Irrigation & Drainage

Agronomy 105
September 10, 2013
Flood Irrigation
Furrow Irrigation

http://photogallery.nrcs.usda.gov/Detail.asp
Furrow Irrigation

Siphon Tubes

Gated Pipe
Traveling Irrigator
Wheel Line/Wheel Move Sprinkler Irrigation System
Sprinkler Irrigation
Center Pivot Irrigation near Garden City, KS
Closeup of Center Pivots in Kansas
Drip/Trickle Irrigation More Efficient
Drip/Trickle Irrigation
Subsurface Irrigation
Irrigation is more common when:

- Precipitation is limiting
- Higher value crops
- Soils have low water holding capacity (sands)
- Irrigation water is plentiful
Types of Field Drainage

• Surface Drainage
  – Waterways
  – Ditches
  – Land leveling
  – Raised Beds

• Subsurface drainage
  – Tile Drainage
Surface Drainage

• This is the first thing that should be looked at in any drainage scheme
• Causes immediate impact on standing surface water
• Surplus water running over farmland will keep it saturated for longer, reducing crop growth and timeliness of field operations
Laser Leveling
Raised Beds

http://www.lsuagcenter.com/MCMS/RelatedFiles/%7BBBE392A09-4035-4F52-9F27-535A15EAF15B%7D/DSCN0006.JPG
Installing Plastic Tile
Drain tile explosion

Drain tile installations have skyrocketed throughout Minnesota farmlands. The Bois de Sioux Watershed District is one of the few agencies that track the activity, which allows farmers to increase yields by draining water under the soil. This year’s pace could surpass 2011; as of April 18, the agency had issued permits for 997 linear miles of tile.

Source: Bois de Sioux Watershed District

PIONEER PRESS

Pattern Tile Drainage

GPS guides installation

Tile spacing depends on soil texture

http://clarkfarmdrainage.com/agriculturalsubsurfacedrainage.html
Managed Drainage

Figure 4: The boards in the control structure are installed to raise the drain outlet after planting (to store water for crops) and after harvest (to improve water quality).

Figure 5: The boards in the control structure are removed a few weeks before field operations such as planting and harvest to allow the field to drain more fully (Purdue University).
1. A characteristic of loess or windblown soil parent material is its
   a. Sand and gravel layers at periodic intervals.
   b. Relative uniformity and usually silty texture.
   c. High organic matter content.
   d. Distinct changes in soil texture from one part of the field to another.

2. The parcel of land containing 80 acres is
   a. NE ¼ NW ¼ section 5.
   b. S ½ SW ¼ SE ¼ section 6.
   c. NW ¼ section 10 and SW ¼ SW ¼ section 10.
   d. N ½ SE ¼ section 36.

3. A farmer could reduce a soil restrictive layer by using any of the following EXCEPT
   a. A rotary hoe on crusted soils.
   b. Deep tillage in late fall with dry conditions.
   c. Tracked tractors and controlled trafficking.
   d. A tandem disk at a consistent depth from year to year.

4. A term that describes water entering the soil profile from the surface is
   a. Infiltration.
   b. Percolation.
   c. Permeation.
   d. Sedimentation.

5. A factor favoring surface runoff is
   a. Preferential flow.
   b. Steep field slopes.
   c. Well-developed soil structure.
   d. Sandy soil texture.
Tillage
Tillage Definitions

• **Conventional-till or intensive-till**  Full width tillage which disturbs all of the soil surface. There is less than 15 percent residue cover after planting

• **Reduced-till**  Full-width tillage which disturbs all of the soil surface. There is 15-30 percent residue cover after planting

• **Conservation Tillage Types**  Any system that leaves 30 percent or more of the soil surface with crop residue after planting.
  – No-till/strip-till
  – Ridge-till
  – Mulch-till

http://www2.ctic.purdue.edu/Core4/CT/Definitions.html
TILLAGE OPERATIONS
Conventional tillage system

PRIMARY
The first operation, usually with a moldboard plow or disk-chisel
Disk/Chisel Plowing
Tandem disk
Field Cultivators and Harrows—Secondary Tillage Designed to Break Up Soils and Prepare for Planting
IMPROVED PLANTER TECHNOLOGY HELPS WITH RESIDUE MANAGEMENT

Planters in years past were relatively light in weight and not designed to work in heavy amounts of crop residue (left). Today’s planters are heavier and are designed to cut through crop residue or push it aside crop rows (right).
No-Till Adoption in the U.S.
1994 - 2004

Millions of acres

1994: 38.9
1996: 42.9
1998: 47.8
2000: 52.2
2002: 55.3
2004: 62.4
No-Till

The soil is left undisturbed from harvest to planting. Planting or drilling is accomplished using disc openers, coulters, row cleaners, in-row chisels or roto-tillers. Weed control is accomplished primarily with crop protection products. Other common terms used to describe: No-till, direct seeding, slot planting, zero-till

Farming Ugly!!
No-till Drill
Strip Tillage

http://www.ia.nrcs.usda.gov/technical/images/GislesonStanding.gif
Strip Tillage
Ridge-Till

The soil is left undisturbed from harvest to planting except for strips up to 1/3 of the row width. Planting is completed on the ridge and usually involves the removal of the top of the ridge. Planting is completed with sweeps, disk openers, coulters, or row cleaners. Residue is left on the surface between ridges. Weed control is accomplished with crop protection products (frequently banded) and/or cultivation. Ridges are rebuilt during row cultivation.
Mulch Tillage

Full-width tillage involving one or more tillage trips which disturbs all of the soil surface but leaves greater than 30% cover. Tillage tools such as chisels, field cultivators, disks, sweeps or blades are used. Weed control is accomplished with crop protection products and/or cultivation. Includes Vertical Tillage.
Vertical Tillage
# Conventional vs. Conservation Tillage

<table>
<thead>
<tr>
<th>Conventional Tillage</th>
<th>Conservation Tillage</th>
</tr>
</thead>
<tbody>
<tr>
<td>Deeper Rooting</td>
<td>Shallower Rooting</td>
</tr>
<tr>
<td>Less Topsoil Moisture</td>
<td>More Topsoil Moisture</td>
</tr>
<tr>
<td>Fewer Pest Concerns</td>
<td>Greater Pest Concerns</td>
</tr>
<tr>
<td>Even Nutrient Distribution</td>
<td>Stratified Nutrient Distribution</td>
</tr>
<tr>
<td>Easier Planting Conditions</td>
<td>More Difficult Planting Conditions</td>
</tr>
</tbody>
</table>

*Generally Speaking...*
Irrigation & Drainage, Tillage

Agricultural Summary

Warm daytime temperatures and little rain took its toll on the corn and soybean crops, according to the Indiana Field Office of USDA's National Agricultural Statistics Service. Many corn fields are reported to be "dying prematurely," which is causing concern as to the effect on final grain yield. Soybean fields are rapidly turning color and shedding leaves with some reports of aborted pods and small beans. A few operations began harvesting corn last week mainly to try out equipment and test grain moisture. Dry conditions have also reduced yields in late season hay crops. Harvest of seed corn, processing tomatoes, corn silage, mint and tobacco was in full swing during the week.

Field Crops Report

There were 66 days suitable for field work during the week. Ninety-five percent of the corn acreage is in the dough stage compared with 100 percent last year and 96 percent for the 5-year average. Seventy-seven percent of the corn acreage is in the dent stage compared with 90 percent last year and 72 percent for the 5-year average. Ninety percent of the corn crop is mature compared with 85 percent last week and 26 percent for the 5-year average. By area, 8 percent of the corn crop is mature in the north, 7 percent in the central region, and 7 percent in the south. Corn condition is rated 61 percent good to excellent compared with 8 percent last year.

Thirteen percent of the soybean acreage is shedding leaves compared with 39 percent last year and 26 percent for the 5-year average. By area, 11 percent of the soybean acreage is shedding leaves in the north, 16 percent in the central region, and 7 percent in the south. Soybean condition declined and is now rated 56 percent good to excellent compared with 24 percent last year.

Livestock, Pasture and Range Report

Livestock were in mostly good condition with only minor heat stress reported. Pasture condition continued to decline during the week but is still rated 52 percent good to excellent compared with only 13 percent last year at this time. The third cutting of alfalfa is 96 percent complete compared with 93 percent last year and 52 percent for the 5-year average.

Crop Progress

<table>
<thead>
<tr>
<th>Crop</th>
<th>This Week</th>
<th>Last Week</th>
<th>Year</th>
<th>5-Year Avg.</th>
<th>Percent</th>
</tr>
</thead>
<tbody>
<tr>
<td>Corn in Dough</td>
<td>95</td>
<td>91</td>
<td>100</td>
<td>96</td>
<td></td>
</tr>
<tr>
<td>Corn in Dent</td>
<td>67</td>
<td>47</td>
<td>90</td>
<td>72</td>
<td></td>
</tr>
<tr>
<td>Corn Mature</td>
<td>9</td>
<td>3</td>
<td>45</td>
<td>26</td>
<td></td>
</tr>
<tr>
<td>Soybeans Shedding</td>
<td>13</td>
<td>NA</td>
<td>30</td>
<td>26</td>
<td></td>
</tr>
<tr>
<td>Alfalfa, Third Cutting</td>
<td>96</td>
<td>91</td>
<td>93</td>
<td>92</td>
<td></td>
</tr>
<tr>
<td>Tobacco Harvested</td>
<td>51</td>
<td>24</td>
<td>49</td>
<td>36</td>
<td></td>
</tr>
</tbody>
</table>

Soil Moisture & Days Suitable for Field Work

<table>
<thead>
<tr>
<th>Soil Moisture</th>
<th>This Week</th>
<th>Last Week</th>
<th>Year</th>
</tr>
</thead>
<tbody>
<tr>
<td>Topsoil Very Short</td>
<td>23</td>
<td>17</td>
<td>16</td>
</tr>
<tr>
<td>Topsoil Short</td>
<td>47</td>
<td>48</td>
<td>32</td>
</tr>
<tr>
<td>Topsoil Adequate</td>
<td>30</td>
<td>34</td>
<td>49</td>
</tr>
<tr>
<td>Topsoil Surplus</td>
<td>0</td>
<td>1</td>
<td>3</td>
</tr>
<tr>
<td>Subsoil Very Short</td>
<td>18</td>
<td>14</td>
<td>39</td>
</tr>
<tr>
<td>Subsoil Short</td>
<td>43</td>
<td>42</td>
<td>37</td>
</tr>
<tr>
<td>Subsoil Adequate</td>
<td>39</td>
<td>44</td>
<td>24</td>
</tr>
<tr>
<td>Subsoil Surplus</td>
<td>0</td>
<td>0</td>
<td>0</td>
</tr>
</tbody>
</table>

Crop Condition

<table>
<thead>
<tr>
<th>Crop</th>
<th>Very Poor</th>
<th>Poor</th>
<th>Fair</th>
<th>Good</th>
<th>Excellent</th>
</tr>
</thead>
<tbody>
<tr>
<td>Corn</td>
<td>2</td>
<td>9</td>
<td>28</td>
<td>44</td>
<td>17</td>
</tr>
<tr>
<td>Soybean</td>
<td>3</td>
<td>11</td>
<td>31</td>
<td>41</td>
<td>14</td>
</tr>
<tr>
<td>Pasture</td>
<td>8</td>
<td>22</td>
<td>28</td>
<td>25</td>
<td>3</td>
</tr>
</tbody>
</table>

Soil Moisture Condition

<table>
<thead>
<tr>
<th>Soil Moisture</th>
<th>This Week</th>
<th>Last Week</th>
<th>Year</th>
</tr>
</thead>
<tbody>
<tr>
<td>Topsoil Very Short</td>
<td>23</td>
<td>17</td>
<td>16</td>
</tr>
<tr>
<td>Topsoil Short</td>
<td>47</td>
<td>48</td>
<td>32</td>
</tr>
<tr>
<td>Topsoil Adequate</td>
<td>30</td>
<td>34</td>
<td>49</td>
</tr>
<tr>
<td>Topsoil Surplus</td>
<td>0</td>
<td>1</td>
<td>3</td>
</tr>
<tr>
<td>Subsoil Very Short</td>
<td>18</td>
<td>14</td>
<td>39</td>
</tr>
<tr>
<td>Subsoil Short</td>
<td>43</td>
<td>42</td>
<td>37</td>
</tr>
<tr>
<td>Subsoil Adequate</td>
<td>39</td>
<td>44</td>
<td>24</td>
</tr>
<tr>
<td>Subsoil Surplus</td>
<td>0</td>
<td>0</td>
<td>0</td>
</tr>
</tbody>
</table>

Crop Progress

Soybeans, Brown Stem Rot Showing Up in Indiana Soybeans

Written by Amanda Gee, Purdue University. Article appears in Ag Answers, posted September 3, 2013. Article can be found online at: https://ag.purdue.edu.Aganswers/Pages/archive.aspx?story=323

WEST LAFAYETTE, Ind. - Soybean producers should look for sudden death syndrome, or SDS, and brown stem rot when scouting fields over the next few weeks in order to identify the fungal diseases and prevent future yield loss due to disease.

Soybean fields across Indiana have started to show symptoms of SDS, and brown stem rot is another disease sometimes confused with SDS. Yield loss from the diseases can be minor or major, depending on how widespread they become - which is why identification is key.

"There is no in-season management for these diseases, but it's important to identify fields that have the diseases to prevent yield loss in future years," said Kiersten Wise, Purdue Extension plant pathologist. "It can help to know which fields have the diseases so producers can select disease-resistant varieties for the next time the fields are planted to soybean."

Listen to Wise discuss why scouting for SDS and BSR is important.

The diseases have similar foliar symptoms, including yellowing or browning of the veins.

Listen to Wise discuss differentiating between SDS and BSR in soybean. "You can tell the difference between SDS and brown stem rot by examining the internodes on the lower stem of the plant," Wise said. "If you pull up the plant and split the lower two internodes you'll see discoloration in the collar of the stem and root. Whereas with brown stem you'll see a discoloration in the pith."

The pith of plants affected by SDS will be white. In some instances, both diseases may be present in a plant, which can make diagnosis difficult.

Identifying the diseases can help producers and good management decisions the next particular field goes into soybeans.

"For instance, if you know a field has the disease, you can select a variety for next year that is less susceptible to either disease," Wise said. "It's important to be sure if you have SDS or brown stem rot since varieties that have resistant brown stem rot might not necessarily be resistant to SDS, and vice versa."

Each seed company has varieties rated for both SDS and brown stem rot resistance, so producers should contact their local seed dealers selecting resistant varieties.