

Efficient Fertilization

Paul Denton

2006 Fertilizer Prices

Material		\$/ton	\$/lb nut.
Mixed fert.	8-16-24 (E TN)	\$410	\$0.43
	9-18-27 (M TN)	\$360	\$0.34
Ammon Nit	34 - 0 - 0	\$365	\$0.54
		\$330	\$0.49
Urea	46 - 0 - 0	\$375	\$0.41
Cal Nitrate	15.5 - 0 - 0	\$320	\$1.04
32 % liquid	32 - 0 - 0	\$275	\$0.43
Mixed fert.*— N only	9-18-27	\$350	\$1.94 (per lb N)

* Very high soil test, no response to P or K

Nitrogen in Tobacco

- **Most responsive nutrient**
- **Most expensive nutrient**
- **Rates not based on soil test**
- **Based on soils, weather, cropping system**

Costs of Excessive N

- **Increased Cost Of Fertilizer**
- **Blue Mold Susceptibility**
- **Slow Ripening Tobacco**
- **Slow Curing, Higher Moisture**
- **Difficulty in Sucker Control**
- **Higher TSNA Content**

N Rates for Burley

Extension Recommendations

- TN – 150 to 200**
- VA – 175 to 200**
- NC – 150 to 200**
- KY – 150 to 350**

UK Recommended Nitrogen Rates

	1 st Yr Tobacco	2nd + Yr. Tobacco
Poorly Drained or Sandy Soils; Poor Sod	250 -300	300 – 350
Well / Mod. Well Drained Soil, Good Sod	200 - 250	250 – 300
Legume Sod or Legume Cover Crop	150 - 200	200 - 250

Nitrogen Loss From Soil

- **Leaching**
 - Coarser soils
 - Rarely a problem in TN
- **Denitrification**
 - Wetter soils, wet springs
 - Often more important than leaching

Replacing Lost N

- **TN – “25 to 50 lbs with heavy early season rainfall ”**
- **KY – “In years of excessive rainfall, an additional application may be sidedressed”**

TN - VA – KY Burley N Study

- **Preplant N – 80, 160, 240 lbs/ac**
- **Sidedress N – 0, 50, 100 lbs/ac**
- **Locations**
 - **Greeneville and Glade Spring, VA in 2004**
 - **Add Springfield and Lexington KY in 2005**

Yield by N Rate – Glade Spring 2004

Sidedress N (lbs/ac)	Preplant N (lbs/ac)		
	80	160	240
	-----Leaf Yd (lbs/ac)-----		
0	<u>2108</u> *	<u>2016</u> *	2269
50	<u>2171</u> *	2225	2243
100	2239	2334	2362

* Sig diff from highest yield, 90 % prob

Yield by N Rate –Springfield 2005

Sidedress N (lbs/ac)	Preplant N (lbs/ac)		
	80	160	240
	-----Leaf Yd (lbs/ac)-----		

0	<u>1745*</u>	2005	2150
50	1882	2110	2041
100	2003	1880	2010

* Sig different from highest yield, 90 % prob.

Yield by N Rate – Glade Spring 2005

Sidedress N (lbs/ac)	Preplant N (lbs/ac)		
	80	160	240
	-----Leaf Yd (lbs/ac)-----		

0	<u>2550*</u>	2752	2790
50	2774	2806	2799
100	2787	2862	2904

* Sig different from highest yield, 90 % prob.

Yield by N Rate – All Locations 04 and 05

Sidedress N (lbs/ac)	Preplant N (lbs/ac)		
	80	160	240
	-----Leaf Yd (lbs/ac)-----		
0	2435	2504	<u>2707</u>
50	2552	<u>2642</u>	2689
100	<u>2622</u>	2632	2665

Nitrogen Fertilizer Strategies: Costs

- **Three strategies give equivalent yields at lowest rates:**
 - 1. 80 lb/ac preplant, 100 sidedressed**
 - 2. 160 lb/ac preplant, 50 sidedressed**
 - 3. 240 lbs/ac preplant only**

N Strategies – Cost of Additional N

Med soil test – 666 lbs 9-18-27 (\$120)

		Cost / ac (\$)	
Preplant N	Sidedr. N	Ammon nit as sidedr.	Calcium nit as sidedr.
(lbs N / ac)			
80	100	63	113
160	50	72	97
240	0	81	81

\$/ lb N =0.45 Urea, 0.54 Am. Nit, 1.04 Ca Nit

Preplant from 8-16-24 and urea

SUMMARY

- **Recommended nitrogen rates give optimum yield with normal rainfall**
- **Splitting nitrogen is beneficial in a wet year**
- **No response to sidedressing when 240 pounds of N used preplant**
- **Need for N may have be reduced by rotation with sod**
- **Higher N prices call for careful consideration of rates and sources**

Ammonium Sources

- Urea
- Ammonium Nitrate
- Ammonium Phosphates
- Ammonium Sulfate
- N Solutions (Liquid N)

Nitrate Sources

- Nitrate of Soda (Sodium Nitrate)
- Potassium Nitrate
- Calcium Nitrate
- Nitrate of Soda-Potash

Nitrogen Source

Ammonium vs. Nitrate

- Ammonium requires nitrification
- Few days to weeks
- No leaching or denitrification until nitrified
- Acid forming (3 to 4 lbs lime per lb N)
- More persistent
- Nitrate immediately available
- Subject to leaching and denitrification
- Not acid forming
- Less persistent
- More expensive

With Proper Liming and Recommended Rates

- **Any Source OK Preplant**
- **Ammonium Nitrate OK for Timely Sidedressing**
- **Urea Not Preferred for Sidedressing**
- **If Sidedressing Late, Switch to Nitrate Source**

Marginal pH

High N Rates

- **Use Mainly Nitrate Sources**
- **All Nitrate for Sidedressing**

What About UAN ???

OK if :

- pH is OK
- Rates are reasonable

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Probability of Response to Fertilizer

- **Low soil test – High probability of response**
- **Medium soil test – Medium to low probability**
- **High soil test – Low probability**
- **Very high soil test – No response expected**

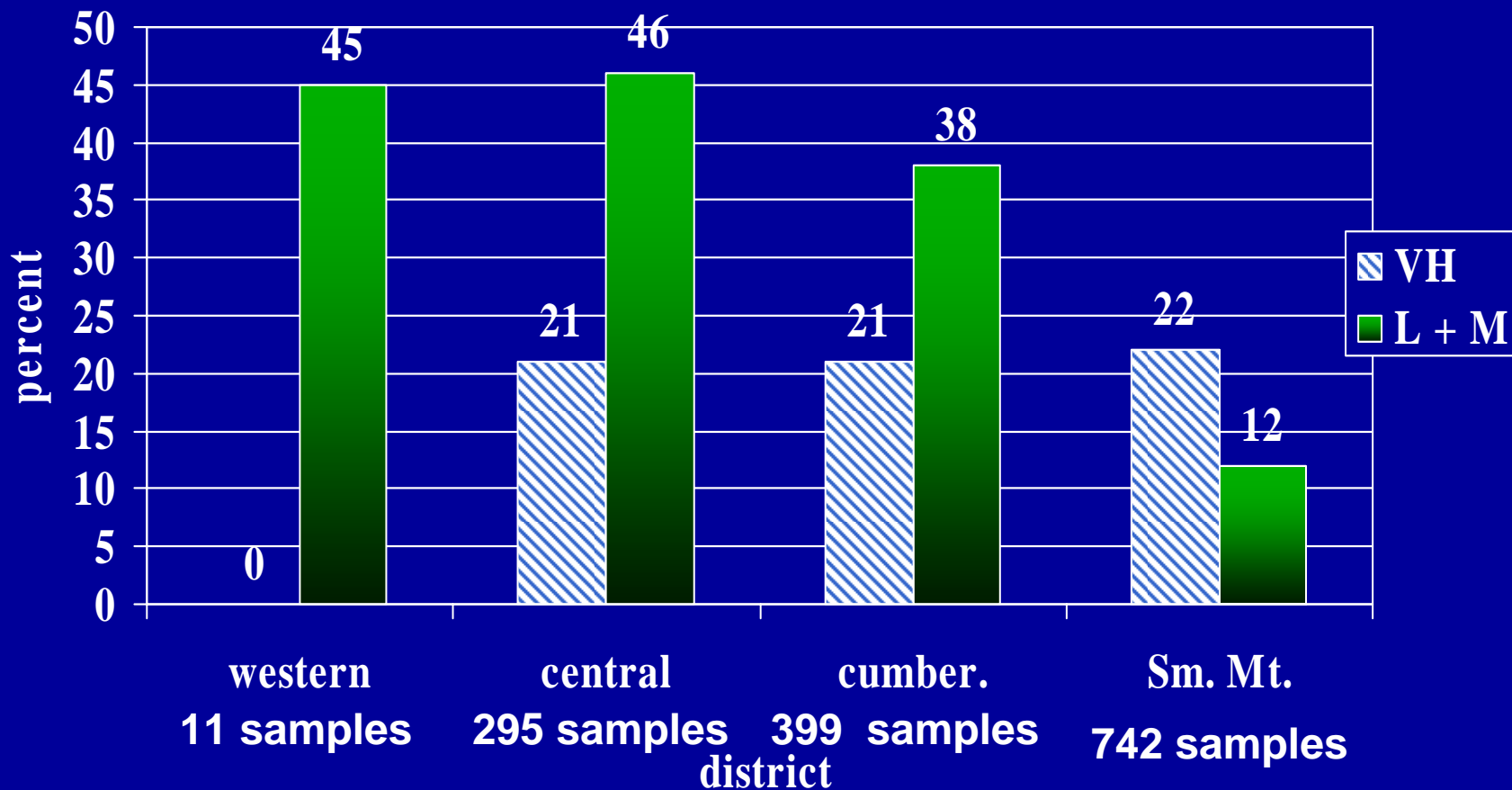
Phosphorus Rates for Tobacco

Soil Test Level	Pounds P2O5/acre
Low	150
Medium	90
High	60
Very High	0

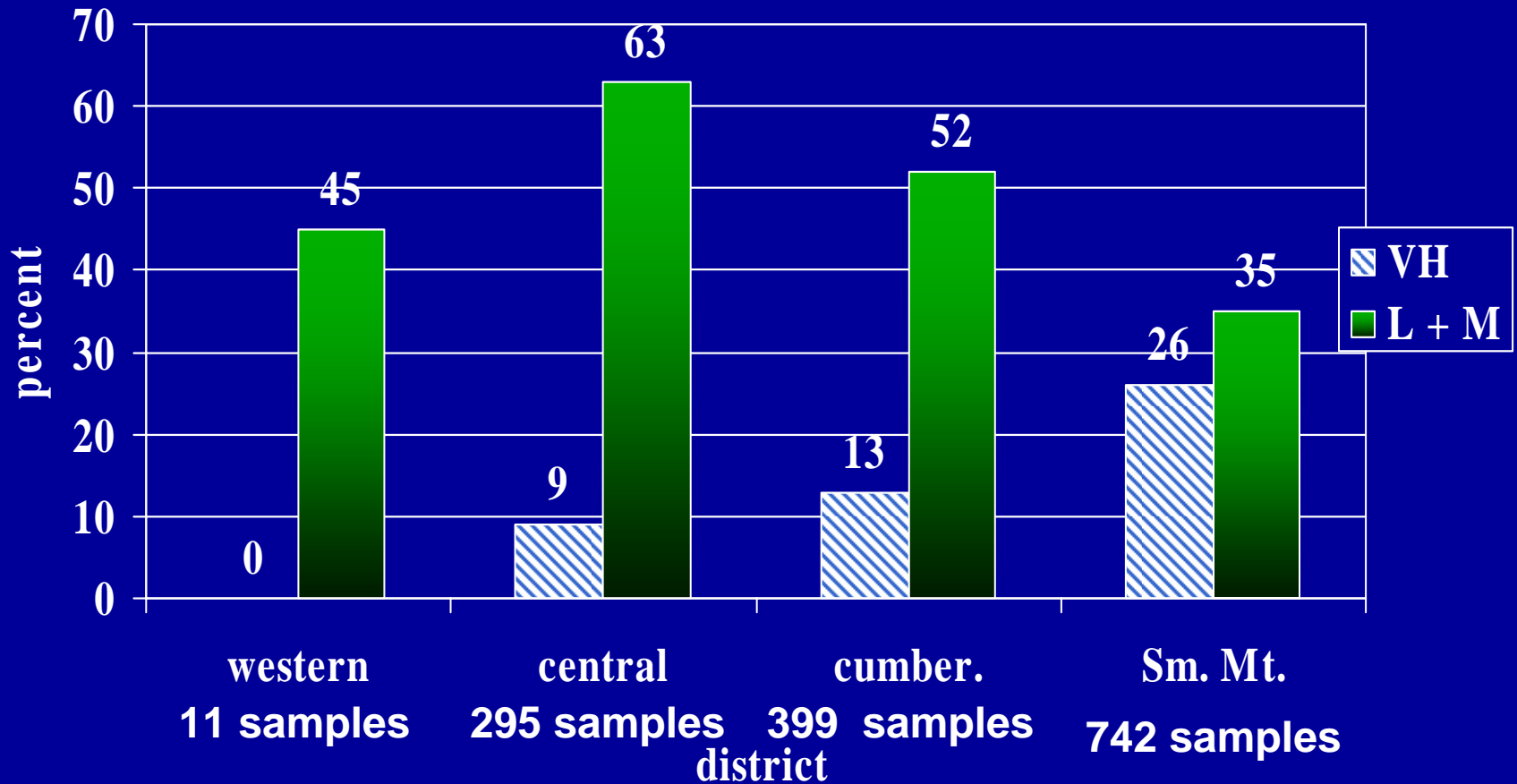
Potassium Rates for Tobacco

Soil Test Level	Pounds K₂O/acre
Low	300
Medium	180
High	120
Very High	0

TN Burley Tobacco Soil Samples Testing Very High or Low to Medium Soil P (Yr. 2000)



TN Burley Tobacco Soil Samples Testing Very High or Low to Medium Soil K (Yr. 2000)



Over half of soils tested were high or very high in P, K or both.

Little or no response to added P or K expected.

Fertilizer Costs per Acre by Soil Test

200 lbs N – Half Sidedress

Sidedress			
Soil Test	8-16-24 (lbs/ac)	Ammon nitrate (\$/ac)	Calcium nitrate (\$/ac)
Low	1250	310	360
Medium	750	227	277
High	500	185	235
Very high	0	101	151

**Would You Apply No P
and K at Very High Soil
Test ??**

Probably not for tobacco

P and K at Very High Soil Test ?????

- **No response in VH areas (most of field)**
- **But, fields not uniform**
- **May be medium testing areas**
- **Yield could be lost with 0 rate in these areas**

P and K at Very High Soil Test ?????

- **Cost of high soil test P and K about \$60 / ac**
- **40 pounds of burley**
- **25 to 30 pounds of dark**
- **1 to 2 % yield increase, probably good risk**
- **Could cut this rate by 30 to 50 %**

No P and K at Very High Soil Test ?????

- **Exception : Very high P soils in Outer Central Basin (TN)**
- **Naturally very high in P, no response to added P**

Fertilizer Costs per Acre by Soil Test

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Soil Testing

UT vs Other Labs

H. Savoy

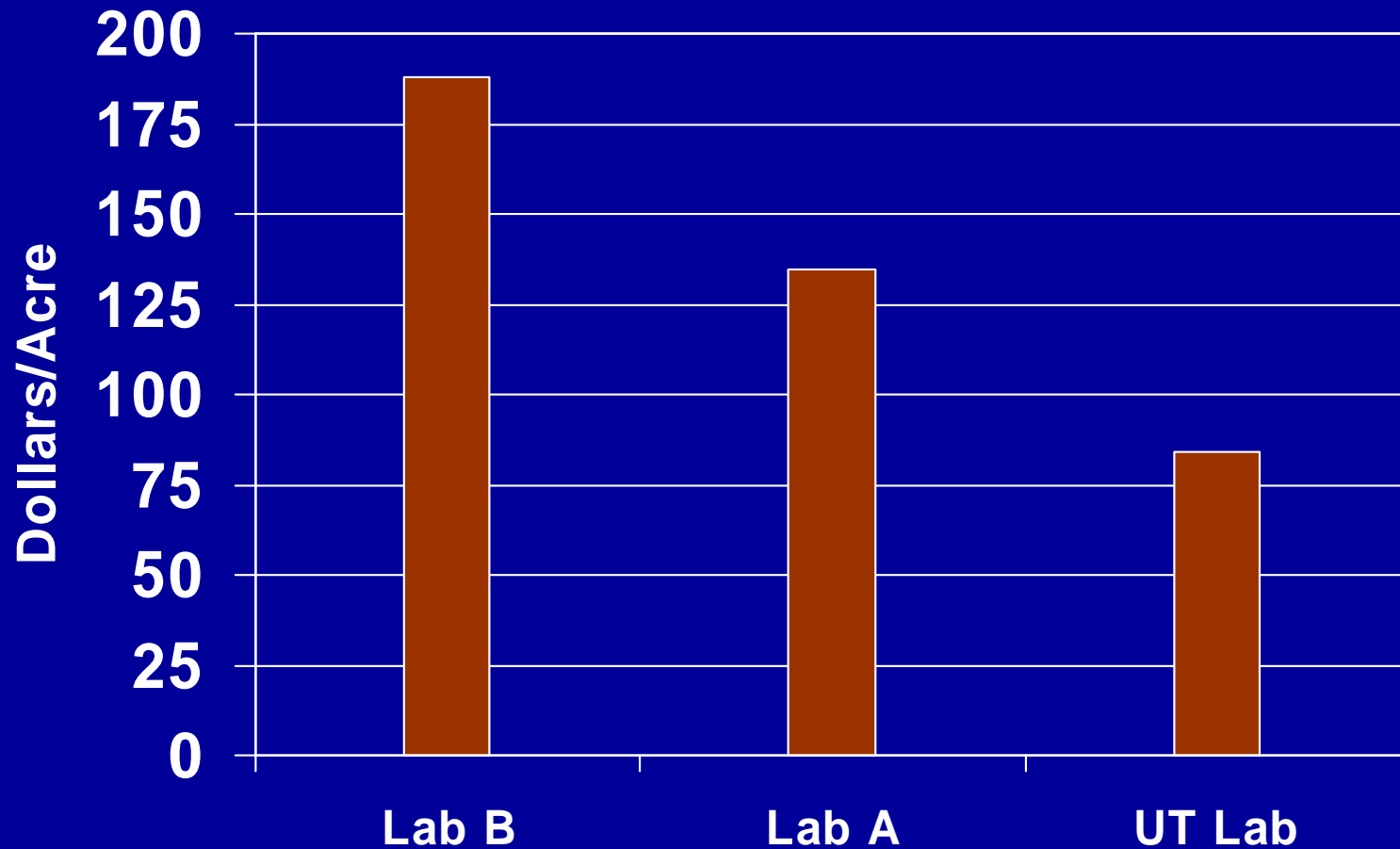
Source: H. Savoy. 2003. University of Tennessee
Fertilizer Recommendations are the Most Profitable .
BEES #101. UT Agric. Exten. Serv.

Soil Test Results by Three Labs

Smith County Tobacco 2002

<u>Soil Test Results</u>	<u>Lime</u>	<u>Fertilizer</u>
<u>U. T. Lab:</u> pH 6.3; P Very High; K High	<u>U. T. Lab:</u> pH 6.3 None	<u>U. T. Lab:</u> 200-0-120
<u>Lab A:</u> pH 6.0; P Very High; K Medium	<u>Lab A:</u> pH 6.0 1 ton/acre	<u>Lab A:</u> 300-0-120 +10S+0.5B
<u>Lab B:</u> pH 6.1; P Very High; K Medium	<u>Lab B:</u> pH 6.1 1 ton/acre	<u>Lab B:</u> 275-0-270 +24S +0.1B+1Zn +0.5Cu

Average Fertilizer Costs From Three Laboratory Recommendations Smith County Tobacco 2002



Tobacco Yield in A Production Field As Obtained From Three Different Laboratory Recommendations, 2002



Boron Deficiency



Boron Deficiency

- **Wet Springs on Sandy or Gravelly Soils**
- **Detect by Plant Symptoms**
- **Confirm by Plant Analysis**
- **Correct With 1 lb/ac B**
- **Sufficient for Several Years**
- **Toxicity Possible, Don't Increase Rate**