Nutrient Cycling: Soil and Fertility Management in Pasture Systems

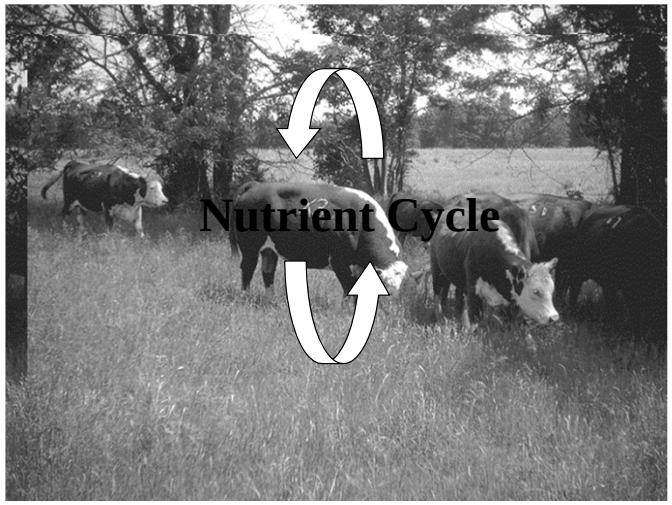
DEPARTMENT OF Plant and Soil Sciences

PHONE • 662-325-2311 BOX 9555 • MISSISSIPPI STATE • MS • 39762 FAX • 662-325-8742

MISSISSIPPI STATE UNIVERSITY EXTENSION SERVICE

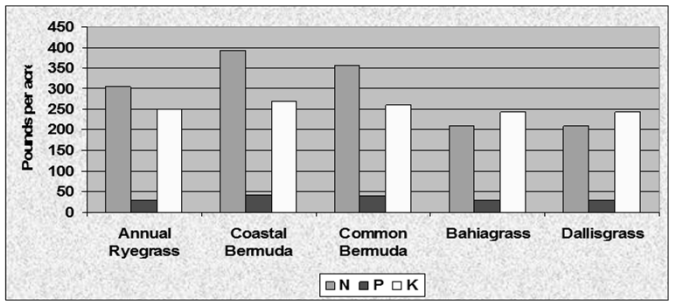
Larry Oldham, Ph.D.

Extension Professor – Soils

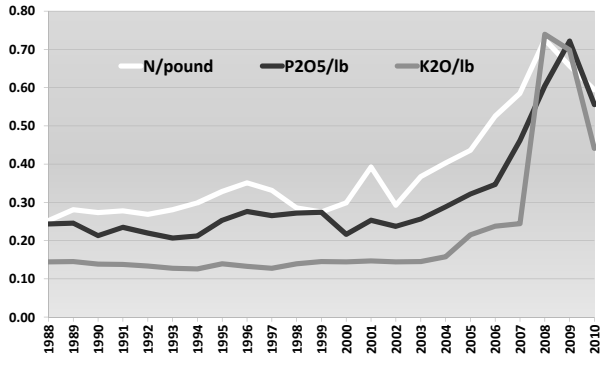


From Mitchell, AU

Macronutrient Uptake by Forages at 90% of Maximum Production (Robinson, 1996)



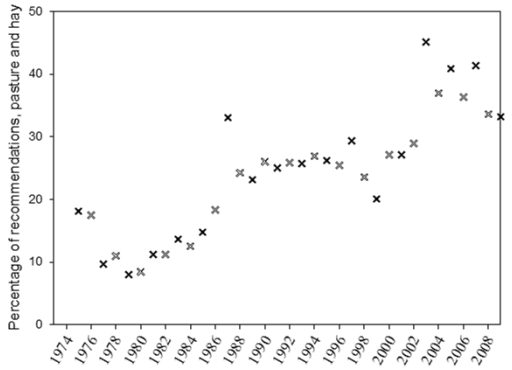
Fertilizer Prices Per Al Pound, from NASS Prices Paid, April each year



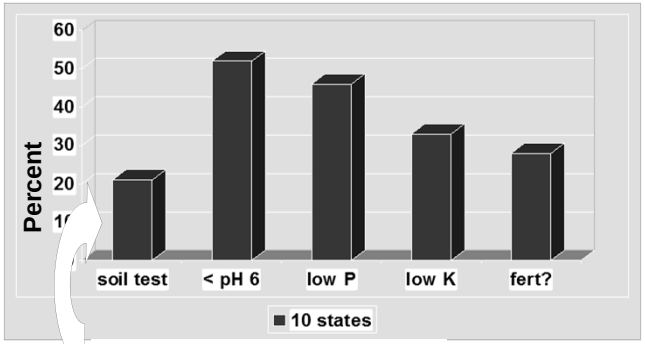
Fertilizer situation: prices, availability

- **Prices for P, K: more stable**
- **N prices: always (almost) tied to energy $**

Pasture and forages, % of MSU ES STL Recommendations

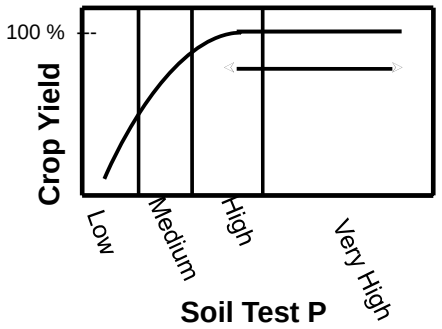


Southern Pasture Fertility



Only 1/5 Soil Test!

Why Soil Test?



Sharpley et al., 1993

Managing Pasture Soil Fertility

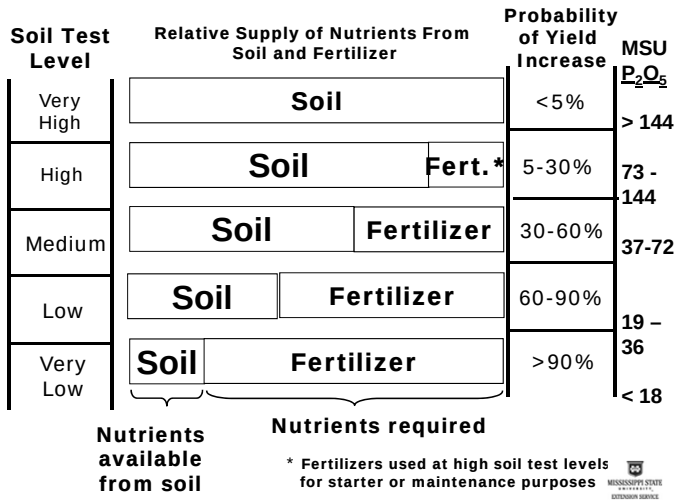
1. Soil test: 2-3 year rotation
2. Lime adequately: pH controls nutrients
3. Grow best crop, fertilize responsive areas
4. Use “right” rate
5. Take nutrient credits as appropriate
6. Maximize efficiency / avoid losses
7. Avoid unnecessary additions

Managing Pasture Soil Fertility

1. Soil test: 2-3 year rotation
2. Lime adequately: pH controls nutrients
3. Grow best crop, fertilize responsive areas
4. Use “right” rate
5. Take nutrient credits as appropriate
6. Maximize efficiency / avoid losses
7. Avoid unnecessary additions

Managing Pasture Soil Fertility

1. Soil test: 2-3 year rotation
2. Lime adequately: pH controls nutrients
3. Grow best crop, fertilize responsive areas
4. Use “right” rate
5. Take nutrient credits as appropriate
6. Maximize efficiency / avoid losses
7. Avoid unnecessary additions



Managing Pasture Soil Fertility

1. Soil test: 2-3 year rotation
2. Lime adequately: pH controls nutrients
3. Grow best crop, fertilize responsive areas
4. Use "right" rate
5. Take nutrient credits as appropriate
6. Maximize efficiency / avoid losses
7. Avoid unnecessary additions

MSU ES Soil Test Calibration and Correlation

Soil Test Category	Soil Test Results	Expected Yield Without Fertilizer		Recommended Fertilizer	
		P_2O_5	K_2O	P_2O_5	K_2O
	---- lb/A ----	------ % -------		------- lb/A ------	
Very Low	0 – 18	35-80	50-80	120	120
Low	19 – 36	75-96	75-96	60	60
Medium	37 – 72	92-100	92-100	30	60
High	73 – 144	100	100	0	0
Very High	> 144	100	100	0	0

Managing Pasture Soil Fertility

1. Soil test: 2-3 year rotation
2. Lime adequately: pH controls nutrients
3. Grow best crop, fertilize responsive areas
4. Use "right" rate
5. Take nutrient credits as appropriate
6. Maximize efficiency / avoid losses
7. Avoid unnecessary additions

Back to the old ways: Explore legumes

	N Fixed	Price of N					
Crop	lb/ac/yr	$0.70	$0.80	$0.90	$1.00	$1.10	$1.20
Alfalfa	150 - 250	105 - 175	84 - 200	135 - 225	150 - 250	165 - 275	180 - 300
Arrowleaf clover	50 - 110	35 - 77	62 - 88	45 - 99	50 - 110	55 - 121	60 - 132
Crimson clover	70 - 120	49 - 84	39 - 96	63 - 108	70 -120	77 - 132	84 - 144
Red clover	75 - 200	53 - 140	42 - 160	68 - 180	75 - 200	83 -220	90 - 240
Sweet clover	80 - 110	56 - 77	45 - 88	72 - 99	80 - 110	88 - 121	96 - 132
White clover	75 - 150	53 - 105	42 - 120	68 - 135	75 - 150	83 - 165	90 - 180
Vetch, Lespedeza, etc	50 - 150	35 -105	28 - 120	45 -135	50 - 150	55 - 165	60 - 180

Managing Pasture Soil Fertility

1. Soil test: 2-3 year rotation
2. Lime adequately: pH controls nutrients
3. Grow best crop, fertilize responsive areas
4. Use “right” rate
5. Take nutrient credits as appropriate
6. Maximize efficiency / avoid losses
7. Avoid unnecessary additions

Efficiency

What is 33-0-0?

Soil test based
Calibrated equipment

Apply: **What you need**
Using appropriate material
When you need it

Managing Pasture Soil Fertility

1. Soil test: 2-3 year rotation
2. Lime adequately: pH controls nutrients
3. Grow best crop, fertilize responsive areas
4. Use “right” rate
5. Take nutrient credits as appropriate
6. Maximize efficiency / avoid losses
7. Avoid unnecessary additions

Strategies for fertilizer situation

We have cycled back!

SEE NUMBER ONE:

Soil test!

What about all this poultry stuff?

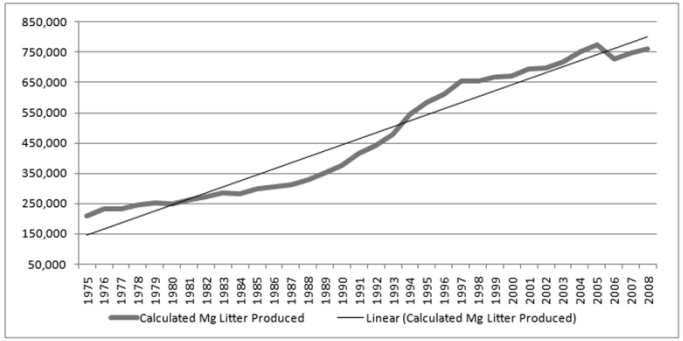
	% content of fresh litter				Pounds per Ton, fresh litter		
	N	P_2O_5	K_2O		N	P_2O_5	K_2O
Alabama	2.68	1.37	2.18		54	27	44
Georgia	3.15	2.77	2.33		63	55	47
Mississippi	3.11	1.57	3.14		62	31	63
Texas	2.83	3.55	3.07		57	71	61

Litter as Forage Fertilizer

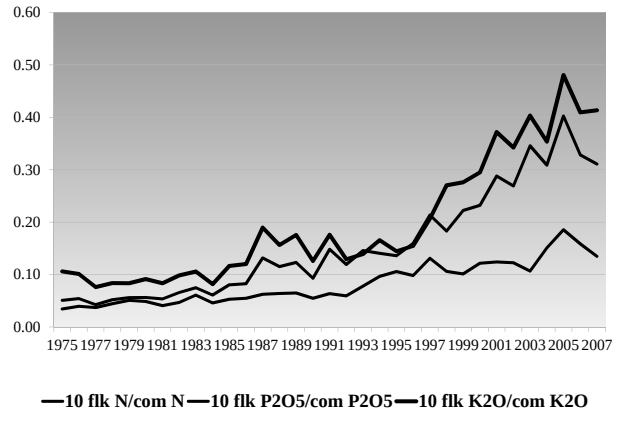
Four tons of Mississippi litter/acre
248 – 124 – 252

In the application season, about:
- **half the N is used**
- **25 to 40% of phosphate ***
- **up to 90% of potash**

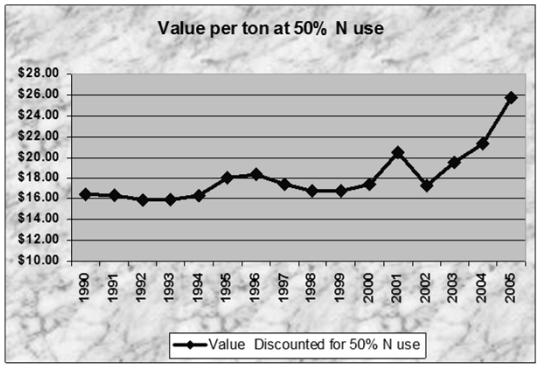
How Much Poultry Litter is there?



How Much Poultry Litter is there?

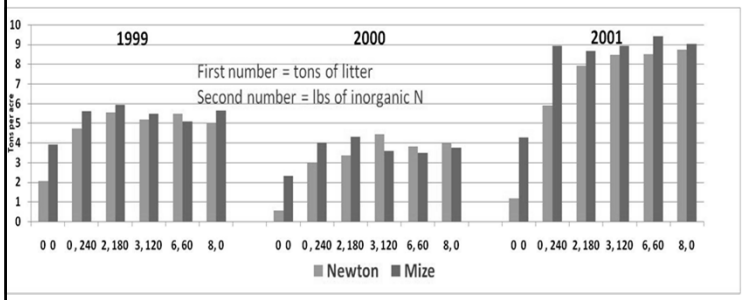


Dollar Value of Poultry Litter

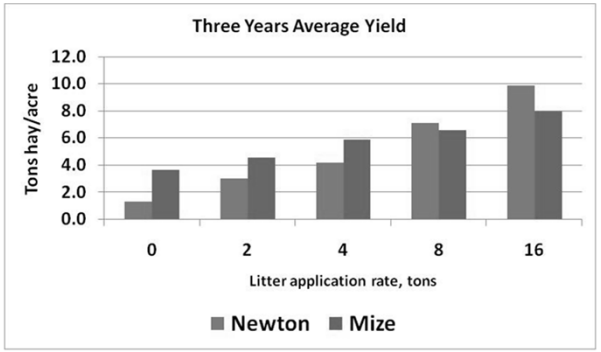


Based on Mississippi

Bermudagrass yields with litter fertilizer, N fertilizer, or combined



Three Year Mean Litter Applications



Fertilizer Management Tool for Pastures and Forages

Fertilizer Calculator for Pastures in Mississippi

http://msucares.com/pubs/publications/p2562.pdf

http://msucares.com/pubs/publications/p2562.xls

Thank You!

Larry Oldham, Ph.D.
loldham@pss.msstate.edu
larryo@ext.msstate.edu

Office: 662-325-2760
Cell: 662-312-9250

MISSISSIPPI STATE UNIVERSITY
EXTENSION SERVICE