A message from Ben…

Well, as I'm writing this, we are getting ready to have potentially one of the largest rainfall events the National Weather Service has ever forecasted. So, what is that going to look like for our area, that's going to be a question all of us are going to be able to answer after it happens. But until then, who knows.

In keeping with the weather, although we have had several rounds of severe weather, our area hasn't had the storms other areas have seen and we are thankful for that. Though we have had several storms come through, field work is well underway with fertilizer, chicken/hog manure applications, burndown, spring tillage, and even planting. Though we are not as early as we have been some years, we are steadily moving through the tasks of spring planting. Once we begin to dry out after this rain event, please take time to double-check your parked equipment for any wildlife that has taken shelter in the nooks and crannies of the equipment. We have already had 3 equipment fires this season, 10-15 minutes checking and cleaning out birds' nests cost much less than even the cheapest, oldest tractor in the operation. Also, along those lines while it is raining, double-check your fire extinguishers to make sure they are charged and in good working order.

I am going to hold-off on any updates on crop conditions as there are several important updates included in this newsletter concerning fertilizers and weed control,

As we continue through 2025, please remember your land grant universities have many programs and testing programs available. Many of the resources are free or have reduced costs, so please take advantage of these programs. If you have any questions, please feel free to reach out.

Thanks,

Fulton County Agent for
Agriculture and Natural Resources

2114 South 7th Street | Hickman, KY 42050 | P: 270-236-2351 | F: 270-236-1841 | fulton.ca.uky.edu

2025 Upcoming Events

April 16 – NWS Paducah Weather Spotter Program, Fulton Co Extension Office, 6:00 pm

May 7 – Private Applicator Training, Fulton Co Extension Office, 8:30 am

May 13 – Wheat Field Day, UKREC, Princeton, KY

May 15 – KATS Crop Scouting Workship, Princeton, KY

June (TBD) – KATS Planter Clinic

June 26 – Pest Management Clinic, Princeton, KY

July 22 – Corn, Soybean, Tobacco Field Day, Princton, KY

July 31 – WAVE Ag Day, Columbus-Belmont State Park, Columbus, KY

August 28 – KATS Field Crop Pest Management & Spray Clinic, Princeton KY

Variety Test Results

- Univ of Kentucky Variety Trials - https://varietytesting.ca.uky.edu/
- Univ of Tennessee Variety Testing Program Homepage - https://search.utcrops.com/

FREE SOYBEAN CYST NEMATODE TESTING!!

The Kentucky Soybean Board is continuing to fund free soybean cyst nematode (SCN) testing. Fall and Spring (before planting) are the best times to collect soil samples from fields for SCN testing. To take advantage of the free SCN testing, please contact the Extension office for testing forms and instructions. Samples for SCN testing are to be sent to the University of Illinois Plant Clinic. The KY Soybean Board will get the bill, and you'll get the results. In the past, there has been an allotted number of samples per county, based on soybean acreage; however, we have not gotten very close to the maximum number of samples for the state. So for the foreseeable future, we have lifted the allotment of samples per county. We do, however, ask that all samples go through County Agents and County Extension Offices so that we do have some control over the number of samples. Be sure to obtain and read the sampling instructions in order to take a good, accurate sample. Please consider taking advantage of this free SCN testing opportunity!

Private Applicator Training – May 7th

A certified private pesticide applicator can use Restricted Use pesticides to produce any agricultural commodity on property owned or rented by him (her) or an employer, or to the lands of a farmer-neighbor, if the application is made without compensation other than trading of personal services between producers of agricultural commodities. Certified private applicators also may train workers to satisfy Worker Protection Standards.

Private applicator certification is valid for 3 years and expires on December 31 of the final year. Applicators must go through the county training program to keep their certification in effect. There will be two opportunities for training on Feb 29, 2024, a morning training beginning at 9:00 am or evening at 6:00 pm and one session on March 11 at 6 pm. If you cannot attend any of these sessions, please contact the Fulton County Extension Office at 270-236-2351 to make additional arrangements.

Special Announcement

Late last year, Congress passed the American Relief Act of 2025 which (among other items) authorized $10 billion of economic assistance to U.S. farmers due to depressed crop prices and slumping farm income. USDA has already opened applications for the Emergency Commodity Assistance Program (ECAP) which will run through August 15, 2025. Payments are made for 22 different crops with rates being $42.91/acre for corn, $30.69/acre for wheat and $29.76/acre for soybeans. Double crop producers are eligible for dual payments.

ECAP payments will be based upon 2024 eligible/reported planted (not base) acres times the 85 percent of the payment rate to ensure total national program payments do not exceed available funding. If additional funds remain after the initial payments, FSA may eventually issue a second payment to fulfill the $10 billion funding. Pre-filled ECAP applications will be mailed to all eligible producers. After verifying and completing FSA-63 ECAP producers should submit their application to their local FSA county office either in-person, electronically, via fax, or online. Based on 2024 planted acres, Kentucky farmers will be eligible for around $135 million based upon 100% of our planted acres and full payment rates. Full program details from USDA can be found by clicking here, (https://www.fsa.usda.gov/resources/programs/emergency-commodity-assistance-program) with an excellent summary available from Farmdoc (University of Illinois) by clicking here. (https://farmdocdaily.illinois.edu/2025/03/the-2025-emergency-commodity-assistance-program.html)

Maximizing Value: 2025 Spring Application of Broiler Litter for Grain Crop Production

Jordan Shockley, Associate Extension Professor, University of Kentucky

Spring is here and grain producers across the state are gearing up for planting. One of the many decisions producers have to make before planting is in regard to their nutrient management plan. Broiler litter provides a great opportunity as a complete fertilizer and is being produced and used throughout the state in grain production. However, the value of broiler litter can vary greatly depending on the management practices, nutrient content of the litter, soil test data and commercial fertilizer prices.

Spring application of broiler litter maximizes plant available nitrogen resulting in the maximum economic value of broiler litter. As mentioned in previous issues, the average nutrient content of

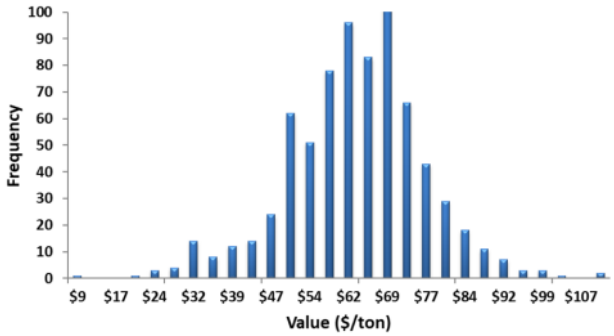
Table 1. Sample statistics for the nutrient content of broiler litter samples (n=740)

	N (lbs/ton of litter)	P2O5 (lbs/ton of litter)	K2O (lbs/ton of litter)
Average	50	56	47
Minimum	7	4	2
Maximum	186	124	109

a ton of broiler litter in Kentucky (as received) is 50 lbs of nitrogen, 56 lbs of phosphate, and 47 lbs of potash. In addition to three macronutrients, broiler litter contains other beneficial elements such as micronutrients (zinc and copper), other secondary macronutrients (calcium carbonate, magnesium, and sulfur), and organic matter which are difficult to quantify in value. For this analysis, the three primary

macronutrients (N, P_2O_5, and K_2O) will be used to determine the value of broiler litter. If your soil test recommendations supported the application of broiler litter and you applied or plan on applying this spring, that is equivalent to 50% commercial nitrogen, 80% commercial phosphate and 100% commercial potash per ton of broiler litter (as received). Therefore, the nutrients that would be available to the crop from an average ton of broiler litter in Kentucky would be 25 lbs of nitrogen, 45 lbs of phosphate, and 47 lbs of potash. With current fertilizer prices of $548/ton for Urea ($0.60/lb N), $765/ton for DAP ($0.60/lb P_2O_5), $447/ton for potash ($0.37/lb K_2O), and $13.50/ton for lime (at the quarry), the average expected value of broiler litter is $61/ton. Therefore, if you can buy broiler litter and have it delivered and spread for less than $61/ton this Spring, broiler litter is a better economic option than commercial fertilizer. This is comparable to last year with the nutrient value of an average ton of broiler litter was $64/ton. But remember, broiler litter nutrient content will vary (see max and min values in Table 1). Figure 1 applies current fertilizer prices to each broiler litter sample submitted for analysis to illustrate the range and frequency in the value of a ton of broiler litter. Given the wide range in value, make sure you measure broiler litter for nutrient content to understand what you are receiving and avoid the risk of overpaying for broiler litter.

Figure 1. Value of Kentucky Broiler Litter Using Current Fertilizer Prices



Since the value of broiler litter is dynamic and always changing, a decision tool is available so grain producers can enter soil test data, nutrient content of measured litter, commercial fertilizer prices, and management practices to determine the value of boiler litter. You can find the decision tool titled "Economic Value of Poultry Litter: Grain Crops" at the following website: https://agecon.ca.uky.edu/extension/publications-budgets-decision-aids.

Potential N loss from Heavy Rains *(From graincrops.blogspot.com April 3, 2015)*

Edwin Ritchey, Extension Soils Specialist, University of Kentucky

With the heavy rains in the past few days and the rain forecasted for next week, producers are wondering how much of the applied N has been lost.

The amount of N lost will depend on several factors but the major factor is the form of N applied. Some surface applied N can be lost in the runoff water with intense rainfall, but this will generally be only a minor amount. Denitrification losses can be significant if the N is in the nitrate (NO3-) form. Fortunately, at this point of the season the majority of the applied N should still be in the ammonium (NH4+) form which will not denitrify. Lloyd Murdock put together a nice publication a few years back to calculate the potential amount of N loss from denitrification. That publication is attached to this email. With the exception of N lost in surface runoff (probably a minor issue), there has likely been little N loss to date.

ESTIMATING NITROGEN LOSSES FROM WET SOILS

Lloyd W. Murdock, Extension Soils Specialist, University of Kentucky

Wet soils cause nitrogen losses, and determining how much nitrogen is lost is necessary to choose the proper management options. In cases where high intensity rain results in high runoff, leaching losses will probably be low. The primary nitrogen loss mechanism in saturated soils is denitrification, which occurs when soil nitrate nitrogen (NO_3-N) is converted to nitrogen gas by soil bacteria. Two to three days of soil

saturation is required for bacteria to begin the denitrification process. Well-drained upland soils that have been wet from a series of rains probably have not experienced much denitrification. Soils in lower landscape positions that stay saturated longer will likely lose more N. Losses can be calculated by estimating 3 to 4 percent loss of fertilizer NO_3-N for each day of saturation. Use the Table below to determine how much fertilizer NO_3-N was in the soil.

Table 1. The amount of applied fertilizer that is in the nitrate nitrogen form 0, 3, and 6 weeks after application

	Week After Application		
	0	**3**	**6**
N Source	**% Fertilizer as NO_3-N**		
Anhydrous Ammonia (AA)	0	20	65
AA with N-Serve*	0	10	50
Urea	0	50	75
Urea with N-Serve*	0	30	70
UAN	25	60	80
Ammonium Nitrate	50	80	90

*Nitrification inhibitor that slows transformation of ammonium to nitrate.

EXAMPLE: Determining the Amount of N Loss

A farmer applied 175 lb nitrogen (N)/A as urea to corn grown on poorly drained soil. Because of a series of heavy rains, three weeks after application the field became saturated for seven days. How much N was lost?

Step 1. Determine the amount of applied N that was in the nitrate (NO_3-N) form.

According to the table, 50% of the urea will be in the NO_3-N form three weeks after application. 175 lb N X 50% = 88 lb N.

Step 2. Determine the amount of N lost.

Remember that two days are needed for the bacteria to begin the denitrification process. Therefore, denitrification occurred for five days (seven days total saturation minus two days to start the process). With 4% lost each day for five days, 20% would have been lost. 88 lb N x 20% = 18 lb N lost and 157 lb N remaining. The N loss calculated in this example is not as high as most people would assume. A soil N test can verify this estimation.

Nitrogen Soil Test

An additional tool for determining NO_3-N in the soil after flooding is a NO_3-N test. The soil sample should be taken down to 12 inches deep, and several samples should be taken in each field of both the low and higher ground. The samples should be mixed well and a subsample sent for nitrate analysis.

If the nitrate-N is less than 11 ppm, there is a low amount of plant-available N in the soil. Therefore, there is a good chance corn will respond to a sidedress application of N ranging from 100 to 150 lbs. N/acre.

If the nitrate-N is between 11 and 25 ppm, there is a greater amount of plant-available N in the soil, indicating corn may or may not respond to sidedress N. The recommended sidedress N application at this soil test level is 0 to 100 lbs N/acre. If the soil test nitrate-N is close to 11 ppm, then higher sidedress N rates would be used. Lower rates would be used as nitrate-N approaches 25 ppm. The test is least accurate in this range, so the test results can only be used as a broad guide.

If soil test nitrate-N is greater than 25 ppm, there is adequate plant-available N in the soil, which indicates corn will probably not respond to sidedress N application.

Nitrogen Broadcast Prior to Rain

Farmers sometimes broadcast fertilizer nitrogen on a field within 24 hours of a heavy rain. In most cases, very little nitrogen is lost to runoff, especially if the field was under no-till soil management. The nitrogen fertilizer begins to dissolve almost immediately after being applied to the soil surface and will dissolve completely in a short period of time. As rain begins, the first water that falls moves into the soil, taking most of the fertilizer nitrogen with it. Once in the soil, most of the fertilizer nitrogen is protected from runoff. The only exception is a very intense rain soon after application that also erodes topsoil from sloping areas. Even in this situation, the loss would probably be less than one third of the fertilizer applied.

Set the Stage for a Successful Growing Season with a Strong Burndown

Travis Legleiter, UK Extension Weed Scientist, University of Kentucky

After a miserably wet February with several spells of unusually cold temps, March is finally bringing spring weather. Along with spring weather comes winter annual weed growth and burndown applications will begin in earnest in the very near future. As the sprayers head to the field, here are a few quick reminders and tips to help start the growing season with a successful herbicide burndown.

Italian Ryegrass Demands Special Attention

Italian Ryegrass (aka annual ryegrass) is an increasing issue on Kentucky corn and soybean acres with failed burndowns increasing every year across the state.

Annual ryegrass is one of the first weeds to green up in late winter and is already taking advantage of the increasing temperatures. One essential key for a successful annual ryegrass burndown is making applications within the window of the three conditions outlined in Figure 1 (on following page).

Figure 1. The optimal window for Italian (annual) ryegrass burndown occurs when all three of these parameters occur at the same time.

Unfortunately, capturing this window of the correct growth stage, air temperatures, and soil conditions can be almost impossible in most Kentucky springs. With the understanding that we may not be able to capture this magical window on every acre, we must focus on maximizing our burndown applications in other ways. We have found based on our research that the following keys are essential to maximizing the burndown of Italian ryegrass (See Figure 2 on following page for further data from our 2024 spring burndown trial).

- **Use at least 1.5lb ae/a glyphosate (40 fl oz Roundup PowerMax 3)**
    - This has been shown In UK weed science research numerous times and is the single biggest mistake I find when a failure occurs. Ryegrass burndown applications are NOT the place to cut rates when looking to cut inputs
    - There is a handy chart on page 17 of AGR-6 (https://publications.ca.uky.edu/sites/publications.ca.uky.edu/files/AGR6_0.pdf) where you can find the rate of your specific glyphosate product that is equivalent to 1.5 lb ae/a.

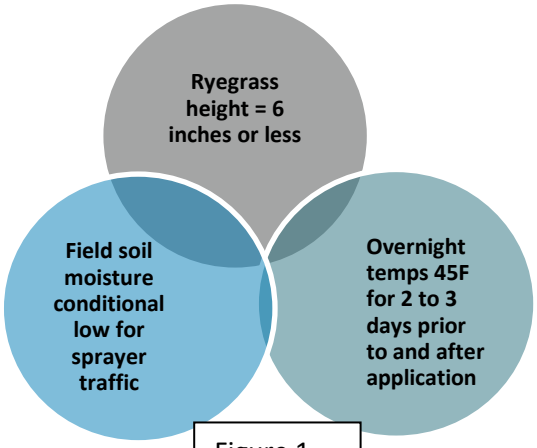
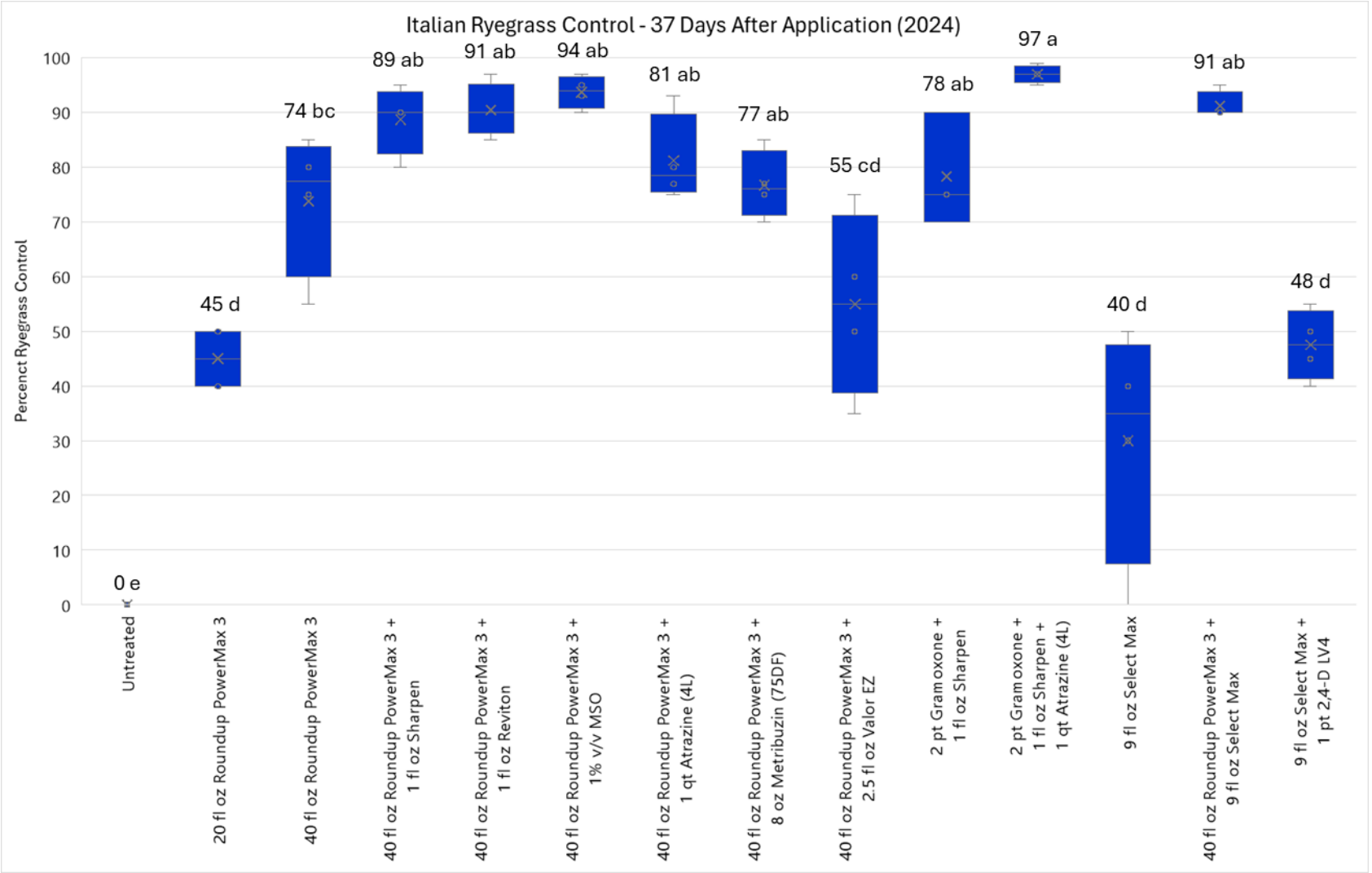


Figure 1

- **The addition of 1 fl oz Sharpen (or 15 fl oz Verdict) to 1.5 lb ae glyphosate results in the consistently greatest ryegrass control in our research.**
    - Our research in 2024 found preliminary results that the inclusion of MSO as an adjuvant in this tank mix may be the leading contributor to the increased consistency in ryegrass control. We are actively conducting a second year of research to confirm these findings.
- **Avoid tank mixing atrazine or metribuzin with glyphosate and as these products will antagonize glyphosate activity on ryegrass**
- **The best non-glyphosate mixture is Gramoxone plus atrazine or metribuzin plus 2,4-D or dicamba.**
    - Paraquat (Gramoxone) and atrazine or metribuzin are synergistic and increase control as compared to each of the components applied alone. The addition of 2,4-D or dicamba is optional for those fields where troublesome broadleaves like marestail (horseweed) exist.
    - These tank mixtures work best on small ryegrass and under warm sunny conditions. A follow up application to capture any regrowth should be planned.
- **Avoid the use of Select Max (clethodim) or other group 1 herbicides**
    - The group 1 herbicides (clethodim, quizalofop, sethoxadim, etc) work very slowly in comparison to other systemic herbicides when the weather is warm. When you spray these products in the spring when temperatures are cool, especially overnight, this only exacerbates the slow activity and ryegrass almost always escapes application of the group 1 herbicides.
    - We have heard of a few applicators using low rates of Select Max (2 to 3 fl oz/a) with glyphosate and have observed increased control over glyphosate alone. We always discourage the use of reduced rates of herbicides, as this is a known pathway to herbicide resistance. Additionally, I suspect that the increased activity has less to do with active ingredient (clethodim) and more to do with the EC or 'oily' formulation that is acting as an adjuvant similar to the MSO mentioned above.

Figure 2. Visual control of Italian ryegrass thirty-seven days after burndown application.



Pay Attention to the Wind

March is bringing a welcome increase in temperatures that will allow for successful spring applications, unfortunately the warmer temperatures are typically accompanied with high winds which are not favorable for spray applications. Each year I receive numerous calls from specialty crop growers, homeowners, and fellow grain crop farmers with complaints of drift from spring burndown applications. Typically, we are including either growth regulators (2,4-D or dicamba) and/or contact herbicides such as saflufenacil in our burndowns which can cause significant off-target injury at very low rates. As the warm temperatures and calendar give us all spring fever and the urge "to do something in the field" be aware of wind conditions and avoid the costly mistake of drifting onto a neighbor.

Adjuvants

Make sure you understand what adjuvants are needed to assure your herbicide applications are effective. Adjuvants are often needed to ensure the product can effectively find its way into the weed and to its target site of action. The exclusion of an adjuvant such as MSO from a Sharpen application can be the difference in a successful and a failed burndown. You can either refer to the herbicide label or AGR-6 (http://www2.ca.uky.edu/agcomm/pubs/agr/agr6/agr6.pdf) for recommended or required adjuvants for the products you plan to apply. Additionally, if you would like more information on the importance of adjuvants in herbicide applications, refer to this CPN Publication: Adjuvants with Herbicides: When and Why They are Needed (https://cropprotectionnetwork.org/publications/adjuvants-with-herbicides-when-and-why-they-are-needed)

Carriers

Last year, we received a few questions about the use of liquid nitrogen as a carrier for spring burndown applications. While the inclusion of a small amount of nitrogen (such as ammonium sulfate) can be beneficial in getting herbicides into plants, larger amounts such as liquid N as a carrier may have the opposite effect. Liquid nitrogen can cause rapid plant tissue necrosis and antagonize the movement of a systemic herbicide to its target site of action allowing weeds to survive the herbicide application.

We would recommend to use water as your burndown carrier for the most effective herbicide applications. Although all water is not created equally, and we must be aware of the properties of the water we use for herbicide applications. As we start a new growing season it may be wise to go ahead and check your water sources' pH and hardness. Adjustment of water hardness and pH can be critical for successful herbicide applications throughout the season. In the challenging conditions of spring burndowns having a quality water carrier can go a long way.

Biological N Fixation Products for Corn: An Update

Dr. John Grove, UK Soil Researcher and Dr. Chad Lee, Grain Crops Specialist, University of Kentucky

Replacing, economically, some or all of corn's fertilizer nitrogen (N) need with biological N fixation (BNF) is becoming a major goal in commercial corn production. With BNF, microbes fix atmospheric N as ammoniacal N and provide additional N nutrition to the crop. Several BNF products have reached the marketplace and questions regarding their efficacy are rising. Field

research evaluating these products is ongoing. This article is intended to review the work that we and some others have done.

Just to our north, in Illinois, field research at 2 sites over 3 years (total of 4 site-years). These authors (Woodward et al., 2025), after averaging their data across the site-years, found that the BNF product, PROVEN 40™ (Pivot Bio), significantly raised yield by 1.8 bu/acre, regardless of the applied N rate, which ranged from 0 to 200 lb N/acre. The grain yield N response was quite positive, averaging 106.1 bu/acre at 0 lb N/acre and 186 bu/acre at 200 lb N/acre (Table 1, right side). These results, on average, indicate that the benefit to the biological product was unrelated to crop N status, whether clearly deficient or entirely sufficient.

When one digs into the supporting information provided with this report (Woodward et al., 2025, suppmat), a more detailed picture emerges (Table 1). At all four site-years corn gave large, positive responses to fertilizer N addition. Only one site-year (Champaign, 2019), the lowest yielding site-year, exhibited a significant positive yield response to the BNF product (+4.6 bu/acre). There was a significant interaction between BNF and N rate on yield for the Champaign, 2020 site-year, where, depending upon the N rate, BNF addition resulted in both lower and higher yield relative to the yield in the absence of BNF. The authors did not explain why they chose to ignore the lack of a positive yield response to the BNF for 3 of 4 site-years and then averaged that response over all 4 site-years of data.

Table 1. Four site-years of corn grain yield from N rate by BNF[§] studies near Champaign and Nashville, Illinois.

	Champaign, 2019			Champaign, 2020			Champaign, 2021			Nashville, 2021			4 Site-Year Ave.		
fertilizer	no	with	N rate	no	with	N rate	no	with	N rate	no	with	N rate	no	with	N rate
N rate	BNF	BNF	ave.	BNF	BNF	ave.	BNF	BNF	ave.	BNF	BNF	ave.	BNF	BNF	ave.
lb N/acre	bu/acre														
0	57.8	59.9	58.9e	104.7	103.7	104.2e	130.0	132.1	131.0e	132.9	130.5	131.7d	106.4	106.6	106.5e
40	71.0	73.8	72.4d	116.3	119.0	117.6d	166.8	167.9	167.3d	163.9	166.9	165.4c	129.5	131.9	130.7d
80	83.0	95.1	89.0c	130.9b	137.2a	134.0c	192.4	193.1	192.7c	189.6	185.6	187.6b	148.9	152.8	150.9c
120	119.2	130.3	124.7b	151.5a	145.1b	148.3b	217.9	218.4	218.2b	193.7	197.7	195.7ab	170.6	173.0	171.8b
200	152.0	147.3	149.7a	162.2	158.3	160.3a	229.3	234.8	232.0a	200.7	203.3	202.0a	186.1	186.2	186.1a
BNF ave.	96.5b	101.3a		133.2	132.7		187.2	189.2		176.3	176.8		148.3b	150.1a	

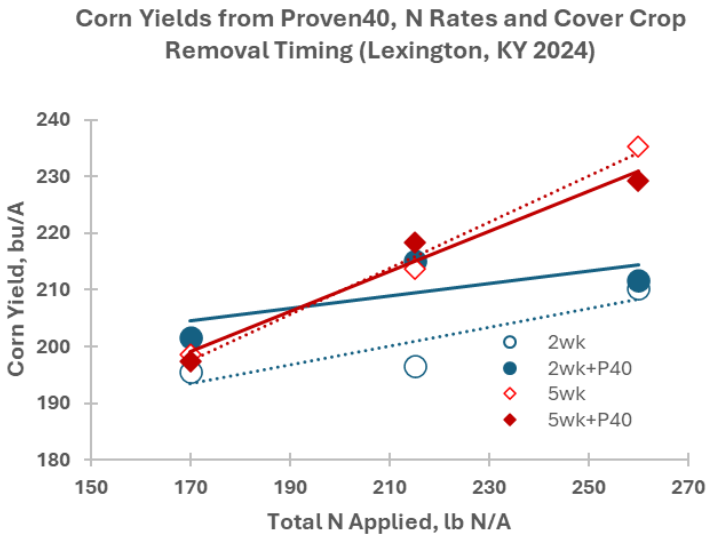
*Within any one column or any one row, yield values followed by the same letter are not significantly different at the 90% level of confidence.

[§]BNF = PROVEN 40™

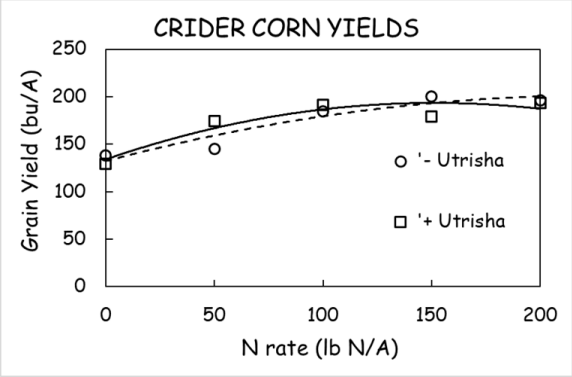
Here in Kentucky, Chad has also looked at PROVEN 40™ BNF product use in no-till corn that was planted into a heavy cereal rye cover crop (Nalley and Lee, 2024). In the first year, 2023, the treatments consisted of two N rates, 140 and 180 lb N/acre, both without and with the BNF product. As was observed in Illinois, there was no interaction between the N rate and the use of PROVEN 40 ™ on corn grain yield. The 140 and 180 lb N/acre rates averaged 199 and 191 bu/acre, respectively, and were not significantly different, statistically. Corn yields with PROVEN 40 ™, at both N rates, averaged 200 bu/acre and were 9 bu/acre better than N applied without the BNF. This difference was statistically significant. Again, the positive impact due to the biological product was not related to the applied N rate. There was speculation that the in-furrow BNF product was beneficial because the decomposing rye cover crop was having a

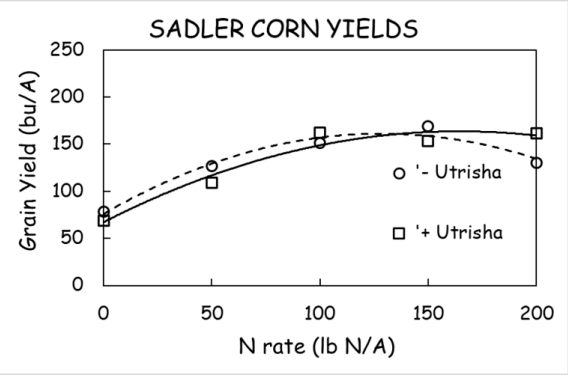
negative impact on corn N nutrition across both fertilizer N rates.

In 2024, Chad's no-till corn followed rye killed either five or two weeks before planting (Lee et al., 2025), resulting in different levels of decomposing rye residue at planting. Three N rates (170, 215 and 260 lb N/acre) were applied, both without and with PROVEN 40™. In the figure below, the lower amount of rye residue resulting from the cover crop kill five weeks before planting improved corn yield response to the higher N rate treatments, but there was no impact of PROVEN 40™. With the heavier rye residues from killing the cover crop only 2 weeks before planting, there was a trend for greater yield with use of PROVEN 40™, regardless of N rate, though the positive yield difference was only statistically significant at 215 lb N/acre. Again, the results indicated that the BNF improved crop yield but not crop N nutrition.



John evaluated the BNF Utrisha N™ (Corteva) in 2022 on two soils (Crider, Sadler) and at each of five fertilizer N rates (0, 50, 100, 150 and 200 lb N/acre). In the figures below one can see there was a good corn yield response to fertilizer N rate but no consistent response to the BNF, even at the lower N rates where some benefit to a BNF product might be expected.





A general lack of corn yield response to BNF products has been widely observed. In the North Central region, 61 site-years of field work with corn, spring wheat, sugar beet and canola, in 10

states, resulted in only two site-years where a positive yield benefit to a BNF product was found. More important than the lack of yield benefit to the use of BNF products is that we cannot predict where or when a BNF product might work, and with a lower probability of benefit, that predictability is critical to grower success with these products. The potential benefit to BNF use in the presence of heavy cover crop biomass decomposition is an interesting possibility and worthy of further investigation.

Grain Crop Phosphate and Potash Rate Recommendations: AGR-1 Updates

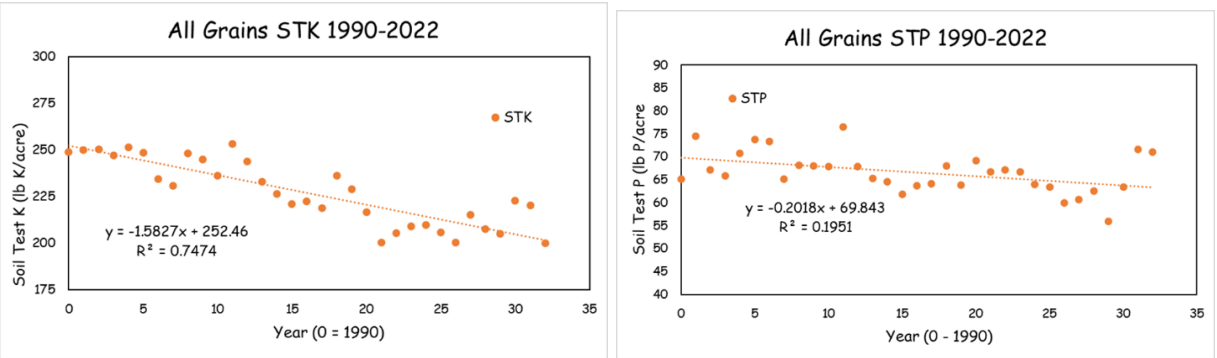
Dr. John Grove, UK Soil Specialist and Edwin Ritchey, Extension Soil Specialist, University of Kentucky

Grain crop fertilizer phosphate (P_2O_5) and potash (K_2O) maintenance rate recommendations in AGR-1 (Ritchey and McGrath, 2020) have not been reexamined since their inception - 1992. Other UK extension faculty (G. Schwab, pers. comm.; B. Lee, pers. comm.) have reported that soil test phosphorus (P) and potassium (K) levels were declining in Kentucky row-crop acres, even when AGR-1 (Ritchey and McGrath, 2020) fertilizer P_2O_5 and K_2O rate recommendations are followed. This analysis was caused by those observations. The declines imply either that: a) there has been an expansion in row crop acreage to areas with lower initial soil test P and K levels; or b) that P_2O_5 and K_2O row crop maintenance rate recommendations are not adequate.

First, there was a need to verify soil test P (STP) and/or K (STK) changes with time. The UK soil test lab provided STP and STK data for the 1990 to 2022 period. The data was sorted according to the commodity to be fertilized, as noted on the sample submission sheet, and then by year. Corn, soybean, and winter small grain (barley, canola, oat, rye, wheat) soil test data were separated from other soil test information. There was considerable fluctuation in annual sample numbers, but the average annual sample number was around 9300.

Across all grain commodities, STK has declined over the entire period (Figure 1a). The annual STK mean values were determined using all values remaining after removal of individual STK values greater than one standard deviation above the mean - to remove samples from manured fields or soils naturally high in STK. The portion of samples removed each year ranged from 9.6 to 15.7%, averaging 12.4%. Using the remaining samples, average annual STK values fell about 1.6 lb STK per acre per year. Over the past three decades, STK has fallen by about 47 lb STK per acre.

Figure 1. Annual average: a) soil test K (STK); and b) soil test P (STP) values from soils in tended for grain production– 1990-2022.



Across the grains, STP has also declined (Figure 1b) over the time period. As was done for STK, the annual STP mean values were determined using all values remaining after removal of individual STP values greater than one standard deviation above the mean - to remove samples coming from manured fields or soils naturally high in STP. The portion of samples removed, per year, ranged from 7.1 to 12.4%, averaging 9.8%. The decline was modest, about 0.2 lb STP per acre per year. Over 33 years, STP has fallen by 7 lb STP per acre across this group of samples. For University of Kentucky (UK) soil test lab users, STP and STK have been falling for several decades.

After a close look at the soil test data for corn and soybean, there was little support for the idea that soybean area expansion into less fertile fields caused the temporal decline in STP and STK values. This does not preclude the fact that recent expansion in both corn and soybean acreage has contributed to some decline in STP and STK values, but the amount of that contribution was not easy to separate.

It was known that STP and STK declines might be related to increasing grain yield, and coincidently greater grain P and K removal. Kentucky's annual average corn, wheat, and soybean grain yield data for 1980 to 2022 were gathered from the National Agricultural Statistics Service (NASS, 2023). Because grain P and K removal are the product of grain yield and grain P and K concentrations, we also needed to update our grain P and K concentration data. A recently published analysis of corn, soybean and wheat grain P and K composition, from the nearby state of Illinois (Villamil et al. 2019), was used (Table 1). The existing AGR-1 grain composition data (Ritchey and McGrath, 2020) was at least 25 years old. Comparing the grain P and K concentrations, recent corn and wheat grain values are lower, while recent soybean grain values are higher (Table 1).

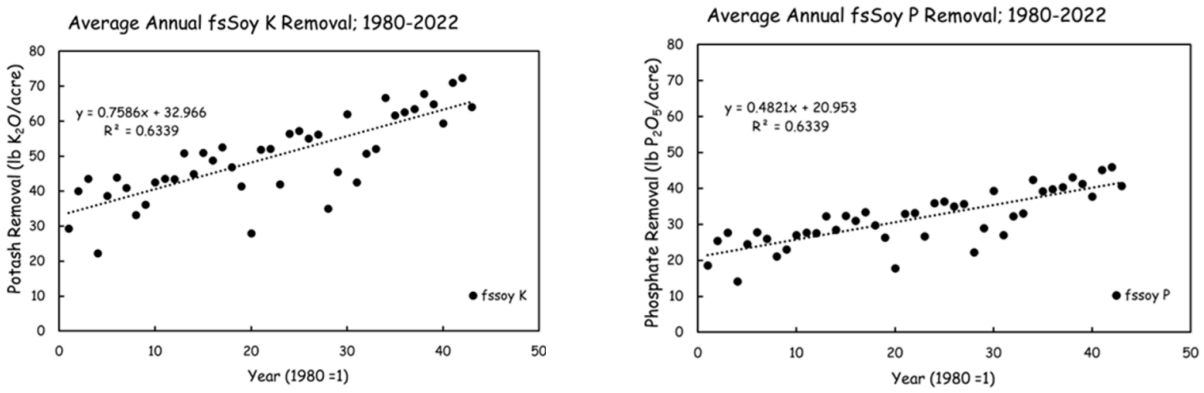
Table 1. Corn, soybean and wheat grain P and K concentrations.

	---------- Grain P ----------		---------- Grain K ----------	
Grain Crop	AGR-1*	Illinois**	AGR-1*	Illinois**
	-------- lb P_2O_5/bu --------		-------- lb K_2O/bu --------	
corn	0.40	0.37	0.35	0.24
soybean	0.70	0.75	1.10	1.18
wheat	0.50	0.46	0.30	0.28

* Ritchey and McGrath, 2020; ** Villamil et al. 2019.

The annual yield data from NASS was combined with the recent grain P and K concentration data to estimate annual average P and K removal for corn, full-season soybean, wheat and double-crop soybean. As an example, Figure 2 illustrates how rising full-season soybean yield was driving grain P and K removal.

Figure 2. Average annual full-season soybean: a) potash; and b) phosphate removal – 1980-2022.



Current AGR-1 grain crop P_2O_5 and K_2O rate recommendations are shown in the three tables that constitute Figure 3. The maintenance portion of the recommendations is contained in the red boxes within each table. The Mehlich III STP and STK values are in lb per acre.

Figure 3. Current AGR-1 grain crop phosphate and potash rate recommendation tables, showing maintenance recommendation rates and associated soil test values bounded by red boxes.

Table 13. Phosphate and potash recommendations (lb/A), corn.

Category	Test Result: P	P_2O_5 Needed	Test Result: K	K_2O Needed
Very high			>420	0
High	>60	0	355 - 420	0
			336 - 354	0
			318 - 335	0
			301 - 317	0
Medium	46 - 60	30	282 - 300	30
	41 - 45	40	264 - 281	30
	37 - 40	50	242 - 263	30
	33 - 36	60	226 - 241	40
	28 - 32	70	209 - 225	50
			191 - 208	60
Low	23 - 27	80	173 - 190	70
	19 - 22	90	155 - 172	80
	14 - 18	100	136 - 154	90
	9 - 13	110	118 - 135	100
	6 - 8	120	100 - 117	110
Very low	1 - 5	200	<100	120

Table 18. Phosphate and potash recommendations (lb/A), small grains.

Category	Test Result: P	P_2O_5 Needed	Test Result: K	K_2O Needed
High	>60	0	>300	0
Medium	48 - 60	30	213 - 300	30
	45 - 47	40	187 - 212	40
	41 - 44	50		
	38 - 40	60		
	34 - 37	70		
	31 - 33	80		
Low	24 - 30	90	159 - 186	50
	17 - 23	100	132 - 158	60
	10 - 16	110	104 - 131	70
Very low	<10	120	<104	80

Table 15. Phosphate and potash recommendations (lb/A), soybean.

Category	Test Result: P	P_2O_5 Needed	Test Result: K	K_2O Needed
High	>60	0	>300	0
Medium	40 - 60	30	242 - 300	30
	34 - 39	40	226 - 241	40
	28 - 33	50	209 - 225	50
			191 - 208	60
Low	22 - 27	60	173 - 190	70
	16 - 21	70	155 - 172	80
	11 - 15	80	136 - 154	90
	9 - 10	90	118 - 135	100
	7 - 8	100	100 - 117	110
	6	110		
Very low	1 - 5	120	82 - 99	120
			64 - 81	130

The new grain crop P_2O_5 and K_2O rate recommendations are shown in the three tables contained in Figure 4. The expanded maintenance portion of the recommendations is contained in the green boxes within each table. As in Figure 3, Mehlich III STP and STK values are in lb/acre. Note that

there is no proposed change to the Mehlich III STP and STK values at which no fertilizer P_2O_5 or K_2O are recommended (60 lb STP/acre and 300 lb STK/acre, respectively). The recommended fertilizer P_2O_5 and K_2O rates for STP and STK values below those associated with the newly expanded maintenance P_2O_5 and K_2O rates also remain unchanged.

Figure 4. New AGR-1 grain crop phosphate and potash rate recommendation tables, showing maintenance recommendation rates and associated soil test values bounded by green boxes.

Table 13. Phosphate and potash recommendations (lb/A), corn.

Category	Test Result: P	P_2O_5 Needed	Test Result: K	K_2O Needed
Very high			>420	0
High	>60	0	355 - 420	0
			336 - 354	0
			318 - 335	0
			301 - 317	0
Medium	46 - 60	50	282 - 300	50
	41 - 45	50	264 - 281	50
	37 - 40	50	242 - 263	50
	33 - 36	60	226 - 241	50
	28 - 32	70	209 - 225	50
			191 - 208	60
Low	23 - 27	80	173 - 190	70
	19 - 22	90	155 - 172	80
	14 - 18	100	136 - 154	90
	9 - 13	110	118 - 135	100
	6 - 8	120	100 - 117	110
Very low	1 - 5	200	<100	120

Table 18. Phosphate and potash recommendations (lb/A), small grains.

Category	Test Result: P	P_2O_5 Needed	Test Result: K	K_2O Needed
High	>60	0	>300	0
Medium	48 - 60	40	213 - 300	40
	45 - 47	40	187 - 212	40
	41 - 44	50		
	38 - 40	60		
	34 - 37	70		
	31 - 33	80		
Low	24 - 30	90	159 - 186	50
	17 - 23	100	132 - 158	60
	10 - 16	110	104 - 131	70
Very low	<10	120	<104	80

Table 15. Phosphate and potash recommendations (lb/A), soybean.

Category	Test Result: P	P_2O_5 Needed	Test Result: K	K_2O Needed
High	>60	0	>300	0
Medium	40 - 60	40	242 - 300	60
	34 - 39	40	226 - 241	60
	28 - 33	50	209 - 225	60
			191 - 208	60
Low	22 - 27	60	173 - 190	70
	16 - 21	70	155 - 172	80
	11 - 15	80	136 - 154	90
	9 - 10	90	118 - 135	100
	7 - 8	100	100 - 117	110
	6	110		
Very low	1 - 5	120	82 - 99	120
			64 - 81	130

Adjusting for modern grain P and K concentrations and increasing yield-driven nutrient removal, we raised corn, soybean and wheat fertilizer P_2O_5 or K_2O maintenance rates by 10 to 20 lb P_2O_5 and 10 to 30 lb K_2O per acre, depending on the individual crop.

A maintenance fertilizer rate recommendation is intended to 'maintain' a level of soil-based nutrition that minimizes the possibility of nutrient deficiency. This kind of 'insurance' recommendation does not imply that there is a good probability of an economic benefit to the fertilizer recommendation in the year of application. Grant Thomas (pers. comm.) wrote: "The soil bank account does not pay interest. In fact, losses to fixation, erosion, etc. cause negative interest. Chemical and biological uncertainty make the soil fertilizer bank much less valuable than those dollars left in a bank. Doses of needed fertilizer are more efficient than doses of maintenance fertilizer." In certain situations, careful and annual soil testing can better ensure adequate, and more economical, soil-based nutrition.

Some challenges remain. There is a need for grain composition data on other important winter crops, including canola, barley and rye. Continuing yield growth with time necessitates ongoing review of crop P and K removal values every 5 to 10 years.

Corn Nitrogen Rate Recommendations: AGR-1 Updates

Dr. John Grove, UK Soil Specialist and Edwin Ritchey, Extension Soil Specialist, University of Kentucky

Corn fertilizer nitrogen (N) ***rate*** recommendations had not been deeply reexamined in 20 years. Additionally, there have been no substantial change to AGR-1 (Ritchey and McGrath, 2020) corn N ***management*** recommendations since the 2004-2005 version of the document. Information on the use of urease inhibitors was added at that time. Other N management recommendations last changed in the 2002-2003 edition, when text supporting use of management alternatives to surface urea application after May 1 were added. This does not mean that research results regarding corn N rate recommendations have not been considered. These evaluations did not find enough evidence supporting a change. Corn producers and extension personnel have voiced concern that current corn N rate and management recommendations were not sufficiently modern/nuanced, considering more of the N management practices available to corn producers.

In response to a 'data call', 174 grain yield N response data sets/entries, from the 2013 to 2023 production seasons, were submitted by UK Plant and Soil Science faculty. Each entry consisted of two or more N rates and the same number of yield values and was accompanied by meta-data that permitted 'binning' of the data. Bins permit comparisons guided by existing AGR-1 N rate recommendations, but additional interesting comparisons were also made. Bins were related to soil drainage; tillage; previous crop; a cereal rye cover crop; manure use; irrigation use; N timing; N placement of the largest N fraction; N loss inhibitor use with the largest N fraction; and location (grower farm vs. research farm). Several of the bins were insufficiently populated and unable to support meta-analysis.

For 152 of the entries there were sufficient N rates, 3 or more, to calculate a corn yield versus N production function. The quadratic-plateau function was favored, but some entries required linear-plateau, quadratic or linear functions. The production functions were used to determine the parameters that were binned: the maximum yield (YAONR), the corresponding agronomic optimum N rate (AONR), the maximum economic yield (YEONR), and the corresponding economic optimum yield (EONR). To find YEONR and EONR, a N to corn price ratio of 0.1 (ex. \$0.50/lb N:\$5.00/bu corn) was assumed. The AONR, YAONR, EONR and YEONR values were subjected to the binning meta-analysis.

Cumulative frequency distributions were developed to visualize the parameter bin populations. These distributions are determined by dividing 100% by the number of observations for a given parameter and then plotting the cumulative frequency percentage (y-axis) as a function of the parameter value (lowest to highest) on the x-axis. Figure 1 illustrates the cumulative frequency distributions for EONR (Fig. 1a) or YEONR (Fig. 1b) values, depending upon whether a winter cereal cover crop (usually rye) was present (n = 49) or not (n = 103) prior to corn planting. In general, there was a greater spread in EONR values (0 to 352 lb N/acre) than in YEONR values (87 to 286 bu/acre). The EONR populations were significantly different with median values of 155 and 193 lb N/acre in the absence and presence of the cover crop and reflecting that the respective distributions lie to the left (without cover crop) and the right (with cover crop) of the 'All Data' distribution of EONR values (Fig. 1a). The YEONR distributions were not significantly different, with median values of 201 and 207 bu/acre in the absence and presence of the cover crop, respectively (Fig. 1b).

Figure 2 illustrates the impact of previous grain crop on EONR and YEONR value distributions.

Where corn was the previous crop (n = 49 entries), the EONR distribution shifted to the right and the median EONR was higher, 186 lb N/acre, than when either soybean (n = 90 entries) or wheat/double crop soybean (n = 11 entries) was grown previously. With the latter two previous crops, distributions shifted to the left and median EONR was lower, 161 lb N/acre (Fig. 2a). The YEONR distributions shifted in the opposite direction; corn after corn yields were lower, mean of 199 bu/acre, and corn after soybean or wheat/double crop soybean yields were higher, mean of 219 bu/acre (Fig. 2b). In this comparison, YEONR differences due to previous crop were greater at the high yield end of the YEONR distribution, indicating greater positive impact of crop rotation in high yield environments (Fig. 2b).

Figure 1. The EONR (a) and YEONR (b) value distributions as related to presence of a rye cover crop.

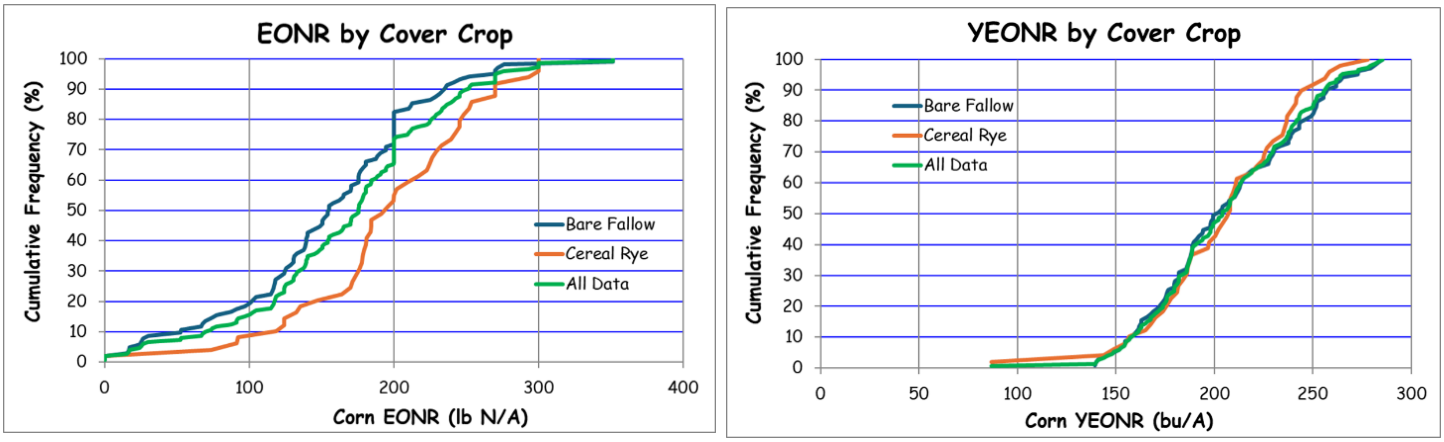


Figure 2. The EONR (a) and YEONR (b) value distributions as related to the previous crop.

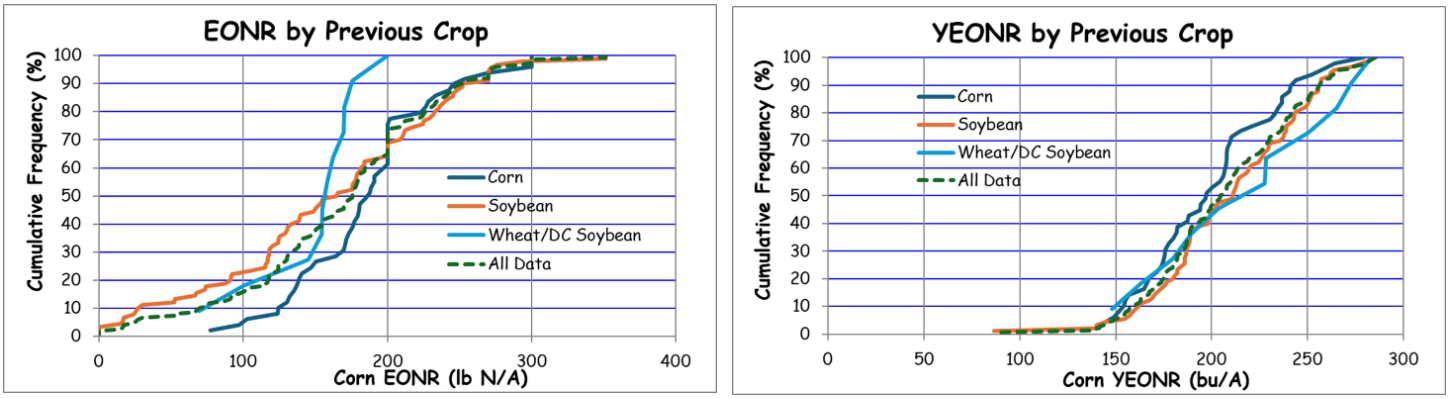
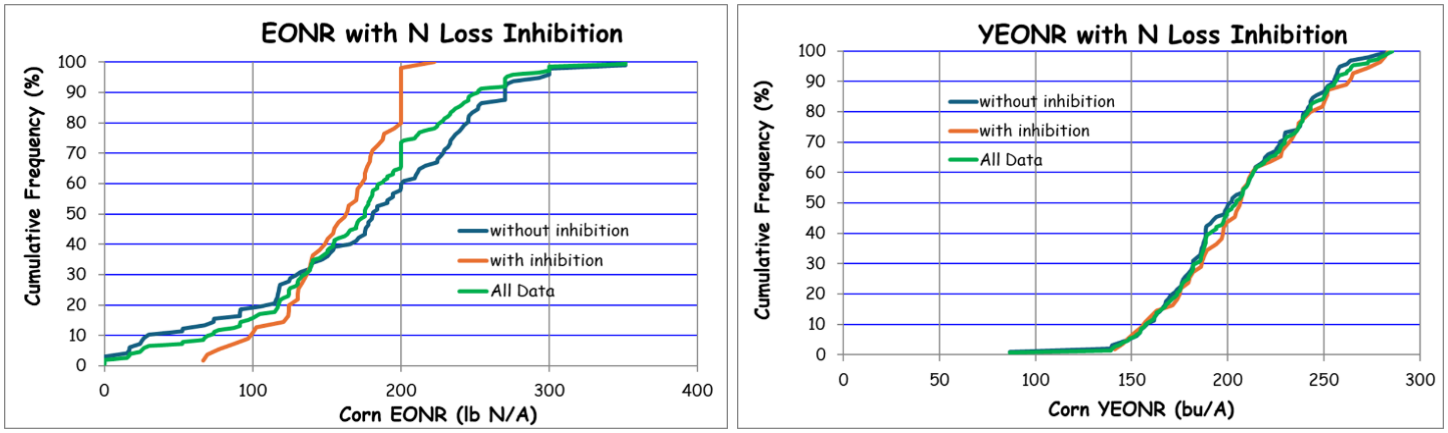


Figure 3 illustrates the impact of N loss inhibitor (usually a urease inhibitor) use on EONR and YEONR value distributions. The YEONR values were similar across the distribution and averaged 201 bu/acre where no inhibitor was used (n = 97 entries), and 207 bu/acre where an inhibitor was present (n = 55 entries). The EONR value distributions were not similar, pulling away from each other when the situation required more N nutrition (at higher EONR values). In these cases, the use of the inhibitor reduced EONR values even more.

Figure 3. The EONR (a) and YEONR (b) value distributions as related to the use of an N loss inhibitor.



The previous corn N rate recommendations (Figure 4) were binned according to previous crop, tillage and soil drainage class. There were three previous crop categories (corn was lumped with the other grain crops), tillage differences were established according to the degree of residue cover, and soil drainage classes did not include the somewhat poorly drained class. Other N rate influencing factors were in footnotes and text that accompanied the table in Figure 4.

Figure 4. Current AGR-1 (Ritchey and McGrath, 2020) corn N rate recommendations. First column head contains an error (reads as 'Cover Crop' instead of 'Previous Crop') as found in the original document.

Table 12. Recommended application of nitrogen (lb N/A), corn.[1]

Cover Crop	Tillage[3]	Soil Drainage Class[2]		
		Well-Drained	Moderately Well-Drained[4]	Poorly Drained
Corn, sorghum, soybean, small grain, fallow	Intensive	100 - 140	140 - 175	175 - 200
	Conservation	125 - 165	165 - 200	
Grass, grass-legume sod (4 years or less), winter annual legume cover	Intensive	75 - 115	115 - 150	150 - 175
	Conservation	100 - 140	140 - 175	
Grass, grass-legume sod (5 years or more)	Intensive	50 - 90	90 - 125	125 - 150
	Conservation	75 - 115	115 - 150	

1 Nitrogen rate for irrigated corn should be increased to 175 to 200 lb N/A.
2 Soil drainage class examples are given on Page 2.
3 Intensive tillage has less than 30% residue cover, and conservation tillage has more than 30% residue cover on the soil at planting.
4 Poorly drained soils that have been tile drained should be considered moderately well- drained.

The new recommendations are in two tables (Figure 5) separate corn/sorghum from other prior grown grain crops, simplify "Tillage" as no-till versus any tillage prior to planting, and split the four soil drainage classes into two bins. Table 12a assumes no inhibitor or rye cover crop use. Table 12b clarifies the impact of those two practices on the recommended corn fertilizer N rate.

Figure 5. New AGR-1 corn N rate recommendations.

Table 12a. Recommended nitrogen application rate (lb N/A) for dryland corn.[1]

Previous Crop	Tillage[3]	Soil Drainage Class[2]	
		Well and Moderately Well Drained[4]	Somewhat Poorly and Poorly Drained
Corn, Sorghum	No-Till	160-190	175-205
	Tilled	150-180	165-195
Soybean, Small Grain, Fallow	No-Till	140-170	155-185
	Tilled	130-160	145-175
Grass, Grass-Legume (≤ 4 years), Winter Annual Legume Cover Crop	No-Till	110-140	125-155
	Tilled	85-115	100-130
Grass, Grass-Legume (≥ 5 years)	No-Till	85-115	100-130
	Tilled	60-90	75-105

[1] Assumes no cereal rye cover crop ahead of corn planting. Assumes no N loss inhibitor used.
[2] Soil drainage class examples are given on Page 2.
[3] No Till = no primary or secondary tillage, fall or spring, prior to planting the crop. Tilled = any primary or secondary tillage, fall or spring, prior to planting the crop.
[4] Somewhat poorly or poorly drained soils that have been tile drained should be considered moderately well drained soils.

Table 12b. ***Cereal rye cover crop and/or urease inhibitor use:***[1] Recommended total nitrogen application rate (lb N/acre) for no-till dryland corn grown on well and moderately well drained soils and where two-thirds or more of the total N rate top/side-dressed with surface applied urea-containing fertilizer in the absence/presence of a cereal rye cover crop without/with use of a urease inhibitor.

Previous Crop	Cereal Rye Cover Crop[3]	Recommended Total N Rate (lb N/acre)	
		No Inhibitor	With Inhibitor[2]
Corn, Sorghum	No	160-190	150-180
	Yes	185-215	165-195
Soybean, Small Grain, Fallow	No	140-170	135-165
	Yes	165-195	150-180

Compared to the prior recommendations, some bin categories declined (e.g., soil drainage classes dropped from 3 to 2), and certain bin categories increased (e.g., previous crop categories rose from 3 to 4). New bin categories/scenarios were found to impact corn yield N response and resulted in new recommendations (e.g. without/with a cereal rye cover crop; without/with a N loss inhibitor). Current fertilizer N rate recommendations depend on the given scenario and are given as an N rate range. The new recommendations generally compress the recommended range relative to the old recommendations, usually by raising the low end of the range without greatly increasing the high end of that same range.

There are some additional needs, going forward. In the newer data, different tillage practices resulted in less difference in EONR values, but there were fewer experiments where the soil was tilled. Irrigation resulted in higher yields, but in the few irrigated studies that were done there was little need for additional N relative to the mean EONR for rainfed corn grown under otherwise similar conditions. The existing fertilizer N rate recommendation will be continued, but again, more irrigated study data are needed.

There was only a small reduction in the total EONR rate (12 lb N/acre) with delaying two-thirds or more of that total fertilizer N rate at least four weeks after planting. However, most of the new data were generated on moderately well and well drained soils. The current delayed fertilizer N rate recommendation was primarily intended for somewhat poorly and poorly drained soils and will remain as is. There were no trials where corn was grown after a forage crop. There is often a wide range in corn planting dates within a given planting season, but there was no study that looked at the corn yield N rate response as a function of planting date, or at the corn response to delayed N timing as a function planting date.

Though there have been some increases in the recommended corn fertilizer N rates (most notably in the presence of a winter cereal rye cover crop and where corn follows corn) the data indicate that continuing improvements in crop and N management practices have increased N use efficiency quite significantly. A lot of the reported studies exhibited apparent fertilizer N use efficiencies between 0.7 and 0.8 lb N/bu – 155 to 175 lb N/acre produced yields around 220 bu/acre. The mean YEONR yield values found in these studies and used to develop these fertilizer N rate recommendations are well above current state-average yields. The ongoing yield trend with time indicates that corn N research needs to be revisited every 5 to 10 years with the objective of evaluating these corn N rate and management recommendations.

PARENT CORNER

Nutrition tips for kids

There is a lot of advice for kids' eating habits. The USDA recommends following these simple tips:

- **Eat more fruit and vegetables.** Make half your plate fruits and veggies every day.
- **Try whole grains.** Add things like oatmeal and whole-wheat bread and pasta to your dishes.
- **Think about your drink.** Choose water and low-fat or fat-free dairy milk (or lactose-free or fortified-soy versions) when you're thirsty.
- **Mix up your protein foods.** Include different foods like seafood, beans, peas, lentils, nuts, seeds, soy products, eggs, meats, or poultry.
- **Involve kids in the kitchen.** Let them help by putting away groceries, stirring ingredients, peeling fruits, or setting the table.
- **Be active.** Find ways for your kids to be active and move their body for at least 1 hour a day. Try walking to school, bike riding, or playing a sport with friends.

Source: https://www.myplate.gov/life-stages/kids

BASIC BUDGET BITES

Buying in bulk

Buying in bulk can save money, but it might not always make sense. Consider these tips before buying in bulk:

- Do you have the room to store the amount of food you are buying?
- Will you be able to eat all the product before the expiration date?
- Is this something you and your family eat often and enjoy, or are you buying something new that you are unsure of the taste?

Source: Jeannie Noble, MS, RD

SMART TIPS

Grocery shopping tips

There are lots of ways to save money while grocery shopping. Here are a few to keep in mind every time you shop.

- Have a plan and stick to a grocery list.
- If possible, do not grocery shop when you're hungry. You are more likely to make impulse purchases when you are hungry.
- Question sale items to avoid food and money waste. Will you eat it, or are you buying it because the price is right? Will you spend the time to prepare the item? Will your family eat it?
- Use the unit price. ***Read more about this by scanning the QR code.***

Source: Jeannie Noble, MS, RD

COOKING WITH KIDS

Turkey Wraps

- *8-inch whole-wheat flour tortilla*
- *1 tablespoon low-fat ranch salad dressing*
- *3 thin slices turkey breast*
- *2 tablespoons assorted diced vegetables*

1. Wash hands with warm water and soap, scrubbing for at least 20 seconds.
2. Spread tortilla with a thin layer of ranch dressing.
3. Place turkey and diced vegetables on top of salad dressing.
4. Roll up and slice in half. Serve.
5. Refrigerate leftovers within two hours.

Recipe makes 1 serving
Serving size: 1/2 wrap

Nutrition Facts per serving: 230 calories; 6 g total fat; 1.5 g saturated fat; 0 g trans fat; 50 mg cholesterol; 540 mg sodium; 24 g total carbohydrate; 2 g dietary fiber; 2 g total sugars; 0 g added sugars; 21 g protein; 0% Daily Value of vitamin D; 0% Daily Value of calcium; 6% Daily Value of iron; 4% Daily Value of potassium

Source: Eat Smart to Play Hard. Heather Shaw, Metcalfe County Nutrition Education Program Assistant, University of Kentucky Cooperative Extension Service

RECIPE

Easy Tortilla Breakfast Pizza

- *Nonstick cooking spray*
- *1 8-inch whole-wheat tortilla*
- *1 cup spinach*
- *3 medium eggs*
- *1/2 medium tomato, diced*
- *Dash of salt and pepper*
- *1/4 cup shredded part-skim mozzarella cheese*

1. Wash hands with warm water and soap, scrubbing for at least 20 seconds.
2. Spray a 10-inch skillet with nonstick spray and place tortilla inside.
3. Place spinach over the tortilla and make three slight wells in the spinach. Crack an egg into each well so it can be cut into three triangles once done.
4. Sprinkle tomatoes, salt, pepper, and mozzarella over the eggs.
5. Cover with lid and cook on medium-low heat for 12 minutes, or until egg yolk is cooked through.
6. Remove from heat and slice into three wedges with one egg each to serve.
7. Store leftovers in the refrigerator within 2 hours.

Recipe makes 3 servings
Serving size: 1/3 of pizza

Nutrition Facts per serving: 140 calories; 7 g total fat; 3 g saturated fat; 0 g trans fat; 50 mg cholesterol; 170 mg sodium; 10 g total carbohydrate; 1 g dietary fiber; 1 g total sugars; 0 g added sugars; 10 g protein; 6% Daily Value of vitamin D; 8% Daily Value of calcium; 6% Daily Value of iron; 2% Daily Value of potassium

Source: Jeannie Noble, Extension Specialist; and Jen Robinson, NEP Area Agent, University of Kentucky Cooperative Extension Service

SKYWARN

Become an official National Weather Service Skywarn Storm Spotter!

Learn about different weather phenomena & how to report them! The class lasts 2 ½ hours and all course material is free!

Date: Wednesday April 16, 2025
Time: 6:00 pm CDT
Where: Fulton County Extension Services Office
2114 7th St. Hickman KY
Local Contact: JL Atwill, EM Director
NWS Instructor: Christine Wielgos

REGISTRATION REQUIRED:

Scan QR code or go to
www.weather.gov/pah/spottertraining

NOAA

For information on the spotter program: contact Christine.Wielgos@noaa.gov

www.weather.gov/pah/

NATIONAL WEATHER SERVICE