Interseeding red clover in winter wheat

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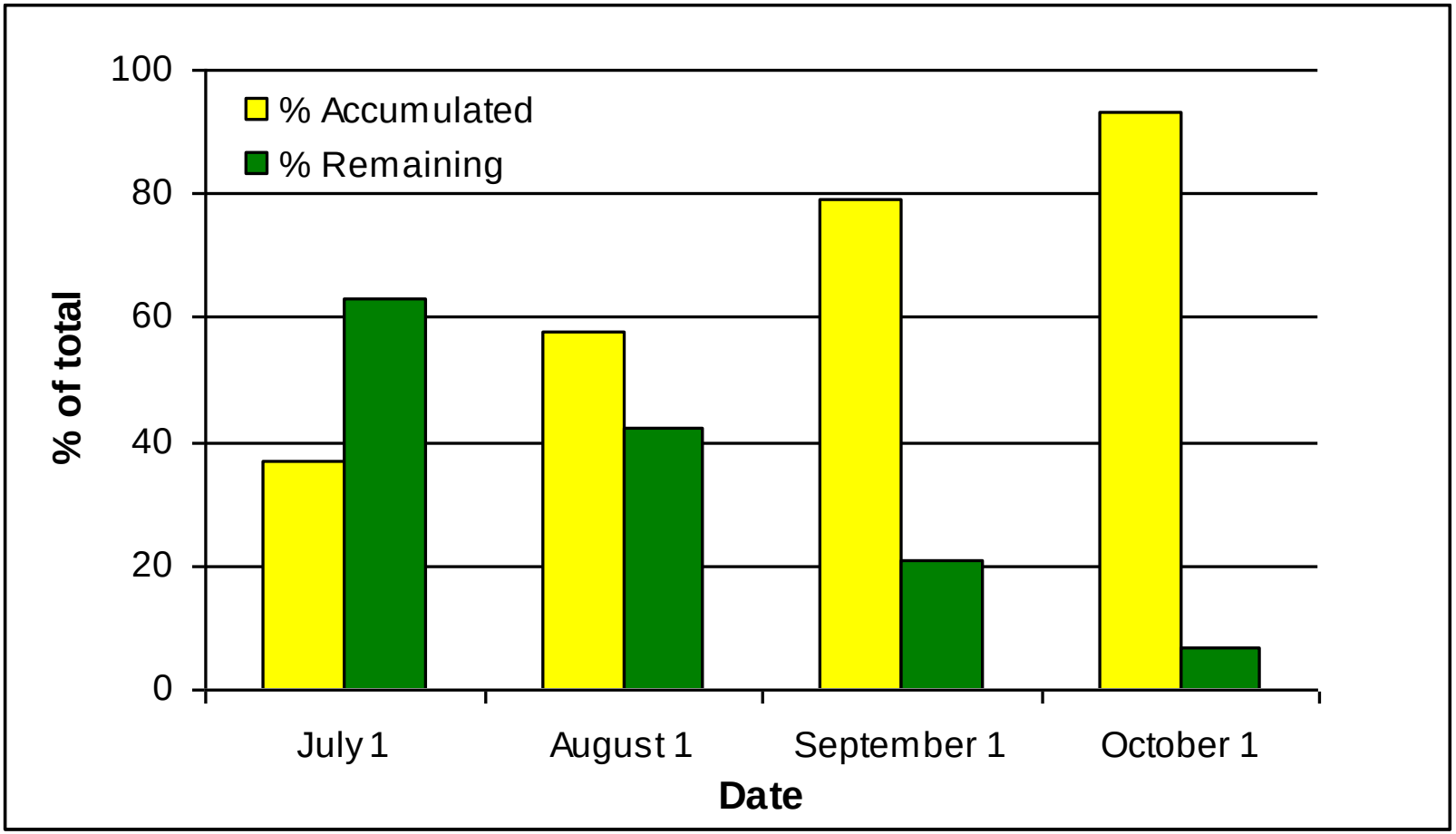
Growing Degree Day Accumulation

Southern Wisconsin



Source: AWON, Arlington data

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The “big picture”

In essence, farms are giant solar collectors, and fields are individual panels
  - Solar energy is converted into saleable products

Relative efficiency is reduced by traditional non-forage crops, both long and short season

Cover crops improve relative efficiency by capturing “wasted” solar energy and storing it in the soil

Why consider interseeding red clover?

Produce N to reduce fertilizer costs

>90 days effective growing season used for N fixation

Soil Conservation

- Season long soil cover
- RUSLE2 estimated soil loss reductions range from 19 to 50% on 6% slope fields depending on tillage

Soil Quality

- OM addition, enhanced biological activity
- Improve structure
- Relieve compaction

Why red clover?

Legume	Above Ground Biomass Yield Mean* (tons/a)	Range	Site Years of Data
Interseeded			
Red clover	1.70	0.33 - 3.26	24
Seeded after harvest			
Hairy vetch	1.37	0.67 - 2.16	10
Crimson clover	0.83	0.69 - 0.97	2
Berseem clover	1.00	0.31 - 1.58	9
Annual sweetclover	0.88	0.18 - 1.72	3
Annual medic	1.00	0.51 - 1.94	8
Chickling vetch	0.49	0.39 - 0.59	2
Annual alfalfa	0.39	0.38 - 0.40	2

*N yield does not necessarily correspond to creditable N.

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Wheat + Red clover

"Shovel Ready" system

- Easily "piggy backed" on current management/ field operations = efficiency + reduced cost

Nitrogen applied to wheat in spring

  - Red clover can be applied at same time using airflow equipment

Glyphosate applied to wheat stubble to control volunteer wheat

  - Growth regulator herbicide is only additional cost

Supplemental N (UAN) can be applied during PRE herbicide applications

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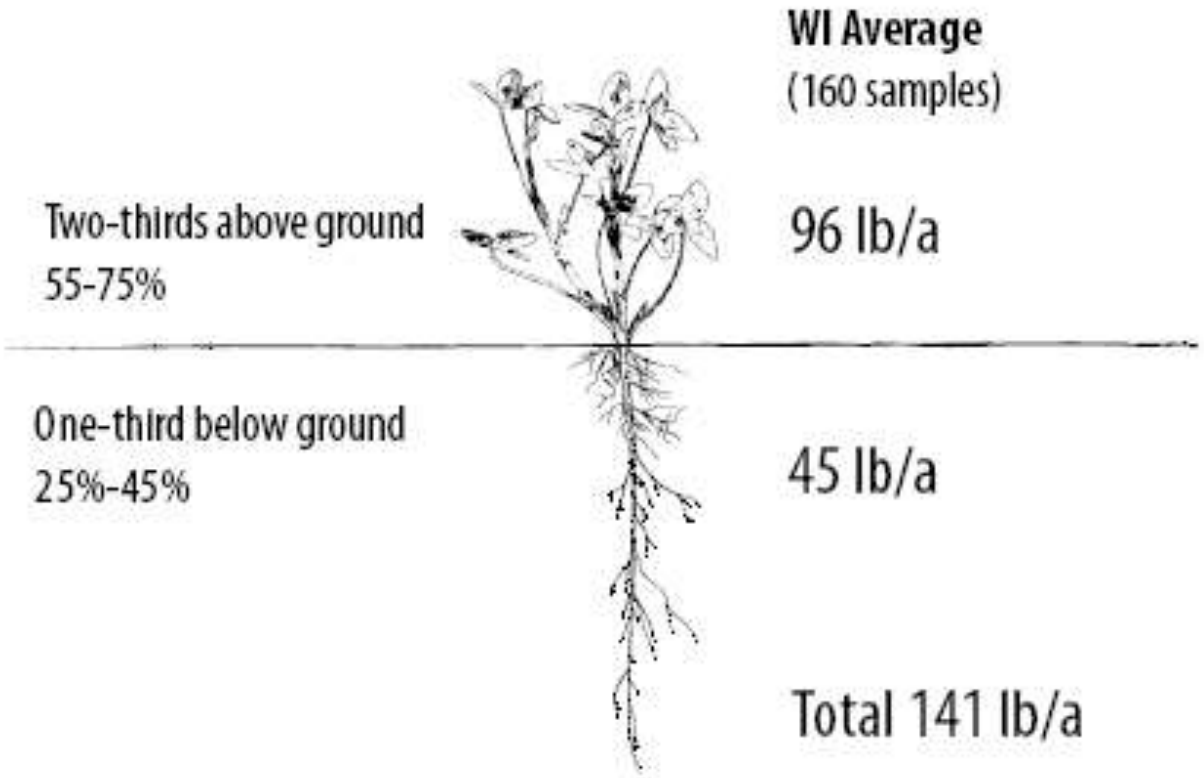
Nitrogen

How much Nitrogen?

UWEX green manure nitrogen credits		
Crop	< 6" growth	> 6" growth
	lb N/a to credit	
Red clover	40	50 - 80

Source: A2809 Nutrient application guidelines for field, vegetable and fruit crops in Wisconsin



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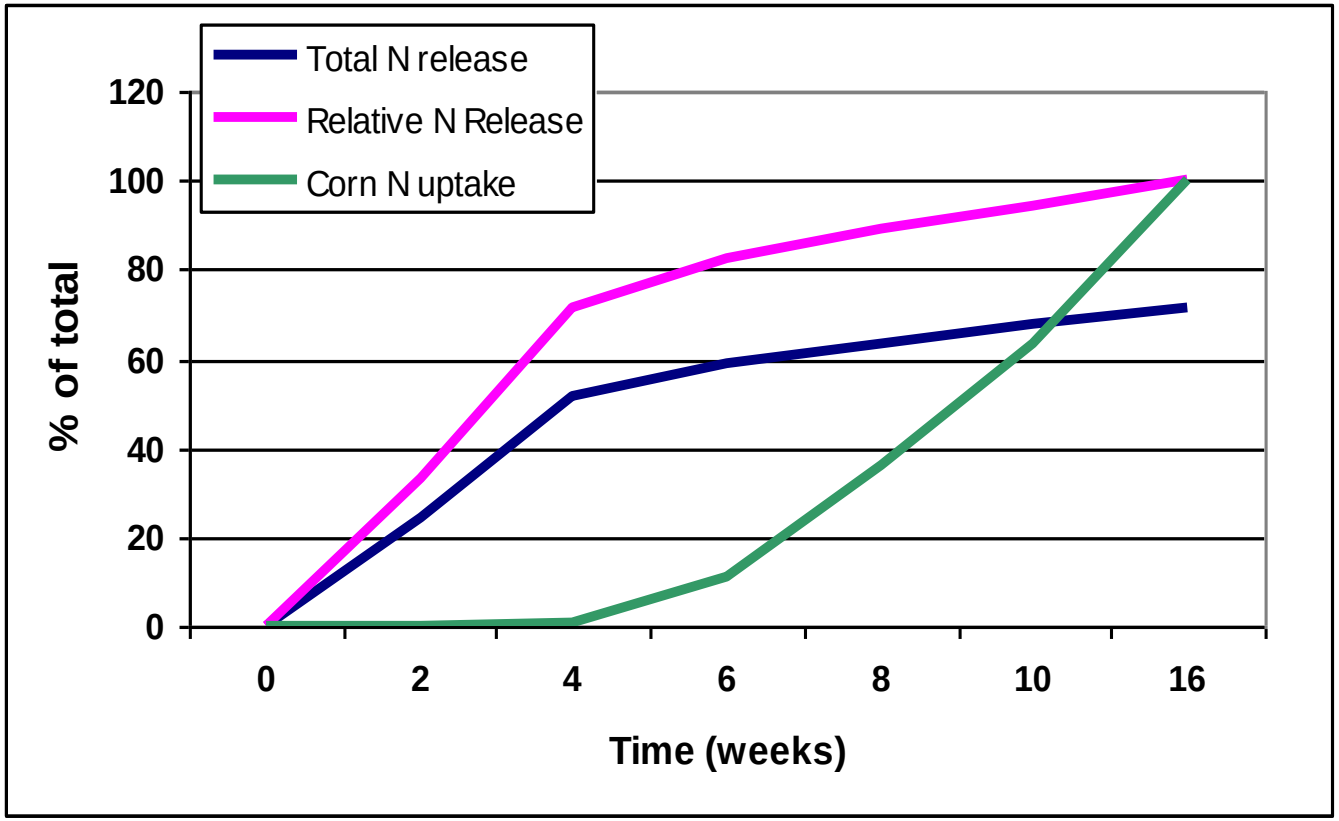
Nitrogen Dynamics: mineralization and corn uptake



Adapted from Stute and Posner, 1995, Agron. J. 1063-1069

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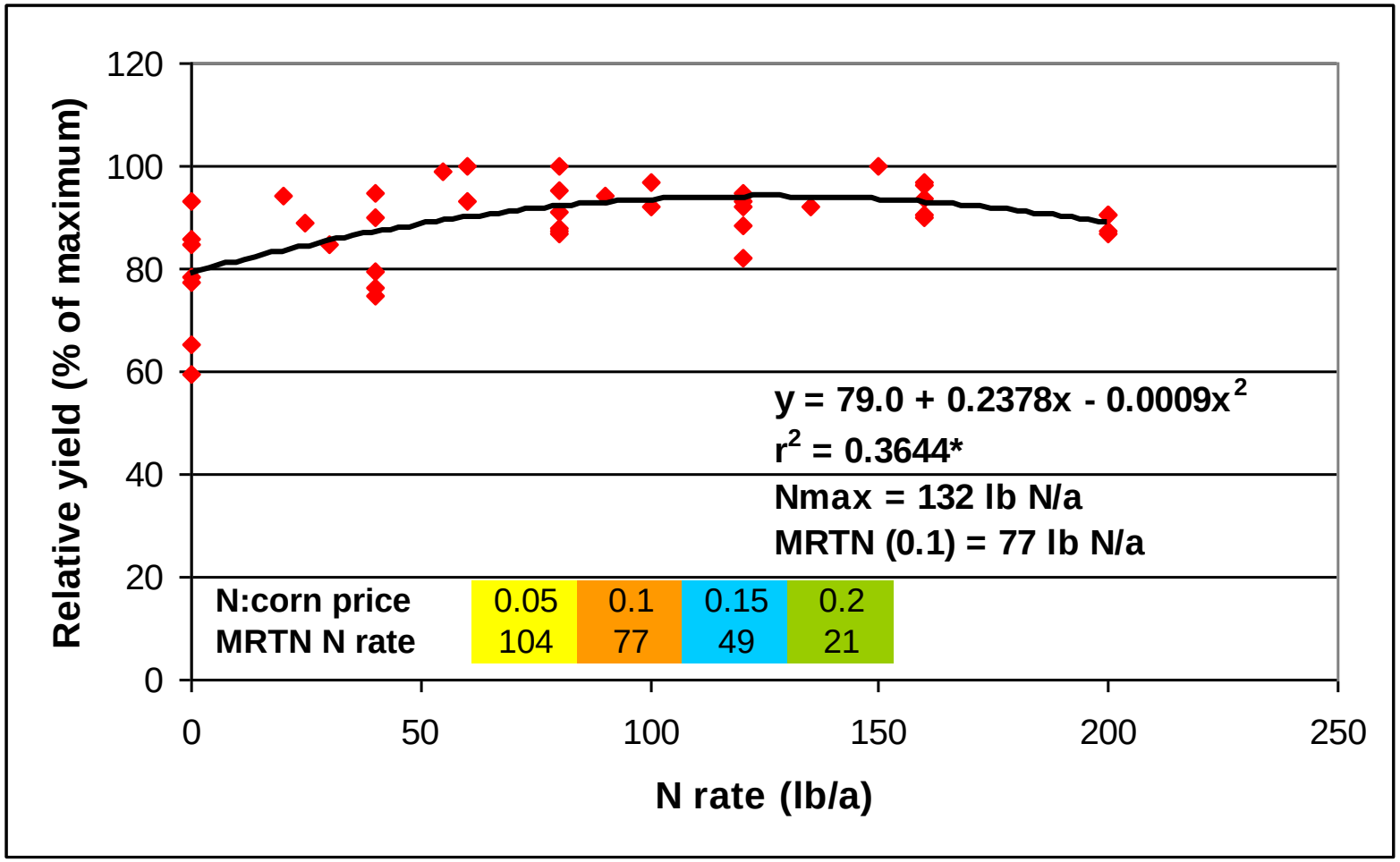
Corn response to additional nitrogen



Source: Stute and Shelley, unpublished

Trial locations: Belvidere, East Troy, Elkhorn, Lancaster, Janesville, Cottage Grove

1999-2010, 7 site years, n=168

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Material Costs, 2011

Material	$/ton	$/lb nitrogen
Anhydrous ammonia	750	0.46
28% UAN	335	0.52
medium red clover (12 lb/a)	1.70 (lb)	0.26

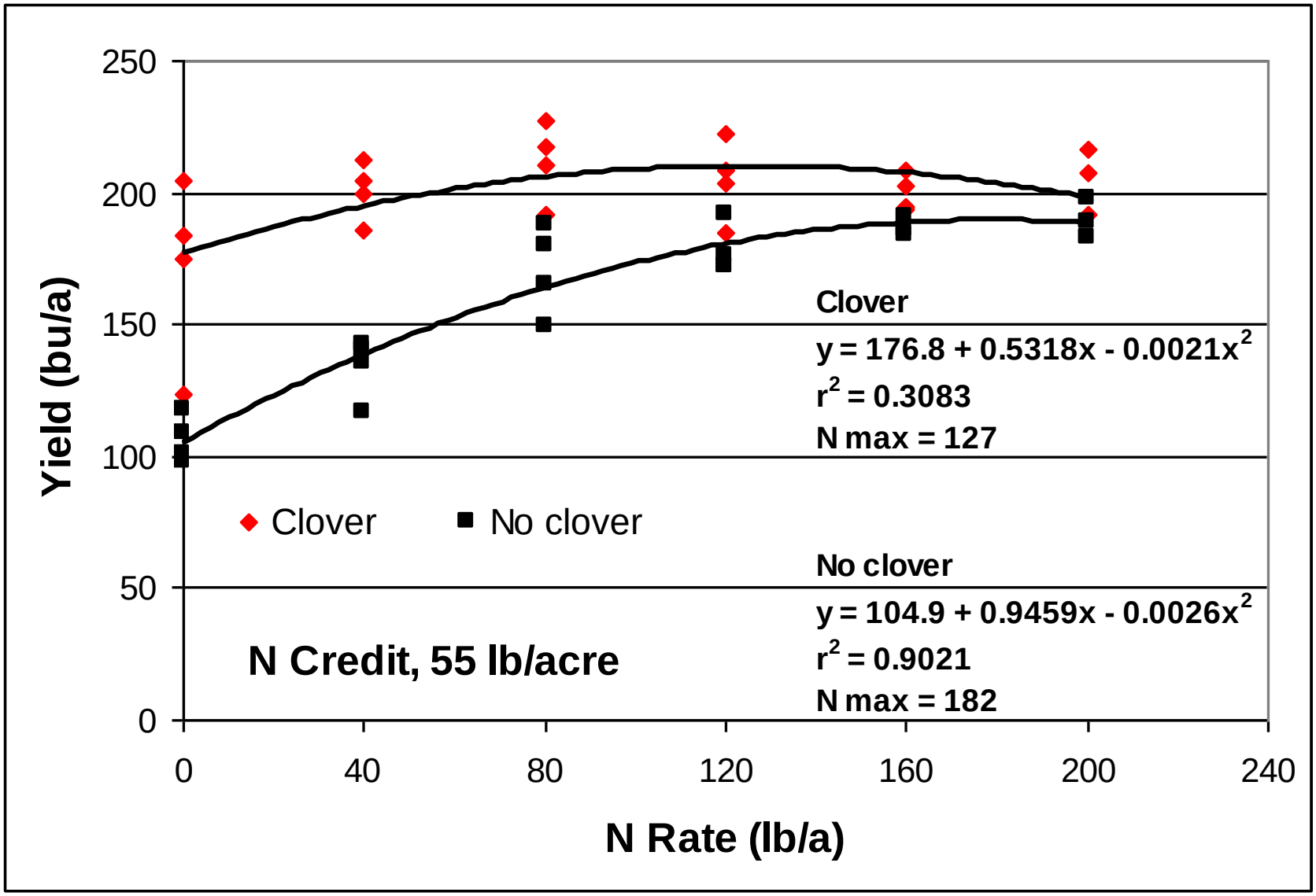
Per Acre Cost

Material	120 N	160 N
Anhydrous ammonia	55.20	73.60
28% UAN	62.40	83.20
80 lb clover N credit + UAN	20.40	20.40
UAN (40, 80)	20.80	41.60
	41.20	62.00
Clover system vs.:		
Anhydrous ammonia	-14.00	-11.60
28% UAN	-21.20	-21.20

Additional costs: Anhydrous application

Red clover: clipping, termination

Corn response to nitrogen, Janesville 2010



Stute and Shelley, unpublished

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Soil Protection

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Cover crop biomass/ residue

Medium red clover

October 1

No-till corn

July 1

Impact on soil erosion: corn-soybean-wheat rotation

Estimated rotation soil loss based on clover residue management

Soil type	"T"	Clover	Clover Management	
			No-till	Fall Chisel
			ton/acre/year	
Fox	4			
		-	0.5	2.4
		+	0.3	1.9
		reduction(%)	40	21
Kidder	5			
		-	0.5	2.7
		+	0.3	2.2
		reduction(%)	40	19
Ogle	5			
		-	0.4	2.1
		+	0.2	1.4
		reduction(%)	50	33

RUSLE2 using SNAP plus, 6% slope

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Soil Quality

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Improvement of soil structure

Legumes increase soil aggregation

- decomposition of residue - polysaccharides
- mycorrhizal associations - glomalin

Legumes contribute to mycorrhizal diversity and abundance

Green manures improve soil tilth even though they don't increase soil organic matter

Relieve soil compaction

Growing roots can exert tremendous pressure, forcing massive soil to fracture

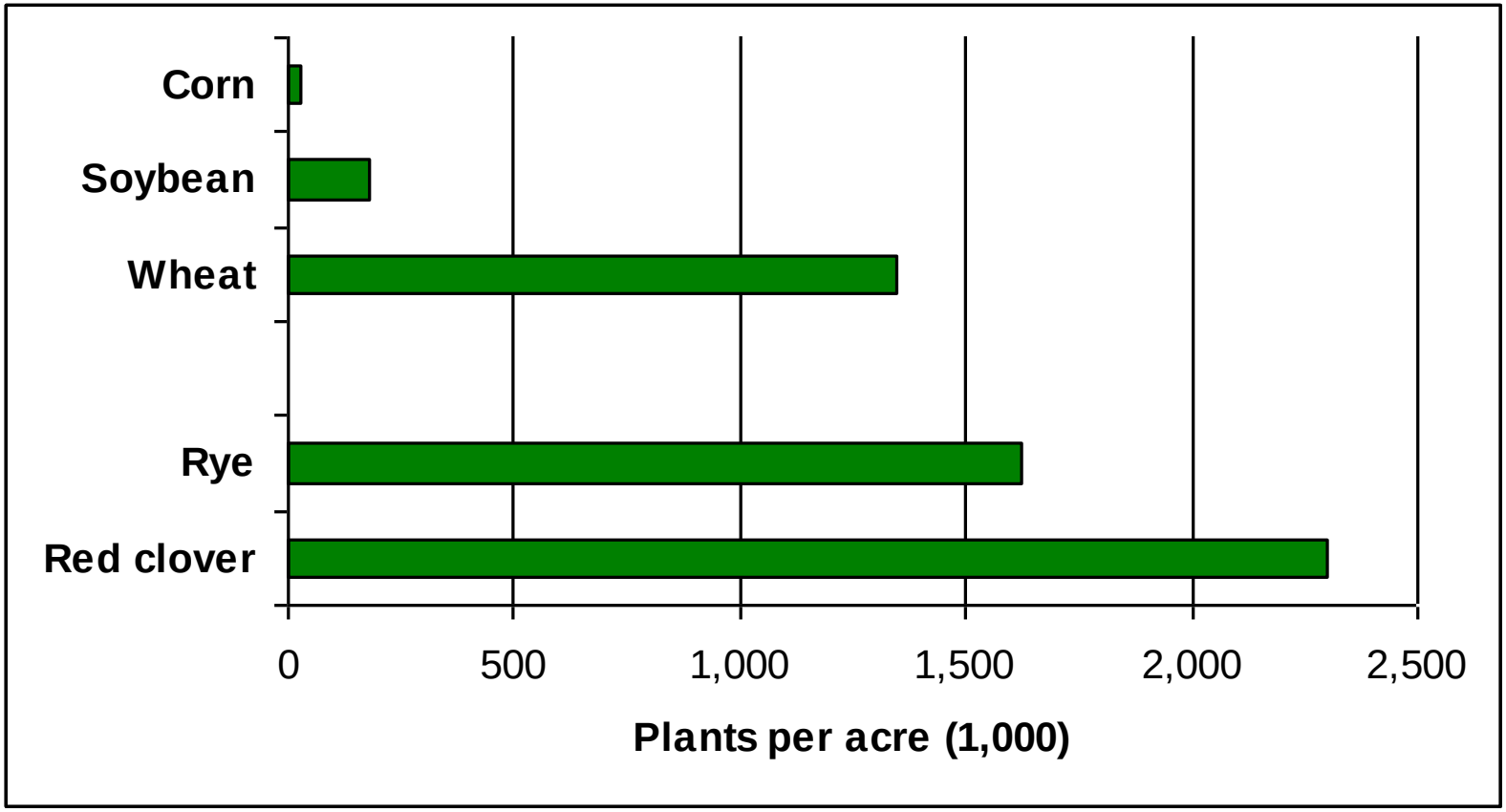
Especially important in no-till

The right cover crop can act as a “living plow”

- surface or subsoil compaction

Red clover planting/ rooting density greatly exceeds crop rooting density

Relative plant population



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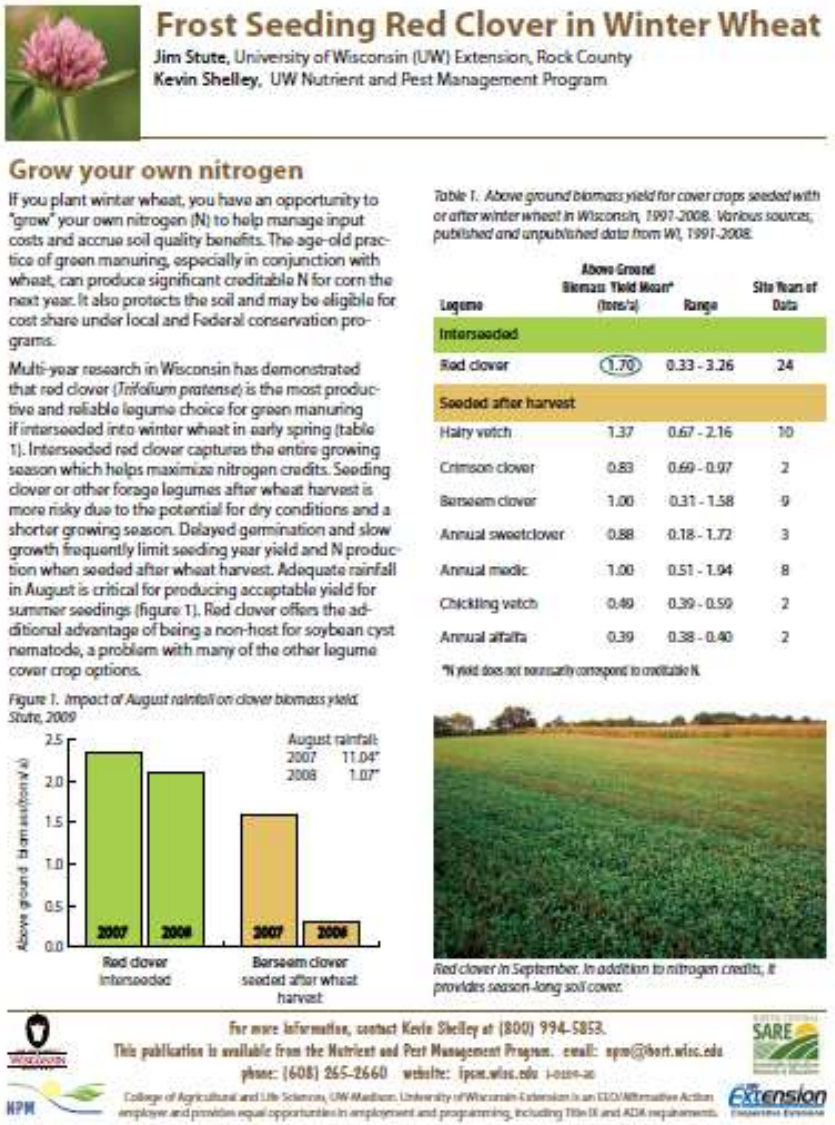

Frost Seeding Red Clover in Winter Wheat

Jim Stute, University of Wisconsin (UW) Extension, Rock County
Kevin Shelley, UW Nutrient and Pest Management Program

Grow your own nitrogen

If you plant winter wheat, you have an opportunity to "grow" your own nitrogen (N) to help manage input costs and accrue soil quality benefits. The age-old practice of green manuring, especially in conjunction with wheat, can produce significant creditable N for corn the next year. It also protects the soil and may be eligible for cost share under local and Federal conservation programs.

Multi-year research in Wisconsin has demonstrated that red clover (*Trifolium pratense*) is the most productive and reliable legume choice for green manuring if interseeded into winter wheat in early spring (table 1). Interseeded red clover captures the entire growing season which helps maximize nitrogen credits. Seeding clover or other forage legumes after wheat harvest is more risky due to the potential for dry conditions and a shorter growing season. Delayed germination and slow growth frequently limit seeding year yield and N production when seeded after wheat harvest. Adequate rainfall in August is critical for producing acceptable yield for summer seedings (figure 1). Red clover offers the additional advantage of being a non-host for soybean cyst nematode, a problem with many of the other legume cover crop options.

Table 1. Above ground biomass yield for cover crops seeded with or after winter wheat in Wisconsin, 1997-2008. Various sources, published and unpublished data from WI, 1997-2008.

Legume	Above Ground Biomass Yield Mean* (tons/a)	Range	Site Years of Data
Interseeded			
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Figure 1. Impact of August rainfall on clover biomass yield. Stute, 2009

Red clover in September. In addition to nitrogen credits, it provides season-long soil cover.

For more information, contact Kevin Shelley at (800) 994-5853.
This publication is available from the Nutrient and Pest Management Program. email: npm@hort.wisc.edu
phone: (608) 265-2660 website: ipcm.wisc.edu

For more information:

Jim Stute

Rock County UW-Extension

(608) 757-5698

(608) 921-9980 (cell)

jim.stute@ces.uwex.edu

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