

**PLNT 1213**  
**Note outline**

**Soil Fertility**

Chapter 10

**Objectives**

Know how plants acquire mineral nutrients  
Know 16 plant essential elements  
Know functions and sources of N, P, and K  
Know how to sample soils for soil testing  
Know the parts of a soil test report

Know how to calculate fertilizer application rates

Understand the nutrient cycling, using the N cycle as an example

Discuss soil pH

Nutrient uptake

Casparian strip

Soil solution

Mechanisms of nutrient uptake

1.

Mycorrhizae

2.

3.

Plant essential elements

There are 16 plant essential elements

Non-mineral nutrients

Macronutrients

Micronutrients

Plant nutrient status

Sufficient

Deficient

Toxicity

The "big 3" nutrients

Nitrogen

Phosphorus

Potassium

Nitrogen

Nitrogen in the plant

Nitrogen sources

1. Synthetic fertilizers

2. Symbiotic nitrogen fixation

3. Soil organic matter

Phosphorous

Phosphorous in the plant

Phosphorous sources

Potassium

Potassium in the plant

Potassium sources

Soil testing

Soil sampling

- 1.
- 2.
- 3.

Soil test report

A soil test report almost always has three pieces of information (sometimes more):

% organic matter

pH

Nutrient recommendation



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**SOIL TEST REPORT**

SWFAL FREE SAMPLE  
 MICHAEL KRESS  
 045 AG HALL  
 OSU,  
 (405) 744-7771

Name:  
 Location:

Lab ID No.: 534361  
 Customer Code: 97  
 Sample No.: 1  
 Received: 6/16/2009

- Routine Test -	- Secondary Nutrients -	- Micronutrients -
pH: 7.6	SO <sub>4</sub> -S(lbs/A) Surface: 15	Fe (ppm): 22.4
Buffer Index:	Subsoil:	Zn (ppm): 5.92
NO <sub>3</sub> -N(lbs/A)	Ca (lbs/A): 10426	B (ppm): 1.07
Surface: 39	Mg (lbs/A): 398	Cu (ppm): 1.84
Subsoil: 86		
Soil Test P Index: 27		
Soil Test K Index: 354		
	- Additional Tests -	
	OM (%): 3.45	

**INTERPRETATION AND REQUIREMENTS FOR *Wheat* (YIELD GOAL = 40bu/acre )**

- Test -	- Interpretation -	- Requirement -	- Recommendations and Comments -
pH	Adequate	No lime required	
Nitrogen	Adequate	None	150 lbs of beef per acre from existing nitrogen
Phosphorus	84% Sufficient	33 lbs/acre P <sub>2</sub> O <sub>5</sub> annually	
Potassium	Adequate	None	
Sulfur	Adequate	None	
Calcium	Adequate	None	
Magnesium	Adequate	None	
Iron	Adequate	None	
Zinc	Adequate	None	
Boron	Adequate	None	
Cu	Adequate	None	
Organic Matter	High		

Signature

## Applying fertilizers

To calculate the amount of fertilizer you'll need to purchase, you'll need to know three things:

1.

2.

3.

Example:

You're the wheat grower who submitted the soil test report we used as an example. You need to apply 33 lbs P<sub>2</sub>O<sub>5</sub>/A. You're going to apply diammonium phosphate (18-46-0) to 80 acres.

How many pounds of fertilizer do you need to buy?

How much N will you also apply?

Answer:

$$\frac{\text{P2O5}}{\text{A}} \times \frac{1 \text{ lb DAP}}{\text{P2O5}} \times \text{A} = \text{lbs DAP}$$

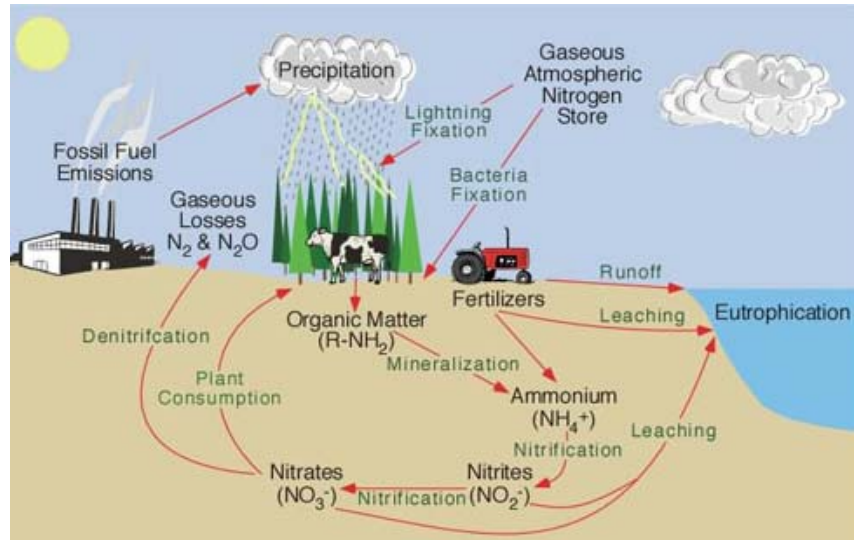
Organic fertilizers (manures)

## Sensor-based nutrient management

N-Rich strips

Nutrient cycling

Nitrogen cycle



Inputs

Symbiotic N fixation

The Haber-Bosch Process

Losses

Eutrophication

Transformations

Mineralization

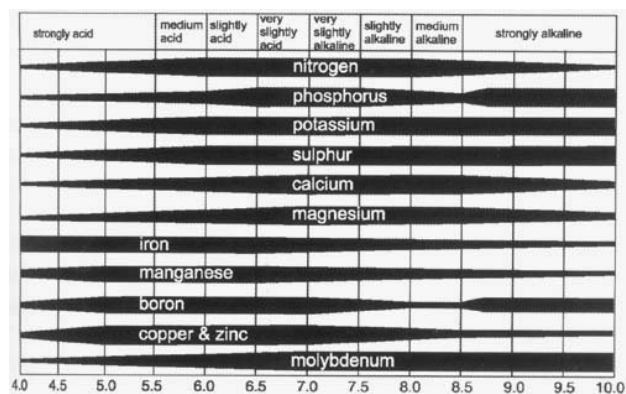
Immobilization

C:N

Soil pH

Applying ammonium-nitrogen fertilizers may

## Soil pH and nutrient availability



Correcting soil pH