HOW TO TREAT YOUR COVER CROP LIKE A CASH CROP

WITH DR. ANDREA BASCHE

• Tech Orientation
• Welcome & Introductions
• Presentation
• Q&A
Your Starting Screen

Presentation

Control Panel
To Display Minimized Control Panel

Click the orange arrow button
To Ask a Question

Type your question in the small box at the bottom of the Questions box.

Press “Send”!
What is the Pasture Project?

The Pasture Project works to advance and integrate regenerative grazing as a scalable, market-driven solution for building healthy soil, viable farms, and resilient communities in the Upper Midwest. Pasture Project is part of the Resilient Agriculture and Ecosystems initiative of the Wallace center at Winrock International.

www.pastureproject.org
Register for upcoming webinars

Fix Your Mix-Using Management Goals to Create Diverse Cover Crop Seed Mixes
Thursday, July 23 (2:00-3:00pm CT)

Register: www.pastureproject.org/events
Audience Poll

Help us frame this webinar to address your particular needs by answering the following questions. Only available to those joining by computer – use your mouse to click answers on screen.

Your responses will be confidential – the Pasture Project never shares personal information.
Today’s Presenter

Dr. Andrea Basche
University of Nebraska-Lincoln, Dept. of Agronomy and Horticulture
### Summary of crop management considerations from my 200-level undergraduate course

<table>
<thead>
<tr>
<th>Management</th>
<th>Corn</th>
<th>Soybean</th>
<th>Wheat</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Planting dates</strong></td>
<td>When soil temperatures reach 50°F – April into May</td>
<td>Earlier planting in April or May equates to more time for nodes to form (3.7 days/node)</td>
<td>Goal to acquire 400 growing degree units before December 31, typically early October depending on location</td>
</tr>
<tr>
<td><strong>Crop varieties (maturity, other selection criteria)</strong></td>
<td>Typically in NE &gt;100-day comparative maturity length hybrids, are utilized depends on location and planting dates</td>
<td>Maturity groups are based on daylength required for onset of flowering/reproductive growth. In Southeast Nebraska typically maturity group 3.0 varieties are utilized and this decreases to 2.0 or less moving north and west across the state.</td>
<td>Variety selection is particularly critical for wheat especially in terms of disease resistance, lodging, quality characteristics</td>
</tr>
<tr>
<td><strong>Row spacing</strong></td>
<td>Typically 15 or 30 inch rows, want to optimize canopy capture of sunlight by the V8 growth stage. Not considered to be critical for higher yield corn as other factors such as planting date or seeding rate</td>
<td>Typically 15 or 30 inch rows, weed pressure in soybean may favor narrower row spacing.</td>
<td>Commonly planted in 7.5 inch rows</td>
</tr>
<tr>
<td><strong>Seeding rates</strong></td>
<td>Depends on location, could have planting rates as low as 20k seeds/acre in non-irrigated/drier environment or as high as &gt;40 seeds/acre in an irrigated/wetter environment. Consider balance of net returns at higher seeding rates.</td>
<td>Seeding rates range typically in Nebraska from 135-175k seeds/acre. Research has found that net returns are diminished after 125k seeds. May consider higher seeding rates at later planting dates.</td>
<td>Dependent upon planting timing. Could range from 1.2 million (earlier planting) to 1.8 million seeds/acre (later planting).</td>
</tr>
<tr>
<td><strong>Fertilizer – N, P, K, pH</strong></td>
<td>N rate dependent upon soil (organic matter, soil nitrate), expected yield, previous crop, fertilizer timing, price considerations. Phosphorus recommended levels based on critical value of 25 ppm (Bray-1 test) for continuous corn or 17 ppm following soybean. Rates depend on application method. Potassium threshold considered to be 125 ppm, no application needed if above that level. Lime recommended at pH &lt; 5.5.</td>
<td>Typically N fertilizer is not applied to soybean. Inoculation is typically recommended on fields where a productive soybean crop has not been grown before. Phosphorus recommended levels based on critical value of 12 ppm (Bray-1 test). Potassium threshold for soybean also considered to be 125 ppm. Recommended optimal pH is 5.5-7.0.</td>
<td>Nitrogen based on regional recommendations, typically between 80-110 lbs. Phosphorus based on 25ppm Bray-1 threshold (similar to corn)*</td>
</tr>
<tr>
<td><strong>Fertilizer timing</strong></td>
<td>Fall, Spring (pre-plant), late spring/early summer (post-plant/in-season) or summer (applied with irrigation)</td>
<td>*</td>
<td>Apply most or all nitrogen as wheat “greens” up in February/March, later applications can improve protein content*</td>
</tr>
<tr>
<td><strong>Residue management and tillage</strong></td>
<td>Reduced to no-till has been found to have a neutral to positive effect on corn yields in the Western Corn Belt region</td>
<td>No till or reduced till typically has a neutral effect on soybean yield. No-till has been found to increase soybean yield in rainfed conditions or after a number of years.*</td>
<td>*</td>
</tr>
<tr>
<td><strong>Most important determinants of high yield management</strong></td>
<td>Weather, nitrogen, hybrid selection, previous crop/crop rotation, plant population/seeding rate, tillage, growth regulators</td>
<td>Variety selection, planting date, weed control, phosphorus fertility, crop rotation, row spacing, seeding rate, rye cover crop</td>
<td>Variety selection, Foliar fungicide, Row spacing, Planting date, Nutrient management, Seeding rate</td>
</tr>
</tbody>
</table>

*topics not discussed in detail in Agro 204
### Summary of crop management considerations from my 200-level undergraduate course

<table>
<thead>
<tr>
<th>Management</th>
<th>Corn</th>
<th>Soybean</th>
<th>Wheat</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Planting dates</strong></td>
<td>When soil temperatures reach 50°F – April into May</td>
<td>Earlier planting in April or May equates to more time for</td>
<td>Goal to acquire 400 growing degree units before December 31, typically early October depending on location</td>
</tr>
<tr>
<td></td>
<td></td>
<td>nodes to form (3.7 days/node)</td>
<td></td>
</tr>
<tr>
<td><strong>Crop varieties (maturity, other selection criteria)</strong></td>
<td>Typically in NE &gt;100-day comparative maturity length hybrids, are utilized depends on location and planting dates</td>
<td>Maturity groups are based on daylength required for onset of flowering/reproductive growth. In Southeast Nebraska typically maturity group 3.0 varieties are utilized and this decreases to 2.0 or less moving north and west across the state.</td>
<td>Variety selection is particularly critical for wheat especially in terms of disease resistance, lodging, quality characteristics</td>
</tr>
<tr>
<td></td>
<td>vs.15 or 30 inch row, want to optimize canopy</td>
<td>Typically 15 or 30 inch row, weed pressure in soybean</td>
<td>Commonly planted in 7.5 inch row</td>
</tr>
<tr>
<td><strong>Row spacing</strong></td>
<td>Capture of sunlight by the V8 growth stage. Not considered to be as critical for higher yield corn as other factors such as planting date or seeding rate</td>
<td>May favor narrower row spacing.</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Seeding rates</strong></td>
<td>Depends on location, could have planting rates as low as 20k seeds/acre in non-irrigated/drier environment or as high as &gt;40 seeds/acre in an irrigated/wetter environment. Consider balance of net returns at higher seeding rates.</td>
<td>Seeding rates range typically in Nebraska from 135-175k seeds/acre. Research has found that net returns are diminished after 125k seeds. May consider higher seeding rates at later planting dates.</td>
<td>Dependent upon planting timing. Could range from 1.2 million (earlier planting) to 1.8 million seeds/acre (later planting).</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Fertilizer – N, P, K, pH</strong></td>
<td>N rate dependent upon soil (organic matter, soil nitrate), expected yield, previous crop, fertilizer timing, price considerations. Phosphorus recommended levels based on critical value of 25 ppm (Bray-1 test) for continuous corn or 17 ppm following soybean. Rates depend on application method. Potassium threshold considered to be 125 ppm, no application needed if above that level. Lime recommended at pH &lt; 5.5.</td>
<td>Typically N fertilizer is not applied to soybean. Inoculation is typically recommended on fields where a productive soybean crop has not been grown before. Phosphorus recommended levels based on critical value of 12 ppm (Bray-1 test). Potassium threshold for soybean also considered to be 125 ppm. Recommended optimal pH is 5.5-7.0.</td>
<td>Nitrogen based on regional recommendations, typically between 80-110 lbs. Phosphorus based on 25ppm Bray-1 threshold (similar to corn)*</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Fertilizer timing</strong></td>
<td>Fall, Spring (pre-plant), late spring/early summer (post-plant/in-season) or summer (applied with irrigation)</td>
<td>*</td>
<td>Apply most or all nitrogen as wheat “greens” up in February/March, later applications can improve protein content*</td>
</tr>
<tr>
<td><strong>Residue management and tillage</strong></td>
<td>Reduced to no-till has been found to have a neutral to positive effect on corn yields in the Western Corn Belt region</td>
<td>No till or reduced till typically has a neutral effect on soybean yield. No-till has been found to increase soybean yield in rainfed conditions or after a number of years.*</td>
<td>*</td>
</tr>
<tr>
<td><strong>Most important determinants of high yield management</strong></td>
<td>Weather, nitrogen, hybrid selection, previous crop/crop rotation, plant population/seeding rate, tillage, growth regulators</td>
<td>Variety selection, planting date, weed control, phosphorus fertility, crop rotation, row spacing, seeding rate, rye cover crop</td>
<td>Variety selection, Foliar fungicide, Row spacing, Planting date, Nutrient management, Seeding rate</td>
</tr>
</tbody>
</table>

*topics not discussed in detail in Agro 204
What resource are we optimizing when we consider planting dates and variety selection?
What resource are we optimizing when we consider planting dates and variety selection?
Opportunities for optimizing or extending the cover crop growing season

• Interseeding or overseeding cover crops into standing corn or soybean, at vegetative growth stages (~June) or closer to harvest (Aug/Sept)

• Planting “green”: planting corn or soybean directly into a live cover crop and terminating it later

• Cover crops drilled after an earlier fall harvest due to earlier spring cash crop planting and/or shorter season varieties and/or different cash crops grown
Opportunities for optimizing or extending the cover crop growing season

- Interseeding or overseeding cover crops into standing corn or soybean, at vegetative growth stages (~June) or closer to harvest (Aug/Sept)
- Planting “green”: planting corn or soybean directly into a live cover crop and terminating it later
- Cover crops drilled after an earlier fall harvest due to earlier spring cash crop planting and/or shorter season varieties and/or different cash crops grown
Field experiment and cover crop simulations

- Field data collected from 2015-2017 at South Central Ag Lab in Clay Center, Nebraska
- Varied corn maturity hybrids (early, medium and late season varieties) were grown before a winter rye cover crop at three different planting dates (April, May and June)
- Simulation modeling using the APSIM platform to extend these results in time and evaluate the impact of different seasons
- Questions:
  - How much difference does a shift in the variety selection or planting date have on yield?
  - How much additional cover crop growth can be expected over different seasons with earlier planting or later termination?
Late season varieties
110-115 day
Late season varieties
110-115 day

Medium season varieties
100-105 day
Early season varieties
80-90 day

Late season varieties
110-115 day

Medium season varieties
100-105 day

Early season varieties
80-90 day
Agricultural Production Systems sIMulator (APSIM)
Corn yield results based on different varieties and planting dates

- **Planting Date: April 20**
- **Planting Date: May 13**
- **Planting Date: June 6**

Yield (kg ha$^{-1}$) vs. Corn Relative Maturity (Days)
No differences in late season varieties when planted in April or May
Yield declines when planted in June
Yield differences between early, medium and late season varieties

- **Planting Date: April 20**
- **Planting Date: May 13**
- **Planting Date: June 6**

Yield (kg ha⁻¹)

Corn Relative Maturity (Days)
Yield differences between early, medium and late season varieties

Planting Date: April 20

Planting Date: May 13

Planting Date: June 6

Yield (kg ha⁻¹)

Corn Relative Maturity (Days)
Yield differences between early, medium and late season varieties

- Planting Date: April
- Planting Date: May 13
- Planting Date: June 6

Yield (kg ha$^{-1}$)

Corn Relative Maturity (Days)
<table>
<thead>
<tr>
<th>Corn planting date</th>
<th>Comparative relative maturity hybrid</th>
<th>Model predicted harvest date</th>
</tr>
</thead>
<tbody>
<tr>
<td>April 20</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>80 day</td>
<td>August 28</td>
</tr>
<tr>
<td></td>
<td>90 day</td>
<td>Sept 7</td>
</tr>
<tr>
<td></td>
<td>100 day</td>
<td>Sept 15</td>
</tr>
<tr>
<td></td>
<td>105 day</td>
<td>Sept 21</td>
</tr>
<tr>
<td></td>
<td>110 day</td>
<td>Sept 25</td>
</tr>
<tr>
<td></td>
<td>115 day</td>
<td>Sept 29</td>
</tr>
<tr>
<td>May 13</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>80 day</td>
<td>Sept 7</td>
</tr>
<tr>
<td></td>
<td>90 day</td>
<td>Sep 16</td>
</tr>
<tr>
<td></td>
<td>100 day</td>
<td>Sept 25</td>
</tr>
<tr>
<td></td>
<td>105 day</td>
<td>Oct 1</td>
</tr>
<tr>
<td></td>
<td>110 day</td>
<td>Oct 4</td>
</tr>
<tr>
<td></td>
<td>115 day</td>
<td>Oct 9</td>
</tr>
</tbody>
</table>
Simulated different planting dates in fall with mid-April termination
Simulated different planting dates in fall with mid-April termination

Seasons based on above or below average moisture and temperature
Simulated different planting dates in fall with mid-April termination
Simulated different planting dates in fall with mid-April termination
Simulated different planting dates in fall with mid-April termination

Average of 55 lb ac\(^{-1}\) biomass per day
Simulated different termination dates in spring with mid-Oct planting
Simulated different termination dates in spring with mid-Oct planting
Simulated different termination dates in spring with mid-Oct planting.
Simulated different termination dates in spring with mid-Oct planting
Simulated different termination dates in spring with mid-Oct planting

Average of 31 lb ac\(^{-1}\) biomass per day
<table>
<thead>
<tr>
<th>Corn planting date</th>
<th>Comparative relative maturity hybrid</th>
<th>Model predicted harvest date</th>
<th>Predicted corn yield (bu ac⁻¹)</th>
<th>Rye planting date</th>
<th>Average biomass (lb ac⁻¹)</th>
</tr>
</thead>
<tbody>
<tr>
<td>April 20</td>
<td>80 day</td>
<td>August 28</td>
<td>169</td>
<td>Sept 3</td>
<td>3123</td>
</tr>
<tr>
<td></td>
<td>90 day</td>
<td>Sept 7</td>
<td>179</td>
<td>Sept 8</td>
<td>2712</td>
</tr>
<tr>
<td></td>
<td>100 day</td>
<td>Sept 15</td>
<td>203</td>
<td>Sept 16</td>
<td>2446</td>
</tr>
<tr>
<td></td>
<td>105 day</td>
<td>Sept 21</td>
<td>219</td>
<td>Sept 22</td>
<td>1761</td>
</tr>
<tr>
<td></td>
<td>110 day</td>
<td>Sept 25</td>
<td>229</td>
<td>Sept 26</td>
<td>1458</td>
</tr>
<tr>
<td></td>
<td>115 day</td>
<td>Sept 29</td>
<td>235</td>
<td>Sept 30</td>
<td>1142</td>
</tr>
<tr>
<td>May 13</td>
<td>80 day</td>
<td>Sept 7</td>
<td>165</td>
<td>Sept 8</td>
<td>2712</td>
</tr>
<tr>
<td></td>
<td>90 day</td>
<td>Sep 16</td>
<td>182</td>
<td>Sept 17</td>
<td>2380</td>
</tr>
<tr>
<td></td>
<td>100 day</td>
<td>Sept 25</td>
<td>200</td>
<td>Sept 26</td>
<td>1458</td>
</tr>
<tr>
<td></td>
<td>105 day</td>
<td>Oct 1</td>
<td>212</td>
<td>Oct 2</td>
<td>1064</td>
</tr>
<tr>
<td></td>
<td>110 day</td>
<td>Oct 4</td>
<td>223</td>
<td>Oct 5</td>
<td>892</td>
</tr>
<tr>
<td></td>
<td>115 day</td>
<td>Oct 9</td>
<td>226</td>
<td>Oct 10</td>
<td>727</td>
</tr>
</tbody>
</table>
Summary of cover crop simulations

• Our experiments demonstrate that the difference between cover crop planting in mid-September and late October is ten times more biomass....

• .... And four times greater biomass when terminating at the end of April versus the beginning

• Above average moisture and temperature can result in four times greater rye biomass than below average moisture and temperature

• No yield penalty associated with planting corn in mid-May

• Small yield penalty associated with medium versus late season varieties but this allows for earlier cover crop planting (particularly if corn is planted in April)

Treating cover crops like cash crops

• Treating winter cover crops more like cash crops requires greater growing season utilization, particularly in cropping systems dominated by summer annual crops and/or colder climates

• While a number of approaches exist to do this, farmers tend to report greatest planting success with drilling post harvest
  • There are opportunities to carefully manage variety selection, planting date to greatly increase cover crop biomass with limited yield impacts

• #1 is determining YOUR goals for the cover crop – giving it more of the growing season might be worth a few bushels for weed control, forage, etc.
How farmers express this idea

• You got to do everything right. It’s not just all that simple ... that we’ll just plant rye and we’ll do things that way we already did, always did. I think you need to do things right to make it work well, but I think you can get just as good of yields and you can get all the advantage of soil savings and we think we're improving the soil’s tilth and the organic matter level. So there’s a lot of advantages, but probably have to make some [management] changes.

How farmers express this idea

• You got to do everything right. It’s not just all that simple ... that we’ll just plant rye and we’ll do things that way we already did, always did. I think you need to do things right to make it work well, but I think you can get just as good of yields and you can get all the advantage of soil savings and we think we're improving the soil’s tilth and the organic matter level. So there’s a lot of advantages, but probably have to make some [management] changes.

• It's a system. You’ve got to get everything right and, you know, some of the researchers at some of the universities, they don’t change anything when they do a cover crop study. Everything’s the same and the cover crop’s going to lose every time.

Everything we have been learning about grass tends to bear out that grass is a source of strength to agriculture; and therefore to the Nation.

The more we fail to realize this, the more difficult it will be to maintain and build up our great agricultural resources and our soil resources – yes, and our human resources too.

The more we think in terms of the world situation and the future of our country the more important grass will become in our agricultural system.
Thank you!

abasche2@unl.edu
Please submit your question by using the “Questions” box in the Control Panel on your screen. You may need to expand the “Questions” box by clicking the small arrow.

Questions will be combined to help us get through as many as we can in the time we have remaining.
REMINDERS!

• Register for upcoming webinars: www.pastureproject.org/events

• Complete the post-webinar survey – it’s quick, confidential, and helps us offer more free webinars
CONTACT US!

Kelsey Vergin
Senior Program Associate,
Pasture Project
Kelsey.Vergin@winrock.org

Dr. Andrea Basche
University of Nebraska-Lincoln
abasche2@unl.edu