic-lab/documents/2021_PP_DiseaseLabChecksheet.pdf.pdf

Shipping address:

K-State Plant Disease Diagnostic Lab
4032 Throckmorton PSC

1712 Claflin Road
Manhattan, KS 66506
clinic@ksu.edu
785-532-1383

SCN Diagnostic Fee: https://www.plantpath.k-state.edu/extension/plant-disease-diagnostic-lab/services-and-fees.html

Internal Clients (KSRE agents) = $25
External Clients (crop consultants, individual producers, etc.) = $35

Remember, your results will only be as good as the sample you send to the lab!

Check out this short, informative video from our lab: Soybean Cyst Nematode-SCN Sampling 2022, https://youtu.be/b6Eo0isl1I0 .

For more information, feel free to contact us at the K-State Plant Pathology Department.

Soil sampling for fertility too?

Save some time in the field if you plan on sampling your fields for soil fertility. The sampling protocol is very similar to the protocol for SCN. All you need to do is split the samples into two sets – one for the Soil Testing Laboratory and one for the Plant Disease Diagnostic Laboratory. Remember to keep the soil for the Plant Disease Lab in the field-moist state and follow all the shipping and handling instructions listed above. More information on soil fertility testing can be found here: https://www.agronomy.k-state.edu/outreach-and-services/soil-testing-lab/

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4. Cover Your Acres Winter Conference, January 16-17 in Oberlin

K-State Research and Extension will host the 21st annual Cover Your Acres Winter Conference for crop producers and consultants on January 16 and 17. The conference will take place in the traditional in-person format at the Gateway Civic Center in Oberlin, KS.

Cover Your Acres is a producer-driven meeting focused on new ideas and research-based updates in crop production in northwest Kansas and the Central High Plains region.

The conference, which typically draws more than 400 attendees from Kansas and other states, highlights the latest technology, methods, and conservation practices to improve crop production in the region. This year's conference will feature university specialists and industry representatives discussing what's driving profitability in northwest Kansas farms. **Confirmed session topics** will include economic drivers on northwest Kansas farms, weed resistance management, cropping systems, and soil fertility management. Additional session topics and speakers are still being finalized and will be announced in an upcoming eUpdate article and on the conference website (link included below).

The same programs will be offered on both days of the conference. Participants attending both days will find catching most or all of the programs easier. The sessions are followed by a social on Tuesday evening, where attendees can visit with industry representatives and conference speakers while enjoying appetizers.

Online registration is open. The fee is $55 for Tuesday, January 16, $60 for Wednesday, January 17, or $80 for both days. After January 10th, and for walk-ins, the cost is $80 per day. The conference fee includes lunch, morning and afternoon refreshments and educational materials. The program will offer continuing education unit (CEU) credits for Certified Crop Advisors and 1A for Commercial Applicators credit.

To view the preliminary conference details, lodging accommodations, and online registration, visit www.northwest.ksu.edu/coveryouracres. For questions, call 785-462-6281.

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5. Save the Date for the K-State/KARA Crop Production Update: Dec. 6-7

Save the date for the 2023 Crop Production Update, hosted by the Kansas Agribusiness Retailers Association (KARA) and in cooperation with K-State Research and Extension. The two-day event is set for December 6 and 7 at the Hilton Garden Inn, Manhattan, KS. Each day will kick off at 8:30 a.m. and conclude around 4:00 p.m. Several CCA CEUs will be offered in addition to one 1A hour and one core hour.

This training provides the latest research and technological advances in weed and insect control, fertilizer and chemical recommendations, soil fertility concerns, and much more. The agendas for each day are still being finalized and will be shared in a future eUpdate article.

Stay tuned to the eUpdate and the conference website (https://www.ksagretailers.org/events-training/crop-production-update/) for registration to open and the final agendas to be released soon.

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