SL269

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# The Basics of Fertilizing Pasture[1]

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## Introduction

Producers who are managing their pastures for maximum forage production need to understand how to read and apply fertilizer recommendations correctly. The soil lab report recommendations supply the pounds per acre of certain nutrients and this must be converted to pounds of a manufacturer's mixture which is bought and then applied. By applying these recommendations properly, producers will get the most out of money spent and also protect the environment from excess nutrients.

Pasture management is the key to cost-effectively feeding grazing livestock. Forages are an effective way to supply nutrients, protein and energy to animals. However, productive pastures that supply sufficient amounts of nutrients to livestock require careful management of soil pH and fertility. Liming and fertilization are common management practices that can increase both forage production and nutritive value.

This article outlines the basics of pasture fertilization whether you are fertilizing for grazing, seed harvesting, or hay production. To begin with, what is N-P-K and what does it do for the pasture?

There are 17 essential mineral nutrients that plants require to survive. Some essential nutrients are found in sufficient amounts in the soil, such as zinc (Zn) and iron (Fe), while others need to be added as fertilizer. Nitrogen (N), phosphorus (P) and potassium (K) are known as macronutrients because plants require them in large amounts. These nutrients are typically applied as a fertilizer mixture. When reading the label on a fertilizer bag, the grade or ratio identifies the percentage by weight of N-$P_2O_5$-$K_2O$ in the mix. The chemical symbols shown on the label that designate various fertilizer constituents may confuse users who have no chemistry background. For example, nitrogen is listed on the label as the element N; phosphorus is given as the oxide $P_2O_5$ (i.e., diphosphorus pentoxide); and potassium is listed as the oxide $K_2O$.

For example, a 100 pound bag of off-the-shelf 20-5-10 fertilizer contains 20% N, 5% $P_2O_5$ and 10% $K_2O$, which equates to 20 pounds of N, 5 lbs of $P_2O_5$, and 10 lbs of $K_2O$ in the bag. The remainder of the weight is filler, which is often sand, limestone, and/or

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**All chemicals should be used in accordance with directions on the manufacturer's label.**

organic materials like biosolids. Producers who purchase fertilizer by the ton can customize the fertilizer grade depending on their fertilization need.

It is essential to test the soil every 2 to 3 years to determine lime, P and K requirements. Fertilizer application rates are calculated based on the forage crop needs and soil test results. Do not apply fertilizer if a soil test indicates the soil nutrient content is sufficient.

Unlike P and K, N application rates are based on expected yields (Table 1). It is important to use realistic yield expectations to avoid excessive cost and the environmental hazard associated with over-applying N fertilizer. Nitrogen is the most limiting nutrient in Florida pastures, therefore N fertilization usually results in an increase in forage yield and crude protein. Fertilizer should be applied in early spring to maximize growth and a decrease feed cost. If a second application is needed, it should be done after the first hay cutting. The more N you apply, the more P and K will be taken up as grass yield increases.

50 lbs $K_2O$ per acre/0.10 $K_2O$ = 500 lbs 20-5-10 per acre.

Therefore, 500 lbs of 20-5-10 per acre will provide the desirable rates of N-P-K. Applying this rate of fertilizer can be very expensive, so you should only fertilize for your production needs. This is a situation where custom blends may be an attractive option.

Fertilizer recommendations can vary according to the forage-management system. For example, if the pasture is only used for grazing, less fertilizer is needed than the amount necessary for a hayfield. Similarly, some forages like bahiagrass can persist with less nutrients than others like Tifton-85 bermudagrass. With the high cost of fertilizer, it is important to consider all the factors discussed above when developing cost-effective fertilization programs for forage crops in Florida. For more detailed information about N fertilizer rates for specific forage crops, refer to *Fertilizing and Liming Forage Crops* by Y. C. Newman, C. Mackowiak, R. Mylavarapu, and M. Silveira. This document is available online at http://edis.ifas.ufl.edu/AG179.

**Table 1.** Nitrogen fertilizer rates needed for three levels of forage growth.*

| Forage growth | N rate (lbs/acre) |
|---|---|
| Low | 50 – 60 |
| Medium | 100 |
| High | 80 + 80 split application |

*N recommendations shown in this table are only valid for grazing bahiagrass pastures. Other forage species or management (hay, seed, etc) will require different N application rates.

## Fertilizer Rate Calculation Example

A producer wants to fertilize a pasture with 100 lbs N, 25 lbs $P_2O_5$, and 50 lbs $K_2O$ per acre. He/she could select a common blend like 20-5-10 and calculate the lbs of fertilizer needed per acre:

100 lbs N per acre/0.20 = **500 lbs of 20-5-10 per acre**.

Notice that if you use $P_2O_5$ or $K_2O$ to calculate the rate, the answer is the same:

25 lbs $P_2O_5$ per acre/0.05 $P_2O_5$ = 500 lbs of 20-5-10 per acre.

## Sources of Nitrogen

N fertilizers typically used in forage production include:

- Ammonium nitrate (33-0-0)
- Ammonium sulfate (21-0-0-24S)
- Urea (46-0-0)
- Organic sources (e.g., biosolids, animal manure, poultry litter)

Besides the differences in N concentration, different N sources may not be equally effective when applied to established pastures in Florida. A number of factors, including soil type, rate and method of application, and environmental conditions can impact the effectiveness of different fertilizer sources to provide N to pastures. Another important aspect to consider is the acidifying potential of the N source. For example, ammonium sulfate has three times the acidifying potential of ammonium nitrate and urea. Thus, use of ammonium sulfate will increase the need for lime in the long term.

## Soil Acidity

A measurement of soil pH provides information on soil acidity. Soil testing for pH should be repeated at least every 3 years. The target pH for bahiagrass and other improved perennial grasses is 5.5. Fertilization is not as effective if the soil pH is too low or excessively high. A “rule of thumb” that has been used for years states that 1 ton of standard agricultural lime applied per acre will raise soil pH about 1 unit. This rule is only an approximation for Florida s mineral soils, since organic matter and soil texture influence how effective lime application will be in raising soil pH. Only a soil test result can provide an accurate lime recommendation. The purpose of liming is to improve fertilizer efficiency, nutrient availability, and root system development, which ultimately increase crop yield. Dolomitic or calcitic lime should be incorporated 3 to 6 months prior to planting. If surface-applied, the lime should be allowed to react in the soil for at least 3 to 6 months before spring fertilization. Liming at the same time as N application (particularly urea or organic sources) may increase N loss through volatilization to the air.

## Collecting and Submitting Soil Samples

Develop a plan to collect samples that accurately represent the area that will be fertilized:

- Be sure the samples are of the same soil type, appearance, or cropping history.
- Separate samples should be taken from problem areas.
- Sample the soil to the depth of tillage, which is usually 6 to 8 inches.
- Collect at least 15 to 20 soil cores from each area.
- Mix the soil cores in a clean plastic bucket.
- Spread the soil on clean paper or other suitable material to air dry. (Do not send wet samples.)
- Mix the dry soil and place about one pint of it in a labeled sample bag.
- Fill out the information sheet for each soil sample.
- Send the soil samples and information sheet to the laboratory.

Soil test results will be sent to you within 5 to 10 days after your sample arrives at the laboratory. For maintenance of established bahiagrass pastures, both plant tissue and soil samples should be submitted to the laboratory for analysis. Information sheets/submittal forms are available on line at http://soilslab.ifas.ufl.edu/pdf%20files/SS18600.pdf, or at your local county extension office.