Evaluation of Red Clover Establishment with Tillage and Seeding Date Combinations

Brant SCIA

Purpose:

To compare the establishment of red clover in wheat across various tillage systems ahead of winter wheat planting and interaction with red clover seeding date.

Most people recognize the value of red clover in a cropping rotation for delivering nitrogen credit, additions to soil organic matter and improved nutrient cycling, water holding capacity, general soil health and reduction in soil erosion. However, the use of red clover has declined in recent years since producers have had trouble getting uniform red clover establishment.

Methods:

In the fall of 2008, eight sites were established to compare tillage treatments and seeding dates. Standard tillage treatments across all sites included 3 intensities of tillage. The most aggressive tillage was achieved with a Salford Wingplow. Moderate tillage was established with a Salford RTS implement (Figure 1). A non aggressive no-till treatment was the standard.

Figure 1: Tillage Implements Used

Salford Wingplow

Salford RTS

Treatments were applied a minimum of 36” wide by the length of the field. Two replicates were used. Tillage occurred in mid October under slightly moist soil conditions. Winter wheat was seeded directly into the applied tillage treatment plots.

Red clover seedings were made perpendicular to tillage treatments. Three replicates of four seeding times were installed with establishment dates of mid December, mid February, mid March and late April. Red clover was seeded at 10 lbs/ac at all sites and seeding dates using a Valmar air boom fertilizer spreader. Plots were 40” by the width of

the tillage plot. The red clover used across all experiments was a double cut source from a single lot. Pre plant germination tests were conducted showing excellent vigor.

The December and April seedings were applied to bare ground. February and March seedings were applied to snow covered ground.

Tillage treatments were sub metre GPS'd to facilitate tillage plot harvest. Wheat yields were determined across the entire tillage strip, not accounting for presence of red clover in some areas of the plot as the establishment of red clover across tillage treatments was fairly uniform. Since tillage is expensive, the tillage plots will be harvested in subsequent corn and soybean crops to determine if the tillage effect has impact beyond the year following its establishment. This would help pay for the tillage treatment if wheat yield differences and red clover stands (nitrogen credit to next years corn crops) did not cover the increased cost of tillage over no-till seeding of wheat.

Assessments collected included visual establishment, heading dates, red clover stands (Pre Anthesis, Post Anthesis, Fall), red clover dry biomass and wheat yield and moisture.

Figure 2: Picture of Differences in Tillage Aggressiveness

Figure 3: Red clover stand across Tillage Treatments

Results:

Wheat yield data was analyzed using Statistix 9.0. No differences in wheat yield were detected across any site in the study (Table 1). No differences in wheat harvest moisture were detected (data not reported).

Red clover results are difficult to assess based on one years worth of data. Weather and other factors resulted in reasonably good red clover establishment across all tillage treatments and sites. The data reported is from very preliminary analysis. Further analysis and addition of a second years results is required for meaningful interpretation.

Table 1: Wheat Yields by Tillage Treatments

	Across Sites	brct09_ab	brct09_db	brct09_om	brct09_ps	brct09_sh	brct09_ss	brct09_tc	brct09_tp
Tillage	Yield (bu/ac)								
WingPlow	74.7	58.6 b	78.5	63.6	80.8	69.7	67.9	88.2	90.2
Rts	75.3	60.6 ab	77.8	63.8	80.1	71.9	72.3	88.6	87.6
NoTill	73.9	62.4 a	75.4	64.0	78.4	72.3	67.3	83.6	88.1
Disk				60.7					
Yetter				62.5					
Sign.	nsd	*	nsd	nsd	nsd	nsd	nsd	nsd	nsd
cv	3.7	1.3	2.5	2.3	5.0	0.5	3.6	6.2	3.0

Red clover data is much more difficult to analyze and interpret. Two sites are reported with further analysis required before accurate interpretation is possible. In Table 2, the data for site brct09_ab is reported. Comparing red clover stand establishment across tillage treatments for all seeding dates combined shows no significant difference in the stand counts of red clover (Ct1and Ct2). No difference in red clover biomass is observed either (Yield t/ha). Observing the middle columns of the table are where the red clover data is reported for seeding date across all tillage systems combined. Significant differences between dates were detected with the December date being significantly worse then the others which were not different from each other.

In the columns on the right of the table is where the results separately across tillage treatments and seeding dates is reported. No significant differences were detected between tillage treatments across the various seeding dates.

The data presented in Table 3 follows similar results. At this site no significant differences were observed between tillage treatments over seeding dates combined, seeding dates over tillage treatments combined or between tillage and seeding dates.

Summary:

This is the first year of a three year study. Based on wet weather conditions throughout the growing season of 2009 red clover establishment was good across all tillage treatments and most seeding dates. Wheat yields did not vary across tillage treatments.

Next Steps:

The study is being continued for two more field seasons.

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Table 2: Red Clover by Tillage Treatment Analysis Site 1

Site brct09_ab												
Tillage	Ct1	Ct2	Yield t/ha	Seeding	Ct1	Ct2	Yield t/ha	Tillage	Seeding	Ct1	Ct2	Yield t/ha
WP	35.3	49.0	2.9	Dec	8.7	25.9	2.1	WP	Dec	9.5	24.7	2.0
RTS	36.4	50.1	2.8	Feb	38.3	45.0	2.9		Feb	38.8	28.7	2.1
NT	31.3	45.7	2.5	Mar	31.2	56.8	2.8		Mar	38.2	24.5	2.1
Sign.	nsd	nsd	nsd	Apr	59.2	65.3	3.0		Apr	54.8	60.7	3.0
				Sign.	*	*	*					
								RTS	Dec	12.3	28.7	2.0
									Feb	40.2	46.3	3.0
									Mar	33.2	54.2	2.6
									Apr	60.0	71.3	3.3
								NT	Dec	4.3	24.5	2.1
									Feb	36.0	45.8	2.6
									Mar	22.3	48.7	2.7
									Apr	62.7	63.8	2.7
								Sign.		nsd	nsd	nsd

Table 3: Red Clover by Tillage Treatment Analysis Site 2

brct09_db												
Tillage	Ct1	Ct2	Yield t/ha	Seeding	Ct1	Ct2	Yield t/ha	Tillage	Seeding	Ct1	Ct2	Yield t/ha
WP	16.3	27.7	2.8	Dec	19.7	24.9	2.7	WP	Dec	18.5	25.5	2.6
RTS	20.3	21.6	2.6	Feb	21.6	21.2	2.7		Feb	12.0	27.5	2.7
NT	21.4	17.0	2.4	Mar	20.1	23.3	2.3		Mar	18.5	30.8	2.6
Sign.	nsd	*	nsd	Apr	16.2	18.9	2.6		Apr	16.3	27.0	3.1
				Sign.	nsd	nsd	nsd					
								RTS	Dec	19.2	27.8	2.8
									Feb	28.3	22.2	2.9
									Mar	19.3	20.2	2.3
									Apr	14.5	16.2	2.5
								NT	Dec	21.3	21.5	2.7
									Feb	24.3	13.8	2.6
									Mar	22.3	19.0	2.0
									Apr	17.7	13.7	2.3
								Sign.		nsd	nsd	nsd