

**TUSCARAWAS COUNTY AGRICULTURE & NATURAL RESOURCES**

February 15, 2024

**CROP RESPONSE TO POTASSIUM FERTILIZER**... is discussed in this OSU Extension C.O.R.N. newsletter article: <https://agcrops.osu.edu/newsletter/corn-newsletter/2024-04/crop-response-potassium-fertilizer-ohio>.

Potassium (K) is an essential plant nutrient. We measure available soil K with a soil test and add fertilizers when the soil available K is insufficient to meet crop needs. There are economic benefits to making informed decisions about K fertilizer use. The under-application of K fertilizer can result in reduced yields, while over-application adds to input costs, with economic losses resulting from both scenarios.

A few frequent questions about K fertilizer use are: Does K fertilizer always result in a positive yield response? How much will yields increase with applied K? What is the likelihood of yield penalty if K fertilizer is not applied?

A recently published factsheet, [Potassium Uptake and Ohio Crop Response](https://ohioline.osu.edu/factsheet/anr-0147) <https://ohioline.osu.edu/factsheet/anr-0147> (Rakkar and LaBarge, 2024), provides a general overview of soil K and highlights the findings of Culman et al. (2023) to answer these practical questions. The study summarized 458 replicated field K trials conducted over the last 45 years across 40 counties in Ohio. The robust dataset evaluated corn, soybean, and wheat response to added K fertilizer in trials conducted on farms and at research stations.

**Below are some key takeaways:**

**Does K fertilizer always result in a positive yield response?**

No. A significant crop yield increase due to K application occurred in 25% of the 458 K field trials. The yield response to added K varied by crop type. Corn responded to K application in 30% while soybean showed a response in 20% of trials with an average yield increase of 11% (Fig. 1).



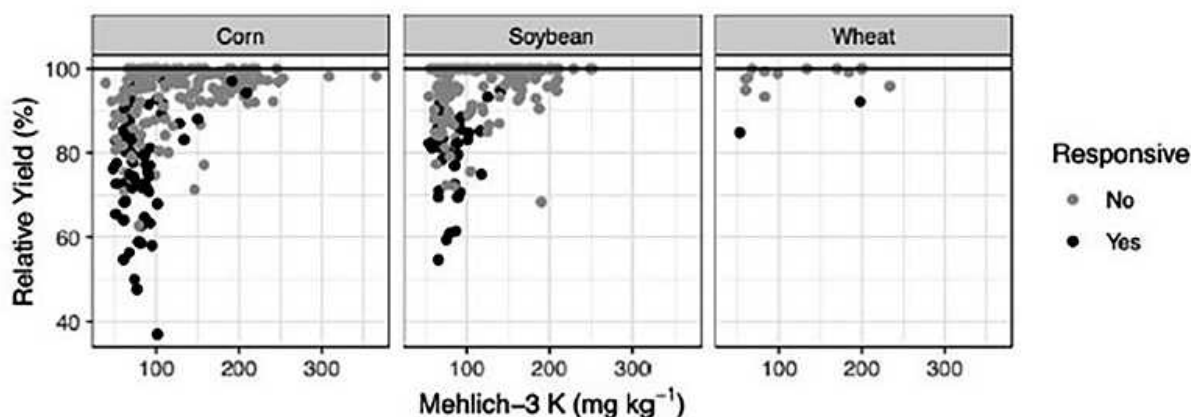


Fig. 1. Relation of relative yield and soil Mehlich-3 K for corn, soybean, and wheat across 457 field trials (Culman et al., 2023).

### How much will yield increase with applied K?

Yield increase will depend on the Mehlich-3 soil test K level. The Mehlich-3 soil measures the soil K that is readily available for crop uptake. Culman et al. (2023) classified Mehlich-3 soil K levels into <70, 70-100, 100-130, 130-160, and >160 ppm to evaluate the yield increase for each soil K category.

The crop yields were presented as Relative Yield, which refers to the yield with no K application divided by the maximum yield obtained across all K treatments. In other words, 100% relative yield means no yield increase with added K. The lower the relative yield, the higher the yield increase from K fertilizer.

Generally, as the soil test K levels decreased, the yield increment from fertilizer K increased (Table 1). When the soil test K was less than 70 ppm, the median relative yield was 86%. As the soil test K level increased above the critical level of 100-120 ppm (Cation Exchange Capacity (CEC) dependent), the median relative yield ranged from 96% to 100%, signifying minimal or no yield increase with added K.

Table 1. Summary of crop response to K fertilizer by soil K classification. (adapted from Culman et al., 2023)

Mehlich-3 soil K classification (ppm)	Number of trials	Fertilizer responsive trials (%)	Median Relative Yield (%)
>160	92	2	98
130-160	62	5	100
100-130	59	22	96
70-100	136	38	89
<70	91	47	86



## What is the likelihood of a yield penalty if K fertilizer is not applied?

We can also determine the likelihood of yield penalty based on Mehlich-3 soil K with the information in Table 1. When the soil K level was less than 70 ppm, 47% of trials showed increased crop yields with applied K. When the K levels were above the critical level of 100-120 ppm (CEC dependent), only 22% of trials showed increased crop yields. In other words, the likelihood of yield penalty with no K application decreases as soil K levels go above 100 ppm. If the soil test K level is less than 100 ppm, there is an increased risk of yield penalty with no K application.

For more soil fertility resources, information, and tools, use the link [go.osu.edu/fertilityresources](https://go.osu.edu/fertilityresources).

**FEBRUARY IS FOR FROST SEEDING**...as discussed in this OSU Extension Beef newsletter article: <https://u.osu.edu/beef/2024/02/14/february-is-for-frost-seeding/#more-15804>.

February is here and it comes with a flood of hearts, flowers, chocolates, and romance. It also brings weather that triggers maple syrup season and the ideal conditions for frost seeding pastures. If your valentine is a pasture manager, I have the perfect gift idea ahead!

Say “I love you” with the gift of clover seed! Instead of a bouquet of roses, consider a bag of red clover. Instead of fancy wine, consider an improved variety of white clover. Maybe just go ahead and get all of the above though, just to be safe.

Not convinced yet? Let me explain why February is a fantastic time to share the love of legumes.

The ideal time for frost seeding tends to be mid-February. When the water in the upper horizon of the soil freezes, the water expands, which leads to pressure that forces soil up and out during a freeze. Then when the water in the soil thaws, it takes up less space, and the soil settles back again.

The freezing, thawing, and soil heaving cycles help work seed that is spread on the surface into the soil. Good seed to soil contact will help seedlings get a jump start on the growing season without the risk of disturbing soils in the early spring when conditions may be too wet to tread on. Broadcasting seed at this specific time is called “frost-seeding”.

Frost seeding is an effective and low input method for thickening up pasture and hay field stands (or even lawns) with a broadcast application of seed. It is a method that is most successful with varieties of red clover and white clover.

Frost seeding can be implemented in both fields with and without livestock present. If livestock are in the field, hoof traffic can assist with seed to soil contact in combination



with soil heaving. You can broadcast the seed by hand, with a hand crank, or with a seed broadcaster on an ATV. Seed could also be aerially applied via plane or drone if the service is available to you.

Frost seeding rates vary depending on the type of forage seed you choose. Frost seeding isn't just for legumes. Some grasses can successfully be frost seeded as well. For best success, start with high quality seed and broadcast the seed during weather patterns where nighttime temperatures drop below freezing and daytime temperatures rise above freezing.

There are many situations where frost seeding legumes is advantageous. The practice can help remediate areas where bare ground is present. Whether the bare ground is a result of high-traffic, herbicide application, or soil disturbance, clover is likely to provide good cover to these areas in the spring. Soil coverage as soon as possible helps prevent weeds from establishing in these sensitive areas.

It is important to consider that some broadleaf herbicides may have residual impacts on the establishment of legumes. There may be a recommended timeframe to wait between treating for broadleaf weeds and adding legumes or forbs back into the pasture. That time frame could vary from a few weeks to several months. Be sure to fully read all labels, keep accurate application records, and follow any restrictions dictated on the label.

Legumes are beneficial additions to pastures and hayfields for their ability to form mutually beneficial relationships with nitrogen fixing soil bacteria. These rhizobia fix atmospheric nitrogen into plant available nitrogen in the root zone around the legumes and thus benefits the other plants growing in the area. To ensure fixation occurs, purchase inoculated seed. Legumes also provide a greater percentage of digestible nutrients and proteins than most grasses, which improves the nutritional value of the pasture or hayfield.

Frost seeding is an economical way to gradually improve pasture condition in combination with providing appropriate fertility and harvest practices. For both legumes and grasses, the recommended seeding rates are less than 10 pounds of seed per acre. In our area, we have access to improved varieties of clovers with rhizobia inoculant for \$3 to \$5 per lb. The impact of that investment could repay itself several times in the first year of growth.

If you are officially considering frost seeding now, note that the window for frost seeding typically spans from February 1 to March 15. The recommended seeding rates for the forages that deliver good establishment through frost seeding are provided below:



Forage Type	Seeded Alone (lb./ac.)	Seeded in a Mixture (lb./ac.)
Red Clover	4-8	3-4
Ladino (white) Clover	2-3	1-2
Alsike Clover	2-4	1-2
Birdsfoot Trefoil	4-6	2-3
Alfalfa	5-8	3-5
Perennial or Annual Ryegrass	8-15	2-3
Orchardgrass	3-4	1-2
Novel Endophyte Tall Fescue	6-8	3-4

Table information sourced from The Ohio State University and University of Wisconsin-Madison

The ease of frost-seeding makes it appealing, but the seeding step alone isn't all it takes for establishment to be successful.

It is important to provide time for frost seeded plants to grow substantial and healthy roots and leaves before allowing animals to graze them. Legumes need adequate sun light to thrive. It may be necessary to clip a pasture in the spring before grazing to allow light to get through the canopy of already established plants. This allows the seedlings to get enough sunlight to be healthy, strong, and resilient to defoliation when grazing or haying begins.


Every farm has its own special traits that set it apart from others. Therefore, it may be beneficial to talk in more detail with a professional about your plans to improve the current status of your forage systems. Contact your local Extension Office for free consultation and take the time to shop for good quality seed before the ideal day to plant it arrives.

**FARMLAND LEASING UPDATE**...sponsored by OSU Extension will be held March 1 (<https://farmoffice.osu.edu/news/its-time-our-ohio-farmland-leasing-update>).

**DATE:**  
March 1, 2024

**TIME:**  
10:00 a.m. - Noon

**Via ZOOM  
Webinar**

  
**THE OHIO STATE  
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**JOIN US FOR A FARM OFFICE LIVE SPECIAL EVENT:**

## Ohio Farmland Leasing Update

Providing economic and legal updates on Ohio farmland leasing issues and needs.

*Topics we'll cover include:*

- Cash Rent Outlook – Key Issues and Survey Data
- Negotiating Capital Improvements on Leased Farmland
- Dealing with Conservation Practices in a Farmland Lease
- Executing and Recording Farm Leases
- New Farmland Leasing Resources

*Speakers:*

- Barry Ward, Leader, OSU Production Business Management
- Peggy Hall, Attorney, OSU Ag & Resource Law Program
- Robert Moore, Attorney, OSU Ag & Resource Law Program

To register, visit [go.osu.edu/register4fol](https://go.osu.edu/register4fol)



**FARM OFFICE LIVE**...sponsored by OSU Extension will be held this Friday, February 16 at 10am. There is no fee, but pre-registration is required.



This month's webinar will feature the following topics:

- Ag & Natural Resources State Update
- Reporting for the Corporate Transparency Act
- 2024 Crop Input Outlook
- OSU Extension's New Food Business Central Course
- Legislative Round-up
- Spring Crop Insurance
- Farm Bill Update – A Panel Discussion
- Upcoming Programs

Featured presenters will include: Chris Zoller (OSU Extension Interim State ANR Leader), Robert Moore & Peggy Hall (OSU Ag and Resource Law Program), Barry Ward (OSU Income Tax School Director), David Marrison & Eric Richer (OSU Field Specialists -Farm Management), Emily Marrison (Assistant Professor and Family & Consumer Sciences Educator), Clint Schroeder (Program Manager – Ohio Farm Business Analysis Program) and Brandon Kern (Director of Public Affairs and Issues Analysis- Ohio Soybean Association)

To register for this program (or to access replays of previous programs):

[go.osu.edu/farmofficelive](https://go.osu.edu/farmofficelive)



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