



Forage Fertilization

Ed Twidwell, Ph.D., Extension Agronomist-Forages

Introduction

The only way to know the amount and kinds of fertilizer that forage crops need is to have a sample of the soil tested. Soil samples can best be taken with a soil probe, but an auger, shovel or any other convenient tool will suffice. Permanent pastures in which optimum fertility levels have been maintained for several years should be soil tested at least once every three years. Fields managed more intensively, such as those used for hay production, overseeded during the winter or devoted to annual forage crops, should be soil tested annually. Also, permanent pastures in which fertility levels have become low or which were recently converted from woodland, should be tested annually.

Taking a Soil Sample

The first time a pasture is sampled, a single sample should represent no more than about 10 acres. On later samplings, one sample may represent a larger area if the entire area has been found to be uniform in fertility and has been treated alike. Any area that is unique because of soil type, drainage or the manner in which it has been managed should be sampled separately. A parish soil survey or a soil conservation map can be a helpful guide to soil

types and thus to soil testing various areas. For each soil sample, collect soil from about 10 to 15 places in the field at random from a depth of about 4 to 6 inches. Place the soil in a clean plastic bucket. Thoroughly mix the soil and collect enough soil to fill a 1-pint container for analysis. The sample can then be mailed or delivered in-person to a soil testing laboratory for analysis.

Soil pH and Liming

The first item to look at on a soil test is soil pH. This is an indicator of the soil environment where nutrients will be applied. Keeping the soil pH between about 5.8 to 6.5 allows for maximum nutrient availability for the major nutrients. If the soil pH is below 5.8, lime can be added to increase the soil pH to an optimum

level. In addition to reducing soil acidity, lime supplies calcium and magnesium, both essential plant nutrients. Liming also increases the availability of phosphorus while reducing the potential toxic effects of manganese and aluminum. Nodulation of legumes is also increased on properly limed soils.

Major Nutrients

The three major nutrients needed by forage plants are nitrogen (N), phosphorus (P) and potassium (K). These nutrients are listed on fertilizer bags as three numbers representing the percentage of N-P-K, in that order. So, in a 100-pound bag of 13-13-13 fertilizer, there would be 13 pounds of nitrogen, 13 pounds of phosphorus and 13 pounds of potassium. The remaining 61 pounds of material in the bag is just filler material and is not needed for plant growth.

Nitrogen is responsible for increasing plant growth more than any other element. It provides for the dark green color of plant leaves and is a major component of proteins, which are used in

photosynthesis for plant growth. Nitrogen deficiency symptoms include reduced growth and a light green color. Some of the major nitrogen fertilizer sources are urea (46-0-0), ammonium sulfate (21-0-0-24) and urea-ammonium sulfate mixture (33-0-0-12).

Phosphorus is critical in establishment of root systems in plants. Phosphorus deficiency in warm-season grasses is exhibited as small, unthrifty plants. In winter grasses and legumes, phosphorus deficiency is exhibited as a reddish-purple color on the leaves and stems. Phosphorus is used in much smaller amounts than nitrogen and potassium. Phosphorus is shown in fertilizers as phosphate

(P₂O₅). The major sources of phosphorus fertilizer are triple super phosphate (0-46-0) and diammonium phosphate (18-46-0).

Potassium is indirectly related to many plant cell functions. Plants sufficient in potassium are much more winter hardy than are deficient plants. Potassium-deficient plants are much more susceptible to certain diseases. Potassium deficiency is exhibited in bermudagrass as *Helminthosporium* disease. The symptoms begin

as small black spots on the leaves. If the deficiency progresses, the spots widen to form dead patches on the leaves; then the grass begins to die out in small clumps. In severe cases of potash deficiency, the stand may be lost. Potassium is shown in fertilizer rates as potash (K₂O). The major potash fertilizer is muriate of potash (0-0-60).

Pasture Fertilization

There are many different strategies of fertilizing pastures. These vary according to stocking rate, presence or absence of legumes and whether the pastures consist of summer or winter plants. In making fertilizer recommendations, the LSU AgCenter recommendations assume that producers have adequate stands of desirable forage grasses and a stocking rate of one cow per acre. Producers using lighter stocking rates can reduce fertilizer use, thereby substituting land for fertilizer.

For established summer grasses, all of the phosphate and potash recommended by soil analysis and 60-80 pounds of actual nitrogen per acre should be applied in the spring soon after the grass begins to grow. In south Louisiana, this is usually early April. Applying fertilizer earlier than this does not make the grass grow any earlier and encourages weed growth. If broadleaf weeds are present, control them before applying fertilizer.

An additional 60-80 pounds of nitrogen per acre should be applied in early to mid-June. These two applications are usually sufficient in most locations. However, if growing conditions are good to excellent in late August or early September, another application of 30-40 pounds of nitrogen per acre may provide for some late fall grazing if ryegrass is not to be overseeded in the field.

For winter forages, sod-seeding ryegrass in mid-October will usually provide good grazing in the spring, but little, if any, in the fall and early winter. The competition by the summer grasses usually eliminates much growth by winter annuals in the fall and early winter.

Usually, 90-120 pounds of nitrogen per acre is sufficient in a sod-seeded system.

Timing of fertilization is important in sod-seeded systems. If fertilizer is applied too early, the summer grasses will grow and choke out the winter annuals. The best system appears to be to apply all of the recommended phosphate and potash and 20-40 pounds of nitrogen per acre after the summer grass has become dormant. Then apply the remainder of the nitrogen in February.

Planting winter forages, such as ryegrass or oats, on a prepared seedbed will generally provide more days of grazing than overseeded systems because of earlier establishment of the crop. On a prepared seedbed system, apply all of the recommended phosphate and potash before the last tillage trip and incorporate. In south Louisiana, where 180 days of grazing may be obtained, a total of 180 pounds of actual nitrogen per acre may be needed. In north Louisiana, only 150 pounds of nitrogen per acre may be needed because of fewer grazing days in the winter and spring.

One method of nitrogen application is to apply half of the needed nitrogen along with the phosphate and potash just before planting. The remainder of the nitrogen can be applied in February. Some producers prefer a three-way split of the nitrogen with 20-30 pounds of nitrogen per acre being applied at planting. When the grass becomes tall enough to fall over, an additional 60 pounds of nitrogen per acre can be applied. The remainder of the nitrogen can be applied in February.

Fertilizing Hay Fields

Fertilizer costs account for a high percentage of the inputs associated with hay production. A properly fertilized hay field will result in high yields, good quality and good cattle performance. Poorly fertilized hay will be of poor quality, yield poorly and cause cattle to be unthrifty even if they consume large amounts of hay.

High-yielding hay removes large amounts of nutrients. The amount of nitrogen to be applied is determined by the yield goal, the forage species and whether the forage will be used for grazing or hay. Nitrogen is the element which is usually most limiting in hay production. The amounts of phosphate and potash needed are determined by soil test results.

The LSU AgCenter recommends the following nitrogen rates for summer hay fields:

- Hybrid bermudagrass: 300-400 pounds per acre
- Common bermudagrass: 200-300 pounds per acre
- Bahiagrass and dallisgrass: 300-400 pounds per acre

With the high rates of nitrogen used in hay production, it is usually not advisable to apply all of the nitrogen at one time. Losses may occur because of heavy rainfall, or the applied nitrogen may not be fully used because of insufficient rainfall. A better alternative is to apply 100 pounds of nitrogen per acre at green-up, then apply 100 pounds of nitrogen per acre after each hay cutting except for the last.

Phosphorus is used in much smaller amounts by hay than are nitrogen and potash. For this reason, it can all be applied in the spring, or it can be split-applied. Phosphorus rates should be based on soil test results. Recommended rates of phosphorus range from 0 to 140 pounds of P₂O₅ per acre, depending on soil test level.

Potassium rates should be established by soil test results. Recommended rates of K₂O range from 40 to 300 pounds per acre, depending on soil test levels. Using the recommended rates of potash is essential in maintaining hay fields. Potassium-deficient fields can lose both yield and stand persistence.

Incorporating Clovers into Forage Systems

In recent years there has been a renewed interest among producers in utilizing clovers in their forage operation. Clovers are classified as legumes and thus have the unique ability to “fix” nitrogen – meaning convert atmospheric nitrogen into a form that is usable to other plants – in nodules located on the roots of the clover. The amount of nitrogen fixed varies depending on species, stand density, soil fertility, weather and the extent to which the clover has been defoliated. However, numerous studies have shown that annual clovers often fix 50 to 200 pounds of nitrogen per acre per year. This can result in substantial savings in fertilizer for producers. Clovers are also usually higher in crude protein. Thus, digestibility is improved because many minerals and vitamins are digested more rapidly than with grasses. The introduction of clovers into grass pastures

often extends the grazing season as compared to grass alone. Addition of cool-season annual clovers to bermudagrass permits production of quality feed during winter and early spring when these pastures would otherwise be unproductive.

Adding clovers to a winter annual system requires two major management changes. First, the soil pH should be above 5.8. Most clovers do poorly in acidic soils. Liming the soil to a pH of at least 5.8 will help ensure a good stand of clover. Second, the nitrogen requirement is reduced or eliminated. Properly managed, clovers can supply all of the nitrogen necessary in a grass-clover mixture. It is recommended to apply all of the recommended phosphate and potash when the clover is seeded or when clover growth begins. Patience is required to allow the clover to become established. Most grazing in a grass-clover system will come in the spring.

Summary

In a livestock-forage operation, it is important to have up-to-date soil tests to determine needed fertilizer application. Proper rate and timing of fertilizer applications are valuable management tools for producing adequate amounts of high-quality forages as they are needed. Each producer must decide on the combination of forages and fertilization practices that best meets the needs of their production system. Instead of simply fertilizing all of your forage acreage with a small amount of fertilizer, a better approach may be to identify the more productive pastures and hay fields and manage them intensively through optimum fertilization and animal stocking rates.
