

Late Summer Cover Crops after Small Grains or Vegetables



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Webinar Outline

Moving Toward Soil Health – Maximizing the Growing Season

Jamie Patton – NPM

Cover Crops Following Short Season Crops – Common Species, Mixes, Management Tips

Daniel H. Smith – NPM

The Power of Legumes

Mike Ballweg – Extension Sheboygan County

Small Grains for Forages and Covers – Management, Varieties and Yields

Kevin Shelley – NPM

Moving Towards Soil Health – Maximizing the Growing Season



Jamie Patton

University of Wisconsin – Madison, Nutrient and Pest Management Program



Late Summer Crop Harvest...

The Potential

- The potential of bare soil...



Nutrients



Late Summer Crop Harvest...

The Potential

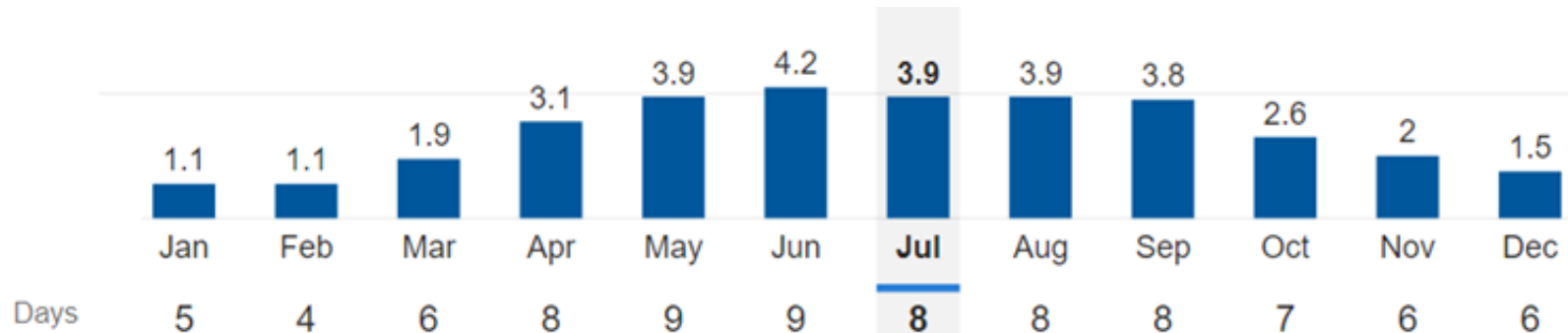
- The potential of late summer cover crops...



Plenty of Precipitation to Come...

Protect and Store

Average Monthly Rainfall (inches) – Stevens Point, WI



Total average rainfall – 33 inches

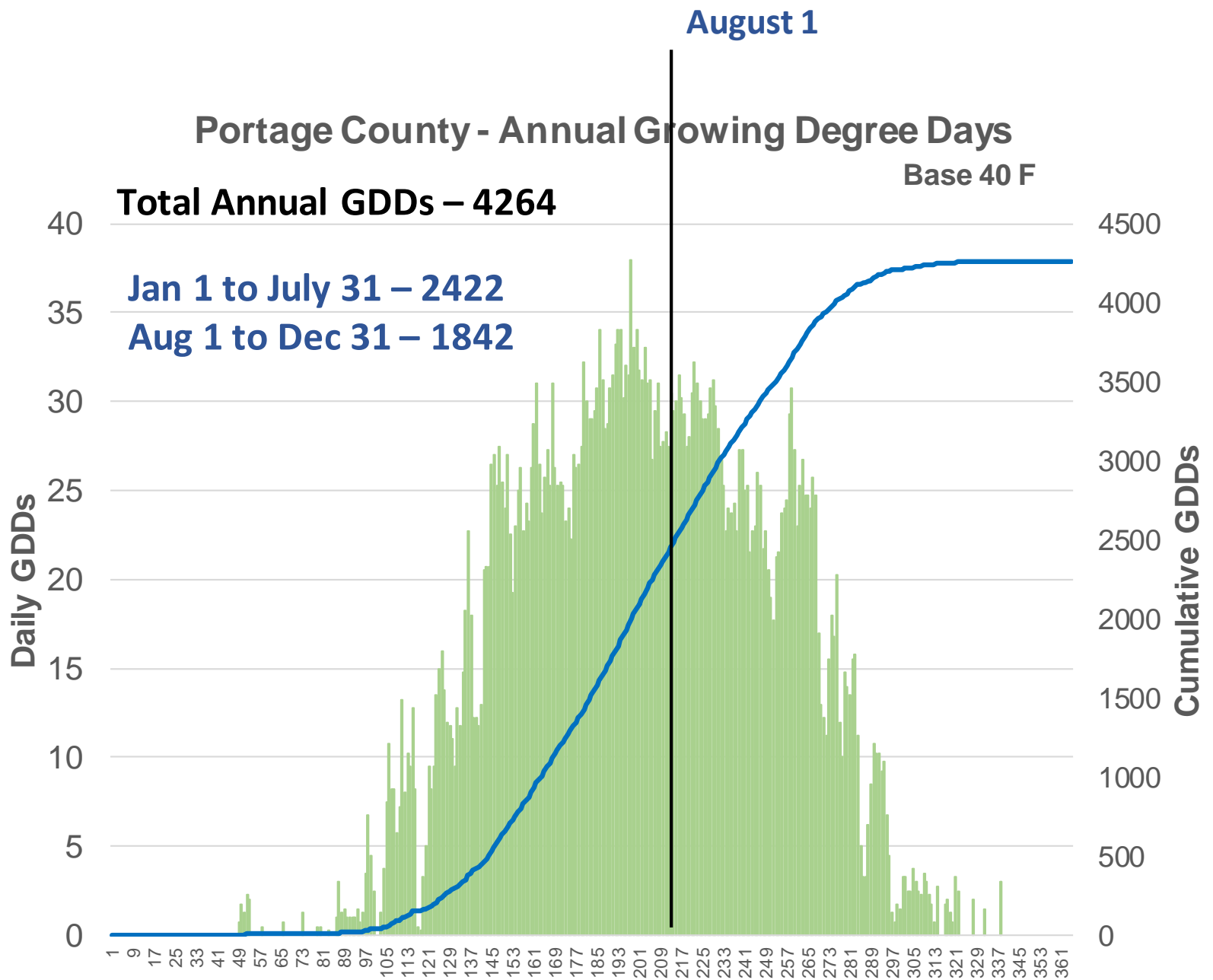
Jan 1 to July 31 – 19.2 inches

Aug 1 to Dec 31 – 13.8 inches

Aug 1 to May 1

21 inches of precipitation

58 events



Cover Crops Following Short Season Crops – Common Species, Mixes, Management Tips



Jamie Patton and Daniel H. Smith

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So Many Cover Crop Species...

What do I Plant?

- Matches goals for:
 - Economic outlay
 - Cost share requirements
 - Cover cropping goals
 - Management options
 - What equipment do you have?
 - Are you going to use herbicides for termination?
 - How much time for management do you have?
 - How comfortable are you with risk?
 - Do you have manure to apply?
 - ...



Plenty of Water and GDDs...

Opportunity for Diverse Mixes

- Soil cover during April-June
- Diversity in:
 - Root architecture
 - Plant exudates
 - Temporal growth
 - C:N ratios

endless possibilities

- Grasses
 - Cereal grains
 - Grasses
- Legumes
 - Clovers
 - Vetch
 - Peas/beans
- Broadleaves
 - Brassica
 - Sunflowers

Get the Basics Right...

Use Your Resources

- Extension
- Demo Farms/Farmer-led Watersheds
- Agronomists
- Co-op/Seed Representatives
- Midwest Cover Crop Council
 - <http://mccc.msu.edu/covercroptool/covercroptool.php>

The screenshot shows the 'Midwest Cover Crops Council - Cover Crop Decision Tool' for 'Wisconsin: Portage County Seeding Dates'. The interface includes a sidebar with a 'NEW UPDATE!' notice and a main form with the following fields:

- Location Information:** Wisconsin (dropdown), Portage (dropdown)
- Cash Crop:** Wheat (dropdown), **Plant Date:** (empty), **Harvest Date:** 07/25/2020
- Drainage Information:** Moderately Well Drained (dropdown), **Flooding:** No (dropdown)
- Goal #1:** Forage Harvest Value (dropdown), **Goal #2:** Erosion Fighter (dropdown), **Goal #3:** Weed Fighter (dropdown)

Below the form, there are several informational rows:

- Attribute Ratings:** 0-Poor, 1-Fair, 2-Good, 3-Very Good, 4-Excellent
- Reliable Establishment:** (Green bar)
- Freeze Risk to Establishment:** (Yellow bar)
- Fast Seeding:** (Red bar)
- Cash Crop Growing Period:** Requires Aerial Seeding or Interseeding of Cover Crop (Blue bar)

The bottom section is a calendar grid showing months from March to February. On the left, there are labels for 'Weed Fighter', 'Erosion Fighter', 'Mechanical Forage Harvest Value', and 'NONLEGUMES'.

Cover Crop Seeding Methods

After Small Grains



Photo: Ted Bay

Seed as Soon as Possible

Watch Seeding Depth!



Photo: Ted Bay

A Month After Seeding



Photo: Ted Bay

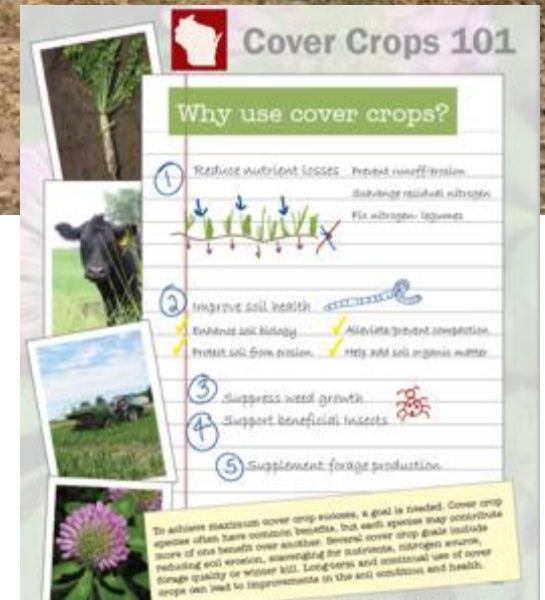


Volunteer wheat control may be desired (alternative: use volunteer wheat as part of cover crop mix). However, we do not recommend waiting for volunteer wheat emergence and termination to seed a cover crop.

Volunteer wheat may be a challenge!

A Few More Considerations

Seeding, Tillage, Manure



A Few More Considerations

Herbicide Persistence/Carryover

- May result in cover crop damage and stand failure
- Can be avoid by careful selection of herbicides

Influence Factors

- Chemical properties of the herbicide
- Rate of application
- Soil pH
- Organic matter content
- Amount of surface plant residue
- Temperature
- Rainfall
- Microbial degradation

Nontreated

Example of herbicide carryover

Herbicide Rotational Restrictions for Cover and Forage Cropping Systems

This publication is intended to be a starting point when considering using cover crops while utilizing herbicides in the cropping system. This publication does not replace the herbicide label. This publication outlines rotational intervals for many commonly used herbicides in Illinois. The rotational interval is the required amount of time from herbicide application to subsequent crop establishment for forage or harvest value. Examples: If herbicide is applied to soybeans with a 10-month rotational interval for winter corn. Winter corn could be established 10 months after the herbicide application for food or feed value. This rotational interval is the gap required prior to crop harvest for feed or forage. Cover crops intended for forage value must follow the rotational interval. Cover crops utilized for soil building do not need to follow the rotational interval. However, they may still be prone to herbicide injury. This herbicide injury is often attributed to herbicide carryover and the chances of injury can be better understood after a field tour. The herbicide label must be followed and prior to making any management decisions. The rotational intervals stated below are the maximum rotation at herbicide rates from the most current herbicide label available at time of printing.

Herbicide Carryover

For cover crops to accomplish their intended goals, they must establish well. Establishment of cover crops can be compromised by use of residual herbicides, those that act on the soil for a period of time after application, applied to the preceding cash crop. The persistence of these residual herbicides is what will affect the cover crop establishment rate in the growing season and can be affected by a wide range of management factors, application rate, and herbicide application method and soil properties (moisture, temperature, soil salinity, soil texture, chemical reactions, pH, microbial populations, and texture and organic matter). Research (Walt, 1993). Cover-cropping and using residual herbicides is not impossible but is challenging. Herbicide-resistant weed management should be considered when planning herbicide applications. The cost of herbicide programs, cover crop benefits, and resistance management should all be considered.

Cover Crop vs. Forage Crop

A crop is classified as a cover crop when no harvest is intended. A cover crop is established for benefits to the soil, cropping system, and environment. A cover crop becomes a forage crop when biomass is harvested for feed. This includes forage used for grazing or mechanical collection. A cover crop can be used for forage, however, most pesticide labels do not provide the plant has 6 weeks from time required from pesticide application to grazing or harvest for cover crop, only forage crop. Therefore, requiring the maximum rotational restrictions be utilized. If these restrictions are not followed, harvesting a cover crop for forage value is illegal. Cover-cropping and using residual herbicides is not impossible but is challenging. Herbicide-resistant weed management should be considered when planning herbicide applications. The cost of herbicide programs, cover crop benefits, and resistance management should all be considered.

A Few More Considerations

Termination



		Winterkill	Crimping	Mowing	Tillage	Herbicide
Brassica	Canola/Radish	Maybe	No	No	Yes	Glyphosate
Legume	Red Clover	No	No	No	?	Glyphosate + dicamba or 2,4-D
	Crimson Clover	Maybe	No	No	Yes*	
	Berseem Clover	Yes	No	No	Yes*	
	Winter Pea	Maybe	No	Yes	Yes*	
	Sweet Clover	Maybe	No	No	?	
	Hairy Vetch	No	Yes	No	Yes*	
Grasses/ Small Grains	Annual Ryegrass	Maybe	No	No	Yes*	Glyphosate 4.5 lb ae per gal, 16-32 fl oz per acre
	Spring Barley	Yes	No	Yes	Yes	
	Winter Wheat	No	Yes	Yes	Yes*	
	Winter Rye	No	Yes	Yes	Yes*	



Tillage Note- May require multiple passes and tillage should fully incorporate cover crop to prevent regrowth.

The Power of Legumes After Short Season Crops



Mike Ballweg

University of Wisconsin – Madison, Division of Extension, Crops and Soils Educator Sheboygan County



Matt Ruark

University of Wisconsin – Madison Soil Science Department



Berseem, Crimson Clovers, Barley & No Cover Crop 3 year study – Sheboygan County

- **Soil – Kewaunee Silt Loam**
- **Planting Dates: August 12 - 15, 2014, 2015, 2016**
 - Berseem clover – (10 – 12) lbs./ac
 - Crimson clover - (10 -12) lbs./ac
 - Barley - 60 lbs./ac
- **Sethoxydim application to clover and no cover treatments**
- **Biomass harvesting – early November all years (after a hard freeze - end of growth)**
- **Nitrogen fertilizer, broadcast urea with Agrotain®**
8 N rates (0, 40, 80, 120, 160, 200, 240, 280 lbs./ac)
- **Solid stands to help understand the contribution to cropping system**



Berseem –2015

Crimson- 2015

Crimson Clover



Barley

Nov. 12, 2014

Crimson Clover—Spring Residue



April 23, 2014



Berseem Cover Crop

Mike Ballweg
UWEX - Sheboygan County
November 9, 2016



Berseem Cover Residue

Mike Ballweg
UMEX - Sheboygan County
April 12, 2017



November 5, 2015



Barley Residue

Mike Ballweg
DAFC - Shreveport County
April 12, 2017



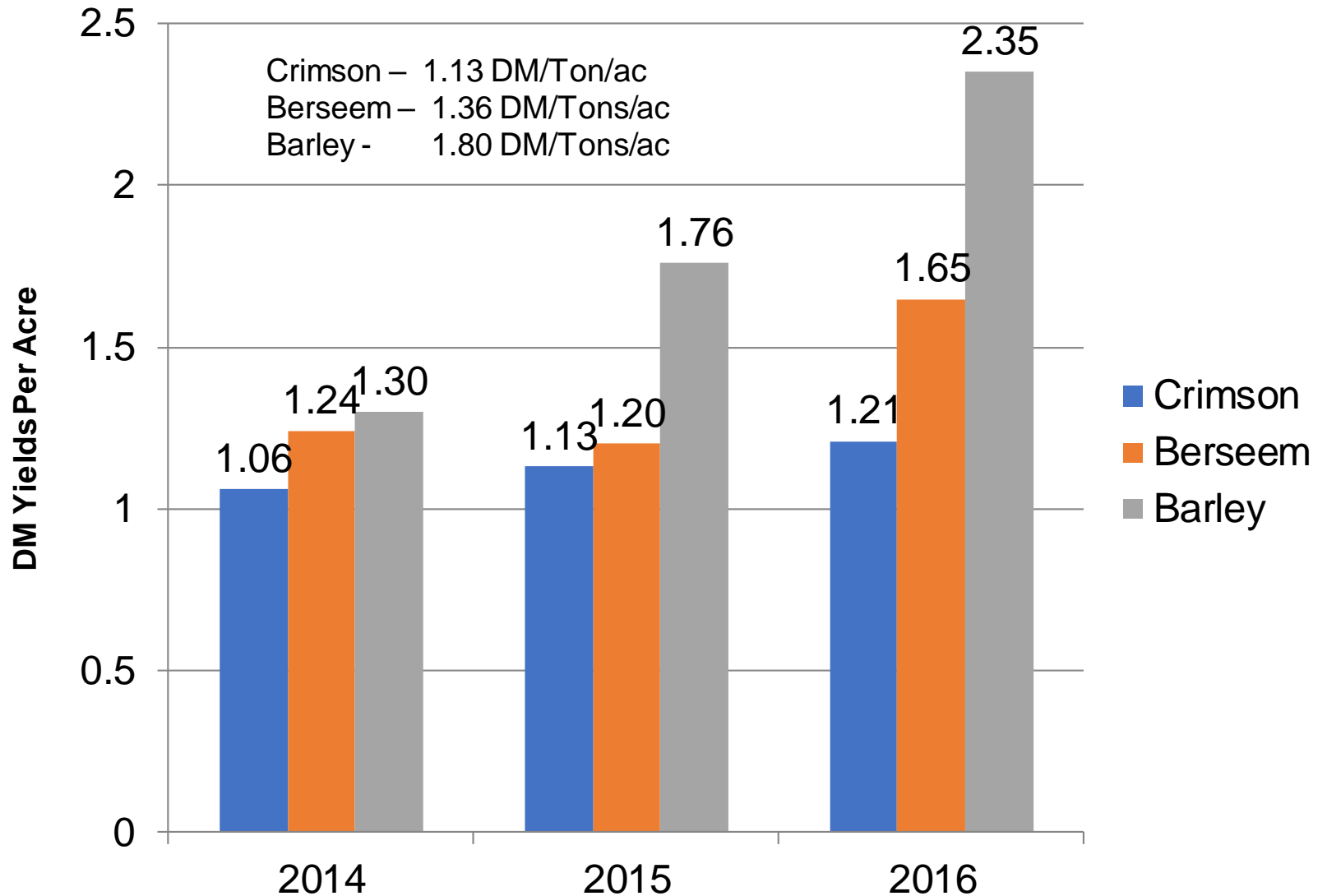
Barley Crop
Residue

No Cover Crop

April 30, 2015



Cover Crop DM Yields After Wheat

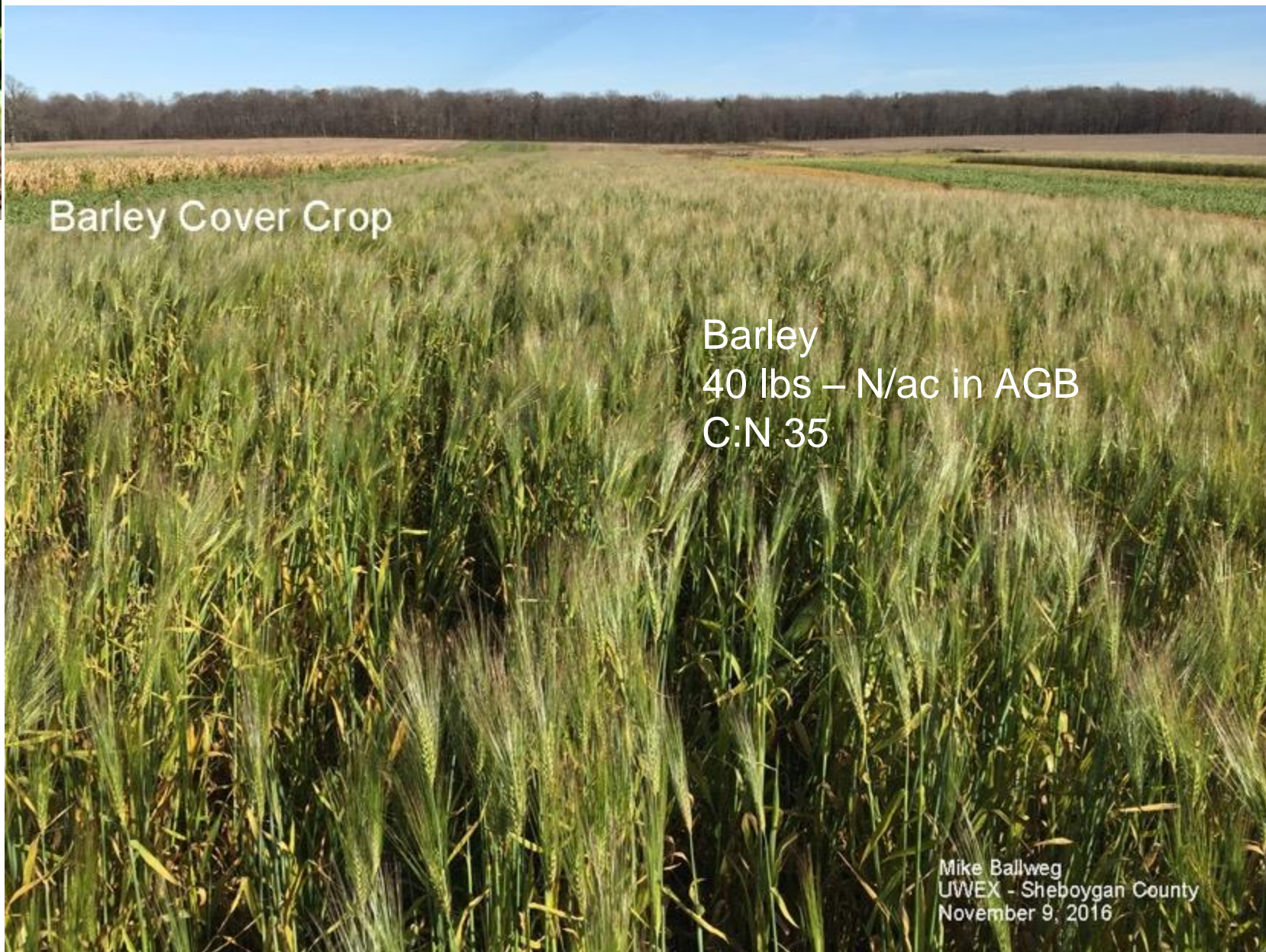


Berseem Clover
81 lbs -N/ac in AGB
C:N 11



Crimson Clover
70 lbs-N/ac in AGB
C:N 13





Barley Cover Crop

Barley
40 lbs – N/ac in AGB
C:N 35

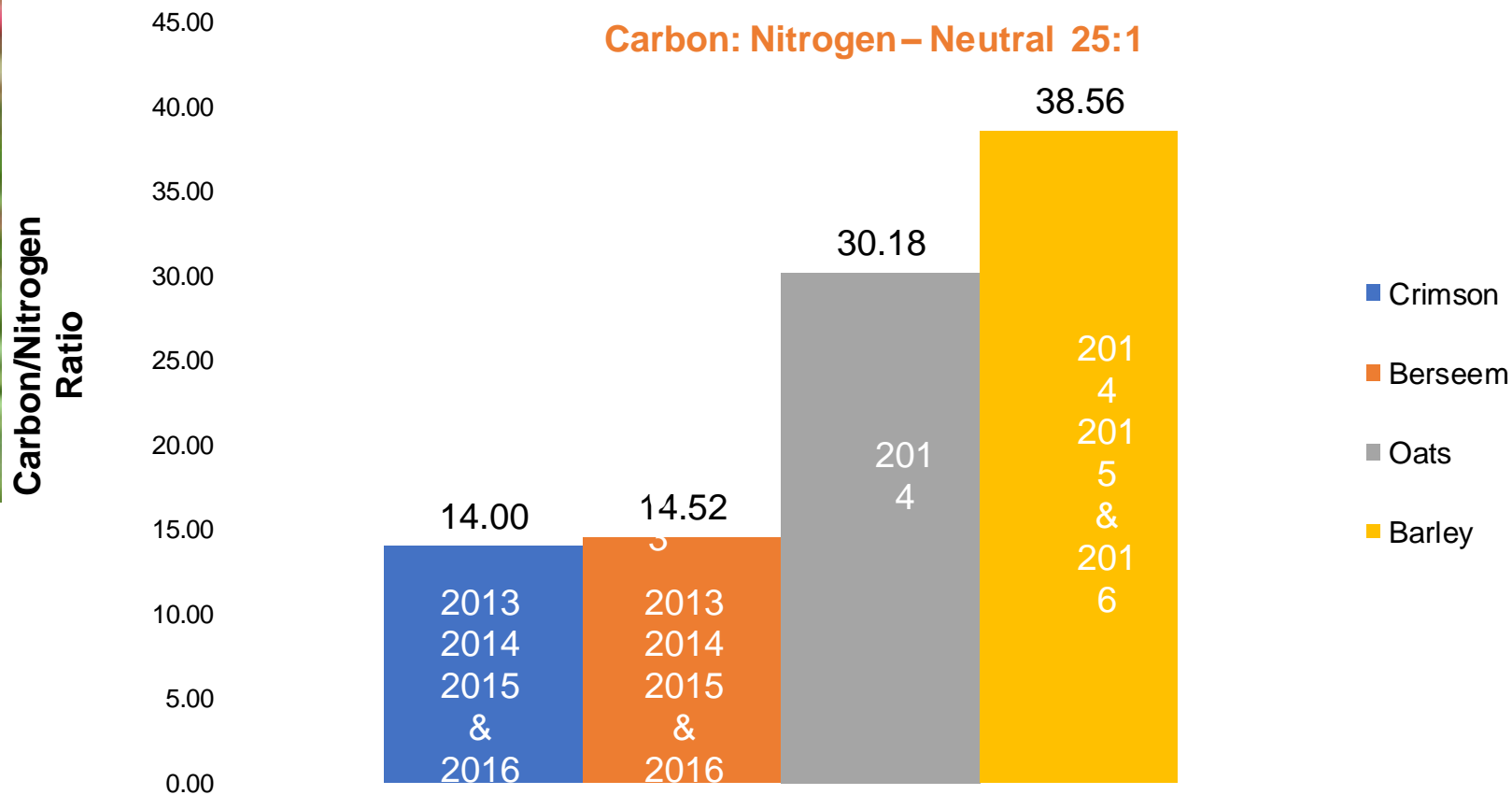
Mike Ballweg
UWEX - Sheboygan County
November 9, 2016



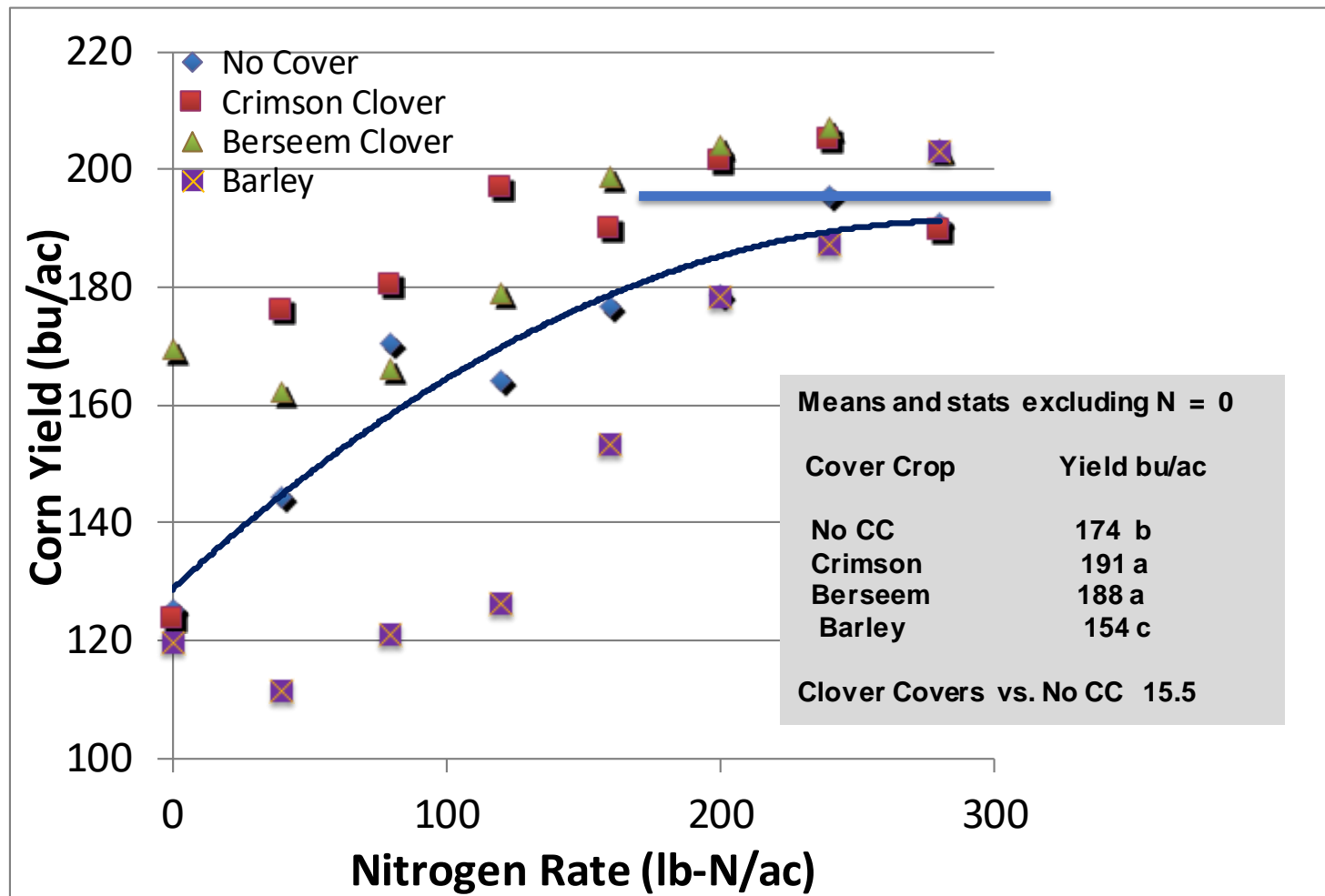
Carbon/Nitrogen Ratio

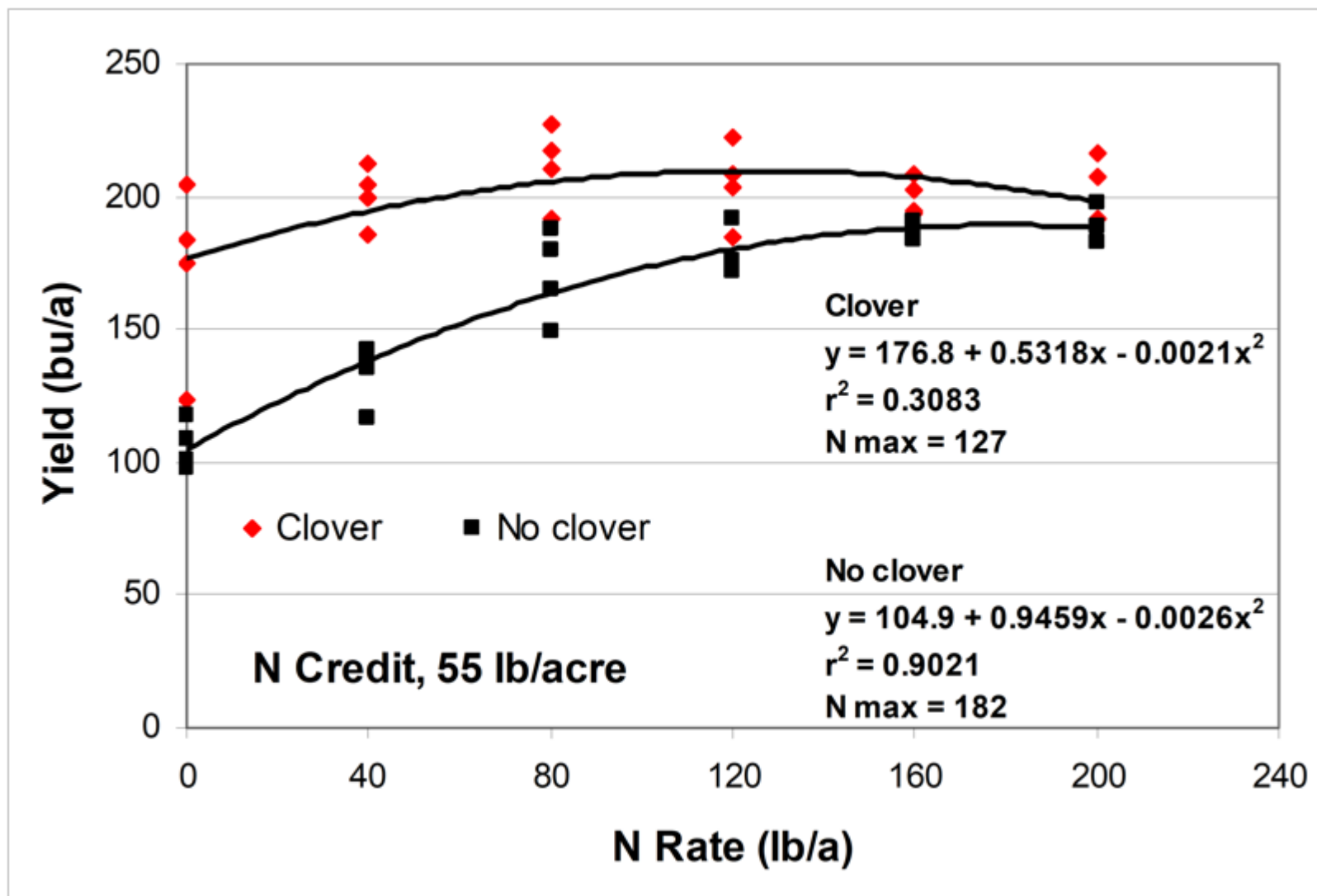
November Biomass Harvest

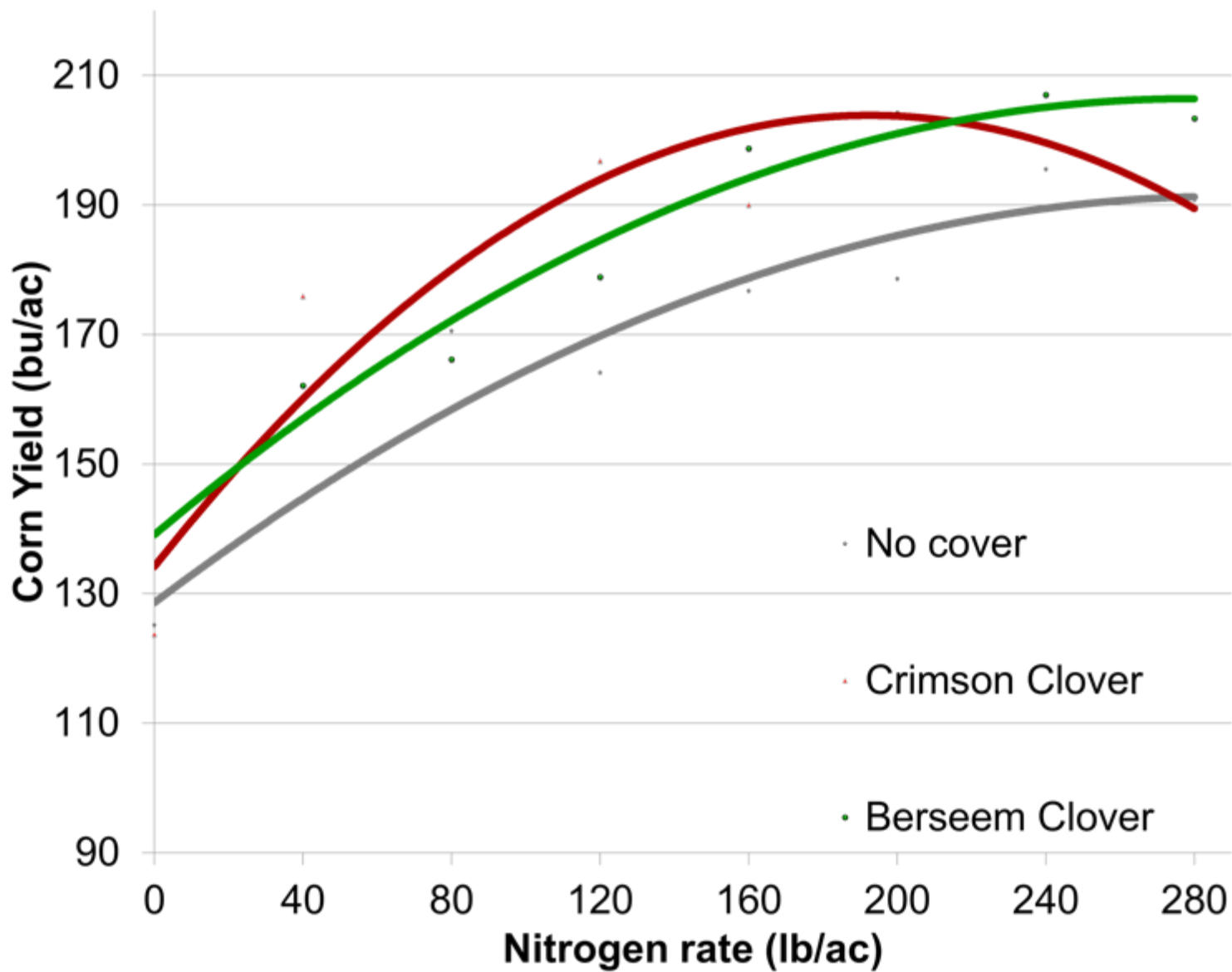
Carbon: Nitrogen – Neutral 25:1



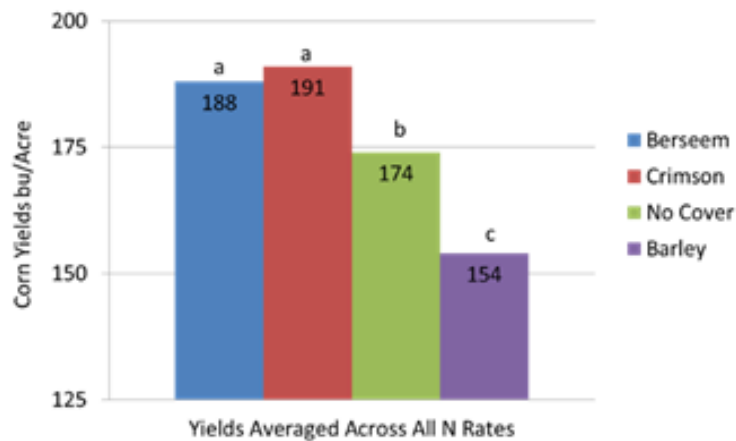
Both crimson and berseem clovers provide yield benefits -2015 - Sheboygan County



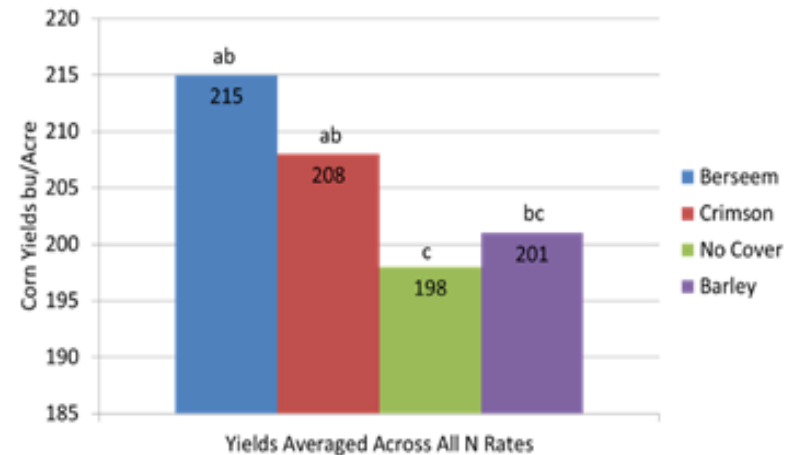




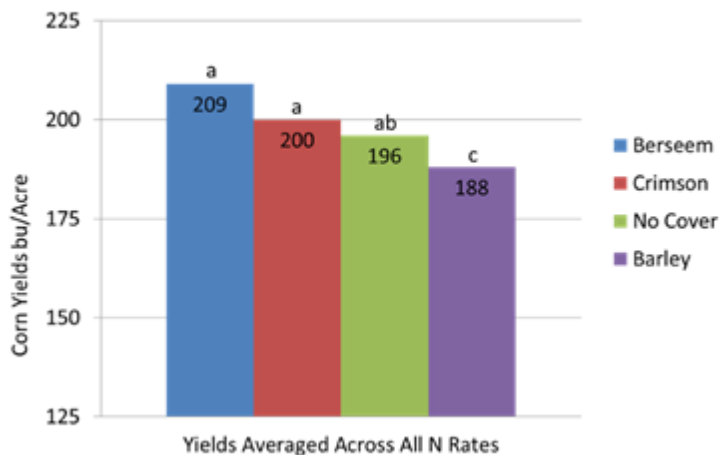
2015 Corn Yields Following Covers



2016 Corn Yields Following Covers



2017 Corn Yields Following Covers



2015 corn yields showed an increase of 9% (15.5 bu./ac) when following Berseem and Crimson Clovers compared to no-cover crop

2016 showed a very similar yield trend with a 7% (13.4 bu./ac) increase when corn followed clovers as compared to no cover crop.

The 2017 yield advantage when corn followed clovers was 4.3% (9 bu/ac) when compared to not covers.

Berseem, Crimson, Barley Mix



Berseem: 4 lb /ac

Crimson: 4 lb/ac

Barley: 40 lb/ac

Planted 8/15/2014

DM on 11/12: 1.6

ton/ac

Berseem and Crimson Mix

Berseem: 6 lb/ac

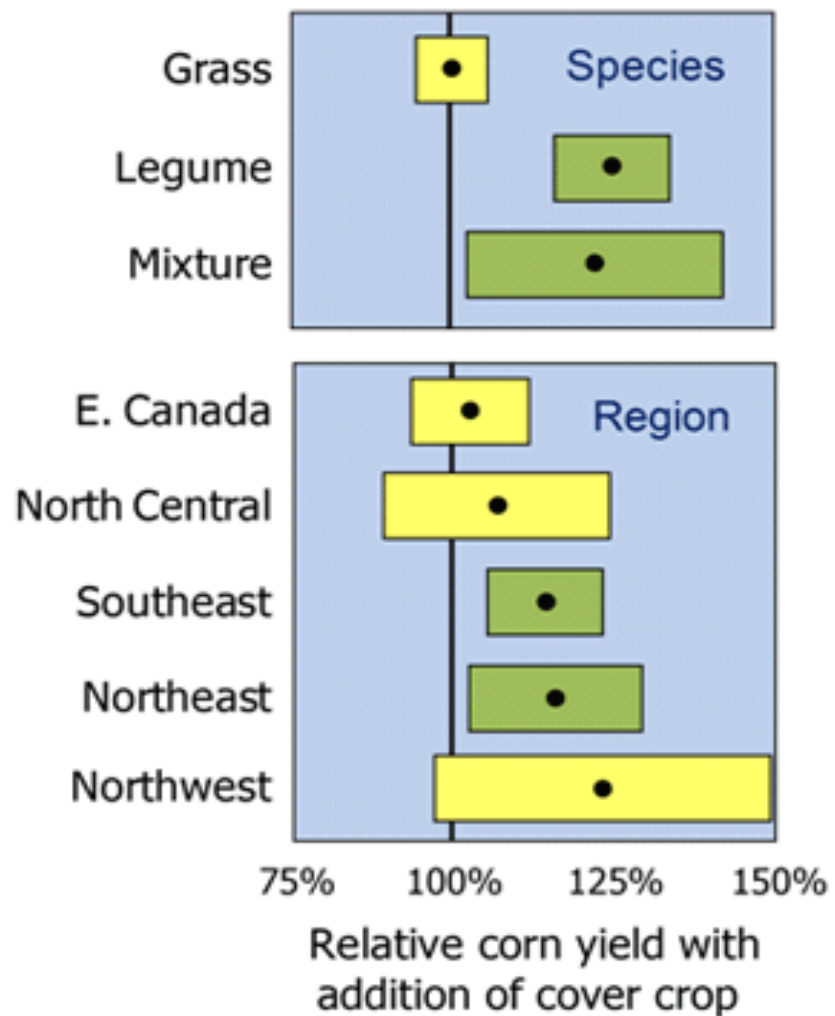
Crimson: 6 lb/ac

Planted 8/15/2014

DM on 11/12: 1.4

ton/ac





Corn yield response to winter cover crops based on cover crop species and region. Miguez and Bollero (2005). Results adapted by: Heggenstaller, DuPont Pioneer



In Summary - Things to consider

- Corn following annual clovers yielded 10 – 15 bu/ac (6.8%) more than no cover crop...rotational benefits.
 - studies show ~ a 10% yield increase when corn follows alfalfa due to rotational benefits
- Corn yields following barley were lower yielding 2 of 3 years. N immobilization
- Greater amounts of carbon (biomass) may result in immobilization of N thus requiring additional N for optimal yields.
- N immobilization (following barley) may have been lessened if no-tilled into the barley residue....no data



Remember
the
Inoculant



Thank You



Acknowledgments

- Matt Ruark, UW-Madison, Soil Science Department
- Jamie West, Research Specialist, UW-Madison Soil Science Department
- Richard Proost, UW-Madison, NPM
- Many UW-Madison students



Summer Planted Spring Cereal Grains for Fall Cover and Forage



Kevin Shelley



University of Wisconsin – Madison, Nutrient and Pest
Management Program

Summer Planted Spring Cereal Grains for Fall Cover and Forage

- Winter cereal grains (rye, wheat, triticale)
 - Winter hardy with rapid spring growth
 - Vernalization required for stem elongation
- Spring grains yield more for fall harvest
 - Stem elongation occurs
 - Growth continues well into October
 - But they will not over-winter
- Forage yields (biomass) highest in WI forage trials = oats or barley
 - 1.5 to 3.0 TDM per-acre biomass/forage yield





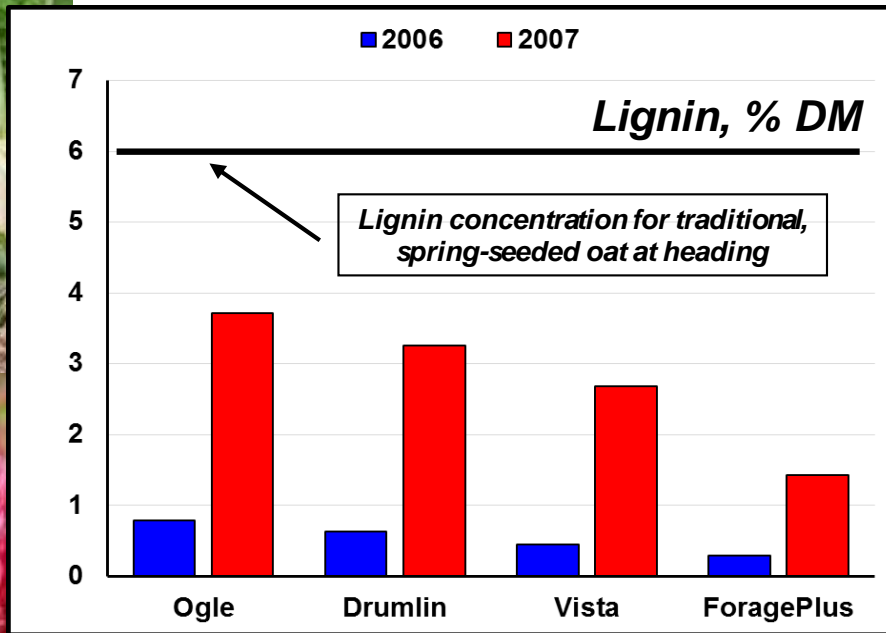
Spring planted cereal grains

Table 2. Average forage quality values for oats harvested at different maturity stages.

Harvest Stage	Crude Protein	NDF
Boot	16-18	52-54
Heading	14-16	56-58
Milk	12-14	59-61
Dough	10-12	59-61

- Fast early-season growth through vegetative stages
- Long-day photoperiod induces flowering
- Yield and nutritional quality optimized at “boot stage,” after which there is rapid:
 - Decrease in protein, energy and digestible fiber
 - Increase in un-digestible fiber
 - Increase in yield (of lower quality forage)
- Harvest window = narrow




Summer planted spring cereal grains



Source: Coblenz, Wayne, USDA ARS Dairy Forage Research Center



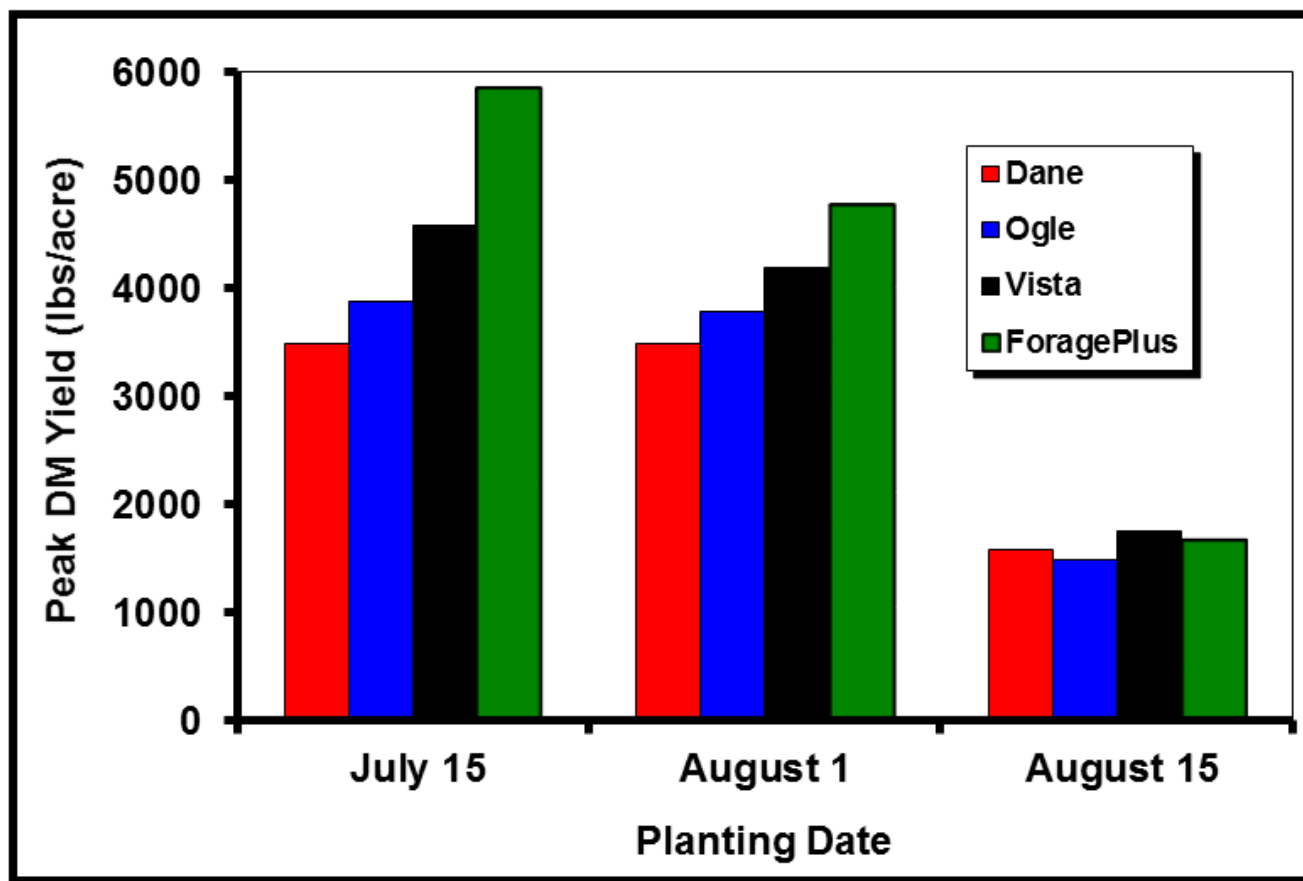
- Slower growth through vegetative stages
- Long-day requirement for flowering disrupted
- Cereals undergo hardening process as winter approaches
 - Cellular accumulation of sugars
 - More stable concentrations of fiber (NDF) and energy (TDN)
- Wider harvest window

- 
- 
- 
- Seed oats at 2.5 to 3 bu/acre (80 – 100 lbs/acre)
 - \$25 - \$45 per-acre seed cost
 - Drill 1-2" deep or broadcast and lightly till-in.
 - Requires **40-60 lbs N**, 20 lbs P_2O_5 , 90 lbs K_2O
 - \$25 - \$35 per acre fertilizer N cost, or
 - Manure application 5000-7000 gal or 25 tons per-acre



**Summer planted
spring cereal
grains**

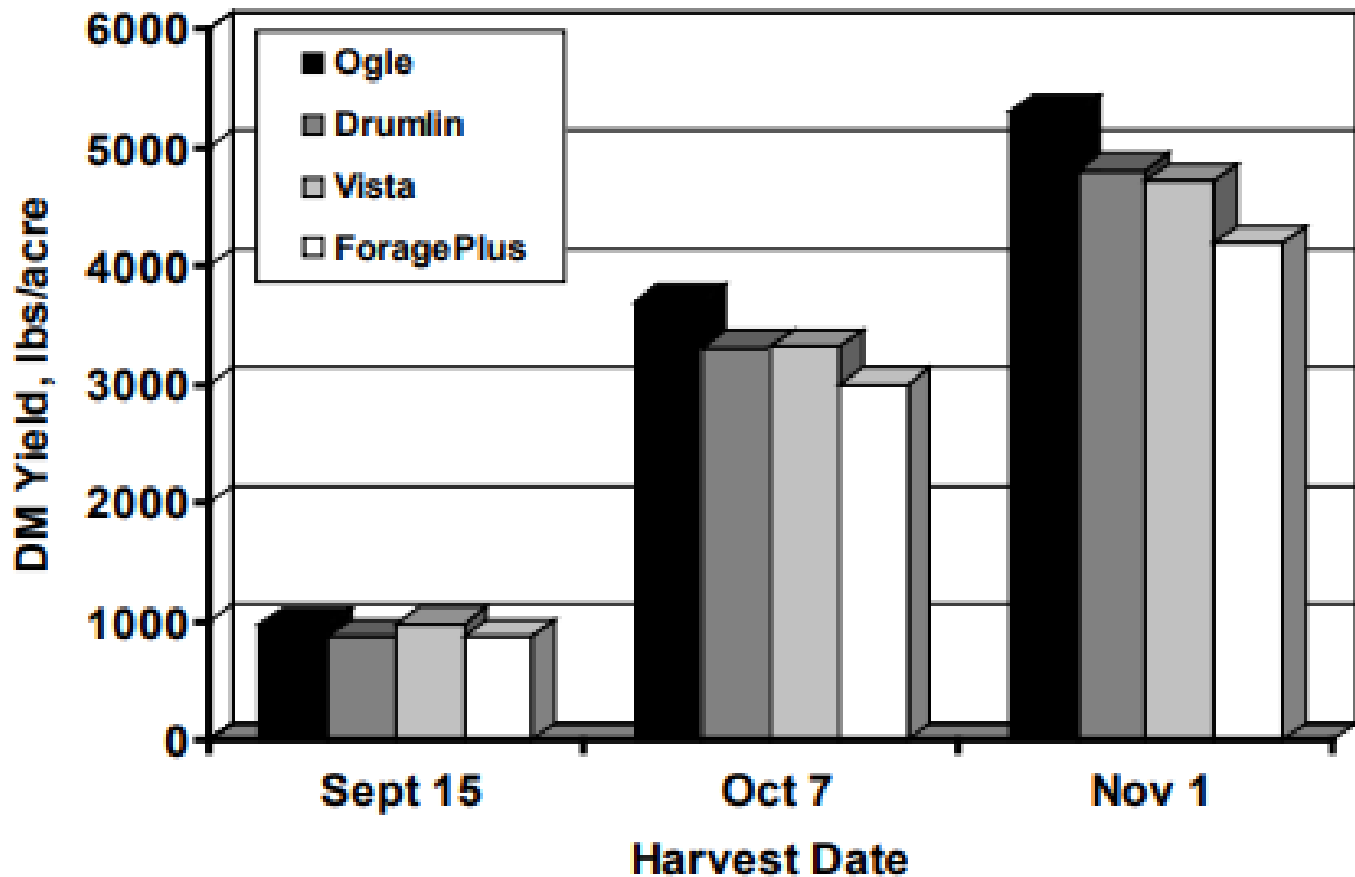
Effect of planting date and variety on yield of fall-grown oat (Marshfield, WI; 2007-2009)



Source: Coblenz, Wayne, USDA ARS Dairy Forage Research Center

Oat cultivar yields from mid-August planting: 2-year means at Prairie du Sac, WI

Coblentz, Wayne and Mike Bertram, 2012. Fall grown oat forages: Cultivars, planting dates and expected yields.



Variety according to planting date

- Objective: maximize forage/biomass yield, but not heading
- Central WI
 - July 20 to August 5 - late maturing or forage-type varieties.
 - August 5 to 15 – plant earlier maturing grain-type varieties



Fall forage oats – enterprise budgets

Yield TDM/acre	1.5 ^a	2.0 ^a	2.5 ^b	3.0 ^b
Value \$/TDM	120	120	130	130
Value (\$/acre)	180	240	325	390
Seed (100 lbs)	28	28	42	42
Planting	20	20	20	20
Nutrient inputs	52	56	60	64
Harvest ^c	70	89	108	127
Interest, pre-feeding ^d	3.39	3.85	4.59	5.05
Cost (\$/acre)	173	196	234	258
Return \$/acre	7.11	43.65	90.91	132.45

^a Mid-maturity, grain type variety

^B Late maturity, forage type variety

^c Mowing =\$12.50/acre + \$38/TDM chopping, hauling bagging

^d 4% annual operating for 6 mos.

Resources / References

- Ballweg, Michael, 2018. Berseem and Crimson Clovers after Winter Wheat. Cover Crops in Wisconsin – Nutrient Management Research.
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- UW-Nutrient and Pest Management Program Cover Crop Resources
<https://ipcm.wisc.edu/covercrops/>

