PRECISION AG/NEMATODE MANAGEMENT IN S. C.

- **South Carolina**
  - Ahmad Khalilian
  - Will Henderson
  - John Mueller

- **Current Coop.**
  - Terry Kirkpatrick
  - Scott Monfort

- **Others**
  - Al Wrather
A typical production field in the Southeastern Coastal Plain

- Sandy Loam
- Sand
- Sandy Clay Loam
## COTTON_THRESHOLDS

<table>
<thead>
<tr>
<th>Species</th>
<th>Nematodes/100cm³</th>
<th>Low</th>
<th>High</th>
</tr>
</thead>
<tbody>
<tr>
<td>Root-knot</td>
<td></td>
<td>100</td>
<td>250</td>
</tr>
<tr>
<td>Reniform</td>
<td></td>
<td>250</td>
<td>625</td>
</tr>
<tr>
<td>Lance</td>
<td></td>
<td>75</td>
<td>190</td>
</tr>
</tbody>
</table>
## COTTON THRESHOLDS

<table>
<thead>
<tr>
<th>Low Threshold</th>
<th>5 to 6 lbs/acre Temik 15G at planting</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>or Avicta</td>
</tr>
</tbody>
</table>

| High Threshold                | 3.0 gals/acre Telone II preplant +    |
|-------------------------------| 3 - 5 lbs Temik 15G at planting     |
|                               | or 5 lbs Temik 15G at planting +     |
|                               | 5 lbs Temik 15G side dressed         |
|                               | or Vydate CLV                         |
|                               | or Rotation                           |
4 Farms – 214 Fields

< Threshold 31%

At low threshold 32%

> High Threshold 37%

Primarily Columbia lance and Root-knot Nematodes
NEMATODE DISTRIBUTION

- Nematodes are not uniformly distributed within fields.

- Distribution is determined by:
  - Soil texture
  - Soil chemical properties
  - Host distribution
“NEW TOOLS”

- AVAILABLE
  - G.I.S./G.P.S.
  - S.E.C.M.

- NEEDED
  - Variable rate applicator for Temik 15G
  - Variable rate applicator for Telone II
OBJECTIVE

- Determine (predict) for each grid:
  - Nematode density
  - Yield potential
  - Soil texture
  - Particle size
  - pH
Columbia Lance Nematode
Soil texture, especially % sand may be the most important factor in determining the distribution of individual nematode species.

Soil electrical conductivity correlates strongly to soil particle size and texture.
Determine the potential for predicting nematode distribution and density using soil electrical conductivity.
Effects of Soil Texture (% Sand) on Soil Electrical Conductivity

R² = 0.9121
Effects of Soil Texture (\% Clay) on Soil Electrical Conductivity (Bamberg Farm)

\[ R^2 = 0.916 \]
Effects of moisture & temperature on soil EC

- **Moisture**: 11.9%, 9.0%, 8.2%
  - **Temperature (°F)**: 80.2, 73.8, 68.5

**R²** values for the regression lines:
- **R² = 0.93**
- **R² = 0.92**
- **R² = 0.95**
Effects of Soil Texture on Columbia Lance Nematode

Youngblood Farm

Soil Electric Conductivity (mS/m)

Nematodes/100 cm³ soil

At Planting

At Harvest

Soil Electric Conductivity (mS/m)
Effects of Soil Texture on Columbia Lance Nematode at Harvest

Soil Electric Conductivity (mS/m)

Nematodes/100 cc soil

Bamberg Farm
Objective 2

To develop a variable-rate applicator for Telone II & Temik 15G.
Objective 3

To determine the accuracy of the variable-rate application systems.
Variable-Rate Telone II Application Equipment Uniformity Test

Measured rate (liter/ha)

Targeted rate (liter/ha)

Average Overall Error = -2.1%

% Error
Row Max. Ave.
1 - 6.7 - 3.3
2 5.5 0.5
3 - 6.7 - 3.5
4 5.3 - 1.9
Variable-Rate Temik 15G Application Equipment Uniformity Test

Measured rate (kg/ha)

Targeted rate (kg/ha)

- Measured

1:1 Line

Average Overall Error = 1.1 %

<table>
<thead>
<tr>
<th>Row</th>
<th>Max.</th>
<th>Ave.</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>-3.0</td>
<td>0.5</td>
</tr>
<tr>
<td>2</td>
<td>4.2</td>
<td>1.6</td>
</tr>
<tr>
<td>3</td>
<td>-3.0</td>
<td>0.9</td>
</tr>
<tr>
<td>4</td>
<td>4.0</td>
<td>1.5</td>
</tr>
</tbody>
</table>
Objective 4

To compare efficacy of variable-rate vs. uniform-rate nematicide application.
# Rates Compared

<table>
<thead>
<tr>
<th>Treatment</th>
<th>Temik (lbs/A)</th>
<th>Telone (gal./A)</th>
</tr>
</thead>
<tbody>
<tr>
<td>STD Temik</td>
<td>6.0</td>
<td>0.0</td>
</tr>
<tr>
<td>VAR Temik</td>
<td>3.0 to 7.0</td>
<td>0.0</td>
</tr>
<tr>
<td>STD Telone</td>
<td>3.0</td>
<td>3.0</td>
</tr>
<tr>
<td>Var. Telone</td>
<td>3.0</td>
<td>0.0 to 3.0</td>
</tr>
<tr>
<td>Control</td>
<td>0.0</td>
<td>0.0</td>
</tr>
</tbody>
</table>
Soil Electrical Conductivity Map (top 30 cm) Youngblood Farm
# Variable Rate Nematicide Application Guidelines

<table>
<thead>
<tr>
<th>Temik 15 G (lbs/A)</th>
<th>Columbia lance per 100 ml soil</th>
</tr>
</thead>
<tbody>
<tr>
<td>3.0</td>
<td>Less than 51</td>
</tr>
<tr>
<td>5.0</td>
<td>51 to 125</td>
</tr>
<tr>
<td>7.0</td>
<td>More than 125</td>
</tr>
</tbody>
</table>
Variable Rate Nematicide Application Guidelines

<table>
<thead>
<tr>
<th>Telone II (gal/A)</th>
<th>Columbia lance per 100 ml soil</th>
</tr>
</thead>
<tbody>
<tr>
<td>0.0</td>
<td>Less than 51</td>
</tr>
<tr>
<td>18.7</td>
<td>51 to 125</td>
</tr>
<tr>
<td>28.0</td>
<td>125 to 200</td>
</tr>
<tr>
<td>37.4</td>
<td>More than 200</td>
</tr>
</tbody>
</table>
Effects of Soil EC and Telone Application Method on Lint Yield

Youngblood Farm, 2003

Cotton Lint (lbs/acre)

Soil Electrical Conductivity (mS/m)
Effects of Soil EC and Temik Application Method on Lint Yield

Youngblood Farm, 2003

Cotton Lint (lbs/acre)

Soil Electrical Conductivity (mS/m)

- Sta. Temik
- Control
- Var. Temik
Effects of variable-rate nematicide application on lint yield and chemical use

<table>
<thead>
<tr>
<th>Treatment</th>
<th>Temik (lbs/A)</th>
<th>Telone (gal/A)</th>
<th>Lint yield (lbs/A)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Sta. Temik</td>
<td>6.0</td>
<td>0.0</td>
<td>650</td>
</tr>
<tr>
<td>Var. Temik</td>
<td>4.0</td>
<td>0.0</td>
<td>687</td>
</tr>
<tr>
<td>Sta. Telone</td>
<td>3.0</td>
<td>3.0</td>
<td>663</td>
</tr>
<tr>
<td>Var. Telone</td>
<td>3.0</td>
<td>0.6</td>
<td>696</td>
</tr>
<tr>
<td>Control</td>
<td>0.0</td>
<td>0.0</td>
<td>566</td>
</tr>
</tbody>
</table>
Conclusions

• Var.-rate Temik system resulted in 5% higher yield and 34% lower nematicide usage compared to single rate.

• Var.-rate Telone increased lint yield by 5% with 78% reduction in nematicide usage compared to single rate.
WHERE TO GO??

- CLN was easy, direct relation of % sand to nematode density (size matters).
- Distribution = damage.
- Immense variation in a field. Easy to i.d. where to put Telone II.
- Columbia lance is a “strong pathogen”
- Columbia lance particle size is possibly not an issue.
- Problems will come in “mixture” fields.
Root-knot & reniform

- Much weaker pathogens on a unit basis
- Distribution does not = damage
  - Rely more on stress
  - Particle size more important??
- Will need data on interaction of
  - Yield potential * nematode density
  - How to predict density or stress??
NEW GRANT FOR SC & AR

Demonstration of Site-Specific Nematicide Placement in Cotton for Water Quality Enhancement, Higher Lint Yields, and Increased Farm Profits.

3 year grant to work with growers to promote the use of site specific application technology.
Investigators: Terry Kirkpatrick, Scott Monfort, and Andy Mauromoustakos

Interrelationship of soil texture and root-knot nematode on yield.
Spatial Data Evaluation

Field divided into 4 soil-texture classes:

1.) 0-30 % Sand
2.) 31-45 % Sand
3.) 46-60 % Sand
4.) > 60 % Sand

Within Soil classes - plot data averaged based on Telone application:

1.) 0
2.) 1.5 gal.
3.) 3.0 gal.
4.) 4.5 gal.