

2008 Hay Production School

Fertilization Strategies for Hay Producers

Fertilization Strategies for Hay Producers

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Questions to be addressed:

- What nutrients are essential for high yields/quality?
- What is “goin’ on” with the fertilizer market?
- How do I get the most out of my fertilizer?
- What are UGA recommendations for N?
- What are the differences between N fertilizer products?
- What are the implications for using poultry litter (or other wastes) as my main source of fertility?



Plant Nutrients

Macro- (Primary)

Element	Available Form
Oxygen	O ₂ , OH ⁻
Carbon	CO ₂ ⁻² , HCO ₃ ⁻ , CO ₂
Hydrogen	H ⁺ , OH ⁻
Nitrogen	NO ₃ ⁻ , NH ₄ ⁺
Phosphorus	HPO ₄ ⁻² , H ₂ PO ₄ ⁻
Potassium	K ⁺

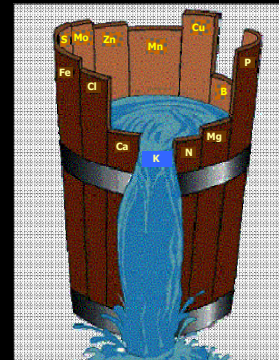
Micro- (Trace)

Element	Available Form
Iron	Fe ⁺² , Fe ⁺³
Copper	Cu ⁺² , Cu ⁺
Zinc	Zn ⁺²
Manganese	Mn ⁺² , MnO ₄ ⁻
Molybdenum	HMoO ₄ ⁻ , MoO ₄ ⁻²
Boron	H ₃ BO ₃ , B ₄ O ₇ ⁻²
Chlorine	Cl ⁻

Meso- (Secondary)

Element	Available Form
Calcium	Ca ⁺²
Magnesium	Mg ⁺²
Sulfur	SO ₄ ⁻²

Liebig's Law of the Minimum



K is for Persistence



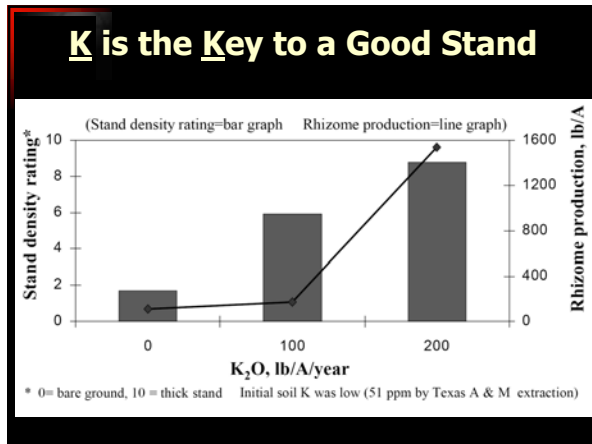
Potash also helps to ward off diseases and prepare for dormancy



Leafspot and winterhardness

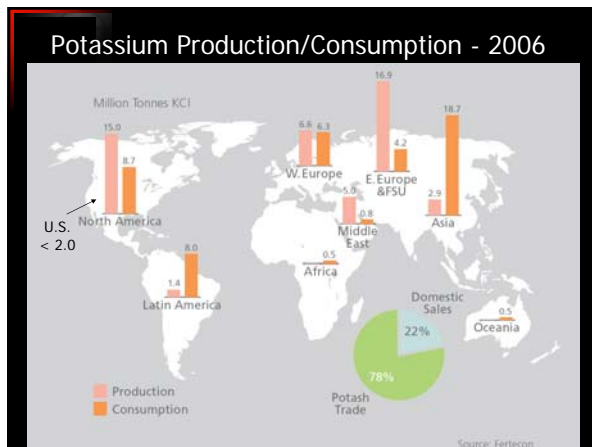
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High Fertilizer Prices Are Probably Here To Stay

- Inorganic N fertilizer is directly tied to the energy (natural gas) market.
 - Haber-Bosch process ($N_2 \rightarrow NH_3$)
 - High international demand
 - Cheap dollar on the world market
- Potassium is no longer the cheap nutrient it once was.
 - High international demand
 - It is mostly an international product
 - Production had been reined-in
 - Mine failures (flooding, particularly in Eastern European countries)

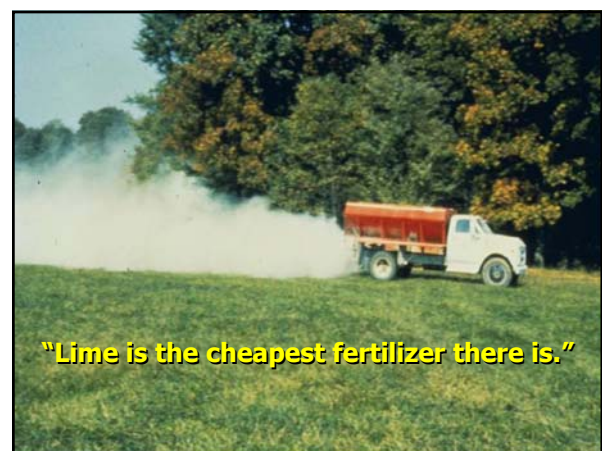


Get the most out of your fertilizer bill...

Soil test each hayfield each year!

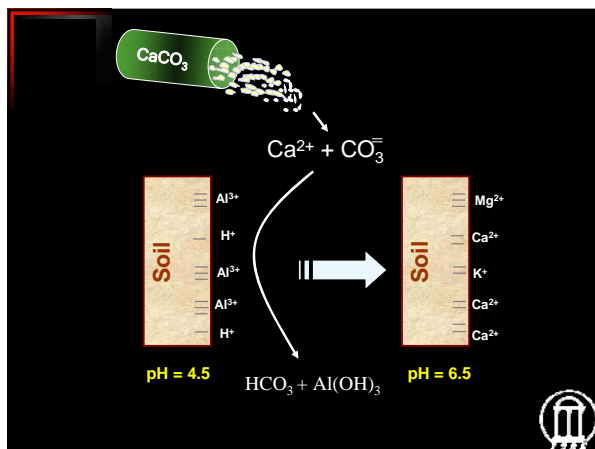
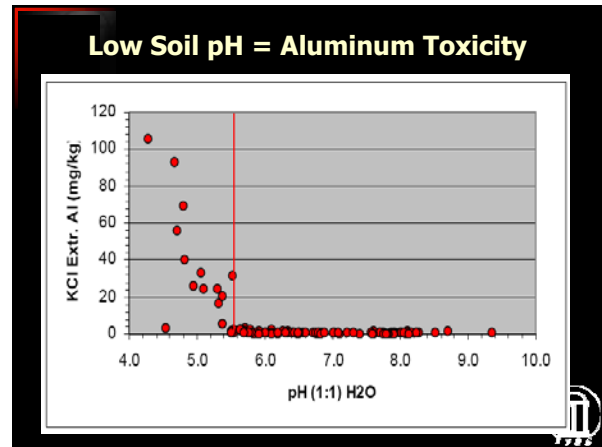
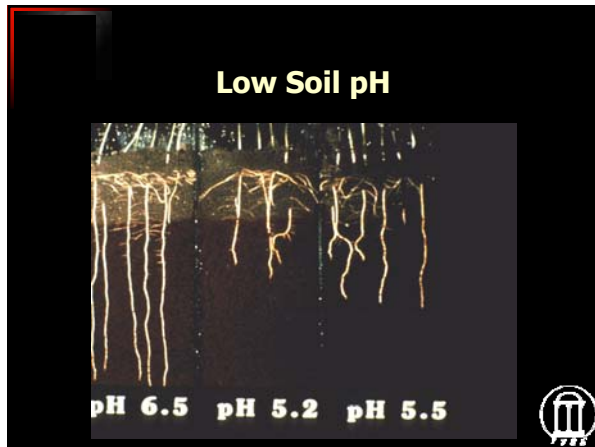
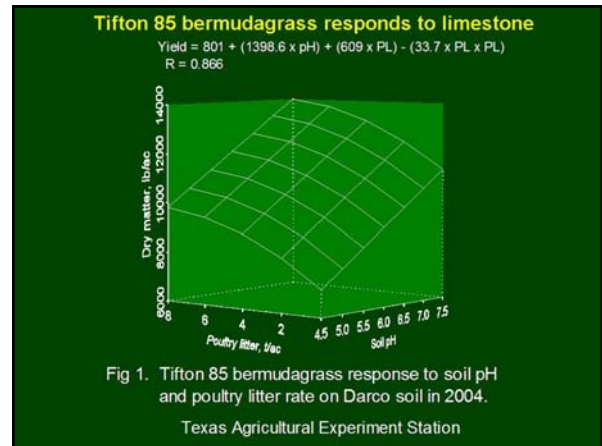
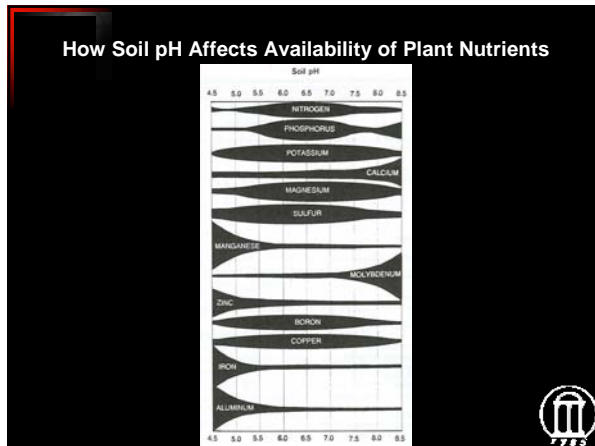
"Add only what is needed"

Mellich I Extractor				UGA Lime Buffer Capacity Method*				
Results	Phosphorus (P)	Potassium (K)	Calcium (Ca)	Magnesium (Mg)	Zinc (Zn)	Manganese (Mn)	pH *	Lime Buffer Capacity (LBC)
Very High	High	High	High	High	High	High	High	High
High	Medium	Medium	Medium	Medium	Medium	Medium	Medium	Medium
Medium	Low	Low	Low	Low	Low	Low	Low	Low
Low	Very Low	Very Low	Very Low	Very Low	Very Low	Very Low	Very Low	Very Low
Soil Test Index	274 lbs/Acre	404 lbs/Acre	2132 lbs/Acre	224 lbs/Acre	22 lbs/Acre	37 lbs/Acre	6.4	310



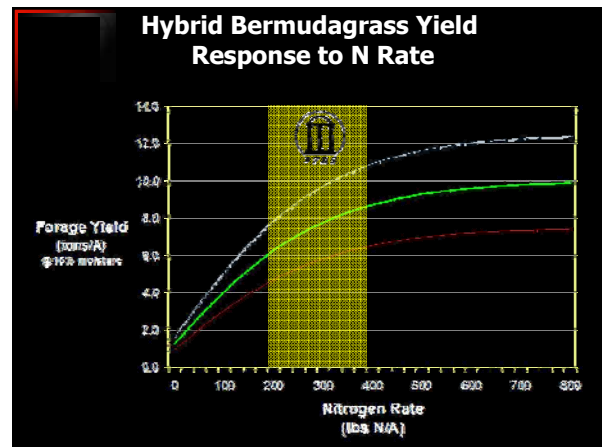
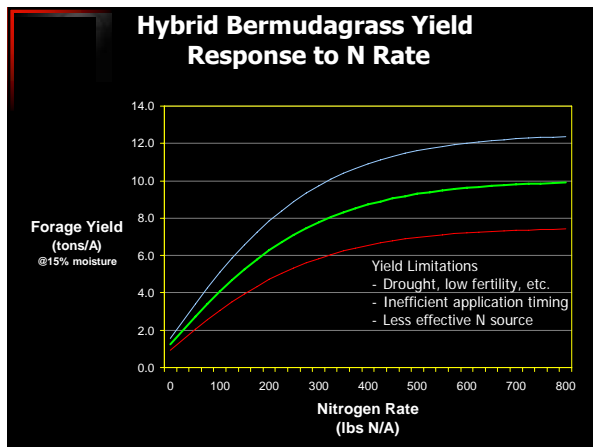
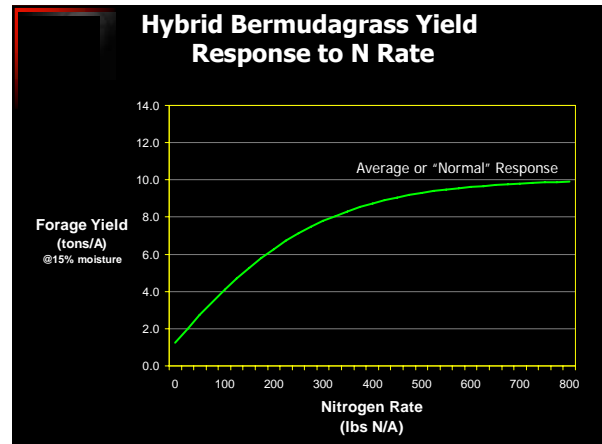
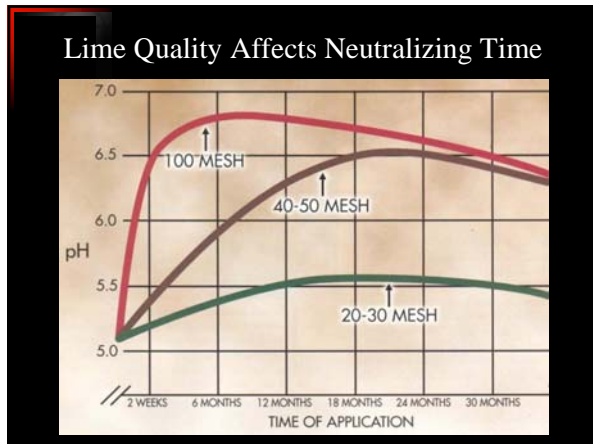
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SPLIT YOUR NITROGEN APPLICATIONS!

- Long-term, this can increase yields by **1200-2400 lbs/acre** and increase NUE by **25-30%**
 - Especially important under extremes
 - Leaching
 - Volatilization (in the case of urea-based products)
 - Late freeze
 - Drought

Other Common Nitrogen Sources

Nitrogen Source	Content	Approx. CCE*
Ammonium Nitrate	34-0-0	-61
Amm. Sulfate	21-0-0-24	-110
Anhyd. Ammonia**	82-0-0	-148
UAN Solution		
32% (35% U + 45% AN)	32-0-0	-55
28% (30% U + 40% AN)	28-0-0	-49
Urea	46-0-0	-81
Urea (Sulfur-coated)	38-0-0-16	-118
Poultry Litter	3-3-2	~10

* Approximate CaCO₃ (limestone) equivalent per 100 lb of product. For example, it will take 61 lbs of pure lime to neutralize the acidifying effect that ammonium nitrate has on the soil.

** Must be injected into the sod. Not recommended for bermudagrass production.

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The Effectiveness of Some Alternative N Sources at Low, Medium, and High Fertilization Rates on Hybrid Bermudagrasses (Relative to Ammonium Nitrate).

Nitrogen Source	Fertilization Rates		
	< 200 lbs*	250-350 lbs	> 400 lbs
Ammonium Nitrate	100%	100%	100%
Amm. Sulfate	95-97%	95-105%	60-70%
Anhyd. Ammonia	92-94%	93-95%	94-95%
UAN Solution	70-75%	85-92%	92-95%
Urea	79-82%	82-92%	88-93%

* Actual lbs of N per acre per year.
Source: Burton and Jackson, 1962; Silveria et al., 2007.

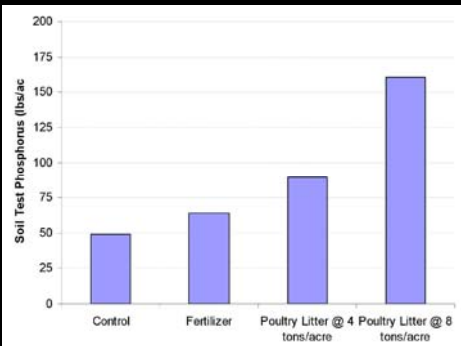
Alternative N Sources

Take-home message:

If you have to use a urea-based product, be careful about cutting your rate back too much.
- They are relatively less effective at low rates.



Too much of a good thing?



Poultry Litter for Hay Fields

- Weed pressure does increase
 - Not a source of weed seed
 - Changes the fertility and makes broadleaf weeds more competitive.
- Potassium fertilization may not be adequate
 - Poultry Litter: 3-3-2
 - Ideal bermudagrass fertilizer: 4-1-3
- May result in excessive sulfur levels
 - Some evidence for a link to copper deficiency in cattle.



Resources on CD

Soil Test Rating	Potassium			
	Low K	Medium K	High K	Very High K
Phosphorus	Conc: 6-70 lbs/A Prod: 6-20 lbs/A	Conc: 71-170 lbs/A Prod: 21-150 lbs/A	Conc: 171-275 lbs/A Prod: 25-60 lbs/A	Conc: 276+ lbs/A Prod: 60+ lbs/A
Low P	0-100-270	0-100-200	0-100-170	0-100-0
Medium P	0-130-270	0-130-200	0-130-170	0-130-0
High P	0-100-270	0-100-200	0-100-170	0-100-0
Very High P	0-0-270	0-0-200	0-0-170	0-0-0



ALABAMA A&M AND AUBURN UNIVERSITIES
Nutrient Content of
Fertilizer Materials

Poultry Litter Application on
Pastures and Hayfields

Fertilization Strategies for Hay Producers

QUESTIONS?

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