



ON FARM FIELD TRIALS USING COVER CROPS – YEARS 2013 AND 2014

INTRODUCTION

- Fall 2012 NRCS in Missouri initiated a 3 year on-farm field trials of cover crop species with landowners in 7 locations across the state.
- Major Land Resource Areas with cropland were selected in the following counties: Caldwell, Cape, Perry, Ralls, Saline, St. Charles, and Worth. Thanks to the local NRCS and SWCD field office personnel that participated in these counties for the field trials.
- NRCS Missouri purchased the seed and the NRCS Elsberry Plant Materials Program and Local NRCS Field Offices coordinated seeding mixtures, distribution of seed, collected data with results and conducted on-farm field days at site locations.
- Each on-farm field trial is 10 acres in size, subdivided into 4-2.5 acre size field. This allowed three different cover crop species/mixture and one control (no cover crops) per farm.

Materials and Methods

Table 1. Cover crop mixes used in the field trials
Missouri Plant Materials Specialist

Mix	Grass	Legume	Forb
3- species	33% annual ryegrass	33% crimson clover	33% oilseed radish
2- species	50% cereal rye	50% crimson clover	
3- species	33% cereal rye	33% hairy vetch	33% Tillage® radish
No cover crop species	Control		

Base seeding rates by species for mixtures and “Varieties”.

3 species- annual ryegrass “Bounty”- 6#/ac, crimson clover “AU Robins”- 6#/ac., oilseed radish “Enricher”-2#/ac.

2 species- cereal rye “Aroostook”-25#/ac, crimson clover “Dixie”-6#/ac.,

3 species- cereal rye “Aroostook” -25#/ac., hairy vetch “Purple Bounty”- 7.5#/ac., oilseed radish “Tillage”- 2#/ac.

Data Collected

- Canopy cover data was collected using 3 transects per field (each 2.5 acres field).
- The canopy cover was taken three times, one month apart during the spring active growing season and just before termination of the cover crop and planting of the cash crop. Canopy cover was determined by the percent of cover that intercepted rainfall prior to hitting the surface. Weeds were also evaluated on dry weight/ acre within the stands verse the control with no cover crop.
- Dry matter data was collected by conducting 3 cuttings per field (each cutting was 1 sq.ft.).
- The cuttings were conducted at the same time that the transect data for canopy cover was taken.
- The cover crop cuttings were dried for each field to obtain dry weight of lbs/acre for each mixture used for that field.
- Weeds were also cut in the sampling and separated from the cover crop species to determine the dry weight in lbs/ acre for each of the 2.5 acre fields including the control.
- Visual ratings of herbicide application were determined 30 days after application in order to determine control for each cover crop species.
- Visual ratings of cash crop were determined 30 days after planting.

Results and Discussion 2013-2014

Canopy Cover

-Cover crop mixtures will control winter annual weeds and spring weeds before termination with 70% or greater canopy cover from the mixture.

-Cereal rye with a legume either crimson clover or hairy vetch provides the highest percentage of canopy cover in most locations.

-Cereal rye in the mixture provided the most consistent and protective ground cover during the winter and early spring cover crop season.

Biomass produced

- Cereal rye and crimson clover produce the most biomass in all locations especially when termination was in early May.
- Annual ryegrass and crimson clover mixture, in all but 1 location, produced 1 ton or less dry biomass in March and April. The Cape county location produced 2 tons of dry biomass by end of April.
- In March, mixtures with cereal rye can be less than 1 ton per acre dry weight; however during April biomass will increase quickly from 1-3 tons/acre dry biomass weight.

Survival and development of cover crop species

- Planted in mixtures, Crimson clover can over winter in North Missouri.
- The cereal rye maintained its green color characteristic through the winter.
- Cereal rye protected the 3 inch height crimson clover seedlings through the winter even with temperatures as low as -20 degrees in Caldwell county. Snow cover provided protection against the wind the winter of 2014.
- Annual ryegrass will desiccate (turn brown) with sub-zero temperatures and no snow cover. Sprouting from roots reoccurred the following spring but dry matter yield were very low and canopy cover was less than 30% in north Missouri.
- Legumes of crimson clover developed pre-bud to blooms before May termination dates for southern locations in Cape and Perry counties. "AU Robin" crimson clover developed flowers one week earlier than "Dixie" crimson clover.
- "Purple Bounty" hairy vetch did develop pre bud to partial flowering before termination in early May for the southern locations in Cape and Perry county.
- Oilseed radishes need to be drilled by mid-September in order to develop a tap root and be beneficial. All oilseed radishes winter killed.

Termination and visual ratings of cover crops 30 days after planting cash crop

- Cover crops were controlled by herbicide treatment.
- Most field trials listed all cover crops as terminated (dead) when the review was completed 30 days after planting cash crop.
- There were two exceptions where the cover crops were not dead. Annual ryegrass in Cape County was listed having severe damage 30 days after termination from mid-April planting of cash crop. Annual ryegrass in Saline County was listed having severe to moderate damage 30 days after termination from the planting the 1st week of May.
- Most cash crops were rated as good to excellent in visual appearance 30 days after planting.
- An exception was in Perry County where nitrogen rates were reduced to see what effect it would have on the cash crop. The mixtures of cereal rye and legumes had a negative appearance to corn (yellowing) and demonstrated a lack of nitrogen availability.

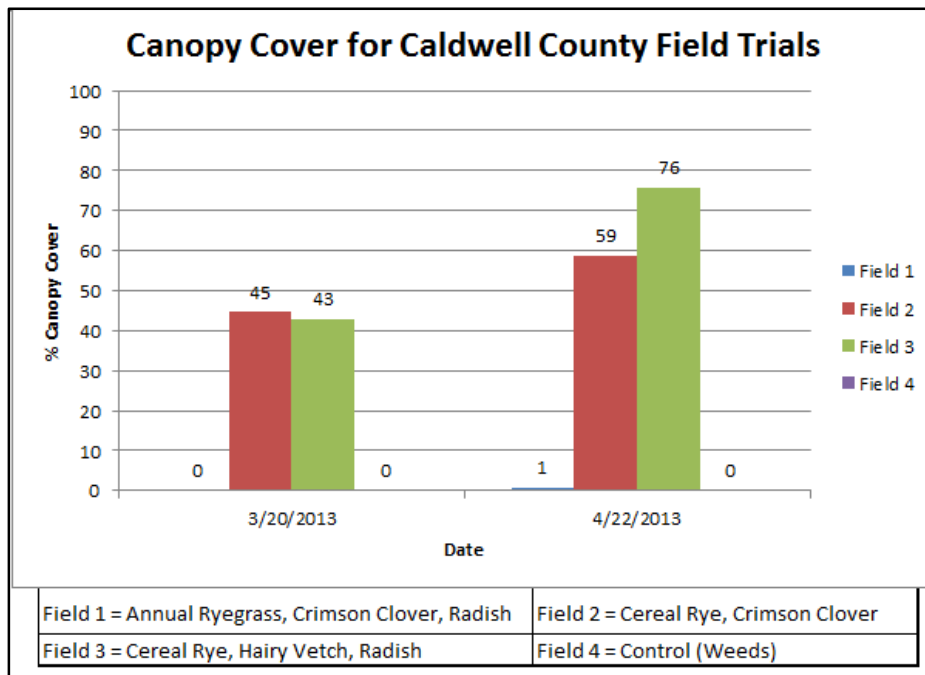
Summary Sheets with Resulting Data Follows Below For Each County Field Trial

The 1st set of COUNTY FIELD TRIAL charts is from:

The planting drilled after harvest 2012 and data collected in 2013.

The 2nd set of COUNTY FIELD TRIALS charts is from:

The planting drilled after harvest 2013 and data collected in 2014.

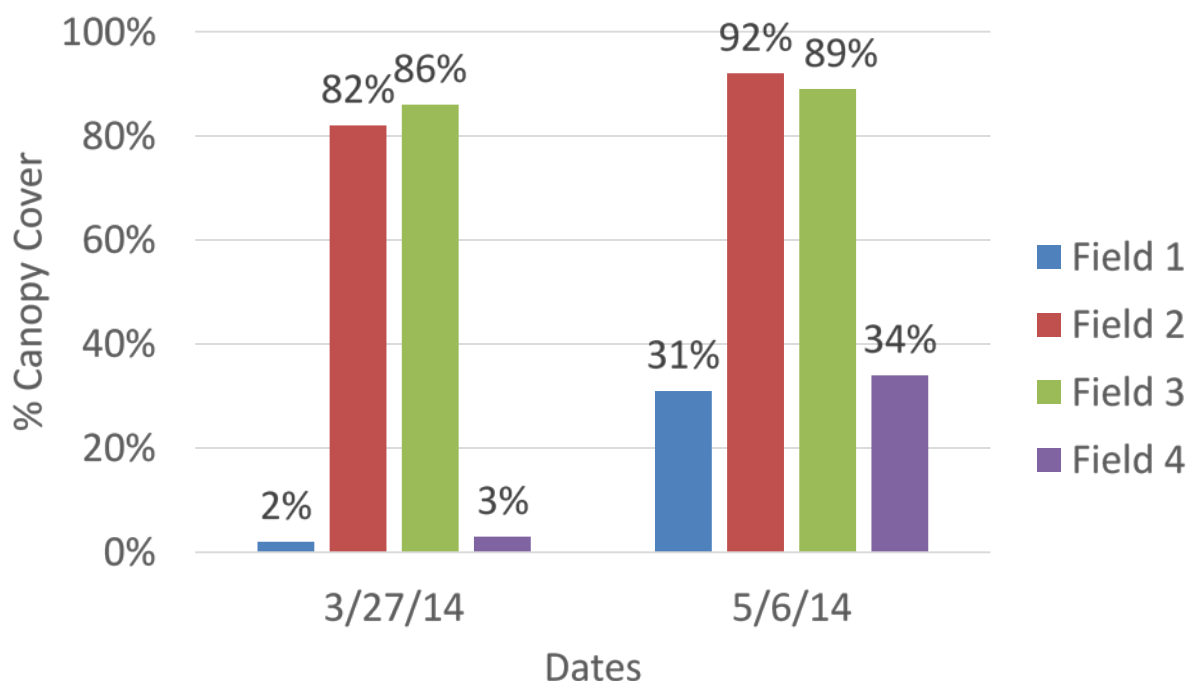


Pounds Per Acre of Dry Matter - Caldwell County							
	Field 1		Field 2		Field 3		Field 4
	Annual Ryegrass, Crimson Clover, Radish	Weeds	Cereal Rye, Crimson Clover	Weeds	Cereal Rye, Hairy Vetch, Radish	Weeds	Control (Weeds)
March	0.00	9.59	588.48	313.43	1125.78	143.92	0
April	3.2	95.95	3757.93	738.79	2446.65	1787.81	0
May							

Termination: 4/25/2013	Date of Cover Crop Termination Rating (Field Flooded)						
Evaluation: 5/24/2013	Rating		Rating		Rating		Rating
Field 1		Field 2		Field 3		Field 4	
Annual Ryegrass	1	Cereal Rye	1	Cereal Rye	1	Grass (Weeds)	1
Crimson Clover	1	Crimson Clover	1	Hairy Vetch	1	Broadleaf Weeds	1
Radish	1	Grass (Weeds)	1	Radish	1		
Grass (Weeds)	1	Broadleaf Weeds	1	Grass (Weeds)	1		
Broadleaf Weeds	1			Broadleaf Weeds	1		
Termination Ratings							
1 = Dead 3 = Severe Damage 5 = Moderate Damage 7 = Light Damage 9 = No Damage							

Date of Visual Rating of Cash Crop						
24-May-13						
	Field 1	Field 2	Field 3	Field 4		
Rating	Flooded					
Ratings						
A = Excellent B = Good C = Average D = Poor E = Very Poor						

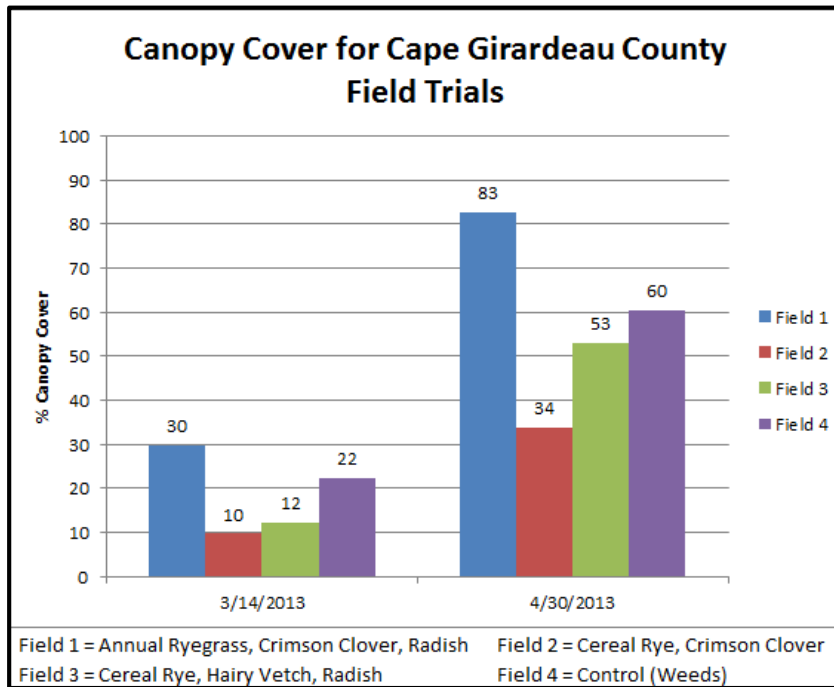
Canopy Cover for Caldwell County Field Trial



Field 1 = Annual Ryegrass, Crimson Clover, Radish	Field 2 = Cereal Rye, Crimson Clover
Field 3 = Cereal Rye, Hairy Vetch, Radish	Field 4 = Control (Weeds)

Pounds Per Acre of Dry Matter – Caldwell County

	Field 1		Field 2		Field 3		Field 4
	Annual Ryegrass, Crimson Clover, Radish	Weeds	Cereal Rye, Crimson Clover	Weeds	Cereal Rye, Hairy Vetch, Radish	Weeds	Control (Weeds)
3/27/14	368	6	1545	35	1481	10	N/A
5/6/14	403	N/A	5501	6	7340	3	387



Pounds Per Acre of Dry Matter - Cape Girardeau County

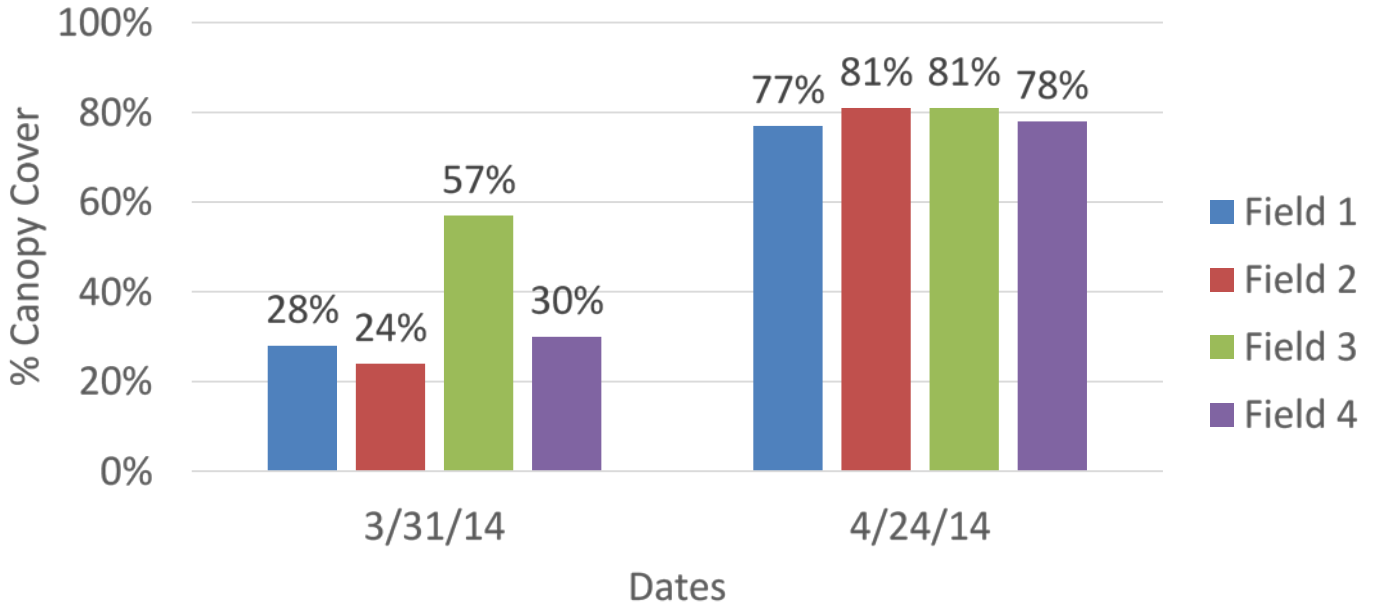
	Field 1		Field 2		Field 3		Field 4
	Annual Ryegrass, Crimson Clover, Radish	Weeds	Cereal Rye, Crimson Clover	Weeds	Cereal Rye, Hairy Vetch, Radish	Weeds	Control (Weeds)
March	150.32	47.97	358.2	12.79	335.81	99.15	70.36
April	4093.74	28.78	4010.59	703.61	2590.57	646.04	869.92
May							

Termination: 4/13/2013	Date of Cover Crop Termination Rating						
Evaluation: 5/16 & 6/20/2013	Rating		Rating		Rating		Rating
Field 1		Field 2		Field 3		Field 4	
Annual Ryegrass	3	Cereal Rye	1	Cereal Rye	3	Grass (Weeds)	5
Crimson Clover	1	Crimson Clover	1	Hairy Vetch	1	Broadleaf Weeds	5
Radish	1	Grass (Weeds)	N/A	Radish	1		
Grass (Weeds)	3	Broadleaf Weeds	N/A	Grass (Weeds)	3		
Broadleaf Weeds	3			Broadleaf Weeds	3		
Termination Ratings							
1 = Dead 3 = Severe Damage 5 = Moderate Damage 7 = Light Damage 9 = No Damage							

Date of Visual Rating of Cash Crop

20-Jun-13				
	Field 1	Field 2	Field 3	Field 4
Rating	N/A			
Ratings				
A = Excellent B = Good C = Average D = Poor E = Very Poor				

Canopy Cover for Cape County Field Trial (Lorberg)

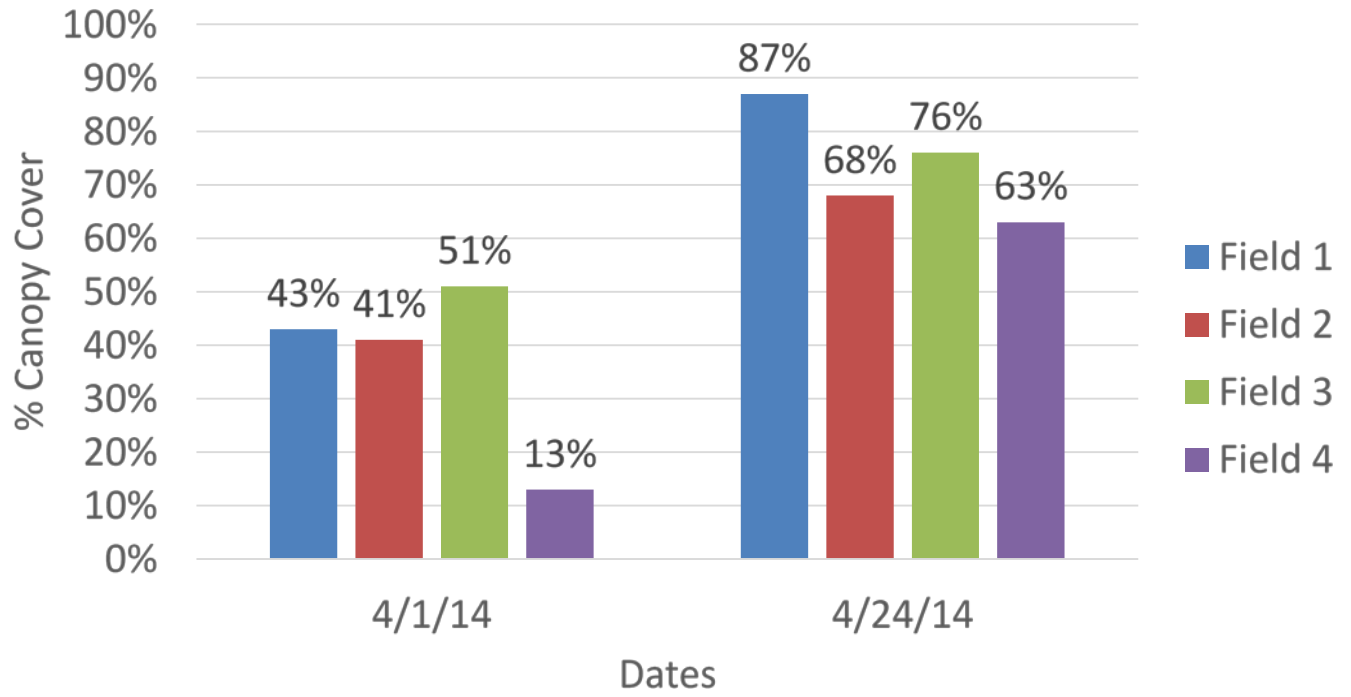


Field 1 = Annual Ryegrass, Crimson Clover, Radish	Field 2 = Cereal Rye, Crimson Clover
Field 3 = Cereal Rye, Hairy Vetch, Radish	Field 4 = Control (Weeds)

Pounds Per Acre of Dry Matter - Cape County (Lorberg)

	Field 1		Field 2		Field 3		Field 4
	Annual Ryegrass, Crimson Clover, Radish	Weeds	Cereal Rye, Crimson Clover	Weeds	Cereal Rye, Hairy Vetch, Radish	Weeds	Control (Weeds)
3/31/14	150	141	566	61	521	19	198
4/24/14	1462	211	2223	112	4490	80	400

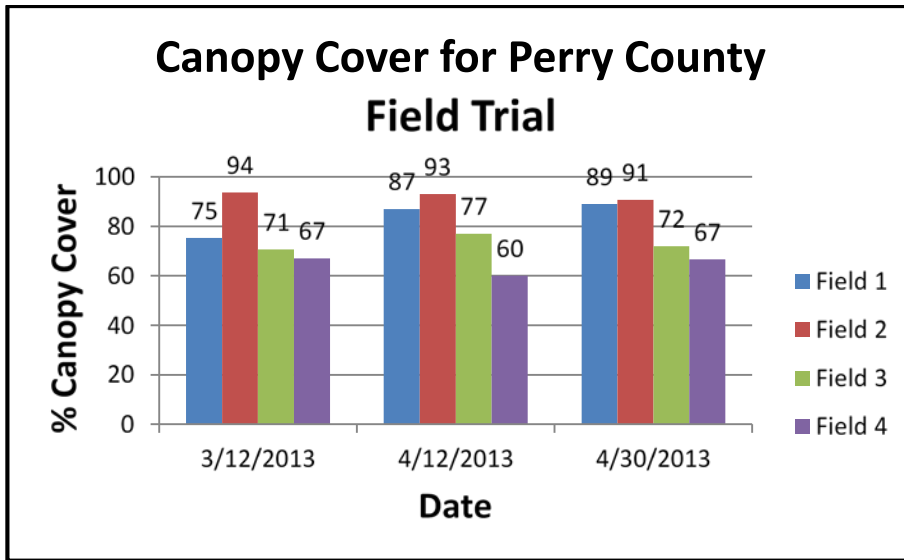
Canopy Cover for Cape County (Quade) Field Trial



Field 1 = Annual Ryegrass, Crimson Clover, Radish	Field 2 = Cereal Rye, Crimson Clover
Field 3 = Cereal Rye, Hairy Vetch, Radish	Field 4 = Control (Weeds)

Pounds Per Acre of Dry Matter – Cape County (Quade)

	Field 1		Field 2		Field 3		Field 4
	Annual Ryegrass, Crimson Clover, Radish	Weeds	Cereal Rye, Crimson Clover	Weeds	Cereal Rye, Hairy Vetch, Radish	Weeds	Control (Weeds)
4/1/14	96	0	457	0	265	0	16
4/24/14	1503	157	2005	38	2056	32	576



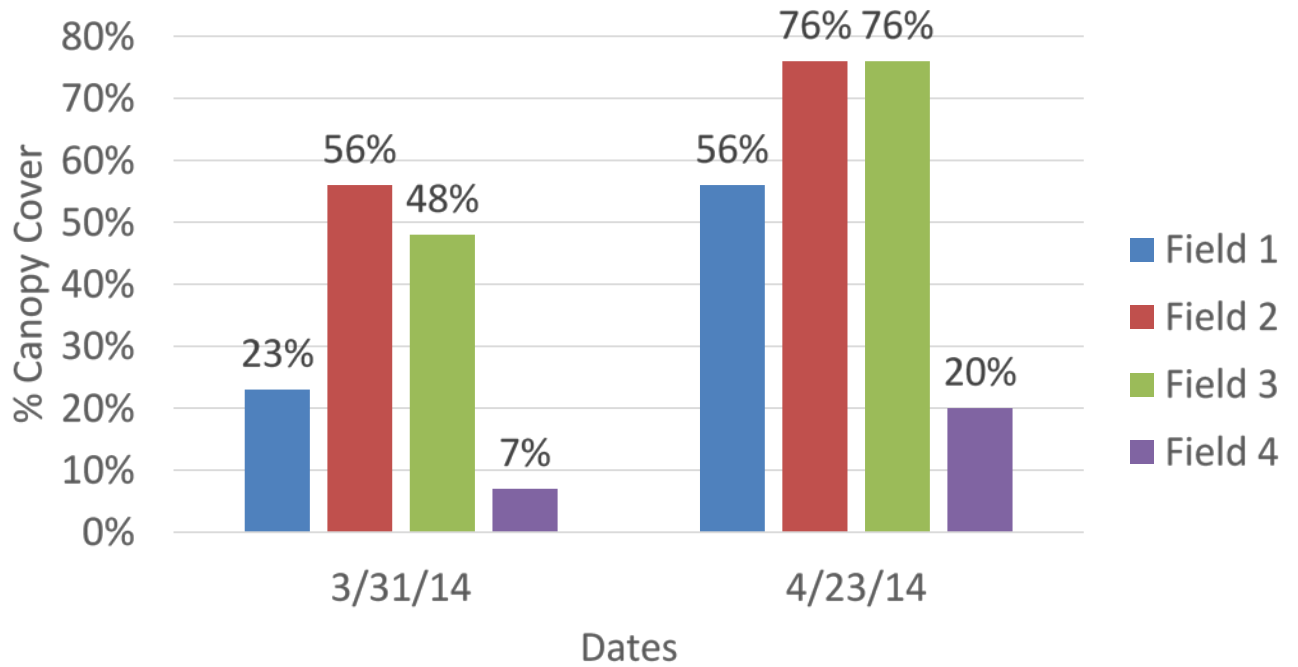
Field 1 = Annual Ryegrass, Crimson Clover, Radish Field 2 = Cereal Rye, Crimson Clover
 Field 3 = Cereal Rye, Hairy Vetch, Radish Field 4 = Control (Weeds)

Pounds Per Acre of Dry Matter - Perry County							
	Field 1		Field 2		Field 3		Field 4
	Annual Ryegrass, Crimson Clover, Radish	Weeds	Cereal Rye, Crimson Clover	Weeds	Cereal Rye, Hairy Vetch, Radish	Weeds	Control (Weeds)
March	1160.96	63.96	1695.07	0.00	802.76	22.39	1020.24
April	2219.58	47.97	4064.96	0.00	4016.99	60.77	869.92
May	2437.06	0.00	8005.19	0.00	6332.51	0.00	620.46

Termination: 5/1/2013	Date of Cover Crop Termination Rating						
Evaluation: 5/30/2013	Rating		Rating		Rating		Rating
Field 1		Field 2		Field 3		Field 4	
Annual Ryegrass	3	Cereal Rye	3	Cereal Rye	3	Grass (Weeds)	1
Crimson Clover	3	Crimson Clover	3	Hairy Vetch	3	Broadleaf Weeds	5
Radish	1	Grass (Weeds)	1	Radish	1		
Grass (Weeds)	1	Broadleaf Weeds	1	Grass (Weeds)	1		
Broadleaf Weeds	1			Broadleaf Weeds	1		
Termination Ratings							
1 = Dead 3 = Severe Damage 5 = Moderate Damage 7 = Light Damage 9 = No Damage							

Date of Visual Rating of Cash Crop				
30-May-13				
	Field 1	Field 2	Field 3	Field 4
Rating	B	C	B	B
Ratings				
A = Excellent B = Good C = Average D = Poor E = Very Poor				

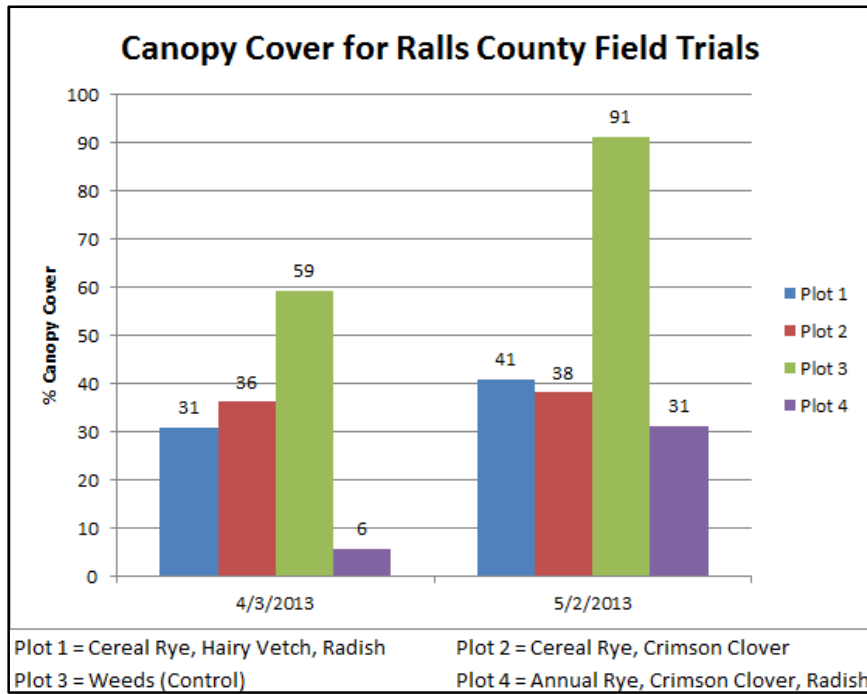
Canopy Cover for Perry County Field Trial



Field 1 = Annual Ryegrass, Crimson Clover, Radish	Field 2 = Cereal Rye, Crimson Clover
Field 3 = Cereal Rye, Hairy Vetch, Radish	Field 4 = Control (Weeds)

Pounds Per Acre of Dry Matter - Perry County

	Field 1		Field 2		Field 3		Field 4
	Annual Ryegrass, Crimson Clover, Radish	Weeds	Cereal Rye, Crimson Clover	Weeds	Cereal Rye, Hairy Vetch, Radish	Weeds	Control (Weeds)
3/31/14	32	13	384	19	320	19	10
4/23/14	652	144	2837	45	1794	29	35



Pounds Per Acre of Dry Matter - Ralls County

	Plot 1		Plot 2		Plot 3	Plot 4	
	Cereal Rye, Hairy Vetch, Radish	Weeds	Cereal Rye, Crimson Clover	Weeds	Control (Weeds)	Annual Ryegrass, Crimson Clover, Radish	Weeds
March	361.40	521.31	428.56	703.61	601.27	35.18	156.71
April	1611.91	345.41	1990.9	1117.78	2317.12	307.03	618.86
May							

Termination: 5/25 - 5/27/2013	Date of Cover Crop Termination Rating							
Evaluation: 6/21/2013	Rating		Rating		Rating		Rating	
Plot 1		Plot 2		Plot 3		Plot 4		
Cereal Rye	1	Cereal Rye	1	Grass (Weeds)	1	Annual Ryegrass	1	
Hairy Vetch	1	Crimson Clover	1	Broadleaf Weeds	1	Crimson Clover	1	
Radish	1	Grass (Weeds)	1		1	Radish		
Grass (Weeds)	1	Broadleaf Weeds	1		1	Grass (Weeds)		
Broadleaf Weeds	1				1	Broadleaf Weeds		

Termination Ratings

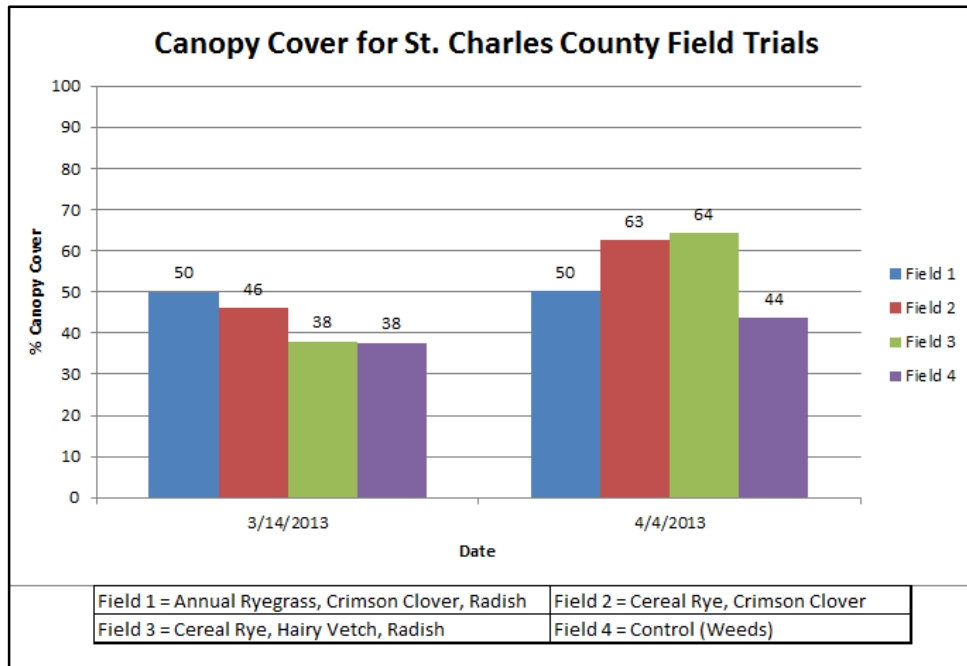
1 = Dead 3 = Severe Damage 5 = Moderate Damage 7 = Light Damage 9 = No Damage

Date of Visual Rating of Cash Crop

1-Jul-13					
	Plot 1	Plot 2	Plot 3	Plot 4	
Rating	B	B	B	B	

Ratings

A = Excellent B = Good C = Average D = Poor E = Very Poor



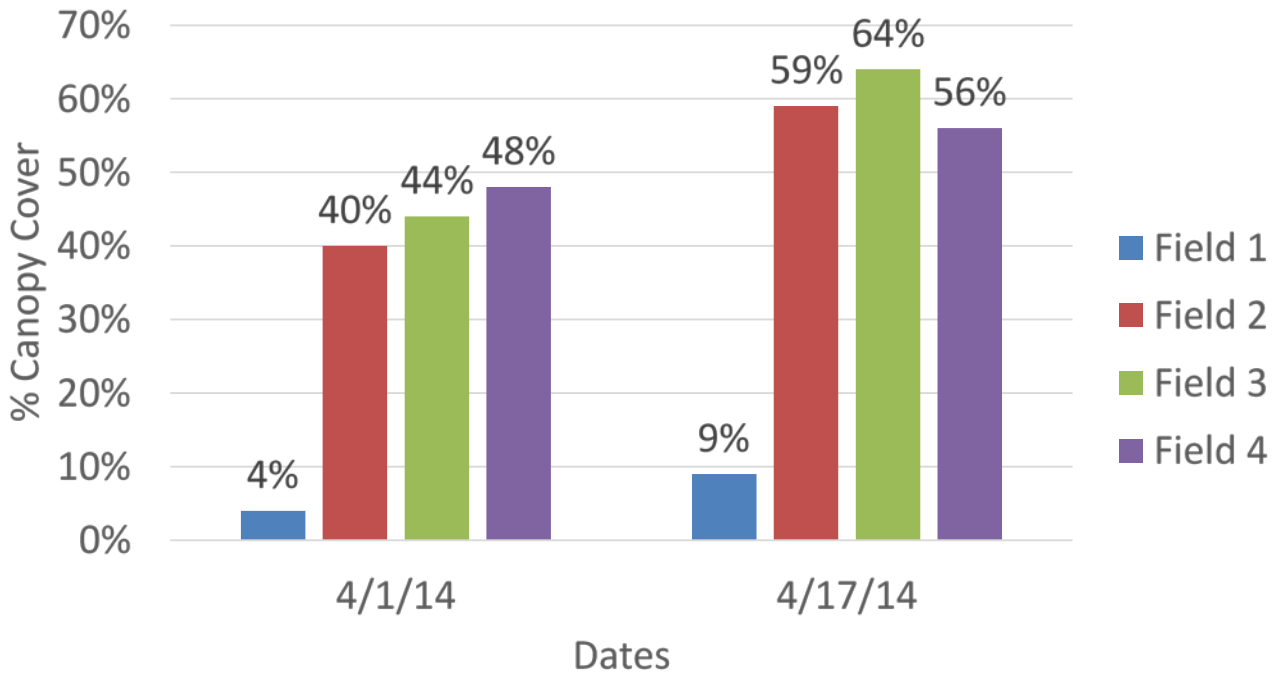
Pounds Per Acre of Dry Matter - St. Charles County

	Field 1		Field 2		Field 3		Field 4
	Annual Ryegrass, Crimson Clover, Radish	Weeds	Cereal Rye, Crimson Clover	Weeds	Cereal Rye, Hairy Vetch, Radish	Weeds	Control (Weeds)
March	821.95	339.01	668.43	259.06	441.36	201.49	431.76
April	476.54	546.9	588.48	153.52	1036.23	108.74	972.26
May							

Termination: 4/5 & 5/14/2013	Date of Cover Crop Termination Rating						
Evaluation: 6/15/2013	Rating		Rating		Rating		Rating
Field 1		Field 2		Field 3		Field 4	
Annual Ryegrass	1	Cereal Rye	1	Cereal Rye	1	Grass (Weeds)	1
Crimson Clover	1	Crimson Clover	1	Hairy Vetch	1	Broadleaf Weeds	1
Radish	1	Grass (Weeds)	1	Radish	1		
Grass (Weeds)	1	Broadleaf Weeds	1	Grass (Weeds)	1		
Broadleaf Weeds	1			Broadleaf Weeds	1		
Termination Ratings							
1 = Dead 3 = Severe Damage 5 = Moderate Damage 7 = Light Damage 9 = No Damage							

Date of Visual Rating of Cash Crop					
19-Jun-13					
	Field 1	Field 2	Field 3	Field 4	
Rating	B	B	B	B	
Ratings					
A = Excellent B = Good C = Average D = Poor E = Very Poor					

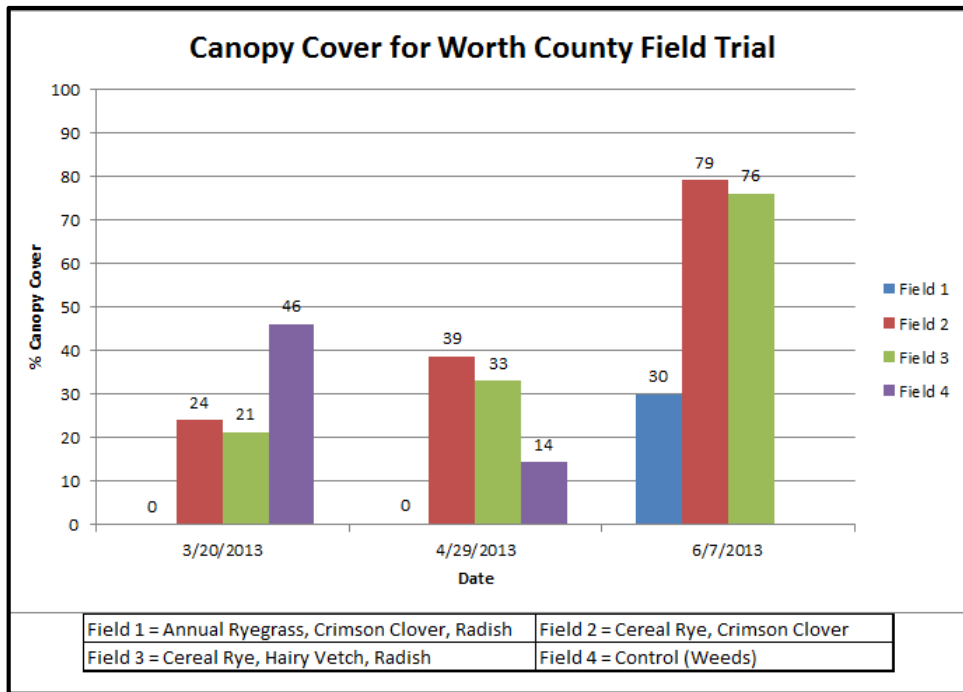
Canopy Cover for St. Charles County Field Trial



Field 1 = Annual Ryegrass, Crimson Clover, Radish Field 2 = Cereal Rye, Crimson Clover
 Field 3 = Cereal Rye, Hairy Vetch, Radish Field 4 = Control (Weeds)

Pounds Per Acre of Dry Matter – St. Charles County

	Field 1		Field 2		Field 3		Field 4
	Annual Ryegrass, Crimson Clover, Radish	Weeds	Cereal Rye, Crimson Clover	Weeds	Cereal Rye, Hairy Vetch, Radish	Weeds	Control (Weeds)
4/1/14	42	521	102	262	214	48	611
4/17/14	262	902	636	553	755	285	678



Pounds Per Acre of Dry Matter - Worth County

	Field 1		Field 2		Field 3		Field 4
	Annual Ryegrass, Crimson Clover, Radish	Weeds	Cereal Rye, Crimson Clover	Weeds	Cereal Rye, Hairy Vetch, Radish	Weeds	Control (Weeds)
March	0.00	111.94	25.59	0.00	28.78	0.00	0
April	31.98	319.82	383.79	134.33	441.36	86.35	502.12
May	706.81	1100.19	5817.59	601.27	4451.95	143.92	3054.32

Termination: 5/28/2013	Date of Cover Crop Termination Rating						
Evaluation: 7/1/2013	Rating		Rating		Rating		Rating
Field 1		Field 2		Field 3		Field 4	
Annual Ryegrass	N/A	Cereal Rye	1	Cereal Rye	1	Grass (Weeds)	1
Crimson Clover	N/A	Crimson Clover	1	Hairy Vetch	1	Broadleaf Weeds	1
Radish	1	Grass (Weeds)	1	Radish	1		
Grass (Weeds)	1	Broadleaf Weeds	1	Grass (Weeds)	1		
Broadleaf Weeds	1			Broadleaf Weeds	1		
Termination Ratings							
1 = Dead 3 = Severe Damage 5 = Moderate Damage 7 = Light Damage 9 = No Damage							

Date of Visual Rating of Cash Crop					
1-Jul-13					
	Field 1	Field 2	Field 3	Field 4	
Rating	B	B	B	B	
Ratings					
A = Excellent B = Good C = Average D = Poor E = Very Poor					

