CURRENT NITROGEN RATE RESEARCH FOR:
OATS, WINTER WHEAT, AND SWEET CORN
Nitrogen studies have been conducted on oat, winter wheat, and sweet corn over the past three years.

The goal of this presentation is to educate the agricultural community about this research and to demonstrate the value of current N recommendations.

Date presented here will be uploaded to our Soils Extension website (www.soils.wisc.edu/extension)
Wisconsin is a “minor” state for oat and wheat.

- Oat: 310,000 acres in 2010; 210,000 acres in 2011
  - 58 bu/A in 2010, 62 bu/A in 2011
- Winter wheat: 240,000 acres in 2010; 345,000 acres in 2011
  - 64 bu/A in 2010, 65 bu/A in 2011
Conducted by Tim Wood at the Lancaster Agricultural Experiment Station

Oats were grown after corn or after soybean

Four nitrogen rates: 0, 20, 40, 80 lb/ac

Measured yield and lodging

Variety: Esker @ 3 bu/ac
OAT YIELD 2010

2010 Oat Study - Lancaster, WI

Nitrogen Rate (lb-N/A)

Oat Yield (bu/A)

UW guidelines
40 lb/ac for 2-10% SOM
60 lb/ac for <2% SOM

40 lb N credit when following soybean

PPNT
85 after soybean
87 after corn

Planted 4/14/10
N applied 4/27/10
OAT LODGING, 2010

2010 Oat Study - Lancaster, WI

Nitrogen Rate (lb-N/A)

Lodging score (%)

[0% = No lodging/ 100% = completely lodged]

- following corn
- following soybean
OAT YIELD, 2011

2011 Oat Yields, Grant County, WI

- Oat Yield (bu/A)
- Nitrogen Rate (lb-N/A)

Following corn
Following soybean

Planted 5/9/11
N applied 5/26/11
OAT LODGING, 2011

2011 Oat Lodging, Grant County, WI

Nitrogen Rate (lb/ac)

Lodging score (%)

[0% = No lodging; 100% = completely lodged]

- Following corn
- Following soybean

Nitrogen Rate (lb/ac)
OATS

- When grown in a “high nitrate environment” – no need for N.
- PPNT can provide some value for oats – to identify high nitrate environments. It is not “calibrated” for oat – i.e. the adjustments.
- Oat remains sensitive to over-applications of N
Current UW-guidelines for winter wheat:
- 20 to 100 bu ac⁻¹ yields

<table>
<thead>
<tr>
<th>SOM</th>
<th>Nitrogen rate</th>
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</thead>
<tbody>
<tr>
<td>%</td>
<td>lb ac⁻¹</td>
</tr>
<tr>
<td>&lt;2%</td>
<td>90</td>
</tr>
<tr>
<td>2 to 9.9%</td>
<td>70</td>
</tr>
<tr>
<td>10 to 20%</td>
<td>40</td>
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<tr>
<td>&gt;20%</td>
<td>0</td>
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Over-application of N to wheat can cause excessive vegetative growth and lodging may occur
Field studies at Arlington and Janesville (S. Conely and J. Gaska, Dept. of Agronomy)

Nitrogen rate & timing
- Yield response to spring N (0, 30, 60, 90, 120 lb/ac) – applied as urea
- Fall N rate (0 or 20 lb ac⁻¹)
- 5 locations; 2008 (2), 2009 (1), 2010 (2)

Nitrogen rate
- Yield response to spring N (0, 30, 60, 90, 120 lb/ac) – applied as urea
- 1 location; 2009, 2010
2008 Winter Wheat Yields, Janesville, WI

Nitrogen rate (lb ac⁻¹)

Yield (bu ac⁻¹)

Following soybean; Recommended N rate = 30 lb ac⁻¹

No significant increase in yield above 30 lb ac⁻¹ of N when 20 lb ac⁻¹ of N was applied in fall.

Benefit from 20 lb ac⁻¹ of N in the fall?

No benefit from split applications.
Nitrogen - Rate

2008 Winter Wheat Yields, Arlington, WI

Following oats;
Recommended N rate = 70 lb ac⁻¹
PPNT = 94 lb/ac
New rec = 34 lb/ac
No significant increase in yield above 30 lb ac⁻¹ of N.

Benefit from 20 lb ac⁻¹ of N in the fall?
No benefit from split applications.
Following soybean; Recommended N rate = 30 lb ac\(^{-1}\)

No significant increase in yield above 30 lb ac\(^{-1}\) of N with no fall N.

No benefit from 20 lb ac\(^{-1}\) of N in the fall.

Benefit from split applications?
Nitrogen - Rate

2010 Winter Wheat Yields, Janesville, WI

Following soybean; Recommended N rate = 30 lb ac$^{-1}$

No significant increase in yield above 30 lb ac$^{-1}$ of N with no fall N.

No benefit from 20 lb ac$^{-1}$ of N in the fall.

No benefit from split applications.
Following soybean; Recommended N rate = 30 lb ac$^{-1}$

No significant increase in yield above 30 lb ac$^{-1}$ of N with no fall N.

No benefit from 20 lb ac$^{-1}$ of N in the fall.

No benefit from split applications.
### N RESPONSE AT CHILTON

Both sites had SOM >3%
Previous crop = oats
No recent manure
Chisel plow

<table>
<thead>
<tr>
<th>N Rate (lb/ac)</th>
<th>2008 Yield (bu/ac)</th>
<th>2010 Yield (bu/ac)</th>
</tr>
</thead>
<tbody>
<tr>
<td>0</td>
<td>79</td>
<td>56</td>
</tr>
<tr>
<td>30</td>
<td>87</td>
<td>56</td>
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<tr>
<td>60</td>
<td>92</td>
<td>60</td>
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<tr>
<td>90</td>
<td>89</td>
<td>53</td>
</tr>
<tr>
<td>120</td>
<td>92</td>
<td>63</td>
</tr>
</tbody>
</table>
If <70 tillers ft\(^{-2}\), then apply N as early as you can
Otherwise wait until jointing
- Improved NUE
- Avoid excessive vegetative growth
- Better diagnosis of plant N

http://www.youtube.com/watch?v=OVAbs_OZT-0
New data supports N recommendations rates and credits
  ▪ Yields maximized with 30 lb/ac (4 of 5 sites)
Demonstrates utility of PPNT and soybean credit
Benefit of fall applied N?
  ▪ 2008 – maybe?
  ▪ 2009 – no
  ▪ 2010 – no (negative)
Split applications – probably not worth it, but know your soil
Wisconsin is a major state for sweet corn processing
- 69,100 acres in 2011 in Wisconsin
- 338,500 acres in 2011 nationally

Fresh Market
- 6,700 acres in 2011 in Wisconsin
- 101,700 acres in 2011 nationally
ON-FARM SWEET CORN TRIALS

- Irrigated – conducted with Ken Schroeder (Portage County) and Don Genrich (Adams County), with help from Seneca Foods
- Rainfed – conducted with Mike Rankin (Fond du Lac County) and A.J. Bussan (UW-Horticulture)
ON-FARM SWEET CORN TRIALS

- Irrigated
- Grower skipped application of N, small plots were established (skipped 90 lb-N/ac of AA)
- N rates: 105, 130, 155, 180, 205, and 230 lb/ac of N
- Yield determined by hand harvest
SWEET CORN YIELD BY YEAR

2009 Sweet Corn Yields, Central Sands

Yield (ton/ac)
8 10 12 14
Site #1
Site #2
Site #3
Site #4

Nitrogen Rate (lb/ac)
80 100 120 140 160 180 200 220 240

Plateau
Continue to rise
Odd response
2010 Sweet Corn Yield, Central Sands

Yield (ton/ac)

Nitrogen Rate (lb/ac)

Site #1
Site #2
Site #3
Site #4

SWEET CORN YIELD BY YEAR

Continued increase
Plateau
Odd response
2011 Sweet Corn Yields, Central Sands

- Site #1
- Site #2
- Site #3
- Site #4

Yield (ton/ac)

Nitrogen Rate (lb/ac)

- Continued increase
- Plateau
- Decline
Relative Sweet Corn Yields (2009-2011)

![Graph showing the relationship between nitrogen rate and relative sweet corn yield. The graph includes data points and a trend line with an R² value of 0.55.](image_url)
RAINFED SWEET CORN

2010 Sweet Corn Yields, Green Lake County, WI

Nitrogen Rate (lb/ac-1)
30 70 100 130 130x3 160 160x3 190

Yield (ton/ac-1)
4 5 6 7 8 9 10

2011 Sweet Corn Yields, Green Lake County

Nitrogen Rate (lb/ac)
30 70 100 130 130x3 160 160x3 190

Yield (ton/ac)
4 5 6 8 10 12

Recommended rate is 130 lb/ac of N
NITROGEN GUIDELINES FOR:

- Oats – still adequate
- Winter wheat – still adequate
- Rainfed sweet corn – still adequate
- Irrigated sweet corn – working on full analysis to develop new recommendation if needed. A new recommendation would involve “caveats” such as the number of split applications.
Priority areas
- Corn
- Potato, sweet corn, snap bean
- Sandy soils
Other?
- Interest in more N work on small grains?
- Other crops?