Site-specific management at Bowles Farming Company

UC Davis Precision Ag Workshop
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Bowles Farming Company, Inc.
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- Family owned and operated
- 150+ years farming in California
- 10,500 irrigated acres in the Central San Joaquin Valley (Los Banos)
- 4,200 acres Cotton, 2,800 Alfalfa, 2,100 Tomatoes, 1,000 Small grains, 500 melons
- Clay Loam Soils - variable
Current Precision Ag Program

- GPS Guided Tractors
  - Sub-inch listing (RTK) (2002)
  - DGPS Tillage (2001)
- Geographic Information System software (2001)
  - Basic mapping
  - Advanced data analysis
  - Data Management
- Variable Rate Prescriptions and Applications (2002)
- Collection of Yield Data (2002)
  - Grain & Cotton
- Satellite Imagery (2002)
  - Field Analysis & Remediation
  - Crop Scouting (basis of VR applications)
  - Drip irrigation fields
Primary Goals

- **Use Advanced Data to Identify Areas of Field Variability and Correct if Possible**
  - Determine Causes
    - Soil Type
    - Leveling
    - Irrigation
    - Mechanical or Chemical Damage
    - Bug Pressure
    - Nutrient Deficiency

- **Use Advanced Data to Target Crop Inputs to Areas of Need**
  - Growth Regulator
  - Defoliant
  - Fertilizer, Amendments, Organic Matter (compost)
Other benefits

- **Cost savings**
  - 15-20% reduction in amendment costs
  - 20% reduction in chemical costs

- **Good to be “progressive”**
  - Compliance with future regulations
    - Nitrogen & other inputs
    - Restricted materials
  - Tells a good story for agriculture
• Over 300 acres
• Identified from historical observations, imagery database and yield monitor data
• Can spend $$$ to remediate
• High salt
• Low organic matter
• Can target spots with VR applications over time
• Use of imagery, field observation and yield data confirms results
Problems

- Data overload
- Time (review, interpret and manage data)
- Interoperability
  - Many different formats from many different companies
- Software
  - Each program does one or two things well
  - Need to learn several systems to achieve desired results
Software

- ArcView (www.esri.com): GIS program for spatial data management and mapping
- HGIS (www.starpal.com): Easily creates zones from imagery
- SMS Advanced (www.agleader.com): Interprets yield data from monitors
- MapStar (www.hemispheregps.com): Creates variable rate maps for Satloc controllers
- Apex (stellarsupport.deere.com): Manage data from John Deere controllers
Imagery – the cornerstone of SSM
All images are not created equal
LandSat vs Aerial Imagery

Quick Cost Breakdown

- **Aerial:**
  - $1.00 - 2.00 / acre (per image) – depends on acreage discounts
  - Some acre minimums – can be flexible
  - Selected fields only

- **LandSat:**
  - $.19 / acre (per image using a 3 image program cost)
  - 100% acres imaged per image

- **To image our cotton acreage (1 image):**
  - With aerial: 4,200 x $1 = $4,200
  - With LandSat: 4,200 x $.19 = $798.00

- **Note:** We subscribe to a LandSat imagery program that guarantees a minimum of six images during the growing season. For this comparison and to be fairer to aerial, I cut the number down to 3 images (there is really a small window of time when we need images for variable rate applications in cotton).
The resolution is too low
- True. LandSat’s 14 meter pixel can’t compare to the 2 meter resolution provided by an aerial image, but what is the unit size that we can apply to?

You can’t get an image on demand or you could miss an image if the sky is cloudy.
- True. LandSat takes an image every two weeks and there have been times when we have missed an image due to clouds. This has been the rarity and not the norm, but it has happened.

LandSat 7 has had recent problems and LandSat 5 is very old. LandSat is just not reliable.
- True. There have been some recent issues with #7 and #5 is operating way past the lifespan that NASA had planned for it, but both are still providing usable data. This is a big concern for LandSat users. Current plan is to launch LDCM in December 2012.
LandSat vs. Aerial Imagery
LandSat vs. Aerial Imagery
Using Imagery for SSM
Analysis Description

Allows the comparison of an attribute(s) or property(s) against other attributes/properties

Analysis Results- Lint Mass Yield
Classified By- Generic: Vigor

<table>
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<tr>
<th>Vigor</th>
<th>Avg. Lint Mass Yield lb/ac</th>
<th>Total Lint Mass Yield lb</th>
<th>Min. Lint Mass Yield lb/ac</th>
<th>Max. Lint Mass Yield lb/ac</th>
<th>Area ac</th>
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<tbody>
<tr>
<td>High</td>
<td>1,942.3</td>
<td>55,854</td>
<td>1,136.8</td>
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<td>Low</td>
<td>1,732.5</td>
<td>59,337</td>
<td>321.92</td>
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<td>Medium</td>
<td>1,839.9</td>
<td>63,122</td>
<td>818.36</td>
<td>2,358.4</td>
<td>34.31</td>
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<tr>
<td>(All)</td>
<td>1,832.3</td>
<td>178,313</td>
<td>321.92</td>
<td>2,358.4</td>
<td>97.32</td>
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</table>

Legend

Lint Yield
- 272 - 1,224
- 1,225 - 1,663
- 1,664 - 1,945
- 1,946 - 2,422
Making an image based Zone Map
Free Resources

  - All your field boundaries have been digitized by the FSA and are free to download. Common Land Units (CLU)
  - High quality imagery for each year (NAIP) by county
    - 1 & 2 meter resolution color images
  - Transportation, hydrography, topology, etc.

- [http://www.atlas.ca.gov/](http://www.atlas.ca.gov/)

- [http://www.mapmaker.com/](http://www.mapmaker.com/)
  - Introductory GIS program.
Thank You

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- Feel free to contact me with any questions or comments.

- Check out California Agricultural Leadership Foundation: [http://www.agleaders.org](http://www.agleaders.org)

- Get involved with social media. Ag needs a voice! [http://twitter.com/agleader](http://twitter.com/agleader)