Soil health: manure management and more

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Number #1 recommendation

- To amending a sandy soil?
- To amending a clay soil?

Foster et al., 1983

Macroaggregate

Soil organic matter ‘sandwich’

Foster et al., 1983
To Build Soil Organic Matter

1. Increase inputs
   - Diversify rotations
   - Grow cover crops
   - Add manure or compost

2. Decrease losses & slow decomposition
   - Reduce tillage
   - Diversify residues - slow to degrade
   - Prevent erosion
A central challenge

- Soil organic matter consists of **carbon** and **nitrogen**
- Is it possible to simultaneously
  - **Till to release** the **nitrogen** (to supply plants with nitrogen)? And control weeds, aerate
  - **NOT release excess carbon** (we need to build soil health by capturing more carbon, yet aeration oxidizes carbon)
  - **Keep replenishing carbon+nitrogen**!

Tillage recommendations

**Avoid wet, clay soil conditions**

- **Avoid inversion** (Moldboard, disk)
- Instead: **fracture** (chisel or ripper)

  **Don’t forget: roots can till for you!**

Manure can provide substantial amounts of nutrients and organic carbon

<table>
<thead>
<tr>
<th>Total manure/yr</th>
<th>65</th>
<th>140</th>
<th>85</th>
</tr>
</thead>
<tbody>
<tr>
<td>Total nitrogen/yr</td>
<td>0.64</td>
<td>2.47</td>
<td>0.84</td>
</tr>
<tr>
<td>Total phosphorus</td>
<td>0.11</td>
<td>0.94</td>
<td>0.07</td>
</tr>
<tr>
<td>Total potash/yr</td>
<td>0.24</td>
<td>0.79</td>
<td>0.27</td>
</tr>
</tbody>
</table>

Fertilizer produced daily by livestock
Manure quality varies

<table>
<thead>
<tr>
<th>Manure type:</th>
<th>Poultry</th>
<th>Swine</th>
<th>Dairy</th>
<th>Beef Cattle</th>
</tr>
</thead>
<tbody>
<tr>
<td>N content</td>
<td>1-3%</td>
<td>3-5%</td>
<td>1-3%</td>
<td>1-2%</td>
</tr>
<tr>
<td>C content</td>
<td>19-27%</td>
<td>15-19%</td>
<td>15-18%</td>
<td>16-25%</td>
</tr>
<tr>
<td>pH</td>
<td>Neutral to alkaline</td>
<td>Acidic</td>
<td>Neutral</td>
<td>Neutral to acidic</td>
</tr>
<tr>
<td>Quality</td>
<td>High (short-term)</td>
<td>High to medium</td>
<td>Low quality (long-term)</td>
<td>Low quality (long-term)</td>
</tr>
</tbody>
</table>

Integrating manure with a cover crop

manure slurry + seed injection

The archived presentation is available at: https://lpelc.org/chronological-webcast-archive/
LFL Organic N inputs: Compost, soybean and clover

Snapp et al., 2010

Living Field Laboratory (KBS @ MSU)

Spring biomass: cover crop vs. weed fallow, LFL 2006-2008
Livestock and Poultry Environmental Learning Community Webinar Series

March 1, 2019

Mixtures of residues - Application of manure with living plants

The archived presentation is available at: https://lpelc.org/chronological-webcast-archive/

Take home: Roots, judicious and diversity: apply with green!

- The goal is mixtures of BROWN (dairy manure, compost, wheat straw and roots, reduced-till) with GREEN (legume hay, goat, poultry or swine manure, green manure, cover crops turned in young)
- Judicious tillage NOT excessive tillage
- Roots, roots, roots
- **Best management practice:** Apply manure to green (cover crop, winter wheat, pasture) or with cover crop seed

Extension resources