Cover Crops Update 2006

Purpose:

This multi-year project was initiated to demonstrate and evaluate the growth potential of a range of cover crops, in manured and non-manured scenarios. Furthermore, the project is evaluating the potential uptake of soil residual nitrogen and fall applied manure nitrogen by the cover crops and the subsequent N release for utilization by succeeding crops such that fertilizer N requirements can be reduced. The work will examine the ability of cover crops to improve N use efficiency in corn production with the concurrent benefit of reducing N_2O emissions from agricultural practices.

Results:

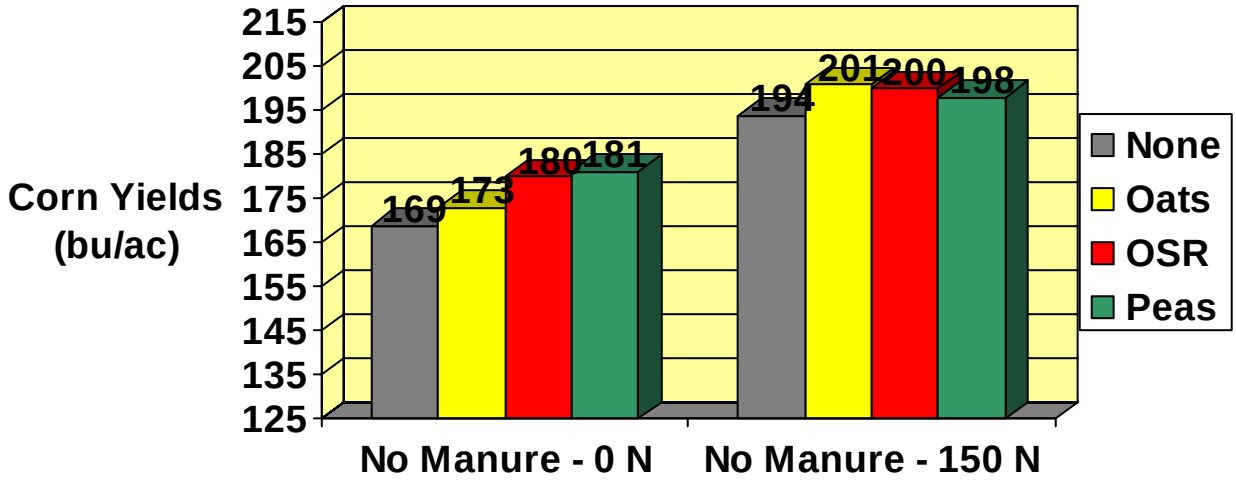
Corn Response following 2005 Cover Crops

Cover crop growth in the fall of 2005 was above average due to early plantings (i.e. mid – August) and a warm fall. By mid-October biomass in many of these cover crop plots , where manure was applied, reached levels of approximately 5500 kg/ha (dry weight) and with significant nitrogen sequestered in this biomass, often with over 100 kg N/ha. Six of these cover crop trials were planted to corn in 2006. At these sites the farm co-operators followed their normal cropping practices with the exception that every cover crop plot was split into two sub-plots. One of these sub-plots received no nitrogen beyond that which was applied in the starter fertilizer, while the other received starter N plus 150 kg N/ha at sidedress time. The focus was to determine the cover crops impact on corn yield and on the amount of nitrogen fertilizer that could be replaced by the use of cover crops.

Corn yields on most of the cover crop sites were above average. However, even with the outstanding cover crop growth in 2005 the impact on corn yields was quite minor and the nitrogen contribution was significantly less than anticipated. Figure 1. highlights corn yields from the Braemar Site near Woodstock. At first glance one could focus their attention on how high the yields were without any manure or nitrogen i.e. (181 bu/ac after a pea cover crop). Our analysis indicates that there was still a very profitable response to some additional nitrogen fertilizer (about 60- 70 kg N/ha) when manure was not applied and that the N credit to the pea crop amounted to only 13 lbs/acre.

Figure 2 highlights another challenge with cover crops that we have not experienced to any great extent in previous years. It appears, based on much of our corn response data that oat and oilseed radish cover crops produced enough biomass in the fall of 2005 that they tied up nitrogen to the point of reducing corn yield on those plots where neither manure nor nitrogen were applied. At the Saintsbury site this was most pronounced, where under the no manure, low nitrogen scenario the corn yields following oats and oil seed radish were significantly depressed compared to the corn following no cover (see Figure 2). Peas which had an equally large biomass as the other two crops, but which fixes its own nitrogen and has a more favourable C:N ratio in the stover, did not cause a similar yield depression. In fact, peas at the Saintsbury site resulted in yields that were nearly 30 bu/ac higher than the no cover option when manure and fertilizer N were omitted. The credit to the peas was estimated from the data shown in Figure 2 at 23 lb N/ac, still quite a ways of from being able to pay for the pea seed and a trip over the field with a no-till drill.

Figure 1. Impact of Cover Crops on Corn Yields
2006 Braemar Site



Commencing in the fall of 2006 another round of cover crop trials were established on 14 farm sites across the province. A similar approach was taken as in past years. Each site had a range of cover crops established by seeding after main plots of manure and no manure where established. Cover crop growth in 2005 was significantly less than experienced in 2005 and more inline with previous cover crop growth from prior years. Table 1 outlines cover crop growth from these 2006 sites, note that the addition of manure increased cover growth significantly. However, in contrast to the past several years the cover crops resulted in a much smaller impact on late fall nitrogen. This is most likely due to the fact that frequent and heavy rainfall leached soil mineral N that would have been normally present in the no cover plots.

Figure 2. Impact of Cover Crops on Corn Yields - 2006 Saintsbury Site

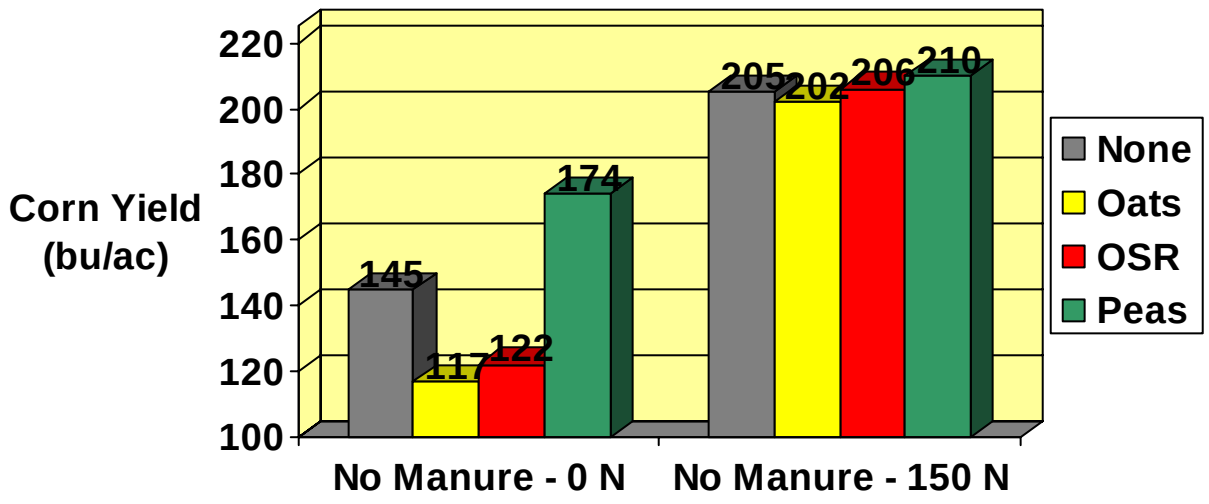


Table 1. Cover Crop Biomass And Late Fall Soil Nitrogen Levels. Fall 2006 Sites.

Site Grouping	Cover Crop	Cover Crop Biomass (tonne/ha – dry matter)		Late Fall Soil N Levels (kg N/ha)	
		Not Manured	Manured	Not Manured	Manured
A	Volunteer Growth	1.0	1.4	38	57
	Oats	2.0	3.0	32	53
	Oilseed Radish	**1.4**	**2.9**	**35**	**42**
Least Significant Difference		0.43 *		9.7 ns	
B	Volunteer Growth	0.9	1.3	38	56
	Oats	1.9	2.8	33	52
	Peas	**1.4**	**1.7**	**40**	**56**
Least Significant Difference		0.34 *		7.4 ns	
C	Volunteer Growth	0.8	1.2	33	45
	Oats	1.4	2.5	29	38
	Red Clover	**1.9**	**2.0**	**39**	**36**
Least Significant Difference		0.72 *		7.5 *	
D	Volunteer Growth	0.6	1.2	31	48
	Oats	0.8	1.6	27	37
	Annual Ryegrass	**0.5**	**2.3**	**26**	**39**
Least Significant Difference		1.87 ns		18.0 ns	
E	Volunteer Growth	0.5	1.2	34	49
	Oats	0.9	2.1	30	39
	Sudan Grass	**0.3**	**1.1**	**33**	**48**
Least Significant Difference		0.8 ns		10.8 ns	

ns Difference between means is not significantly different
* Difference between means is significantly different

Summary:

We are in the final year of this work on cover crops. To date we have noted that reasonable amounts of biomass from cover crops such as Peas, Oilseed Radish and Oats can be grown in most years providing seeding takes place before August 25. In some years the sequestering of nitrogen from the soil profile has been very large. A sign that at least in the short term we are keeping nitrogen tied up in plant biomass rather than having it move into the groundwater or the atmosphere.

Although we are confident that August seeded cover crops can a significant impact in the fall (via cover crop biomass and soil nitrate) we are less confident in our ability to show a significant immediate return to producers buying lowering their N requirements to the following corn crop.

Next Steps:

The economics, feasibility and systems approach to cover crop management including the impact on subsequent soil nitrogen status and corn crop growth will be studied in future cover crop work. Reliable N credits, similar to those we have for red clover, need to be developed for other cover crops both in a manure and non-manure environment.

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