Utilizing Cover Crops as Part of Your Forage System

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Slides adapted from Rebecca Vittetoe and Mark Licht ISU Extension and Outreach

Soil erosion
Increase soil organic matter
Water quality
Soil health
Grazing potential

Cover Crops in Iowa

Iowa Learning Farms 2015 Evaluation Report

Cover Crops in Iowa

Covering A Lot of Ground

Iowa farmers plant more than 2 million acres of cover crops—preventing, on average, 38–31% of nitrogen and 39% of phosphorus from reaching our water.

Why consider cover crops as a forage source?

1. Short on hay or pasture ground
2. Herd expansion
3. Opportunity to integrate cattle and crops to reduce costs in both enterprises

Cover Crop Agronomics

- Start small
- Look for “easy” entry points
  - After corn silage or seed corn, prevent plant acres, grazing/forage?
- Be flexible
- Have a Plan A, Plan B, Plan C…..
Yield and Quality

• Forage type:
  – Grasses = greater fiber / less protein
  – Legumes/brassicas = high protein / highly digestible

• Maturity
  – Less mature = more digestible and higher in crude protein
  – Reach reproductive stage = decrease in digestibility and crude protein

Winter rye cover crop

Definitions

• Cover crop = plant material does not leave the field through harvest or grazing
• Forage crop = feed; leaves the field; harvest or grazing
  – Check pesticide labels for rotational crop restrictions and grazing/harvest restrictions
  – Why?
    ✓ Herbicide residual in the soil may hinder establishment or stunt crop growth
    ✓ Pesticide residue can be taken up by the crop, consumed by livestock, and get into milk or accumulate in fat and pose a human health risk (EPA Pesticide Residue Monitoring Program)

Residual herbicides and interaction with Cover Crops

• Herbicide resistance has led to increased use and rates of residual herbicides
  – Provide several weeks of weed control, generally aimed at small-seeded broadleaves and grasses

• Many herbicides have sufficient longevity to affect cover crop establishment

Herbicide persistence

• Herbicide half-life
  (estimate of soil life under a range of conditions and soil types)
• Soil factors
  – pH, texture, soil microorganisms
• Climate conditions*
  – Moisture, temperature, sunlight
• Herbicidal properties
  – chemical structure, vapor pressure

*If only we could predict this one..
Species Selection:

- Important to consider:
  - Pesticide label restrictions
    - Check for crop rotation and grazing restrictions
    - Good resource to check: www.cdms.net/Label-Database or Greenbook.net
  - When intend to graze (fall, spring, both?)
    - Feed quality
      - Forage type
      - Maturity

Label restrictions regarding cover crops

- Most not developed with cover crops in mind
  - Many cover crops not explicitly listed on label
  - Must be followed if there is any possibility of the cover crop being grazed or harvested for forage
Table 1. Corn herbicides allowing establishment of cover crops for grazing/forage during the season of application.

<table>
<thead>
<tr>
<th>Corn product that allow establishment of cover crops for grazing/forage less than 4 months after application</th>
<th>Cover crops to establish</th>
<th>Alfalfa</th>
<th>Barley</th>
<th>Corn</th>
<th>Clover</th>
</tr>
</thead>
<tbody>
<tr>
<td>Atrazine (3.2%)</td>
<td>yes</td>
<td>yes</td>
<td>yes</td>
<td>yes</td>
<td>yes</td>
</tr>
<tr>
<td>Bromoxynil (2.5%)</td>
<td>yes</td>
<td>yes</td>
<td>yes</td>
<td>yes</td>
<td>yes</td>
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<tr>
<td>Butylated (2.5%)</td>
<td>yes</td>
<td>yes</td>
<td>yes</td>
<td>yes</td>
<td>yes</td>
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<tr>
<td>Calmaxx (1.0%)</td>
<td>yes</td>
<td>yes</td>
<td>yes</td>
<td>yes</td>
<td>yes</td>
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<tr>
<td>Ditrac (2.5%)</td>
<td>yes</td>
<td>yes</td>
<td>yes</td>
<td>yes</td>
<td>yes</td>
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<tr>
<td>Ester (2.5%)</td>
<td>yes</td>
<td>yes</td>
<td>yes</td>
<td>yes</td>
<td>yes</td>
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<tr>
<td>Glyphosate (4.0%)</td>
<td>yes</td>
<td>yes</td>
<td>yes</td>
<td>yes</td>
<td>yes</td>
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<tr>
<td>Lysil (2.5%)</td>
<td>yes</td>
<td>yes</td>
<td>yes</td>
<td>yes</td>
<td>yes</td>
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<tr>
<td>Nicosulfuron (0.8%)</td>
<td>yes</td>
<td>yes</td>
<td>yes</td>
<td>yes</td>
<td>yes</td>
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<td>Paclobuton (4.0%)</td>
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<td>yes</td>
<td>yes</td>
<td>yes</td>
<td>yes</td>
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<tr>
<td>Residue (4.0%)</td>
<td>yes</td>
<td>yes</td>
<td>yes</td>
<td>yes</td>
<td>yes</td>
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<tr>
<td>Strobilur (0.5%)</td>
<td>yes</td>
<td>yes</td>
<td>yes</td>
<td>yes</td>
<td>yes</td>
</tr>
<tr>
<td>Value (2.5%)</td>
<td>yes</td>
<td>yes</td>
<td>yes</td>
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<td>yes</td>
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<tr>
<td>Valor (2.5%)</td>
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<tr>
<td>Valor Plus (2.5%)</td>
<td>yes</td>
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<td>yes</td>
<td>yes</td>
<td>yes</td>
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<tr>
<td>Striga (2.5%)</td>
<td>yes</td>
<td>yes</td>
<td>yes</td>
<td>yes</td>
<td>yes</td>
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<tr>
<td>Tavac (2.5%)</td>
<td>yes</td>
<td>yes</td>
<td>yes</td>
<td>yes</td>
<td>yes</td>
</tr>
<tr>
<td>Tavac Plus (2.5%)</td>
<td>yes</td>
<td>yes</td>
<td>yes</td>
<td>yes</td>
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</tr>
</tbody>
</table>
| U. Of Missouri Research

- Field research with drilled cover crops
  - Herbicides applied in late June/early July; cover crops drilled Sept. 10
  - Biomass, stand measurements
  - Found that environment plays a large role in the effect of herbicides on cover crop establishment
    - Increased rainfall in 2014 resulted in less injury to covers
    - Tillage radish was most sensitive crop tested

https://extension.missouri.edu/media/wysiwyg/Extensiondata/Pro/WeedScience/Docs/CoverCropCarryover.pdf
Species Selection

Cover Crop Agronomics: Species Selection

• Grasses (oats, cereal rye, triticale, wheat)
• Legumes (hairy vetch, crimson clover, Austrian winter pea)
• Brassicas (turnip, rapeseed, radish)
• Other non-legume broadleaves (buckwheat, flax)
• Mixtures or Cocktails?
• Think about…
  • What's the goal of the cover crop?
  • Will the cover crop grow and overwinter?
  • How will it be planted and terminated?
  • What is the current and subsequent crop?
• Good resource: http://mccc.msu.edu/covercroptool/covercroptool.php

• Grains
  • Corn (Zea mays)
  • Soybeans (Glycine max)
  • Wheat (Triticum aestivum)

• Grasses
  • Annual Ryegrass
  • Perennial Ryegrass
• Legumes
  • Crimson clover
  • White clover
  • Austrian winter pea

• Brassicas
  • Turnip
  •rape
  • Radish
• Crop mixtures
  • Buckwheat
  • Flax

Species Selection:

• Grasses
  • Oats
  • Cereal rye
  • Triticale
  • Wheat

• Legumes
  • Hairy vetch
  • Crimson clover
  • Austrian winter pea

• Brassicas
  • Turnip
  • Rapeseed
  • Radish

• Other non-legume broadleaves
  • Buckwheat
  • Flax

Mixtures or Cocktails?

Good resource:

http://mccc.msu.edu/covercroptool/covercroptool.php
Excellent source of Information on species

[Image of a page from the Iowa Learning Studios]

Cover crop species

<table>
<thead>
<tr>
<th>Species</th>
<th>Seeding Rate</th>
<th>Approx. Costs</th>
</tr>
</thead>
<tbody>
<tr>
<td>Grasses</td>
<td>2 to 3 bu/acre (100 to 150 lb/acre)</td>
<td>Oats: $30 - $38/acre</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Cereal rye: $30 - $36/acre</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Wheat: $25 - $35/acre</td>
</tr>
<tr>
<td>Brassicas</td>
<td>5 to 10 lb/acre (recommend seeding with a grass)</td>
<td>Turnips: $9 - $18/acre</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Kale/rape: $14 - $20/acre</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Radish: $15 - $25/acre</td>
</tr>
<tr>
<td>Legumes</td>
<td>5 – 75 lb/acre</td>
<td>$20 to $150/acre</td>
</tr>
<tr>
<td>Mixes</td>
<td>100 to 150% of full seeding rate</td>
<td>See above Example: 80 lbs/acre oats (80% seeding rate) 2 lbs/acre turnips (40% full seeding rate) Total: 120% full seeding rate</td>
</tr>
</tbody>
</table>

[Image of a page from the Iowa Learning Studios]
**Fall Cover Crop Growth**

**Single VS Mix Seeding**

**Benefits of a Cocktail Mixture**

- Cocktail mixtures of cover crops increase the likelihood that something will grow—provide a more balanced nutrient profile than monocultures.

- Combinations of grasses and legumes or brassicas provide biomass and greater crude protein.

**Benefits of Cocktail Mixture Continued**

- Oats and brassicas seeded into cash crops will provide late fall/early winter forage.

- Cereal Rye, winter triticale, winter peas or hairy vetch will yield some tonnage in the fall but will provide plenty of forage in the spring.

**Seeding methods**

- Aerial, Drill, Broadcast, and Interseeding
  - Each method has pros and cons
  - Weather plays a big factor in establishment

**Keys to Success - Establishment**

- **Broadcast**
  - Last week of August thru first week of September

- **Drill**
  - Target before October 15

- **Aerial/Overseeded**
  - 60-70 pounds per acre of cereal rye or oats

- **Drilled**
  - 50-60 pounds per acre cereal rye by Nov. 1
**Species Selection: Feed Quality**

- **Forage type:**
  - Grasses = greater fiber / less protein
  - Legumes/brassicas = high protein / highly digestible

- **Maturity**
  - Less mature = more digestible and higher in crude protein
  - Reach reproductive stage = decrease in digestibility and crude protein

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**Establishment in the fall - - - Right species**

Grass | Brassica | Legume
--- | --- | ---
Establishment in the fall - - - Right species
Grass | Brassica | Legume
Establishment in the fall - - - Right time, Right method
- Drilled or Planted before Sept. 15
- Aerial or Overseeded between Aug. 20-Sept. 10
- Drilled or Planted before Nov. 1

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**Number of grazing days per acre (beef cattle)**

<table>
<thead>
<tr>
<th>Aboveground forage DM yield (lb/ac)</th>
<th>Animal bodyweight (lb)</th>
</tr>
</thead>
<tbody>
<tr>
<td>500</td>
<td>1000</td>
</tr>
<tr>
<td>8.3</td>
<td>7.6</td>
</tr>
</tbody>
</table>

---

**Practical Farmers**

Developing a cover crop grazing plan

1. Make sure your plan is flexible
2. Labor needed to maximize utilization
   - Seeding
   - Termination
   - Fence
     - Water supply
3. Determine desired grazing period
   - Use "pluck test" to determine if plant is rooted before grazing.

Developing a grazing plan

- Fall grazing
  - Targeting seeding behind silage, seed corn, or early maturity soybeans
  - Utilize fast-growing species: oats, cereal rye, brassicas
  - Oats and brassicas will winterkill
  - Species that winterkill do not require termination in spring
  - Minimal compaction risk

Developing a grazing plan

- Spring grazing, seed winter hardy species in the fall
  - Winter Rye is very popular
  - Some legumes can establish well enough (winter pea, and hairy vetch)
  - Harvest (mechanically or grazed) before reproductive stage
  - Soil compaction may be an issue depending upon spring.

Potential grazing issues

- Nitrate toxicity concerns
  - Accumulation possible in highly fertilized fields
  - Grasses and brassicas affected
- Sulfur toxicity concerns
  - Avoid feeding brassicas or other high sulfur feeds
  - They are high in sulfur and lower in fiber.
  - Seed brassicas with a small grain forage
- Manage by:
  - Testing forage
  - Provide hay/other supplements
  - Controlling animal intake

Grazing issues

- Moisture content
  - Brassica species are about 90% water
  - Cereal grains are about 60-65% moisture at boot stage
  - Corn stalks are about 8-10% moisture

Spring Forage Values
Cereal rye yield and quality
(ISU Grazing Cover Crop Project)

<table>
<thead>
<tr>
<th>Component</th>
<th>Average</th>
<th>Range</th>
</tr>
</thead>
<tbody>
<tr>
<td>Yield (ton DM/acre)</td>
<td>0.75</td>
<td>0.25 – 1.50</td>
</tr>
<tr>
<td>RFV</td>
<td>216</td>
<td>106 – 318</td>
</tr>
<tr>
<td>TDN, %</td>
<td>72.4</td>
<td>60.6 – 78.8</td>
</tr>
<tr>
<td>DM, %</td>
<td>19.0</td>
<td>12.2 – 26.6</td>
</tr>
<tr>
<td>CP, %</td>
<td>21.6</td>
<td>12.3 – 32.2</td>
</tr>
<tr>
<td>ADF, %</td>
<td>21.2</td>
<td>12.9 – 36.6</td>
</tr>
<tr>
<td>NDF, %</td>
<td>35.0</td>
<td>22.7 – 53.5</td>
</tr>
</tbody>
</table>

Data from cereal rye collected fall 2015/spring 2016 in Southern and Northwest Iowa.

Fall Forage Values

<table>
<thead>
<tr>
<th></th>
<th></th>
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<th></th>
<th></th>
<th></th>
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</tr>
</thead>
<tbody>
<tr>
<td>Oaks</td>
<td>25</td>
<td>31</td>
<td>34</td>
<td>32.5</td>
<td>25</td>
<td>31</td>
<td>34</td>
<td>32.5</td>
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<tr>
<td>Chestnut</td>
<td>28</td>
<td>38</td>
<td>40</td>
<td>36.0</td>
<td>28</td>
<td>38</td>
<td>40</td>
<td>36.0</td>
</tr>
<tr>
<td>Walnut</td>
<td>25</td>
<td>36</td>
<td>37</td>
<td>35.3</td>
<td>25</td>
<td>36</td>
<td>37</td>
<td>35.3</td>
</tr>
<tr>
<td>Red Oak</td>
<td>18</td>
<td>21</td>
<td>20</td>
<td>19.3</td>
<td>18</td>
<td>21</td>
<td>20</td>
<td>19.3</td>
</tr>
<tr>
<td>Mix</td>
<td>22</td>
<td>22</td>
<td>23</td>
<td>22.3</td>
<td>22</td>
<td>22</td>
<td>23</td>
<td>22.3</td>
</tr>
</tbody>
</table>

Mowing Cereal Rye

- Mowing of rye at boot stage is most ideal for tonnage, feed quality, and palatability.
- Harvesting reduces some of the concerns with rye limiting soil moisture and nitrogen to subsequent crops.
- Mowing can be done with a disk-bine or haybine, but drying can be a challenge.

Chopping Cereal Rye

- Max tonnage let rye grow past late boot stage
- Quality best at late boot stage
General recommendations for crops following cover crops

• Terminate grass cover crop 10 to 14 days prior to planting corn
  – Consider applying fertilizer at or near planting (P and N in particular)
• Cover crop termination for soybeans done close to or following planting
  – Check herbicide crop rotation restrictions!
• Have a plan and a backup plan!
  – Mother Nature can alter our best plans…
• Scout for potential insect pests and treat if warranted

Termination of Cover Crops

• Terminate Cover Crops in the Spring • Cover crops that survive the winter must be terminated in the spring ahead of planting, to avoid affecting corn and soybean crop yields.
• With corn, terminate the cover crop before it is 8 inches tall, and 10 to 14 days before planting corn.
• With soybean, terminate the cover crop before it is 12 inches tall, and 3 to 7 days before planting soybean. If spring weather conditions are abnormally dry, terminate cover crops earlier than otherwise recommended.
• Terminate cover crops using glyphosate. Use the full label rate and apply when days are warmer than 60°F and nights are above 40°F to increase effectiveness. Avoid using high amounts of ammonium sulfate or urea ammonium nitrate tank-mixed with the glyphosate. Always read and follow herbicide label instructions.

Other things to consider...

• Management for success may be different
  - Not like pasture or hay acres
• Still learning best way to manage cover crops
  - Row crop and livestock management changes by farming practices or individual farm

Summary

• Commit to planting quickly
  – Maximum yields will be obtained when soil conditions permit quick germination and emergence
• Start with a simple cover crop grazing plan
  – One species before planting a mix
  – Utilize grazing management to extend forage utilization
  – Herbicide selection
• Be flexible!

Any Questions?