Building A Working Conservation Cropping System Focusing on Soil Health

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United States Department of Agriculture
Making Soil Health A Priority!

- **What does *Soil Health* mean?**
- **Soil Health Key Indicators =**
  - **Increasing** organic matter
  - **Improving** aggregate stability
  - **Increasing** water infiltration
  - **Increasing** water-holding capacity
  - **Improving** nutrient cycling
  - **Balancing** and diversifying soil biology
Soil Health Principles

- Provide Continuous Living Roots
- Minimize Disturbance
- Maximize Biodiversity
- Maximize Soil Cover
Key characteristic: Soil Microbial Diversity (Soil Biodiversity) biodiversity = most valuable property of any ecosystem [E.O Wilson, 1999]

Greater Biodiversity => Greater range of pathways for primary production and ecological processes (i.e., nutrient cycling); alternative pathways available if one is disturbed [Bob Kremer- Prof. of Soil Microbiology, University of Missouri]
Conservation Cropping Systems
Fully Functional No-Till = High Soil Health

Resilience!
We can package a system of practices that Improve Soil Health!

- Quality No-Till
- Adapted Nutrient Management
- Prescribed Cover Crops
- Diverse Crop Rotation
- Integrated Weed & Pest Management
- Precision Technology
Where can we build reactive carbon?

Most occurs 0”-4”

Maybe it occurs 4”- 24”-?”

Previous bean root, annul ryegrass root, and earthworm
How was the deep rich soil of the prairie formed?

Nature has provided the template

10 Years of C-SB continuous No-Till and 2 years of cover crops

Larry Strole, Brook IN
Cover Crops

...Strategies for a Corn-Soybean Rotation
Strategically…
CC should complement the following crop
Corn or
Soybean
Strategically…
CC should complement the following crop

Corn after
High C (Corn)
Strategically...
CC should complement the following crop

Corn after
High C (Corn)
...or
High N (Protein)
Strategically…
CC should complement the following crop

Corn after Cereal Rye?
…plus
Strategically...

CC should complement the following crop:

Corn after
High C (Corn) plus
High N (Protein)
Strategically…
CC should complement the following crop

Corn after
High C (Corn)
Strategically…
CC should complement the following crop

Corn after
High C (Corn)
plus
High N (Protein)
Strategically…
CC should complement the following crop

Corn after
High C (carbon)
and
High N (Protein)
Strategically…

Do Soybeans need N?
…Sure, but they capture their own!
Strategically…

Do Soybeans need N?

…Sure, but they capture their own!
Strategically…
CC should match desired C:N Ratio

<table>
<thead>
<tr>
<th>Material</th>
<th>C:N Ratio</th>
</tr>
</thead>
<tbody>
<tr>
<td>rye straw</td>
<td>82:1</td>
</tr>
<tr>
<td>wheat straw</td>
<td>80:1</td>
</tr>
<tr>
<td>oat straw</td>
<td>70:1</td>
</tr>
<tr>
<td>corn stover</td>
<td>57:1</td>
</tr>
<tr>
<td>rye cover crop (anthesis)</td>
<td>37:1</td>
</tr>
<tr>
<td>rye cover crop (vegetative)</td>
<td>26:1</td>
</tr>
<tr>
<td>mature alfalfa hay</td>
<td>25:1</td>
</tr>
<tr>
<td>Balanced Microbial Diet</td>
<td>24:1</td>
</tr>
<tr>
<td>rotted barnyard manure</td>
<td>20:1</td>
</tr>
<tr>
<td>daikon radish</td>
<td>19:1</td>
</tr>
<tr>
<td>legume hay</td>
<td>17:1</td>
</tr>
<tr>
<td>beef manure</td>
<td>17:1</td>
</tr>
<tr>
<td>ryegrass (vegetative)</td>
<td>15:1</td>
</tr>
<tr>
<td>young alfalfa hay</td>
<td>13:1</td>
</tr>
<tr>
<td>hairy vetch cover crop</td>
<td>11:1</td>
</tr>
<tr>
<td>soil microbes (average)</td>
<td>8:1</td>
</tr>
</tbody>
</table>
Strategically…
Planning the system

1. Drill or VT Cereal Rye into Corn Stalks
Strategically…
Planning the system

1. Drill or VT Cereal Rye into Corn Stalks
2. Plant a short season Soybean into the Rye (preferably early in the season)
Strategically…
Planning the system

3. Plant a low C:N mix into or after Soybean
4. NT Corn into an N rich healthy soil
All Genetic and Tech Advancements are Greatest When Soil Health is Maximized

Capture the potential!

United States Department of Agriculture

Conservation Cropping Systems Initiative
Mastering the Details is Key to Optimum Production

Capture the potential!
Mastering the Details is Key to Optimum Production

“you’ll need many silver bullets...
...and a well planned system to keep them on target”
Mastering the Details is Key to Optimum Production

“We can take production and conservation further with Conservation Cropping Systems that build Soil Health.”