Optimizing Rotations with Improving Soil Health with Biological Primer
MAKING NO-TILL WORK

229 bu. Corn with 50# N
YELLOW BLOSSOM SWEET CLOVER – 2YR FOR BENEFIT
CRIMSON CLOVER
FABA BEAN
COW PEA
SUNN HEMP
HAIRY VETCH
Chickling Vetch
Austrian Winter Peas @ 30 lbs/acre
Tap Root 9” deep
Legume Nitrogen Potentials

- Red Clover – 60lbs/A
- Sweet Clover – 80lbs/A
- Crimson Clover – 75lbs/A
- Hairy Vetch – 150lbs/A
- Cahaba/Chickling Vetch – 30lbs/A
- Winter Pea – 125lbs/A
- Cow Pea – 50lbs/A
- Sunn Hemp – 100lbs/A
BUCKWHEAT
Makes Phosphorous available
SUNFLOWER MAY HELP RELEASE MICRO NUTRIENTS LIKE ZINC AND COPPER
LIFTS SOIL

IMPROVES WATER INFILTRATION

HOLDS NUTRIENT (N-P-K)
PRECISION PLANTED PEAS AND RADISH
Deep rooted radish
Reaches 2 feet into the soil
# Recycling of nutrients by Oilseed radish

<table>
<thead>
<tr>
<th>Nutrient</th>
<th>Concentration (%)</th>
<th>Content (lbs/a)</th>
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</thead>
<tbody>
<tr>
<td>Nitrogen</td>
<td>1.89</td>
<td>250</td>
</tr>
<tr>
<td>Phosphorus</td>
<td>0.97</td>
<td>23</td>
</tr>
<tr>
<td>Potassium</td>
<td>3.27</td>
<td>230</td>
</tr>
<tr>
<td>Sulfur</td>
<td>0.81</td>
<td>60</td>
</tr>
<tr>
<td>Calcium</td>
<td>2.17</td>
<td>150</td>
</tr>
<tr>
<td>Magnesium</td>
<td>0.26</td>
<td>20</td>
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CEREAL RYE
Began with cover crops in 1978
Soybean planted into Cereal Rye
With the use of a crop roller to terminate large cover crops, no herbicide is used.
6ft Tall Rye, No Herbicide
Designing the “right” mix

- Always start with your goals! Ask: why?
- Helps determine species mix
- What don’t you have?
ANNUAL RYEGRASS
New ways to apply cover crops have made them more adaptable.
Diversity – Crop Types

- Cool Season Grass
  - Barley
  - Durum wheat
  - Oat
  - Spring wheat
  - Winter triticale
  - Winter wheat

- Cool Season Broadleaf
  - Canola
  - Crambe
  - Flax
  - Lentils
  - Mustard
  - Pea
  - Red clover
  - Sweet clover
  - Turnip
  - Radish
SOIL BUILDER 4 WAY MIX
6 WAY MIX
ARE YOU CURIOUS?
Diversity – Crop Types

- **Warm Season Grass**
  - Corn
  - Proso millet
  - Pearl millet
  - Sorghum
  - Sudan
  - Sudan-sorghum hybrid

- **Warm Season Broadleaf**
  - Alfalfa
  - Buckwheat
  - Chickpea
  - Amaranth
  - Cowpea
  - Soybean
  - Safflower
  - Sunflower
  - Hairy vetch
10 WAY MIX – HIGH LEGUME RATIO FOR NITROGEN RELEASE
MIXES ATTRACT POLLINATORS
HOW THICK DO YOU WANT THE COVER TO BE
HIGH CARBON MIX
Effects of mixed cover crops in continuous no-till on soil total nitrogen content under corn-soybean-wheat rotation.

<table>
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<tr>
<th>Effects</th>
<th>LSD$_{p&lt;0.05}$</th>
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<tbody>
<tr>
<td>Cover crop</td>
<td>0.01</td>
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<tr>
<td>Soil depth</td>
<td>0.03</td>
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</table>

![Diagram showing the effects of mixed cover crops on soil total nitrogen content under corn-soybean-wheat rotation.](image)
Cover Crops – Why?

- Feed the soil foodweb
- Forage- grazing
- Soil cover (armor, moderate temps)
- Wildlife- food/cover
- Capture/cycle nutrients
- Fix atmospheric N
- Catch snow
- Water management
- Support pollinators
- Create pores in compacted soil
Corn Sample from Blends Protein Analysis

No Fertilize  9.1% Protein
Half Rate Fertilizer  8.6% protein
With Fertilizer  7.5% protein
Convention Corn  5.3% protein

9.1 protein means increasing value of grain by 27 cents = $27/100 bu. of corn... example... 100,000 bu. X 0.27 = $27,000 dollars.... another pickup truck
# Liberty Union FFA Field Plot

<table>
<thead>
<tr>
<th>Company</th>
<th>Brand</th>
<th>Yield</th>
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<tbody>
<tr>
<td>Channel</td>
<td>20232STX</td>
<td>178.0 bu</td>
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<tr>
<td>Channel</td>
<td>20537VT3P</td>
<td>189.8 bu</td>
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<tr>
<td>Channel</td>
<td>20713VT3P</td>
<td>183.4 bu</td>
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<tr>
<td>Pioneer</td>
<td>PO832AMXR</td>
<td>220.1 bu</td>
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</table>

**Nitrogen Applied @ rate of 140lbs /per acre**

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<tbody>
<tr>
<td>Channel</td>
<td>20232STX</td>
<td>121.0 bu</td>
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<tr>
<td>Channel</td>
<td>20537VT3P</td>
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<tr>
<td>Channel</td>
<td>20713VT3P</td>
<td>119.0 bu</td>
</tr>
<tr>
<td>Pioneer</td>
<td>PO832AMXR</td>
<td>129.0 bu</td>
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WHEAT WITH RADISH