Adapting to drought through demonstration of water conservation technologies

José Payero, Ahmad Khalilian,
Gilbert Miller, Mike Marshall
Climate-related projects

- USDA-NIFA: Climate Change Education
- NRCS-GIG: Drought Adaptation
- Cotton Board: ET Calculator
- Cotton Inc.: Irrigation Scheduling
- Cotton Board: Subsurface Drip Irrigation
- Clemson: Center Pivot Automation
- Monsanto: Varieties
Advanced Farming Technologies for Reducing Climate Risks

Learn from other farmers, researchers, specialists, and Extension professionals:

- management alternatives that can make production more efficient, more profitable, and more resilient to climate risks
- Taking the plunge – is irrigation right for me?
- Irrigation Scheduling: Sensor-based and weather-based tools for managing center pivots
- Drip irrigation
- AgroClimate: Tools and Climate Information
- Sod-Based Rotation

We will cover . . .

- Drought management
- Reducing risks and costs
- Barriers and solutions to adopting new strategies
- Irrigation technologies
- Crop insurance issues
- The latest climate outlook

WHEN
February 11, 2014
9:00 AM - 4:00 PM

WHERE
Edisto Research & Education Center, 64 Research Road,
Blackville, SC 29817

FREE REGISTRATION
http://www.agroclimate.org/secclimate/events
South Carolina is vulnerable to Drought because:

• Predominance of dryland production
• Uneven rainfall distribution
• Soils with very low water holding capacity
• Soils with shallow hardpan
• Soils with high spatial variability
Promoting adoption of water conservation technologies by:

• Identifying interested farmers;
• Establishing “Prototype Fields”;
• Providing training;
• Demonstrating benefits of technologies
Water Conservation Techniques:

1. Conservation tillage and controlled traffic,
2. Cover crop,
3. Drought tolerant varieties,
4. Skip-row planting,
5. Deficit-irrigation,
6. Sensor-based irrigation and,
7. Variable rate irrigation.
An Introduction to Soil Moisture Monitoring Systems

April 2013 | José Payero, Ahmad Khalilian, Gilbert Miller, Rebecca Davis, Edward Research & Education Center

What are the benefits of measuring soil moisture?

Measuring soil moisture is one way of determining when crops need irrigation and how much irrigation water to apply. This could save water, use less energy, reduce pumping cost, increase yields, and help protect the environment from excess irrigation. Excess irrigation will increase cost of production and can have negative environmental effects such as runoff, waterlogging, and leaching of soil nutrients and other chemicals that can eventually contaminate water sources and reduce yield. Although it is common for farmers to estimate soil moisture by the hand-feel method (Figure 1), soil moisture can be measured or monitored more effectively and accurately using a variety of commercially available soil moisture monitoring systems. Some of these systems provide continuous data collection.

What is a soil moisture monitoring system?

A soil moisture monitoring system is a combination of devices that can perform one or more of the following functions: sense soil moisture, read/store data, transmit data to a computer, organize, help visualize and interpret soil moisture data (Figure 2).

Figure 2. Functions of a soil moisture monitoring system.

A soil moisture monitoring system can, therefore, be divided into the following five components: (1) the soil moisture sensing probe, (2) the power supply, (3) the data collection device, (4) the data transmitter, and (5) the base station (Figure 3).

Figure 3. Components of a soil moisture monitoring system.
Skip-row planting
Skip-row Cotton Demonstration
Economics of Skip-row

- Solid: $800/
- Single Skip: $287/acre
- Alternate skip: -$137/acre
- Double Skip: -$78/acre
Sensor-based Irrigation
On-farm site in Chesterfield County - Watermelons
Water savings

<table>
<thead>
<tr>
<th>Year</th>
<th>Farmer (inches)</th>
<th>Sensor-Based (inches)</th>
<th>Water savings (gal/Acre)</th>
</tr>
</thead>
<tbody>
<tr>
<td>2011</td>
<td>11.51</td>
<td>6.13</td>
<td>146,632</td>
</tr>
<tr>
<td>2012</td>
<td>14.15</td>
<td>5.51</td>
<td>233,524</td>
</tr>
<tr>
<td>Average</td>
<td>12.83</td>
<td>5.82</td>
<td>190,078</td>
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</tbody>
</table>
Conservation tillage & controlled traffic
Effects of tillage on cotton lint yield

<table>
<thead>
<tr>
<th>Lint yield (lbs/acre)</th>
<th>Irrigated</th>
<th>Dry land</th>
</tr>
</thead>
<tbody>
<tr>
<td>1200</td>
<td>a</td>
<td>c</td>
</tr>
<tr>
<td>1400</td>
<td>b</td>
<td>d</td>
</tr>
<tr>
<td>1600</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

- Paratill: 21% increase
- No deep tillage: 41%

- a: Irrigated with Paratill
- b: Dry land with No deep tillage
- c: Irrigated with No deep tillage
- d: Dry land with Paratill
Cover Crop – Rolled Prior to Planting
Corn 4 weeks after planting

Picture Taken 4/23/12
Cover crop farm demonstration
Variable rate irrigation
Deficit irrigation, varieties, and VRI
Summary

• Educating farmers on how to adapt to drought
• Using farm demonstrations and training
• Focusing on seven water conservation technologies

Thanks to NRCS-CIG for funding project