Corn & Soybean News

December 2023

Volume 5, Issue 12

Martin-Gatton College of Agriculture, Food and Environment

Grain and Forage Center of Excellence

Kentucky Corn and Soybean Yields in 2023 Compared to Past Years

Kentucky corn and soybean yields this year were better than many expected. They didn't set records, but they were close. November estimates put corn yield at 183 bu./acre (record is 192 bu./acre in 2021), while soybean came in at 55 bu. /acre (record is 56 bu./acre in 2021) according to the National Agricultural Statistics Service. The abnormally dry and drought conditions that developed in Kentucky in June and early July (according to the Drought Monitor, published weekly at https://droughtmonitor.unl.edu/CurrentMap/aspx) fueled concerns that yields might be low this year. There was, however, no indication of any lack of moisture from mid-July to mid-September according to the Drought Monitor. Rainfall in the soybean growing areas of Kentucky was mostly above normal during this period and temperatures tended to be slightly below normal. The relatively cool and wet weather during the critical part of the growing season no doubt contributed to the good yields.

Corn and soybean yields in Kentucky increased steadily from the approximate beginning of the high-input era of agriculture in 1950 (Fig. 1). Linear regression curves described the trends in the data in Fig. 1 [The regression analyses were statistically significant and the r^2's were high for corn (0.93) and soybean (0.89)], and they provide no evidence that yields are starting to plateau. Apparent plateaus have occurred in the past (see, for example, corn from 1976 through 1988 or soybean from 1971 through 1976), but they were probably weather related and yield growth continued when favorable weather returned. The linear curves also suggest that climate change has not yet reduced corn and soybean yields; that reduction will probably become apparent in the future as climate change intensifies.

The variation of yield from year-to-year is primarily a result of variation in weather conditions, with rainfall being the most important. The water available to a crop depends on rainfall and the water stored in the soil. Unfortunately, Kentucky has substantial areas of soil that are shallow (often as a result of hardpans) and don't hold much water. Year-to-year variation of yield on these soils is much greater than on soils with better water holding characteristics. Frequent rainfall is required for high

yields of crops growing on shallow soils. Soils that can store more water can withstand longer dry periods without losing yield. The larger deviations for Calloway County (low yield) compared with Union County (high yield) provide a vivid example of the greater variability of yield associated with soils with lower water holding capacity (Fig. 2).

Interestingly, weather does not always affect the two crops in the same way in the same year (Fig. 1). The year 2012 is an obvious example of this differential effect – corn yields were drastically reduced (54% below the trend line) while soybean yields were just 10 % below the trend line. In 1983, both crops showed large reductions in yield (~48% below the trend line) (Fig. 1).

The key to the effect of drought stress on yield is the growth stage of the crop when the stress occurs. Both corn and soybean can tolerate drought stress during vegetative growth much better than during reproductive growth. Stress when the crop is deciding how many seeds (kernels) to produce (silking plus or minus 20 days in corn, growth stage R1 to R5 in soybean) will reduce the number of seeds (kernels) and yield. If the stress is relieved during seed filling, the crop may not be able to recover all of the lost yield by producing larger seeds, making the flowering/seed set period a very critical period. Stress during seed filling (after seed number is determined) will reduce yield by reducing seed size (weight per seed).

The importance of growth stage in determining the effect of drought stress on yield provides a mechanism to explain differential effects of stress on corn and soybean yields. For example, a lack of rainfall could result in stress around silking, reducing corn yield, but if the stress misses the soybean flowering period, yield would not be affected. The timing of stress and critical growth stages probably explains most of the differential year-to-year variation of yield in Fig. 1.

Increasing yields (Fig. 1) are usually attributed to improved varieties or hybrids (genetics) or better management. There is considerable disagreement over the relative importance of these two sources of yield improvement, not surprisingly, plant breeders tend to favor the first explanation, while agronomists and crop physiologists favor the second. In reality, I think it is impossible to separate the two sources. I don't think it would be possible to produce bragging yields by applying modern management techniques to a 1960's variety (hybrid). Conversely, the same can be said for growing 2020's varieties (hybrids) with 1960's management. Improved management and improved varieties (hybrids) go together, and it is a waste of time to argue about which is more important.

Improvements in weather could also increase yields. Interestingly, one important aspect of the environment is the steady increase in CO_2 concentrations in the atmosphere which could contribute to higher soybean yields. Photosynthesis in soybean (C_3 type photosynthesis) increases as the CO_2 concentration increases which should result in higher yield. Higher CO_2 concentrations do not directly affect photosynthesis in corn (C_4 type photosynthesis). Ironically, the same gas (CO_2) that is causing climate change that is expected to decrease yield is also increasing soybean yield.

This year was a good year for Kentucky corn and soybean producers as yields were near record levels. Good weather conditions allowed the high yield potential created by modern high yielding varieties (hybrids) and up-to-date management practices to be expressed. Producers can ensure high yield potential by selecting high yielding varieties (hybrids) and utilizing the best management practices, but they are still at the mercy of the weather.

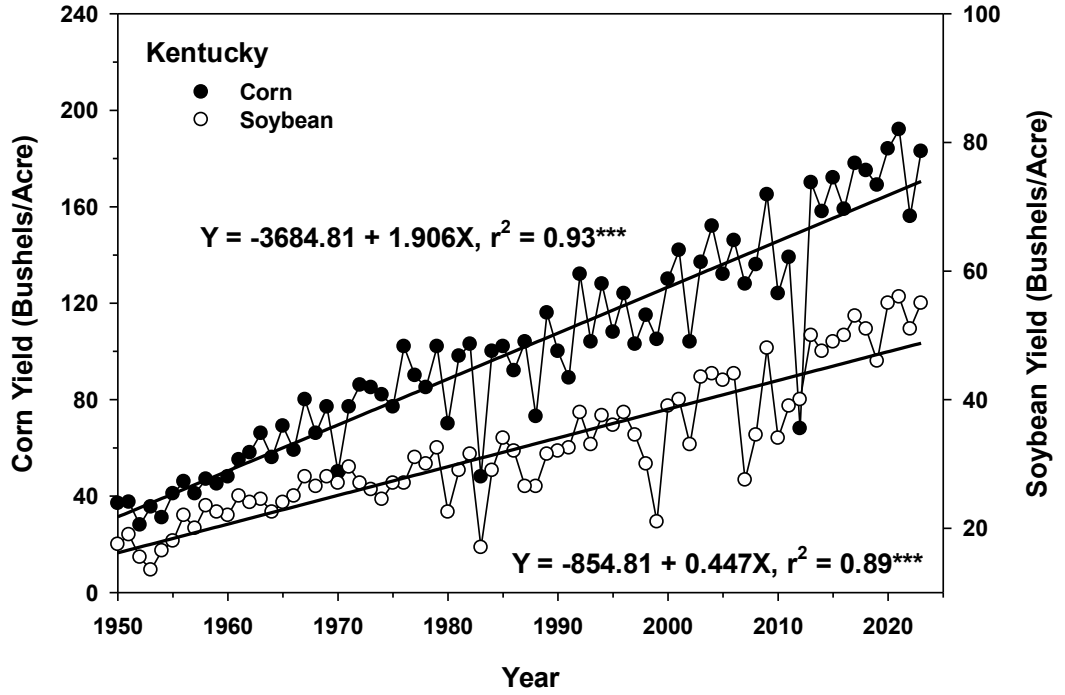


Fig. 1 Corn and Soybean yield in Kentucky (1950 – 2023).
Data from National Agricultural Statistics Service.

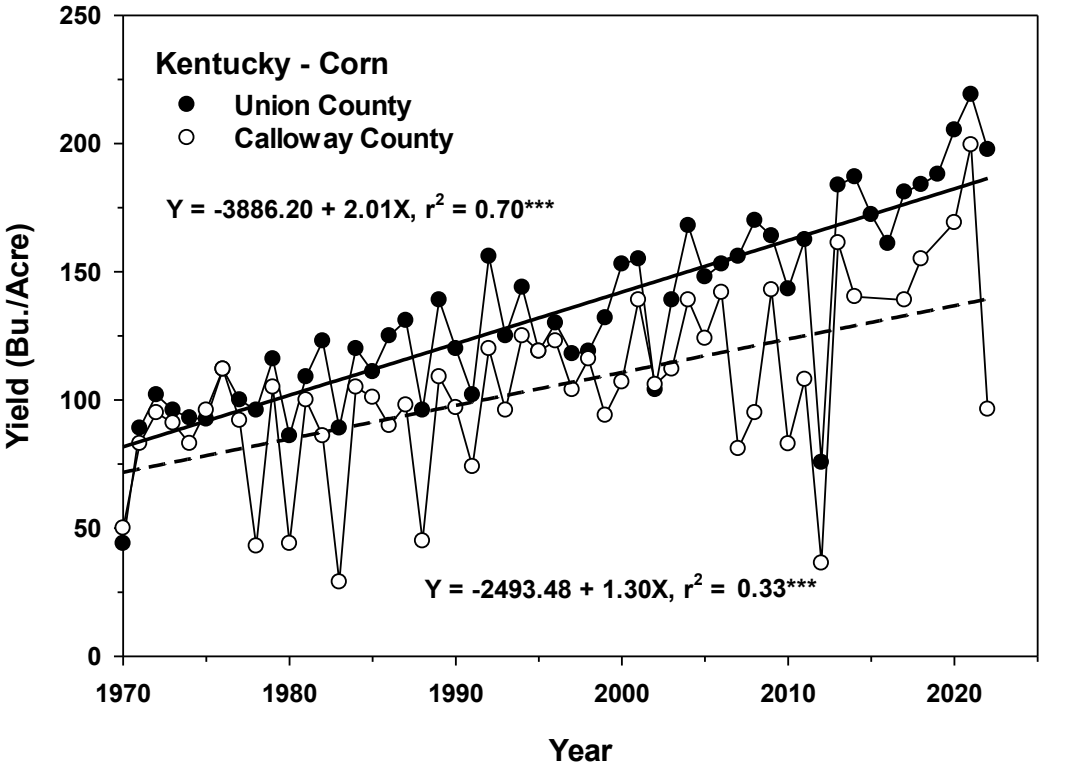


Fig. 2. Corn yield in Union and Calloway counties (1950 -2022).
Data from the National Agricultural Statistics Service.

Dr. Dennis Egli
UK Professor Emeritus (859) 218-0753 degli@uly.edu

Excellent Corn and Soybean Yields Despite Low Rainfall Totals

Both corn and soybean finished strong across Kentucky despite lower total rainfall amounts across most of the state. The 2023 Kentucky corn crop is estimated by the Kentucky Office of the United States Department of Agriculture National Agricultural Statistics Service (USDA-NASS) at 183 bushels per acre, up 17% from 2022, making the second largest corn crop on record. The 2023 Kentucky soybean crop is estimated by USDA-NASS at 55 bushels per acre, a 7.8% increase from 2022. Yet, the Kentucky rainfall totals are below normal from April to September 2023 across most of the state (Figures 1 and 3).

Corn in Kentucky often experiences peak water demand in July while soybeans often need most water in July or August. On average across the state and in western Kentucky, rainfall was above average for those two months. The higher rainfall in April made planting a challenge but started off the season with excellent soil moisture. While temperatures from April to September averaged near normal to below normal for most of the state (Figures 2 and 4), they were below normal for April, May, and June, which caused the crops to demand less water. Both temperatures and rainfall increased to above normal in western Kentucky during July when corn needed water the most. August, historically the warmest month in Kentucky, experienced slightly cooler temperatures on average, allowing crops to stretch the seed filling period a little longer in many fields. For most of the state, these weather patterns were favorable for excellent crop production.

These first set of graphs do not tell the complete story and rainfall totals can be misleading sometimes. Fulton County received 30.54 inches of rain from April 1 to September 30, 2023, suggesting more than adequate rainfall (Figure 5). By comparison Union County, Marshall County and Todd County received 20.62 inches, 23.11 inches and 28.5 inches, respectively. These numbers suggest that Fulton County experienced the best growing conditions. However, Fulton County was hit with over 12 inches of rain in 3 days in early August. Receiving 40% of the total rainfall in 3 days is not healthy for the crops and skews the total amount of water used by the crops. In fact, that much rain that fast hurt yields in Fulton County. Fulton County reported the most rainfall of these counties, but corn and soybean likely were more stressed in Fulton County than in the other three.

All four locations in Figure 5 experienced a dry spell from part of May into June. Fulton County had 11 days without rain, one day with 0.14 inches and 9 more days without rain. Todd County experienced 17 days without measurable rainfall. Marhsall County received no rain for 21 days from May 21 to June 10. Union County received 0.02 inches over 21 days from May 17 to June 6. Yet, each of these counties received measurable rains prior to and following the dry spells. Most of these counties received timely rainfall in July and the early part of August. Again, these rainfall events in July and August coincided with peak water demand for corn and soybeans in most fields. The heavy rainfall in late August may have helped double-crop soybeans but likely did little for the corn. As we mentioned earlier, the deluge in Fulton County was harmful to the crops.

Rainfall totals and average temperatures do not tell a complete story regarding yield. Timing and intensity of that rainfall combined with daily temperatures relative to crop development explain why corn and soybeans yielded so well in a season when rainfall totals were lower across most of the state. While most farmers, crop consultants and university agronomists stressed about having enough rain during the growing season, hindsight tells us that most fields received enough rain exactly when the crop needed it. If we knew the outcome before starting, I think all of us would gladly take this weather pattern again.

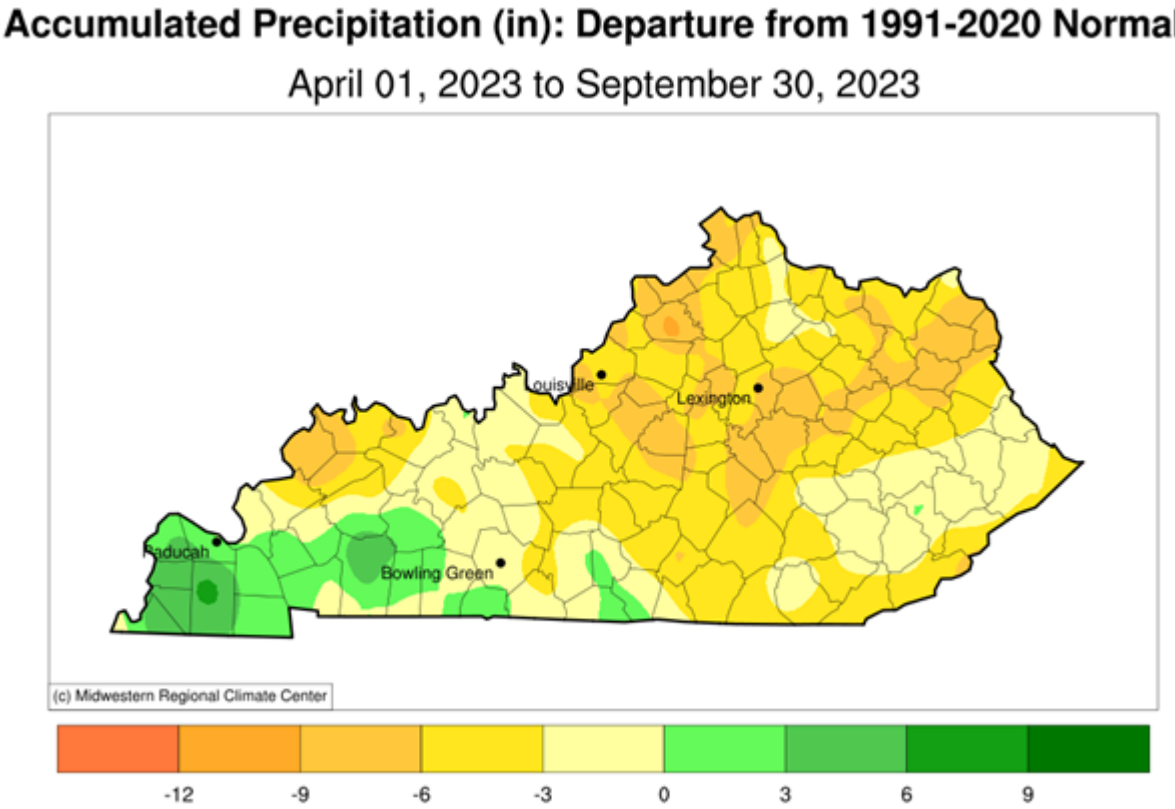


Figure 1. Accumulated Precipitation Departure from Normals from the Midwest Regional Climate Center.

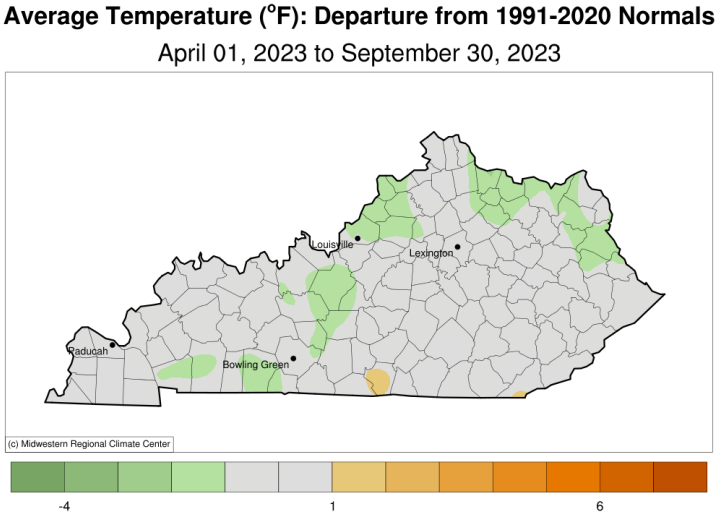


Figure 2. Average Temperature Departure from Normal from the Midwest Climate Date Center.

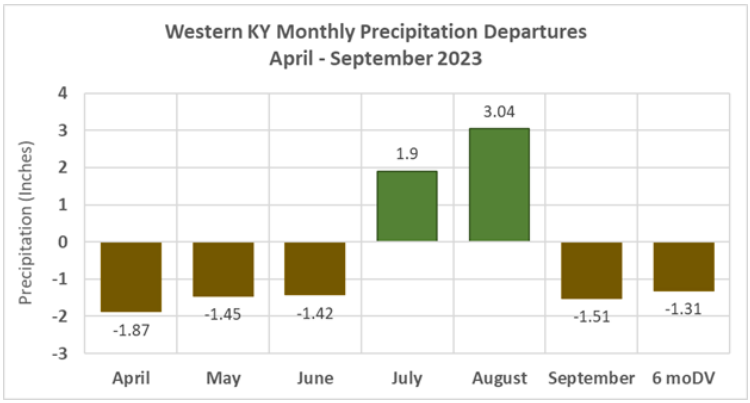


Figure 3. Western Kentucky Monthly Precipitation Departures. Summary generated by Matt Dixon, UK Ag Weather Center.

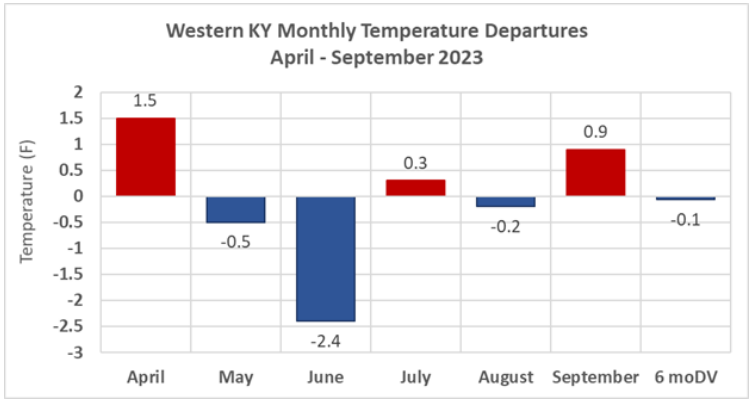
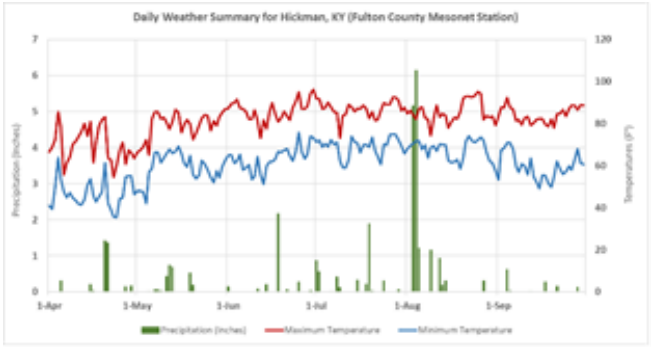
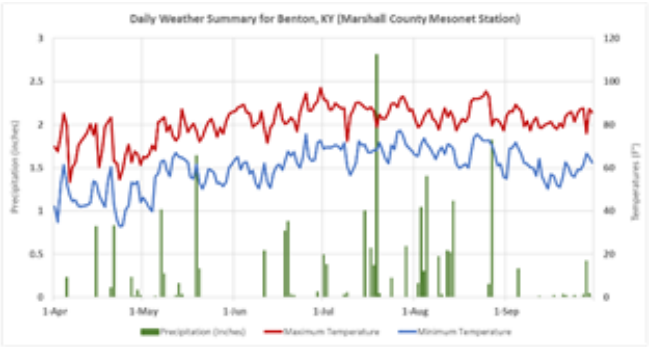
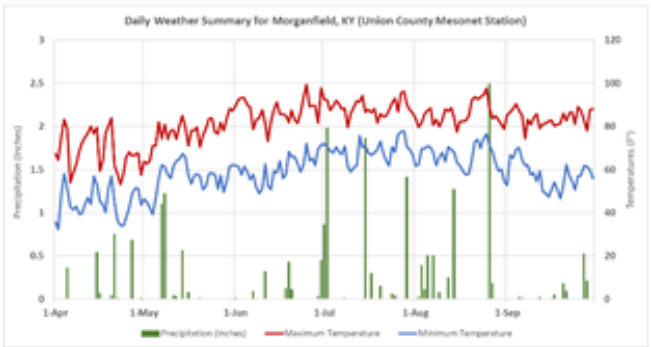


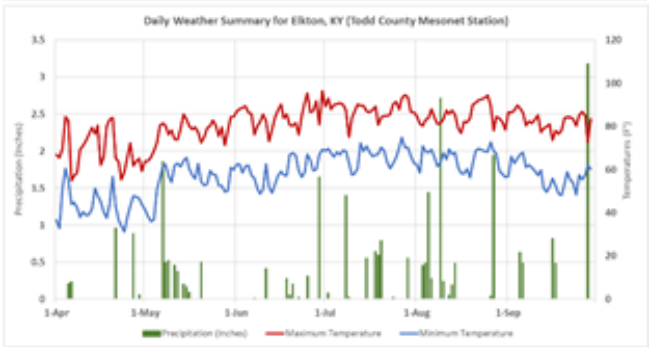
Figure 4. Western Kentucky Monthly Temperature Departure from Normal. Summary generated by Matt Dixon, UK Ag Weather Center.

Figure 5. (Below) Daily precipitation (left x-axis and green bars) and daily minimum and maximum temperatures (right x-axis and blue and red lines, respectively) for Fulton, Marshall, Union and Todd counties. Data from the Kentucky Mesonet. Graphics compiled by Matt Dixon, UK Ag Weather Center.









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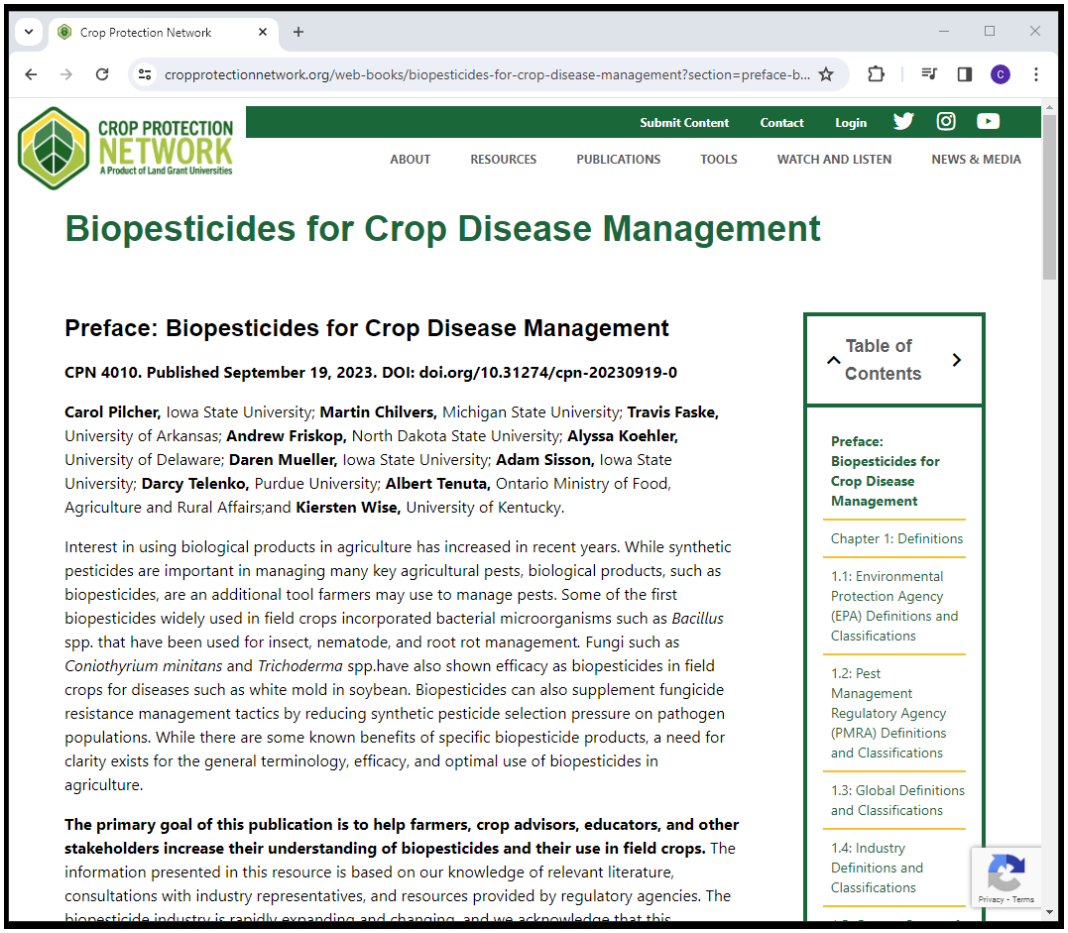
New Web Book Available on Biopesticides in Agriculture

The use of biological products in agriculture has increased in recent years, and questions abound about how to use these products for pest management. The recent web book, Biopesticides for Crop Disease Management, co-authored by Kiersten Wise and released through the Crop Protection Network, addresses the use of biopesticides for field crop disease management.

This web book discusses the definitions and classifications of biopesticides, regulatory requirements for biopesticides, and information on how to optimize biopesticide use, handling and storage. The biological industry is rapidly changing, and this resource aims to help farmers and others in the agricultural industry better understand these pesticides and how to use them in field crop disease management programs. Certified Crop Advisors can complete quizzes for each chapter in the web book, earning up to six continuing education units within the web book.



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WINTER WHEAT MEETING

Feb 1, 2024

TOPICS INCLUDE:

- Keynote Speaker - Rick Siemer
- Wheat Crop Update
- Preparing Grain Producers for the Evolution of Carbon Markets
- Soil Ph Management
- Wheat Diseases Update
- Differences on Cereal Aphids Captured in Suction Traps vs Scout Sampling
- Capitalizing on Price Volatility in Soft Red Winter Wheat
- Kentucky Wheat a Perfect Scenario for Winter Annual Grass Weeds
- An Herbicide Resistance Screening Program for the Commonwealth of Kentucky
- Yield Contest Winners' Practices
- YEN – Dennis Pennington

Martin-Gatton College of Agriculture, Food and Environment
University of Kentucky

Bruce Convention Center
Hopkinsville, KY 42240
9 am - 3 pm CT
Registration 8:30 CT

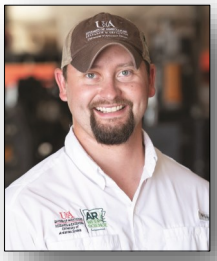
KENTUCKY Small Grain GROWERS' ASSOCIATION

For additional information email claurent@uky.edu

KCHC
Kentucky Crop Health Conference

Feb. 8, 2024 - National Corvette Museum - Bowling Green, Ky.

Speakers include University of Kentucky Extension Specialists
and invited nationally prominent Extension Specialists from across the United States



Thomas Butts
University of Arkansas

Topic: Drone Herbicide Applications: What Do We Need to Know for Success?

Nicholas Seiter
University of Illinois Urbana-Champaign

Topic: Above- and below- ground traits for insect management in corn – new tools, old pests, and resistance

Gregory Tylka
Iowa State University

Topic: Soybean Cyst Nematode: Past, present, and future

Carl Bradley
University of Kentucky

Topic: Red Crown Rot of Soybean: Disease Management and Potential Impacts of this New Disease on Soybean Production in Kentucky

Travis Legleiter
University of Kentucky

Topic: Dealing with the Stretch - Early Planted Soybean and Weed Control

Raul Villanueva
University of Kentucky

Topic: Abundance of Emergent Pests in the 2022-23 Corn and Soybean seasons in Kentucky

Kiersten Wise
University of Kentucky

Topic: It's always something! New corn disease concerns for Kentucky

Martin-Gatton
College of Agriculture, Food and Environment
University of Kentucky

Tickets on sale now - breakfast and lunch included
Conference sign-in begins at 8:30 a.m. CST

Scan QR Code or visit: **https://kchc2024.eventbrite.com** (non-refundable after Jan. 25, 2024)

CREDITS — CCA: 5 CEUs, IPM **— PAT**: 6 CEUs Category 1A (Ag Plant); 1 CEU Category 11 (Aerial)

SAVE THE DATE

Italian Ryegrass Control Field Tour

Thursday, March 28, 2024

Please meet at the Caldwell County Extension Office
1025 US Highway 62 West, Princeton, KY
Registration is at 8:30 a.m. CDT

A caravan will proceed to the UKREC in Princeton for plot tours of Italian ryegrass research

Italian ryegrass (aka Annual Ryegrass) is rapidly becoming one of the most problematic weeds in no-till corn and soybean production in Kentucky.

Presented by **Dr. Travis Legleiter, UK Extension Associate Professor - Weed Science**, this field tour will highlight the options available to Kentucky farmers for maximum control of this problematic weed in the fall and spring prior to corn and soybean planting.

For more information about the field tour call (859) 562-2569.

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Agriculture and Natural Resources
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4-H Youth Development
Community and Economic Development

MARTIN-GATTON COLLEGE OF AGRICULTURE, FOOD AND ENVIRONMENT

Lexington, KY 40506

UPCOMING EVENTS

2024 Winter Wheat Meeting

February 1, 2024

Kentucky Crop Health Conference

February 8, 2024

Italian Ryegrass Control Field Tour

March 28, 2024

KATS Planter Workshop

April 4, 2024

Wheat Field Day

May 14, 2024

KATS Crop Scouting Workshop

May 21, 2024

KATS Soil Properties & Their Impact on Delivering Water & Nutrients

June 6, 2024

Pest Management Field Day (IPM Grain Crops)

June 27, 2024

Corn, Soybean & Tobacco Field Day

July 23, 2024

KATS Field Crop Pest Management & Spray Clinic

August 29, 2024

Cooperative Extension Service
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LEXINGTON, KY 40546

Disabilities accommodated with prior notification.