Today’s Topics

• Soil testing
• Recommendations
• Fertilizers
• Amendments
What is a soil test?

• Dried, ground & sieved soil
• Sample measurement
• Chemical extraction (extractable nutrients)
• Analysis
• Results to formulate recommendations
A Good Soil Sample

- Composite of the area
- 6 inch profile
- Collect same time each year
- Before amendments are applied
Soil test is NOT ideal for...

- Measuring transient/leachable nutrients like N & S
  Exception-PSNT (NO₃)
- Inadequate sample depths
- Post fertilization/liming
Soil testing and Plant analysis

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- Plant analysis should be used in combination with soil test results
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Fertilizer Recommendations

• Provided in pounds nutrient per acre
• Source of nutrient is your choice
• Basis:
  – Soil test results
  – Expected or desired yield
  – Nutrient removal rate or amount to increase rating
  – Quick build or sustainable application rate
  – Cost of nutrients
  – Cost of application
Fertilizer Selection

- Cost- per lb. nutrient and shipping/application fees
- Dry - blend or ammoniated
- Liquid / fluid
- Manures or by-products
- Storage capabilities

UAN 32-0-0 $245 per ton (1/20/16)
2,000 lbs fertilizer x 0.32 = 640 lbs. N

$245 ÷ 640 lbs. N = $0.38 per lb N
Dry (granular) Fertilizers

- Usually less expensive per pound of nutrient
- Higher nutrient percentages
- Great for macro or primary nutrients
- Minerals can “sort” during transport/application
- Incorporation can be issue
Ammoniated Fertilizers

- Chemically combined in ammonium form
- All nutrients in single pellet-equal distribution
- Micros available
- Cost
- Availability
Liquid Fertilizers

- Easy to use
- Can be single nutrient or several (complete) formulations
- Effectiveness is same as other fertilizers (by pound)
- Good for applying micros
- Requires specialized storage and application equipment (sprayers/pumps/tanks)
- Containment regs
Liquid Fertilizers

Clear

• Completely dissolved
• Easy to use
• Low to high nutrient concentrations
• Cost per pound of nutrient relatively high
• Long storage as long as held above freezing
Liquid Fertilizers

Suspended

- Higher nutrient concentrations
- Fine clays added to keep nutrients from settling
- Requires constant agitation
- Reduced shelf life
- Cost
Liquid Fertilizers-Ground or Foliar

• Applied during growing season
• Rapid uptake
• Foliar-
  – Phytotoxicity- excessive nutrients
  – uptake is limited-make take repeated applications
  – Good for areas with limited root uptake
  – Quick supplementation
Nutrient Density

- 10 – 11 lbs. per gallon
- 9 – 10 gallons supply same as 100 lbs. dry fertilizer

\[ 22 - 0 - 0 \]

\[ 100 \times 0.22 = 22 \text{ lbs. N dry} \]

\[ 11 \times 0.22 = 2.42 \text{ lbs. N per gallon} \]

\[ 22 \div 2.42 = 9.1 \text{ gallons} \]
Comparing N Cost

Prices (1/20/2016) $ per ton

Urea 46-0-0 $375 (untreated)

Liquid 4-12-8 $21 gal

11(lbs/gal) x .04 = 0.44 lb. N

$21/gallon ÷ 0.44 lbs. N / gal = $47.73 per lb N

2,000 lbs fertilizer x 0.46 = 920 lbs. N

$375 ÷ 920 lbs. N = $0.41 per lb N
Comparing P2O5 Cost

Prices (1/20/2016) $ per ton

DAP 18-46-0 $470

\[
2,000 \text{ lbs fertilizer} \times 0.46 = 920 \text{ lbs. P2O5} \\
$470 \div 920 \text{ lbs. P2O5} = \text{$0.51 per lb P2O5}
\]

Liquid 4-12-8 $21 gal

\[
11(\text{lbs/gal}) \times 0.12 = 1.32 \text{ lbs. P2O5} \\
$21/\text{gallon} \div 1.32 \text{ lbs. P2O5/gal} = \text{$15.91 per lb P2O5}
\]
Comparing K2O Cost

Prices (1/20/2016) $ per ton

Potash 0-0-60  $355

- 2,000 lbs fertilizer x 0.60 = 1200 lbs. K2O
- $355 ÷ 1200 lbs. K2O = $0.29 per lb K2O

Liquid 4-12-8  $21 gal

- 11(lbs/gal) x .08 = 0.88 lb. K2O
- $21/gallon ÷ 0.88 lbs. K2O/ gal = $23.86 per lb K2O
Animal Manures

- Cheap (if near source)
- Good for building organic matter/ low testing soils
- Slow release
- Generally high % nutrients
- Can build P quickly
Which nutrient source to use?

- Agronomic response same per nutrient
- Economics- Cost of nutrient unit
- Maximum returns by applying deficient nutrient
- Maximize profit-Rate of fertilization that produces at or near maximum yield
- Quality of dealer service
Lime Quality

Purity and Fineness
• CCE-Calcium Carbonate Equivalent
  – 75% minimum
• Crushed or ground- Screen size
  • = or not less than 85% passing 10 mesh
  • Not less than 50% passing 40 mesh
• PSE-Particle Size Efficiency
  • Efficiency factors related to % passing each mesh
• RNV-Relative Neutralizing Value
  • 65% minimum

https://tn.gov/assets/entities/agriculture/attachments/AgLicLimeRules.pdf
Lime Quality

• Relative Neutralizing Value (RNV)
  – Purity - Calcium Carbonate Equivalent (CCE)
  – Fineness - % on 10 mesh
    - % passing 10 mesh
    - % passing 40 mesh

• CCE, fineness (10 and 40 mesh) and RNV should be on label or delivery slip
Ag Lime: Ground or Pelletized

• Calcitic or Dolomitic
• Pelletized is finely ground ag limestone bonded together
  – Contains about 9% lignosulfonates (for binding)
  – Does not react faster than ag lime
• Application rates
  – Depends on RNV
  – If pelletized is higher (RNV), then you can reduce rates but compare cost
Liquid Lime

- Water and finely ground limestone
- RNV- usually much lower than ag or pelletized
- Usually marketed as Ca amendment (not Ag Limestone)
- Cost
  - Material
  - More trips
Calculating Application Rates

1 ton/acre (RNV 65)

Ex. RNV 85  \[ \frac{65}{85} = 0.76 \]
0.76 \( \times \) 2000 = 1,560 lbs. limestone

Ex. RNV 50  \[ \frac{65}{50} = 1.3 \]
1.3 \( \times \) 2000 = 2,600 lbs. limestone

Ex. RNV 26  \[ \frac{65}{26} = 2.5 \]
2.5 \( \times \) 2000 = 5,000 lbs.

Liquid- RNV 26  1 gal weighs 10 lbs.
5000 \( \div \) 10 = 500 gal liquid product
Take Home

• Apply fertilizer by soil test
• Plant response is the same per lb of plant nutrient
• Compare cost
• Be smart concerning micros
• Know your lime quality – expect an analysis
Soil, Plant & Pest Center
Ellington Agricultural Center
– 5201 Marchant Drive
– Nashville
– 615.832.5850
https://ag.tennessee.edu/spp
www.facebook.com/SoilPlantPestCenter
djoines@utk.edu