

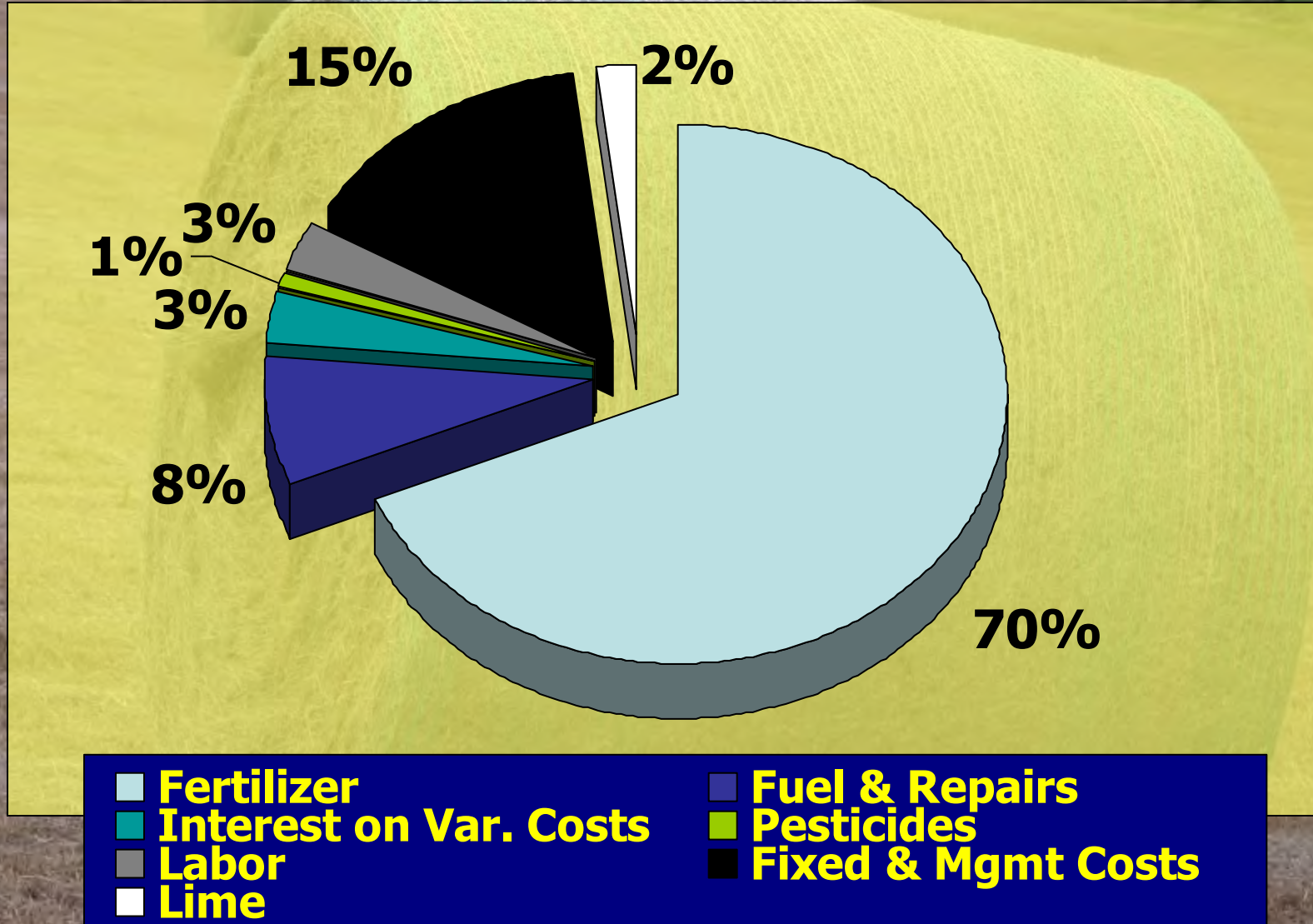
Fertilizing Forages for Fun and Profit !



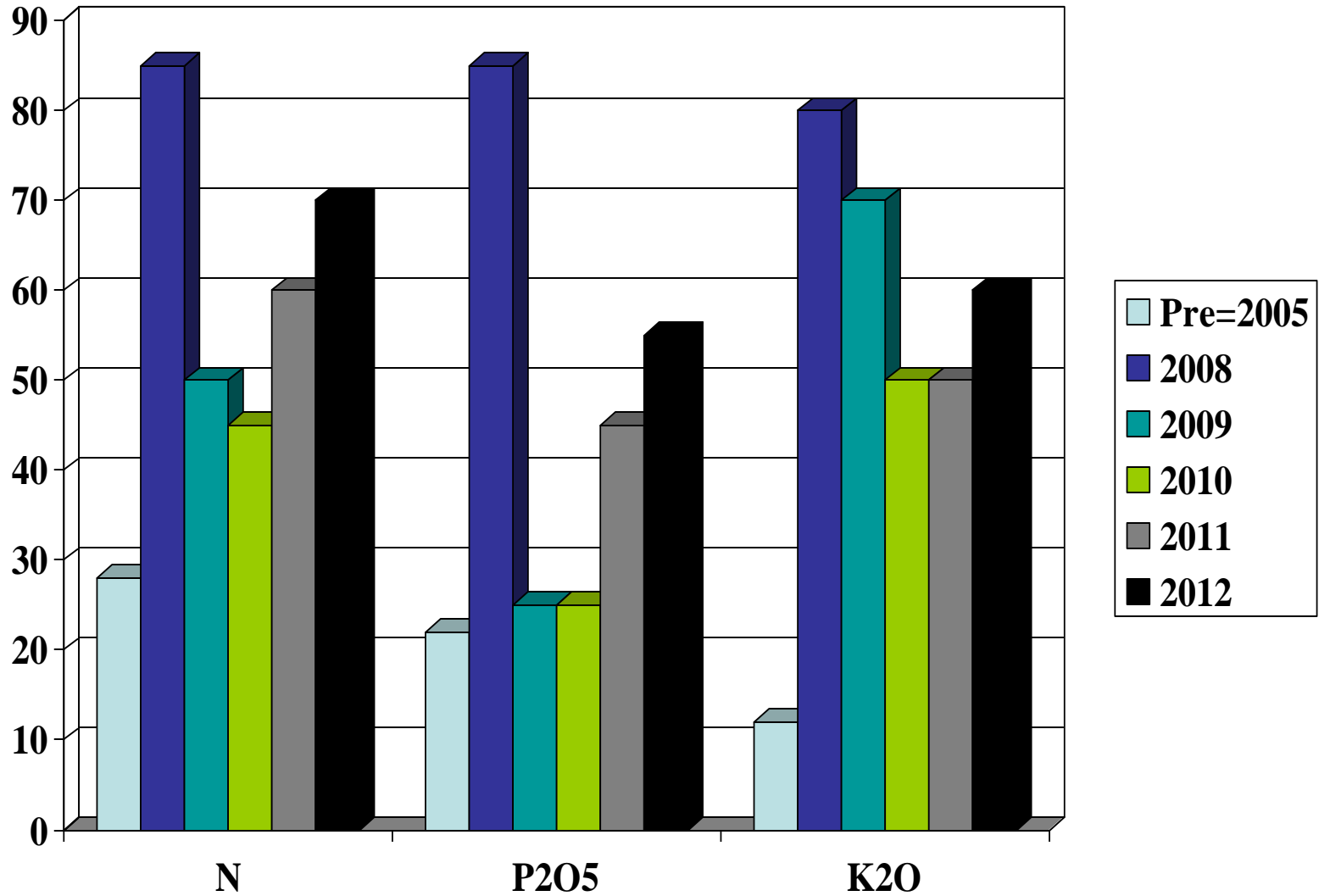
Glen Harris – UGA (Tifton)

Hay Production – 2008

Cost Breakdown – C. Lacy



Fertilizer Prices (cents/lb)



Basics of Soil Fertility for Forages

- **Nitrogen**
- **pH and Liming**
- **Potassium**
- **Soil Testing**



Lime -

- * Dolomitic vs. Calcitic
- * High Rates ?



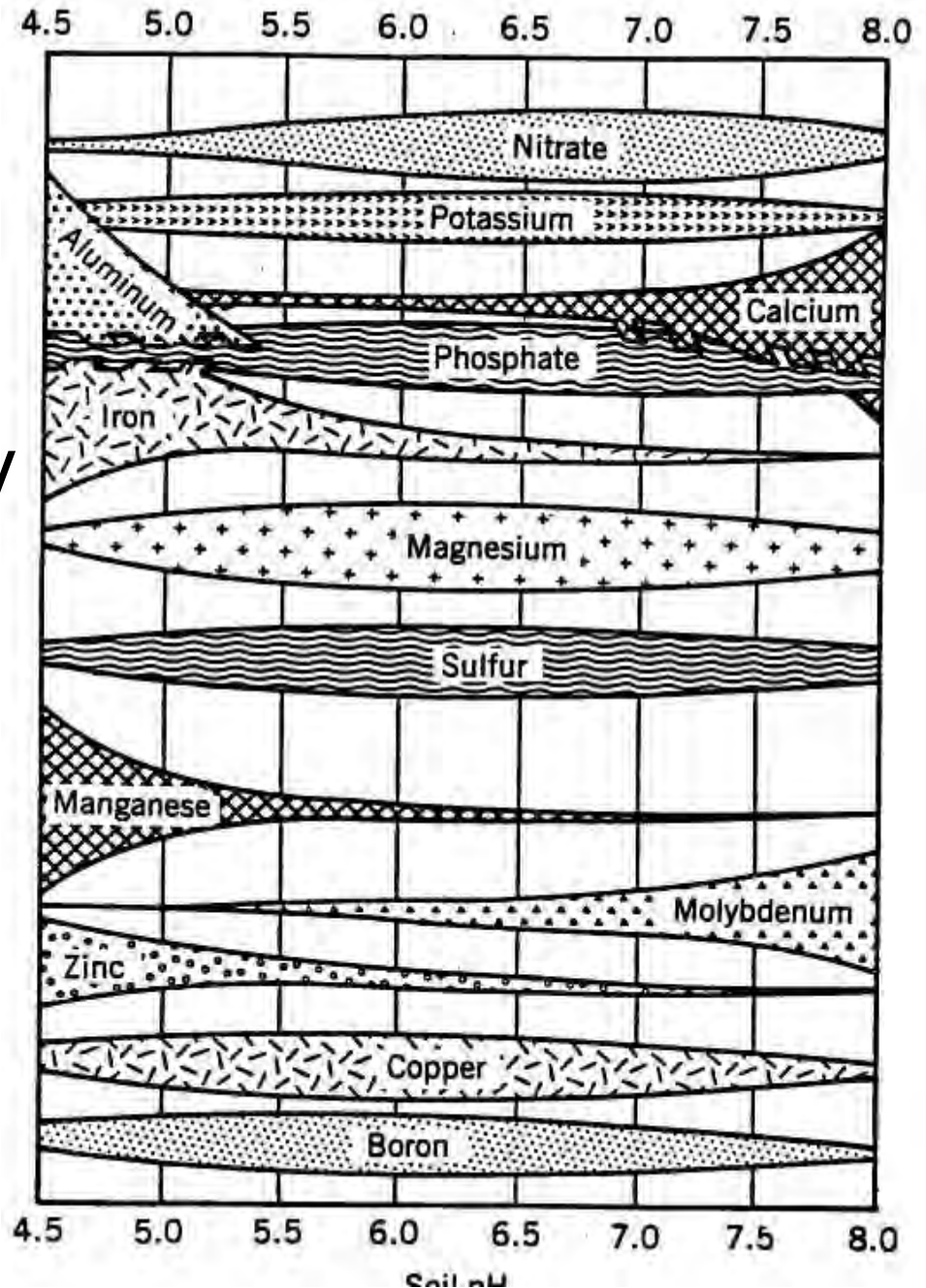
Some common soil liming materials.

<u>Material</u>	<u>Relative Neutralizing value</u> ----- % -----	<u>Comment</u>
pure CaCO ₃	100	not generally available
Calcitic agricultural lime, (calcium carbonate, CaCO ₃ + impurities)	90 - 100	easily available
Dolomitic agricultural lime, CaCO ₃ + MgCO ₃	95 - 108	easily available; provides Mg
Ground oyster shells	85 - 95	
Selma chalk/marl, CaCO ₃ + clay	50 - 85	contains clay; keep dry
Burned lime, CaO	150 - 175	very caustic; don't use
Hydrated lime or builders' lime, Ca(OH) ₂	120 - 135	caustic; use with caution; no Mg
Basic slag	50 - 70	contains some P & micronutrients; byproduct
Wood stove or fireplace ashes	40 - 70	provides some plant nutrients
Boiler wood ash	30 - 60	provides some plant nutrients
By-products	Variable	use as specified by manufacturer
Gypsum and/or ground drywall, CaSO ₄	0	NOT A LIMING MATERIAL

Source: Soil Acidity and Liming, Internet Inservice Training, Lippert et al.

Why Lime?

Nutrient Availability
Nutrient Unavailability
Provide Ca and Mg
Nitrogen Fixation
Biological Activity

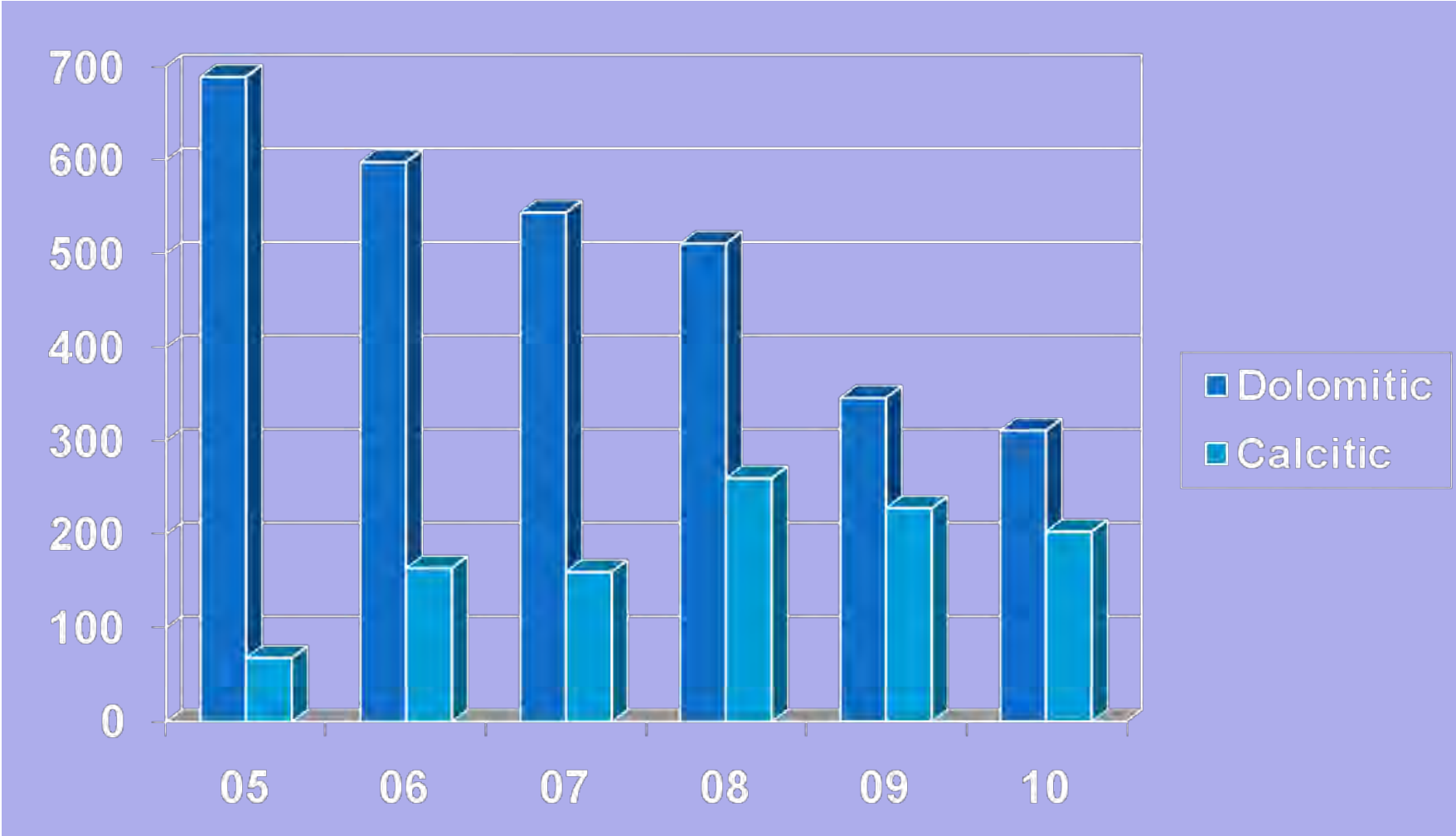


Source: Foth and Ellis
Soil Fertility



Calcitic and Dolomitic Lime

(x 1000 tons)



Magnesium Ratings for Forages (Coastal Plain Soils - lb/a, Mehlich 1)

*Low = 0 – 30

*Medium = 31- 60

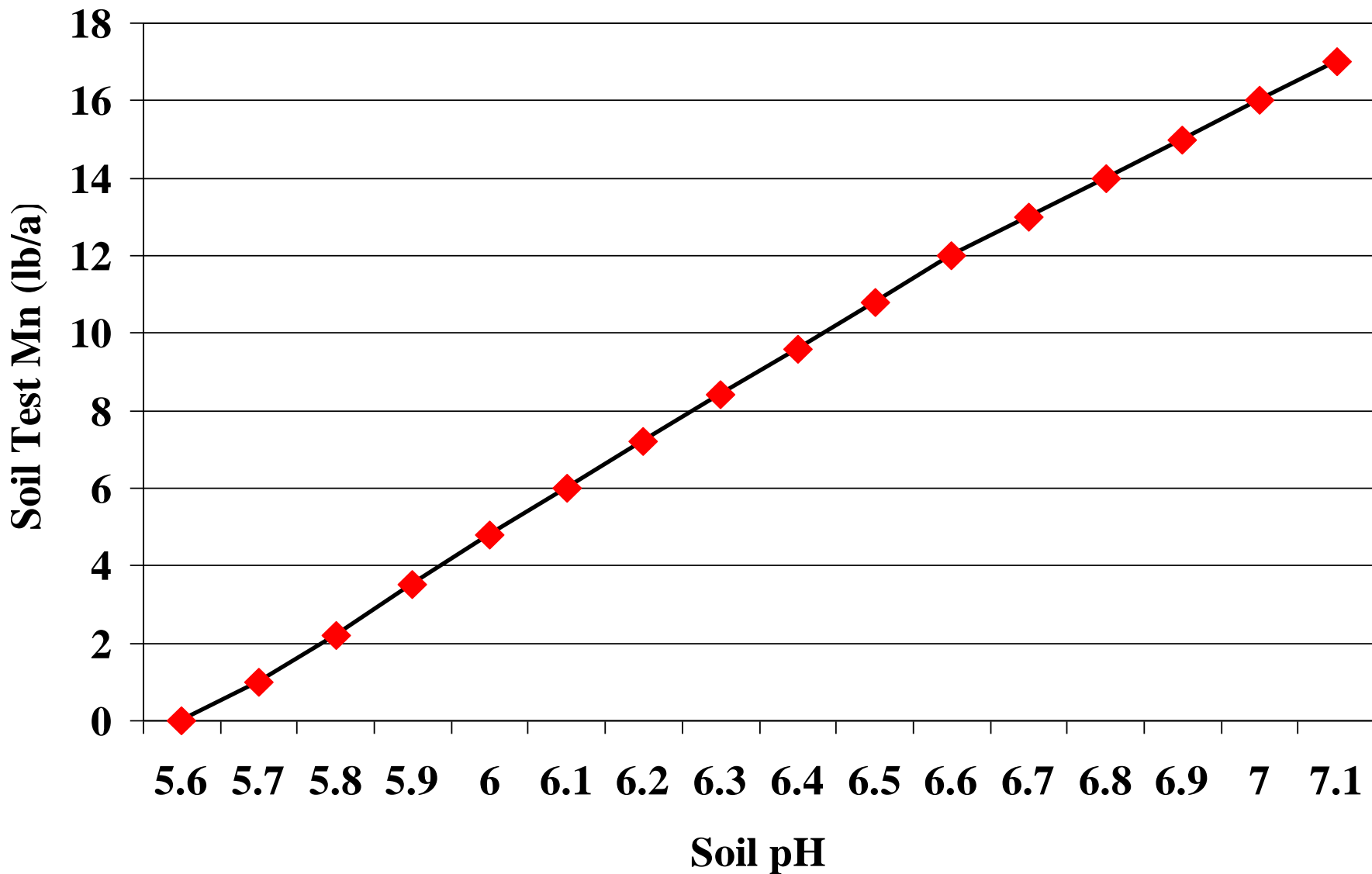
High = 61 +

From The Soil Test Handbook for Georgia” :

**“If soil test magnesium is low,
use dolomitic limestone” !**



Figure 1. Relationship between pH and manganese availability. Maintain soil test manganese levels above the line to help avoid manganese deficiency.
Source: Soil Test Handbook for Georgia



N with no K can kill a stand in 2 years



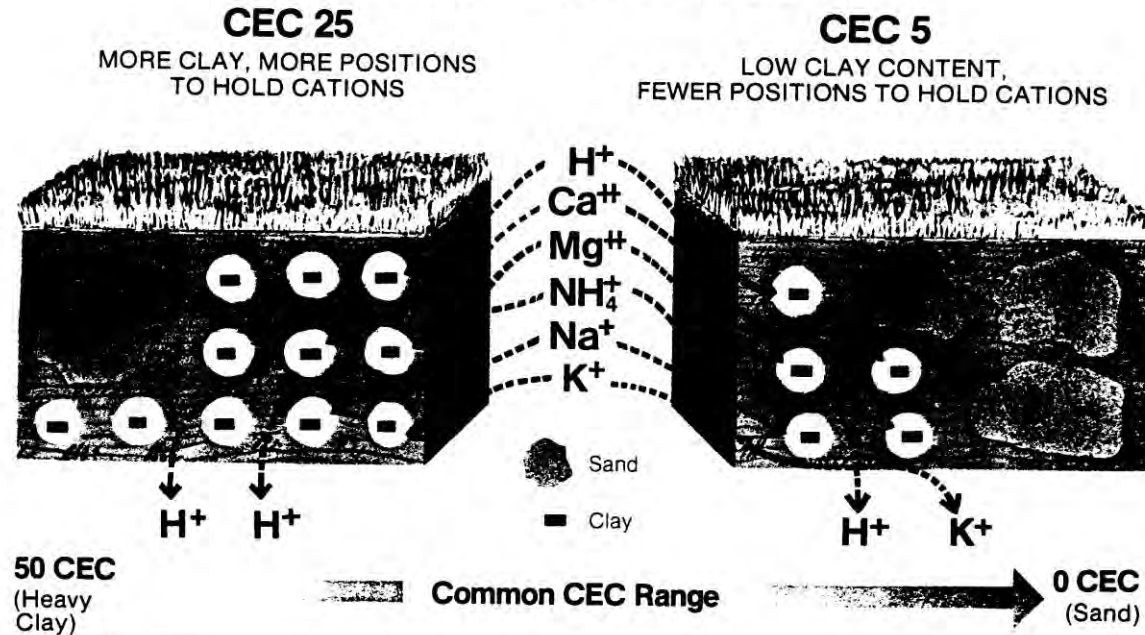
K is for Persistence !



N	P	K	N	P	K
200	40	160	200	40	0

Deficiency
Weeds
Winterkill
Loss of
Stand

A SCHEMATIC LOOK AT CATION EXCHANGE



SOME PRACTICAL APPLICATIONS	
Soils with CEC 11-50 Range	Soils with CEC 1-10 Range
<ul style="list-style-type: none"> • High clay content • More lime required to correct a given pH • Greater capacity to hold nutrients in a given soil depth • Physical ramifications of a soil with a high clay content • High water-holding capacity 	<ul style="list-style-type: none"> • High sand content • Nitrogen and potassium leaching more likely • Less lime required to correct a given pH • Physical ramifications of a soil with a high sand content • Low water-holding capacity

CEC – Ability of soil to hold cations = how many “neg charges” from clay and OM

Base saturation (%) – what percent of CEC is Ca, Mg and K (and Na?)

“Enhanced Efficiency (EE)” Fertilizers

New Term Coined by The Fertilizer Institute (TFI)

“...products that minimize the potential of nutrient loss to the environment.”

Slow/Controlled Release

Absorbed
Coated
Occluded
Reacted



CoRoN

Stabilized/Additive

Urease Inhibitors
Nitrification Inhibitors
Stabilizers
Humates



Nutrisphere – N (?)

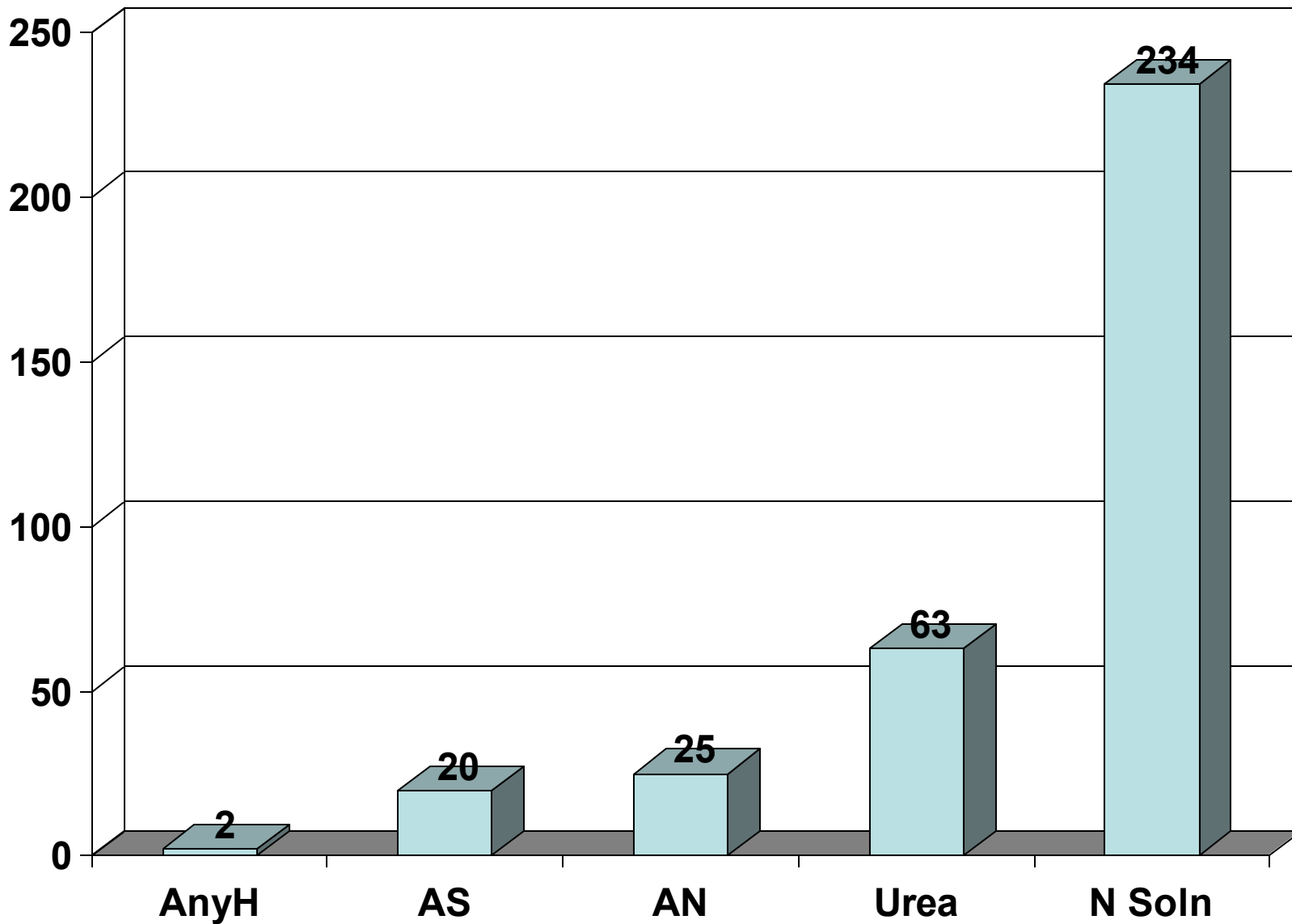
Association of American Plant Food Control Officials (AAPFCO)

Comparing Nitrogen Fertilizers

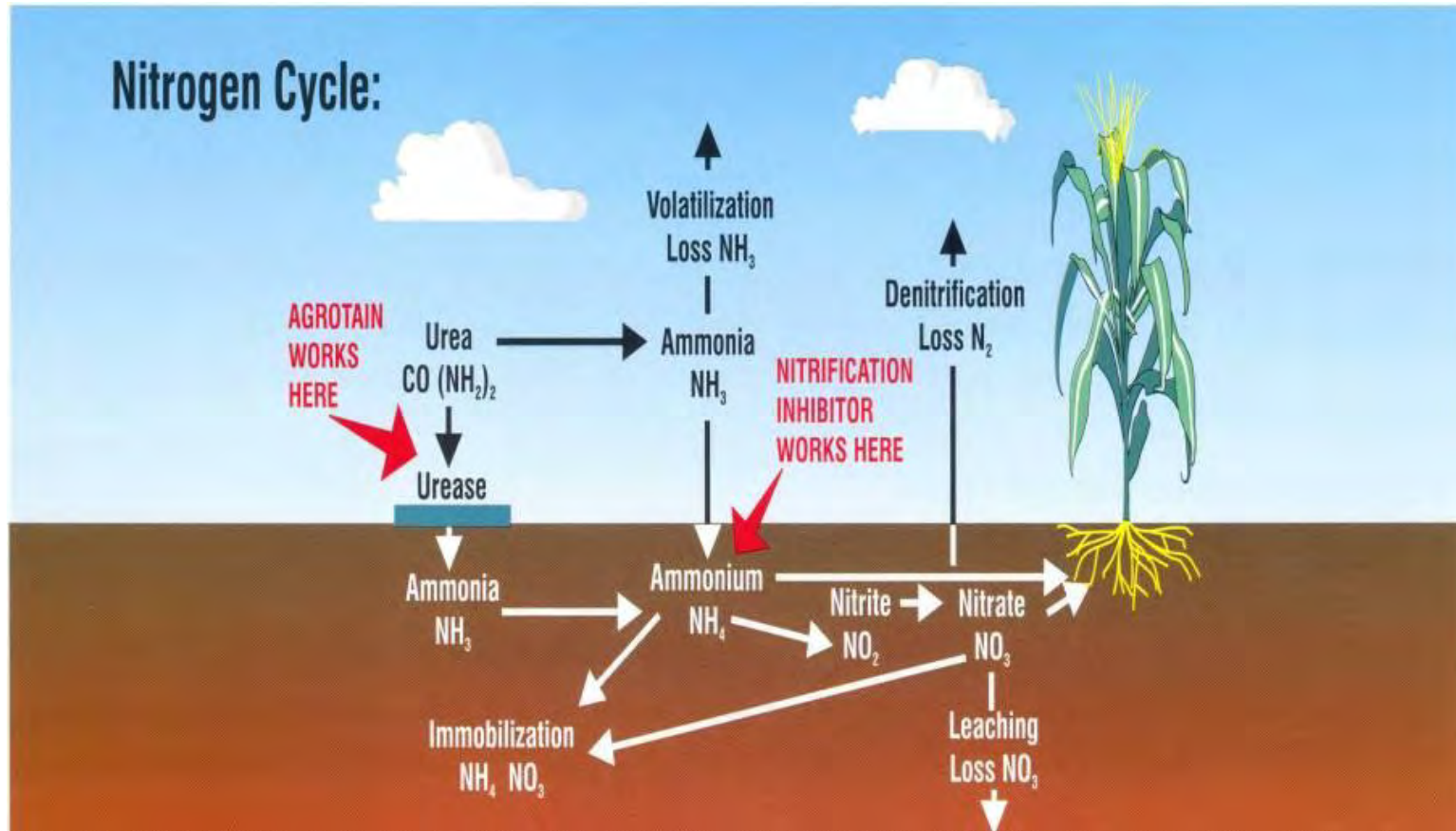
Nitrogen Source	Comments
Anhydrous Ammonia (82%N)	Gas Safety/Dealer Insurance Methamphetamines
UAN Solutions (28-32%N)	Liquid Urea+Ammonium+Nitrate
Urea (46%N)	Solid Concentrated Volatilization
Ammonium Nitrate (34%N)	Solid Regulations/Availability
Ammonium Sulfate (21%N)	Least Concentrated Acidifying

Nitrogen Fertilizers Sold in Georgia - 2010

X 1000 tons



Volatilization and Nitrification

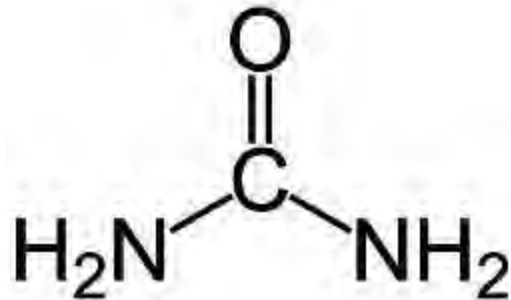


Volatilization = Urea -----> Ammonium (NH_3) gas

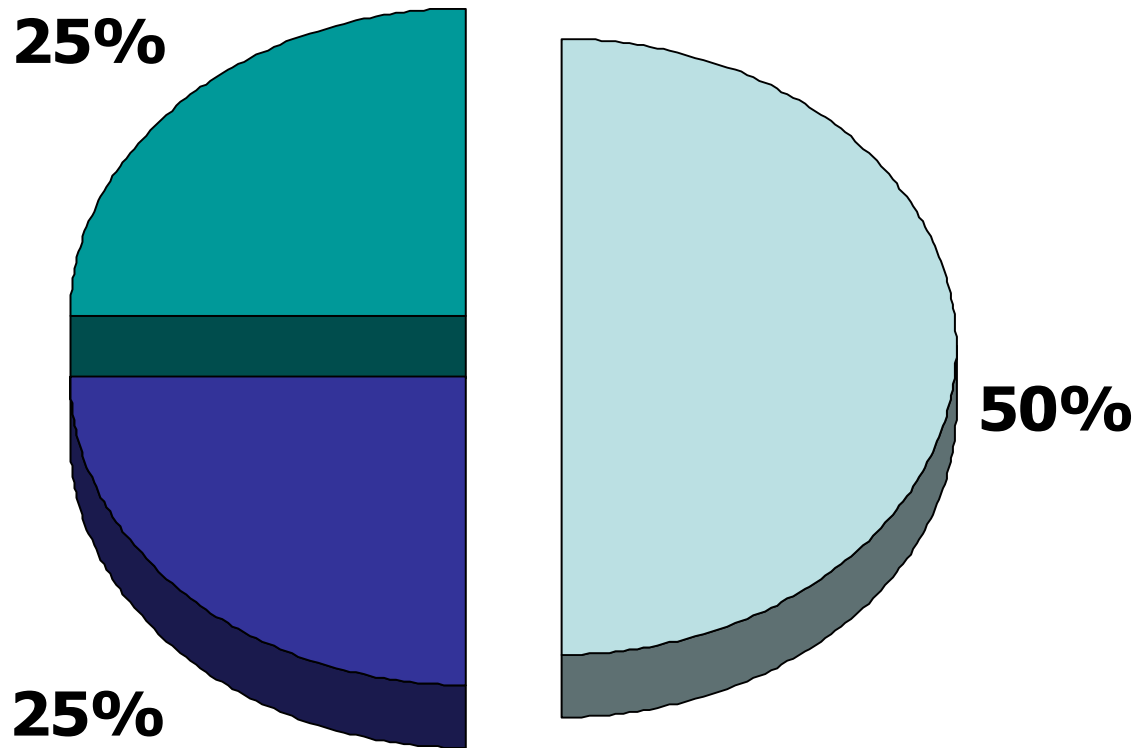
Nitrification = Ammonium (NH_4^+) ---> Nitrate (NO_3^-)

Forms of Nitrogen

- Ammonia – NH_3 (gas)
- Ammonium – NH_4^+
- Nitrate – NO_3^-
- Urea – $\text{CO}(\text{NH}_2)_2$



Composition of UAN (32 – 28 % N)

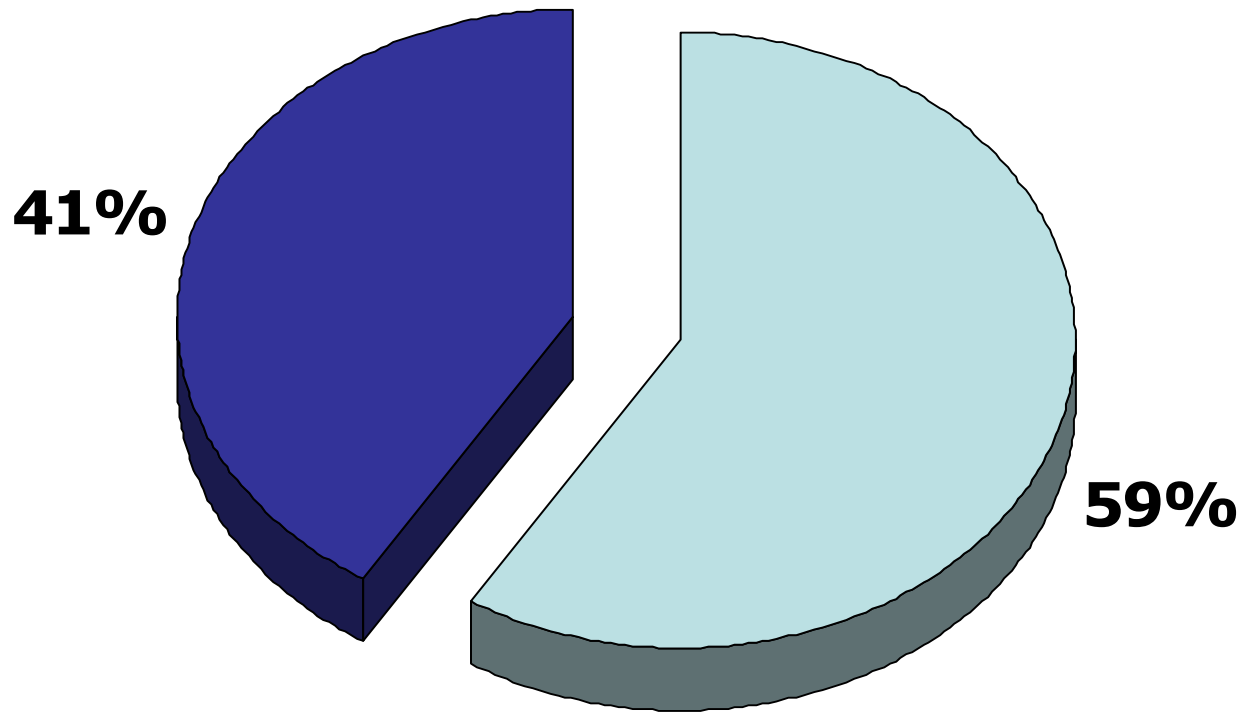


■ Urea

■ Ammonium(NH4)

■ Nitrate (NO3)

Composition of "19-E" (19 – 18 %N)

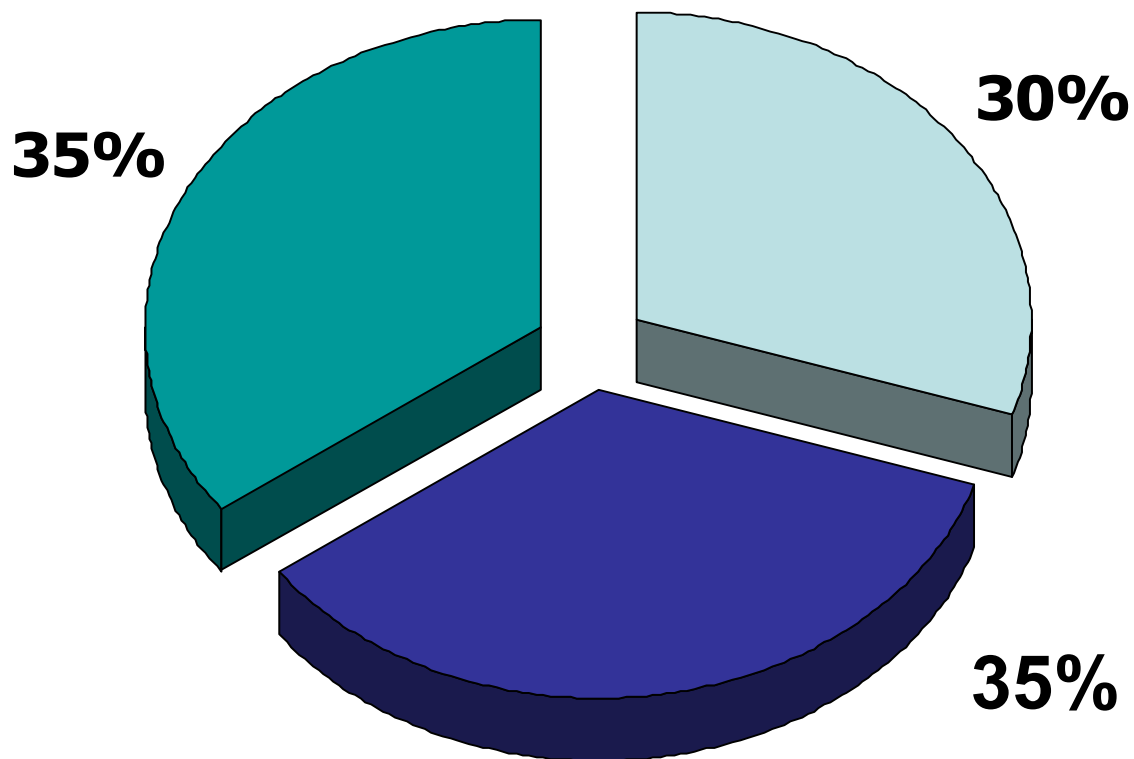


■ Nitrate (NO₃)

■ Ammonium (NH₄)

Composition of 24-0-0-3(S)

(Urea+Ammonium Nitrate+Sodium Nitrate)



■ Urea

■ Ammonium(NH₄)

■ Nitrate(NO₃)



- Agrium Company
- ESN = Environmentally Smart Nitrogen
- Polymer Coated Urea
- “Controlled Release” (not “slow release” ?)
- “Releases as the Soil Warms”
- Slow Release vs. Split Applications

How Much Fertilizer Do I Need for 300 Bushel Corn ?

Soil Test Handbook of Georgia (aesl.ces.uga.edu)

Base (Irrigated) Yield Goal = 150 bu/a

For every 10 bushel increase → add 12-6-10

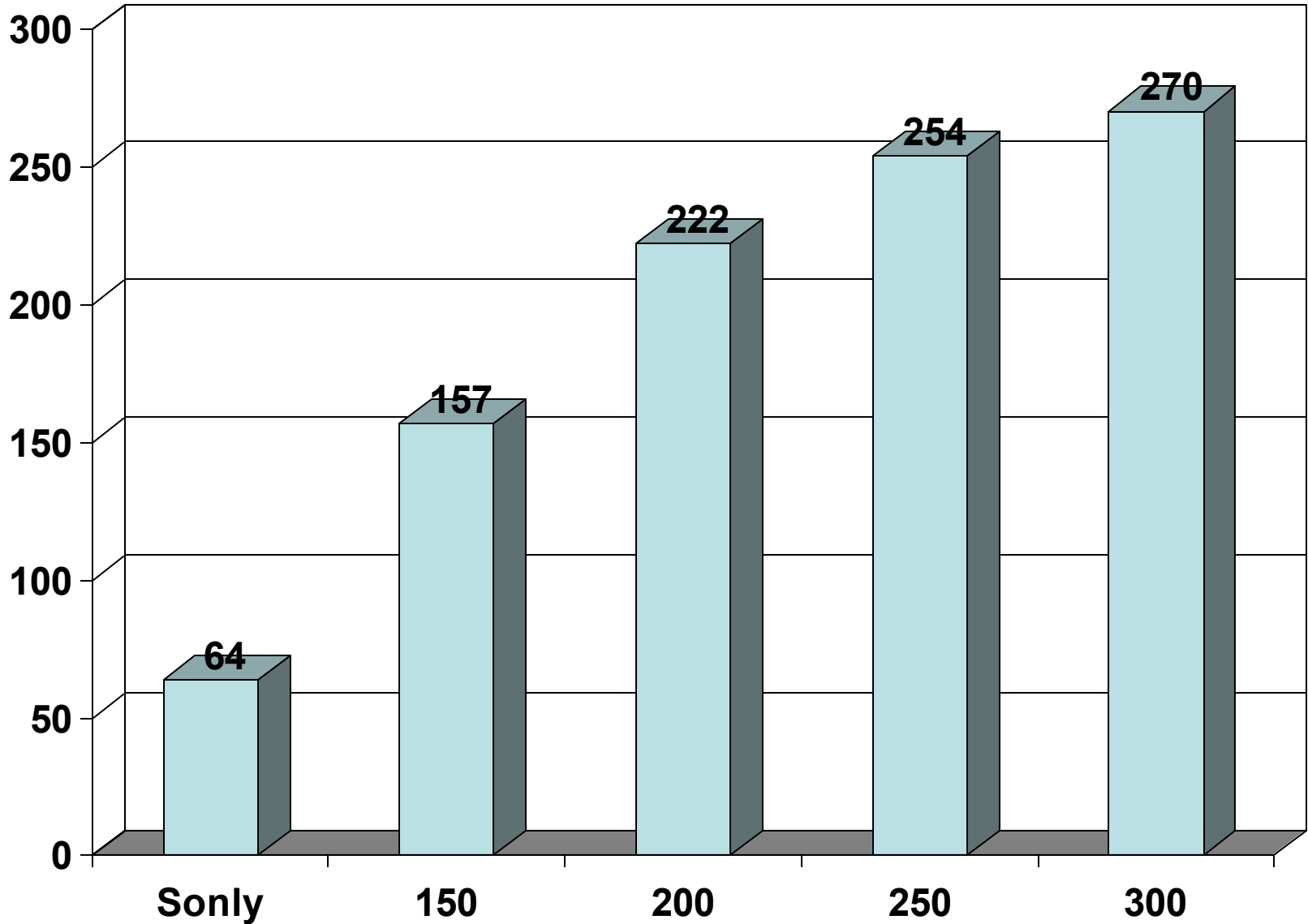
	<u>150</u>	<u>200</u>	<u>250</u>	<u>300</u>
Low	180-110-130	240-140-180	300-170-230	360-200-280
Med	180-90-90	240-120-140	300-150-190	360-180-240
High	180-70-70	240-100-120	300-130-170	360-160-220

4Rs = Rate, Timing, Source and Placement

High Yield Corn – 2013


Bu/a

(Pioneer 2023 35,000 pop. planted 3/20)



Nutrient Removal

<u>Crop</u>	<u>Yield</u>	<u>N-P2O5-K2O</u>
Bermuda hay	8 tons	400-80-300
Corn grain	120 bu	115-47-32
Corn silage	16 tons	160-67-160
Peanuts	2 tons + vines	240-39-185
Wheat grain	60 bu	70-33-20
grain+straw	60 bu	100-40-122
Fescue pasture	300 lb. beef	9-7-1
Bahia pasture	200 lb. beef	6-5-1



50-10-40 lb.
N-P₂O₅-K₂O
per ton

Exports

Hay Removes A Lot of Nutrients

Pastures Recycle Nutrients

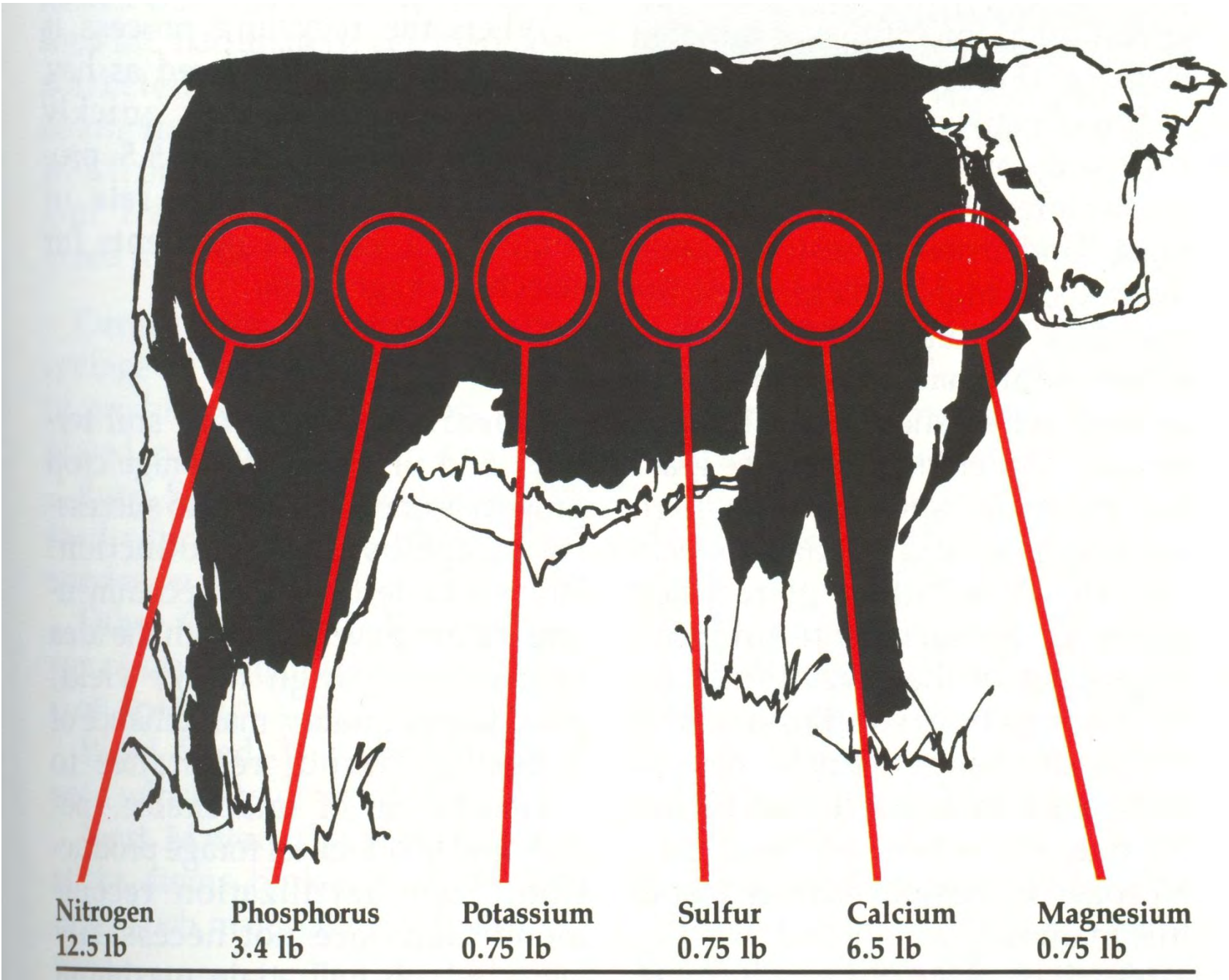
Inputs

- * fertilizer
- * manure
- * legumes (N)
- * feed

Nutrient Cycle

Exports

- * calves
- * beef



The Value of Litter

- Pre 2005 Prices

- 60# N x .28 x .6 = 10.08
- 60 # P2O5 x .22 x .8 = 10.56
- 40 # K2O x .12 x .8 = 3.84
- » Total = **\$24.48**

- 2008 Prices

- 60#N x .85 x .6 = 30.60
- 60#P2O5 x .85 x .8 = 40.80
- 40#K2O x .80 x .8 = 25.60
- » Total = **\$97.00**

- » 2013 Prices

- 60#N x .72 x .6 = 25.92
- 60#P2O5 x .55 x .8 = 26.40
- 40#K2O x .52 x .8 = 16.64
- » Total = **\$68.96**



Other Nutrients ?
Organic Matter ?
Liming ?
Nematode Suppresion ?

Basics of Soil Fertility for Forages

- **Soil Testing**
- **pH and Liming**
- **Potassium**
- **Nitrogen**



Questions ?

