

Nitrogen is a key in grassland production

CARL HOVELAND

Nitrogen is the most important input for production of pasture and hay on Southeastern cattle farms. Although the air around us contains 79 percent nitrogen, it is unavailable for plant growth.

Fertilizer nitrogen has been relatively cheap for a long time, but recent shortages of the natural gas feedstock used for its manufacture has resulted in a rapid escalation in price. The high price of nitrogen fertilizer will certainly reduce the amount applied to grassland, which will in turn reduce pasture and hay yields. In addition, forage receiving little or no nitrogen fertilizer will contain less protein. Livestock producers having access to poultry litter or dairy waste will be able to maintain productivity at low cost.

Other sources of nitrogen

Varying amounts of nitrogen are fixed by lightning in thunderstorms, most of this coming during the summer. Also, small amounts are fixed by blue-green algae and free-living bacteria in the soil. The quantities fixed by these methods probably do not total more than 15 to 20 pounds of nitrogen per acre annually. Warm-season grasses such as bahiagrass contain symbiotic bacteria inside the roots that may fix 15 to 20 pounds of nitrogen per acre annually. Cool-season grasses do not have any such symbiotic nitrogen-fixing bacteria. Clearly, the total amount of nitrogen from these sources is of value in unfertilized pastures but is not adequate for good forage production.

The biggest biological source of nitrogen is from symbiotic nitrogen-fixing bacteria living in nodules on the roots of most legume plants. The most important forage legume species that use atmospheric nitrogen and fix it for use by plants are the clovers (white, red, arrowleaf, crimson, ball, berseem), alfalfa, lespedeza and perennial peanut. Other legume plants having nitrogen-fixing nodules on their roots are soybean, pea, bean, cowpea, kudzu, as well as mimosa, redbud, and black locust trees.

Amount of legume-fixed nitrogen

Alfalfa is the best legume for nitrogen

fixation, producing 150 to 250 pounds of nitrogen per acre annually. The reason for this high level of fixation is that alfalfa is a perennial legume and has a longer productive season than any other legume. Red clover fixes 75 to 200 and white clover about 75 to 150 pounds per acre. Annual clovers such as crimson, ball and arrowleaf have a shorter productive season so the fixation rate is lower, about 50 to 150 pounds of nitrogen per acre. A legume fixing 150 pounds of nitrogen per acre is worth \$60 per acre at \$0.40 per pound nitrogen fertilizer, a substantial saving in pasture cost.

Improving animal performance

Even though free nitrogen is a good reason for planting legumes, these plants are valuable for an even more important reason: their superior nutritive quality improves cattle performance. Beef cattle on pastures with legumes look better, have higher conception rates, and calves have higher weaning weights. Legumes are higher in crude protein, are more digestible and contain more calcium and magnesium than grasses. White or red clovers in an endophyte-infected tall fescue pasture reduces the effects of toxicity as compared to tall fescue alone fertilizer with nitrogen. Annual clovers on bermudagrass or bahiagrass pasture give a big boost to cattle performance.

Successfully establishing legumes in grass sods

1. Get a soil test several months before planting. Apply lime, if needed, as early as possible and fertilizers at planting time.

2. Before planting, mow or graze grass sod closely.

3. Plant at the correct time of the year. Annual lespedeza should be planted in March on bermudagrass or tall fescue. Annual clovers are planted on bahiagrass or bermudagrass sod after killing frost in autumn, red or white clover on tall fescue in October-November or late January-February. Autumn planting on tall fescue will give earlier production but disease (crown and stem rot) and insect (pygmy cricket) losses are greater than from

January-February plantings. Nothing can be done to control this disease problem, but crickets can be controlled with a granular insecticide. Check pastures frequently for seedling damage. The first signs are small half-moon-shaped bites eaten from the new cotyledonary leaves of the clover plants. Crickets can rapidly destroy the leaves and kill seedlings.

4. Be sure clover seed is inoculated before planting. Some seed is pre-inoculated with a pelleting material containing the proper inoculum around the seed. This coating protects the life of the bacteria longer and makes it likely that the new clover plants will be adequately inoculated to develop active nodules for nitrogen fixation. If pelleted seed is not available, then you will have to inoculate the seed. Be sure to buy the correct inoculum for your clover, keep the inoculum cool before planting, and mix it with a sirup-water mixture to serve as a sticker for the inoculum on the seed. A commercial sticker can also be used instead of sirup.

5. The best planting method is with a no-till drill. Plant seed shallow, only 1/4 to 1/2 inches deep. Broadcast planting of red and ladino clovers on tall fescue is a cheap but less reliable method of establishment and generally gives poorer stands than drill planting. Stands are better if broadcast seeded in February rather than in autumn.

Clover varieties for grass sods

On bermudagrass and bahiagrass sods, there are a number of options. Yuchi arrowleaf used to be the clover of choice because of its long productive season but virus and root disease problems can cause serious stand losses, especially when clover has been grown in the pasture previously. However, some producers continue to use it even with this handicap. Crimson clover can occasionally have crown and root rot losses in winter, but it is still well worth planting. The commonly planted variety is Dixie but Flame, AU Robin and AU Sunrise will provide more winter production. Cherokee red clover is a long season annual in south Georgia and is highly productive. All these clovers

require well-drained soils. For wet soils, ball clover is a good choice.

On tall fescue sod in north and central Georgia, white clover is commonly planted. Regal, Osceola and Will are ladino or giant types of white clover. They give excellent production the first year but generally deteriorate in succeeding years due to various diseases and lack of competitive ability in grass sods, resulting in stands disappearing after two to three years. To maintain white clover in a pasture, it is recommended that seed be planted at least every other year. This is the best way to maintain clover, and it is relatively cheap, especially when broadcast planting is done. Dr. Joe Bouton at the University of Georgia has developed two new white clover varieties that have persisted well in both tall fescue and bermudagrass sods and been superior to any now available. Seed should be available to livestock producers in fall 2002.

Red clover has a long productive season and generally persists in pastures for about two years in tall fescue pastures if not grazed closely. Recommended varieties include Royal red, Cinnamon, Acclaim and Redland III. Close continu-

ous grazing will eliminate any of these varieties.

An alternative to high-cost nitrogen

Legumes offer the cheapest alternative to high-cost nitrogen fertilizer. Annual lespedeza can be planted now but clovers and alfalfa should be planted in the fall. Plans need to be made now so lime can be applied soon if it is needed. It might not be a bad idea to line up clover seed supplies as demand will likely be up. Legumes are one way to beat the high cost of nitrogen and provide a bonus in higher quality forage for livestock.

Carl Hoveland is a Terrell Distinguished Professor for the University of Georgia.
