Cover Crops for Nitrogen Management in Sweet Corn

Ken Schroeder
University of Wisconsin Extension, Portage County

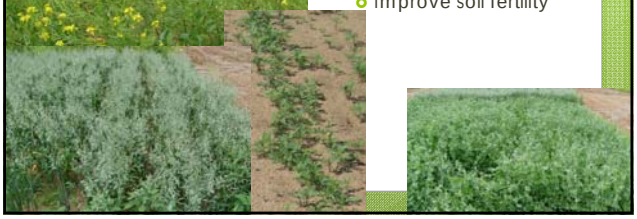
AJ Bussan
UW Horticulture

Crop Management in Rotational Years

- Crop rotation
  - 3 yr minimum
  - Agronomic
  - Food crops
  - Forages

Crop Management in Rotational Years

- Manage pests in rotational years
  - Cover crops
  - Suppress soil borne disease
  - Improve soil fertility



Crop Management in Rotational Years

- Forage legume
- Modify annual cropping system
- Incorporate perennial legume

Snap Bean Yield with Understory Perennial Crop

	Yield (8/3)		
Treatment	< 3 Ton/A	4 & 5 Ton/A	Total Ton/A
No cover crop	0.24	0.58	0.82
Hairy vetch	0.09	0.29	0.38
Alfalfa	0.19	0.42	0.60
Red Clover	0.12	0.28	0.40
Sweet/Yellow Clover	0.28	0.56	0.84
Alsike Clover	0.18	0.56	0.74

Sweet Corn Yield

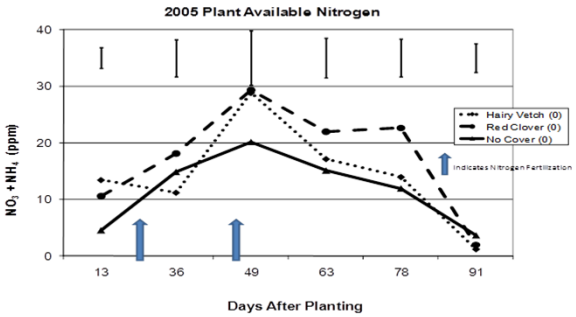
	Yield (ton/a)	
Cover crop	0 N	Rec N
No cover crop	1.82	8.36
Hairy vetch	6.87	8.88
Alfalfa	6.45	8.08
Red Clover	7.31	8.81
Sweet/Yellow Clover	8.09	8.57
Alsike Clover	7.14	7.85

0.97

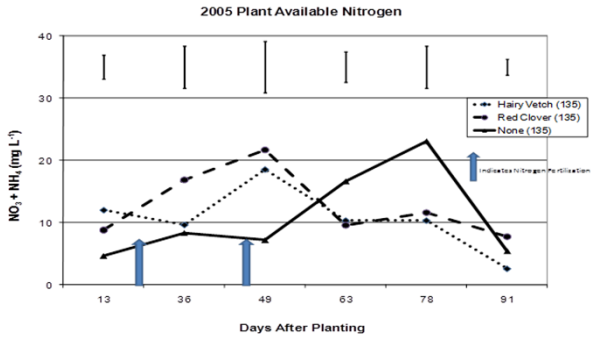
Optimizing Clover Planting Date

Main Effects	Treatment	Snap Bean Yield	Percentage of Pods ≤ Sieve Size #3	Dried Residue Yield
		Mg/ha	%	Mg/ha
Clover Planting Date	Planting	7.67 b	28.8	0.021
	Unifoliate	8.19 a	28.6	0.026
	3rd Trifoliate	8.63 a	28.5	0.025
	Bud Stage	8.45 a	29.4	0.027
	Post-Harvest	8.33 a	28.0	0.037

Cover Crop Effects on Plant Available Nitrogen – 0 N



Cover Crop Effects on Plant Available Nitrogen – 135 N



Cover Crops in Central Wisconsin

- Cereal rye is the most common cover crop used.
- Why rye?
  - Rapid establishment
  - Good germination and growth under cool conditions
  - Winter persistence & spring regrowth
  - Weed suppression
  - Low establishment costs
  - Good nitrogen scavenger
    - However, on sandy soils most if not all nitrogen unavailable to subsequent crop

Why Cover Crops?

Cover Crops in Central Wisconsin

- Traits of the ideal cover crop for sandy soils
  - Cost effective
  - Effective wind erosion control
  - Effective nutrient scavenger
  - **Able to release nutrients to the commercial crop when needed by that crop**
- Recent studies to address these needs
  - Small-plot research at Hancock demonstrated that perennial legumes could be inter-seeded and maintained throughout vegetable cropping rotations
    - Nitrogen benefit from legume

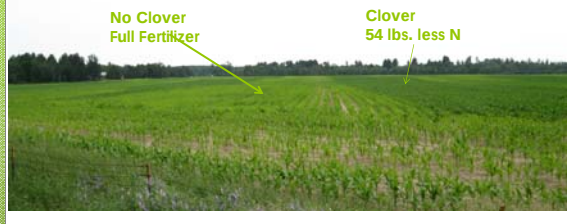
Inter-seeding Red Clover 2009

Clover Stand Prior to Sweet Corn Planting 2010

Tilling in the Clover

Red Clover N credits
- **> 6" tall 50 to 80 lbs N**

Sweet Corn Response



Sweet Corn Harvest 2010

- Yield
  - Clover 8.05 ± 0.23 ton/a
  - No clover 7.88 ± 0.47 ton/a
- Costs
  - Clover seed - $29.92/acre at 8 lb/a
  - Savings on N - $27.00/acre
    - 54 lb/a less N fertilizer
    - $0.50/lb for fertilizer

Trial 1 2011
Inter-seeding Red Clover July 11

July 20, 2011

Beans harvested
July 26, 2011

Cover Crop Stand Sept. 22

Cover Crop Stand Oct. 17

Cover Crop May 14, 2012

- 12 to 14" tall
- Buccaneer 32 oz 5/16
- Tilled and applied
  3 pt Eptam and 1 pt Prowl
- Snap Beans planted 5/24

2012 Snap Beans at 2.5 Weeks

2012 Snap Beans at 6.5 Weeks

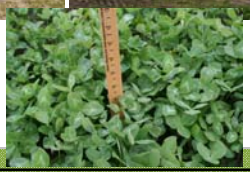
Trial 2
Drilled Red Clover with Oats

Planted August 2011
8 lbs clover ½ bu oats

Trial 2
Snap Beans at 6 Weeks

Snap beans planted 6/12/12

Trial 3
Drilled Red clover Early Sept 2011



4" to 5"

Trial 3
No-Till Field Corn

- Planted 5/11/12
- 70 lbs./acre less N on clover
- Cornerstone 5/22 and 6/6 at 5 oz

Trial 3
No-Till Field Corn

6/13/12

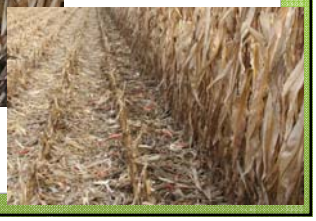
Trial 3
No-Till Field Corn

9/12/12

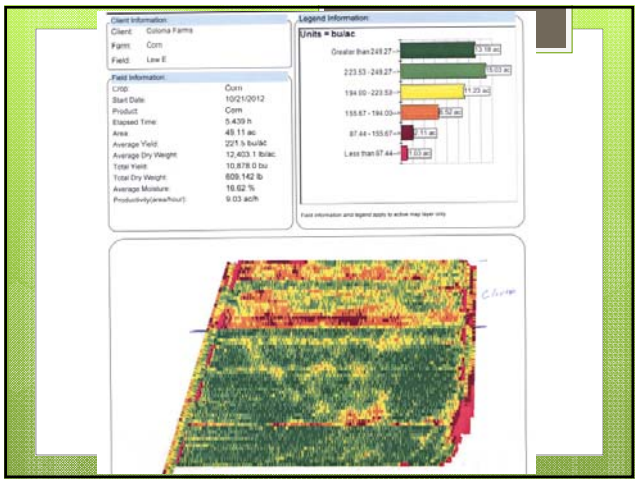
Trial 3
No-Till Field Corn

10/24/12
Clover 4”

Trial 3
No-Till Field Corn



Trial 3
No-Till Field Corn



Benefits of perennial legume cover crop system

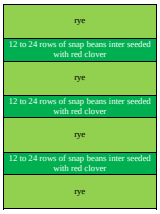
- Wind erosion control
- Weed reduction
- Soil quality improvement
- Nutrient recycling
- Reduced dependence on petroleum-based fertilizers
  - Applying 50lbs/A less nitrogen to all processed sweet corn in WI
    - 4.4 million lbs. less nitrogen used
    - $2.2 million in savings
    - Decrease likelihood of nitrates leaching into groundwater

Questions?

Contact Ken Schroeder
Ken.schroeder@ces.uwex.edu
715-346-1316

On-Farm Research

- Research duration – three years
- Crop rotation – snap beans, sweet corn, potato
- Field Layout – At least three 12 to 24 row strips across the field inter seeded with red clover at the last cultivation of the snap bean crop and maintained until planting of the potato crop. Balance of the field to be seeded to a rye cover crop between vegetable crops.
- Data to be collected – crop yields from conventional and red clover cover crop strips.



Procedures

- **First year:** sow red clover cover crop (8-11 lbs/acre) between snap bean rows at last cultivation (not to occur before 1st trifoliate leaf stage), record snap bean yields and harvesting data, allow cover crop to grow naturally. Sow rye or oats cover crop on balance of field.
- **Second year:** use a burn-down herbicide (glyphosate) on cover crop and disk/chisel prior to planting sweet corn, treat corn with herbicides other than Callisto, Laudis, or Impact if possible, apply 50 to 60 lbs less nitrogen per acre on the clover strips, record sweet corn yields and harvesting data, allow clover cover crop to grow naturally and sow rye or oats cover crop on balance of field.
- **Third year:** till under cover crop and plant potatoes, apply 50 to 60 lbs less nitrogen per acre on the clover strips, record potato yields from red clover areas and rye or oats areas.