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DIVISION OF AGRICULTURE
RESEARCH & EXTENSION
University of Arkansas System

Tips for Adding Clover to Pastures and Hay Fields

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Adding legumes to grass pastures and hay fields offers many benefits to forage system sustainability. Legumes improve animal performance, increase nutritional quality of hay and pasture, extend grazing seasons and reduce the need for nitrogen fertilizer. Adding legumes to pastures is not complicated, but following these steps increases success:

1. Most legumes have a higher soil fertility requirement than grasses, so a soil test is the first step. Soil pH should be above 6.2 and phosphorus and potassium levels should be near optimum for best results. Soil tests from several fields can help identify where legumes have the best chance of growing and also where major fertility changes are needed before attempting planting.

2. To get fertilizer and lime recommendations for overseeding legumes, ask for soil test code #116, Legumes Overseeded Into Grass Sod, when submitting soil samples to the county Extension office.

3. Weed problems should be controlled before planting clover. Winter annual weeds such as buttercup, henbit and thistles can be sprayed during December or early January with 2,4-D, then clover can be seeded in late February or early March. A combination of good soil fertility, well-timed herbicide application and good grazing management is the most effective weed control program.

4. Select a legume species that is adapted to your area, and find a seed source well in advance of planting. Your local dealer may not have the desired variety on hand the day before you want to plant. Annual legumes include crimson and arrowleaf clover, annual lespedeza or hairy vetch. Other annual clovers include subterranean, rose, ball or berseem. Perennial legumes include white and red clover or alfalfa. Each has different characteristics and growth patterns.

Recommended seeding rates for legumes commonly planted into pastures and hayfields

Annual Legumes	Seeding Rate (lbs per acre)
Annual lespedeza (*Kummerowia stipulacea* and *K. striata*)	15-20
Arrowleaf clover (*Trifolium vesiculosum* Savi)	8-10
Crimson clover (*Trifolium incarnatum* L.)	15-20
Hairy vetch (*Vicia villosa* Roth)	15-20
Subterranean clover (T*rifolium subterraneum* L.)	12-15
Winter peas (*Pisum sativum L.)*	20-30
Perennial Legumes	
Alfalfa (*Medicago sativa* L.)	20-25
Red clover (*Trifolium pretense* L.)	10-12
White clover (*Trifolium repens L.)*	2-3

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5. Make sure the seed is pre-inoculated or be sure to purchase the correct rhizobia bacterial inoculant for the legume species selected. Check the label on the inoculant package to match it with the correct legume. For example, red clover inoculant does not work for crimson clover or arrowleaf clover.

6. Schedule a window of time for planting. For fall planting, late September to mid-October works well most years. For winter planting, the month of February to early March works well.

7. The grass sod needs to be grazed or clipped short, preferably down to 2 inches or less, before interseeding the legume. Short sod allows the seed to reach the soil easily or allows the no-till drill to place the seed at the right depth.

8. Make sure to get good seed/soil contact, but don't plant the seed too deep. For broadcasting seed, pull a drag or harrow over the field before or simultaneously with planting. This opens the grass residue so the small legume seed can reach the soil surface. For planting with a no-till drill, set the drill so that the disk openers barely cut the sod or even so that they don't cut the sod. Use more down pressure on the press wheels to push the seed into the soil surface rather than depending on the disk openers. Setting the disk openers to cut too deep is a common mistake. The depth of the cut determines the depth of planting, and the seed should not be planted deeper than ¼ inch.

9. Graze across the field in early spring to control fescue, ryegrass or weeds before the clover comes up. This allows more light to reach the legume seedling. Remove cattle when the legume is emerging well.

10. In spring, rotationally graze the field to improve legume persistence. If the legume is in a hay field, make sure to fertilize the field according to soil test recommendations for legume/grass. This means do not apply nitrogen fertilizer. Nitrogen will cause excess competition from the grass, resulting in shading and loss of the legume.

11. Several legume species can reseed to help maintain stands over time. Even if reseeding does not occur, follow these steps to plant more seed later.

For more information on interseeding legumes and drill calibration ask for FSA3111, C*alibrating Drills and Broadcast Planters for Small-Seeded Forages*, and FSA3134, *Interseeding Clover and Legumes in Grass Sod*, at your county Extension office or look on the web at www.uaex.edu under publications.

Managing Alfalfa During the Cold Months of the Year

Dirk Philipp, Assistant Professor - Forages

Winters are usually not very hard in the South, but temperatures can dip well below the freezing point for some time, which can potentially damage perennial forage crops such as alfalfa. This crop, which will likely become more popular in the southern U.S., is sensitive to incorrect management, but there a few things producers can do to maintain good stands despite the relative large temperature differences between the hot summers and the cool, damp winters there.

Although temperatures rarely drop below 20 degrees F, research has demonstrated that freeze damage can occur in a short amount of time at such levels. Temperatures of less than 18 degrees have been shown to inflict damage to alfalfa taproot cells in as little as 30 minutes. Further, some areas in the southeastern U.S. receive one or two winter storms resulting in ice cover for several days. In this case, winter damage may be inflicted through diminished air flow to the alfalfa crowns. In addition, metabolites such as lactic acid, ethanol, methanol and lactic acid accumulate under the ice sheets and may become toxic if the ice remains in place for longer than two weeks. Although this scenario is rather unlikely in the South, there are a few other factors that influence alfalfa winter hardiness positively or negatively.

Keeping soil fertility and pH in check will reduce the likelihood of a winterkill.

> Alfalfa is sensitive to incorrect management, but there are a few things producers in the South can do to maintain good stands despite the relatively large temperature differences between the hot summers and cool, damp winters.

Alfalfa stands with sufficiently high soil potassium levels will withstand cold or freezing temperatures much better than stands that are stressed from insufficient levels of this mineral. Phosphorus will promote vigorous spring growth and strong root systems. A soil pH of above 6.6 has been shown to increase the winter hardiness of alfalfa stands and is in line with recommendations of maintaining adequate pH levels at all times.

The time of the last cutting before winter and the length of the cutting intervals during the growing season will also affect winter hardiness. Alfalfa stands should not be cut between 4 and 6 weeks before the first killing frost that occurs in the fall (about 25 degrees F). When days become shorter and cooler, alfalfa stands are not able to fully restore root energy reserves that are crucial for winter survival when cut too late in the season. Stands should be managed so that at the average onset of the first frost, canopies are about 10 inches high. Harvest should take place soon after the first killing frost. Under these circumstances, hay will be difficult to cure because of the cold weather, so silage or baleage may be a better option. A stubble height of 6 inches should be left in any case so that snow, if any, can be trapped and serve as insulation.

Alfalfa that is grown on well-drained soils is less susceptible to cold-weather damage. An inadequate planting location cannot be changed afterwards; therefore, much care should be taken when selecting a new alfalfa field or an area for additional alfalfa establishment. Plants achieve winter hardiness by desiccating cells while maintaining minimal metabolic activity, and in wet, water-logged and cold soils this is difficult to accomplish. In Arkansas, alfalfa varieties with winter dormancy ratings of 3 to 5 are adapted statewide.

During the following spring, winter injuries of alfalfa stands appear as uneven growth patterns, slowed plant development and root damage. The latter can be examined by unearthing the roots; they should be white in color compared to the gray color of winter-killed root tissue. If water can be squeezed from the roots, then frost damage is likely. There are ways to minimize the effects of winter kill during the following growing season, however. Affected stands could be allowed to mature longer until the mid-bloom development stage before either the first or the second cut is taken, and cutting heights should be higher than normal. The minor sacrifice in quantity and quality in one season is being outweighed by having healthy alfalfa stands for the years to come.

Use of Prostaglandins in Breeding Management of Dairy Cows

Rick Rorie, Professor - Animal Science

The ideal calving interval for dairy cows is between 12 and 13 months. Longer calving intervals result in longer periods of low milk production. There are numerous estrous synchronization protocols that can be used to improve the chances of detecting cows in estrus and conceiving after insemination. One of the simplest protocols has been referred to as targeted breeding.

Targeted breeding consists of treating lactating cows with a prostaglandin F2alpha product (Lutalyse, Estrumate, Prostamate, estroPLAN, In-Synch) three times at 14-day intervals. The first prostaglandin injection can be given 30 to 40 days after calving. However, a better response would be expected if the first prostaglandin treatment were delayed until 70 days. The purpose of the first prostaglandin injection is to synchronize the cows for a better estrus response at the second injection. After the second prostaglandin injection, cows are observed for the next 4 or 5 days and inseminated after detected estrus. Only cows that are not detected in estrus after the second prostaglandin injection are given the third injection and again observed for estrus and inseminated after detected estrus. Cows not detected in estrus within 72 hours of the third prostaglandin injection can be time-inseminated at 80 hours, but the conception rate may be low. Alternatively, the prostaglandin treatments can be continued at 14-day intervals until the remaining cows are detected in estrus and inseminated.

Large studies utilizing hundreds of dairy cows have reported an overall pregnancy rate of around 40% when using targeted breeding (three injections of prostaglandin F2alpha at 14-day intervals). Only cows that are cyclic (i.e., have a corpus luteum to regress) would be expected to respond to targeted breeding based only on prostaglandin injections. Incorporation of gonadotropin-releasing hormone (GnRH; Cystorelin, Fertagyl, Factrel, OvaCyst, GONAbreed) into targeted breeding improves the effectiveness on noncyclic cows. With this modification, GnRH is injected 7 days before the second prostaglandin injection. The GnRH injection would be expected to cause ovulation of any large, dominant follicle present on the ovaries of cows, even if the cows are not yet cyclic. The corpus luteum that forms after ovulation should then regress in response to the second prostaglandin injection given 7 days later. Incorporation of GnRH into the targeted breeding protocol has been reported to result in a higher percentage of cows expressing estrus, leading to higher overall pregnancy rates.

In addition to estrous synchronization, prostaglandin F2alpha products have been used for reproductive therapy. After calving, the cow's uterus must undergo involution (shrink back to normal size and function) before another pregnancy can be established. Usually, uterine involution is complete within the first 30 to 45 days after calving. However, inadequate prostaglandin F2alpha production by the uterus can delay involution. Therefore, treatment with prostaglandin, starting at 20 to 30 days after calving, might enhance or ensure uterine involution. Studies have reported that cows receiving prostaglandin treatment as a reproductive therapy have a reduced interval from calving to first service, improved first service conception rate and improved pregnancy rate. However, these improvements have been attributed to greater synchronization of estrus and improved detection of estrus rather than a therapeutic benefit.

Are there differences in the effectiveness of different prostaglandin F2alpha products? Commercially available products contain either the "natural" prostaglandin analogue (dinoprost; Lutalyse, Prostamate, In-Synch) or a synthetic prostaglandin analogue (cloprostenol; Estrumate, estroPLAN). Cloprostenol has a longer half-life in circulation than does the natural (dinoprost) form of prostaglandin F2alpha, so it might be expected that there would be differences in effectiveness. A large study utilizing over 4,000 lactating dairy cows reported that cloprostenol increased the estrus detection rate after synchronization, as well as overall pregnancy rate when compared to dinoprost, but only in first parity cows. Both the natural and synthetic products resulted in similar estrus detection, conception and pregnancy rates in lactating cows in their second and later parities. On the other hand, another large study utilizing over 2,000 dairy cows reported that dinoprost was more effective than cloprostenol in regressing the corpus luteum of lactating dairy cows, but pregnancy rates after AI were similar for both products. Overall, it is likely that all prostaglandin products have similar effectiveness in lactating dairy cows.

Cattle Traffic Areas: Thinking and Planning Ahead for Wet Weather

Karl VanDevender, Professor - Extension Engineer

Winter is upon us, and cattle traffic areas that in the summer are bare, hard-packed soil will, with the wet weather, become muddy. While muddy areas can't be completely avoided, they can be managed to reduce mastitis and production concerns associated with dirty cows and muddy conditions.

The primary ingredients to mud are soil and water. Therefore, the key concept to minimizing muddy conditions it to keep the amount of soil and water that mixes to a minimum. The first step is to lay out and size cattle traffic areas so cattle can move around the farm as needed, while keeping the area where grass does not grow due to cattle traffic as small as possible. At times, this of course will require appropriate fencing to direct cattle traffic. When laying out fence lines and gates, equipment and human access will also need to be considered.

Depending on soil conditions, some situations may require steps to increase the load-bearing capacity of the soil. While concrete is often an option, its expense may make other options such as gravel, with or without a geo-textile, or the use of coal plant fly ash attractive. As with most decisions, initial cost, useful life and maintenance costs should be considered. Proper layout and management should minimize, and potentially avoid, the expense of increasing the load-bearing capacity of the soil.

A key component in traffic area layout is to divert as much water as possible away from areas such as travel lanes and loafing lots. Berms and surface drainage can be used to redirect surface water runoff. For roof runoff, gutters might need to be considered. In some cases, it may be appropriate to use culverts to direct clean water flows under traffic areas.

Even after appropriate water diversions are put in place, it will rain directly into the traffic areas. This means the traffic areas should be designed and managed to minimize water ponding and surface erosion. Ponding will increase mud problems. Erosion tends to increase the time and cost of traffic area maintenance. Ideally, the traffic areas should be sloped enough so that water flows off but not so much that erosion is a problem. The slopes should be oriented in such a way that water flows minimal distances while in the traffic area. In addition, the slopes should be designed and maintained to avoid low spots that will pond water.

The key concept to minimizing muddy conditions is to keep the amount of soil and water that mixes to a minimum.

Runoff water from traffic areas will likely contain some microorganisms, nutrients and sediment from its contact with manure and soil. The commonly accepted method to address environmental concerns is vegetative filtering. Usually, this runoff water is directed to flow as a broad uniform sheet of water into a vegetated filter strip. This provides the vegetation in the filter strip a chance to treat the runoff water to protect any potential downslope streams and ponds.

As with many farming practices, proper maintenance is important. The condition and effectiveness of diversions, fencing and vegetated filter strips should be monitored and maintained. Periodic scraping of the traffic areas may be needed to remove excessive amounts of manure solids. When scraping, care should be taken to maintain slopes and avoid creating low areas where ponding will occur. Any scraped material should be thinly applied as a soil amendment to growing vegetation well isolated from downslope water bodies. To avoid handling the material twice, it should be left in place until suitable conditions exist for land application. If it must be collected and stored prior to land application, it should be protected from the weather to avoid runoff, as runoff from stockpiled manure is subject to liquid manure regulations.

For additional information, the publications *Runoff Water Management for Animal Production and Environmental Protection* (FSA1036); *Reducing MudProblems in Cattle Heavy Use Areas With Coal Combustion By-Products (Fly Ash)* (FSA1043); and *Beef Cattle Management for Water Quality Protection in Arkansas* (MP375) are available at www.uaex.edu/Other_Areas/publications.