Utilizing Multiple Precision AG Practices to Reduce Costs and/or Maximize Profits

Cotton Inc.

Crop Management Seminar

Nov. 12, 2008

Topics

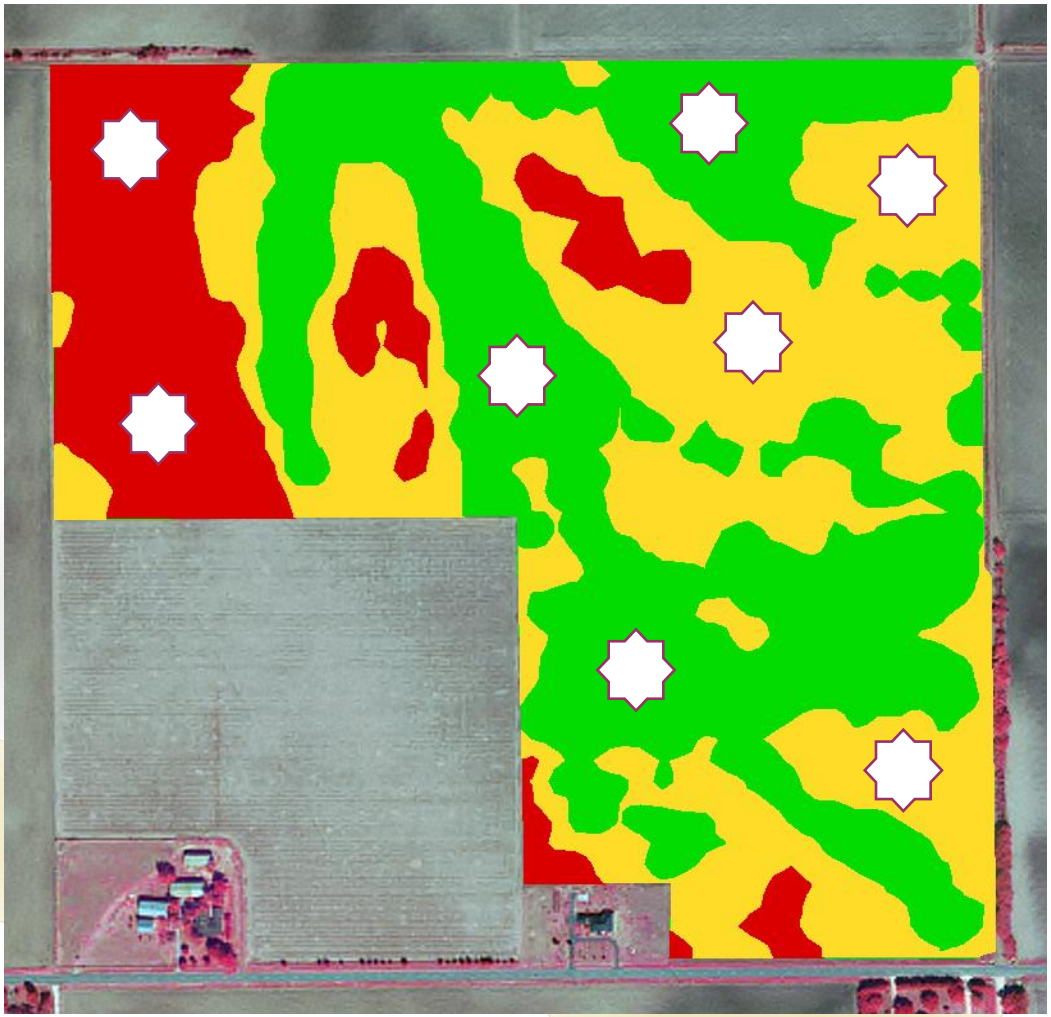
- Which technologies are right for me?
- How do I make it happen?
- Does all of this technology really work?
- Is there any way to make this easier?
- What is the ultimate goal?

Soil Fertility Management

- Grid sampling
  - *10, 5, 2.5, 1 acre grid?*
  - *Interpolates/estimates values between sample points*
- Zone sampling
  - *Field is divided into zones (EC or bare soil imagery)*
  - *Each zone is treated as an individual field*

Management Zones

- Provide Guides for soil sampling
- Identify “Fields within Fields”
- Track productivity or profitability of any subset of the field



In-season fertility management

- Directed tissue and/or soil sampling
- Aerial imagery
  - *Directs where to collect tissue or soil samples*
  - *Relies heavily on ground truthing*
  - *Limited by clouds*
- On-the-go sensors
  - *Measure reflectance data and simultaneously vary the rates*
  - *Relies heavily on algorithms*
  - *Not limited by clouds*

Making it happen

- Hardware needs
  - *Consultant/Service provider*
    - *GPS, handheld computer, computer*
  - *Fertilizer applicator*
    - *GPS, VR controller*
- Software needs
  - *GIS software*
    - *Mapping and soil sampling capability*
    - *Ability to import data to make management zones*
    - *Ability to write and export prescriptions to any VR controller*

Making it happen

- Committing the time and resources
- Realizing that there will be setbacks!!

Does this really work?

- Yes and NO
- Lower fertilizer costs inhibit ability to work
- Higher fertilizer cost enhance opportunities

Field A

- 2004 Straight Rate
- Grower Standard 20 Gal/ Acre of 11-37-0
- Fertilizer Cost - $1.34/Gal for Total of $26.72/Acre
- Yield – 1,327# Lint/Acre

- 2006 Variable Rate
- 11-27-0-7 + 1 Gal/Acre Hydra Hume
- Average Rate per Acre = 14.7 Gal/Ac
- Fertilizer Cost - $1.35/Gal + Hydra-Hume @ $5.00/Gal for a **Total of $24.85/Acre**
- Total Fertilizer Cost in 2004 Dollars was $22.79
- Yield – 1,387# Lint/Acre

Comparision

- **$950/ton DAP; $575/Ton 0-0-60**
- Rice-
  - *100 lbs DAP*
  - *150 lbs 0-0-60*
- Cost per acre 80 acre field
  - *$47.50 for DAP*
  - *$43.00 for 0-0-60*
- $90.50/ A

- Hyground-zone sampling
- Rice-
  - *45 lbs DAP*
  - *180 lbs 0-0-60*
- Cost per acre
  - *$22.00 for DAP*
  - *$51.75 for 0-0-60*

  $73.75/A

Shallow EC Polygons

Deep EC Polygons

Lon: 096.16145° W

Season: 2009
Min: 2.86 mS/meter
Avg: 42.50 mS/meter
Max: 105.50 mS/meter

Season: 2009
Min: 1.46 mS/meter
Avg: 31.47 mS/meter
Max: 83.64 mS/meter

Field Boundary Shallow EC Polygons mS/meter
2.9 - 20.7 (7.6 ac) (15%)
20.8 - 38.9 (18.7 ac) (37%)
39 - 58 (9.5 ac) (19%)
58.5 - 76 (8.8 ac) (17%)
76.2 - 105.5 (6.1 ac) (12%)

Field Boundary Deep EC Polygons mS/meter
1.5 - 22.8 (20.3 ac) (40%)
22.9 - 40.2 (15 ac) (30%)
40.2 - 55.6 (8.4 ac) (16%)
55.7 - 68.4 (4.5 ac) (9%)
69.1 - 83.6 (2.5 ac) (5%)

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HyGround

P - Soil Test

Field Boundary
P - Soil Test ppm
11.3 - 51.3 (28.2 ac) (56%)
51.5 - 113.1 (15.1 ac) (30%)
114.4 - 180.7 (2.5 ac) (5%)
185.5 - 233.2 (2.8 ac) (5%)
243.6 - 290.7 (2.2 ac) (4%)

Season: 2009
Min: 11.31 ppm
Avg: 67.36 ppm
Max: 290.73 ppm

Min Rate: 21.46 lb/ac
Avg Rate: 15.91 lb/ac
Max Rate: 42.52 lb/ac
Total Nutrient: 773.18 lb
Applied Area: 27.90 ac
Purpose - Year 1 -- Dry Grain
Build Years -- 0
Yield Goal - Year 1 -- 200
Crop - Year 1 -- Rice
P Rec Option -- No Build

P Recommendation

Field Boundary
P Recommendation lb/ac
0 - 0 (22.9 ac) (45%)
21.5 - 28.8 (16.9 ac) (33%)
29 - 35.3 (10.3 ac) (20%)
36.1 - 39.1 (0.4 ac) (1%)
40 - 42.5 (0.2 ac) (0%)

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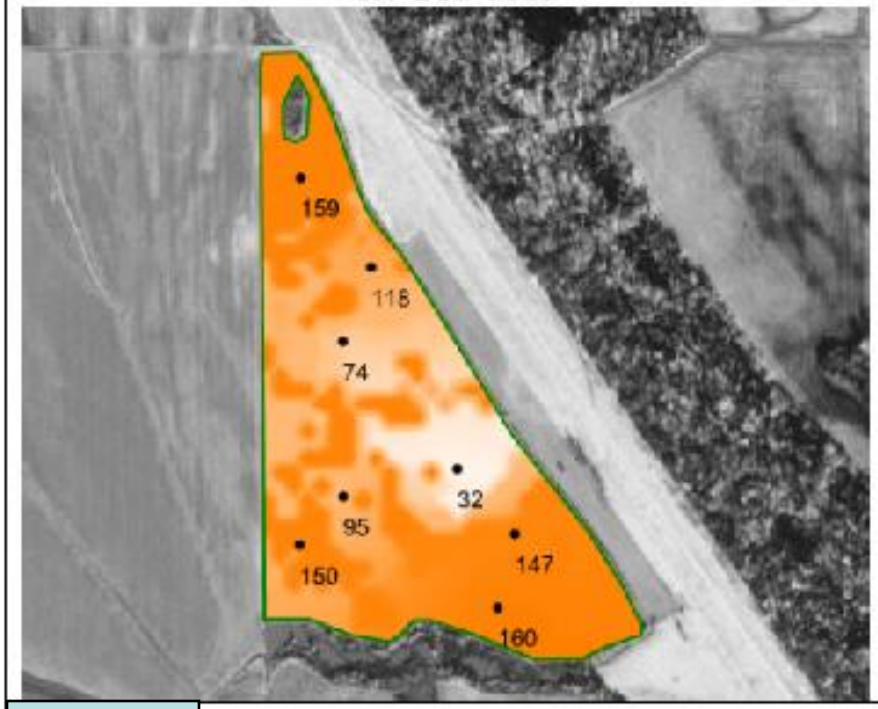
HyGround

K - Soil Test

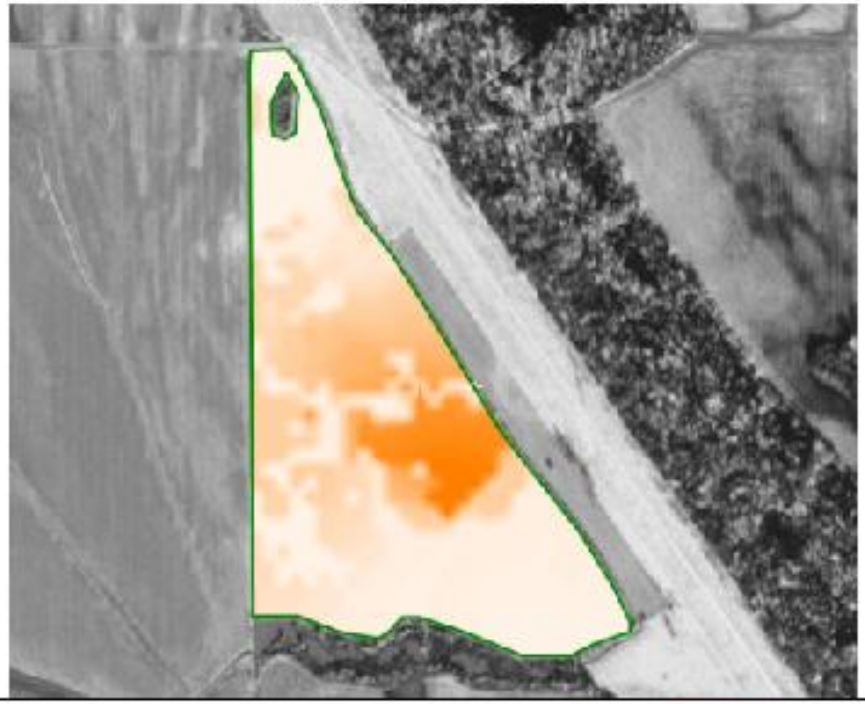


- Field Boundary
- K - Soil Test ppm
  - 31.5 - 51.1 (3.7 ac) (7%)
  - 53 - 71.7 (3.2 ac) (6%)
  - 72.1 - 90.9 (4.2 ac) (8%)
  - 92.7 - 126.8 (14.2 ac) (28%)
  - 127.7 - 160 (25.5 ac) (50%)

Season: 2009
Min: 31.47 ppm
Avg: 120.17 ppm
Max: 160.00 ppm

Min Rate: 40.00 lb/ac
Avg Rate: 53.58 lb/ac
Max Rate: 93.09 lb/ac
Total Nutrient: 2,742.71 lb
Applied Area: 50.76 ac
Purpose - Year 1 -- Dry Grain
Build Years -- 0
Yield Goal - Year 1 -- 200
Crop - Year 1 -- Rice
K Rec Option -- No Build

K Recommendation



- Field Boundary
- K Recommendation lb/ac
  - 40 - 49.7 (26.8 ac) (53%)
  - 49.9 - 62.7 (12.7 ac) (25%)
  - 63.4 - 73.1 (4.7 ac) (9%)
  - 73.6 - 82.5 (2.9 ac) (6%)
  - 83.7 - 93.1 (3.7 ac) (7%)

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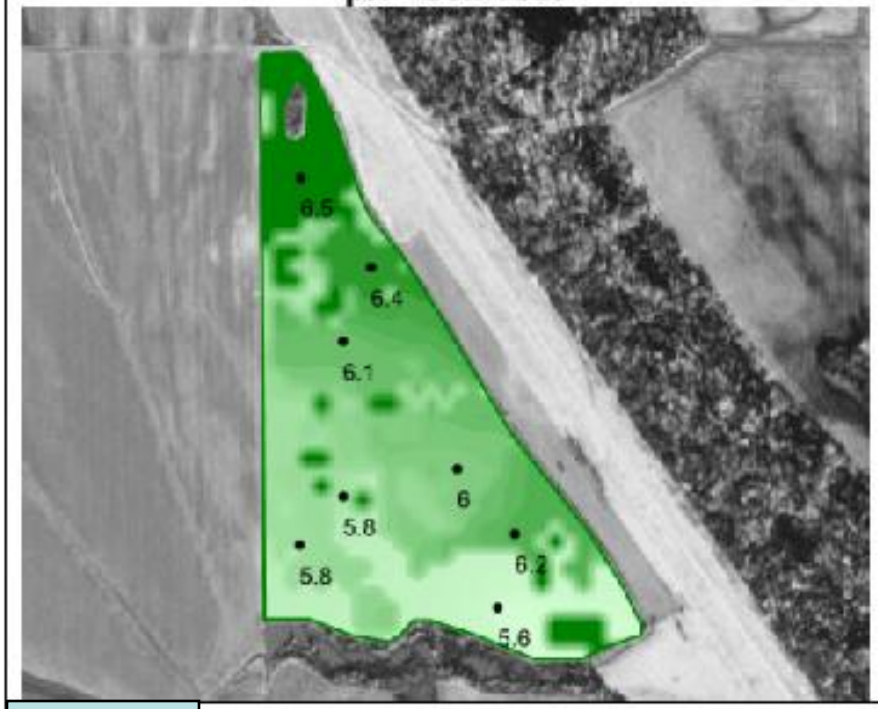
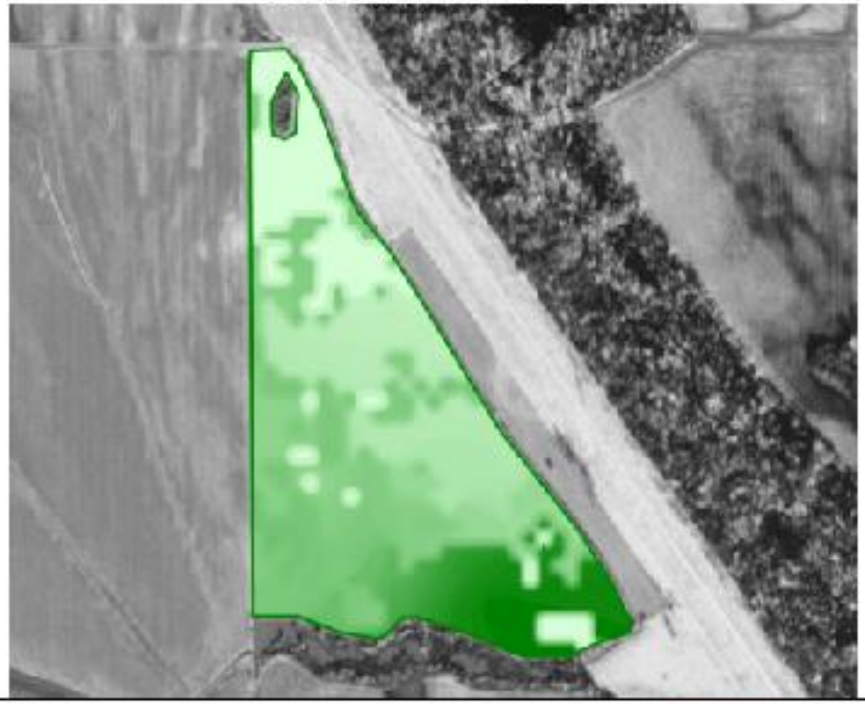
HyGround

pH - Soil Test



Lime Recommendation



- Field Boundary
- pH - Soil Test PH SCALE
  - 5.6 - 5.7 (7.8 ac) (15%)
  - 5.7 - 5.9 (13.4 ac) (26%)
  - 5.9 - 6.1 (12.1 ac) (24%)
  - 6.1 - 6.4 (9.7 ac) (19%)
  - 6.4 - 6.5 (7.9 ac) (16%)

- Field Boundary
- Lime Recommendation lb/ac
  - 0 - 0 (9.1 ac) (18%)
  - 1750.3 - 2361.7 (14.5 ac) (28%)
  - 2378.8 - 3024 (18.8 ac) (37%)
  - 3034.5 - 3610.6 (2.5 ac) (5%)
  - 3618.1 - 3920 (5.9 ac) (12%)

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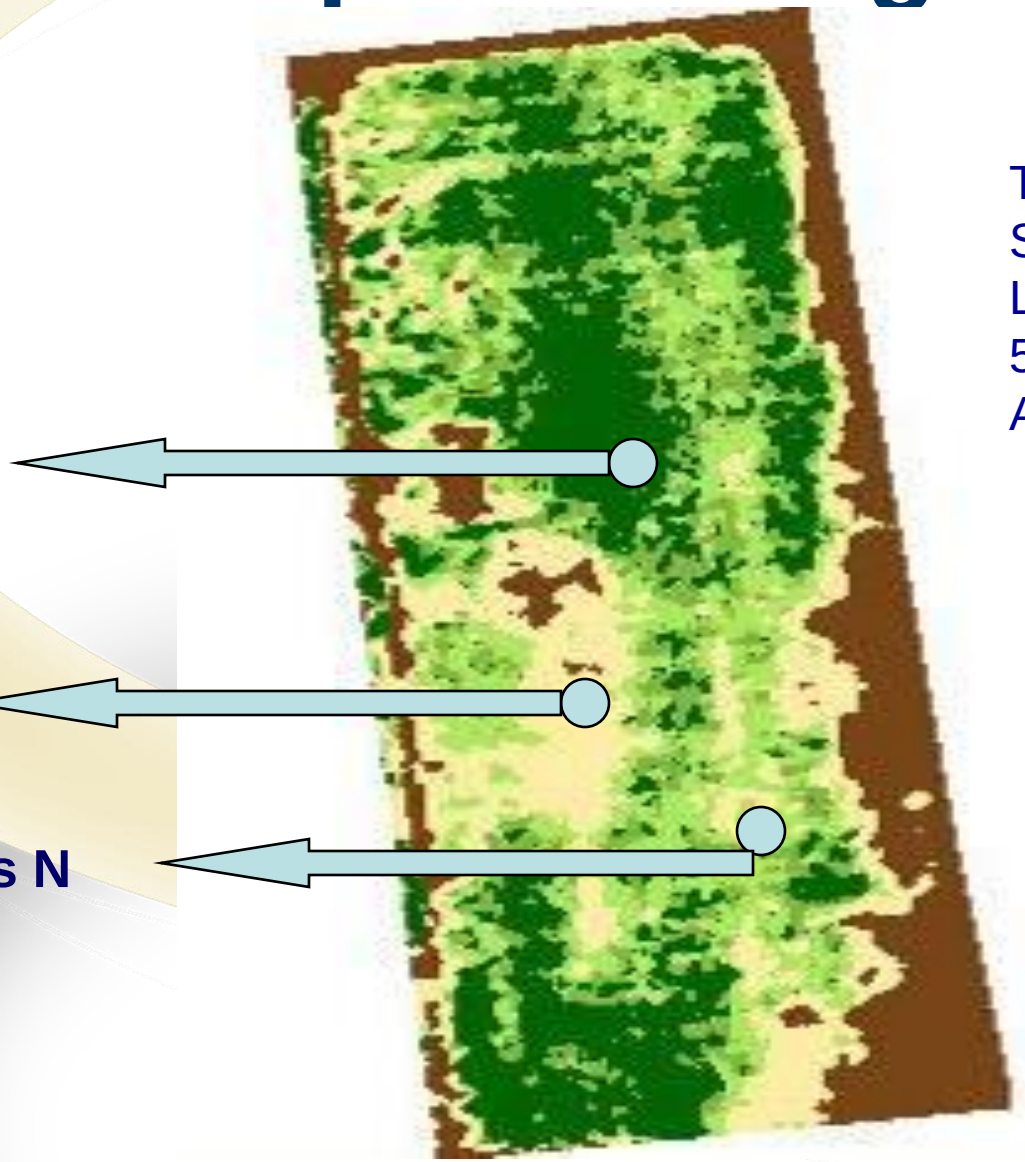
Season: 2009
Min: 5.60 PH SCALE
Avg: 6.00 PH SCALE
Max: 6.50 PH SCALE

Min Rate: 1,750.25 lb/ac
Avg Rate: 2,182.31 lb/ac
Max Rate: 3,920.00 lb/ac
Total Nutrient: 111,162.41 lb
Applied Area: 41.67 ac
pH Target -- 6.5
Lime Rec Option -- SMP Buffer pH

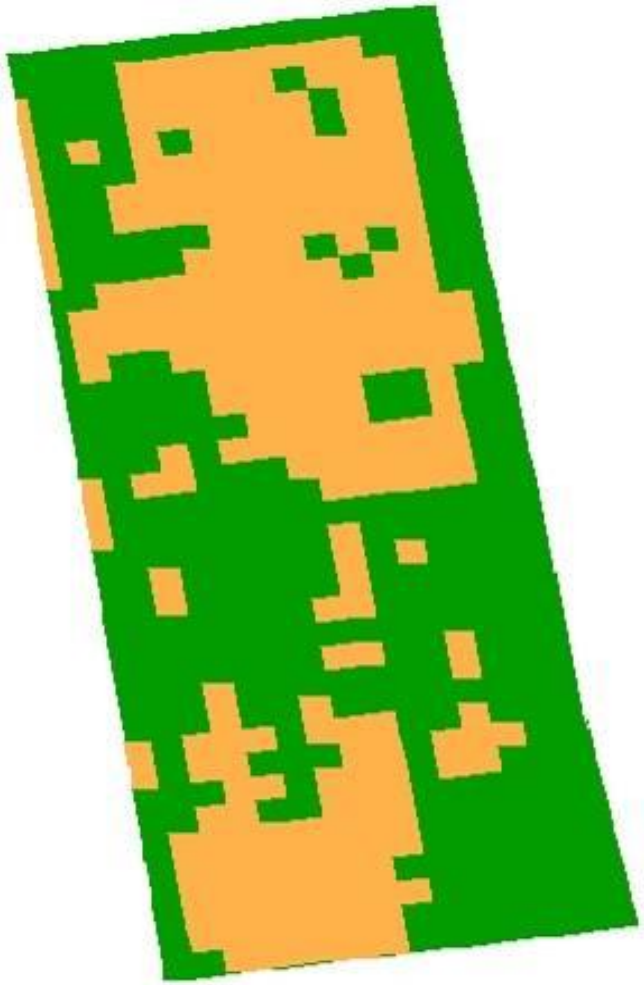
HyGround

Scout Map from Aug. 2004



The 2006 samples Showed that the N Levels ranged from 55.4 to 73.6 lbs of Available N.

RX Map

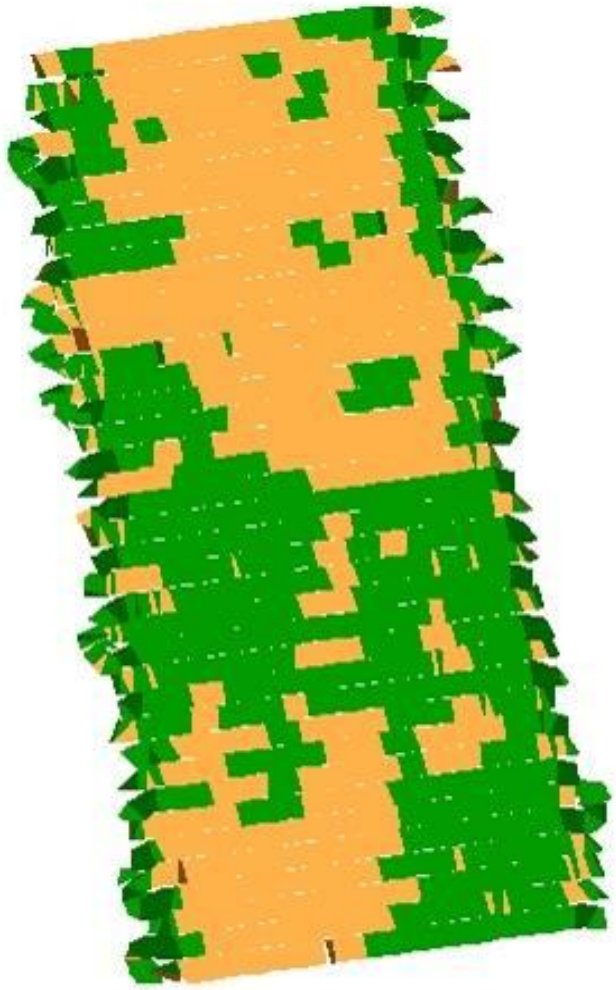


RX Rate

90

120

As-Applied Map



Applied Rate

0.10 - 75.00

75.01 - 105.00

105.01 - 135.00

135.01+

lbs Ammonium Nitrate

Results

Leaf Tissue N:
Peak Bloom
Class 3: 4.05% N
Class 4: 4.34% N
Class 5: 5.43% N

Leaf N Critical Values:
Mid-bloom: 4.1%
Cut-out : 3.8%
(Bell et al.,2003 Crop Science)

DP 432 RR

2004 Yield- 1333 lbs/A
2005 Yield- 1253 lbs/A

Is there any way to make this easier??

- Obstacles
  - *Substantial investment for hardware and software*
  - *Taking the time to learn software*
  - *Getting results in a format that is usable*
- Possibilities
  - *Relationships with larger service providers*
    - *Allows for consultant to do field work*
    - *Service provider does computer processing*
    - *Consultant makes agronomic decisions from the results*

Where are we headed

- Would tying yield maps and record keeping data to fertility management be useful??