OHIO’S MINIMUM WAGE LAW IS CHANGING...in 2022. Beginning January 1, 2022, the Ohio minimum wage will rise to $9.30, up from the current $8.80, for non-tipped employees. However, as an agricultural employer, the law provides some exemptions to paying federal or state minimum wage. In this post, we review minimum wage requirements, agricultural exemptions to minimum wage, and who qualifies for the agricultural exemptions.

Ohio versus federal minimum wage. As discussed above, Ohio’s minimum wage will rise to $9.30 for non-tipped employees but federal minimum wage will remain at $7.25. An agricultural employer is required to follow both state and federal laws, but when the two sets of laws differ, there may be some confusion about which one applies. Normally, federal law reigns supreme and usually preempts, or overrides, state law. But in this case, the federal law sets the floor for minimum wage. This means that employers across the country that are subject to the Fair Labor Standards Act (“FLSA”) cannot pay less than $7.25 per hour to their employees. However, if a state law requires that employers pay their employees more than the federal minimum wage, then the employer must meet the state’s minimum wage standard. Thus, Ohio employers must pay the Ohio minimum wage, unless an exemption applies.

Ohio’s “small employer” exemption. Starting in 2022, Ohio employers that grossed less than $342,000 in 2021 are not required to pay Ohio’s $9.30 minimum wage. Instead, those employers are required to pay the $7.25 federal minimum wage to their employees, unless another exemption applies.

Ohio and federal agricultural exemptions. Under both Ohio and federal law, agricultural employers are exempt from paying the federal or Ohio minimum wage to their employees if any of following apply:

1. The employer did not use more than 500 man-days of agricultural labor during any calendar quarter during the preceding year.
2. The employee is the parent, spouse, child, or other member of the employer’s immediate family.
3. The employee:
   a. is employed as a hand-harvest laborer;
   b. is paid on a piece-rate basis;
   c. commutes daily from their permanent residence to the farm; and
   d. was employed in agriculture for less than 13 weeks during the previous calendar year.
4. The employee is:
   a. 16 years of age or younger;
   b. employed as a hand-harvest laborer;
   c. paid on a piece-rate basis;
   d. employed on the same farm as their parent or legal guardian; and
500 man-days exemption. The “man-days” exemption was intended to exempt small and family-sized farms. A “man-day” is any day during which an employee performs at least one hour of agricultural labor. To calculate a “man-day”, an agricultural employer needs to keep track of the number of people who worked each day and for how long. 500 “man-days” is roughly equal to having seven employees working for at least one hour each, five days a week during a calendar quarter. It is also not just full-time employees that are counted towards the 500 “man-day” exemption, temporary and seasonal workers also count towards the “man-day” exemption.

Family member exemption. An agricultural employer is not required to pay family members the minimum wage. This family member exemption applies to employees engaged in agriculture and are either the parent, spouse, child or other member of the employer’s immediate family. However, not every blood relative is considered “other immediate family.” According to the U.S. Department of Labor, the following will be considered as part of the employer’s “other immediate family”: stepchildren, foster children, stepparents, and foster parents. Other family members, including siblings, cousins, nieces, nephews, uncles, and aunts do not count as immediate family members.

Employed in agriculture. Ohio law closely resembles, if not mirrors, FLSA requirements when it comes to agricultural exemptions to minimum wage and overtime requirements. But, to qualify for the agricultural exemptions discussed above, an employer must have employees that are employed in “agriculture.” Under the FLSA, “agriculture” has two distinct branches, primary agriculture and secondary agriculture. Employees engaged in primary agriculture are considered to be employed in agriculture for that workweek. Employees engaged in secondary agriculture are only considered to be employed in agriculture if the activities are performed by a farmer or on a farm in connection with the farming operations.

What is considered primary agriculture? Primary agriculture “includes farming in all its branches” and are those activities traditionally viewed as agricultural, including:

- Cultivating and tilling the soil;
- Dairying;
- Producing, cultivating, growing, and harvesting agricultural or horticultural commodities; and
- Raising livestock, bees, fur-bearing animals, or poultry.

Activities that qualify as primary agriculture do not necessarily have to take place on a farm. For example, someone employed in a hatchery that is located in an industrial complex is engaged in a primary agriculture activity (raising poultry) and is considered to be employed in agriculture. On the other hand, even though an activity takes place on a farm, it does not necessarily mean it is considered to be a primary agriculture activity. For example, courts have determined that employees of Dairy Farm A are not engaged in a primary agriculture activity when they process milk produced by Dairy Farm B.
What is secondary agriculture? Secondary agriculture includes all activities, including forestry or lumbering operations, that may not themselves be considered agricultural practices but are necessary to agriculture. For an activity to be considered secondary agriculture it must meet two requirements:
(1) the activity must either be performed by a farmer or on a farm; and
(2) the activity must be incidental to or in conjunction with such farming operations.

Secondary agriculture includes preparing an agricultural product for market, delivering agricultural products to storage, to market, or to carriers for transportation to market.

Any activity that is performed by a farmer’s employees, is also considered to be “performed by a farmer.” Moreover, an activity is considered “incidental to or in conjunction with” farming activities if the work being performed is:
(1) An established part of agriculture;
(2) subordinate to the farming operations of the farm; and
(3) not an independent business.

Mixing it up. After understanding what work is considered agricultural, it is important to understand the impact of an employee performing both exempt and non-exempt work. If an employee does both exempt and non-exempt work in the same week, then the employee loses their exemption status and must be paid according to federal/Ohio minimum wage and overtime requirements. However, if an employer can separate the employee’s exempt and non-exempt work into separate weeks, then the employer would only have to pay the employee federal/Ohio minimum wage and overtime for those weeks that the employee performed non-exempt work.

This especially important to agricultural employers that also engage in agritourism activities. Having a farm employee perform work related to an agritourism activity does not qualify for the agricultural exemptions under federal/Ohio law. Agricultural employers should be careful when assigning their employees tasks. Assigning tasks outside the realm of agriculture will subject the employer to the provisions of federal and state minimum wage and overtime laws.

Overtime. Agricultural employers are exempt from paying their agricultural employees an overtime wage rate. This exemption applies to all agricultural employees, not just small farm employees or immediate family members.

Conclusion. Determining whether your employees qualify for an agricultural exemption can be a complex issue, with multiple layers of analysis. It is always best to ask an attorney to help clarify whether your employees are considered to be “employed in agriculture” and thus qualify for the agricultural exemptions to minimum wage and overtime laws. Further, it is always a good idea to seek a lawyer’s counsel every so often to help make sure your operation is continuing to be compliant with labor and employment laws.

(Source: Jeff Lewis, Attorney & Research Specialist, OSU Extension, https://farmoffice.osu.edu/blog/fri-12032021-1006am/new-year-new-minimum-wage)
SOIL HEALTH WEBINARS...sponsored by OSU Extension will be offered in 2022. Farmers, industry, and academic experts will weigh in on practical steps to improve soil health and measure impact on crop yield and farm profitability.

Programs include:
- January 6th, 8:00-9:00am – What’s Your Soil Health Resolution? (Farmer Panel)
- February 3rd, 8:00-9:00am – What does the Research Tell Us about Cover Crops & Soil Health?
- March 3rd, 8:00-9:00am – What’s the Future of Soil Health?

There is no cost to attend these programs, but registration is required. Register at www.go.osu.edu/soilhealth2022. 1 hour CCA CEU in Nutrient Management will be offered at each session. CCA CEUs are only available to participants attending live sessions (we cannot give CCA credit for watching the recordings).

All programs will be recorded, and recordings will be available to view on our YouTube channel. Last year’s Soil Health Webinar sessions can be viewed online here.

AG ECONOMY BAROMETER...is published monthly by Purdue University. The latest report is available here: https://ag.purdue.edu/commercialag/ageconomybarometer/wp-content/uploads/2021/12/November-2021-Ag-Economy-Barometer.pdf. The Ag Economy Barometer slipped to a reading of 116 in November, down 5 points from October and 30% lower than in November 2020 when the barometer stood at 167. Once again, weakness in the barometer was tied to weaker sentiment regarding current conditions as well as weaker expectations for the future.

Concerns about government policies impacting agricultural producers remain elevated among farmers. Starting in October 2020, various surveys have included questions regarding expectations for environmental regulations, estate taxes and income taxes. In October 2020, the percentage of ag producers expecting more restrictive environment policies, higher estate taxes and higher income taxes ranged from just 35% (income
taxes) to 41% (environmental regulations). There was a marked shift in responses to these questions immediately following the 2020 election as the percentages rose to a range of 66% (estate and income taxes) to 77% (environmental regulations). On the November 2021 survey, 82% of respondents said they expect more restrictive environmental regulations in the years ahead while 74% said they expect higher estate taxes and 77% said they expect higher income taxes.

BEDDED-PACK MANURE…is a valuable fertilizer material, as discussed in this OSU Extension Beef newsletter: https://agcrops.osu.edu/newsletter/corn-newsletter/2021-39/valuing-bedded-pack-manure. Due to the increase in fertilizer prices, there is renewed interest in the nutrient value of manure. This article will discuss bedded-pack manures that involve straw, sawdust, or wood chips to absorb moisture. The nutrients and organic matter in pen-pack manure are an excellent addition to farm fields. The most common types of bedded manure are beef, dairy, and sheep or goats. Small ruminant bedded pack manure contains the most nutrients per ton followed by beef manure and dairy manure.

Pen-pack manure contains the macro nutrients nitrogen, phosphorus, and potash along with a host of micronutrients. The nutrient content can vary depending on species, feed products fed, and the amounts of straw or sawdust used for bedding. The farm’s manure handling and storage practices also impact the nutrient content of manure. Manure stored under roof will usually maintain a higher nutrient value than manure exposed to rainfall.

Pen-pack manure nutrients are measured as pounds of nutrient per ton of manure. Typically, the nitrogen content will be 10 to 16 pounds per ton. About two pounds of this nitrogen is in the ammonium form and the remainder will be in the organic form. While ammonium nitrogen is immediately available to a growing crop, organic nitrogen takes time in a field to mineralize and become available over three or four years. The phosphorus content, in the P2O5 form, will usually be from 6 to 12 pounds per ton. The potash content, in the K2O form, will usually be between 10 and 15 pounds per ton.

Applying pen-pack manure can be more precise if you know the application rate being applied in tons per acre. If you are unsure how many tons per acre your solid manure spreader applies there is a simple way to
make a determination. Make a tarp that is 56 inches by 56 inches (21.8 square feet). Fasten it to the ground with weights on the corners and apply manure across the tarp. Fold up the tarp and weigh the manure captured. Many people use a bathroom scales for this. One pound of manure captured on the tarp is equivalent to one ton of manure applied per acre. Thus, if you captured 10 pounds of manure the application rate was 10 tons per acre.

We always want to keep water quality in mind when handing manure. The goal is to make good use of the manure nutrients and keep the manure nutrients out of streams and ditches. For more information about how and when to sample manure, Penn State Extension has a good publication available on-line at http://extension.psu.edu/plants/nutrient-management/educational/manure-storage-and-handling/manure-sampling-for-nutrient-management-planning

**LIME IS A CRITICAL COMPONENT**...of successful crop production. This OSU Extension C.O.R.N. newsletter article (https://agcrops.osu.edu/newsletter/corn-newsletter/2021-40/lime-considerations) discusses management considerations.

It is important to test soil pH and determine whether any lime needs to be applied for future crops. Proper soil pH is important for nutrient availability, herbicide activity, and crop development. For most soils, additional lime is not needed every year. Consider these points before liming your fields:

- **Do I need lime?** Each year we hear stories of people adding lime to their fields without a soil test. The grower has a source of free waste-product lime that they pick up and apply to their fields. In many cases their soil pH was fine, but they did not want to pass up a "good deal". Without knowing the soil pH, a grower may inadvertently raise their soil pH to the high 7's. At this elevated pH, certain nutrients may become limited, and the productivity of their crop may be reduced and require special management practices. Western Ohio has the greatest risk of elevating soil pH from careless applications of lime. A soil analysis is the best step to determine if a field needs lime.

- **What is the pH of my subsoil?** Generally, a laboratory recommends lime when the soil pH drops two to three units below the desired value. The desired value depends upon the crop and the pH of the subsoil. In parts of Ohio where the subsoil pH is less than 6.0 for mineral soils (eastern Ohio), additional lime is recommended after the soil pH drops to 6.2 for corn and soybean, and 6.5 for alfalfa. In other parts of the state (generally western Ohio), the subsoil pH for mineral soils is greater than 6.0 and lime is not needed until the soil pH drops below 6.0 for corn and soybeans, and 6.2 for alfalfa. Private laboratories may not take in account the subsoil pH and use recommendations based on a subsoil pH less than 6.0 for all parts of the state, possibly recommending lime applications several years earlier than needed for some areas.

- **What is the Effective Neutralizing Power of my lime source?** An important item from a lime analysis report is the Effective Neutralizing Power (ENP) value, which is required for material sold as lime for agricultural purposes in Ohio. This value allows a producer to compare the quality among lime sources because ENP considers the purity, neutralizing power (including fineness) and moisture content. In
other words, the ENP tells you how much of that ton of lime neutralizes soil acidity. The unit for ENP is pounds/ton (be careful not to use %ENP, which may also be on a lime analysis report). The ENP allows a producer to compare different lime sources because they can now determine price per pound or ton of actual neutralizing material.

- Should I use “hi cal” or dolomitic lime? In most situations it does not matter, so a producer can select the least expensive of the two lime sources. Transportation is often the largest cost of a lime material, so generally the closest lime source (quarry) is often the most economical.

Several parts of the state are historically low in soil magnesium (eastern and southern Ohio). Adequate soil magnesium is important to reduce the risk of such problems as grass tetany for grazing animals. Soil test magnesium levels need to be greater than 50 ppm (100 lb) for optimal corn, soybean, wheat, and alfalfa production on fine to medium textured soils and greater than 35 ppm on coarse textured soils. Often areas low in magnesium also need lime, which has made the application of dolomitic lime an economic solution for both concerns.

The ratio between calcium and magnesium is important. Soils should contain more calcium than magnesium. Extensive research has shown that crops yield the same over a wide range of calcium to magnesium ratios and will not affect crop production if the calcium to magnesium ratio is larger than 1. High calcium lime should be used in situations where the soil test calcium to magnesium ratio is less than 1, or in other words, the soil magnesium levels are greater than the soil calcium levels. I have not observed any Ohio soil tests where the magnesium levels are above the calcium levels. Also keep in mind that almost all dolomitic lime sources will contain more calcium than magnesium. Unfortunately, some producers have been led to believe that magnesium levels in dolomitic lime may be undesirable. The level of magnesium is unimportant if the calcium level is above magnesium. The focus should be selecting lime on its Effective Neutralizing Power (ENP) rather than its calcium level.

- How about gypsum as a lime source? Gypsum is not a lime source. It does not have the right chemical composition to neutralize soil acidity, such as carbonate (gypsum is calcium sulfate). Gypsum is used as an amendment for soil physical properties and/or as a fertilizer providing calcium and sulfur.

In summary, make sure you take a soil test to determine if lime is needed, determine if magnesium is needed, know the historic pH of your subsoil, and then use the ENP to select the most cost-effective lime material. A soil test every three to four years will determine the lime requirements for your fields. Additional information on ENP and lime sources and liming rates may be found at the following location: [https://agcrops.osu.edu/FertilityResources](https://agcrops.osu.edu/FertilityResources) scroll down to the ‘pH and Liming’ section.

WITH HERBICIDES ANTICIPATED...to be in short supply in 2022, OSU and other university Extension weed scientists have developed management strategies to consider. The complete article is available here: [https://agcrops.osu.edu/newsletter/corn-newsletter/2021-40/alternative-spring-burndownpostemergence-strategies-when](https://agcrops.osu.edu/newsletter/corn-newsletter/2021-40/alternative-spring-burndownpostemergence-strategies-when). The two main active ingredients that we’re hearing about right now are glyphosate (Roundup, others) and glufosinate (Liberty, others), for which prices have increased substantially. There will
likely be limited supplies of other pesticide active ingredients as well, but in the short term, a shortage of these two active ingredients poses some major challenges for corn and soybean production. The purpose of this article is to discuss ways to minimize the impact of herbicide shortages, primarily glyphosate, on corn and soybean production. As you search for alternatives to these two herbicides and others, the weed control guides and technical guides produced by University Extension and industry are an important tool for planning weed management programs and herbicide purchases. Links to the university publications are at the end of this article.

Some guiding principles based on our experience that may help with decisions, especially where glyphosate will not be in all applications:

1. Spring tillage is an option to replace herbicide burndown. Can cause long-term compaction problems if tilled when too wet. Waiting until weeds are large makes tillage less effective. Weeds that survive tillage will be difficult to control with POST herbicides. In other words, till when soil conditions are fit and before weeds are huge.

2. Where it’s only possible to use glyphosate once, it may be needed most in the burndown. Saflufenacil can be added for enhanced control of rye and ryegrass, and marestail. ACCase herbicides (e.g. clethodim, quizalifop) can then be used for POST grass control in soybeans. Glufosinate, Enlist Duo, or XtendiMax/Engenia can be used for many broadleaf weeds, especially the glyphosate-resistant ones. Where residual herbicides are omitted, or do not provide enough control, we would expect POST treatments to struggle more in the absence of glyphosate with weeds such as lambsquarters. So use residuals. Glyphosate is still more than just a grass herbicide.

3. If glyphosate is omitted from burndown, grasses become a bigger issue than broadleaf weeds. Options for annual grasses: Gramoxone; rimsulfuron – if small, corn only; ACCase herbicides – clethodim (wait 7 days to plant corn), quizalifop (soybeans only) – need 60 degree days, apply alone if possible, weak on winter annuals under cold conditions. Where trying to reduce glyphosate rates, a rate of 0.38 lb ae/A will control most annual grasses.

4. Burndown programs typically contain two to three “burndown” herbicides in order to ensure control of a diversity of weeds under various environmental conditions. This is why glyphosate is not used alone in burndown programs, but mixed with 2,4-D, dicamba, or Sharpen. We suggest following this same strategy when glyphosate is omitted – try to have at least two herbicides with substantial burndown activity in the mix. Increasing rates of components of the burndown mix should be generally helpful, in accordance with label guidelines for soil type, weed size, time until planting, etc. There are also other herbicides that can improve control in some mixes although we don’t consider them “burndown” herbicides on their own – chlorimuron, atrazine, metribuzin.

5. There are generally more options for burndown and POST applications in corn compared with soybeans, so it might make sense to save a limited supply of glyphosate and glufosinate for use in soybeans.
6. Control of little barley and annual (Italian) ryegrass in a burndown requires glyphosate, ACCase herbicides are not effective enough in spring. For annual bluegrass – ACCase can work - 60 degree day, no tank mixes. High rates of metribuzin can provide fair control of bluegrass.

7. For burndown of a legume cover prior to corn, clopyralid and dicamba are the most effective herbicides. For cereal rye, Gramoxone plus atrazine or metribuzin may be best option in the absence of glyphosate.

8. It’s possible to chop and bale a cover, then use glyphosate POST to kill regrowth. The addition of an ACCase herbicide may help control regrowth in soybeans. POST corn herbicides will not kill the rye, including nicosulfuron, rimsulfuron, and Group 27 herbicides (Impact, Shieldex, Laudis etc).

9. Mixing ACCase herbicides with dicamba or 2,4-D (no glyphosate) can cause reduction in grass control due to antagonism. Apply separately to avoid this.

10. Increasing the number of applications can help with weed and herbicide management when certain products are short or glyphosate rates need to be reduced. For example, three applications instead of two: 1) Fall or early spring burndown when weeds are small; 2) residuals plus possibly additional low-rate burndown at planting; 3) POST.

11. Best opportunity to omit glyphosate or reduce the rate will be: 1) in fields treated the previous fall, or those with a low population of small weeds; and 2) where the POST program is comprehensive enough to control weeds that escape the burndown – Enlist, XtendiFlex, LL GT27 (their effectiveness also depends upon whether glyphosate is being used POST).

12. Take all necessary steps to maximize herbicide activity - optimize adjuvants and sprayer parameters (nozzles, volume, pressure, speed) per label guidelines.

13. Check on availability of premix herbicides that may contain glyphosate or another herbicide that is unavailable as a single ingredient product. Examples that contain glyphosate – Sequence, Halex GT, Acuron GT, Extreme, Flexstar GT.

**Burndown programs that deemphasize use of glyphosate – pros and cons.**

**Can be used in corn and soybeans**

**Gramoxone + 2,4-D + metribuzin/atrazine (atrazine – corn only)**

Strengths: best non-glyphosate option for rye burndown; adequate for general spring weeds including marestail <6” tall; can be applied before either corn or soybeans (depending on rate); has activity on grasses

Weakness: perennial weeds; large marestail; annual ryegrass; special training required to apply
Comments: Metribuzin rate for corn varies by soil type and is limited to a maximum of 5.33 oz of 75DF.

**Sharpen + glyphosate (low rate 0.38 - 0.56 lb ae/A) + 2,4-D**

Strengths: adequate cereal rye and other cover crop burndown; marestail control; can be applied before either corn or soybeans (depending on rate)

Weakness: large weeds; overall weed control is fair due to low glyphosate rate

Comment: Rates higher than 1 oz require wait of 15 to 30 days to plant soybeans. Must wait 2 weeks to plant soybeans if 1 oz is mixed with flumioxazin or sulfentrazone product.

**Sharpen + 2,4-D + metribuzin/ atrazine (atrazine – corn only)**

Strengths: good foliar and residual marestail control; good initial Palmer/waterhemp control; burndown and residual in one pass

Weakness: does not control grasses (atrazine control grass up to an inch when applied with oil); must wait 2 weeks to plant soybeans if mixed with flumioxazin or sulfentrazone product. Metribuzin rate for corn varies by soil type and is limited to a maximum of 5.33 oz of 75DF.

**Basis Blend/other rimsulfuron products + 2,4-D + metribuzin/ atrazine**

Comments: some grass control; limited burndown activity on several key species; better used in corn due to long wait to plant soybeans (15 to 60 days)

**Harmony Extra/similar products + 2,4-D + metribuzin**

Comments: average (70-80%) control on many key broadleaves; no grass control; additional residuals and POST products necessary for in crop weed control; can be used in corn or soybean

**Corn only**

**Acuron/Lexar/generic equivalents/Resicore + atrazine**

Strengths: winter and summer annuals; burndown and residual in one-pass; can add more atrazine or 2,4-D

Weakness: poor control of cereal rye and ryegrass; corn only
**Soybeans only**

**2,4-D + metribuzin + clethodim**

Strengths: some grass suppression including cereal rye and ryegrass;

Weakness: 2,4-D antagonizes clethodim activity; cool weather limits clethodim activity; use rate of clethodim is not high enough if used before corn planting

**Metribuzin + 2,4-D + chlorimuron product**

Comments: good fit in fields that were treated prior fall; Some chlorimuron products contain metribuzin – suggest supplementing with additional metribuzin so total is the equivalent of 6 to 12 oz of 75DF. Does not control grasses. Canopy/Cloak Ex contains tribenuron, which improves control of chickweed.

**PRECISION UNIVERSITY**...will return in January 2022. Just as ag technology is always updating, so too is Precision University. This year our focus is Using Ag Technology to Manage 2022 Challenges. Based on feedback from last year, it will be delivered in 2 webinars and a half-day, in-person event.

The **January 5** webinar will focus on adapting to supply chain shortages. A panel of industry representatives will share what they are seeing and how to work around what you might not have.

The **January 12** webinar will turn your attention to sulfur. Some have seen responses to sulfur application while others have not. Dr. Shaun Casteel, Purdue University, and Dr. Steve Culman, The Ohio State University, will share results from their on-farm sulfur research. Dr. John Fulton, The Ohio State University, will also discuss recent research on sulfur and share tips for conducting your own on-farm research to determine if sulfur is a limiting factor on your farm.

On **January 19**, we will round out the 2022 Precision University with a hands-on look at equipment that will help farmers adapt and fine tune nutrient and crop protection delivery. This event will take place from 9:30-1pm at the Champion Center in Springfield and will include breakfast and lunch.

The webinars are set for 9-10am and are free to attend. The in-person event has a cost of $35. You can register at [http://go.osu.edu/PrecisionU](http://go.osu.edu/PrecisionU).
DETERMINING PASTURE RENTAL RATES...is something many livestock producers and landowners wonder how to calculate. This OSU Extension Beef newsletter article (https://u.osu.edu/beef/2021/12/15/pasture-rental-rates-do-you-know-your-price/#more-11870) addresses this topic.

Here are some options and consideration before entering into a pasture lease agreement.

- **Know each party’s responsibility**- The two parties are the Livestock owner and landowner. There two parties should come to an agreement and understand their responsibilities. The landowner should cover the real estate taxes, cost of infrastructure (fence, barns, water) and their repairs, farm insurance. Livestock owners should calculate and budget what he or she can afford to pay in rent. Responsibilities such as fertilizing, mowing, and fixing damaged fence, should be reflected in the final rental agreement.

- **Communicate and put it in writing**- When discussing lease agreements make sure to record and write down rates, responsibilities, contract length, stocking rates, disaster clause, and other specific discussions made during the negotiation process.

- **What rental method works best for you?** – There are several pasture rental methods that can be used but is each operation is set up differently, make sure to do your research evaluate which method works best for your farm operation.

1. Animal Unit Method takes into account the average animal units time the average hay price on a per ton basis times the pasture quality factor. An animal Unit is equal to 1000 lbs. and pasture quality factors include:

<table>
<thead>
<tr>
<th>Factor</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>0.12</td>
<td>Unimproved, poor</td>
</tr>
<tr>
<td>0.15</td>
<td>Fair to good</td>
</tr>
<tr>
<td>0.18</td>
<td>Very good</td>
</tr>
<tr>
<td>0.20</td>
<td>Excellent</td>
</tr>
<tr>
<td>0.22</td>
<td>Lush legume pasture</td>
</tr>
</tbody>
</table>

Ohio mixed grass hay prices for the last week of November ranged from $80-$150 per ton.

<table>
<thead>
<tr>
<th>Livestock type</th>
<th>Animal Unit</th>
</tr>
</thead>
<tbody>
<tr>
<td>Mature Cow with unweaned calf at side or heifer two years or older</td>
<td>1.25</td>
</tr>
<tr>
<td>Bull, two years or older</td>
<td>1.3</td>
</tr>
<tr>
<td>Young cattle, one to two years old.</td>
<td>0.8</td>
</tr>
<tr>
<td>Weaned calves or yearlings</td>
<td>0.6</td>
</tr>
</tbody>
</table>
As an example, let’s say your cow herd size is 1000 lbs. with a newly born calf weighing around 250 lbs. by her side and the current local hay market is $80/tan for fair grass mixed hay which is equivalent to the pasture you are wanting to lease = 1.25 AU x $80/ton x .15 pasture quality factor = $15 per head per month. Factors such as current hay prices, pasture quality, and animal units can have a direct effect on the pasture rental rate.

2. Per acre rental method is an easy and common method used by producers. In 2020 USDA, NASS Ohio field office reported that the average pasture rental rate equaled $26/acre ranging from $17/acre in southeast Ohio to a high of 50.50/acre West Central Ohio. USDA NASS also reported current pastureland value price for Ohio equaled $3,370, find more details at [https://www.nass.usda.gov](https://www.nass.usda.gov).

3. Pasture rental rates utilizing yields and Land capability from soil survey considers soil productivity based on average yield and the amount of forage or feed one animal unit for 30 days. The productivity and suitability of soil for grazing can be found in the Ohio soil survey. Local Soil and Water Conservation districts can provide county soil ratings or go to [https://websoilsurvey.sc.egov.usda.gov/](https://websoilsurvey.sc.egov.usda.gov/) to learn more about your soil suitability rating. Rental rates can be based on seasonal cost and grazing period cost. Season cost takes into account the price of hay per ton and equivalent pasture value x soil survey yield. Example – $80/ton hay value or 40/ton pasture x 2.5tons/acre rating = $100/ac. Grazing period cost takes into account pasture value x soil survey yield and grazing period indicated in the soil survey divided by animal unit days also indicated in the soil survey. Example $40/ton pasture value x 2.5tons/acre x 60 days of grazing/150 animal unit days = $40/ac.

In summary, there are many factors that can affect the price paid for pasture rental, from pasture quality, water availability, conditions of fence/facilities, current hay prices, and supply and demand. Before approaching the landowner producers need to have their ducks in a row, make sure to have a budget prepared also indicate incentives for the landowner to lease to you over other producers. Incentives such as good pasture management, rotational grazing practices, and good livestock husbandry are always good ways practices to highlight when negotiating. Finally, communication is critical, 2022 has many unforeseen issues, don’t make a disgruntled landlord one of them due to miscommunication.

To learn more about pasture rental lease agreements you can go to:

- [What’s in Your Farmland Lease? A Checklist of Farmland Lease Provisions](#)
- OSU Extension Fact Sheet FR-8, Establishing a Fair Pasture Rental Rate, 2006 [ohioline.osu.edu/factsheet/FR-8](https://ohioline.osu.edu/factsheet/FR-8)
- Maximizing Fall and Winter Grazing of Beef Cows and Stocker Cattle, Bulletin 872.1998. Ohio State University Extension


**Spring 2022 Price Expectations**

In their *Weekly Farm Economics* newsletter, the University of Illinois Farmdoc Daily reviewed price changes from October to April for the years 2008 to 2020. For anhydrous ammonia, 28% of the time the price was lower in April than in October. The largest decline ($441 per ton) occurred from 2008 to 2009, and the largest increase ($262 per ton) was realized between October 2020 to April 2021. Whether fertilizer prices will decline in 2022 is anybody’s guess. Manufacturing may increase, but uncertainties in winter heating or other delays can impact production and pricing.
Management Considerations

Soil Sampling & Testing
Soil testing is always an important management consideration, but its importance is an even better investment with the present fertilizer pricing situation. Sampling is recommended every three years to maintain proper soil fertility and promote healthy plants. Soil testing is also critical for determining soil pH and the need for lime applications. A target soil pH of 6.0 to 6.8 is ideal for most crops.

The Tri-State phosphorus and potassium recommendations define how vital the fertilizer application is in the upcoming year. Using the soil test value, we can answer the question, “Do I need to apply fertilizer this year, or can I wait into the future?” If your soil test value is above the critical level, added fertilizer is not expected to increase the yield of the upcoming crop. When soil test values are above the critical level, the chance of a yield response is highly unlikely. The critical phosphorus soil test level for corn and soybean is 20 ppm and 30 ppm for alfalfa and wheat. The critical potassium soil test does not differ by crop but by soil cation exchange capacity (CEC). For soil with a CEC greater than 5, it is 120 ppm, and when less than 5, it is 100 ppm. All these soil test values are for the Mehlich 3 soil test.

Manure Testing
When comparing \( P_2O_5 \) and \( K_2O \) availability in manure to commercial fertilizer, there are two things to know. First, the pounds of available P and K nutrient shown on the manure test is equivalent to commercial fertilizer. Therefore, those manure nutrients are a one-to-one replacement for commercial fertilizer. Second, manure is not a good substitute when starter fertilizer is needed.

Apply Recommended Rates
Applying the correct amount of fertilizer will optimize crop yield and minimize environmental concerns. Reference the tables from the Tri-State Fertilizer Recommendations for Corn, Soybeans, Wheat, and Alfalfa bulletin from OSU Extension. A pdf copy of this bulletin can be accessed here: https://go.osu.edu/tristatefertilizerrecommendationpublication

NITROGEN FERTILIZER PRICES...are above expected levels, as discussed in this University of Illinois Farmdoc newsletter: https://farmdocdaily.illinois.edu/2021/12/nitrogen-fertilizer-prices-above-expected-levels.html. Nitrogen fertilizer prices are positively related to corn and natural gas prices. Because of current high corn and natural gas prices, one would expect nitrogen prices also to be high. However, in recent months, anhydrous ammonia prices have exceeded levels one would expect, even given higher corn and natural gas prices. Supply disruptions caused by Hurricane Ida may help explain recent high prices, but other factors could also be in play. In any case, high nitrogen fertilizer prices are likely into the spring, which suggests that large reductions in nitrogen rates need to occur.

Nitrogen Prices Continue to Increase
Since summer, nitrogen prices have risen dramatically, reaching record-high levels (see Figure 1). According to the most recent data from the Agricultural Marketing Service, nitrogen prices have continued to rise into December. On December 3rd, the average price in Illinois for anhydrous ammonia was $1,434 per ton, up by $91 per ton from the price two weeks prior. Since last December, anhydrous ammonia prices have increased $960 per ton, more than doubling in price.
Factors Explaining Nitrogen Prices
Nitrogen fertilizer prices have historically been related to two fundamental factors: corn prices and natural gas prices. Corn Prices: Over time, rising corn prices coincide with rising anhydrous ammonia prices and vice versa. For example, monthly anhydrous ammonia prices in Illinois have a .72 correlation with national average corn prices reported by the National Agricultural Statistics Service (NASS).

Two reasons have been advanced for this correlation. The first is that rising corn prices can signal more corn acres and more nitrogen fertilizer use. Higher demand for nitrogen fertilizer leads to higher nitrogen prices. A second reason is that higher corn prices mean more income for farmers and a higher ability to pay. As a result, fertilizer manufacturers charge higher prices when corn prices are high. Either reason explains a positive relationship between ammonia and corn prices.

Natural gas prices: Natural gas is a significant input into producing anhydrous ammonia. As a result, higher natural gas prices are expected to lead to higher anhydrous ammonia prices. From 2008 to 2020, there is a .46 correlation coefficient between ammonia prices and natural gas prices at the Henry Hub.

Explanatory Power of Corn and Natural Gas Prices
Until October 2021, the Illinois price of anhydrous ammonia was explained very well by corn and natural gas prices. To illustrate, a statistical regression model that explains Illinois’ anhydrous ammonia price was fit. This model uses monthly price observations from 2008 to November 2021. The price variables in the model are:

Corn price. The national average corn price reported by the NASS was used (see Figure 1). Corn prices were statistically significant. The model indicates that higher corn prices increase ammonia prices and vice versa.

Natural gas price. The monthly natural gas price at Henry Hub was used (see Figure 1). These gas prices are reported by the Energy Information Agency, an agency of the U.S. Department of Energy. The model indicates that higher natural gas prices increase ammonia prices and vice versa.

Lagged anhydrous ammonia prices. As with most economic relationships, there are lagged relationships. Lagged ammonia prices capture this time dimension. Inclusion or exclusion of lagged ammonia prices does not change the statistical significance or signs of the coefficients associated with corn and natural gas prices.
For most of the period, the model has an excellent fit, meaning the predicted values closely match the actual values (see Figure 2). The model explains 95% of the variability in anhydrous ammonia prices. The actual values and the model predictions for anhydrous ammonia prices are within $50/ton of each other most of the time.

However, the closeness of the fit breaks down in October and November 2021 (see Figure 3). In October 2021, the model predicted a price of $795 per acre while the actual price was $996 per ton. In this month, the model’s prediction differed from the actual value — also known as the residual — by $201 per ton ($996 actual value – $795 predicted value). In addition, there was another large under-prediction (i.e., residual) of $141 per ton in November 2021.

Commentary
Then, a central question is: What happened this fall that caused ammonia prices to deviate from their typical relationships with corn and natural gas prices? Supply disruptions caused by Hurricane Ida shuttering ammonia plants could have led to short supplies leading to higher prices. While a reasonable explanation, other factors could have led to higher ammonia prices.
If corn and gas prices remain at their current levels, the fitted model predicts an anhydrous ammonia price near $1,000 per ton in April 2022, a decline from present levels but still very high. However, we note that the predictive power of this model has declined in recent months, such that confidence in predictions from the model have diminished. In any case, it seems reasonable to expect very high nitrogen fertilizer prices in spring.

Given high prices, strategies to reduce nitrogen use should be undertaken, with reductions in nitrogen rates to Maximum Return to Nitrogen (MRTN) levels seem prudent. More detail on strategies is covered in the November 30th farmdoc Daily.

EMERGENCY PREPAREDNESS THROUGH A FARM WALK-THROUGH...is something all farms should consider. Jason Hartschuh, OSU Extension Educator, discusses the topic in this OSU Extension Buckeye Dairy News article: https://dairy.osu.edu/newsletter/buckeye-dairy-news/volume-23-issue-6/emergency-preparedness-through-farm-walk-through.

When something goes wrong on your farm and emergency service personnel respond either for a fire or farm accident and everything is moving fast, trying to remember every detail responders need to know can be a challenge. Emergency response personnel are required to have continuing education training in order to stay certified. One part of this training can be doing site visits. Unlike urban departments who often must inspect buildings on a regular basis, rural fire departments often never get to visit farms until there is an emergency. Even in rural fire departments, many of the responders are not directly connected to farms, and even if they are, many do not know the hidden hazards around your farm. The best way to bridge the gap between your farm and emergency responders is to invite them to walk around your farm, identify hazards, and help you create an emergency plan.

The emergency action plan can include the farm walk around, plus an equipment close-up review, especially of machinery that may not be utilized on many farms in your area. It will also be worth your time to do a short course on animal handling. You may want to have disposable plastic boots available for biosecurity and so that visitors can walk around in your barn.

Fire
Fires in livestock facilities can cause many challenges. The first two things that should be discussed is how to handle livestock during the fire, where to move them to, and how to shut the power and backup generators off. Livestock are often scared during a fire, and even once chased out of the barn, they may run back in unless they are secured in another location, not only endangering them but also the responders. One of the first safety steps fireman take during a fire is to shut the power off, making it safe to use water on the fire and not risk electrocution. Shutting the power off also stops fans that may still be running and fueling the fire. If you have any type of fuel going to the building, such as propane or natural gas, it is important to show responders where to turn the gas off.

Chemical storage, especially flammables, need pointed out to responders. Even non-flammables can release toxic gases that will endanger responders. While outside the barn, be sure to point out any buried tanks that may be hazardous if firefighters happen to drive over them or attempt to use that area as a means of entry. A tour within the buildings can be very important, especially when we have put additions onto your barns to expand the facility. Pointing out to responders the areas where buildings are tied together or areas where the buildings have leveraged headers can keep everyone safe in the future.

During the tour, it is important to discuss if hay is still stored in the haymows and if specialized equipment like an aerial fire truck may be needed to reach over the barn to a fire in the middle. As part of the fire tour, be sure to discuss the nearest source where water can be pumped from and if there are any water storage tanks on the farm.
Rescue/Medical Responses

Emergency medical rescues are another area to have an action plan for with your local fire department. Do you have confined spaces on the farm, such as manure storage, upright silo, bulk milk tanks, or bulk fertilizer tanks? These are all areas that can be a hazardous on the farm and can be a risk to you and responders. One of the risks with confined spaces is dangerous gasses. While on the tour, have a discussion with first responders about gas detection equipment that they have available if they need to enter a confined space. Hydrogen sulfide, methane, carbon monoxide, and ammonia are gases of concern. Pit gases from any storage pit, whether closed, open, or under barn storage, can be toxic to both humans and livestock. H₂S gas concentration levels of 2 to 20 ppm will cause symptoms of nausea, headache, and dizziness. H₂S levels greater than 100 ppm will cause altered breathing, collapse, and death.

While all animals can turn dangerous on the farm, be sure to tell responders if you keep a bull on the farm. Let them know where he is housed and if any restraint devices are available to restrain him. Another consideration is pinching/crushing hazards on the farm, e.g., these are often air or hydraulic operated gates in milking parlors. Be sure to show responders the emergency shut offs and how to operate all gates. Other hazards are medications and chemicals stored on the farm. Show responders where material safety data sheets are kept and the different storage locations so that accidental poisonings or needle sticks can be responded to quickly. Lastly, be sure to discuss your farm location naming so that if responders are called, they know where to find the victim, such as the old pole barn, dry cow barn, and east addition.

By inviting your local fire department to your farm for a tour and emergency preparedness, planning can make a bad day on your farm a little less stressful.

A TORNADO IN WESTERN KENTUCKY...destroyed the University of Kentucky Princeton Research and Extension Center. A video of the damage is available at this link: https://u.osu.edu/beef/2021/12/15/kentucky-rising-above-tornado-aftermath/#more-11926. The video below shows the remains of the University of Kentucky research center at Princeton that was destroyed by the tornadoes. This research station has a heavy focus on crop, forage, and beef production.

Many have asked how they can help. The Kentucky Cattlemen’s Association office has been in touch with local, state and national contacts to determine what needs there are and how to assist. Presently they are accepting donations for Tornado Relief through their Kentucky Cattlemen’s Foundation. All donations will be used to help local producers in need of farm supplies. These donations can be made by calling 859-278-0899, through Paypal at https://www.paypal.com/donate/... or by mail at:

KY Cattlemen’s Foundation
Attn: Tornado Relief
176 Pasadena Drive
Suite 4
Lexington, KY 40503

For those interested in donating to restore the UK research station at Princeton, their immediate needs include fencing supplies and solar chargers (they will likely be without electricity for quite some time). You’re invited to contact UK Assistant Extension Professor of Beef Cattle Nutrition Katie VanValin, at 270-792-4231, Princeton herd manager Blair Knight at 270-350-5460, or the Hardin County Extension office at 270-765-4121 for an update on supply needs and how best to get them there.

(Source: OSU Extension Beef newsletter: https://u.osu.edu/beef/2021/12/15/kentucky-rising-above-tornado-aftermath/#more-11926)
SOIL HEALTH...webinar series will be sponsored by OSU Extension in early 2022. Farmers, industry, and academic experts will weigh in on practical steps to improve soil health and measure impact on crop yield and farm profitability. Programs include:

- **January 6**th, 8:00-9:00am – *What’s Your Soil Health Resolution?* (Farmer Panel)
- **February 3**nd, 8:00-9:00am – *What does the Research Tell Us about Cover Crops & Soil Health?*
- **March 3**nd, 8:00-9:00am – *What’s the Future of Soil Health?*

There is no cost to attend these programs, but registration is required. Register at [www.go.osu.edu/soilhealth2022](http://www.go.osu.edu/soilhealth2022). 1-hour CCA CEU in Nutrient Management will be offered at each session. CCA CEUs are only available to participants attending live sessions (we cannot give CCA credit for watching the recordings).

All programs will be recorded, and recordings will be available to view on our [YouTube channel](https://www.youtube.com). Last year’s Soil Health Webinar sessions can be viewed online [here](https://www.youtube.com).

FARM BUSINESS SUMMARIES FOR 2020...from OSU Extension for crop and dairy enterprises are available here: [https://farmprofitability.osu.edu/business-summaries](https://farmprofitability.osu.edu/business-summaries). If you are interested in participating in the Ohio Farm Business Analysis and Benchmarking Program, input forms are available here: [https://farmprofitability.osu.edu/input-forms](https://farmprofitability.osu.edu/input-forms).

PLANNING FOR THE FUTURE OF YOUR FARM...workshops sponsored by OSU Extension will be held in 2022. Join OSU’s farm management educator David Marrison and legal educators Peggy Kirk Hall and Robert Moore for three in-person workshops and an online workshop in 2022. [Dates and locations for the day-long workshops are](https://www.osu.edu):

- Greene County--February 10, 2022
- Wayne County--February 25, 2022
- Wood County--March 4, 2022

The online Zoom webinar will be two hours each night on January 31 and February 7, 21 and 28.

Please contact me for additional information.
DAIRY OUTLOOK FOR 2022... was released by USDA on December 15, 2021, as part of their monthly Livestock, Dairy, and Poultry Outlook. The most recent report is available here: https://www.ers.usda.gov/webdocs/outlooks/102870/ldp-m-330.pdf?v=4191.4. A brief summary of dairy pricing is provided below.

Dairy Forecasts for 2022
The number of dairy cows is expected to continue declining in 2022-Q1 and Q2. Accordingly, the annual 2022 forecast has been lowered to 9.385 million head, 10,000 head below the last month’s forecast and 65,000 less than the forecast for 2021. The 2022 forecast for milk per cow is 24,265 pounds, 15 pounds lower than last month’s forecast. The projection for 2022 milk production has been lowered to 227.7 billion pounds, 0.4 billion pounds below last month’s forecast but 1.5 billion pounds above 2021.

Considering the lower projected milk supply, dairy product price forecasts for 2022 have been raised from last month’s projections. Wholesale price forecasts for Cheddar cheese, butter, NDM, and dry whey are $1.775 (+1.0 cent), $1.940 (+3.0 cents), $1.510 (+2.5 cents), and $0.575 (+4.5 cents) per pound, respectively.

With higher projected wholesale prices for cheese and dry whey, the Class III milk price forecast for 2022 is $18.15 per cwt, $0.40 higher than last month’s forecast. Due to higher butter and NDM price forecasts, the Class IV milk price projection for 2022 is $19.00 per cwt, $0.30 above last month’s forecast. The all-milk price forecast for 2022 is $20.75 per cwt, an increase of $0.50 from last month’s projection.

BQA TRAINING... for beef and dairy producers will be held at Sugarcreek Stockyards on the following dates and times:

- January 20 at 1pm
- February 28 at 7pm
- March 30 at 7pm

Please call 330-339-2337 to RSVP.

CERTIFIED CROP ADVISOR (CEUs)... are available free of charge. These corn and soybean seeding rate 30-minute modules can be completed at your own pace. Topics include:

- Module 1- Collecting Quality Soil Samples for Variable Rate Decisions. Compare whole field, zone, and grid soil sampling and learn how to use Google tools to create grid soil sampling maps. (0.5 NM CEU)
- Module 2- Soybean Seeding Rate. What’s the optimum soybean seeding rate for various planting dates? (0.5 CM CEU)
- Module 3- Replant Decisions for Soybean and Management of Late-Planted Soybean. Learn how to adjust your management when you need to replant or plant late. Learn how we do soybean stand counts. (0.5 CM CEU)
- Module 4- Corn Seeding Rate. Recommended corn seeding rates for Ohio and how other management decisions can impact seeding rate. (0.5 CM CEU)
These self-study modules also can be used to earn CCA CEU credit in 0.5 hr increments with up to 1.5 hr in Crop Management and 0.5 hr in Nutrient Management. Register for this training course here: https://cfaesosu.catalog.instructure.com/courses/seeding-rate-decisions-for-soybean-and-corn-91w-e4-mz

These modules were made possible through funding support from the Critical Agricultural Research and Extension (CARE) program from USDA-NIFA (Award number 2018-68008-28356).

CROP ENTERPRISE BUDGETS...developed by OSU Extension are available here: https://farmoffice.osu.edu/farm-management/enterprise-budgets#2022. The 2022 corn and soybean crop will likely be the most expensive ever planted. The projected total costs vary based on yield and are presented below:

- Corn $904 to $1,135 per acre or $6.17 to $5.15 per bushel
- Soybean $578 to $721 per acre or $12.74 to $10.30 per bushel
- Corn Silage $852 to $1,054 per acre or $44 to $40 per ton

Anticipated shortages of fertilizers, seed, chemicals, and parts only add to the difficult decisions when planning for next year. I encourage you to consult these budgets as you develop your cropping plan for 2022.

PRECISION UNIVERSITY 2022...was going to offer an in-person program, however, due to stress in the supply chain and other unforeseen circumstances, we are not able to present the January 19 in-person portion of Precision University to the caliber that our clientele would expect. Therefore, we have cancelled that day and hope to resume our in-person event in 2023. Webinars will continue on January 5 and 12 as scheduled.

The January 5 webinar will focus on adapting to supply chain shortages. A panel of industry representatives will share what they are seeing and how to work around what you might not have. Topics: Technology Management for 2022; Equipment and Part Shortages; Outlook Having a Plan B. Speakers: Dr. John Fulton (OSU), Jenna Elleman (AgPro), Doug Wical (Sunrise), Sarah Waltner (Raven)

The January 12 webinar will turn your attention to sulfur. Some have seen responses to sulfur application while others have not. Dr. Shaun Casteel, Purdue University, and Dr. Steve Culman, The Ohio State University, will share results from their on-farm sulfur research. Dr. John Fulton, The Ohio State University, will also discuss recent research on sulfur and share tips for conducting your own on-farm research to determine if sulfur is a limiting factor on your farm.

The webinars are set for 9-10am and are free to attend. You can register at http://go.osu.edu/PrecisionU.
HIGH FERTILIZER PRICES...impacts all crops, including pastures. Management strategies are provided in this OSU Extension Beef newsletter: https://u.osu.edu/beef/2021/12/22/tips-for-weathering-high-fertilizer-prices/.

In the last year, the cost of fertilizer had increased more than 125%, 85%, and 115%, for urea (nitrogen), diammonium phosphate (phosphorus), and muriate of potash (potassium), respectively (Figure 1). The price of nitrogen could continue to increase due to the idling of N manufacturing capacity caused by weather issues and increased natural gas and shipping costs. Nitrogen prices could conceivably reach $1.00/lb N early next year. So, the question becomes what management strategies ruminant livestock producers could use to manage soil fertility as fertilizer markets continue to experience volatility.

Figure 1. Fertilizer price trends for nitrogen (urea), phosphorus (DAP) and potassium (muriate of potash). In the last 12 months fertilizer prices have increased more than 50% (Data from Russ Quinn at DTN).

We wish we had a miracle cure for high fertilizer prices, but we don’t. And we would caution you to closely scrutinize claims from retailers of products that are offering you something that sounds too good to be true. One competitive advantage that well managed grazing systems have is that nutrient removal is very low and with good grazing management strong nutrient cycles can be developed (Figure 2).
Below you will find some strategies that can be implemented to help you get through the current period of high fertilizer prices.

**Soil test pastures and hay fields.** You are probably saying to yourself why in the world would I even bother soil testing when fertilizer prices are so high. It is impossible to manage something without data. A soil test allows you to target fertilizer applications to fields that have the potential to respond. If the P or K soil test level for a given nutrient is in the low range, then the probability of a yield response is high (Table 1). If the P or K soil test level is in the medium or high range, the probability of a yield response diminishes. So, our best advice at this time is that if your soil test value is a SOLID MEDIUM, do NOT apply that P or K fertilizer until prices moderate.

Table 1. Probability of forage yield response for soil test levels ranging from very low to very high (Edwin Ritchey and John Grove, personal communication, April 19, 2021).

<table>
<thead>
<tr>
<th>UKY Soil Test Level</th>
<th>Probability of Yield Response†</th>
</tr>
</thead>
<tbody>
<tr>
<td>Very High</td>
<td>0%</td>
</tr>
<tr>
<td>High</td>
<td>&lt;25%</td>
</tr>
<tr>
<td>Medium +</td>
<td>25 to 50%</td>
</tr>
<tr>
<td>Medium</td>
<td>50%</td>
</tr>
<tr>
<td>Medium -</td>
<td>50 to 70%</td>
</tr>
<tr>
<td>Low</td>
<td>70-90%</td>
</tr>
<tr>
<td>Very Low</td>
<td>&gt;90%</td>
</tr>
</tbody>
</table>

†These are estimates and will vary with soil type and environmental conditions.
Monitor soil test levels in hayfields closely. Since hay removes much higher quantities of nutrients than grazing, it is important to closely track nutrient levels and apply P or K fertilizer when soil test values drop below the MEDIUM range. This will prevent nutrient mining and yield decline.

Apply lime according to soil test. Soil acidity or alkalinity can have a profound impact on soil nutrient availability to forage plants (Figure 3). Maintaining soil pH between 6.0 and 7.0 results in the greatest availability of macro- and secondary-nutrients such as nitrogen, phosphorus, potassium, magnesium, and sulfur. In contrast to fertilizer prices, lime costs have remained about the same. If your soil test indicates that you need lime, it will likely be the best buy you can make at the current time.

Capitalize on nutrients in hay. Every ton of hay contains approximately 50 lb N, 15 lb P2O5, and 50 lb K2O. The current value of the nutrients in one ton of hay is approximately $50. How we manage hay feeding will determine the actual value of these nutrients. If we feed hay in one paddock near the barn, then the value of these nutrients will be low because they will be concentrated in one small area. In contrast, if we move feeding points and feed the hay on pastures with lower soil test values, then the value of the nutrients in hay will be higher.

Implement rotational stocking. This doesn’t sound like much of a nutrient management strategy, does it? In large continuously stocked pastures, animals will consume nutrients in the form of forage and concentrate them around shade and water sources in the form of dung and urine. One way to improve nutrient distribution in pastures is to subdivide and implement rotational grazing. Confining livestock to smaller areas for short periods of time significantly improves dung and urine distribution.

Replace commercial nitrogen by overseeding clover into pastures. Legumes fix nitrogen from the air to a plant available form via symbiotic nitrogen fixation, improve forage quality and animal performance, and dilute the toxic effects of the endophyte found in tall fescue. Red and white clover are estimated to fix between 50 and 120 lb N per acre per year.
This fixed nitrogen is indirectly shared with legumes through grazing and the associated deposition of dung and urine, through death and decomposition of above and below ground plant parts, and the senescence of root nodules.

**Frost seed clover in February.** The simplest and most cost-effective way to introduce clover into pastures is by broadcasting 6-8 lb of red clover/A and 1-2 lb of ladino clover/A onto closely grazed pastures in February and allowing the freezing and thawing cycles to incorporate the seed. Allow animals to remain on these pastures until the new clover seedlings have become tall enough to be grazed off. At this point, remove animals and allow the seedling to reach a height of 8-10". At this point, these pastures can be incorporated back into the rotation.

**Determining nitrogen fertilizer needs.** There are no good soil tests for N, so use university rate recommendations. Most rate recommendations are a ‘range’, so consider an application rate at the lower end of the range when fertilizer N prices are high. Consider your personal experience with N response in your pastures and hayfields. Well managed pastures that have a strong legume component and are rotational stocked can have strong nitrogen cycle. This will tend to make them less responsive to nitrogen fertilizer. Remember, more N drives more grass growth, BUT it is only a good investment if the additional forage will be utilized!

**Take Home Points**

Although there is no “silver bullet” for high fertilizer prices, some key management strategies will help you weather these high prices in the short-term and develop grazing systems that are less dependent on commercial fertilizer inputs in the long-term.

1. Soil test pastures to provide baseline data for short- and long-term fertilizer management.
2. Do NOT apply P and K fertilizer to pastures testing MEDIUM until fertilizer prices moderate.
3. Apply needed lime to pastures according to soil test to make nutrients in the soil more available to forage plants.
4. Closely monitor soil test levels in hayfields to prevent nutrient mining and yield decline.
5. Feed hay on pastures with low soil test values.
6. Move hay feeding points around the pasture to improve nutrient distribution.
7. Implement rotational stocking to improve dung and urine distribution in pastures.
8. Frost seed clover into pastures to improve forage quality, help with tall fescue toxicosis, and fix atmospheric nitrogen into a plant available form.
9. Apply fertilizer nitrogen at the lower end of the recommended rate range, knowing that you will use resulting grass growth.