Potential of Variable-Rate Seeding for Site-Specific Plant Growth Management in Cotton

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Rank growth in Cotton - tall and excessive vegetative growth
- plants more susceptible to boll rot and late season insects
- delays maturity and makes it more difficult to defoliate

Plant Growth Regulator (PGR)
- used to manage vegetative growth
- proper rate and timing is important
- uniform applications are most common
- few growers utilize “spot spray” method

Source: UF | IFAS Extension
**Introduction**

- **Challenge** - Spatial variability within the fields in the Southeastern US (soil type, elevation, etc.)
  - Grower interest in better management strategies to address growth variability

- **Seeding Rate/Plant Population** - area between plants, competition, canopy coverage, sunlight penetration and yield

![Aerial imagery showing differences in soil types across a field](image1)

![In-season satellite imagery showing crop growth variability](image2)
Can seeding rate be adjusted appropriately in certain field areas (management zones) to reduce the potential of rank growth?

**Objective**

Evaluate variable-rate seeding as one of the strategies for site-specific plant growth management in cotton
Field 1:
- Colquitt County, GA
- 27.5 ha
- Irrigated

Management Zones:
- Soil Type
- Crop Health
- Yield
Methods

Field 1:
- Colquitt County, GA
- 27.5 ha
- Irrigated

Management Zones:
- Soil Type
- Crop Health
- Yield
Field 2:
- Dougherty County, GA
- 12.1 ha
- Irrigated

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- Soil Type
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- Yield
**METHODS**

**Study Layout:**

- **Zone – 1 & 2**
- **Three Seeding Rates**
  - 53.1 ksd/s/ha
  - 63.0 ksd/s/ha
  - 72.9 ksd/s/ha (Grower Nominal)
- **Three Replications**
- **9 Randomized Passes**

12-row planter @ 91.4 cm spacing; planter = 10.9 m

Field 1: DP2012; Field 2: DP2038
Data Collection

(randomly selected locations in center 6 rows)

- Emergence (stand counts)
  - 3.0 m of row
- Plant Heights & Node Counts
  - 60 plants (in center 6 rows)
- Yield (12-rows)
  - Weighing each pass separately
  - Yield map

Data Analysis

- Two-way ANOVA using JMP Pro 15
- Means comparison using a $p \leq 0.10$
# Results

## Field 1

<table>
<thead>
<tr>
<th>Zone</th>
<th>Target Rate (kds/ha)</th>
<th>Population (plants/ha)</th>
<th>Emergence (%)</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>53.1</td>
<td>50,230 c</td>
<td>95% a</td>
</tr>
<tr>
<td>1</td>
<td>63.0</td>
<td>59,531 b</td>
<td>94% a</td>
</tr>
<tr>
<td>1</td>
<td>72.9</td>
<td>69,099 a</td>
<td>95% a</td>
</tr>
<tr>
<td>2</td>
<td>53.1</td>
<td>47,107 c</td>
<td>89% a</td>
</tr>
<tr>
<td>2</td>
<td>63.0</td>
<td>49,632 c</td>
<td>79% b</td>
</tr>
<tr>
<td>2</td>
<td>72.9</td>
<td>55,879 b</td>
<td>77% b</td>
</tr>
</tbody>
</table>
Plant Height & Nodes

**Field 1**

- **Plant Heights (cm)**
  - Seeding Rate (kds/ha): 53.1, 63.0, 72.9
  - Zone 1 and Zone 2

- **#nodes**
  - Seeding Rate (kds/ha): 53.1, 63.0, 72.9
YIELD

Field 1

Zone 1

Zone 2

Seeding Rate (ksds/ha)

- 53.1
- 63.0
- 72.9
YIELD

Field 1

Zone 1

Zone 2
Results - Emergence

Field 2

<table>
<thead>
<tr>
<th>Zone</th>
<th>Target Rate (ksds/ha)</th>
<th>Population (plants/ha)</th>
<th>Emergence (%)</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>53.1</td>
<td>40,994 e</td>
<td>77% bc</td>
</tr>
<tr>
<td>1</td>
<td>63.0</td>
<td>48,170 c</td>
<td>76% c</td>
</tr>
<tr>
<td>1</td>
<td>72.9</td>
<td>55,612 b</td>
<td>76% c</td>
</tr>
<tr>
<td>2</td>
<td>53.1</td>
<td>44,317 d</td>
<td>83% a</td>
</tr>
<tr>
<td>2</td>
<td>63.0</td>
<td>53,951 b</td>
<td>85% a</td>
</tr>
<tr>
<td>2</td>
<td>72.9</td>
<td>59,598 a</td>
<td>82% ab</td>
</tr>
</tbody>
</table>
PLANT HEIGHT & NODES

Field 2

- **Plant Height (cm)**
  - Seeding Rate (ksds/ha): 53.1, 63.0, 72.9
  - Zone 1: d, bc, b
  - Zone 2: a, a

- **# nodes**
  - Seeding Rate (ksds/ha): 53.1, 63.0, 72.9
  - Zone 1: c, b, b
  - Zone 2: b, a, b
SUMMARY

➢ Seeding rate had an influence on plant growth in both fields. The lowest seeding rate resulted in less vegetative growth in both zone 1 and 2.

➢ In field 2, zone 1 had lower emergence, shorter plants, and yielded more than zone 2.

➢ There is a potential to reduce seeding rate from grower nominal without any yield impact in both fields.

Future Research:

❑ Evaluate the use of variable-rate seeding and variable-rate PGR applications by management zones for cotton production in the Southeastern US.
Thanks!

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