Ripping No-till Soils

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Overview

 Does Ripping prior to No-till implementation make a difference?
 How long do the effects of Ripping last?
 Does the type of Ripper used influence effectiveness?
Does Ripping prior to No-till implementation make a difference?

- First need to know if compaction is a problem?
- How deep and significant is the compaction?
Evaluating Soil Compaction

- Using a Penetrometer.
  - Sensitive to soil moisture
  - Dry soils will have high resistance to penetration
  - Used when soils are at field capacity
  - Spring time after soaking rain
  - Root growth is restricted at 300psi
Evaluating Soil Compaction

- Best tools are a shovel and your eyes
- Look for horizontal soil structure and root growth
- Evaluate root growth of tap rooted plants. Fibrous roots can also show compaction.
Does Ripping prior to No-till implementation make a difference?

- **Short-term:** *Maybe*
- **Research in the region is very limited**
  - In tilled systems, yield has inconsistent response to ripping
- **Producers are uncertain about benefits**
  - Soils perceived as compacted may have other problems
    - Fertility, salinity, or naturally poorly drained clayey soils
  - Clayey soil may appear compacted but are generally not.
    - Surface hardness more of a problem than subsurface compaction?
Why are short-term affects inconsistent

1. Soils are not sufficiently compacted to respond to ripping
   - Sandy soils will respond more readily than clay soils

2. Insufficient rainfall after ripping to recharge subsoil.

3. Rainfall is sufficient to maintain adequate moisture in surface soil
   - Improved rooting depth is of little value

4. Response to ripping is optimized when rainfall recharges subsoil shortly after ripping and mid to late season rainfall is limited!
Long-term Affects of Ripping

- Water movement in soil can seal cracks
- Continued traffic will compact soils
  - Efforts must be made to minimize compaction
Corn Root Distribution during 3-yrs after Ripping

- No significant differences in total root density
- No significant yield differences

<table>
<thead>
<tr>
<th></th>
<th>1990</th>
<th>1991</th>
<th>1992</th>
</tr>
</thead>
<tbody>
<tr>
<td>Grain yield (bu/acre)</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Subsoiled</strong></td>
<td>26.4</td>
<td>120</td>
<td>103</td>
</tr>
<tr>
<td><strong>No-till</strong></td>
<td>29.1</td>
<td>120</td>
<td>116</td>
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Loamy sand, Coastal Plain of SC, Vepraska, et al. (1995)
Influence of rainfall on penetration resistance after ripping in conventional tillage system

- Resistance to penetration in ripped channel increased as a function of cumulative rainfall

Loamy sand, Coastal Plain of SC, Busscher et al. (2002)
Most information suggests that ripping prior to no-till has limited long-term effect. Maybe valuable under highly compacted soil conditions. Accumulation of organic matter and improvements in soil structure will alleviate compaction. Intensive tillage prior to no-till conversion may delay this OM accumulation.
Penetration Resistance in 7-yr No-till, Altus, OK

- Long-term No-till decreases penetration resistance.
Ripper types:

- There are numerous ripper designs
- Even more numerous shank points available
Disk Ripper

- Combines deep tillage with surface tillage
- Generally greatest horsepower requirement
  - 37-55 hp per shank
V Ripper

- Slightly less horsepower than disk ripper
  - 25-40 hp per shank
- May require secondary tillage to smooth surface
Straight-line Rippers

- Designed to minimize surface disturbance
- Has a rolling coulter and straight shank
- Horsepower
  - 30-40 hp per shank
Paraplow

- Designed to minimize surface disturbance
- Slanted legs are meant to lift soil
- Horsepower
  - 25-35 hp/shank
Paraplow vs. In-Row Subsoiler for Corn Production

- Annual ripping with a standard straight shank can provide the same benefit as a Paraplow

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<thead>
<tr>
<th></th>
<th>1999</th>
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<tbody>
<tr>
<td>Subsoiler</td>
<td>167</td>
<td>175</td>
</tr>
<tr>
<td>Paraplow</td>
<td>162</td>
<td>167</td>
</tr>
<tr>
<td>No-Till</td>
<td>145</td>
<td>137</td>
</tr>
<tr>
<td>Least Significant Diff.</td>
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<td>14</td>
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Sandy loam, GA, Lee et al. (2002)
Soil Condition is Important!

- Soil moisture at time of ripping can have greater impact on effectiveness of ripping than does the ripper itself.
- Soil needs to be dry to allow for shatter
- Set depth to just below compacted layers.

Roots growing into slits left after ripping wet soil
Questions on Ripping