Grazing Cover Crops

by Sjoerd Willem Duiker, Professor of Soil Management and Applied Soil Physics, Penn State Extension

Grazing cover crops is receiving new attention. Here are some reasons to take a hard look at it.

Grazing is a very cost-effective way of feeding animals—the cost per ton of dry matter fed is half or less of that of feeding harvested forages.

The threat of soil compaction is reduced in long-term no-till due to increased surface organic matter content that makes soil resist compaction, a firm matrix reducing 'pugging' (hoofs sinking into the soil), high biological activity, and the actively growing roots of the cover crop.

Nutrient management can be improved because urine from grazing animals soaks into soil quickly, reducing the likelihood of large ammonia volatilization losses.

Soil health may benefit from grazing animals. For example, soil biological activity will be high under the manure pies. Look for dung beetles and earthworms under the pies!

Grazing adds value to cover crops, making it more attractive to farmers to plant them on time, use higher seeding rates, and thus increase cover crop biomass production from roots and tops.

Some farmers in Pennsylvania are exploring grazing of cover crops and have installed permanent exterior fencing around some of their crop fields, obtained mobile electric fencing, and installed watering systems with assistance from USDA-NRCS and the Capital Region RC&D Council, with funding from the National Fish and Wildlife Foundation.

Penn State is helping document the effects of grazing on soil health and the bottom line. These farmers have developed a grazing plan and are learning how to manage grazing animals. All participating farmers plan to use Management Intensive Grazing (MIG) practices. Some plan to graze their cover crops several times in the spring before planting a summer crop such as a cover crop mixture, sorghum-sudangrass, or pearl millet, while others plan to graze their cover crop only one time and then plant corn.

The farmers are using triticale, wheat, or annual ryegrass/crimson clover mix. Rye would be another possible choice, although harder to manage because it goes to head so quickly. Interestingly, one farmer grazed his wheat that is planned for grain harvest this summer. He grazed this wheat field once in the fall and once in the spring—a new practice for Pennsylvania!

It is important to plan ahead—if your field is big and you have few animals, you will not be able to get across the field before the forage at the other end of the field becomes undesirably mature—and with reduced feed quality comes reduced animal growth. For best animal growth, graze cereal cover crops before they go to head.

Further, the participating farmers are learning to have fields available for grazing at different times of the year (combining permanent pastures with cover crop fields) so they can maximize the number of grazing days.

If you only graze cover crops planted after corn and soybeans you will have a very short growing season in the spring! Therefore, several of our farmers grow small grains for grain harvest and follow them with warm-season cover crops for grazing in late summer or mixtures with cool-season species for grazing in the following year as well.

Nonetheless, it is wise to have a back-up area where you can feed hay in case the soil is too wet or when you run out of grazing forage. The spring is a time when soil moisture content is often high, and soil compaction needs to be managed to avoid negative effects on the following crop. One way is to consider the soil type of the field you plan for spring grazing—a soil that dries out quickly would be the best choice.

Also, the farmers are learning the importance of MIG—the cattle are moved every day, getting sufficient forage but limiting the exposure time of soil to hoof traffic.

The animals tend to congregate around the water source, and it is important that you use a mobile water system that is moved every day as well. Providing shade is not recommended because that is another area where animals tend to congregate.

If you plan to re-graze a cover crop, leave at least six inches of stubble for regrowth. This is less critical if you do not plan to re-graze. However, leaving stubble is also important to protect and feed the soil, so it is still a good practice.

One final issue that needs attention if you plan to graze is your herbicide program. Be sure you are not violating the herbicide label. Herbicide labels include rotational restrictions to protect humans and animals from herbicide residues which the following crop may accumulate, besides making sure the following crop is not damaged through herbicide carryover. More information can be found at 'Herbicide rotation restrictions in forage and cover cropping systems' from the University of Wisconsin, and 'Herbicide use may restrict grazing options for cover crops' from Iowa State University.

Proper Storage Saves Forage

by Amanda Grev, Ph.D., University of Maryland Extension

Most of us are aware that forage losses can accumulate in a hurry, particularly for hay. Adding up potential losses incurred during harvest, storage, and feeding, as much as 60% of forage dry matter can be lost between the field and the cow's mouth.

Whether you purchase hay or make it yourself, that hay is an investment, so why not do your best to preserve that investment?

A huge amount of money is lost each year on dry matter and forage quality losses that occur while hay is stored.

Consider the fact that the outer six inches of a round bale account for about one-third of the bale's total dry matter—this means a few inches of deterioration can add up to a lot of loss!

Many of us probably do not realize how large our losses really are, but round bales can lose anywhere from 5 to 40% dry matter in as little as six months depending on the climate and the degree of protection from the weather.

Hay dry matter losses have a simple explanation—moisture. At some point, water entered the bale and was not able to leave through evaporation, resulting in spoilage.

The deeper that water penetrates the bale and the longer that water stays in the bale, the greater the expected losses.

Fortunately, there are several management practices that have been proven to be effective at reducing hay losses during storage.

Indoor Storage

While this option is not always feasible, indoor storage remains the best way to keep hay losses to a minimum.

Although bales stored indoors can still be subject to some loss, those losses will generally be minimal and bales will conserve their value very well.

The images (Figures 1-5) come from a study conducted at South Dakota State University evaluating the impact of different hay storage options on bale moisture content.

For each image, areas shaded in blue represent regions of higher moisture, where spoilage will be likely, while a yellow or red color represents areas with less moisture where spoilage is not likely to occur.

Figure 1 is depicting moisture distribution for a hay bale stored indoors—in this case in an open front hay shed. Although the bottom of the bale wicked some moisture up from the dirt floor, the vast majority of the bale contained less than 20% moisture.

Although it has been documented that indoor storage of round bales typically results in the best economic return, the reality is indoor storage is not always feasible and many round bales will continue to be stored outside.

Fortunately, there are still things we can do to limit forage losses when round bales are stored outdoors.

Outdoor Storage

When storing bales outdoors, the overarching goal is to limit places where moisture will collect and maximize air movement and sunlight so bales are able to dry out more easily after precipitation.

Bales stored outside will readily wick up moisture from the ground, so storing them in a well-drained area or even up off the ground (if possible) is ideal.

When storing bales outdoors in rows, the common recommendation is to leave several feet of space between rows to allow for more airflow and keep the bottom quarter of the bales drier.

If this space is not left between the rows and instead the bales are butted up side-to-side, water runs down into the crevice formed by the touching bales and results in a very high moisture levels and an increased chance for spoilage where the bales touch (Figure 2).

It is fairly common practice to store hay as a row of bales butted tightly together end-to-end. However, no matter how tightly those bales are pushed together, it is still possible for water to drain and collect between the vertical faces of the bales. Consequently, it is more difficult for these bales to dry and researchers found that about 66% of the bale was above 22% moisture when hay was stored end-to-end (Figure 3).

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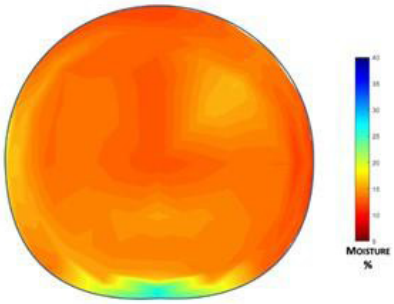

Figure 1. Moisture distribution of an alfalfa round bale stored under roof in open front hay shed. Note the wicking of moisture in the bottom portion of the bale. Source: Bauder et al., 2020.

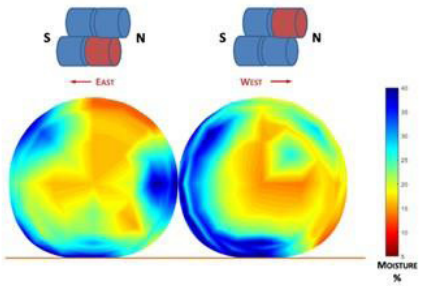

Figure 2. Moisture distribution of alfalfa round bales stored outdoors in a row running north to south with bales butted tightly together and no space between the rows. Note how water ran into the "gutter" formed by the touching bales, resulting in very high moisture where the bales touched. Source: Bauder et al., 2020.

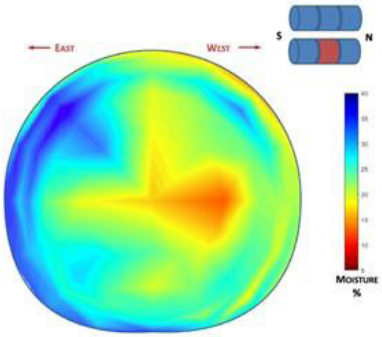

Figure 3. Moisture distribution of an alfalfa round bale stored outdoors in a row running north to south with bales butted tightly together; approximately 3 feet was left between parallel rows. Note how limited air movement and sunlight on the bales in the middle of the row affect the moisture content. Source: Bauder et al., 2020.

When bales were left outside with no contact (a gap was left both between the bales in a row and between the rows), air movement was not restricted by any neighboring bales and only about 15% of the bale was above 22% moisture (Figure 4).

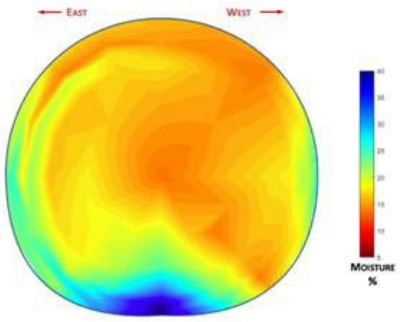

Figure 4. Moisture distribution of an alfalfa round bale stored outdoors with no other bales around it. Note the lower moisture observed on the west-facing side of the bale and the slight moisture wicking from the soil. Source: Bauder et al., 2020.

This suggests that spoilage can be limited when the bales are not in contact with each other and indicates there might be some value in leaving a space between bales in a row.

It is also fairly common practice to stack bales to reduce the amount of space needed for storage. However, unless the stacked bales are covered, water that is shed from the upper bales will flow down to the bales below and can collect in all of the crevices formed by the touching bales.

Since the bales on the bottom of the stack have limited air movement and exposure to the sun, the water cannot be readily evaporated, leading to increased moisture levels and an increased chance for spoilage (Figure 5).

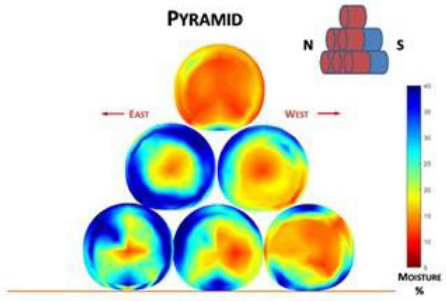

Figure 5. Moisture distribution of alfalfa round bales stored outdoors stacked in a pyramid shape. Note that water shed from the upper bales flows down to the bales below and limited air movement and sun exposure make it difficult for this water to be removed by evaporation. Source: Bauder et al., 2020.

Bales on the bottom of the stack can also lose some of their integrity and start to squat, which means additional contact with the ground, increased moisture accumulation, and greater spoilage potential.

In addition to the considerations mentioned above, other strategies you can use to limit forage losses include:

Utilize net wrap: Net wrap is far more effective than twine and will reduce losses by shedding water better. Research has shown that dry matter losses for net-wrapped bales will be reduced by about one-third compared to twine-wrapped bales.

Make dense bales: Loose bale lets water and air in, while a denser bale will shed water better. A dense bale will also sag less, so there is reduced bale-to-ground contact, which is important since much of the storage loss occurs on the bottom of the bale.

Keep bales off the ground: Having something like a rock base under round bales is ideal to promote drainage, but if that is not practical then select an area that is well-drained and/or use something like wooden pallets or used tires to keep bales up off the ground.

Keep bales out of the shade: Place bales where they are not shaded by buildings or trees to maximize sun exposure and drying.

Leave space between rows: Leave at least three feet of space between bale rows to enhance air movement and allow the lower quarter of the bale to dry.

Stack only if covered: Unless you are fully covering the bales, don't stack bales in a pyramid or other formation where the sides of bales will be touching, as this allows water to collect in the crevices between bales.

What to Do When Forages are Deficient In Protein

by Matt Booher, Virginia Cooperative Extension

I have seen more than a dozen forage quality analyses thus far from 2023 hay and stockpiled pasture in Virginia's Shenandoah Valley that are unusually low in crude protein.

Most of them generally matched the expected energy value for the forage (55-60% TDN first cutting hay; 60-70% TDN fall-stockpiled fescue), but they were several percentage points lower than normal in crude protein (6.5-8% CP first cutting hay, 8-10% CP fall-stockpiled fescue).

Crude protein (CP) is a measure of both protein-nitrogen and non-protein nitrogen (nitrate and ammonium) in the plant. Rumen microbes utilize both sources for their own growth and replication, which ultimately becomes the microbial protein that livestock digest.

The lower CP values we've been seeing are likely the result of the 2023 drought, which may have caused less nitrogen mineralization in the soil as well as less nitrogen uptake by grass plants. It is also possible that less nitrogen fertilizer was applied this year.

Cool-season grass forage in Virginia is much more commonly deficient in energy rather than protein, so this is a little out of the ordinary for us. So, it is especially important to test your hay this winter and provide the precise supplementation that is needed.

Microbial growth and reproduction provides most of the energy, protein, and vitamins that the ruminant animal needs.

When the diet is deficient in protein, microbial growth and reproduction is reduced, which results in reduced forage utilization. If deficiencies persist, growth of young animals will be compromised; winter or spring-calving cows that do not maintain a body condition score of 5 to 6 going into calving may have reduced colostrum production and fail to cycle back on time.

See the next page for options for providing supplemental protein.

Protein blocks or tubs (sometimes called roughage converter blocks) are a poured molasses block around 24% protein.

Individual consumption can range from 1 to 4 lbs./day, probably averaging around 2 lbs./day.

These are a convenient option, and an especially good fit for late gestation cows because of their relatively low protein needs.

A couple notes/precautions: Because it is essentially a lick block, this may not provide enough protein per day, depending on the class of livestock you are feeding and the deficiency of your hay.

This being said, if protein blocks are the best option for you, it is definitely better than nothing.

Be aware also that protein tubs are often the most expensive protein source, currently around $1.50/pound of protein.

Byproducts such as wheat midd pellets, commodity pellets, and dried corn distillers grains are readily available and are the cheapest source of protein for most people.

Currently they are around $1/pound of protein from these sources.

Their great downside comes in the inconvenience of feeding them. Feeding on the ground results in trampling and waste as high as 30%, but feeding large numbers of animals with troughs is often impractical. A few tips to remember if you go this route are:

Pour feed on top of hay that has been unrolled. This works even better if you can run a line of temporary electric wire over top of the unrolled hay to minimize trampling.

Feed double the amount, every other day. For example, if you need to feed 2.5 lbs. of pellets per head per day, you would simply feed 5 lbs. every other day. Numerous nutritional studies have shown that “phase feeding” protein in this way is just as effective as daily supplementation.

When priced on an energy or protein basis, byproducts are often similar to grains, so why might someone choose to feed them? Here

are a few facts that should be relevant to most forage-based farms.

Grains like corn are a starch-based energy source, while byproducts are a fiber-based energy source (the starch has been removed).

Feeding starchy grains can depress animals’ intake and digestion of hay and pasture if supplemented at a level higher than about 1/2% of bodyweight (for example, feeding more than about 5 lbs. of corn to a 1,000-lb steer).

Conversely, fiber-based energy sources favor the rumen microbes that most efficiently digest hay and pasture.

Research indicates that fiber-based byproducts give 15-30% better performance per unit of supplemental energy than do starch based sources. When comparing the cost of energy between fiber-based and starch-based energy sources, this suggests that you can justify paying 15-30% more per unit of energy for a byproduct.

When supplementing protein to ruminants on low-protein forages, performance tends to be better with natural protein sources (like distillers grains) than with non-protein sources (like most protein tubs).

There are a few precautions with feeding byproduct feeds.

Like grains, byproducts tend to be high in phosphorus and low in calcium, and some (like distillers grains) can be high in sulfur. Mineral content can be variable, so it is worth keeping an eye on. This is one reason why it is generally recommended that byproduct feeds be limited to no more than 30% of an animal’s daily dry matter consumption, and this is probably a good rule-of-thumb for grazing operations.

In operations where the feed ration can be more tightly controlled, higher rates of byproducts are often fed.

Byproduct feeds sometimes do not store as well as grains during hot, humid weather.

Lastly, even though their starch content is very low, the finely processed starch that remains and the small particle size of many byproducts would indicate that feed changes should be made gradually, just as with any other feedstuff.

Byproduct feeds are an economical fit for many forage-based farms needing to supplement hay to prevent nutritional deficiencies this winter.

In the case of the many farms in drought stricken areas who are short on hay supplies going into winter, byproducts can help to stretch hay supplies without compromising intake or digestibility of the forage.

Can Virtual Fences Help More Ranchers Adopt Regenerative Grazing Practice?

by Lisa Held, reprinted from CivilEats.com

At Georges Mill Farm in northern Virginia, Molly and Sam Kroiz's goats are on the move. Some roam through pastures testing bunches of fescue, a cool-season grass, for the sweetness the frost brings. Others push into a strip of bushes, munching through brambles. One scales a boulder and balances on its hind legs to take bites out of a tree branch.

This herd, however, is not quite as free-range as it appears.

All 70 of the animals wear what look like big, boxy cowbells around their necks. When one goat gets close to an invisible fence line the farmers set up on an app, the box emits a high-pitched tone, eliciting an immediate response. Any goat within hearing distance perks up, freezes, and then slowly moves away from the line, despite the lack of any physical barrier.

The system was created by a Norwegian company called Nofence, and Molly and Sam are among 43 pilot farms testing it ahead of an official United States debut expected in early 2024. And Nofence is just one of several companies getting into the virtual fencing game.

U.S.-based Vence, which was acquired by veterinary pharmaceutical giant Merck Animal Health in 2022, has been slowly rolling out a similar system on larger cattle ranches across the West since 2019. Other systems, including eShepherd and Corral Technologies, are also in development.

Virtual fencing is gaining traction in American agriculture because it can save farmers time and money. But it could also enable them to more easily adopt practices—and entire systems—that promote environmental benefits.

When farmers are able to control how, where, and when their animals move between pastures, they can more easily accomplish ecological goals that might include increasing soil carbon, reducing water pollution, or incorporating trees.

The technology also has the potential to rid the West of barbed wire that negatively

impacts wildlife migration and adapt grazing to an age of increased wildfires by making it easy to keep cattle out of burned areas.

Given how few farms are using it, there are still many questions about limitations—like the absence of cell service in some rural areas, farmer acceptance, accuracy, and ongoing costs—but buzz about virtual fencing's applications continues to grow.

In September, a project dedicated to sustainable beef production in the Southwest created a Virtual Fence Forum for farmers on Facebook; in November, ranchers gathered in Arizona for a workshop on the technology.

"People have been talking about virtual fencing for a long time," said Juan Alvez, an extension research associate at the University of Vermont's Center for Sustainable Agriculture, whose expertise includes grazing management, "and now it's just coming to market."

More (Virtual) Fencing Facilitates Animal Movement

Sam's family has been farming Georges Mills' 90 acres since the 1750s, and the infrastructure harkens back to a time before farmers used even simple machinery. At night, the goats sleep in a barn built in the mid-1800s from large blocks of local stone and weathered wood.

Since the couple took over about a decade ago, they've been looking to make their goat dairy and cheesemaking operation more sustainable—both financially and ecologically. In past grazing and milking seasons, which run from March through December, Sam regularly had to move fencing—sometimes every day—to keep providing them access to new fields with fresh plants and keep their waste dispersed across the landscape. He also had to construct pathways to move the goats back to the barn for milking.

"He was having to put out posts, roll out four wires. He put a lot of steps in, and it took a lot of hours," Molly said of Sam's efforts. Now, with the virtual system, "Sam can update the fence lines while he's drinking his coffee in the morning."

He does that using Nofence's app, which creates and updates the boundaries by GPS, with no physical infrastructure other than the collars worn by the goats.

Each collar is outfitted with tiny solar panels to continuously charge the battery, and Molly said it's usually about a month until they have to take them off to charge them manually.

While physical fencing for cattle can be slightly less involved than for goats, since a single electrified wire will keep cows in place (most of the time), cattle graziers need a lot of fencing and frequent movement if they're pursuing climate and other environmental goals.

To effectively build soil health, Alvez said, farmers and ranchers who use systems referred to as rotational, intensive, or mob

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grazing should move their animals to new pastures at least once a day. While continuous grazing depletes pastures and overloads fields with waste, these alternative approaches build soil health by naturally spreading the manure, fertilizing new grass growth, and building healthy communities of microbes.

Traditionally, many farmers struggle to set up enough paddocks for continuous movement, because installing fencing can be expensive and labor intensive, Alvez said.

"More paddocks versus less is always better for graziers and climate-smart goals, because you're always moving these animals to a fresh pasture," he said. "Fresh pastures mean most [of the other] pastures are in a vegetative state, often accumulating carbon from the atmosphere into the soil where it belongs."

With virtual fencing, there's an upfront investment, but adding new paddocks can be done on the fly, without additional costs.

Nofence's collars cost $299 each for cattle and $199 for goats or sheep, and come with a five-year lifespan. In addition, farmers then have to pay a monthly subscription fee that varies depending on herd size and other factors. It's no small cost—for Georges Mill farm's 70 goats, it would cost around $14,000 for the collars—but fencing, depending on the type, generally costs thousands of dollars per acre upfront, plus the added daily labor.

One drawback is that since the lines the system draws are not as exact as a physical barrier, farms may still need to put permanent physical fences up in places where a hard stop is needed, like along busy roads. At some, a physical fence creates the overall farm barrier, while virtual lines create pasture barriers.

The biggest limitation with virtual fencing, however, is that, connectivity could be an issue. With Nofence, strong Wi-Fi is not required, but a cell phone signal is, and Meghan Filbert, the company's adoption program manager, said that if a farmer can't typically receive calls or texts in their pastures, the system won't work for them.

That could be a major issue in lots of rural places, including Alvez's neck of the woods in Vermont, where cell service often cuts in and out. It's something he hopes will improve (and there are many efforts currently underway to improve broadband in rural areas around the country) because he believes his area could benefit more from virtual fencing.

"In areas where it's more mountainous, with rugged landscapes and lots of marginal land, having this technology would really simplify the amount of paddocks you can establish," he said. That's because putting physical fencing in those places is more difficult compared to areas with flat, open terrain.

Controlling Grazing Near Water and Trees

Virginia's landscape also has unique characteristics that make virtual fencing an attractive option said Alston Horn, a restoration specialist at the Chesapeake Bay Foundation who works with farmers, including Molly and Sam, to implement conservation practices.

In the field at Georges Mill, Horn said that a lot of land in the hilly, populated region is better suited for grazing than other types of agriculture and that he got interested in virtual fencing through his work making sure that grazing benefits the Chesapeake Bay watershed instead of contributing to its pollution. Continuous grazing that allows manure to build up can result in excess nutrients ending up in waterways, and cattle getting into streams can also deposit nutrients and contribute to erosion.

He sees the technology—which can enable more movement and control where animals are in relation to water sources and trees—as one tool farmers could use to better manage pastures.

"Well-managed pastures [are] good for water quality because we're actually infiltrating more water, and there's less runoff going down to our local creeks and streams," he said. "If our local creeks and streams are cleaner, ultimately, the rivers—and as we go east, the Bay and everything else—they have better water quality too."

Virtual fencing may also aid farmers in implementing agroforestry practices that reincorporate trees into farm systems and come with significant climate and biodiversity benefits.

For example, a quick swipe of a finger on a virtual fencing app could allow a farmer to protect riparian buffers, strips of bushes and trees alongside streams that prevent runoff and support wildlife, from cattle until the plants are well-established.

That's the application Alvez is most excited about, because the difficulty of putting up fencing that can contain animals and also protect trees as they grow is often a complicating factor in getting agroforestry systems off the ground.

And in a system where sheep are grazing in alleys between fruit trees, a farmer might try to put up a fence and encounter difficulties because of tree roots. "With virtual fencing, you could put the line six feet off the trees and still have the benefit of the shade for the animals and at the same time protect the trees," he said.

The Way Forward for Virtual Fences

At this point, of course, agroforestry systems are about as novel as virtual fencing. And even with the many companies gearing up to expand, it will be some time before the systems are widely available.

Nofence is prioritizing its sales in Norway, the United Kingdom, and Spain, where it is already widely available. While the system will officially roll out in the U.S. in 2024, Meghan Filbert said it will be slow and that "availability will be limited."

Alvez is working with a developer in Brazil to bring another product to the U.S. that works in a similar way but uses an ear tag instead of a collar. That system will also provide data like body temperature from the cattle that wear it, and Alvez hopes to begin using it as a research tool.

Back at Georges Mill, Molly and Sam didn't opt to use virtual fencing in order to better incorporate trees and livestock, but during their pilot of the system, that happened naturally.

One recent morning after a thunderstorm, they moved the goats to a distant field across a road. Only after they got them there did they notice a cherry tree—which is toxic for goats—had fallen in a thicket within the field.

In the past, Molly said, that would have meant "moving the herd all the way back into the barn while Sam totally cuts it up and clears it out, because you can't have any of the leaves around—if they eat them, they'll die. It's a huge disruption, a huge amount of time."

This time, however, "We were able to just draw an exclusion zone around it and keep everybody off of it," she said. "That was huge."

Winter Hay Feeding Strategies

by Amanda Grev, Ph.D., University of Maryland Extension

When it comes to feeding hay during the winter, a variety of feeding strategies can be implemented.

Hay can be fed in a confinement or field-based setting, with or without bale feeders, or by utilizing a strategy like unrolling hay or bale grazing.

Each of these methods carries its own advantages and disadvantages regarding wasted hay, impacts on standing forage, nutrient and manure dispersal, soil health implications, and labor requirements.

Keep in mind that the hay we are feeding is not only a source of nutrition for livestock but can also be a valuable source of soil nutrients.

Every bale of hay contains nutrients, and when fed to livestock a majority of those nutrients will pass through the animals and can be recycled for future forage growth.

As an example, if we assume one ton of hay contains 45 pounds of nitrogen, 15 pounds of phosphorus, and 55 pounds of potassium, at the current nutrient prices that one ton of hay equals over $90 per ton in nutrient value. How and where that hay is fed will make a big difference in nutrient recovery.

Bale Feeders

Feeding hay out of bale feeders is most often done in a confinement setting or designated feeding area, but can also be done on pasture or hayfields.

Advantages to utilizing a bale feeder include minimizing hay waste and feeding losses, with feeder design having a significant impact on the amount of waste.

Feeders that are more restrictive and limit the opportunity animals have to trample or soil hay will reduce waste substantially.

Disadvantages to using a bale feeder include the machinery and labor requirements needed to move or distribute bales, manure removal if livestock are confined to a given area, and damage from livestock trampling that occurs around feeder sites.

Mud creates two main problems for cattle during the winter: more energy is needed to walk through it compared to solid ground, and caked on mud robs the hide of its insulation properties.

As mud depth increases, energy needs increase but daily intakes have been shown to decrease, resulting in a reduction in animal gains. If feeding in a single location, providing a footing such as crushed gravel or concrete will help minimize ground damage and mud issues.

Alternatively, hay feeding areas can be moved around periodically to minimize the damage to any one given area, provide some manure and nutrient dispersal, and reduce accumulation of waste residue.

Unrolling Hay

Feeding hay using this strategy involves unrolling bales out on the ground across a pasture or hay field, thereby spreading the hay across a greater feeding area.

Advantages of this strategy are that it can minimize the concentrated ground damage that often occurs around feeder sites where livestock have congregated for extended periods of time.

This means there are often fewer issues with mud, keeping livestock cleaner and making it easier for them to maintain body condition.

Unrolling hay also allows valuable nutrients from hay waste and animal manure to be deposited back onto the soil and spread across a greater area of the field.

Decomposing hay residue, along with manure and urine, is distributed across the field and can help improve soil organic matter and increase forage growth in subsequent years.

Nutrient retention under this type of setting has been shown to be superior to that of traditional systems that involve handling and spreading manure, even if the manure is composted.

Disadvantages to rolling bales out include the labor and machinery required to unroll bales on a regular basis and the potential for increased hay waste.

Unrolling hay typically results in more hay waste compared to other feeding methods, particularly when conditions are wet and muddy.

That said, the amount of hay wasted will depend on a number of factors, including the quality of the hay and the amount of hay offered at one time.

For example, if a 3-day (or longer) supply of hay is provided at one time, feeding losses of 40% or more can be expected, but if hay is fed daily those losses can be reduced down to 15% or less.

To minimize spoilage with unrolled hay, it is recommended to not unroll more than the group can eat in 24 hours.

Animals will also waste less if the hay is higher quality, and waste can be further reduced by running a single strand of polywire along the center of the windrow.

(*article continues on page 8*)

Bale Grazing

Livestock are given access to a portion of the bales at one time using electric fencing. After a given number of days or once the hay is cleaned up, the fencing is re-set or livestock are rotated to provide access to a new set of bales.

The number of bales offered at once and the time period in a given area can vary, but an optimal bale grazing period will balance labor requirements, animal nutrition, and hay waste.

Offering more bales at a time and moving livestock every few weeks requires less labor but will likely result in greater waste, more trampling, and potentially less than optimal gains, while offering fewer bales at a time and moving livestock every few days requires more labor but will likely limit excessive waste, minimize trampling, and maximize gains.

Advantages to bale grazing include a reduction in machinery use, fuel costs, and labor during the feeding period.

Because the bales are preset, hay can be put out in late fall or early winter when the weather is better and there is often less soil damage and compaction from equipment driving on wet fields.

Moving wagon loads of hay during dry conditions is also much more efficient than hauling one or two bales at a time by tractor throughout the winter months.

Similar to unrolling hay, bale grazing can also offer benefits in terms of added soil fertility, improved manure and nutrient distribution, and cleaner wintering conditions for livestock. Bale grazing is a great way to spread manure and nutrients across a pasture, and bales can be strategically placed on poorer areas of the field, such as those with thinning forage, bare spots, less productive yields, or nutrient deficiencies.

Disadvantages to bale grazing include the potential for hay waste and damage to existing forage stands.

Depending on the amount of bales offered at a given time, this method also has potential for greater amounts of hay waste; however, hay rings can still be utilized within this system to help limit waste. Where hay rings are used, they can be rolled from old bales to new bales and flipped over into place.

There is also concern over whether this feeding strategy will damage pasture stands, especially in regions with more rainfall and warmer winters. While this is a legitimate concern, utilizing good management practices can help to minimize these issues.

The key to effective bale grazing on wetter soils is to keep the animals moving forward to new areas and to feed at low hay densities. Current recommendations for the Eastern US are to keep feeding densities to two tons of hay or less per acre. Feeding at higher densities can result in more severe pugging in wet conditions.

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The views and conclusions contained in this document are those of the authors and should not be interpreted as representing the opinions or policies of the U.S. Government or the National Fish and Wildlife Foundation and its funding sources. Mention of trade names or commercial products does not constitute their endorsement by the U.S. Government, or the National Fish and Wildlife Foundation or its funding sources.

When it comes to feeding hay in a field-based setting, there are some management strategies that can be implemented to help minimize issues.

Here are some tips for success:

Choose a feeding area with well-drained soils, ideally on a gentle to moderate slope, and avoid feeding near surface water.

Avoid damage to standing forage by feeding hay bales at low densities. Spacing bales further apart can help limit the amount of ground that gets torn up. Declines in pasture quality can mean animals or bales are stocked too heavy.

Limit the amount of time livestock are fed in a given area. Moving livestock every day or every few days will help minimize ground damage.

Feeding frequency will impact hay waste. Although it is tempting to provide enough hay for several days, livestock will waste less hay when the amount fed is limited to what is needed each day, as daily feeding will force them to eat hay they might otherwise refuse, trample, or waste. On average, 25% more hay is needed when a 4-day supply is fed with free access.

When picking feeding areas, select areas that are in need of some improvements or renovation. Prioritize poorer areas of the field, such as those with thinning forage, bare spots, less productive yields, or nutrient deficiencies.

Feed high quality hay to minimize refusals and hay waste. Livestock will waste a greater percentage of poor-quality hay than they will of good-quality hay.

Be flexible and be cognizant of animal and weather conditions. If an area is too wet or ground conditions are deteriorating, move livestock to another area or to a dry lot.

Last but not least, it should be recognized that no single hay feeding strategy will work best for all farms. Instead, producers must weigh the benefits and drawbacks from these different feeding methods, select a method based on their goals, and manage accordingly.

UPCOMING EVENTS

Southern Maryland Forage Conference
January 16, 8:30 AM–3:30 PM
Calvert County Fairgrounds
140 Calvert Fair Drive, Prince Frederick, MD
The annual event will feature regional experts and local speakers covering a variety of topics on growing and managing forages on the farm. To register for the event, please visit go.umd.edu/smdforage.

Tri-state Hay and Pasture Conference
January 17, 9:00 AM–4:00 PM
Garrett Information Enterprise Center
687 Mosser Road, McHenry, MD
The annual event will feature regional experts and local speakers covering a variety of topics on growing and managing forages. To register for the event, call 301-387-3069.

Central Maryland Forage Conference
January 18, 8:30 AM–3:30 PM
New Midway Volunteer Fire Company
12019 Woodsboro Pike, New Midway, MD
The annual event will feature regional experts and local speakers covering a variety of topics on growing and managing forages on the farm. To register, visit go.umd.edu/cmdforage.

Franklin County Graziers Winter Meeting
January 18, 9:30 AM–2:00 PM
Chambersburg Mennonite Church
1800 Philadelphia Avenue
Chambersburg, PA
Hear from beef, dairy, and sheep graziers at the winter meeting. Registration fee is $20 and includes a hot lunch. Visit pglc.org for more information and to register.

Nourish & Flourish: From the Ground Up
Future Harvest CASA Annual Conference
January 18–20
College Park, MD
Future Harvest's 25th annual conference has seven tracks designed to meet multiple experience levels and a diversity in scale and products. Visit futureharvest.org/2024-conference to register today.

2024 Winter Forage Conference
January 23, Wytheville, VA
January 24, Chatham, VA
January 25, Warrenton, VA
January 26, Weyers Cave, VA
January 26, Virtual only
Learn about the specific nutritional requirement for cow-calf, heifer-development, forage-finishing, dairy, and stocker operations; how to identify and address the nutritional gaps in your forage supply; developing supplementation programs that dovetail with your forage system; and guiding herd genetics to match your nutritional supply. Visit vaforages.org/events for more information.

2024 Sustainable Agriculture Conference
February 8-10
Lancaster County Convention Center
Lancaster, PA
Join Pasa Sustainable Agriculture for their annual conference and trade show. More information can be found here.

Southeast PA Grazing Conference
February 15-16
Solanco Fair Association
Park Avenue, Quarrysville, PA
Visit springwoodfarm.com to learn more and to register.

Pennsylvania Forage Conference
February 28
Centre Hall Fire Station
Centre Hall, PA
Attend the Pennsylvania Forage and Grassland Council's conference to learn how to build soil health in forage systems, pasture reclamation, and other topics. Visit afgc.org to register and learn more.

Appalachian Grazing Conference
March 7-9
Waterfront Hotel
Morgantown, WV
The Appalachian Grazing Conference is held every two years and offers informative presentations and demonstrations to farmers with cattle, goats and sheep. Participants hear from America's leading speakers on strategies designed to increase their profits. Visit wvagc.com to register.

Western Pennsylvania Grazing Conference
March 14
Trinity Point Church of God
Clarion, PA
Attend the 26th annual conference promoting sustainable grazing practices. This year's keynote speaker will be multi-generational farmer, Daniel Salatin of Polyface Farm. Visit westernpagrazing.com to register.

Basic Grazing School
May 14 and 15
Rapidan River Ranch
3357 Graves Mille Road, Madison, VA
Designed with beginning and experienced producers in mind, this 2-day, intensive course will teach you everything you need to know to better manage grazing on your farm. Visit vaforages.org/events for more information.

Mountains-to-Bay Grazing Alliance

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