Kentucky Field Crops News

Spanning 5 departments and 120 counties **January 2026, Volume 02, Issue 01**

Martin-Gatton College of Agriculture, Food and Environment | Grain and Forage Center of Excellence

UK Wheat Science Group
UK Corn & Soybean Science Group

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Is Controlled Drainage Worth the Extra Bucks, Time, and Efforts in Soybean Fields?

Dr. Mohammad Shamim, UK Extension Associate Grain Crops

The Midwest United States is one of the world's leading soybean-producing regions. According to a 2017 Food and Agriculture Organization report, the region accounts for more than 34% of global soybean production. Over the years, soybean yields have increased steadily thanks to improved genetics and better management practices. While growers can influence genetics and management, weather remains largely out of our control.

Drought during critical reproductive growth stages can cause major yield losses, as many growers experienced this year. On the other hand, excessively wet springs can be just as damaging, leading to delayed planting, poor root development, and waterlogging. The good news is that yield losses from both dry and wet conditions can be reduced with proper water management—irrigation during drought and effective drainage during wet periods.

Although irrigation is often a costly investment and not feasible for all operations, drainage systems are one of the most effective and widely adopted tools for managing excess water. Good drainage improves soil health, allows timely field operations, and prevents prolonged waterlogging. Studies have shown that improved drainage can increase soybean yields by up to 8% (about 4 bu/acre) compared with poorly drained fields.

While surface drainage has been used for many years, subsurface drainage is increasingly recognized as a practical long-term solution. Growers considering subsurface drainage generally have two options: conventional (free-flow) drainage or controlled drainage. Controlled drainage systems use a water-level control structure to regulate how much water leaves the field. This allows producers to remove excess water during wet periods while retaining soil moisture during drier conditions. In addition to improving yield stability, controlled drainage has been shown to reduce nutrient losses and improve downstream water quality.

A multi-state study evaluating controlled drainage systems included 55 site-years across 13 field locations in the Midwest and North Carolina between 2000 and 2017. Overall, the researchers found no consistent yield advantage of controlled drainage compared with conventional (free-flow) drainage in corn production. However, weather conditions played a major role. During mild to moderate drought years, controlled drainage increased corn yield by 4–14% by helping conserve soil moisture. In contrast, during wetter growing seasons, yields were reduced by 4–10% due to excess soil water (Youssef et al., 2023).

Similar results have been reported for soybean. Researchers from the University of Minnesota, North Carolina State University, and the University of Missouri analyzed data from 13 site-years collected between 2007 and 2018 to compare soybean yields under control and conventional drainage systems (Strock et al. 2025). Across all site-years, median soybean yields were nearly identical, 58.21 bu/acre under controlled drainage and 58.00 bu/acre under conventional drainage, indicating no overall yield difference between the two systems.

That said, yield responses varied depending on seasonal conditions. In about 35% of the site-years, soybean yield either increased or decreased by up to 4% under controlled drainage. When researchers focused on a subset of 11 site-years, controlled drainage reduced plant stress during mild to moderate drought and increased soybean yields by 4–8% in six of those site-years. However, during wetter growing seasons, controlled drainage reduced soybean yields by 4–9% in five site-years.

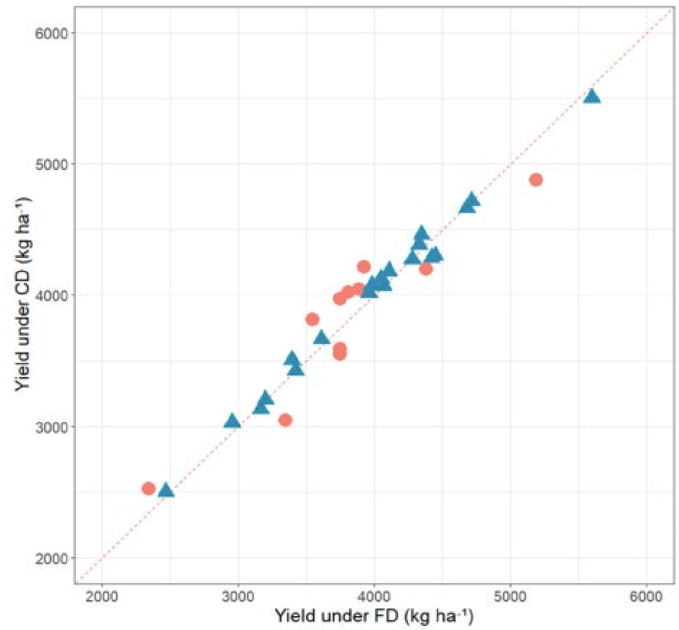

Figure 1. Soybean yield under full drainage (FD) and controlled drainage (CD) across study sites. Sites shown with circles were included in additional analyses (see Figure 2). For reference, 1,000 kg/ha is approximately equal to 15 bu/ac. Source: Strock et al. (2025)

The researchers also examined when soybean plants were most likely to experience stress during the growing season, both by growth stage and by month. Results showed that soybeans were most affected by excess water from planting through the V5 stage, while drought stress was most common around the R4 (pod development) stage. In Figure 2, the smaller bars (at P-V5 and R4) indicate that these stress conditions occur more frequently, suggesting that wet conditions are more likely early in the season, while dry conditions are more likely later during pod development.

The flowering period (R1) appeared to be a transition point between wet and dry conditions. The wide boxplots during this stage show that soybeans can experience either excess moisture or drought during flowering, depending on the season.

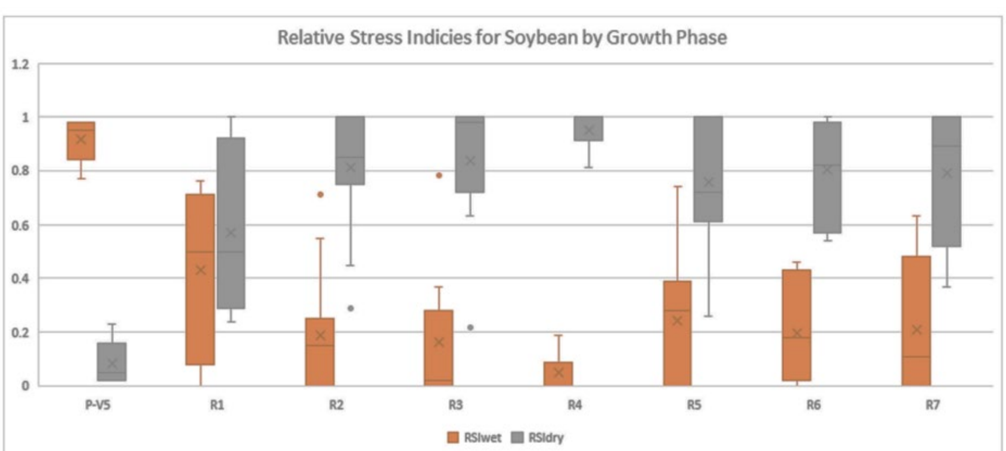

Figure 2. Relative stress index for soybean at different growth stages. RSwet represents stress caused by excess soil water or waterlogging, while RSdry represents stress caused by drought. Source: Strock et al. (2025)

On a monthly basis, excess moisture caused the greatest plant stress in May. June represented a transition period from wet to dry conditions, while the remaining months of the growing season were primarily characterized by drought-related stress.

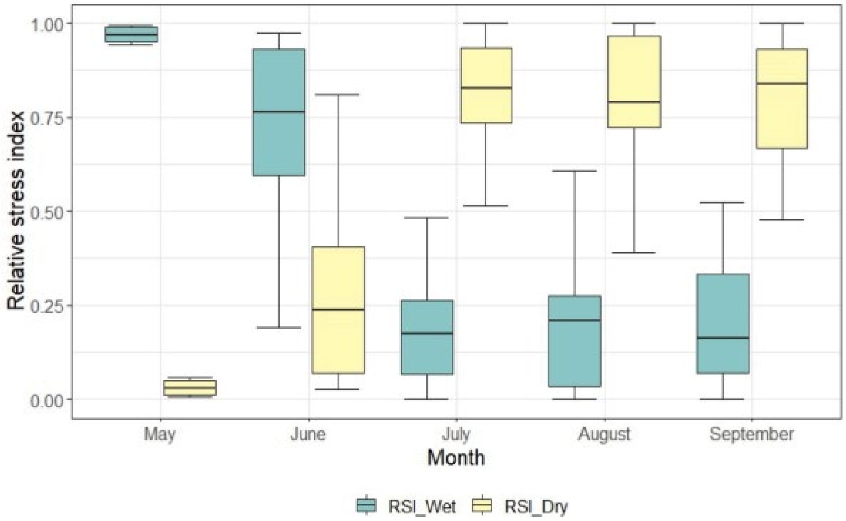

Figure 3. Relative stress index by month during the soybean growing season in the Midwest United States. Source: Strock et al. (2025)

Using a different stress index, the authors found that excess moisture was a greater challenge than drought at only two of the 11 study sites. Even at those locations, drought stress was still present. Overall, these results indicate that drought poses a greater and more widespread challenge to soybean production than wet conditions across most sites.

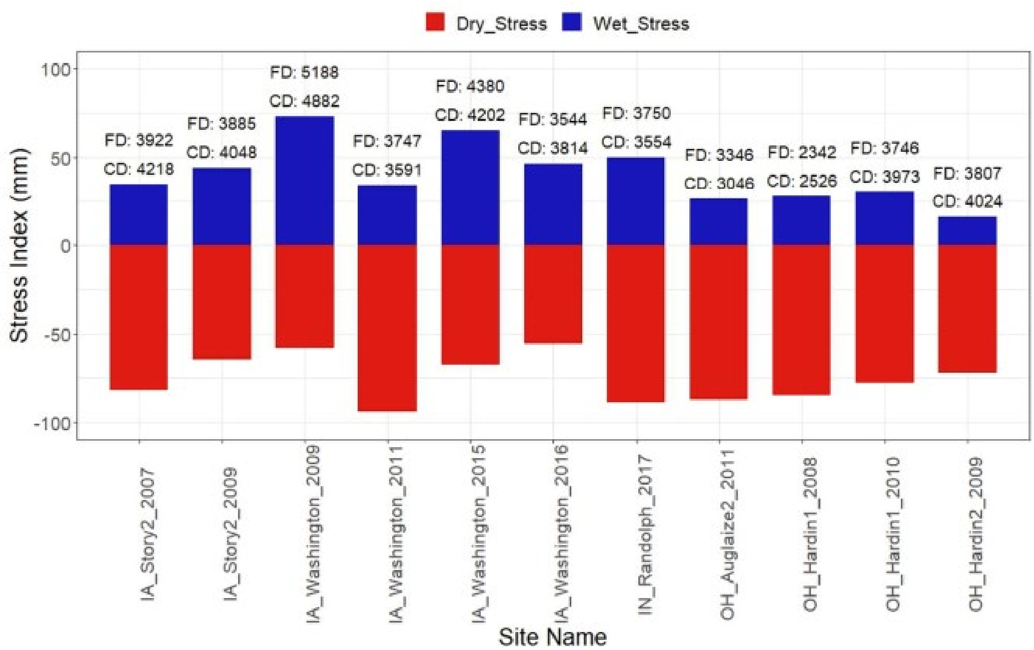

Figure 4: Growing-season wet and dry stress indices and soybean yield across 11 site-years in the U.S. Midwest. Source: Strock et al. (2025)

Based on multiple analyses, the authors developed practical guidelines for switching between controlled drainage and full drainage during the soybean growing season. They recommend using full drainage during vegetative stages to quickly remove excess water, then shifting to controlled drainage at flowering (R1) while closely monitoring rainfall and returning to full drainage when heavy precipitation occurs. Controlled drainage is most beneficial from full bloom through pod elongation (R2–R4) and can continue from beginning seed through pod fill (R5–R6), with adjustments back to full drainage during wet periods. Finally, full drainage is recommended from physiological maturity through harvest maturity (R7–R8) to ensure good field conditions for harvest.

Although soybean yields were not significantly different between full and controlled drainage systems overall, controlled drainage has been previously reported to reduce nutrient losses and helped relieve mild to moderate drought stress in some years. These benefits make controlled drainage an option worth considering, especially in fields prone to late-season dryness. However, managing manual control structures across large farms can be challenging, and sensor-based automated systems may be difficult to justify economically given that yield gains (around 4%) occur only in certain years. In short, controlled drainage is more of a risk-management and water-quality tool than a guaranteed yield booster. For most Kentucky soybean fields, sticking with a free-flow (full) drainage system is likely the best option. Free-flow systems are easier to manage and require less time and investment. Controlled drainage may still help in specific situations, such as drought-prone fields; but for typical Kentucky soils, your soybean field may just like things the old-fashioned way: free-flowing, full speed ahead, and hassle-free.

Sources

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Strock J.S., Youssef, M.A., Moursi, H., Nelson, K., Ranaivoson, A.Z., Poole, C.A. 2025. A synthesis of soybean yield response to controlled drainage under varying precipitation patterns in the US Midwest. Vol (318), https://doi.org/10.1016/j.agwat.2025.109707.

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Why Does Your Canola Look So Ugly in Winter? (And Why That's Actually a Good Thing)

Dr. Mohammad Shamim, UK Extension Associate Grain Crops

Canola can be one of the most beautiful crops you'll ever grow, bright yellow flowers, happy bees, and neighbors slowing down to look. But once winter shows up, that same field can look like it lost a bar fight. Purple leaves, wilted plants, and a general "this can't be alive" appearance are all common. Before you write its obituary, let's talk about what's really going on.

Canola in bloom. Photo taken April 10 in Graves County. Hard to believe this is the same crop that looked half-dead in February.

Leaves are the plant's sugar factories. Using sunlight, carbon dioxide, and water, they produce sugars through photosynthesis, which fuel growth, root development, and survival. Those sugars are moved from leaves to roots and growing points through the phloem, while water and nutrients move upward through the xylem, basically the plant's plumbing system.

When cold weather arrives gradually, the first thing that slows down is sugar movement in the phloem. Sugars build up in the leaves because transport becomes inefficient at low temperatures. That sugar buildup often shows up as purple leaves, a response also seen in corn during cold snaps. This is usually the first sign that winter is settling in, and the start of canola's "ugly phase."

As temperatures continue to drop, photosynthesis slows because the enzymes that drive it don't work well in the cold. At the same time, the plant shifts into survival mode. Cells actively lose water and increase solute concentration inside the cell. Why? Because more concentrated cell contents lower the freezing point, much like spreading salt on icy roads. This process helps prevent ice crystals from forming inside cells and damaging them. This gradual adjustment is known as cold hardening.

During hardening, older outer leaves, especially large lower ones, often die. They've done their job. The important parts, the crown and growing point near the soil surface, become more cold-tolerant. To the untrained eye, the field may look like a total failure, but underground, the plant is quietly preparing for spring.

Problems arise when extreme cold hits suddenly. If temperatures drop too fast, the plant doesn't have time to harden. Cells retain too much water, ice forms, cell membranes rupture, and leaves turn white or translucent. In severe cases, the growing point can be killed; and that's when winter injury becomes real.

So, should you panic in January? Absolutely not. If someone tells you your canola is dead, invite them back between March 25 and April 10. Winter canola has a bad habit of looking terrible right before it looks fantastic. Think of it as a dramatic winter makeover, this is canola talk, nothing more.

Left: Canola leaves turning purple. Photo was taken after a mildly cold spell in Clinton, KY on Dec 12, 2025. Right: Canola after a cold winter. Photo taken Feb 27, 2025, in Ballard County. It looked finished—but it wasn't.

The good news is that modern hybrids are quite winter-hardy, and most of Kentucky is well suited for winter canola. If you avoided planting too early or too late (mid-September; roughly Sept. 15–25 is ideal) and didn't overdo nitrogen in the fall, chances are your canola will survive just fine.

So be patient. Let winter do its thing. And when spring arrives, don't forget to take a few photos; preferably with grandma and grandpa in front of a bright yellow field. Nature may be tough, but it usually puts on a pretty good show in the end.

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W.G. Duncan – Father of Crop Models

Dr. Dennis B. Egli, UK Professor Emeritus

Did you know that one of the 'fathers' of crop simulation modelling was a professor in the old Agronomy Department at the University of Kentucky? I was reminded of this at a recent seminar where the speaker used a crop simulation model to investigate the effects of planting date and variety maturity on soybean growth and yield. William G. Duncan, a friend and colleague from many years ago, was one of the first scientists to believe that it was possible to write a computer program that simulated the growth and production of yield by a grain crop.

Many crop scientists at that time felt that crop growth was so complex and influenced by so many factors that it was impossible to construct a model that would mimic growth of a crop. Bill realized that the complexity of the system made it an ideal candidate for a simulation model. If scientists could describe the system, the computer could handle the complexity. Today that does not sound like such a rash proposition, but 60 some years ago it was an extraordinary idea, and it took an extraordinary person to give birth to such an idea. Bill Duncan was such an individual.

Bill was a native Kentuckian and, after obtaining a B.S. degree in chemical engineering from Purdue University in 1930, he farmed and operated a fertilizer business in Hopkinsville, Ky. When he was 54 years old, he decided to sell his business and go back to school to study agronomy, receiving his Ph.D. degree from Purdue University in1959. He then joined the Agronomy faculty at the University of Kentucky.

Bill's first model, developed with scientists at the University of California, Davis, (Duncan et al., 1967) was a simple model that calculated daily photosynthesis for a crop community as a function of leaf area, leaf display and solar radiation. This simple model was the precursor to today's complex models that simulate growth throughout the crop's life cycle and provide an estimate of yield. Modeling is now a very active research field with models available for all major grain crops.

There are at least three major benefits associated with the development and use of crop simulation models. First, as Bill put it – a model is "one way of putting what we know about the parts of the system back together to see how it functions as a whole" (Duncan, 1967). Crop scientists often study individual pieces of the system (photosynthesis, roots, seeds, nutrient or water availability etc.) without considering how their piece fits into the complete system. Models put the information on pieces back together to evaluate the contribution that each piece makes to the complete system.

Secondly, building a model requires a precise detailed description of the entire system. Developing this description often identifies important processes that haven't been studied by crop physiologists. Model building stimulates research on these under-studied processes, so the interaction of modelers and experimentalists advances our overall understanding of crop growth.

Finally, models make it possible to thoroughly study the interaction between the crop and its environment. Crop scientists know very well that they must evaluate varieties and management practices over a period of years and locations to sample a range in environments. It is never practically possible to run experiments long enough or at enough locations to thoroughly sample all possible environmental conditions. A three-year field experiment, for example, may never encounter a dry year, thereby providing a biased estimate of the treatment effect. Models make it possible to easily evaluate 30 years of weather data for many locations, providing a thorough evaluation of the treatment. Models may also make it possible to evaluate treatments that are impossible to test experimentally.

One of Bill's first papers (Duncan, 1971) (its publication was a 'breakthrough' of sorts because at that time journals were reluctant to publish model papers because they had no real data) illustrates the value of models. At that time, there was a lot of interest in whether vertical leaves would increase corn yield, a proposition that was very difficult to evaluate experimentally. Bill evaluated leaf angle with his model, where he could assign any angle to the leaves, and found that vertical leaves increased photosynthesis if the leaf area of the community was large enough; if it was too small, photosynthesis was reduced because vertical leaves reduced light interception.

Duncan had a tremendous effect on agronomy and crop physiology until he died in 1986. He made fundamental contributions to our understanding of how crop communities develop and produce yield, but his most important contribution was demonstrating that it was possible, with the help of a computer, to develop crop simulation models and thereby greatly enhance our ability to understand crop growth and its interaction with the environment. His contributions are even more impressive when we remember that he began his career at an age when many people are thinking of early retirement and that he received only token pay throughout his career. The legacy of William G. Duncan, the father of crop models, will always be with us. Remember – "Science is built with facts as a house is built with stones – but a collection of facts is no more science than a heap of stones is a house." Jules Henri Poincare (1854 – 1912) French Philosopher of Science and Mathematics.

Adapted from Egli, D.B. 1991. W.G. Duncan – Father of Crop Models. Journal of Agronomic Education. 20: 165-167.

References

Duncan, W.G. 1967. Model building in photosynthesis. p. 309-313. *In* A. San Pietro and F.A. Greer (ed.) Harvesting the sun – photosynthesis in plant life. Academic Press, New York.

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University of Kentucky to Host Winter Wheat Meeting on February 3rd

Jennifer Elwell, UK M-G CAFE Marketing and Communications

The University of Kentucky Wheat Science Group, part of the Martin-Gatton College of Agriculture, Food and Environment, welcomes wheat growers, industry professionals and crop advisers to its Winter Wheat Meeting on Tuesday, Feb. 3.

Attendees will hear from a range of UK wheat production specialists covering topics such as pest management, marketing and the use of new precision agriculture tools, such as drones and artificial intelligence.

Dave Van Sanford, UK wheat breeding specialist, will showcase the changes in Kentucky wheat over the past 40 years. Grower Quint Pottinger, of Affinity Farms in Nelson County, will share his experience on planting wheat autonomously.

According to Chad Lee, Grain and Forage Center of Excellence director and Martin-Gatton CAFE Extension professor, the Winter Wheat meeting draws more than 100 farmers, crop advisers, county agents and wheat industry stakeholders.

"This meeting is an opportunity for growers and advisers to connect, learn and gain actionable insights," Lee said. "It's always rewarding to see the level of engagement and the exchange of ideas that happen here."

Educational opportunities include continuing education credits for Certified Crop Advisers and pesticide applicators. Credit approvals are pending.

Lunch will be provided by the Kentucky Small Grain Growers Association, offering a chance for attendees to connect with peers and discuss the topics of the day.

The event runs from 9 a.m. to 3 p.m. CST at the James E. Bruce Convention Center in Hopkinsville. Registration begins at 8:30 a.m.

For additional information, including the full agenda, visit https://wheatscience.mgcafe.uky.edu/.

For questions, contact Colette Laurent, UK Grain Crops Group coordinator, at colette.laurent@uky.edu.

Citation: Elwell, J., 2025. University of Kentucky to Host Winter Wheat Meeting on February 3rd. Kentucky Field Crops News, Vol 2, Issue 1. University of Kentucky, January 16, 2026.

Jennifer Elwell, M-G CAFE Marketing and Communications

University of Kentucky

2026 Winter Wheat Meeting

Tuesday, February 3, 2026
9 a.m. – 3 p.m.
The Bruce Convention Center
303 Conference Center Dr, Hopkinsville, KY 42240

Changes in Kentucky Wheat Over the Past 40 years
Dr. Dave Van Sanford

Best Practices for Drone Applications
Dr. Tim Stombaugh

Driving Innovation in Wheat Production with AI and Precision Tools
Dr. Katsutoshi Mizuta

Planting Wheat Autonomously
Quitt Pottinger, Affinity Farms

Wheat Disease Management Update
Dr. Carl Bradley

Aphids, Hessian Flies and Occurrence of Resistant Pockets of Fall Armyworm Populations in Wheat in Kentucky
Dr. Raul Villanueva

Wheat Economics
Mr. Brent Burchett and Mr. Brandon Garnett

Wheat Crop Update - UK Specialist & Researchers

Verdict on Harvest Weed Seed Control of Ryegrass in Wheat
Dr. Travis Legleiter

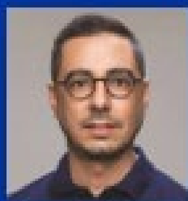
Educational Credits
CCA: Pending
Pesticide applicator: Pending

Martin-Gatton College of Agriculture, Food and Environment | Grain and Forage Center of Excellence

Kentucky Small Grain Growers' Association

KCHC
Kentucky Crop Health Conference

9 a.m. to 3:30 p.m. CST, Feb. 5, 2026 - National Corvette Museum - Bowling Green, Ky.



Horacio Lopez-Nicora
Ohio State University

Digging Deeper: Managing Soybean Cyst Nematode and Other Soilborne Pathogens

Jocelyn Smith
University of Guelph, Ridgetown

The Resurgence of European Corn Borer in Canada

Rodrigo Werle
University of Wisconsin-Madison

Targeted Herbicide Applications: Research Insights and Impact on the Future of Weed Control

Carl Bradley
University of Kentucky

Research update on Red Crown Rot of Soybean

Raul Villanueva
University of Kentucky

Update on Mollusk Management and Corn Leafhoppers

Travis Legleiter
University of Kentucky

The Battle Against Ryegrass Continues

Kiersten Wise
University of Kentucky

Winning the Battle Against Corn Disease

Matthew Springer
University of Kentucky

Multiple Methods to Reduce Wildlife Losses in Row Crop Production

Breakfast and lunch included — Sign-in begins at 8 a.m. CST
Scan QR Code or visit: https://kchc2026.eventbrite.com
Tickets non-refundable after January 29, 2026

Credits: CCA: 6 CEUs in IPM;
KY Pesticide Applicator: 5 CEUs for Category 1A; 1 CEU for Category 10
Tennessee Applicator credits available

Upcoming Events

February 3, 2026, Winter Wheat Meeting, The Bruce, Hopkinsville, KY

February 5, 2026, Kentucky Crop Health Conference, Bowling Green, KY

February 26, 2026, Pattern Drone Testing, Princeton, KY

March 26, 2026, Italian Ryegrass Field Tour, Princeton, KY

March (TBA) Soil Properties Workshop at Spindletop Farm, Lexington, KY

May 12, 2026, UK Wheat Field Day, Princeton, KY

May 28, 2026, Crop Scouting Clinic, Princeton, KY

June 25, 2026, Pest Management Field Day, Princeton, KY

July 21, 2026, UK Corn, Soybean and Tobacco Field Day, Princeton, KY

July 23, 2026, High School Crop Scouting Competition, Princeton, KY

TBA 2026, Drone Pilot Certification Workshop, Madisonville, KY