ECONOMICS OF CONSERVATION SYSTEMS: DO THEY MAKE "CENTS"?

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CONSERVATION SYSTEMS: WHAT AND WHY?

• What is a conservation system?
  • Maintain crop residues on the soil surface
  • Use a winter cover crop

• Why is the adoption of a conservation system important in Alabama?
  • Highly weathered soils
  • High rainfall, high temperatures, and high humidity so low organic matter content
2012 CENSUS OF AGRICULTURE: SECTION 31 - LAND USE PRACTICES

• During 2012, considering the total acres on this operation -
  • 1d) On how many cropland acres were no-till practices used?
  • 1e) On how many cropland acres were conservation tillage, excluding no-till, practices used?
  • 1f) On how many cropland acres were conventional tillage practices used?
  • 1g) How many cropland acres were planted to a cover crop? Exclude CRP acres

2012 CENSUS OF AGRICULTURE: DEFINITIONS

• Land use practices – includes all agricultural land used for the production of agricultural commodities
  • **Conventional tillage** – tillage operations that use standard practices for a specific location and crop to bury crop residues
  • **Conservation tillage** – conserves the soil by reducing erosion and decreasing water pollution
  • **No-till practices used** – using no-till or minimum till is a practice used for weed control and helps reduce weed seed germination by not disturbing the soil
  • **Cover crop** – a crop planted primarily to manage soil fertility, soil quality, water, weeds, pests, diseases, or wildlife

Acres of Tillage Practices as a % of Total Cropland

- **conventional**
- **conservation**
- **no-till**

<table>
<thead>
<tr>
<th>State</th>
<th>% of Total Cropland</th>
</tr>
</thead>
<tbody>
<tr>
<td>Alabama</td>
<td></td>
</tr>
<tr>
<td>Arkansas</td>
<td></td>
</tr>
<tr>
<td>Florida</td>
<td></td>
</tr>
<tr>
<td>Georgia</td>
<td></td>
</tr>
<tr>
<td>Louisiana</td>
<td></td>
</tr>
<tr>
<td>Mississippi</td>
<td></td>
</tr>
<tr>
<td>Missouri</td>
<td></td>
</tr>
<tr>
<td>North Carolina</td>
<td></td>
</tr>
<tr>
<td>South Carolina</td>
<td></td>
</tr>
<tr>
<td>Tennessee</td>
<td></td>
</tr>
<tr>
<td>Texas</td>
<td></td>
</tr>
<tr>
<td>Virginia</td>
<td></td>
</tr>
</tbody>
</table>
Cover Crop Acres as a % of Total Cropland

% of Total Cropland

% of Total Cropland

Alabama | Arkansas | Florida | Georgia | Louisiana | Mississippi | Missouri | North Carolina | South Carolina | Tennessee | Texas | Virginia

0% | 2% | 4% | 6% | 8% | 10% | 12% |
BENEFITS

• Control soil erosion and reduce runoff
  • Increase crop residues and soil organic matter
  • Absorb rainfall impact
• Improve soil quality
• Reduce yield variability
  • Reduce risk
• Increase plant available water
  • Increase efficiency of a rain event or irrigation event.
  • Potential for lower water requirements
  • Preserve water resources and lower production costs
Rainfall Variability
E.V. Smith Research Center
Shorter, AL
Plateau
Conventional: 1060 lb/ac
Conservation: 1212 lb/ac
Difference = $99

Eroded Slope
Conventional: 976 lb/ac
Conservation: 1132 lb/ac
Difference = $101

Depression
Conventional: 1175 lb/ac
Conservation: 1302 lb/ac
Difference = $83

Yield Variability
Conventional: 199 lb/ac ($129)
Conservation: 170 lb/ac ($111)
COSTS

• New/modify tillage and/or planting equipment
• Cover crop establishment and termination
• Learning curve for managing high residue cover crops
  • Limited experience with conservation tillage and/or cover crops
• Change in chemical use
• Increased seeding rate
CONVERTING TO A CONSERVATION SYSTEM

Conservation Systems Research

Modifying In-Row Subsoilers and Planters for High-Residue Systems

CONSERVATION SYSTEMS FACT SHEET NO. 03

In-Row Subsoilers

Toolbar Extension
Ensures coulter is running on firm ground ahead of the shank. This helps cut any residue present and minimizes residue dragging.

Splitter Points
Weld a piece of metal (an old peanut blade) perpendicular to the center of the metal shank tip. Helps prevent soil blow-out (especially dirtier soils). Some newer shanks incorporate this design.

Cover Sharp Edges
Allows soil residue to flow past equipment, can minimize wrapping-up.

Polyshields
Effective in heavy, wetter soils. Prevents soil build-up on shanks, which leads to blow-out.

Row Cleaners
Possible alternative to row cleaners on planters. Commonly offered by KMC, Remlinger Mfg., Co., and Yetter.

Equipment Option | Price
--- | ---
Splitter points | $31
Polyshields (cover & chin) | $9
Row cleaners | $465

Prices current as of 9-15-10

Planters

Down-Pressure Springs
Prevents excessive bouncing of planter units in heavy residue and uneven soil conditions to maintain desired seeding depth.

Row Cleaners
Various manufacturers, configurations, and methods of adjustment.
Help level seedbed and move residue away from seed trench to prevent hastening, which decreases seed emergence. When set too aggressively, dig out seed bed and promotes weed seed germination in the row.

Notched Opening Disks/Seed Firmers
Notched opening disks cut residue not removed by row cleaners to prevent hastening. Seed firmers ensure good seed-to-soil contact and prevent seed from bouncing out of the seed trench when planting shallow (i.e., cotton) in high residue or uneven soil conditions.

Spoke Closing Wheels
Beneficial for heavy, wet soils to prevent surface sealing (crusting) following planting.
Use caution when planting shallow. May kick seed on top of ground. Also may use only one per row to minimize this problem.

Equipment Option | Low-end | High-end
--- | --- | ---
Down pressure springs* | $39 | ---
Row cleaners* | 253 (Yetter) | 530 (Dawna)
Spoke closing wheels* | 110 | 258
V-disc inserts | 26 | ---
Notched disc openers | 209 | ---
Seed firmers | 26 | ---

Highly recommended
Prices current as of 9-15-10
Research Centers - AL
Agricultural Experiment Stations

- E.V. Smith Research Center, Shorter, AL
- #1 – Tennessee Valley Research and Extension Center, Belle Mina, AL
- #3 - North Alabama Horticulture Research Center, Cullman, AL
- #7 - Prattville Agricultural Research Unit, Prattville, AL
- #11 - Wiregrass Research and Extension Center, Headland, AL
CONSERVATION SYSTEMS FOR WEED CONTROL


The bar chart shows the average net returns in $ per acre for different conservation tillage systems with early cover crop planting dates. The systems include conservation tillage with early cover crop planting, conservation tillage with normal cover crop planting, conservation tillage with late cover crop planting, and conservation tillage with winter fallow. The chart compares the net returns for the years 2007, 2008, and 2009.
• At 100 lb N/ac, including sunn-hemp increases yield by 24 bu/ac over fallow. At $3.00/bu corn, that is an increase of $72/ac.

• To realize similar yields without sunn-hemp, it would require an additional 50 lb N/ac. At $0.60/lb N, the savings from using less fertilizer is $30/ac.
# ROLLING DIRECTION AND ROW CLEANERS: COTTON YIELD


<table>
<thead>
<tr>
<th>Treatment Combinations</th>
<th>2004</th>
<th>2005</th>
</tr>
</thead>
<tbody>
<tr>
<td>Rolling</td>
<td>EVS</td>
<td>TVS</td>
</tr>
<tr>
<td>No rolling</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Rolling</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Row Cleaner</td>
<td></td>
<td></td>
</tr>
<tr>
<td>No row cleaner</td>
<td>0.00</td>
<td>0.00</td>
</tr>
<tr>
<td>Dawn</td>
<td>0.44</td>
<td>-9.77</td>
</tr>
<tr>
<td>Dawn/no coulter</td>
<td>9.87</td>
<td>15.53</td>
</tr>
<tr>
<td>Yetter</td>
<td>16.17</td>
<td>23.57</td>
</tr>
<tr>
<td>No row cleaner</td>
<td>39.35</td>
<td>-0.36</td>
</tr>
<tr>
<td>Dawn</td>
<td>41.53</td>
<td>11.75</td>
</tr>
<tr>
<td>Dawn/no coulter</td>
<td>31.40</td>
<td>-4.89</td>
</tr>
<tr>
<td>Yetter</td>
<td>36.99</td>
<td>18.32</td>
</tr>
</tbody>
</table>
SOYBEANS AND COVER CROPS

Net Returns to Soybeans (US$/acre)

<table>
<thead>
<tr>
<th>Year</th>
<th>Black Oat</th>
<th>Rye</th>
<th>Wheat</th>
<th>Fallow</th>
</tr>
</thead>
<tbody>
<tr>
<td>1995</td>
<td>$800</td>
<td></td>
<td>$600</td>
<td>$200</td>
</tr>
<tr>
<td>1996</td>
<td>$1,000</td>
<td></td>
<td>$800</td>
<td>$400</td>
</tr>
<tr>
<td>1997</td>
<td>$600</td>
<td></td>
<td>$200</td>
<td>$400</td>
</tr>
</tbody>
</table>
IMPACT OF CONSERVATION SYSTEMS ON A COTTON/CORN ROTATION

(UNPUBLISHED DATA)

- Prattville, AL from 2004-2009
- Dryland Cotton/Corn Rotation
- Four tillage treatments
  - Fall paratill, spring paratill, strip-till, and no-till
- 3 cover crop treatments
  - Fallow, Rye, and Wheat
- Cover crop biomass and soil organic carbon discussed in:

<table>
<thead>
<tr>
<th>Rainfall from March 1 to October 31 (inches)</th>
</tr>
</thead>
<tbody>
<tr>
<td>2004</td>
</tr>
<tr>
<td>32.19</td>
</tr>
</tbody>
</table>
Change in Revenue from Spring Paratill (US$/acre)  
Assuming a Cotton Price of $0.65/lb
Change in Revenue from Spring Paratill (US$/acre) 
Assuming a Corn Price of $3.00/bu

- SPT Rye
- SPT Wheat
- NT Fallow
- NT Rye
- NT Wheat
- ST Fallow
- ST Rye
- ST Wheat
TOMATOES AND CONSERVATION SYSTEMS

• There is potential in the Southeast for winter cover crops to increase corn yields.

<table>
<thead>
<tr>
<th>Winter Cover Crops</th>
<th>Effect</th>
</tr>
</thead>
<tbody>
<tr>
<td>Biculture (various combinations of grasses and legumes)</td>
<td>Positive</td>
</tr>
<tr>
<td>Grass (cereal rye, wheat, oats, annual ryegrass, etc.)</td>
<td>Neutral</td>
</tr>
<tr>
<td>Legume (hairy vetch, crimson clover, white clover, red clover, etc.)</td>
<td>Positive</td>
</tr>
</tbody>
</table>
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Dynamically Speaking

It is harvest season and the NSDL is busy with data collection from experiments across the state. If you come by our laboratory, you are sure to notice that we have a brand new roof that has greatly improved the appearance of our main building. Inside, we have also made significant improvements to our staff. This summer Mr. Karl Mannashack retired and we thank him for his service to NSDL and wish him the best in his retirement years. We also have some additions to our staff, with several international visiting scientists who will work with us for a year before returning home to their own country and research institutions. We have two scientists who are visiting from China: Dr. Shuan Wang and Dr. Quaigang Zhang who are from the College of Natural Resources and Environment, Northwest A&F University, Yangling, China. Also visiting is Dr. Liia Suttikota from Lithuania who won a one-year research scholar award from the Baltic-American Freedom Foundation.

I hope you enjoy reading about some of the research efforts we have included in this issue of National Soil Dynamics Highlights, and please visit our web site for more information about our ongoing projects (http://www.ars.usda.gov/sea/ndl).

Cover Crop Management Considerations

Conservation tillage combined with high residue cover crops can benefit degraded soils typically found throughout the Southeast. High residue cover crops are arguably the most critical component, but they also require the most management to ensure good success and maximize associated soil and health benefits. In light of the upcoming winter cover crop season, we would like to share some things growers may consider as they prepare to implement, grow, and terminate cover crops on their farm.

By now, growers should have secured their seed supply to ensure they can plant their desired cover crop across their intended acres. As early as possible, prioritizing the process helps growers to avoid potential unexpected increases in costs or seed supply shortages, which allows them to make adjustments that ensure seed is available at the earliest opportunity to plant. Average regional seed costs are provided on Fact Sheet FS506: Cover Crops for the Southeast - Costs (Available at http://www.ars.usda.gov/5372/UserFiles/Place/5372/506/FS506.pdf).

Securing an adequate seed supply directly relates to one of the most important management aspects of winter cover crops: planting the cover crop as early as possible in the specified planting window. The ideal planting window for many cover crops across the Southeast is October to November, with a preferred completed planting date by Thanksgiving. However, growers must consider the specifics of each cover crop species and management options to determine the best planting window for their operation.

Figure 1. Early spring cover crop growth attributed to a fertilized and non-fertilized no-till cover crop.

Continued on p. 2