Using Cover Crops to Tie Up Manure to Prevent Losses

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Mimic Mother Nature with Application of Manure

60 Million Bison in USA in early 1800’s
Did they stop eating or pooping in winter?
Water Quality?

Managing plant roots affects nutrient recycling

80% 60% 50% 30%
ECO Farming acts like a biological valve or plug to absorb N and P.

- No-till Alone
- No-till + Cover Crop

Continuous no-till

Intensive tillage

Network of biopores

SOM and Available Water Capacity

<table>
<thead>
<tr>
<th>Percent SOM</th>
<th>Sand (Inches)</th>
<th>Silt (Inches)</th>
<th>Silt Clay (Inches)</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>1.0</td>
<td>1.9</td>
<td>1.4</td>
</tr>
<tr>
<td>2</td>
<td>1.4</td>
<td>2.4</td>
<td>1.8</td>
</tr>
<tr>
<td>3</td>
<td>1.7</td>
<td>2.9</td>
<td>2.2</td>
</tr>
<tr>
<td>4</td>
<td>2.1</td>
<td>3.5</td>
<td>2.6</td>
</tr>
<tr>
<td>5</td>
<td>2.5</td>
<td>4.0</td>
<td>3.0</td>
</tr>
</tbody>
</table>

The average soil in the USA has lost 50-60% of its SOM (Lal, 2011)

This presentation is archived at:
http://www.extension.org/pages/21819/chronological-webcast-archive
Saving Nutrients in the Soil

...is related to the speed of Water!

If the velocity of water is doubled, how many more nutrients travel with the water in a stream?

$2^2 = 64$ times more nutrients lost!

<table>
<thead>
<tr>
<th>Velocity (mph)</th>
<th>Multiplier</th>
</tr>
</thead>
<tbody>
<tr>
<td>1 to 2 mph</td>
<td>64x</td>
</tr>
<tr>
<td>2 to 4 mph</td>
<td>128x</td>
</tr>
<tr>
<td>4 to 8 mph</td>
<td>256x</td>
</tr>
<tr>
<td>8 to 16 mph</td>
<td>512x</td>
</tr>
<tr>
<td>16 to 32 mph</td>
<td>1,024x</td>
</tr>
</tbody>
</table>

Cover crops & live plants reduce the speed of water.

Nutrient Extraction

What Cover Crops to Use

• Grasses versus Brassicas versus Legumes
• Grasses tie up N and P with fibrous roots.
• Live year round: Most grasses (not oats).
• Grasses provide some traction/less mud.
• Brassicas have high N concentrations.
• Legumes already make their own N but readily absorb free N.
Type of Cover Crops

Grasses: Scavenger nutrients (fine roots), C:N ratio depends on killing date: cereal rye, triticale, annual ryegrass, barley, wheat, oats, Sorghum-Sudan, millets

Brassicas: Good for surface compaction and take up N readily: radish, turnips, kale, rape

Legumes/Clovers: Make Nitrogen, low C:N ratio, taproots: cowpeas, winter pea, hairy vetch, common vetch, red clover, sweet clover, alfalfa, soybeans

Nitrogen Uptake

ARG had 5-5.3% N in the tissue with 400-450# of N being recycled.

Cereal ryegrass has 4-4.5% N in tissue or 350 to 400# of N.

Daikon radish-Highest uptake 5.3-5.5%N Also fastest release.

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Best Cover Crops for Manure Uptake

1) Oats, Radish
2) Cereal rye*, Annual ryegrass*
3) Wheat*, Barley*
4) Kale*, Rape*, Turnips, Radish

* Means they generally survive the winter

Annual Ryegrass 45 Days
6,000 Gallons Swine Manure
Cover Crops for Winter Manure

What do we want to in a good cover crop if we are applying manure in the winter?
1) Live plant to absorb N and P.
2) Fibrous Root system vs Tap root
3) Hold up equipment in wet weather.
4) Forage possibilities
5) Easy to kill
6) No carryover problems for next crop (insects, weeds, nutrient tie up).

Cover Crops for Winter Manure

Good Cover Crops  | Mixtures/Minimize
---|---
Cereal rye  | Radish
Annual Ryegrass | Oats
Triticale  | Legumes
Barley  | Other Issues
Wheat  | Short pasture

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