Preliminary Evaluation of Cotton Quality Mapping

Dr. Jason Ward, Assistant Professor, NC State University
Dr. Terry Griffin, Associate Professor, Kansas State University
Enrique Pena, MS Student, NC State University
Background

• “The U.S. is the world’s most reliable producer of high quality cotton.” – Cotton Inc
Cotton Digital Agriculture

Cotton may be perceived as “regional” and has not had the same level of investment, but can still generate large data sets.
Background

Cotton quality is determined using a High Volume Instrument (HVI) Testing

- Micronaire (Diameter)
- Strength
- Color Grade
- Length
- Uniformity Index
- Trash
Opportunity

i. Traceability of cotton modules back to the field

ii. Cotton quality mapping as a tool for growers
Objectives

i. Map quality variability in cotton fields by using machine and gin data provided

ii. Explore relationships between quality variables and yield
# Machine Data Streams

- Generated by CP690 during harvest operations
  - Yield
  - Harvest ID (HID)

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<th>module_sn</th>
<th>Lat</th>
<th>Lon</th>
<th>GMT_Date</th>
<th>GMT_Time</th>
<th>Tag_Count</th>
<th>Client</th>
<th>Farm</th>
<th>Field</th>
<th>Variety</th>
<th>Machine_Operator</th>
<th>Gin</th>
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</table>
Gin Data Streams

• Classing by Permanent Bale Identifier (PBI)
  – Not Module Averaged
• PBI by Module Serial No.
  – Only truly manual step
Make and Drop Map

Yield Map
Discrete Module Path

- Randomly selected modules selected for visualization
- Impacts of travel path of data quality
<table>
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<tr>
<th>Module</th>
<th>Mic</th>
<th>Area (ac)</th>
<th>Weight (lb)</th>
<th>Value</th>
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Statistical Summary

- Tested HVI quality measures.
  - Alpha = 0.05
  - Proc Glimmix in SAS 9.4

- All measures significantly different
  - Some individual modules were different
  - Dispersion made meaningful means separation difficult
  - Still understanding system significance
Micronaire at Field Scale
Strength at Field Scale
Length at Field Scale
Length Uniformity at Field Scale

The graph illustrates the length uniformity at field scale, with data points indicating the regional mean, NC mean, and field mean. The x-axis represents length uniformity (%) ranging from 80 to 85, while the y-axis shows module serial ID. The data points are dispersed across the graph, indicating variability in length uniformity across different modules.
Bale Value at Field Scale
Mean Module Staple Length (32s)

- 36.00 - 36.50
- 36.50 - 37.00
- 37.00 - 37.50
- 37.50 - 38.00
- 38.00 - 38.40
Mean Module Length Uniformity (%)

- 80.5 - 81.0
- 81.0 - 81.5
- 81.5 - 82.0
- 82.0 - 82.5
- 82.5 - 83.0
- 83.0 - 83.5
- 83.5 - 83.9
Mean Module Bale Value ($)

- 254.210 - 255.000
- 255.000 - 260.000
- 260.000 - 265.000
- 265.000 - 270.000
- 270.000 - 275.000
- 275.000 - 280.000
- 280.000 - 283.650
Spatial Analyses for Growers

- Mapping quality variables and yield variability for growers to use
- Production practices
Future Analysis

- OLS Residual Plot
  - Mic vs Soil Type and Elevation
  - Appears to suggest complex spatial pattern
Questions?

Enrique Pena // eepena@ncsu.edu
Jason Ward // jason.ward@ncsu.edu