Kentucky Field Crop News

Spanning 5 departments and 120 counties

UK Wheat Science Group | UK Corn & Soybean Science Group

Martin-Gatton College of Agriculture, Food and Environment

August 2026 – Volume 02 Issue 08

In this Issue:

Subscribe

To sign up & receive the Kentucky Field Crops News,

click the link: KFCN NEWSLETTER SIGN-UP or scan the QR code.

Yield Goal and Fertilizer Rate Recommendations: P and K

Dr. John H. Grove, Soil Science Research & Extension

I wrote last month about using the old yield goal model to come up with corn fertilizer nitrogen (N) rate recommendations. That is not the limit to the use of yield goal in corn nutrition management. Let's look at phosphorus (P) and potassium (K) nutrition. Are phosphate (P_2O_5) and potash (K_2O) rate recommendations influenced by the yield goal provided by the client? Because the original Stanford (1973) publication dealt only with N, I naively believed that only corn N rate recommendations were being affected by the yield goal approach.

First, I should note that I've found that differences in soil test based P_2O_5 and K_2O recommendations are not caused by differences in laboratory measurements of plant available P and K – as long as the same extractant is used. For example, in 2025 I split 20 field soil samples after drying, mixing and crushing them. One set was sent to the UK soil test laboratory, and the second set was sent to a popular private lab using the same Mehlich 3 extraction procedure for soil test P and K determination. The results of the comparisons are in Figure 1.

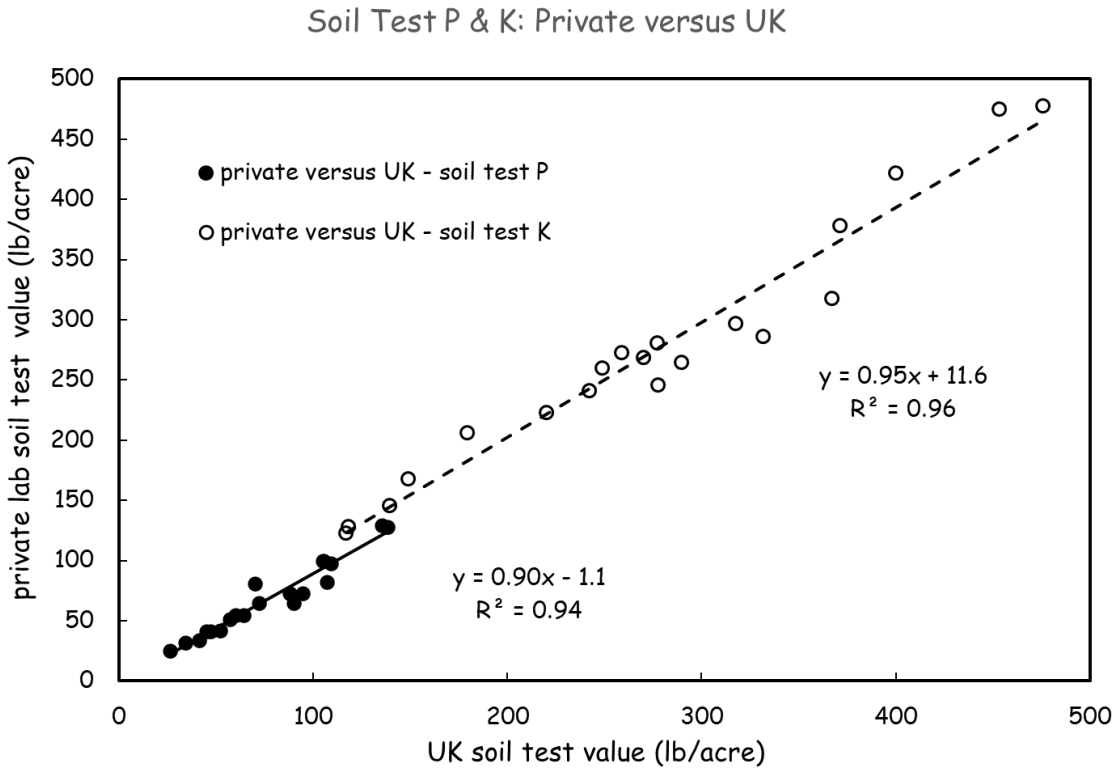

Figure 1. Mehlich 3 extractable soil test P – private lab versus UK lab (closed black circles); Mehlich 3 extractable soil test K – private lab versus UK lab (open black circles).

Soil test P values are lower and found in the lower left corner of Figure 1. The values are nearly equal – the variance is almost nil ($R^2 \approx 1$), the slope is nearly 1.0, and the intercept is

nearly 0. The relationship between private lab soil test K and UK lab soil test K (in the middle and upper right part of Figure 1) is equally strong. Essentially, the private lab and the UK lab measure the same amounts of soil test P and K in any one sample.

When I submitted those split 2025 soil samples to the private lab, the submission sheet invited me to declare a "yield goal". As these were research samples from a variety of sites/soils – I merely wanted the analytical results. I had no foreknowledge of the season to come, so I simply chose a value a bit above the current state-wide average corn yield: 200 bushels/acre. Later, a producer brought me soil test reports (same private lab) for a dozen fields intended for corn production. As I was examining the fertilizer P and K recommendations in the producer's reports, I found that the recommended rates were significantly higher than those that I received – and the ranges in soil test P and K values were similar. These comparisons are shown in Figure 2.

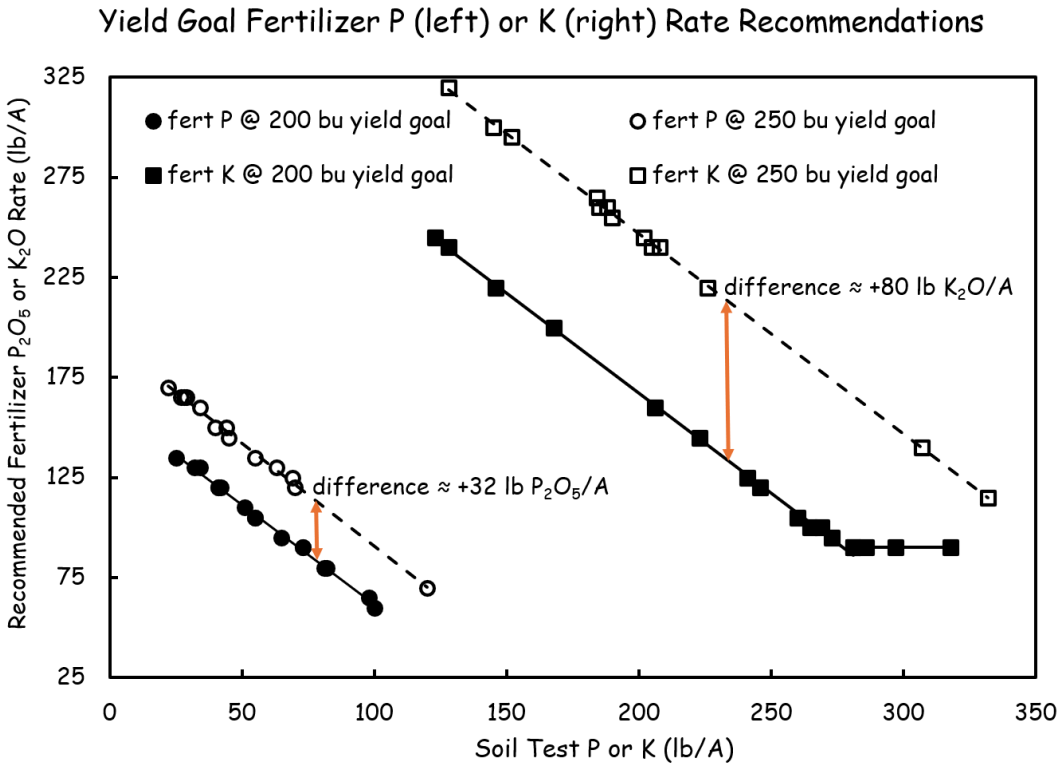

Figure 2. Recommended fertilizer phosphate (P_2O_5) rate versus Mehlich 3 soil test P at 200 (closed circles) and 250 (open circles) bu/A corn yield goals (lower left); Recommended fertilizer potash (K_2O) rate versus Mehlich 3 soil test K at 200 (closed squares) and 250 (open squares) bu/A corn yield goals (middle and upper right).

Figure 2 illustrates two situations, 200 and 250 bu/A corn yield goals. For both nutrients, the greater yield goal (open circles and open squares) resulted in a greater fertilizer rate recommendation, averaging 32 lb P_2O_5 and 80 lb K_2O per acre (when soil test K reaches 275 lb/A, the recommended potash rate levels out at 90 lb K_2O/A and the difference due different yield goals gets smaller) . The extension of the yield goal concept from corn nitrogen (N) nutrition to P and K nutrition flies in the face of Stanford's (1973) work, which considered only N addition and never considered P and K fertilization.

The relationship of soil test P and K to recommended fertilizer P_2O_5 and K_2O rates is not well related to yield potential (goal). The critical soil test value, the value at which grain yield no

longer rises with increasing soil test levels, is generally independent of the yield level. In Kentucky, "correlation" of yield with soil test P or K has found that the yield maximizing soil test level is the same, a sufficient level of available nutrition, regardless the grain crop yield level (except in seasons like the summer of 2012, where water was the most limiting crop growth factor). Different soils with different chemistries and textures might require different amounts of P and K to achieve the critical soil test value. Kentucky's surface soil properties don't vary so greatly – textures are largely silt loam and silty clay loam, field soil organic matter ranges between 1.5 and 3.5%, and grain crop soil pH is usually maintained between 5.5 and 7.0.

Fertilizer P and K rate recommendations at soil test values near/above the critical soil test value are "maintenance" nutrition. UK fertilizer P and K rate recommendations recognize a need for maintenance fertility but are limited to what is needed to maintain critical soil test levels, especially when samples are taken once every 2/3 years. UK maintenance recognizes that greater crop yield removes more soil P and K – UK recommendations were revised to reflect recent grain crop yield gains. The private lab seems to be using yield goal to generate P and K maintenance fertilizer rates, rates above those needed to maintain critical soil test levels. Excessive maintenance P and K fertilizer is taking financial resources and putting them into the soil. But the soil bank account does not pay interest. Erosion, chemical fixation, runoff, etc. cause 'negative interest'. Chemical and biological uncertainty make 'more soil nutrients' less valuable than equal funds ($) still in the bank. Doses of needed fertilizer are more efficient than maintenance fertilizer doses (Thomas, 1989).

Using the producer's soil test reports, Table 1 gives the private lab's soil test P and K values and fertilizer P_2O_5 and K_2O rate recommendations (250 bu/A yield goal). UK's P_2O_5 and K_2O rate recommendations at those same soil test values were tabulated alongside.

Table 1. Private lab and UK phosphate and potash rate recommendations, for corn.

Field Number	Soil Test P	Private Lab Fert Rec	UK Lab Fert Rec†	Soil Test K	Private Lab Fert Rec	UK Lab Fert Rec†
	lb/A	lb P_2O_5/A	lb P_2O_5/A	lb/A	lb K_2O /A	lb K_2O /A
1	44	150	50	188	260	70
2	22	170	90	128	320	100
3	28	165	70	208	240	60
4	63	130	0	205	240	60
5	69	125	0	202	245	60
6	34	160	60	307	140	0
7	40	150	50	184	265	70
8	29	165	70	226	220	50
9	45	145	50	145	300	90
10	70	120	0	190	255	70
11	27	165	80	152	295	90
12	55	135	50	185	260	70
13	120	70	0	332	115	0
Ave.		142	44		243	61

†Taken from AGR-1 (Ritchey and Grove, 2025).

For a number of the producer's corn fields, the UK lab recommends no P_2O_5 and/or no K_2O fertilizer. For the private lab, no level of soil test P or K triggered such a recommendation. The last line in Table 1 illustrates the large differences between UK and the private lab in their fertilizer phosphate and potash recommendations: 142 - 44 = 98 lb P_2O_5/A and 243 - 61 = 182 lb K_2O/A. If 0-0-60 (MOP) costs $494/ton, then the recent potash price is $0.412/lb K_2O. If 18-46-0 (DAP) costs $914/ton and the value of N is $0.719/lb N (aggregated across recent anhydrous ammonia, urea, UAN 28 and UAN 32 prices), then the recent phosphate price is $0.712/lb P_2O_5 (Neeley, 2026).

So, 98 lb P_2O_5/A x $0.712/lb P_2O_5 = $69.78/A; 182 lb K_2O/A x $0.412/lb K_2O = $74.98/A. The total cost difference averages nearly $145/A at these prices (Neeley, 2026). Differences in these recommendations are not due to differences in the soil test analytical results. The additional cost to yield goal related fertilizer phosphate and potash rate recommendations rises as the yield goal rises – with no field research demonstrated corn yield benefit to using the yield goal approach. Does the corn producer get good value, a good ROI, from the yield goal approach to their corn fertilizer phosphate and potash rate recommendations?

References:

Neeley, D.T. 2026. DTN Retail Fertilizer Trends. DTN Progressive Farmer. Minneapolis, MN. https://www.dtnpf.com/agriculture/web/ag/crops/article/2026/08/05/fertilizer-prices-fall-uan32-leads

Ritchey, E., and J. Grove. 2025. 2025-2026 Lime and Nutrient Recommendations. Bulletin AGR-1. University of Kentucky Cooperative Extension Service, Lexington, KY.

Stanford, G. 1973. Rationale for optimum nitrogen fertilization in corn production. J. Environ. Qual. 2:159-166.

Thomas, G.W. 1989. The soil bank account and the farmer's bank account. J. Prod. Agric. 2:122-124.

Citation: *Grove, J., 2026. Yield Goal and Fertilizer Rate Recommendations: P and K. Vol. 02, Issue 08. University of Kentucky, August 14, 2026.*

Residual Herbicides are also Beneficial in Wheat

Dr. Travis Legleiter, UK Extension Weed Specialist

Weed control in any crop starts as soon as the crop is planted if not before. This is especially true for control of Italian ryegrass in wheat as the use of a residual herbicide is critical for successful control. Those fortunate enough to not have Italian ryegrass in their wheat fields can also benefit from the use of residual herbicide in wheat.

A list of residual herbicides available in winter wheat in Kentucky is available in Table 1.

Herbicide products that contain pyroxasulfone (see table 1) are best suited for fields where ryegrass control is a priority. It is important to note that while the primary active ingredient, pyroxasulfone, is the same in Anthem Flex, Zidua, and Fierce EZ the timing of application varies among the three products. This variance in timing is based on additional active ingredients in the products and crop safety. Over several years of testing of the pyroxasulfone products we have found minimal differences in control among them. Anytime we have found differences it has typically been due to environmental conditions rather than individual products. The key environmental condition that improves ryegrass control is the reception of an activating rainfall event within approximately 10 days of the residual herbicide application. Overall, it should be expected that pyroxasulfone products will provide 80% or better control of ryegrass the following spring. In essence, it should be expected that some ryegrass escapes may occur in the spring and a postemergence application of Axial Bold may be needed. On those fields with resistance to Axial Bold, there unfortunately is no other postemergence options available to control those escapes.

Anthem Flex and Fierce EZ allow for applications preemergence or 14 Days Pre Plant, respectively. The use of pyroxasulfone applied prior to wheat emergence comes with the risk of crop injury, although this risk is relatively low, especially if you follow the specific restrictions that are outlined on each herbicide label. In general, these restrictions include planting into a quality seed bed to assure complete furrow closure, planting at least 1 inch in depth, and avoiding planting into extremely dry conditions when heavy rainfalls are forecast.

All three pyroxasulfone products are also allowed to be applied early postemergence to wheat. This timing can be beneficial in allowing the residual to extend further into the late winter and early spring to capture later emerging ryegrass. If choosing this timing you will need to also include 2 to 3 oz of a 75DF metribuzin product to kill any emerged ryegrass that exist at the time of application. There is risk of injury on wheat with metribuzin, especially if cold and wet weather follows immediately after the application.

Determining which product and timing to use for ryegrass control is up to each grower and what fits their needs best. In general, we find the preemergence timing offered by Anthem Flex offers the most flexibility, although it also comes with the greatest risk of crop injury. The use of any of the three products as an early POST may be the best option for those who are dealing with ryegrass that is resistant to postemergence applications of Axial Bold. As

mentioned above these applications occur later in the fall and can extend the residual activity into the early spring to reduce potential escapes.

Lastly, those not dealing with ryegrass in wheat can still benefit from the use of residual herbicides. Products like Finesse Cereal and Fallow or Valor EZ while not providing residual control of ryegrass provide control of numerous other winter annuals. The use of a product like Finesse Cereal and Fallow provides a wide spectrum of weed control and can reduce or eliminate the need for spring postemergence herbicide applications in certain scenarios. Those looking to use a Finesse Cereal and Fallow should be aware that an STS, SR, or BOLT double crop soybean variety will need to be used following wheat harvest.

Table 1. Herbicides with residual weed control that are labeled for use in winter wheat in Kentucky.

Trade Name	Active Ingredients	Labeled Application Timings[1]	Use Rates[2]
Zidua SC	Pyroxasulfone	Delayed PRE & Early POST	1 to 4 fl oz/A
Anthem Flex	Pyroxasulfone + carfentrazone	PRE[3], Delayed PRE, & Early POST	2.5 to 3.6 fl oz/A
Fierce EZ	Pyroxasulfone + flumioxazin	14DPP & Early POST	6 fl oz/A 3 fl oz/A
Valor EZ	Flumioxazin	7 DPP	2 fl oz/A
Finesse Cereal & Fallow	Chlorsulfuron + metsulfuron	PRE	0.2 to 0.4 oz/A

[1] **14 DPP:** Fourteen days prior to wheat planting. **PRE:** From planting up to spiking. **Delayed PRE:** 80% germinated wheat with ½" shoots up to spiking. **Early POST:** Spiking to 4 tiller wheat

[2] Refer to herbicide labels for use rates by soil texture and application timing

[3] Labeling of Anthem Flex PRE applications in wheat is through a 24c supplemental label valid in Kentucky.

Citation: *Legleiter, T., 2026. Residual Herbicides are also Beneficial in Wheat. Vol. 02, Issue 08. University of Kentucky, August 14, 2026.*

The Side Effects of Unnecessary Insecticide Applications

Dr. Rogerio Lira, UK Postdoctoral Fellow
Dr. Felipe C. Batista, UK Postdoctoral Fellow
Dr. Ric Bessin, UK Entomology Extension Specialist

In many production systems, insecticide applications are sometimes made without considering whether pest populations justify treatment. In other cases, insecticides are simply added to planned fungicide or herbicide applications because they are cheap or convenient. Although these approaches may appear efficient, unnecessary insecticide applications can have important long-term consequences. Simply finding insects in a field does not necessarily mean that treatment is needed. The consequences of an unnecessary insecticide application extend far beyond the immediate financial cost.

In every crop system, beneficial insects, spiders, and naturally occurring pathogens help suppress pest populations (Figure 1).

Figure 1. Hoverfly (Syrphidae) larva preying on aphids. Beneficial insects such as hoverflies play an important role in naturally suppressing pest populations. Photo: Felipe C. Batista.

When these natural enemies are eliminated, the balance of the agroecosystem is disrupted, allowing species that previously caused little or no economic damage to increase rapidly. During the past spring, repeated pyrethroid applications targeting alfalfa weevil greatly reduced natural enemy populations in some alfalfa fields in western Kentucky. Combined with favorable weather conditions, aphid populations increased dramatically after the applications (Figures 2 and 3), requiring additional insecticide

treatments. Rather than solving the problem, repeated broad-spectrum insecticide applications disrupted biological control and contributed to a secondary pest outbreak.

Figure 2. Alfalfa field showing patches of plants heavily damaged by aphids following repeated insecticide applications that reduced natural enemy populations. Photo: Felipe C. Batista.

Figure 3. Close-up of heavy aphid infestations on alfalfa stems from the affected field. Photo: Felipe C. Batista.

Another important consequence of unnecessary insecticide use is the development of insecticide resistance. Repeated use of products with the same mode of action favors the survival of tolerant individuals and over time, insecticides that once provided excellent control become less effective. During the 2024 and 2025 seasons, fall armyworm populations collected from wheat fields showed reduced susceptibility to several pyrethroid insecticides, resulting in poor field performance of products that had previously provided reliable control (Figure 4). Preserving the effectiveness of available insecticides

requires minimizing unnecessary applications and rotating products with different modes of action whenever treatment is needed.

Figure 4. Poor control of fall armyworm in wheat following insecticide application. Laboratory bioassays conducted with this fall armyworm population revealed reduced susceptibility to several pyrethroid insecticides. Photo: Felipe C. Batista.

When insecticide applications are justified, choosing products that are less disruptive to natural enemies can improve long-term pest management by conserving beneficial insects that continue to suppress other pests in the field. Unnecessary insecticide applications may solve one problem today while creating several new ones tomorrow. Using insecticides only when justified by field scouting and comparing them with economic thresholds helps to protect beneficial insects, delays resistance and preserves effective management tool.

More Information

- Batista, F. C., & Villanueva, R. T. 2025. Pyrethroid Resistance in Fall Armyworm in KY Wheat: Prevention & Management. Kentucky Field Crops News.
- Batista, F. C., & Villanueva, R. T. 2025. Insecticide resistance: How it happens & how to prevent it in your fields. Kentucky Pest News.

Dr. Rogerio Lira, Felipe C. Batista, UK Entomology Postdoctoral Scholar

Dr. Felipe C. Batista, UK Entomology Postdoctoral Scholar

Dr. Ric Bessin, Entomology Extension Specialist
(859) 257-7456 | Ric.Bessin@uky.edu

Citation: *Lira, R., Batista, F., Bessin, R., 2026. The Side Effects of Unnecessary Insecticide Applications. Vol. 02, Issue 08. University of Kentucky, August 14, 2026.*

Pest Management Workshop

The Kentucky Agriculture Training School (KATS) will host a Pest Management Workshop on August 27th, designed for crop advisors, agricultural agents, producers, and other professionals in the agriculture industry. This hands-on workshop will begin at 8 a.m. and conclude with lunch at noon and be held at the University of Kentucky Research and Education Center in Princeton. Topics will include late-season insect scouting and identification, herbicide mode of action identification, identifying and quantifying corn disease and management decisions, and spot sprayer calibration. The training cost is $65 and pre-registration is required at https://katspestmanagement2026.eventbrite.com.

Fall Crop Protection Webinar Series Begins Oct. 22

Save the dates for a series of webinars focusing on agronomic crops and Integrated Pest Management. The University of Kentucky Martin-Gatton College of Agriculture, Food and Environment and UK Grain Crops Pest Management will present the 2026 Fall Crop Protection Webinar Series. The series will begin at 10 a.m. ET/ 9 a.m. CT on Thursday, Oct. 22, 2026, and will continue consecutive Thursday mornings through Nov. 19, 2026, at the same time. Each webinar will be one hour in length.

Applications are pending for Continuing Education Units for certified crop advisors and Kentucky pesticide applicators to receive credit for participation in the webinars. Webinar links for pre-registration will be available and announced soon for those planning to join.

The webinars are open to agriculture and natural resource county extension agents, crop consultants, farmers, industry professionals, and others, whether they reside or work in Kentucky or outside the state.

Webinar #1: Extension Weed Science Update
Oct. 22, 2026; 10 a.m. ET/ 9 a.m. CT; Marcelo Zimmer, Extension Weed Science

Webinar #2: Extension Entomology Update
Oct. 29, 2026; 10 a.m. ET/ 9 a.m. CT; Felipe Batista, UK Entomology Postdoctoral Scholar

Webinar #3: Extension Plant Pathology Update
Nov. 5, 2026; 10 a.m. ET/ 9 a.m. CT; Kiersten Wise, Extension Plant Pathologist

Webinar #4: Extension Weed Science Update
Nov. 12, 2026; 10 a.m. ET/ 9 a.m. CT; Travis Legleiter, Extension Weed Science

Webinar #5: Extension Plant Pathology Update
Nov. 19, 2026; 10 a.m. ET/ 9 a.m. CT; Carl Bradley, Extension Plant Pathologist


Marcelo Zimmer


Felipe Batista


Kiersten Wise


Travis Legleiter


Carl Bradley

Upcoming Events

2026

Pest Management Workshop – Princeton, KY
August 27, 2026

Fall Crop Protection Webinar #1 - Marcelo Zimmer
October 22, 2026

Fall Crop Protection Webinar #2 - Felipe Batista
October 22, 2026

Fall Crop Protection Webinar #3 - Kiersten Wise
October 22, 2026

Fall Crop Protection Webinar #4 - Travis Legleiter
October 22, 2026

Fall Crop Protection Webinar #5 - Carl Bradley
October 22, 2026

2027

Kentucky Commodity Conference - Bowling Green, KY
January 21, 2027

UK Winter Wheat Meeting – Princeton, KY
February 2, 2027

Kentucky Crop Health Conference - Bowling Green, KY
February 4, 2027

UK Wheat Field Day – Princeton, KY
May 11, 2027