

Nutrient Control Best Management Practices

Shabnam Sadeghibaniani

PhD Agronomy, Postdoctoral Research Associate, Everglades REC, UF/IFAS

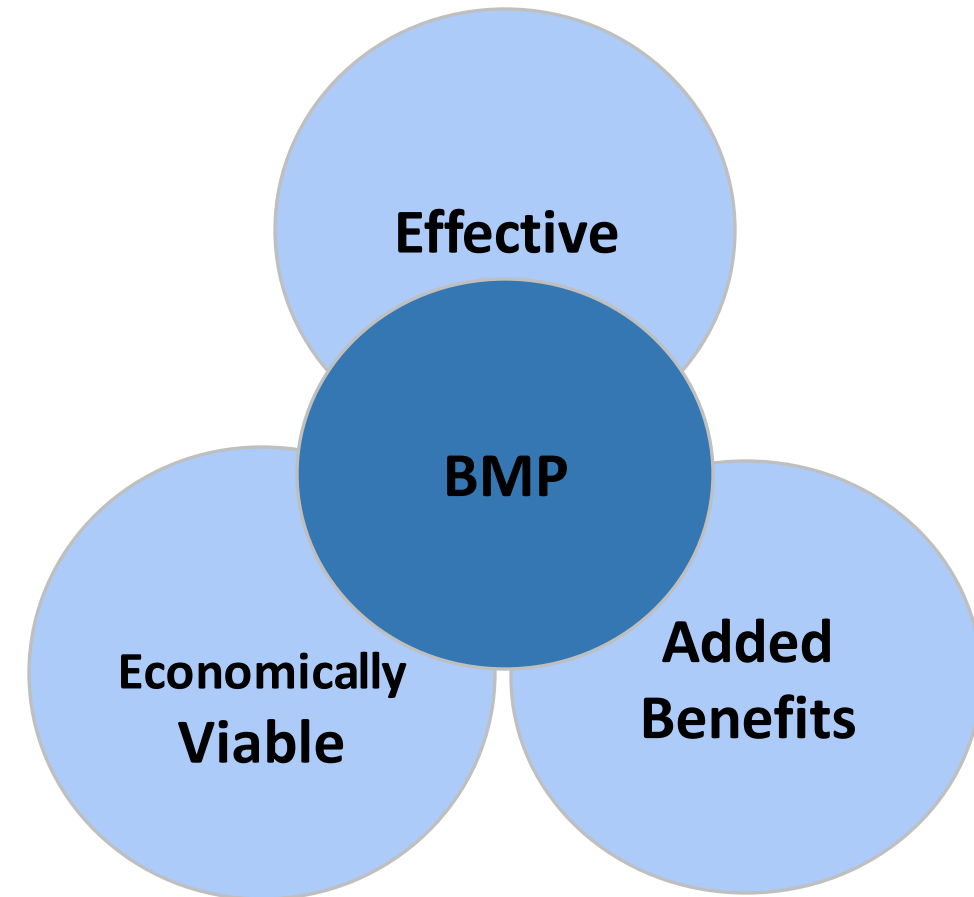
BMP Topic Includes

- BMP definition and goal
- Effectiveness of BMPs in the EAA
- The (4+1) Rs of Nutrient Stewardship
 - Fertilizer Recommendation
 - Plant Tissue Testing
 - Soil Testing
 - Optimum Yield
- Spill Prevention

BMP Definition:

An alternative management practice that is **technically feasible, economically viable, socially acceptable, and scientifically sound.**

The Main Goal of BMPs is when it is implemented, it should effectively **reduce P concentrations and loads** exiting farms in the EAA while **maintaining agricultural productivity.**



Best Management Practices in Florida



- The **University of Florida/IFAS** started its P concentration and load reduction agricultural BMP R&E program in 1986.
- **In January 1995, SFWMD**, incorporated specific BMPs into a regulatory program, making their implementation mandatory.
- Since 1995, EAA growers have successfully reduced P loads by **over 50%**, exceeding legal requirements reduction.

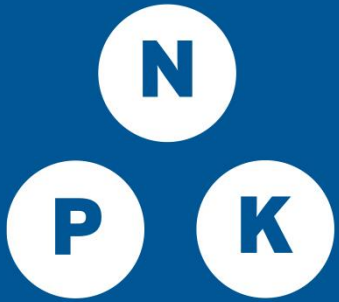
Reducing P concentration in drainage water:

- **Reduces P loads off the farm**
- Prevents algal blooms
- Limits aquatic weed growth which could reduce drainage capacity
- Helps maintain adequate dissolved oxygen levels



The use of fertilizer BMPs is part of the (4+1) Rs of nutrient stewardship

RIGHT SOURCE



RIGHT RATE



RIGHT TIME



RIGHT PLACE

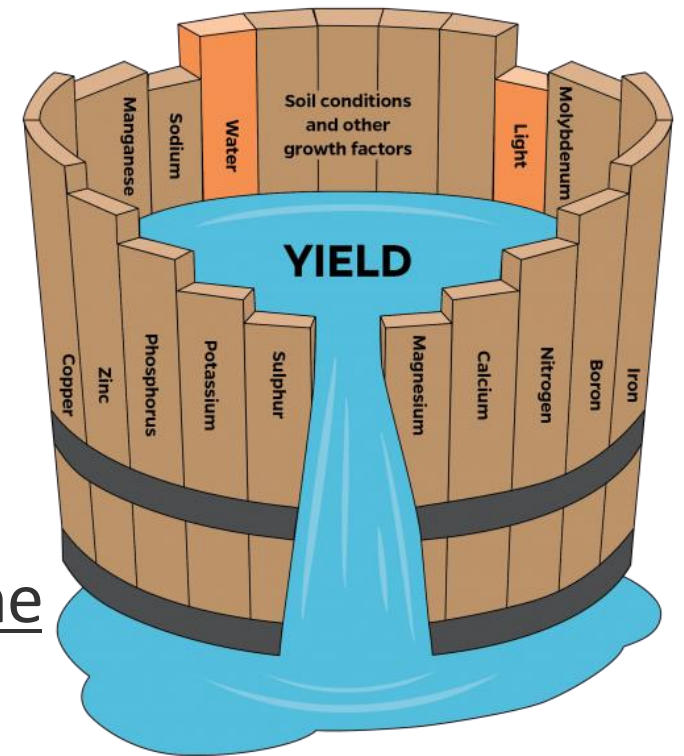


The (4+1) Rs philosophy leads to **enhanced environmental protection, increased production, increased farmer profitability, and improved sustainability.**

Nutrient Balance leads to Reach Optimum Yield

Fertilizer Recommendation:

- 1- Integrating Soil Testing
 - 2- Plant Tissue Analysis
 - 3- Optimum Yield
- ❖ Applying an adequate amount of nutrients saves the producer money, helps protect the environment, maximizes crop yields, conserves valuable resources, and prevents nutrient imbalances.

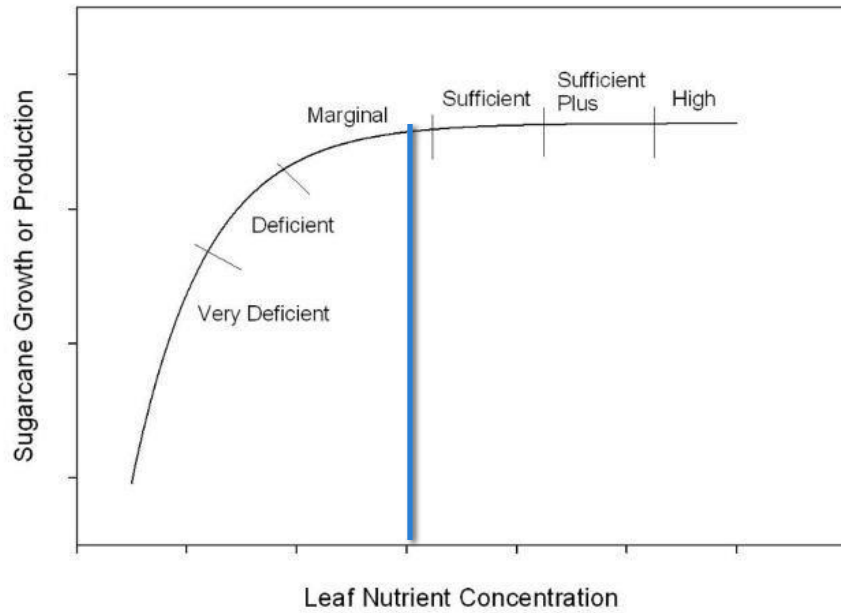


Plant Tissue Analysis:

- Critical Nutrient Level (CNL) approach and the Diagnosis and Recommendation Integrated System (DRIS).
- Plant tissue testing, when used in conjunction with soil testing, can be a valuable tool for refining fertilizer recommendations and improving crop yield.
- It provides a current snapshot of the plant's nutrient status, aiding in adjusting future fertilizer applications as needed.



Sugarcane Leaf Nutrient Ranges



† Very Deficient: Estimated production losses > 25%
 Deficient: Estimated production losses 6%–25%
 Marginal: Estimated production losses 1%–10%

Nutrient	Optimum Range	Est. 5-10% Loss	Est. 25% Loss
	-----%-----		
N	2.0-2.6	1.8	1.6
P	0.22-0.30	0.19	0.17
K	1.0-1.6	0.9	0.8
Ca	0.22-0.45	0.20	0.18
Mg	0.15-0.32	0.13	0.11
Si	≥0.60	0.50	0.20
	-----mg/kg-----		
Fe	55-105	50	40
Mn	20-100	16	12
Zn	17-32	15	13
Cu	4-8	3	2

The CNL: nutrient concentration at which production losses reach 5% to 10% and are considered as a minimum acceptable level of nutrient concentration.

Additional Leaf Analysis Information

McCray, J. M., and R. Mylavarapu. 2020. **Sugarcane nutrient management using leaf analysis.** <http://edis.ifas.ufl.edu/AG435>

McCray, J.M., V.I. Ezenwa, R.W. Rice, and T.A. Lang. 2019. **Sugarcane plant nutrient diagnosis.** <http://edis.ifas.ufl.edu/SC075>

Ezenwa V.I., J.M. McCray, P.R. Newman, and R.W. Rice. 2021. **Sugarcane leaf tissue sample preparation for diagnostic analysis.** <http://edis.ifas.ufl.edu/SC076>

Excel Spreadsheet to calculate DRIS indices for Sugarcane
<http://erec.ifas.ufl.edu/DRIS/DRISCalculator.zip>



Importance of soil Testing:

- Soil testing was accepted as an essential tool to formulate how to use lime and fertilizer properly in the late 1940s.
- However, with increased emphasis on **environmental quality** and **the rising cost of fertilizer materials**, soil testing is becoming an important tool to **determine areas where adequate or excess fertilization has occurred.**

Soil Testing: From Sampling to Recommendation

1. Soil Sampling:

Collection of Soil Samples

Handling and Submitting

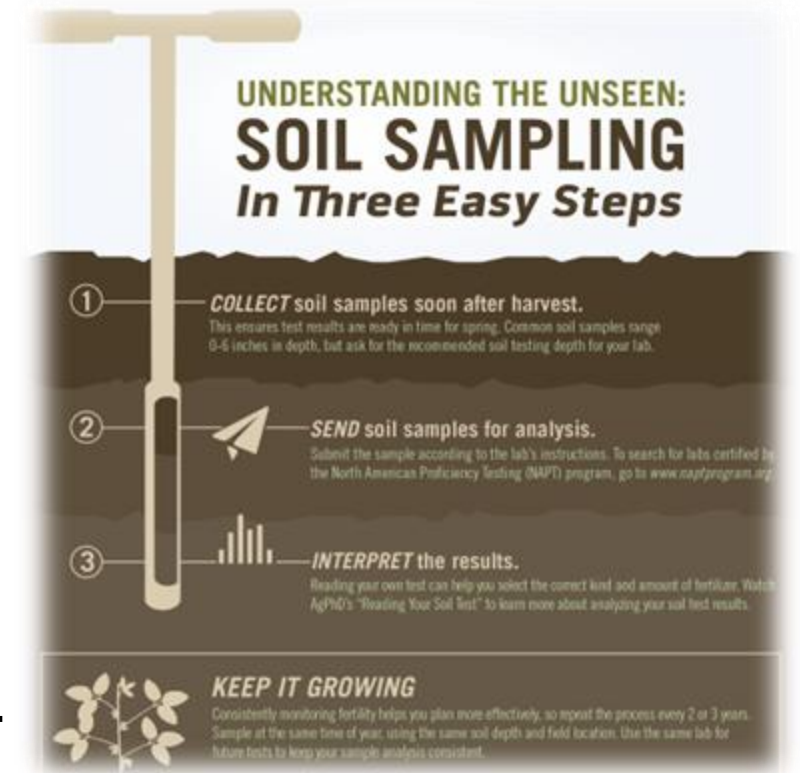
2. Laboratory Extraction and Analysis:

Sample Preparation

Extraction and Measurement of Nutrients

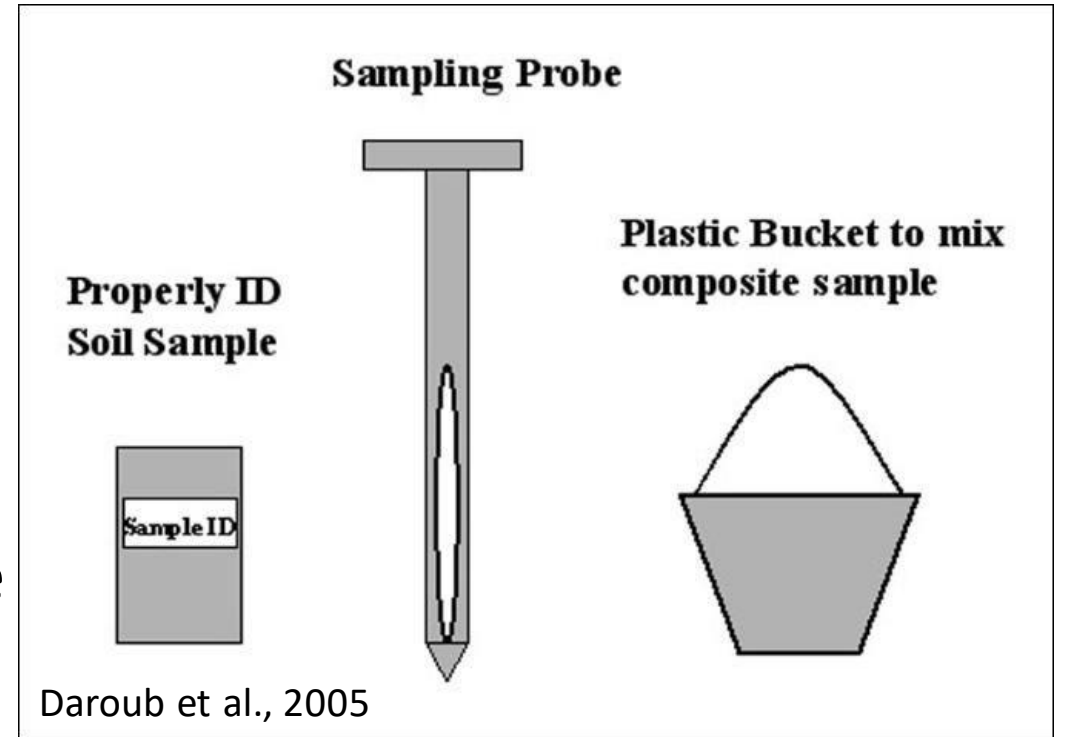
3. Interpretation and Fertilizer Recommendation:

Research-based fertilizer recommendations for Specific crops



1- Soil Collection

- Use a proper sampling tool
- Zig-zag, V-pattern
- Take a representative sample
- Take samples from the crop root zone
- History of previous samples should be considered



- 20-25 cores (40 acre block) are needed for a composite sample; and mixed well

1- Soil Collection

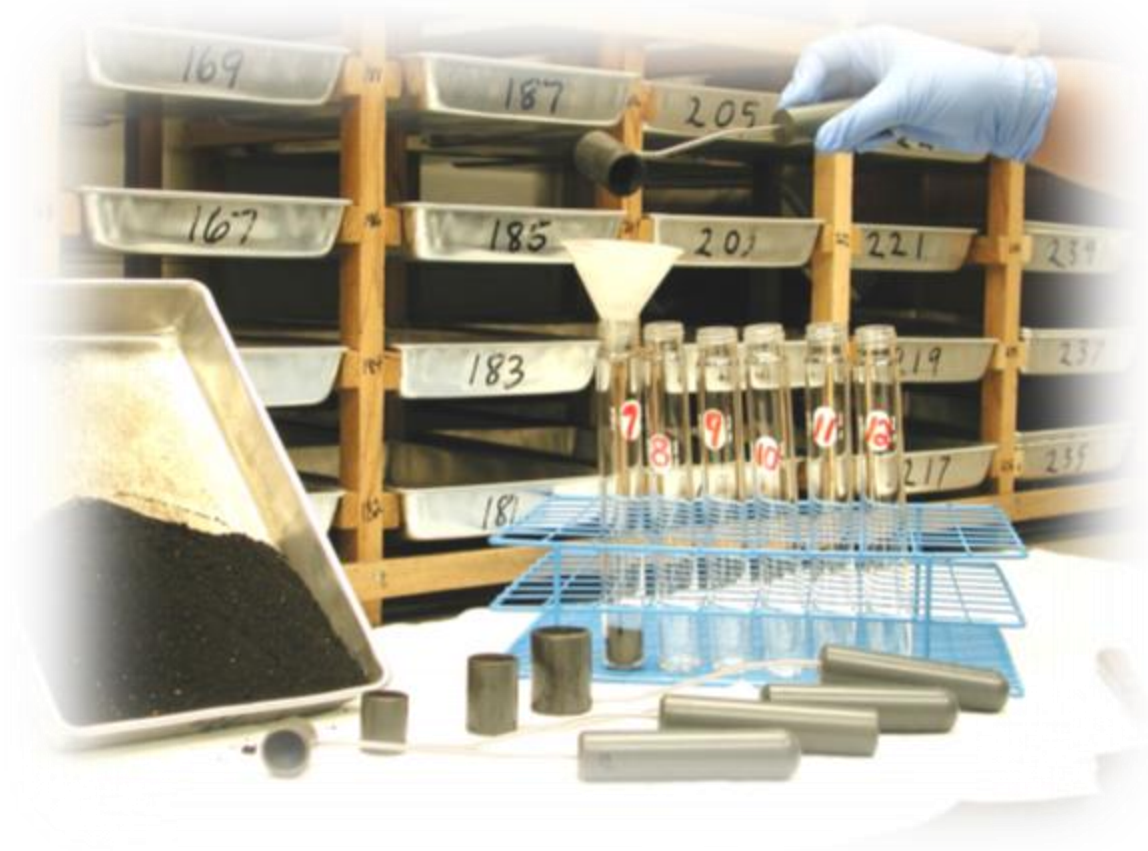
- Take separate samples from areas with different fertilizer or cropping history
- Don't take samples within 100 ft of field ends or 30 ft of ditches. **Why?**
- Clearly label and identify the sample and include contact information
- Fill out the appropriate information sheets and submission forms.



2- Laboratory Analysis:

Sample Preparation and extraction

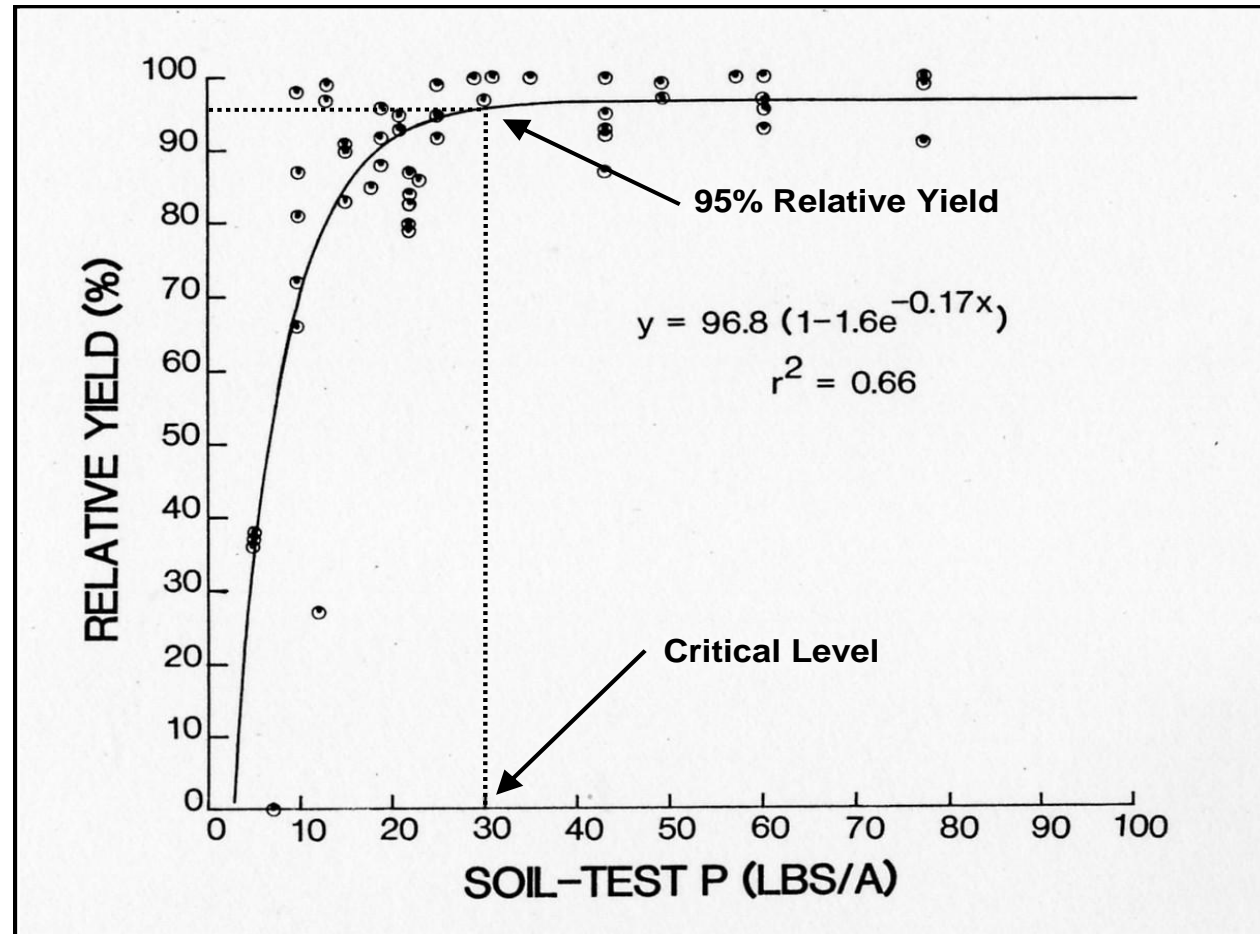
- Soil samples should be air-dried before shipping to the laboratory for analysis.
- Soil tests are available for pH, P, K, Ca, Mg, Si, and Fe.



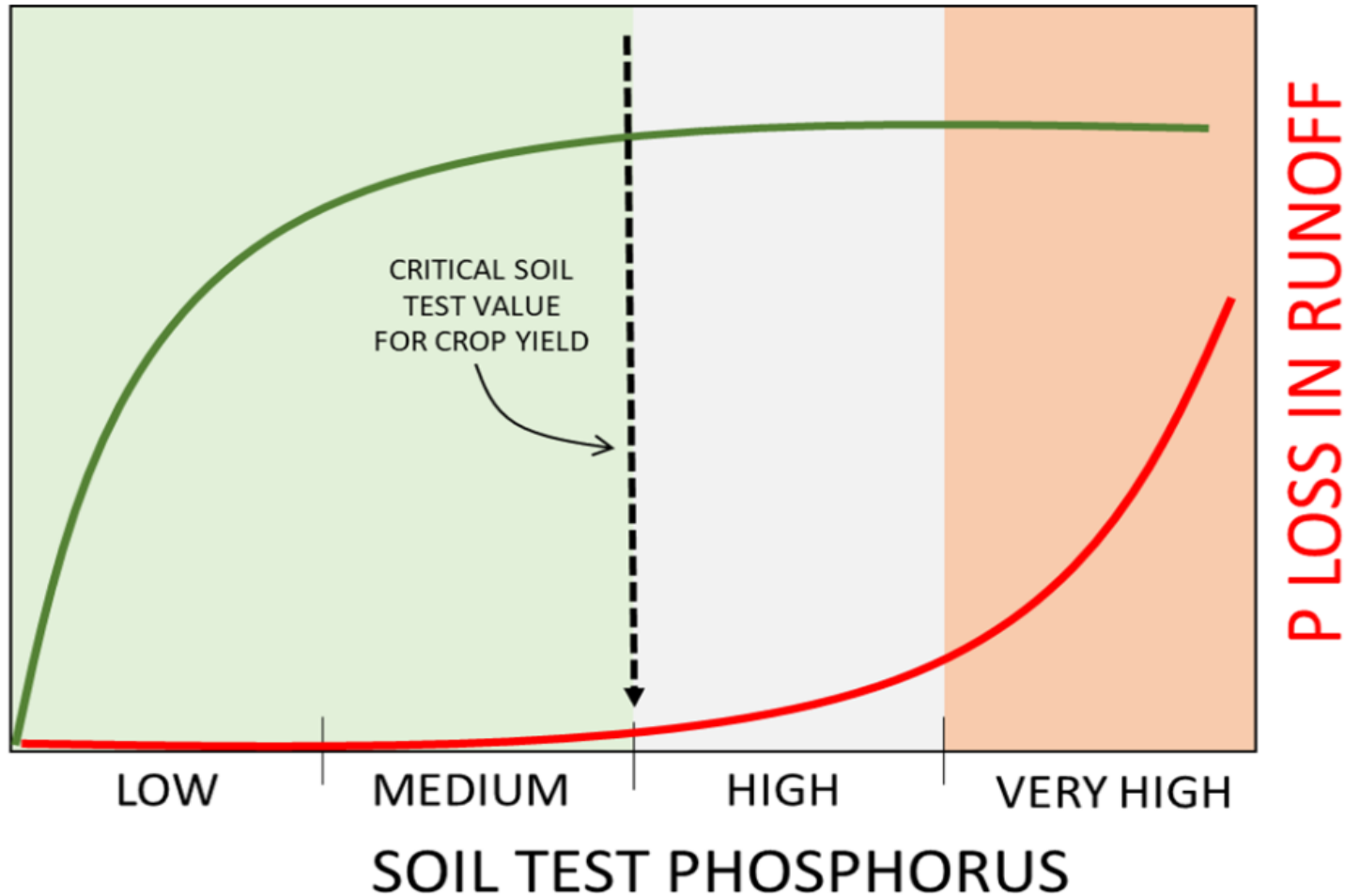
Laboratory Analysis: Measurement



3. Interpretation and Recommendation: Response of Crisphead Lettuce to Soil Test P Levels



Relationship Between Soil Test P, Crop Yield, and Potential for Environmental Problems due to Excessive Soil P



Right Place: Banding P Fertilizer

More efficient P uptake

Less P fixation in soil

Reduces overlapping application

Reduces P rate, especially for vegetables



Right Rate: Nutrient Management Research

New Recommendations for Sugarcane on Mineral and Transitional Soils

P, K, Si, N, and S

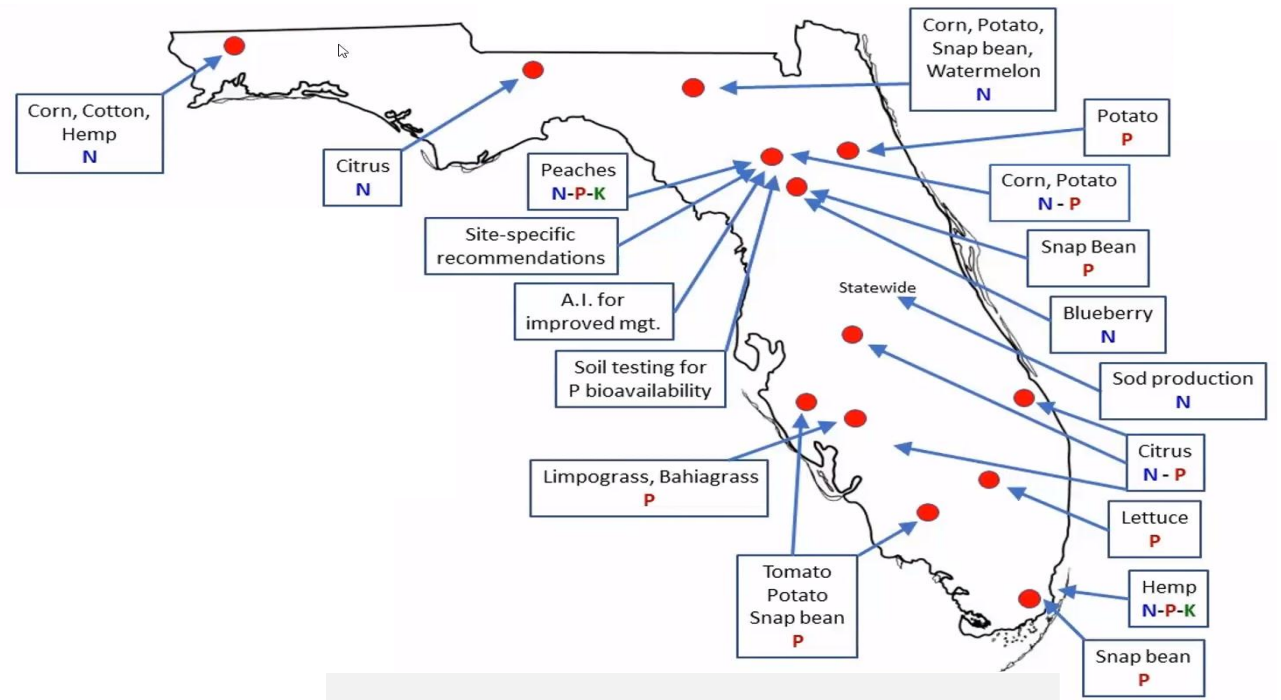
Carrots N

Potato P

Strawberry N

Turf grass P, N

Citrus Ca, Mg, Mn, and Zn



Prevent Fertilizer Misapplication

- Don't apply nutrients at higher than recommended rates
- Turn off the spreader at the ends of fields
- Calibrate equipment
- Train personnel



Recommendations to Reduce Fertilizer Spills:

- Limit the number of loading sites
- Contain spills on tarps
- Have buckets and shovels available for cleanup
- Apply small spills to target field
- All personnel should be trained in handling spills
- Park fertilizer trailers away from canal banks
- Loading sites should be on level ground



Take Home Summary

By implementing BMPs, farmers can effectively control fertilizer application to optimize crop productivity while minimizing negative environmental effects.

New Comprehensive Sugarcane Nutrition Guide in EDIS

Nutritional Requirements and Fertilizer Recommendations for Florida Sugarcane

<https://edis.ifas.ufl.edu/publication/SC028>