Dryland Soil Water Management

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Capture the Water!

Cortez – Monthly Precip

Yearly Total = 12.57
Capture the Water!

Yearly Total = 14.9
Capture the Water!

Ignacio – Monthly Precip

Yearly Total = 16.57
Cropping Strategies – Manage Soil Water

• Dryland Soil Moisture Management – 2 Major Tools
  • Tillage Strategies
    • Conventional tillage
    • Reduced Tillage
    • No-till (difference between no-till and never till)
  • Cropping Systems
    • What crop to plant
    • The sequence (rotation) – needs to be flexible
Cropping Strategies - Rotations

• Wheat
• Safflower
• Dry Beans
• Fallow
• Feed
• Other crops?
• Other considerations – weeds
Cropping Strategies - Rotations

- Wheat – Spring Planted Crop – Fallow (plant into stubble)

- Spring Crop – safflower/ Dry Beans/ sunflower/feed/corn/milo - drought tolerant
  
- Leave stubble standing over winter
Cropping Strategies
- Rotations

• Grass – broadleaf-fallow
• Pittlekow, et al., reported a 2.5 bushel increase in soybeans in a 4 year rotation.
• Hansen, et al., in Colorado reported wheat-corn-fallow resulted in 20-40% increase in net farm income vs wheat-fallow.
Tillage Strategies

Weed Control
Seedbed Prep
Erosion Control
Residue Management

Tools:
- Herbicides
- Equipment
Tillage Strategies

• Conventional Tillage
  • Till every year

• Reduced Tillage
  • Till when necessary (weed issues/planting accommodations, etc)

• No-Till (never till vs flexible)
Tillage Strategies

Advantages vs Disadvantages of no-till

**Benefits**
- ↓ Soil Erosion (wind/water)
- ↓ Soil Compaction
- ↓ Time for field activities
- ↓ Fuel Costs ($4/a)
- ↓ Soil Water loss
- • Healthier Soil (organic matter, soil carbon)

**Disadvantages**
- Equipment
- ↑ Herbicide Costs

Source: No Till Agriculture
Tillage Strategies

• 1990 – 6% of US Farmland was no till
• 2016 – 35% of US Farmland is no till
• 1982 – 2003 USDA reported a reduction in soil erosion of 43% mostly due to reduced tillage
• 4% slope in field averaged 0.3 inches water runoff/yr with residue mngmt (Hansen, et al.)
• 4% slope in field averaged 3 inches of water runoff/yr without residue
Tillage Strategies

Soil Health and Water Quality

Soil Erosion

Conventional Tillage

Strip Tillage

Bauder et al.
Tillage Strategies

• Hansen, et al., in Colorado reported a 25% decrease in soil erosion due to reduced tillage

• Peterson, et al., in Colorado reported water storage losses of 80% when no residue was left on soil surface (evaporation losses)

• Peterson reported soil water storage efficiencies increased to 50% using minimal tillage (strategic tillage)

• Following wheat harvest – use herbicides to control weeds and plant the spring crop into wheat stubble. Leave standing stubble into winter. Resulted in 3 inches of extra water capture in soils in the fall.
Tillage Strategies

• Tillage
  • Can cost 0.25 inches of water per pass
  • At 90 F. with wind the water loss can be as high as 0.5 inches per pass.
  
  • Plowing – CO2 loss was 400 lbs/a
  • No Till – CO2 loss was 5 lbs/a
Tillage Strategies
Weed Management

Substitute spraying for tillage
Herbicide costs will increase
<table>
<thead>
<tr>
<th>Operation</th>
<th>1 day</th>
<th>4 days</th>
</tr>
</thead>
<tbody>
<tr>
<td>One way</td>
<td>0.33</td>
<td>0.51</td>
</tr>
<tr>
<td>Chisel</td>
<td>0.29</td>
<td>0.48</td>
</tr>
<tr>
<td>Sweep plow</td>
<td>0.09</td>
<td>0.14</td>
</tr>
<tr>
<td>Rod weeder</td>
<td>0.04</td>
<td>0.22</td>
</tr>
</tbody>
</table>

Table 1: Water losses from different operations 1 and 4 days after tillage.
<table>
<thead>
<tr>
<th>Operation</th>
<th>% residue lost due to each operation</th>
</tr>
</thead>
<tbody>
<tr>
<td>Spraying</td>
<td>0</td>
</tr>
<tr>
<td>Sweeps (24 inches)</td>
<td>10</td>
</tr>
<tr>
<td>Disk drills</td>
<td>20</td>
</tr>
<tr>
<td>Disk chisels</td>
<td>10</td>
</tr>
<tr>
<td>Rod weeder</td>
<td>15</td>
</tr>
<tr>
<td>Chisel plow – Straight points</td>
<td>25</td>
</tr>
<tr>
<td>– Twisted Points</td>
<td>50</td>
</tr>
<tr>
<td>Tandem disk 3” deep</td>
<td>80</td>
</tr>
<tr>
<td>Tandem disk 6” deep</td>
<td>90</td>
</tr>
<tr>
<td>Moldboard plow</td>
<td>90-100</td>
</tr>
<tr>
<td>Overwinter weathering</td>
<td>15-25</td>
</tr>
</tbody>
</table>
No Till Acres over Time
Weed Control

Canada Thistle
- Curtail 2 pt/a – rosette stage
- Stinger .05 pt/a – rosette stage
- Glyphosate – 32 oz/a pre-bolting
- Dicamba – 1 pt/a fall after first fall frost

Field Bindweed
- 2,4-D ester 1.5 pts/a short term control
- Dicamba 1 pt/a late season (adjuvant)
- Facet L 22 oz/a plant wheat deeper than 1 inch
- Glyphosate 32 oz/a depending on formulation

Grasses
- Glyphosate 32 oz/a post weed emerge
Summary

• Capture Water!
  • Use Cropping Systems to Maximize Opportunities (Flexible, drought and heat tolerant crops)
• Reduce Tillage Trips
• Allow Crop Stubble to Remain Over Winter