

## The Basics of Fertilizing Pasture<sup>1</sup>

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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.

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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.

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.

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>.

### 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)

## How can you AFFORD not to fertilize?

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## Production Goals

- What are your production goals?
  - Raising feeder calves
  - Raising replacement heifers
  - Raising bulls
  - Growing Hay
  - Growing Annual Grasses
- How can fertilizing help you meet your production goals?
  - Fertilizer promotes healthy forages

## How Does Fertilizing Pay You

- Higher Pregnancy Rates
- Heavier Weaning Calves
- Healthy weed free pastures
- High protein hay
- Higher yielding hay crops



## Hay

- Why do we care about the protein in Hay?

If hay is poor quality you are wasting time and money bailing. If hay is lacking nutrients you will still have to provide more feed to get cattle to rebreed.

So your goal should be to fertilize and cut at the proper time to get the most out of each cutting.

Less rolls of high quality hay is better than a bunch of poor quality hay.

## Pregnancy Rates

The first goal in a beef operation is to increase pregnancy rates because this effects the bottom line more than any other factor.

Forages are the most economical means of feeding cattle.



## Why fertilize pastures in spring

- Spring is when grass is low in supply and high in demand.
- Spring is optimum time for breeding cattle so you want nutrient intake high so they will cycle and rebreed.
- When summer rolls around there is usually plenty of grass available.
- Summer bahia grass is poor quality because of increased lignin and high in moisture content.

### Weaning Weights

- Besides good genetics why do calves grow?

Mothers Milk  
Good Forage

Both of these are dependent on fertilizing pastures.

### Replacement Females

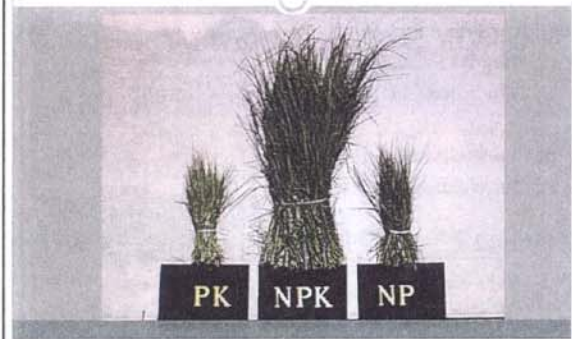
- If you are raising your own replacement females they have to be 65% of mature weight to breed at 1 year of age.
- How much do your heifers weigh at weaning and what are you doing to prepare them for breeding?
- This is impossible to do with out really good forage and supplemental feeding after weaning.

### Soil Condition

- If the pastures are left unfertilized for several years it can be detrimental to the growth of forage.
- Thus negatively impacting cattle health and production.



### Balance Nutrients



### No Fertilizer - Cattle

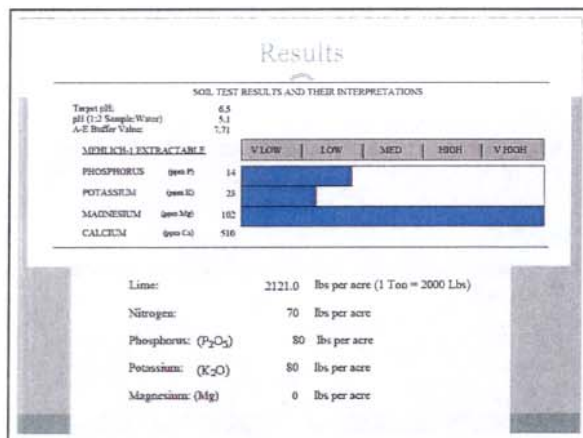
- A sure way to save money is no fertilizer but that leads to a loss of about 1,700 lb per acre per year of bahia forage.

Is this a loss you are willing to take thus reducing productivity of herd and your cattle's reputation?

### No Fertilizer - Hay Fields

- Cutting out required nutrients will lead to a loss of stand thus drastically decreasing yield.
- This loss in stand will take several years to make right.
- It will take several years of fertilizer application to get nutrients back to the proper levels.





### Bermuda Hay

Bermudagrass Production in Florida

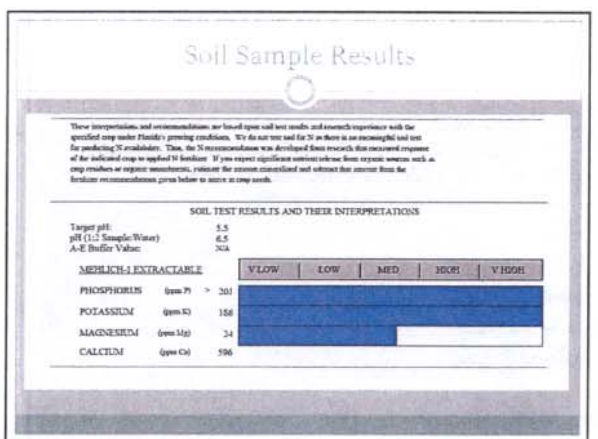
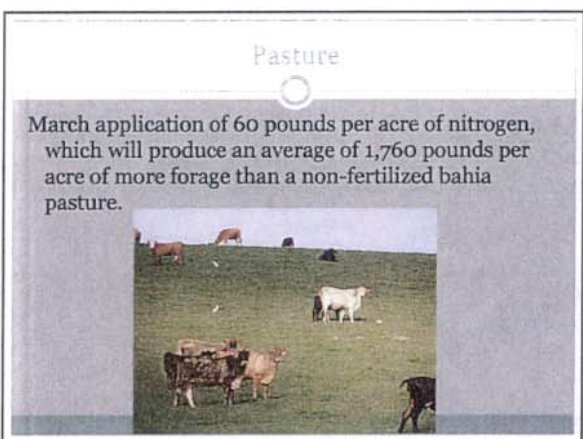
Table 1. Estimates of crude protein, dry matter yield and nitrogen removal for bermudagrass harvested every six weeks.<sup>1</sup>

Applied N (lb/acre) <sup>2</sup>	Crude Protein (%)	Optimum Season		Dry season	
		Dry Matter (tons/acre)	N Removal (lb/acre)	Dry Matter (tons/acre)	N Removal (lb/acre)
100	9.2	5.0	160	2.5	75
200	11.0	7.0	250	3.5	125
300	12.2	8.8	340	4.4	170
400	13.1	9.8	410	4.9	205
500	13.8	10.4	460	5.2	230

<sup>1</sup>University of Florida, IFAS, Circular 838, "Estimation of bermudagrass production in Florida" by A. R. Overman et al.  
<sup>2</sup>Applied in split applications over growing season.

- ### Weeds
- Weeds are caused from bare spots in the grass. These spots are caused from stressed caused by overgrazing, drought, and poor nutrients.
  - After killing weeds best way to control them is help the grass to out grow them by fertilizing it so it will fill in those bare spots.
  - Low pH encourages growth of undesirable grasses.

- ### Application Timing
- Timing of application to coincide with the expected season of maximum growth response is the desired goal.
  - When the quantity and quality is most beneficial to the cattle for which it is targeted.
- Bermuda- spring and after 1<sup>st</sup> cutting  
 Bahia-spring  
 Winter Annuals- at planting and 1 month after grazing



## Soil Sample Results for Hay

For hay fields apply 80 pounds of Nitrogen per cutting.

LIME AND FERTILIZER RECOMMENDATIONS	
Correct: Improved potential grasses other than bahiagrass (see table, http://soilslab.ifas.ufl.edu)	
Lime:	0.0 lbs per acre (1 Ton = 2000 Lbs)
Nitrogen:	100 lbs per acre
Phosphorus: (P <sub>2</sub> O <sub>5</sub> )	0 lbs per acre
Potassium: (K <sub>2</sub> O)	0 lbs per acre
Magnesium (Mg)	20 lbs per acre

Amounts are given in pounds per acre. These amounts are an integral part of fertilization recommendations. Please read label carefully.  
Soil Sampling: 1/1/14 12/12/14 12/14/14

## Soil Sampling

### All Forage Soil Sample

<http://soilslab.ifas.ufl.edu/pdf%20files/SS18600.pdf>

### Bahia Soil Sample

<http://soilslab.ifas.ufl.edu/pdf%20files/BahiaProtocolForm.pdf>

## Basics of Soil Nutrients

- If you don't stick to the basics you will pay for it eventually.

**Lower**  
Weaning Weights  
Pregnancy Rates  
Hay Production



## What is 20-5-10

- N- 20% nitrogen  
 $.20 \times 300 \text{ lbs/acre} = 60 \text{ lbs per acre of N}$
- P- 5% phosphorus  
 $.05 \times 300 \text{ lbs/acre} = 15 \text{ lbs per acre of P}$
- K- 10% potassium  
 $.10 \times 300 \text{ lbs/acre} = 30 \text{ lbs per acre of K}$

## Practice

You have a 40 acre pasture that needs 60 pounds of Nitrogen, 0 pounds of Phosphorus, and 40 pounds of Potassium. Which mixture will you buy and how many pounds per acre are needed.

10-10-10- \$325  
20-0-10- \$390  
20-5-10 \$410  
18-0-9 \$350

## Answer

- 300 pounds per acre of 20-0-10  
 $300 \times .20 = 60 \text{ pounds of nitrogen}$   
 $300 \times .10 = 30 \text{ pounds of potassium}$

### Things to ponder

- Fertilize 1 acre per cow/calf pair each spring. Using a 20-0-10 that would be approximately \$55 per cow.
- Is having a bred cow and a nice calf to sell worth \$55?
- Rotate pastures that you fertilize. Don't try to the whole ranch every year.
  - If nothing else make sure the pH is right.

Questions?  
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