Strategizing & Implementing a Soil Health Management System
Module 9

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Agronomist
Goals

By the end of this lesson you will be able to:

1. Identify key components of practices and activities to develop a Soil Health Management System
2. Describe the interaction, dependency and synergy between practices in a SHMS
3. Recognize barriers to implementation
4. Describe an entry level strategy to develop a SHMS
The 4 Principles that Conserve the Soil Ecosystem

1. Minimize Disturbance
2. Maximize Living Cover
3. Maximize Biodiversity
4. Maximize Continuous Living Roots
Soil Health Management System

Collection of NRCS conservation practices, BMPs, activities, that focus on maintaining or enhancing soil health

Address all 4 of the soil health principles

Create a “synergistic” effect

Cropping system specific
Best Accepted New Technology

- Conservation activities that might not be in an NRCS conservation practice standard. Examples:
  - Companion cropping
  - Traffic management
  - Precision application of nutrients and pesticides
  - Use of flotation tires
Soil Health Management System

• Achieving soil health through:
  - A Quality No-till/ Strip-till System
  - Diverse and Strategic Cover Crops
  - Adapted Nutrient Management
  - Integrated Weed & Pest Management
  - Diverse Crop Rotations
  - Precision Farming Technology
  - Prescriptive Buffers

Soil Health is not a destination...it’s a Journey
We can package a system of practices that improve soil health!

- Prescribed Cover Crops
- Quality No-Till/Strip-till
- Diverse Crop Rotation
- Adapted Nutrient Management
- New Technology and Integrated Weed & Pest Management
Planter set-up and maintenance is critical

No-Till / Strip-Till
Goal: Every seed at the exact same depth...
No-Till Planter Attachments

Less total down pressure is needed

Match field conditions on the go!
Crimp and Plant
Spread the Weight!

Spread the Detritus (residue)
Crop Talk!

• Listen to what the crop is telling you...

My feet are hurtin’ in these tight shoes!
Compounding extent of soil degradation and effect on other cycles

**Denitrification:**
- Anaerobic conditions cause Losses of $\text{N}_2$, NO and $\text{N}_2\text{O}$

**Leaching**
- Plenty of heat to convert ammonium to nitrate
- Nitrate leaves with the water

Both applied and soil available N are at risk of loss
Nitrogen Mineralization and Immobilization

Biology

Nitrogen transformations

urea-N → NH₄⁺ → NO₃⁻

organic-N → NH₄⁺ → NO₃⁻
Effect of Tillage on Microbial Activity

- Which tillage system has more microbial activity when the crop benefits from the CO₂?
With Space Shuttle Tech

No-Till Planters

Precision nutrient placement and rate

Sense and adapt to field conditions on the go!
Integrated Pest Management

- Prevention
- Avoidance
- Monitoring
- Suppression
Cont No-Till Corn SB-Wheat Rotation 60 Bushel Soybeans
Gleaner R52 Crary Air Reel
The Nozzles

Part Numbers
TDXL/TDCXL11001
TDXL/TDCXL110015
TDXL/TDCXL11002
TDXL/TDCXL110025
TDXL/TDCXL11003
TDXL/TDCXL11004
TDXL/TDCXL11006
TDXL/TDCXL11008
TDXL/TDCXL11010

Description
110° Flat Fan Multi-purpose medium pressure air induction nozzle
20 - 120 psi Overall pressure range
30 - 90 psi Optimal pressure range
Estimated life (60’ boom, 20” centers)
20,000 - 30,000 acres TDXL
60,000 - 80,000 acres TDCXL
Polyacetal Venturi body and SprayMax TipCap nozzle with EPDM seat gasket.
TDXL has ceramic metering orifice in place of a rubber internal seat.

The most proven multi-purpose Venturi air injection nozzle

TurboDrop® XL Medium Pressure Nozzle (TDXL)

<table>
<thead>
<tr>
<th>Feature</th>
<th>TDXL 20-120psi</th>
<th>TDCXL 30-150psi</th>
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<tbody>
<tr>
<td>Wide Pressure Range</td>
<td></td>
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<tr>
<td>Wide Drift Control Range</td>
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<tr>
<td>Separate Injector (Venturi)</td>
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<tr>
<td>Patented Stabilization Chamber</td>
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<tr>
<td>Excellent With Rate Controllers</td>
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<tr>
<td>Improved Coverage, Reduced Runoff</td>
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<td>Interchangeable Tip / Cap</td>
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<tr>
<td>Proven TurboDrop® Technology</td>
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<tr>
<td>Longer Wear Life</td>
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- Wide Pressure Range: TDXL 20-120psi, TDCXL 30-150psi
- Wide Drift Control Range:
  - Sizes 01-02: 20-60+ psi
  - Sizes 02-04: 20-80+ psi
  - Sizes 05-10: 20-100+ psi
- Separate Injector (Venturi): Comes apart by hand, easy to clean (no tools required).
- Patented Stabilization Chamber: Even and uniform mixing of air with liquid which gives a tighter, more uniform droplet spectrum and a homogeneous spray solution across a wide operating range.
- Excellent With Rate Controllers: Wide pressure range allows greatest speed variations.
- Improved Coverage, Reduced Runoff: Air-filled droplets spread on the target surface rather than bouncing off.
- Reduced Clogging: Round metering orifice versus elliptical slit.
- Interchangeable Tip / Cap: Two spray nozzles in one. Other tips may also be used.
- Proven TurboDrop® Technology: Over 17 Years in 40 countries.
- Longer Wear Life: TDXL: 20-30,000 Acres
Roundup Resistant Water-hemp
New Herbicide for Resistant Weeds

• Enlist Weed Control system includes seeds that are genetically modified to tolerate the new herbicide from Dow, Enlist Duo.

• Enlist Duo contains 2,4-D that adds another mode of action to the glyphosate-based herbicides.

• Better protection against tougher weeds, which have been growing resistant to the glyphosate.

• Commercial application of the system requires both the new seed traits as well as the new herbicide to be approved by the regulatory authorities.

• Corn production in 2014, for soybean production in 2015 and cotton production in 2016.
Strategically...CC Should Complement the Following Crop

What about Corn?
Strategically... CC should match desired C:N Ratio

<table>
<thead>
<tr>
<th>Material</th>
<th>C:N Ratio</th>
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<tbody>
<tr>
<td>Rye Straw</td>
<td>82:1</td>
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<tr>
<td>Wheat Straw</td>
<td>80:1</td>
</tr>
<tr>
<td>Oat Straw</td>
<td>70:1</td>
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<tr>
<td>Corn Stover</td>
<td>57:1</td>
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<tr>
<td>Rye Cover Crop (Anthesis)</td>
<td>37:1</td>
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<tr>
<td>Rye Cover Crop (Vegetative)</td>
<td>26:1</td>
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<tr>
<td>Mature Legumes</td>
<td>25:1</td>
</tr>
<tr>
<td>Balanced Microbial Diet</td>
<td>24:1</td>
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<tr>
<td>Daikon Radish</td>
<td>19:1</td>
</tr>
<tr>
<td>Crimson Clover</td>
<td>17:1</td>
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<tr>
<td>Ryegrass (Vegetative)</td>
<td>15:1</td>
</tr>
<tr>
<td>Young Alfalfa</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>
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Good for Soybean

Good for Corn
Strategically...CC Should Complement the Following Crop

Corn into:

• High N (Protein)
• Cover Crop (Clover/Peas)
• Contributes high quality N
• Less likely to harbor disease pathogens
Strategically...CC Should Complement the Following Crop

Corn into a mix:
High Carbon (Rye)
Provides:
• Erosion Control
• Moisture Savings
Uses/immobilizes:
• Nitrogen/nutrients
• Disease?
Starter N a must!
Strategically...

- Soybeans do well into a high carbon Cover Crop.  
  ...Why?
- Low nitrate conditions early, weed control, late season soil moisture and late season nutrient cycling (residue mineralization)
Strategically...Planning the System Using the Step by Step Approach

1. Drill or Aerial Seed Cereal Rye or Annual Ryegrass into Corn Stalks (early maturing corn)
2. Terminate the Cereal Rye at 12”...
Strategically...Planning the system

2. Plant a short season Soybean into the Cereal rye (preferably early in the season)
Strategically...Planning the system

3. Plant a low C:N mix into Soybean at senescence (oat, barley, radish, rapeseed, turnip)
4. NT Corn into a: Biologically active high functioning soil
Strategically... Planning the system

5. Enjoy The Rewards of Soil Health!
SHMS Keys

• Implementation phase (compaction, residue breakdown slow, N-tie-up following wheat, equipment adjustments balling up residue in drill/planter)

• Planting depth, uniformity of stand important

• Residue Uniformity, PolySkids allow header to run on ground for soybeans without any problems with corn stalks; wheat stubble height, fall grazing on corn stubble

• Reduce weed pressure and disease with canopy & mulch cover, & rotate WS grass, WS broadleaf, CS grass

• Rotate herbicides and crops to minimize weed resistance (water hemp resistance biggest challenge)

• Keep sprayer in top condition (do your own spraying)
SHMS Keys

• Residue cover = money in hot dry conditions (need more residue as biology increases)

• Cover crops, C:N ratio 25, avoid brassica monoculture, limit water use, some years will not use cover crops, canopy and ground cover = less weeds and lower “E” in ET

• Uniform emergence is important (Corn 2-1/2; SB 1-1/2, Sorghum 2”) (deeper than we used to, consider planting dates)

• Fertilizer mgt (gradually need less N fertilizer, split apply N on wheat for yields by first node, P starter for corn and SB, manage pH)
Questions

Mike Kucera Agronomist