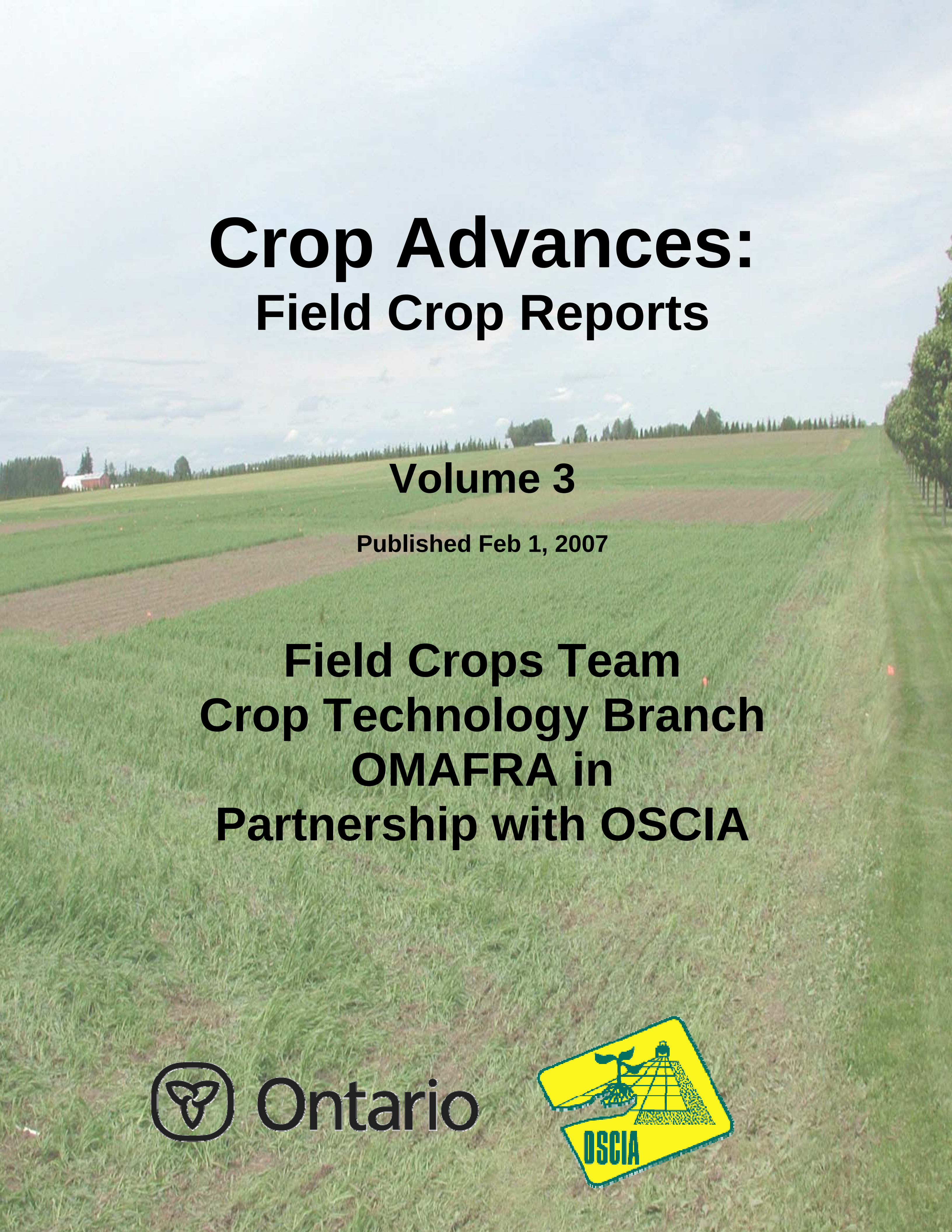

Crop Advances:
Field Crop Reports

Volume 3

Published Feb 1, 2007

Field Crops Team
Crop Technology Branch
OMAFRA in
Partnership with OSCIA

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Grant Type	Funding Supplied By
OSCIA-OMAFRA Partner	**OSCIA-OMAFRA Partner Grant**
OSCIA-OMAFRA-Major	**OSCIA-OMAFRA-Major Grant**
CORD	**Canadian Agricltural Adaptation Council**
OSC	**Ontario Soybean Growers**
OWPMB	**Ontario Wheat Producers Marketing Board**
OCG	**Ontario Canola Growers**
CAPAEI	**Canadian Agricultural Producers Addressing Environmental Issues Program**
AAC--AESI	**Canadian Agricultural Adaptation Council – Agri Environmental Stewardship Iniatiative**

Introduction

This report summarizes many of the completed projects that the Field Crop Team, Crop Technology Branch of the Ontario Ministry of Agriculture and Food (OMAF) were involved with over the past few years. Interim reports are also included highlighting on-going projects . In addition, this report highlights some of the key extension events involving OMAFRA Field Crop Staff that occurred during up until the end of 2005.

The OMAFRA Field Crop Team works in collaboration with producers, associations, academics, government and industry to evaluate new technologies and issues that are of importance to the people of Ontario and field crop agriculture throughout the province. The group would like to thank the many farm cooperators, university, government and industry partners who have contributed to the projects summarized in this report. Funding for projects is obtained from various institutions including provincial and federal governments, industry and producers. This contribution is greatly appreciated and we trust that the information generated in the activities of these projects will be of benefit to Ontario producers and the public.

This report summarizes both completed and on-going projects. Final versions of the full and completed report(s) can be obtained by following the link in the "Location of Final Report" section of each report. Interim projects are detailed but may not include data generated in initial years of a project. Data contained in an interim report should not be used for making significant changes in ones operation. Interim reports are included at the discretion of the Project Lead and may not contain data because the data is not complete, or in the opinion of the Project Lead may not reflect truly on the expected results and further investigation is warranted. The interim reports are included to highlight Field Crop Team activities and the information should be considered as incomplete until the final report of each project is released.

Other important resource information which the Field Crop Team contributes to include:

"The Cropline" at 1-888-449-0937 and new this year **Cropline** is available as a **Podcast**, get information on how to access this tool here:
http://www.omafra.gov.on.ca/english/crops/cropline/index.html

"Agricultural Information Contact Centre" at 1-877-424-1300

The OMAFRA Website:

Main Page : www.ontario.ca/omafra

Crops Page: www.ontario.ca/crops

Crop Pest: www.omafra.gov.on.ca/english/crops/field/news/news_croppest.html

Crop Talk: www.omafra.gov.on.ca/english/crops/field/news/news_croppest.html

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Valuable publications include:

<table>
<tr>
<td>Paid Publications:
• ALL NEW Soil Fertility Handbook (Publication 611)
• Agronomy Guide For Field Crops (Publication 811)
• Guide to Weed Control (Publication 75)
• Field Crop Protection Guide (Publication 812)
• Ontario Weeds (Publication 505)

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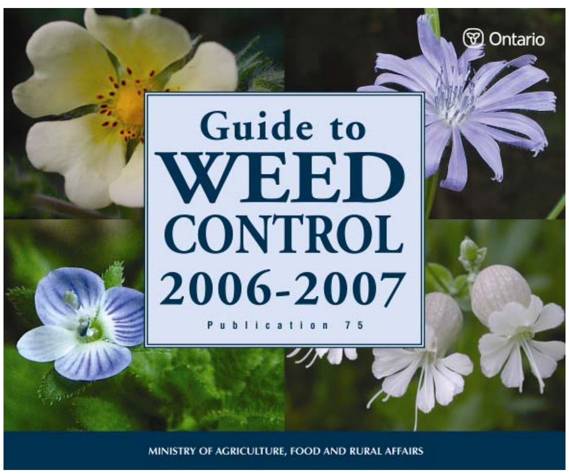
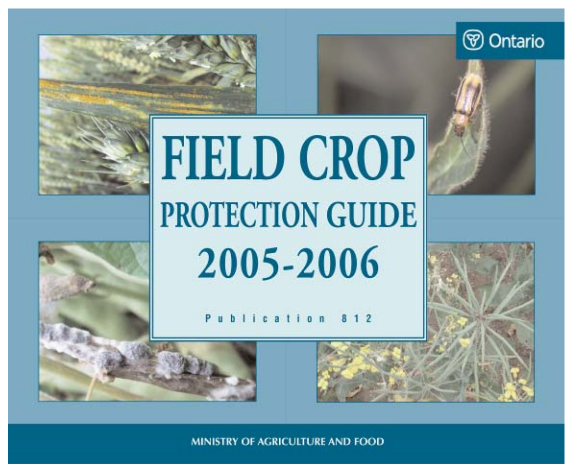
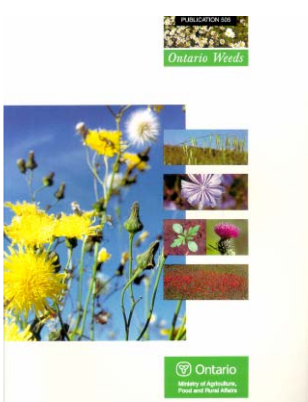
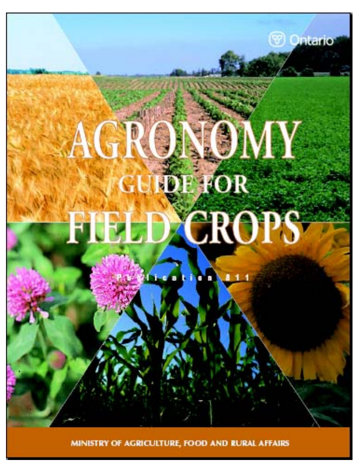
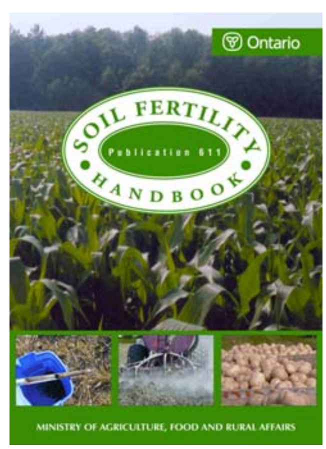
If you have general comments or concerns with the content or format of this report please forward these to the Field Crop Applied Research Coordinator Ian McDonald (Ian.McDonald@omaf.gov.on.ca.) or any of the Field Crop Team staff.











Cereal Leaf Disease Management with Headline, Tilt and Folicur Fungicides in Spring Cereals

FINAL REPORT 2006

Purpose:

To evaluate the effectiveness of HEADLINE fungicide and compare the Cereal Leaf Disease Control of HEADLINE, TILT, and FOLICUR with a non-treated strip. HEADLINE is a new fungicide for the control of leaf diseases in cereal crops. HEADLINE has the same window of application as TILT. Company literature promotes that there is a greater yield advantage for HEADLINE as compared to TILT. HEADLINE is not the same product as FOLICUR, although, some growers found that FOLICUR gave some control of late diseases and yield increases. HEADLINE should be applied by the flag leaf stage. This product can be applied, with a later application of Folicur to reduce Fusarium Head Blight.

Methods:

HEADLINE and TILT were applied on the cereal crop immediately after flag leaf emergence in strips, leaving a non-treated (check) strip for comparison. For 2005, HEADLINE was also applied earlier than the flag-leaf stage with the herbicide by some cooperators. This is referred to as “HEADLINE EARLY” for comparison. In 2006, BASF promoted the use of ½ rate (80 ml per acre) with the herbicide to be followed by FOLICUR was applied at the 75% head emerged stage of the spring wheat. In all plots, FOLICUR was applied at the 75% head emerged stage of the spring wheat. Strips of each treatment were harvested.

Results:

The results for the fungicide treatments in 2004, 2005 and 2006 are shown in the tables on the pages 2 to 5.

Fungicides on Oats showed no yield advantage and little improvement in Test Weight in 2004 (Table 1). Headline is not registered for use on oats, but was under a special research permit for this plot. Unfortunately there was not any comparison on oats in 2005 or 2006 to see if there was a yearly difference.

HEADLINE on barley resulted in a 3 to 5 bu/ac increase. Some barley varieties have better genetic resistance and therefore some varieties responded less than others (Table 2 & 3). At a cost of $23.00 per acre for product and application and a $100 per tonne for barley, the breakeven is about 10 bu/ac.

In spring wheat, the use of *HEADLINE - early* applied at the same timing as the herbicide did not show any improved yield (the negative yield response is due to field variability and lodging at this site) in 2005 (Table 5). In 2006 there was a slight yield advantage to ½ rate HEADLINE applied with the herbicide (Table 6). Because leaf diseases are rarely a present at this stage of wheat plant, we would not expect and yield response from a fungicide product.

The use of *HEADLINE at the flag leaf* emerged stage showed an economical yield advantage of 6.7 bushels per acre (bu/ac) in 2005 at Kinburn site only (Table 5). At this site there was heavy Septoria leaf disease pressure in stand at the flag leaf emerged stage of the wheat when the HEADLINE was applied. At other fields, there was no visible leaf disease present at the flag leaf stage of the wheat, therefore no yield improvement was expected.

In 2005 use of *FOLICUR only* showed about a 3 to 5 bu/ac increase in yield in spring wheat, with only a small advantage to including the *HEADLINE* with the herbicide. The use of *HEADLINE* with the herbicide and followed by the application of *FOLICUR* did not show an advantage as compared to the FOLICUR only treatment. It is interesting to note that in 2004 where HEADLINE was used at the flag leaf stage, there was about twice the fusarium and toxin level in the grain samples (Table 4). Although we are not sure why this is, the thinking is that HEADLINE controlled the other leaf diseases other than fusarium and because the fusarium mold did not have to compete with the other diseases and there was more growth of the fusarium.

Table 1: 2004 Fungicides on Oats – Strip Plots

Cooperator:	**Variety**	**Treatment**	**Moisture (%)**	**Test Wt. (lbs/bu)**	**Yield @13% (bu/ac)**
Munster, Ontario	AC Goslin	Headline	14.6	37.0	90.8
Munster, Ontario	AC Goslin	Headline	14.8	37.0	96.4
Munster, Ontario	AC Goslin	Headline	17.0	35.4	91.4
Munster, Ontario	AC Goslin	Headline	14.9	37.6	90.7
		Average	**15.3**	**36.8**	**92.3**
Munster, Ontario	AC Goslin	Tilt	13.9	37.3	88.4
Munster, Ontario	AC Goslin	Tilt	14.0	38.1	96.5
		Average	**14.0**	**37.7**	**92.4**
Munster, Ontario	AC Goslin	Non	14.1	37.5	96.6
Munster, Ontario	AC Goslin	Non	14.1	37.8	91.8
		Average	**14.1**	**37.7**	**94.2**
Richmond	AC Goslin	TILT	12.5	39.2	145.5
Richmond	AC Goslin	Non	12.0	37.7	145.3
		Difference	**0.5**	**1.4**	**0.1**

Table 2: 2004 Fungicides on Barley – Strip Plots

Site Location	Variety	Type	Diff. Moisture (%)	Diff. Test Wt. (lbs/bu)	Diff. Yield @14.5% (bu/ac)	Diff. Grade No	Diff. Fusa	Diff. VOM (ppm)	Comment
Douglas, Ontario	AC Klinck	6-row	0.0	0.1	-1.4	3.0	3.05%	0.00	High VOM in both
Ste. Isodore	OAC Baxter	6-row				0.0	0.80%	-1.70	
Douglas, Ontario	AC Klinck	6-row	0.0	0.1	2.8	4.0	4.00%	0.00	High VOM in both
Bromley, Ontario	AC Parkhill	2-row	1.5	-3.1	4.7	0.0	0.80%	0.00	High VOM in both
Bromley, Ontario	AC Parkhill	2-row	-0.2	-0.5	9.5	0.0	0.30%	0.00	High VOM in both
Douglas, Ontario	AC Parkhill	2-row	0.4	2.2	10.3	0.0	-0.01%	1.29	
	Average			**-0.21**	**5.17**	**1.17**	**1.49%**	**-0.07**	

Table 3: 2006 Fungicide Barley – Strip Plots

Variety	Treatment	Moisture (%)	Test Wt. (lbs/bu)	Yield @ 14.8% (mt/ac)	Yield @ 14.8% (bu/ac)	Average Yield @ 14.8% (bu/ac)
Encore	Headline #1	11.3	42.9	1.6	73.5	
Encore	Headline #2	11.5	42.3	1.8	81.0	77.3
Encore	No Headline #1	11.0	42.5	1.6	74.0	
Encore	No Headline #2	11.7	43.1	1.6	74.4	74.2

Note: HEADLINE was applied at flag emerged stage of the barley.

Table 4: 2004 Headline on Spring Wheat – Strip Plots

Site Location	Difference Test Wt. (lbs/bu)	Difference Yield @14.5% (bu/ac)	Difference Fusarium (+ = increase, - = decrease)	Difference VOM (ppm) (+ = increase, - = decrease)
Panmure	-0.8	-8.4	178%	196%
Woodlawn	-0.5	-2.2		
Panmure	-0.6	-1.4	13%	194%
Vernon	-1.3	-1.3		
Ste. Isodore	0.0	0.0	122%	140%
Vernon 2	-1.7	0.7	105%	-97%
Osgoode	-0.1	2.1	78%	440%
Dwyer Hill Rd	-0.5	2.9	118%	91%
Vernon 3	0.0	3.0		
Kinburn	0.0	3.0		
Vernon 2	0.6	3.1	32%	-1%
Kinburn	0.0	3.5		
Williamstown	0.9	4.5		
Dalmeny	0.2	10.3	200%	-12%
Average	**-0.26**	**1.42**	**106%**	**119%**

Note: Headline was applied at early emergence of the flag leaf.

Table 5: 2005 Fungicide Spring Wheat – Strip Plots

Site Location	Treatment	Yield (Treated - Untreated)	% Change in Fusarium	% Change in VOM
Osgoode	Headline - early	-10.6	9%	0%
Kemptville	Headline - early	-3.5	0%	-51%
Pakenham	Headline - early	1.5	212%	334%
	Average	**-4.2**	**74%**	**94%**
Kinburn	Headline @ flag leaf	6.7	-98%	18%
Renfrew	Tilt @ flag leaf	-2.3	-52%	0%
	Average	**2.2**	**-75%**	**9%**
Osgoode	Folicur Only	11.8	26%	8%
Renfrew	Folicur Only	0.1	-55%	0%
Kemptville	Folicur Only	5.5	100%	58%
Pakenham	Folicur Only	3.4	371%	474%
	Average	**5.2**	**111%**	**135%**
Kemptville	Headline + Folicur	6.2	-5%	-13%
Pakenham	Headline + Folicur	5.8	376%	103%
	Average	**6.0**	**186%**	**45%**

Table 6: 2006 Fungicide Spring Wheat – Strip Plots

Location	Variety	No Fungicide	1/2 rate Headline + No Folicur	Difference (bu/ac)
Brinston	Sable	55.1	57.3	2.2
Douglas	Sable	72.8	73.6	0.8
Beachburg	AC Barrie	50.4	54.2	3.7
Vernon	606	57.9	59.3	1.4
			Average	**2.0**

Comparison of Headline at ½ rate applied with the grower's herbicide, followed by an application of Folicur vs. Folicur only.
Note: FOLICUR only was better than combination with the HEADLINE

Table 6b: 2006 Fungicide Spring Wheat – Strip Plots

Location	Variety	Folicur Only	Headline 1/2 rate + Folicur	Difference (bu/ac)
Chesterville	606	65.3	64.7	-0.6
Pakenham	Sable	76.6	75.2	-1.4
Douglas	Sable	74.2	73.3	-0.9
Osgoode	AC Brio	67.2	62.6	-4.5
Osgoode	Sable	78.4	72.2	-6.2
Kemptville	Winfield	55.2	53.9	-1.3
Osgoode	Sable	71.3	66.6	-4.7
Vernon	606	66.1	65.5	0.7
			Average	**-2.4**

Summary:

HEADLINE, TILT and FOLICUR cost about $13.00 to $15.00 per acre plus application. Custom application rate is about $9.00 per acre. Grain yield loss due to sprayer trampling is about 2.5% or about 1.5 to 2 bu/ac. The break-even on spring wheat is about 5.5 bu/ac ($22/ac @ $5.25/bu = 4bu +1.5 bu for trampling). In 2005, the leaf disease pressure was low at most sites. Under these conditions, yield response would not be expected to be great. Only when leaf diseases are present would there be an economical yield response to the HEADLINE or TILT such as at the Kinburn site. FOLICUR was applied in only 4 side-by-side comparison strips in 2005. The average yield advantage was 5.2 bu/ac. However a project conducted from 2001 to 2003 with FOLICUR has shown only an average yield advantage of only 1.7 bushels/acre. The use of ½ rate HEADLINE with the herbicide application would need about 1.5 bu /ac to break-even.

Next Steps:

2006 crop year was the final year of this 3 year project.

Acknowledgements:

Thank you to the farm co-operators and to Summer Field Crop Technician for their work on this project. Also thank you to Pride Seeds - Ron Ferguson, Hyland Seeds and Pioneer - Bit-A-Luk Farms and Vernon Valley Farms for the use of their weigh-wagon. A special thank you to the *Ottawa Valley Seed Growers Association* for supporting this project.

Project Contacts:
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Economic Evaluation of Spring Wheat vs. Barley Potential

Purpose:

In 2006, Ontario farmers planted over 140,000 acres of spring wheat, the largest on record. There is a growing market demand for spring wheat with a large flour milling industry located in Ontario. The economics of spring wheat appear very attractive with the price in 2006 at around $180/t. However, growers have experienced variable yields with spring wheat in the past and question if the economic returns are higher than barley. Newer higher yielding spring wheat varieties are being offered. Spring wheat offers the potential for farmers to participate in a higher value end market and to continue to diversify crop rotations and income sources.

In 2006, the Georgian Region Soil & Crop Improvement Association initiated a 3 year project to evaluate the yield, quality and returns from spring wheat and barley. A second objective was to evaluate seeding rates for spring wheat.

Methods: Field-length strips of barley and spring wheat were planted applying the correct inputs for each crop. Nitrogen was applied at 80 lb/ac actual to spring wheat and 40–50 lb/ac to barley. A foliar fungicide was applied to plots if required where it was practical. Each site included 2 replications. Final plant population, yield, moisture, test weight and protein information was collected. At 7 of the 10 sites, three spring wheat seeding rates were compared; 1.2, 1.6, & 2.0 million seeds/ac. These sites were seeded using the Middlesex Soil & Crop JD 1560 no-till drill. The current recommended spring wheat seeding rate is 1.4 – 1.6 m seeds/ac. Two seeding rates were employed for barley at these locations; 1.0 and 1.4 million seeds/ac.

Results:

The spring of 2006 was warm and dry, allowing growers to plant the majority (65%) of spring cereal crop before the last week in April. This was especially important for spring wheat, which has significantly better yield potential when seeded very early. The average yield of the spring wheat crop was 49.2 bu/ac, with yields of over 70bu/ac reported. The plots were all planted during the last 2 weeks in April into excellent soil conditions. The yield and returns for each of the 10 locations are presented in Table 1. The average yield across locations was 49 bu/ac for spring wheat and 76 bu/ac for barley. Cash income was calculated using a crop price of $180/t for spring wheat and $120/t for barley. Costs were based on 2006 Ontario Ministry of Agriculture, Food and Rural Affairs (OMAFRA) crop budgets, excluding land costs and costs for bailing straw. The returns for straw are not included since no straw yields were collected, even though this is an important component in determining overall profitability.

Year 1 Preliminary Results.

Quality of the spring wheat was good at all locations and all samples achieved the maximum protein premium. Dry weather took its toll on yields. The average return over costs was $18/acre for spring wheat and $(-2)/acre for barley. The highest return was $117/ac from spring wheat that yielded 70 bu/ac at Arthur 1 site. At none of the sites did the return from barley exceed $50/acre. Spring Wheat produced higher returns than barley at 6 out of the 10 sites.

Table 1 - Comparison of Yield & Economics Of Spring Wheat Vs Barley

Location	Planting Date	Wheat Yield	Barley Yield	Wheat Income	Wheat Return	Barley Income	Barley Return
		bu/ac	bu/ac	$/ac	$/ac	$/ac	$/ac
Durham	5-May	40	62	196	-$25	162	-$37
Ayton	21-Apr	45	62	220	-$1	162	-$37
Arthur 1	27-Apr	70	95	343	$117	248	$44
Arthur 2	2-May	51	86	250	$27	224	$22
Grand Valley	3-May	60	87	294	$70	227	$24
Grand Valley 2	3-May	37	65	181	-$39	170	-$29
Listowel	4-May	50	97	245	$23	253	$49
Arthur 3	26-Apr	49	62	240	$18	161	-$37
Stayner	5-May	38	82	186	-$34	206	$12
Elmira	3-May	50	65	245	$23	170	-$29
		Average Net Return/acre			$18		$-2

Note: Input costs for Barley = $188 + trucking, Wheat = $214 + trucking.

Spring Wheat Seeding Rate Comparison

The current OMAFRA recommended seeding rate for spring wheat is 1.4 – 1.6 million seeds/ac. This trial evaluated 3 seeding rates, 1.2, 1.6, and 2.0 m seeds/ac (Table 2). Final stand counts achieved were 60% across all target seeding rate. The final stand counts were lower than expected, even though the drill was calibrated for seeding rate on several occasions. This will be reviewed for 2007. There was a slight trend to higher yield with the 1.6 and 2.0 seeding rate (Table 3). In previously conducted trials with earlier planting dates, we have not seen a yield increase with higher seeding rates.

Table 2 - Spring Wheat final populations

	Seeding rate in million seeds/ac		
Location	**1.2 m/ac**	**1.6 m/ac**	**2 m/ac**
	Plants /ac (million/ac)		
Arthur 1	0.83	1.0	1.2
Arthur 2	0.76	0.98	1.2
Grand Valley	0.69	0.82	0.94
Grand Valley 2	0.83	1.0	1.2
Listowel	0.81	1.1	1.5
Elmira	0.74	1.0	1.35
Arthur 3	0.71	0.80	0.97
Arthur 4	0.73	0.94	1.2
Average m/acre	**0.76**	**0.97**	**1.2**

Table 3 - Comparison of Spring Wheat Seeding Rates

	Seeding rate million seeds/ac		
Location	**1.2**	**1.6**	**2 m/ac**
	Yield bu/ac		
Arthur 1	72	73	73
Arthur 2	51	51	51
Grand Valley	57	59	63
Grand Valley 2	35	38	38
Listowel	48	49	53
Elmira	46	52	52
Arthur 3	48	48	51
Arthur 4	64	66	68
Average bu/ac	53	55	56

No comparison for barley seeding rate is presented due to too few locations.

Summary:

Preliminary results from this study indicate:

- The return from wheat exceeded that from barley at 6 of the 10 sites. Spring wheat returned $20/acre more than barley averaged over all sites excluding straw income.
- A Trend to higher yields of spring wheat with higher seeding rates when planted in the last week of April.

Next Steps:

The project is to be continued for 2 more years. In 2007, the goal will be to plant some sites at an earlier date.

Acknowledgements:

The Ontario Soil and Crop Improvement Association members that participated in the trials
The Georgian Regional Soil & Crop Improvement Assoc for funding this project
C & M Seeds, Hyland Seeds, Cribit Seeds for seed for the trials
Mike McFarlane, Nicole VanOstaeyen – summer students

Project Contacts:

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Innovative Nitrogen Management Strategies For Winter Wheat

Purpose:

To determine if new nitrogen level detection equipment such as "Green Seeker" Technology along with innovative application windows for supplement nitrogen fertilization could achieve consistent minimum protein levels in newer varieties of hard red winter wheat as required to meet market demands with Ontario millers.

Methods:

A series of small plot and farm scale research trials are being established in various locations across Ontario. In small scale plots the goal is to determine varietal response to nitrogen rate/timing systems. This work is being conducted at the Elora Research Station of the University of Guelph. Mid size plots have also been established by project partners C&M Seeds of Palmerston and Hyland Seeds of Blenheim Ontario in which nitrogen rate/timing systems will be applied to existing and new materials being developed separately by each partner.

Field scale trials will be located in the Ridgetown area of Ontario and coordinated by Ridgetown College. In these cases, a full size self propelled sprayer has been outfitted to apply 28% UAN (urea ammonium nitrate) at various rates and timings. Fields planted to hard red winter wheat varieties in the fall of 2006 are being monitored to determine suitable sites for installation of the trials in early spring 2007. Additional sites are being scouted in the Golden Horseshoe Soil and Crop Region to complement these more intensive Ridgetown sites.

The main project was to commence in the fall of 2006 for two growing seasons (2007 and 2008); however, pilot work was performed in the 2006 crop on a small scale as a step toward more extensive plans for the fall of 2006 and in preparation for 2007.

Two handheld Green Seeker Units (http://www.ntechindustries.com/) have been purchased for the project. These are being calibrated and will be used to optically monitor nitrogen relationships in the soil from early spring until post anthesis on a by variety basis. The goal is to determine if such technology has a useable place in eastern Canadian wheat production to assist in judging nitrogen application volume requirements and potentially more importantly, optimal timing of nitrogen application to target minimum wheat protein levels of 12%.

The nitrogen rate and timing components of the project are based on work done internationally that indicates post anthesis nitrogen applications being more consistent in achieving milling quality protein levels then has been experienced with North American single nitrogen application or split early and pre anthesis application timing methods.

Due to the nature of the fall 2006 wheat planting season, the limited number of trials that were able to be seeded will be monitored carefully through early spring to determine their suitability for the study. There is concern that yield potential has been compromised on these sites because of the late date and difficulty of planting coupled with continued poor conditions through the Nov 2006 to Jan 2007 period. Although the fall 2006 sites will likely be followed through in 2007 the partners have discussed the issue of predisposition of results due to poor yield potential and are prepared to conduct the trials for an additional year. The small plot trials at Elora were unable to be seeded. These will be planted in the fall of 2007 and 2008 instead of the previously planned 2006 and 2007 windows.

Results:

Two fields were acquired during 2006 where N rates and their timing were investigated on wheat yield and protein concentrations. N was applied at various rates during March or April for the early application; more N was applied in a second application around flowering. There was an economical response to an early N application up to approximately 90 kg N ha^{-1}. Protein concentrations did not respond to late application of N in the one field, while samples still need to be analyzed for protein the second field. We expected little protein response from the first field because of extremely high yields and the relatively low rate of N in the second application at flowering, but we expect higher protein concentrations in the second field because of lower yields compared to the other field. One of the objectives of this project in the future is to determine or fine-tune N rates for the late timing that would account for yield potential. Currently, no recommendations exist in Ontario.

We participated in a workshop in Oklahoma for using optical sensing technology for fine-tuning N applications. This research has been conducted around the world with promising results, but little research has been conducted in Ontario on our wheat's and in our climate. Therefore, field-length N rates were established in 2006 on several wheat fields with varying yield potentials across varying topography and soil types. With the assistance of A&L Laboratories, we optically-sensed field-length strips of wheat on-the-go in late April using an ATV-mounted Greenseeker sensor equipped with a GPS data logger. Field maps were generated, whereby wheat yield potentials will be subsequently determined (see Figure 1). These potentials will be compared with actual yield data from the combine. Small plots were also established on these fields to determine the response to N fertilizer (see Figure 2). Both of these are needed to test and calibrate optical sensing technology for Ontario. All data have yet to be analyzed, but early results and comparisons indicate promise for using the tool to fine-tune N requirements for hard red winter wheat and for attaining higher and more consistent protein concentrations at harvest.

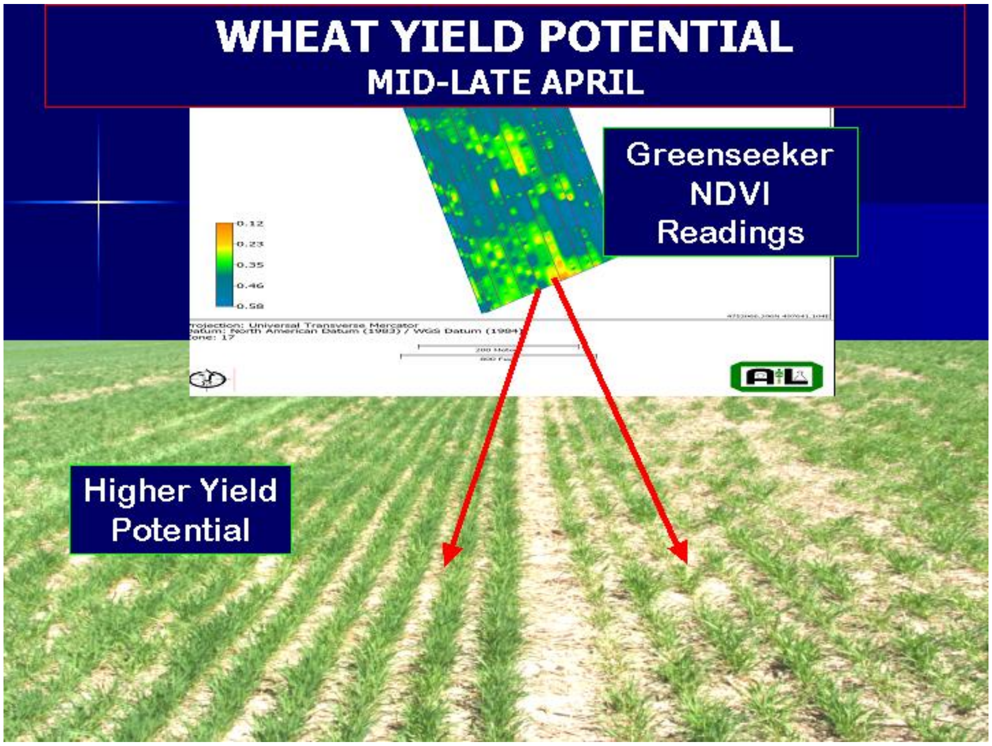

Figure 1. Wheat yield potential map generated from optical sensing tool in mid-late April.

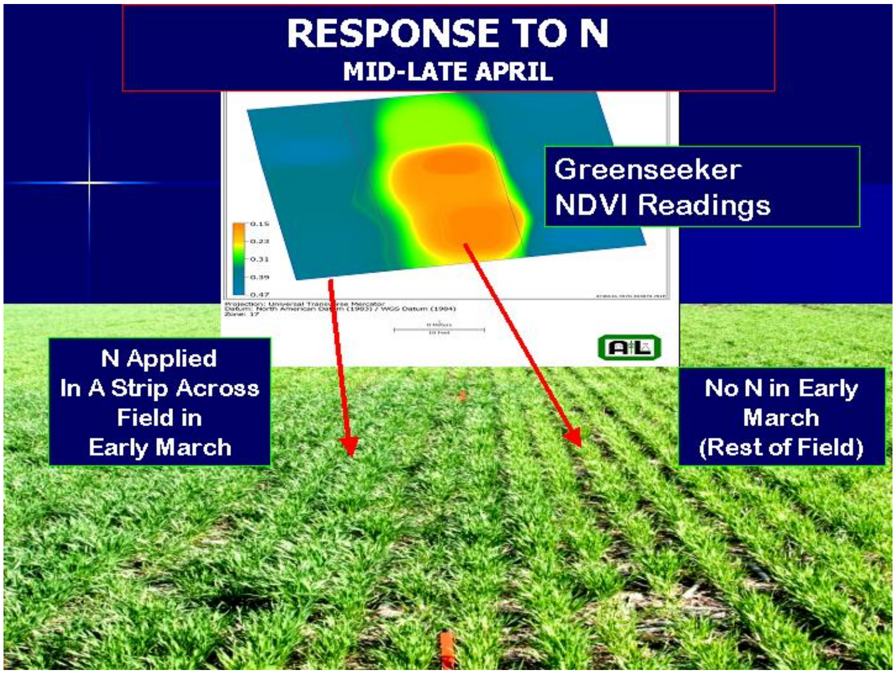

Figure 2. Response to N from an early application in March during mid-late April. The difference in the response is related to the amount of mineralized N in the soil solution, and the wheat crop is used as the indicator to determine the response to N fertilizer.

When we couple the N response with the yield potential, N rates may be fine-tuned from our current recommendations.

Summary:

NA

Next Steps:

Described in “Methods” above.

Acknowledgements:

The project principles would like to thank the following organizations for their contributions to the project.

OMAFRA New Directions Program
Ontario Soil and Crop Improvement Association Regional Partner Grant with GHSCIA
Ontario Wheat Producers Marketing Board
C&M Seeds, Palmerston
Hyland Seeds, Blenhiem
University of Guelph Dept. of Plant Agriculture and Ridgetown College.

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Location of Project Final Report:

Cruiser Insecticide On Winter Wheat

Purpose:

To evaluate the impact of Cruiser as a seed treatment on winter wheat for the control of soil borne insects.

Methods:

Cruiser was commercially applied to the seed, with the same seed lot having no Cruiser applied as well. All seed was treated with Dividend to prevent seedling diseases. Field length side by side comparisons were planted in the fall of 2005 and harvested in the summer of 2007. Plant stand counts were assessed where visual differences were observable.

Results:

Table 1 shows the cumulative results of 25 trials in 2006. Cruiser out yielded the untreated check in 18 of the 25 trials (72%), but on average showed only a 1.6 bu/ac increase. In only 4 of the 25 trials was the yield increase greater than 5 bu/ac (average 7.4, range 5.1 to 9.0), and of these 4, only 2 showed significant difference in plant stand. In both of these cases, European Chafer was the insect causing the reduced plant stand.

These initial results indicate that insecticide seed treatments are not economic on an “every field” basis. However, where growers have a history of white grubs (European Chafer, June Beetle) or heavy wireworm infestations, the addition of an insecticide as a seed treatment can make the difference between having a crop to harvest and having no crop to harvest.

Table 1: 2006 Cruiser results

Trials	Cruiser	No Cruiser	Difference
	Yield (bu/ac)		
25	90.1	88.5	1.6
4	74.1	66.7	7.4

Summary: Average yield increase to Cruiser insecticide as a seed treatment on winter wheat showed only a 1.6 bu/ac yield increase, which does not give the grower an economic payback. In fields where significant insect pressure existed, stands were improved and yields increased by up to 9 bu/ac. Growers that have a history of soil borne insect pressure should consider planted Cruiser treated seed. However, given the small demand for this specialized seed treatment, growers may have difficulty in acquiring seed treated with Cruiser, and need to make these arrangements well in advance.

Next Steps: Further simple scouting methods need to be developed to allow growers to determine high risk fields quickly and easily prior to planting. The development of an effective, easily applied drill box treatment would ease the difficulty associated with finding commercially treated seed at planting time.

Acknowledgements: Many thanks to Pioneer Hi-Bred Ltd., and the Ontario Wheat Producers Marketing Board, for supporting this project.

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Location of Project Final Report:

Peter Johnson

Folicur and Headline Impacts on Wheat

Purpose:

To evaluate the benefit of applying Folicur fungicide alone on winter wheat in Ontario. To further evaluate the use of half rate (80 ml) Headline fungicide applied at weed control timing followed by Folicur at Fusarium timing.

Methods:

Folicur was applied to winter wheat at the recommended rate in field length strip trials over a four year period. Timing was targeted at the Fusarium control window, between Day 1 and Day 4 (Day 0 is when 75% of the heads have fully emerged above the flag leaf). In other plots, Headline fungicide was applied at ½ the full label rate (80 ml/ac applied) followed by Folicur application at Fusarium timing.

Results:

The 2006 results for Folicur alone are listed in Table 1 below. 2006 was not a Fusarium year, thus the average response would be expected to be lower than during a Fusarium outbreak. This outcome is supported by Table 2, the 4 year summary data, where the response in 2005 and 2006 (little Fusarium pressure years) is lower than in 2003 (significant Fusarium pressure). While 2006 was not a Fusarium year, rust was a much larger concern than in past years. There is some concern that the race of leaf rust may have shifted to overcome the tolerance of some varieties, notably Vienna and FT Wonder. This has not been confirmed to date, but undoubtedly more rust was evident at an earlier stage on these varieties, often resulting in very significant yield responses to applied fungicides.

The results are surprisingly consistent. In 2006, Folicur application increased yield in 79% of the trials, a consistent trend over the 4 years of the project. Over the 4 years of the trials, Folicur application improved yield in 75 to 80% of the trials. However, at an average 5.4 bu/ac yield increase, Folicur is not a guaranteed payback. Using $21.50/acre as a cost of product plus application, a grower would need to sell his wheat for more than $4.00/bu in order for the Folicur application to be profitable, on an average basis. This does not factor into account any increase in grade that might occur under a Fusarium outbreak. In 2003, Folicur application improved the grade in 1/3 of the trials. This impacts profitability tremendously, often increasing price by $30 to $50/tonne. In these cases Folicur would prove extremely profitable!

Table 1: 2006 Folicur Trials

Location	Folicur	No Folicur
	Yield (bu/ac)	
Perth	121.9	119.2
Perth	126.3	115.3
Huron	97.4	96.8
Huron	83.3	80.5
Middlesex	116.4	104.1
Middlesex	101.7	101.8
Middlesex	121.2	118.8
Middlesex	123.8	113.3
Perth	116.3	117.0
Middlesex	95.3	94.6
Middlesex	94.7	91.0
Lambton	100.2	103.3
Huron	94.4	93.7
Huron	92.3	90.2
Lambton	106.2	89.7
Lambton	90.5	79.4
Elgin	103.8	103.9
Kent	101.5	97.9
Middlesex	111.4	104.5
Wellington	95.0	87.0
Wellington	109.8	104.3
Middlesex	111.4	108.3
Lambton	77.5	79.2
Lambton	102.0	99.0
Average	**103.9**	**99.7**

Table 2: 2003-2006 Folicur Summary

Year	# Trials	Check	Folicur	Gain
		Yield (bu/ac)		
2003	27	93.8	101.4	8.1
2004	29	83.0	89.6	6.6
2005	23	85.4	88.2	2.8
2006	24	99.7	103.9	4.2
03-06	**103**	**90.3**	**95.7**	**5.4**

The second part of this trial included investigating ½ rate Headline applied with the herbicide, to limit disease development prior to Folicur application. The results are presented in Table 3. On average, yields increased by 1.9 bu/ac. This project will need to be continued in the future to have enough trials to determine if this practice is of real value or not.

Table 3: 2006 Headline plus Folicur

Location	Headline	No Headline
	Yield (bu/ac)	
Lambton	100.0	89.0
Lambton	105.0	106.0
Elgin	85.5	91.5
Middlesex	106.3	104.8
Middlesex	118.5	120.0
Middlesex	115.4	107.5
Middlesex	91.1	89.8
Average	**103.1**	**101.2**

Summary: Over 4 years and 103 trials, Folicur applications increased winter wheat yields an average of 5.4 bu/ac, increasing yield 78% of the time. An initial look at ½ rate Headline applied with the herbicide, followed by Folicur at Fusarium timing, further increased yield 1.9 bu/ac, but only showed yield increase in 4 out of 7 trials. In both cases, profitability is based on the price the wheat crop is sold. When wheat is above $4.00/bu, fungicide applications are generally profitable. The exception is under Fusarium pressure, where Folicur applications showed a grade increase in the crop 1/3 of the time. In these situations, Folicur applications will greatly increase profitability.

Where growers have contracted winter wheat well above $4.00/bu, a Folicur application would be a prudent management inputs. Headline applications at herbicide timing require further study. However, on years with very low disease pressure (i.e.: 2005), growers must recognize that they will not get payback from fungicide application. Unfortunately, it is nearly impossible to forecast when these conditions will occur. When weather appears to be holding in a hot, dry pattern, growers should forgo fungicide applications.

Next Steps: Further trials are required to assess the impact of ½ rate Headline applied with the herbicide. The new Fusarium fungicide Proline needs to be evaluated in field trials if it achieves registered status in time.

Acknowledgements: Many thanks to all the co-operators, the Middlesex Soil and Crop Improvement Association, the Ontario Wheat Producers Marketing Board, BASF the Chemical Company, Bayer, Pioneer Hi-Bred Ltd, and a special thanks to all our student prodigy's over the years of this project.

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Location of Project Final Report:

Peter Johnson

Row Width Effects on Winter Wheat and Red Clover Establishment

Purpose:

To evaluate the impacts of various row width configurations on the yield of wheat and the establishment of under seeded red clover.

Methods:

Two replicate randomized field length trials were planted in the fall of 2005, with red clover applied early in the spring of 2006. Row width configurations included 7.5", "1 in 4" (1 row blocked, three rows on, or 75% of the rows on), "1 in 3" (1 row blocked, 2 rows on, or 67% of the rows on), and 15" (50% of the rows turned on). Populations were kept as equal as possible, regardless of row width configuration. Clover was applied by the grower using whatever was the normal practice on that farm. Nitrogen rates were maintained at full rate across the trials. Weed control was applied as needed, or as per the farms normal practice. Yields were taken from the wheat at harvest 2006, with subsequent clover counts one month after harvest.

Results:

Wheat yield results are shown in Table 1 below, with the summary data presented in Table 2. At both the Shady and Thorndale location, the 7.5" rows were planted with a drill, while the 15" rows were planted with a planter. At all other locations all treatments were planted with a drill and rows were simply plugged. Yield data was lost at the Woodstock 2 site.

There is a definite trend to decreased yield as row configurations moved away from the standard 7.5" configuration, but the trend is not exactly consistent. It is interesting to note that the latest planted site (Woodstock), which had very little fall growth and no fall tillering, showed by far the least effect of row widths. Whether this is an impact of spring tillering, low yield potential, or just a random effect, is unclear.

If wider row spacing indeed results in a 5 to 7% yield drop as these initial results indicate, this would have a major impact on the economics of clover, even if these wider row configurations did result in improved stands.

Clover stand counts are shown in Table 3. While there is a slight numeric trend toward increased clover stands with wider row widths, there is such variability in the data that no conclusions can be drawn. Some of this variability may be due to the wet fall experienced, and the amount of small clover plants that started to grow after wheat harvest. Red clover was extremely stressed by dry conditions through much of June and early July, which coupled with high wheat yields, resulted in poor stands in many fields. Early indications, however, would suggest that light penetration by wider row widths of wheat will not answer the clover establishment dilemma.

Table 1: Individual Data 2006 Row Widths

Location	7.5"	1 in 4	1 in3	15
		(75%)	(67%)	(50%)
	Yield (bu/ac)			
Woodham	98.4	84.5	84.5	74.8
Woodstock	69.7	69.5	72.4	69.1
Lucan	97.0	95.9	93.7	93.1
Perth	72.8	72.0	70.0	62.7
Elgin	97.3			95.2
Shady	104.5			106.8
Thorndale	112.8			106.2

Table 2: Summary Data 2006 Row Widths

Site #'s	7.5"	1 in 4	1 in3	15
	Yield (bu/ac)			
4 trials	84.5	80.5	80.2	74.9
7 trials	93.2			86.8

Table 3: Clover counts per 6 sq. ft.

Location	7.5"	1 in 4	1 in3	15
		(75%)	(67%)	(50%)
	Yield (bu/ac)			
Woodham	18.9	19.2	18.4	21.1
Woodstock	18.9	17.4	21.0	17.8
Woodstock 2	16.1	16.9	14.3	15.8
Lucan	6.2	8.0	9.5	11.2
Perth	15.7	13.9	18.6	22.3
Average	15.2	15.1	16.4	17.6

Summary: Widening row widths reduced wheat yields by 5 to 7% on average, and increased clover stand counts from 0 to 14%. However, clover stand count data was extremely variable, and while a trend may exist, no conclusions should be drawn. This study will run for a second year in 2006/2007.

Next Steps: 5 locations have been planted in the fall of 2006, to continue with the second year of this study.

Acknowledgements: Many thanks to the Ontario Wheat Producers Marketing Board, the Thames Valley Regional Soil and Crop Improvement Association, all our co-operators, Dr. Bill Deen and Adam Queen from the University of Guelph. A special note of thanks to Mike McFarlane and Nicole Van Ostaeyen for all the real work on these plots!

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Sulphur Impacts on Winter Wheat

Purpose:

With declining sulphur additions to the soil in the form of acid rain and dry deposition, there is some question if our soils now require additional sulphur fertilization to maximize yield and protein levels. This study evaluated the addition of sulphur fertilizer over a two year time period (2005/2006 wheat harvest).

Methods:

Field length, two replicate strip trials were planted using additional sulphur in the seed placed starter band at a rate of 20 pounds actual sulphur per acre, or as 10 pounds actual sulphur supplied in the spring with the nitrogen fertilizer application. Visual assessments of colour differential were taken (greenness factor). SPAD meter readings would be taken if any visual differences were evident. Yield, protein, moisture, test weight and thousand kernel weight measurements were all taken at harvest.

Results:

2006 data is presented in Table 1, with the 2005/2006 combined summary presented in Table 2. There was essentially no response to sulphur applications in 2006, in which the month of May had relatively normal rainfall, but June and July were relatively dry. Conversely, there appeared to be reasonable response to sulphur in a limited dataset in 2005, a season which tended to be dry from May through to July. The only location with any positive response in 2006 was the Nairn location, definitely a lighter soil type than the other locations. Protein content of the grain was not changed by sulphur addition.

From this data, there is no reason to suggest the requirement for any additional sulphur on wheat at this time. Growers on sandy soils with low organic matter may wish to continue these sulphur trials, as these soils should be the first to show a sulphur deficiency.

Table 1: 2006 Sulphur on Wheat Data

	Yield		Protein	
Location	**No Sulphur**	**Sulphur**	**No Sulphur**	**Sulphur**
	bu/ac		**% Protein**	
Lucan	99.2	95.5	9.3	9.2
Lucan 2	95.2	93.8	9.9	9.9
Perth	72.6	68.5	8.9	9.0
Carthage	69.9	69.2	9.4	9.3
Nairn	103.1	106.0		
Brantford	57.6	57.6		
Average	82.9	81.8	9.4	9.4

Table 2: 05/06 Sulphur Summary

	Yield	
Location	**No Sulphur**	**Sulphur**
	bu/ac	
Carthage 05	83.2	89.3
Stratford 05	89.3	93.5
05/06 average	83.8	84.2

Summary: Fertilizer sulphur additions over two years showed response in an unusually dry spring (limited data set), with no response in a spring that was dry but not abnormally so. Over the two year dataset, there is no indication that a blanket sulphur fertilizer recommendation is required.

Next Steps: This trial should be continued on sandy soils with low organic matter (no manure applied) for another two years.

Acknowledgements: Many thanks to the Ontario Wheat Producers Marketing Board, the Middlesex Soil and Crop Improvement Association, the Wellington Fertilizer Company, all our co-operators, and a special vote of thanks to the technicians that do all the real work on these trials.

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Location of Project Final Report:

Peter Johnson

Frost Seeding Winter and Spring Cereals

Purpose:

To evaluate the potential of frost seeding to increase spring cereal yields and to extend winter cereal seeding opportunities.

Methods:

Two replicate field length trials were established in from December 2005 to April 2006. Treatments included winter wheat and spring cereals seeded into frost (not frozen) soil at various dates. Spring cereal trials included treatments assessing seeding rates and final populations, as well as seed placed starter fertilizer trials. Populations evaluated included the lowest recommended seeding rate, the highest recommended seeding rate, and a rate approximately 20% higher than the highest rate. (0.8, 1.2, 1.6 million seeds/acre for oat, 1.2, 1.6, 2.0 million seeds per acre for spring wheat). Seed placed starter fertilizer trials used 50 pounds/acre of MAP (11-52-0) versus no starter fertilizer.

Results:

Winter cereals were frost seeded at three locations, with the data presented in Table 1. Frost seeding of winter wheat was very successful at both the Lucan and Huron locations, indicating that winter wheat could be successfully seeded much later than traditional recommendations. The frost seeding at the Perth location was not successful, with a very poor stand surviving the winter. The main reason for this difference is thought to be the amount of frost in the ground at the time of seeding. At both the Lucan and Perth site, frost was at a minimum to carry the seeding equipment. The drill was easily able to penetrate the frost, and place the seed into the soil rather than on the soil surface. At the Perth location, the frost was considerably harder, and the drill was barely able to create a slot at all to drop the seed into. As a result, much of the seed remained at or near the soil surface. Without the insulating effect of soil to protect these seeds, many of them did not survive the cold temperatures and lack of snow experienced later in the winter. The resulting stand was extremely thin and would not be acceptable.

At both the Huron and Lucan sites, stands were acceptable but barely so. Seeding rates had been maintained at all locations at 1.6 million seeds/acre. Growers would be advised to increase seeding rates to a minimum of 2.0 million seeds/acre if considering seeding late into frost. However, these trials do indicate an opportunity for growers to help stands that have experienced difficulty from wet fall conditions, or when planting some wheat is essential to the growers operation and fall conditions do not permit this to occur.

Table 1: Frost Seeded Winter Wheat

Site	Date Planted	Yield
		bu/ac
Lucan	Dec.17, 2005	59.9
Huron	Jan. 24, 2006	57.8
Perth	Jan. 24, 2006	31.2

Spring cereals were frost seeded at three locations, with the data presented in Tables 2 through 5. The conclusion is OBVIOUS!! Frost seeding shows huge yield advantages, and impressive test weight gains. These differences appear exacerbated when a poor rotation is followed. Spring wheat following soybean shows much higher yields, particularly when seeded later into dry soil conditions, than following corn. Test weights respond in the same manner.

There appears to be a slight yield advantage to increased seeding rates under frost seed conditions that does not exist under dry soil conditions. However, it is doubtful if these yield increases offer an economical response, after seed costs are taken into account.

Table 2: Thorndale Oat Data

	Yield		Test Weight	
Population	Frost	Dry	Frost	Dry
	bu/ac		lbs/bu	
0.8	139.8	120.2	37.2	35.5
1.2	142.1	122.7	37.4	36.2
1.6	139.1	118.9	37.2	35.8
Average	140.3	120.6	37.3	35.8

Table 3: Thorndale Spring Wheat after Corn

	Yield		Test Weight	
	bu/ac		lbs/bu	
Population	Frost	Dry	Frost	Dry
1.2	53.2	35.5	54.8	51.7
1.6	63.8	40.0	59.0	51.7
2.0	64.6	42.7	59.9	52.6
Average	60.5	39.4	57.9	52.0

Table 4: Thorndale Spring Wheat after Soybean

	Yield		Test Weight	
	bu/ac		lbs/bu	
Population	Frost	Dry	Frost	Dry
1.2	66.8	55.6	60.7	59.0
1.6	65.9	58.7	61.0	58.9
2.0	70.4	58.1	61.0	59.3
Average	67.7	57.5	60.9	59.1

Table 5: Huron site

Date Planted	Yield
	bu/ac
Jan. 24 frost	49.3
Mar.22 frost	48.0
April 21, dry	32.9

Summary:

Frost seeding trails on both winter and spring cereals has proven most successful. While there are some considerations around winter cereals (lower yield, less winter survival), spring frost seeding results are nothing short of incredible. Significantly higher yields and higher test weights make this a practice every grower should attempt!

Next Steps:

Further study is required on winter cereal frost seeding. Further study is required on seeding rates for frost seeded spring cereals.

Acknowledgements:

Many thanks to Syngenta Seeds Ltd., C&M Seeds Ltd., the Ontario Wheat Producers Marketing Board, and the Huron Research Station. A special vote of thanks to Mike McFarlane and Nicole Van Oestayen for all their help with this project.

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Location of Project Final Report:

Peter Johnson

Cabbage Seedpod Weevil Management in Winter Canola

Purpose:

To determine effective monitoring tools, thresholds and insecticide application timings for the control of cabbage seedpod weevil in winter canola. Properly timed spray applications will ensure insecticides are used at the most effective time, reducing the risk of unnecessary applications to the environment and non-targets.

Methods:

This past season, we conducted on-farm trials with growers who have a history of seedpod weevil damage in their winter canola fields to determine the number and timing of applications of Matador™ required to reduce damage from this weevil. Three trials were located in Thamesville, Grand Valley and Holstein, Ontario. A fourth location in Thamesville was used but did not have sufficient weevil populations to observe any treatment effects.

Each field site had 5 treatments (spray timings), with 4 replications per treatment. Each treatment plot was ½ spray boom wide (12-18m) and approximately 20m in length, Using farm or custom applicator equipment Matador™ was applied to large replicated plots at various timings relative to flowering:

1) at first (10%) flower,
2) at mid-flowering,
3) at first and mid-flowering,
4) at first, mid-, and end of flowering, and
5) no insecticide applied.

These flowering events are typically 7 to 10 days apart in a typical season.

Weevil populations were monitored by sweep net, taking 10 sweeps per plot each week and sticky traps were placed in each plot and were monitored weekly. 10 racemes were removed from each plot prior to harvest. On the main raceme 10 pods were examined for exit holes (% pods attacked) and seeds were examined under the microscope for damage (% seed damaged). A swath through each plot was harvested with a plot combine and yields were adjusted to Kg/ha at 8.5% moisture.

Results:

Though weevil infestations were different at each field, the trend was the same for the treatments applied to each field. In Fig. 1a, overall damage to the seed itself (percent lost to weevils) was nearly 14%. One application of Matador™ at first bloom was not effective, but a single application at mid-flowering was more effective and had about the same effect as two applications at first and mid-flowering timings. Three applications provided the greatest protection to the seed. These same trends were also apparent in the overall percent pods damaged (Fig. 1b).

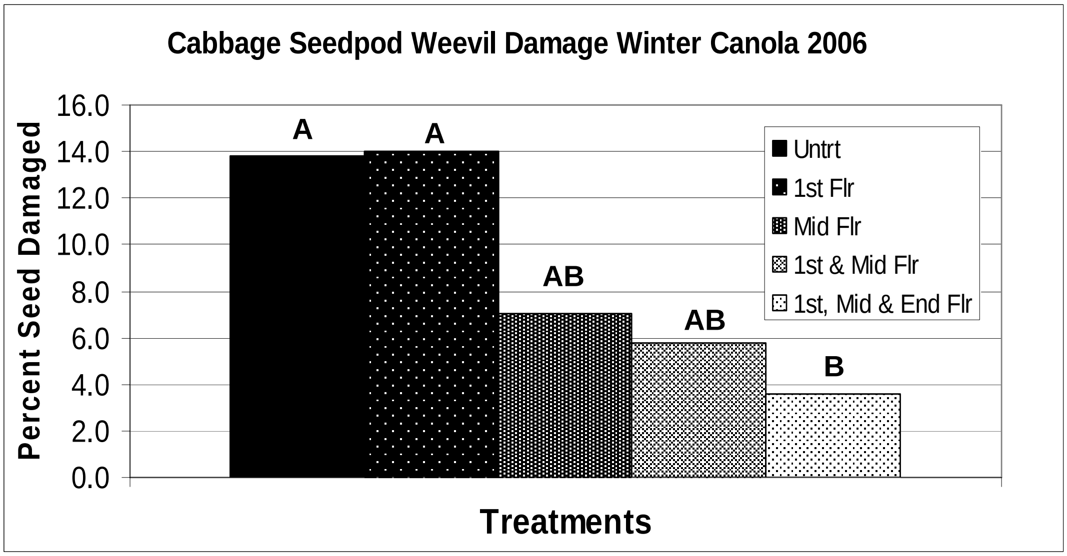

Figure 1a. Percent seed damaged by seedpod weevil feeding after Matador™ was applied at different intervals during flowering of winter canola in Ontario, 2006. Columns with the same letter are not different.

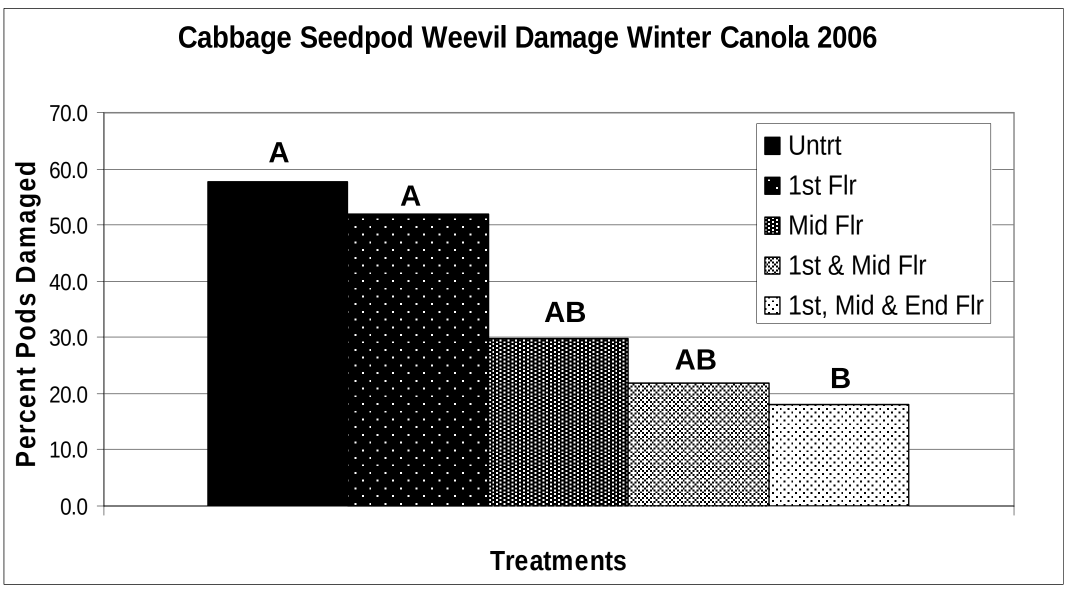

Figure 1b. Percent canola pods damaged by seedpod weevil feeding after Matador™ was applied at different intervals during flowering of winter canola in Ontario, 2006. Columns with the same letter are not different.

Yields also appeared to follow the same treatment effect as did seed and pod damage (Table 1). Yields tended to be greater when two applications of Matador™ were used, one at first flower and again at mid flower. When applying insecticide only once to the crop, a single application at mid-flowering produced a greater yield than a single application at first flower. Three applications resulted in greater yield in general, but may not be cost-effective.

Table 1. Yield (Kg/ha @ 8.5% moisture) from winter canola field plots at three locations in Ontario sprayed with Matador^{TM} at various timings during bloom, 2006.

Treatment	Thamesville	Grand Valley	Holstein
Untreated	2168 a	1034 a	1448 a
First flower	2380 ab	1114 a	1464 a
Mid-flower	2288 ab	1279 ab	1821 b
First and mid-flower	2469 b	1434 b	1867 b
First, mid- and end-flower	2454 ab	1270 ab	n/a

Values followed by the same letter are not significantly different, P<0.05, Tukey's mean separation test.

Summary:

Unfortunately, cabbage seedpod weevil is a significant pest of winter canola. In our trials, cabbage seedpod weevil damage was much higher on winter canola than spring canola crops, and damage by crucifer flea beetles and cabbage seedpod weevil was highest in the earlier plantings of spring canola. To reduce your risk of insect damage, time your planting dates to help avoid the key pests in your area. In spring canola, if cabbage seedpod weevil is the main pest concern, then later plantings will help to minimize losses to this pest.

For seedpod weevil control, applications must be made during flowering. One application during the middle of flowering has an effect, but two applications, one at first flower and the second 7 to 10 days after that are better than one application. Unfortunately, this is also the period in which pollinators are present in the crop so if you do decide to spray, contact local beekeepers before you spray and spray in the evening when bees are least active in the field.

Next Steps:

Future work will continue to determine if sticky traps can be used as a monitoring tool for adult populations. Other foliar insecticide chemistries will also be tested for potential future registrations. We will also examine the potential of trap cropping by manipulating planting dates and using winter canola varieties and other crucifers so that a small area of the field flowers earlier than the rest, attracting the majority of the overwintering adults which can then be controlled in the trap crop, hopefully reducing the need for an insecticide application on the entire field.

Acknowledgements:

This project was possible through joint funding from the Ontario Canola Growers, the Agricultural Adaptation Council and Ag. Industry. We'd like to thank our grower co-operators for allowing us to conduct our research in their fields. And thanks to Jeff Jacques of Cargill Ag Horizon, Harriston and Nick Zwambag of Agris co-op, Thamesville for arranging cooperator fields and spray applications.

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Dr. Peter Mason, AAFC, Ottawa - Research Scientist

Location of Project Final Report:

North-Eastern Ontario Regional Canola Trials - 2006/2007

(2006 Interim Report)

Purpose:

An initial 2005 study into "canola opportunities for N.E. Ontario" indicated a common factor across four districts. Under dry & hot conditions, plant tissue analysis appears to point out a sulphur deficiency in canola (in many locations) during the blooming period. This was similar to complementary soil tests taken at the same time. Unconfirmed canola yields suggested that yield could be improved if sulphur was added to the fertilizer.

The 2006 trials were designed for 2 purposes. First, confirm that increased canola yields could be attained with the addition of sulphur to fertilizer. Second, as recommended by John Rowsell of NLARS, determine the extent of the Sulphur deficiency across the north-east and prove whether it is (or is not) a regional issue.

Methods:

Four co-operators in the Temiskaming and Nipissing Districts agreed to test the value of added sulphur on canola crops. A test of 10# of actual S was to be added to the test plots in replication across the field.

27 individual canola fields (from 19 farmers across the Districts) would have one acre each evaluated for sulphur content of plant tissue (during the blooming period). This would be matched with soil tests from the same site. A 24" soil profile would be broken into samples representing the top 6", the 6" to 24" depth, and an 18" to 24" subsection.

These 27 sites represented a cross-section of soil types within the region.

Note that in a supporting financial agreement with Agri-Food Laboratories, we were able to measure much more than just the sulphur content of the Tissue and the soil. We also measured N, P, K, Mg, Ca, Zn, Mn, Cu, Fe, & B. Also measured were the September levels of Nitrate Nitrogen and Ammonium Nitrogen in 7 soil profiles (3 levels per profile).

Results:

Out of the four co-operator trials, one was lost due to errors in fertilization. Two were lost to extreme damage by flea beetles in May and June, despite the fact that the seed had been coated in "Helix". The fourth site was a major success.

This operator planted the whole field with a broadcast fertilization program of 80# actual N, plus 10# of S. The exception was three widely spaced strips of over 2 acres each, where no sulphur was placed, but the soil still received the full ration of N. Although the yield varied considerably between the sulphur-free strips, it was always lower than the yield obtained to each side of these strips where the sulphur had been added. The co-operator was very pleased with the results, and calculated that he had earned an additional $25 to $30 /acre yield to balance against an increased fertilizer and application cost for sulphur of $4 to $5 per acre

The weather in 2006 was the direct opposite of 2005. The cool and wet conditions seemed to be ideal for sulphur to be drawn out of the atmosphere and deposited into the fields throughout the Region. This was suggested by the results of the mid-season top-soil tests in MOST (but not all) fields, where sulphur was at least marginally adequate. However, sulphur was deficient in the lower levels of the profile in many of the test locations, much to our surprise as it was expected that these lower regions would be the storage area for sulphur.

In contradiction to the apparent sufficiency of sulphur in the soil, every last one of the tissue tests indicated that sulphur was deficient in the plant during the blooming period, the time when the plant needs sulphur most in order to maximize yields. (Note that even in the "successful" strip test area; sulphur in the plant remained deficient, although the content was considerably higher in these tissue tests than in those where no sulphur was added to the soil.)

Also note that the 7 soil tests obtained in September ALL showed sufficient sulphur accumulation throughout the 24" profile. This compares to the fact that many soils showed deficient sulphur in lower parts of the soil profile in mid summer. (Does this indicate that fall soil tests for sulphur may not show the actual availability of soil Sulphur during the growing season?)

Summary:

Next Steps:

In 2007, the project will continue with many more side by side comparisons of growth and yield under the influence of added sulphur, with extensive evaluations of sulphur in the plant tissue and in the soil profile.

Acknowledgements:

The NEOSCIA would like to thank OSCIA for the initial funding of the Laboratory analysis section of this project, and to Agri-Food Laboratories for providing a matching grant to the OSCIA funding. We also wish to thank the Temiskaming Agricultural Development Agency for taking the initiative to acquire matching funds from the Northern Ontario Heritage Grant program. Finally, a big thank you, to the 19 farmers who allowed us to use their fields as a research area.

Project Contacts:

For more data on this project, contact Graham Gambles, Regional Communication Co-ordinator for the NEOSCIA t 705-647-3105 (e-mail gamblesgraham@yahoo.ca). Alternatively, contact Daniel Tasse at OMAFRA, New Liskeard, Ontario.

Swede Midge Impact and Management in Spring Canola

Purpose: To determine the impact of swede midge in canola in Ontario and find effective integrated pest management solutions for this newly invasive species. This is one component of a long term canola insect pest project, looking at cultural, biological and chemical strategies for both swede midge and cabbage seedpod weevil.

Methods:

Effect of Planting Date on Susceptibility of Spring Canola

Pheromone traps were established at two field locations (Elora & Arkell) in Ontario in mid-May and will be maintained until the end of September 2006 in order to monitor swede midge populations. Swede midge populations were quite high at the Elora site, but low at Arkell, throughout the season. Therefore, only results from the Elora site are summarized in this report.

Our two spring canola field locations were set up in a split-plot design, with the main plot as planting date, foliar insecticide applications as subplots and seed treatments (Helix Xtra or fungicide alone) as sub-subplots. There were three planting dates (early spring, two weeks after first planting, and two weeks after second planting), which were replicated four times. The first planting was made on May 24. These trials were conducted using Invigor 5030 (Liberty Link; i.e. glufosinate tolerant). Each plot consisted of three seven row subplots and were 5 m long, with assessments made on plants in the middle three rows. Alternating applications of ASSAIL™ (acetamiprid) and MATADOR™ (lambda-cyhalothrin) were made at weekly intervals from early June (June 8 Elora, June 12 Arkell) until browning down of plants in late August.

Swede midge damage assessments were conducted during the vegetative, flowering and pod filling stages for each of the three planting dates. A damage rating on the primary racemes was used where: 1.0 = mild twisting of petioles and crumpling of leaves, but little damage to the raceme or flowers, 2.0 = severe distortion of foliage and distortion of pods and racemes, 3.0 = death of main raceme, clusters of pods and undeveloped buds. A damage rating on the secondary racemes was used where 4.0 = mild twisting of petioles and crumpling of leaves, but little damage to the raceme or flowers, 8.0 = severe distortion of foliage and distortion of pods and racemes, 12.0 = no secondary racemes present, clusters of pods and undeveloped buds on stunted main raceme only. Yield, seed quality and free fatty analysis were also taken for each planting date after harvest in mid-September.

Experiments were also conducted in winter canola, but with only one planting date (September 11, 2006). The same foliar and seed insecticides mentioned above were used in a random complete block design. Damage assessments were done in both the fall and spring. Results from our winter canola trials are briefly summarized below.

Results:

In our 2005-06 winter canola trials, the swede midge caused only minor damage in the fall, with damage restricted to leaves that were lost during subsequent overwintering. During the following spring and summer growing season, winter canola was in an advanced enough plant stage when the overwintering adults emerged in the spring that it experienced little to no damage by swede midge.

In spring canola, damage by the swede midge occurred to some extent during the seedling and early rosette stages, but tended to be more severe during stem elongation and pod formation. Damage was significantly higher at late planting dates than in early and mid-planting dates in trials where all three plant stages were examined [vegetative, flowering and pod-filling] (Figs. 1a and 1b). Earlier-planted spring canola crops were past the vulnerable stages when swede midge populations were at their peak, whereas late plantings were very heavily hit by swede midge and little flowering occurred as a result.

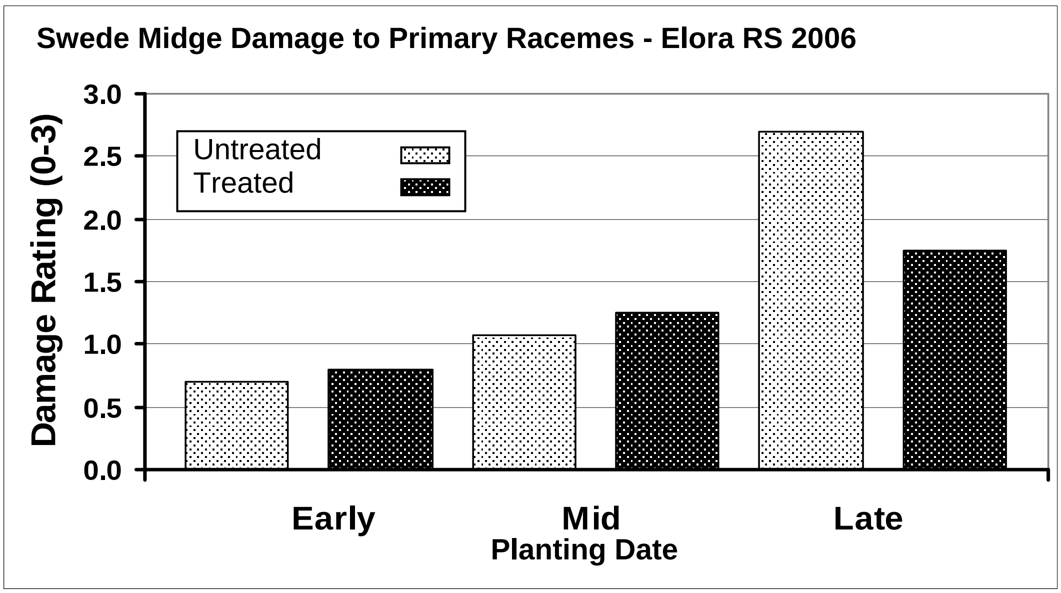

Figure 1a. Damage by swede midge to the primary racemes of spring canola planted at three intervals (May 24, June 7 and June 21 at Elora Res. Stn. Ontario, 2006. A damage rating of 1.0 = mild twisting of petioles and crumpling of leaves, but little damage to the raceme or flowers, 2.0 = severe distortion of foliage and distortion of pods and racemes, 3.0 = death of main raceme, clusters of pods and undeveloped buds.

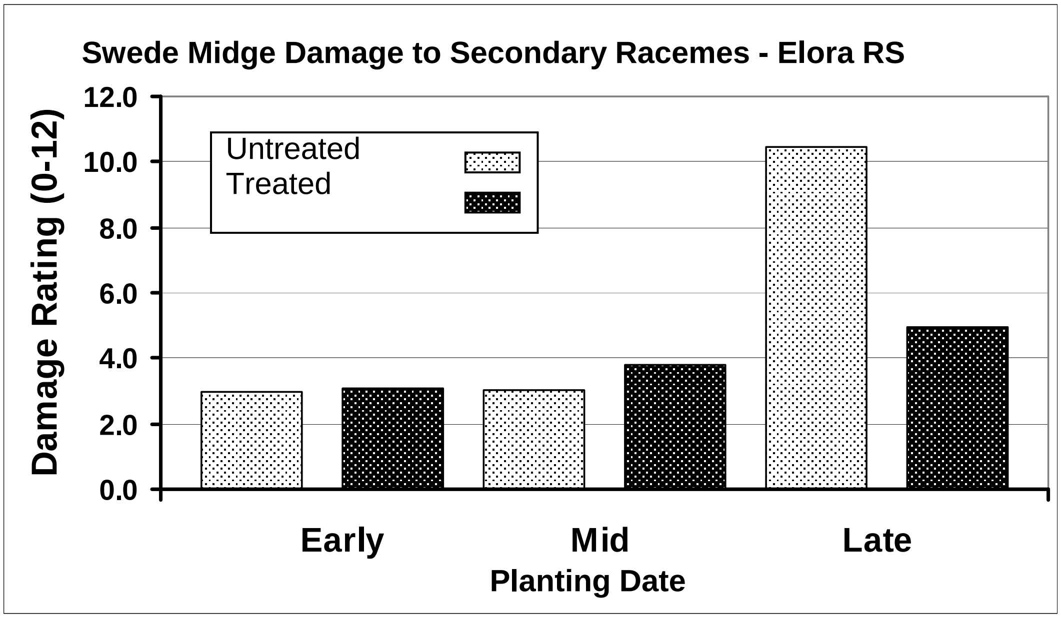

Figure 1b. Damage by swede midge to the secondary racemes of spring canola planted at three intervals (May 24, June 7 and June 21 at Elora Res. Stn. Ontario, 2006. A damage rating of 4.0 = mild twisting of petioles and crumpling of leaves, but little damage to the raceme or flowers, 8.0 = severe distortion of foliage and distortion of pods and racemes, 12.0 = no secondary racemes present, clusters of pods and undeveloped buds on stunted main raceme only.

Summary:

There are two main periods when canola is vulnerable to damage by the swede midge – at bud formation and when secondary and tertiary buds are developing in leaf axils. Once bud formation is complete and plants are in full flower, canola is safe from economic damage by swede midge. Both winter canola and early planted spring canola escape injury from swede midge, as these vulnerable plant stages occur before swede midge populations are at their highest.

To reduce your risk of insect damage, time your planting dates to help avoid the key pests in your area. In spring canola, if swede midge is the main pest of concern, then early plantings are recommended; however if cabbage seedpod weevil is the main pest concern, then later plantings will help to minimize losses to this pest.

For swede midge, foliar insecticide application while plants are still in the rosette stage is recommended. Once registration of Matador™ and Assail™ has been achieved, our study indicates that application of these products should take place prior to stem elongation.

Next Steps:

We will continue the planting date work in 2007. Experimental parameters and design will be re-evaluated by March 2007 to determine crop phenological aspects and planting dates to be considered in 2007. Variety susceptibility, monitoring strategies and seed and foliar insecticide testing for future registrations is also a component of this long term project. Our final goal is to find a best management practice for both cabbage seedpod weevil and swede midge, two new invasive pests that Ontario canola growers are dealing with. Western Canada is also at risk from the eventual spread of swede midge to other regions and work done in Ontario will provide them with the management tools needed to react quickly when it does arrive.

Acknowledgements:

This project was made possible through joint funding from the Ontario Canola Growers, the Agricultural Adaptation Council and Ag. Industry.

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Dr. Hugh Earl, Dept. of Plant Agriculture University of Guelph

Dr. Peter Mason, AAFC, Ottawa - Research Scientist

Location of Project Final Report:

Reducing Soybean Seed Costs Through Lower Seeding Rates (2006 Interim Report)

Purpose:

This study was designed to determine the most profitable soybean seeding rate in solid seeded (7.5”) and intermediate (15”) row widths for various CHU regions, soil types, and planting dates.

Current Ontario Ministry of Agriculture Food and Rural Affairs (OMAFRA) seeding rate recommendations are based on research conducted with conventional varieties, untreated seed, and with less precise planting equipment than is now available. Current OMAFRA seeding recommendations are:

225 000 seeds/acre in 7.5 inch rows,
200 000 seeds/acre in 15 inch rows,
170 000 seeds/acre in 22 inch rows,
160 000 seeds/acre in 30 inch rows.

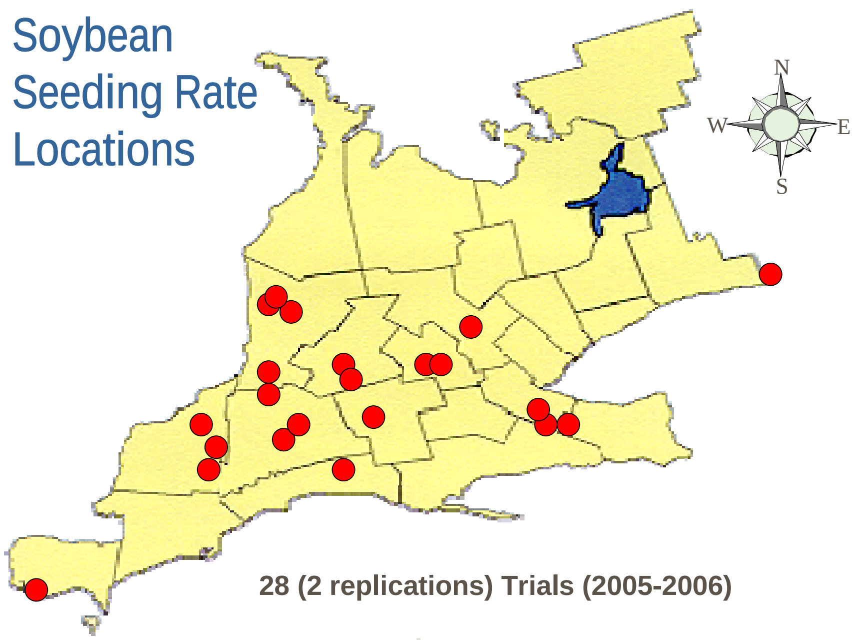
If recommended seeding rates could be reduced (for example from 225 000 to 200 000 seeds/acre in 7.5 inch rows) while still achieving maximum yields, a significant savings could be realized. This reduced seeding rate would represent a savings of approximately $5.92 per acre, assuming a $32.00 per unit cost for glyphosate tolerant seed with 2700 seeds/pound. If a producer could switch from 7.5 inch rows to 15-inch rows, that producer could potentially save $11.84 per acre in seed costs (reducing seeding rates from 225 000 to 175 000 seeds per acre). At present, little Ontario field scale data is available on which to base seeding rate recommendations when taking into account new technology such as glyphosate tolerant varieties, seed treatments, and better planting equipment. These innovations have significantly changed the potential of soybean seed, making the study of lower seeding rates necessary.

Methods:

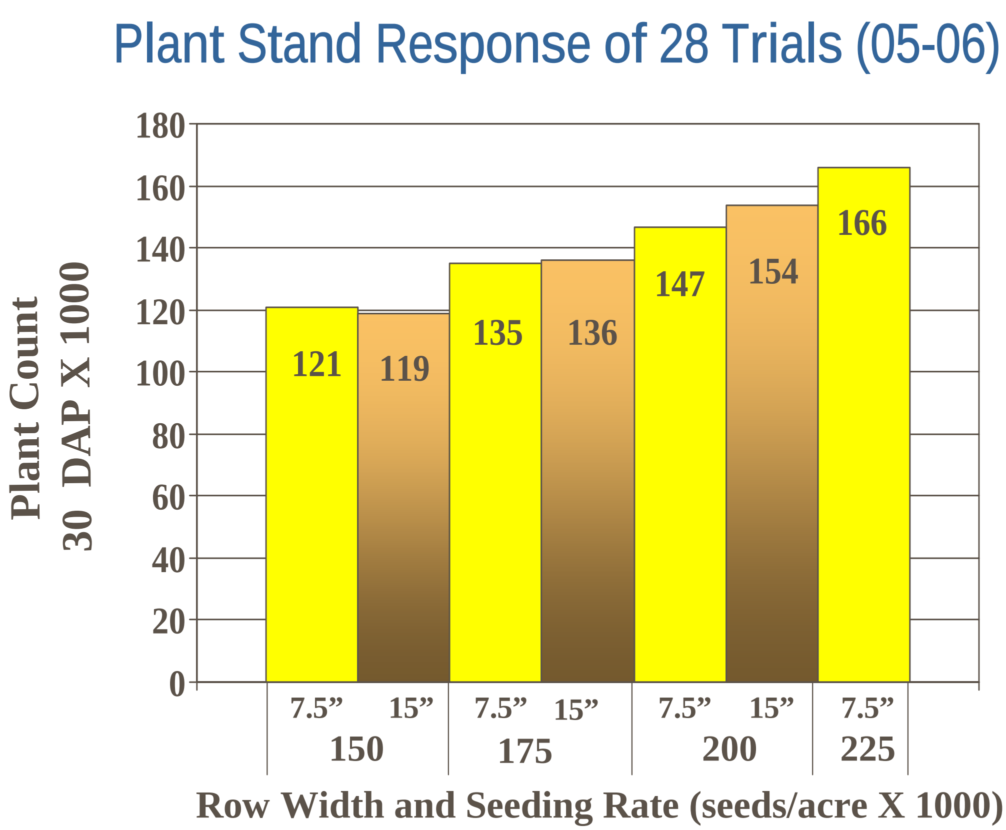
This project compared plant stands and final yields of 7.5 inch rows compared to 15 inch rows at various seeding rates, soil types, and planting dates. Trials did not include wider row widths because most Ontario producers use row widths of less than 20 inches. Each treatment was 20 feet wide with a minimum length of 1200 feet. Most sites were field length strips (>1500 feet). In total, 12 sites were harvested in 2005 and 16 in 2006, with a minimum of two replications per site. Most of the sites were no-till soybeans following corn, although some sites were soybeans following soybeans. At three of the sites each year, two different planting dates were seeded. The two planting dates included the ideal planting date (May 5-25) and a late planting date.

Treatments included:

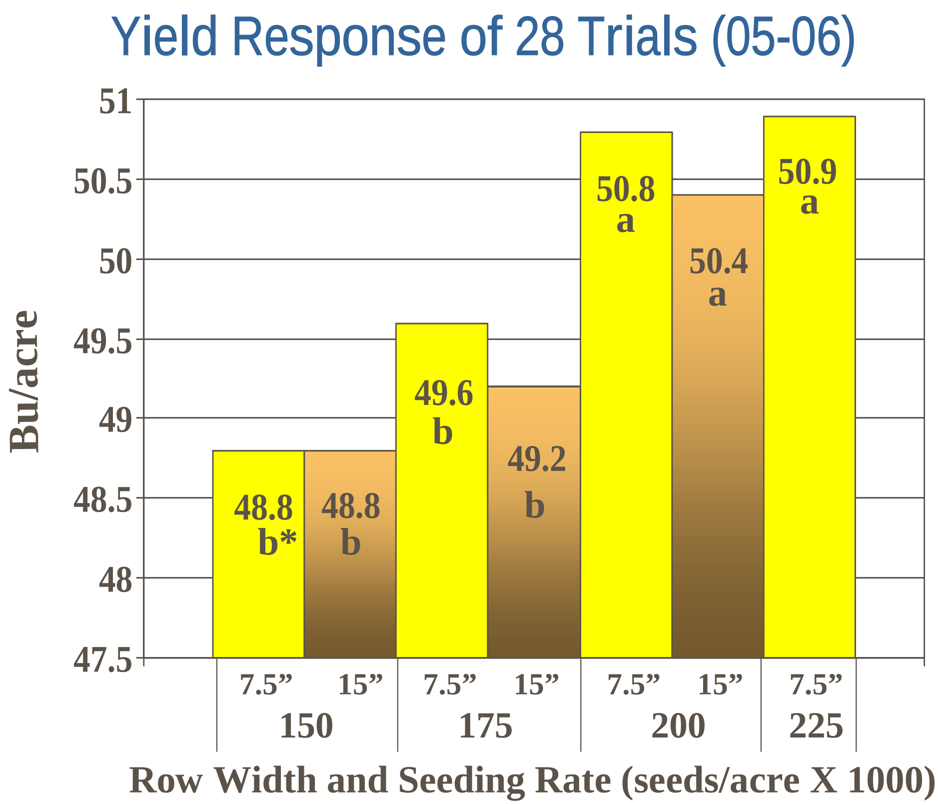
Row Width	Seeding Rate (x 1000)			
7.5 inch	150	175	200	225
15 inch	150	175	200	



Results and Summary:



Plant stand counts taken at 30 days after seeding showed that between 73 – 80% of the seed emerged and survived to 30 days after planting. The highest seeding rate (225 000 seeds/acre) produced the lowest percentage of surviving plants. 74% of seeds planted survived to 30 days after planting (166 000 plants of the 225 000 seeds that were planted). The lowest seeding rate (150 000 seeds/acre) produced the highest percentage of surviving plants 30 days after planting. 80% of what was planted survived to 30 days after planting. The difference in emergence percentages may be a result of early season competition reducing the seedling survival at higher seeding rates.



*Values followed by the same letter are not significantly different at the 5% level.

In the two years of this experiment, the highest yields resulted from the following three seeding rates:

225 000 seeds/acre in 7.5" rows,
200 000 seeds/acre in 7.5" rows,
200 000 seeds/acre in 15" rows.

These three seeding rate/row width treatments had statistically equal yields.

The following treatments all resulted in statistically lower yields compared to the treatments listed above:

175 000 seeds/acre in 7.5" rows,
150 000 seeds/acre in 7.5" rows,
175 000 seeds/acre in 15" rows,
150 000 seeds/acre in 15" rows.

These four treatments all produced statistically equal yields.

Results were similar for soil type, planting date, tillage practice, and CHU area. There was also no difference in the results based on whether the seed was treated with a fungicide. Glyphosate tolerant and conventional varieties behaved the same in this study. These results indicate that seeding rates could be reduced to 200 000 seeds/acre when planting in either 7.5" rows or 15" rows. A saving in seed cost of approximately $5.92 per acre could be realized by reducing seeding rates from 225 000 to 200 000 in 7.5" rows. However, a reduction of 1.2 bu/ac occurred when reducing seeding rates to 175 000 seeds/acre and another 0.8 bu/ac reduction occurred when rates were reduced to 150 000 seeds/acre.

7.5" rows sometimes yielded higher than 15" rows. This study found that under poor growth conditions such as late planting, heavy soils, and low fertility, solid seeding provided slightly higher yields than 15" rows (1-3 bu/ac).

This study has found that a plant stand taken at 30 days after seeding of 150 000 plants per acre produced the highest actual and economic yield. In this study 200 000 seeds/acre were required to achieve a plant stand of 150 000 plants/acre. When emergence conditions are excellent (warm soils, no crusting, etc) it is often possible to achieve 150 000 plants/acre with a lower seeding rate than 200 000 seeds/acre. Some producers may be able to seed 175 000 seeds/acre while others will need to seed 200 000 seeds/acre depending on the equipment used, the conditions following planting, residue levels etc.

Although the yield losses associated with reduced seeding rates are relatively small they are real. A seeding rate of 200 000 seeds/acre provided the highest economic return as well as the highest yields. When using a seed drill to plant soybeans in Ontario significantly cutting seeding rates lowers profits. Further studies will be conducted to investigate if seeding rates can be reduced successfully when using planter units.

Next Steps:

This study will be conducted for one more year and will be completed by the fall of 2007. More sites will focus on conventional tillage to determine if plant response is similar.

Acknowledgements:

Special thanks to all those who participated in the project:
The Ontario Soil and Crop Improvement Association (OSCIA) members that conducted the trials, the *Heartland Regional OSCIA* and the *Ontario Soybean Growers* for funding this project, and the Middlesex Soil & Crop Improvement Association for making available their no-till drill at a reduced cost.

Project Contacts:

Stay tuned for future results and contact Horst Bohner, horst.bohner@ontario.ca if you wish to be involved in 2007.

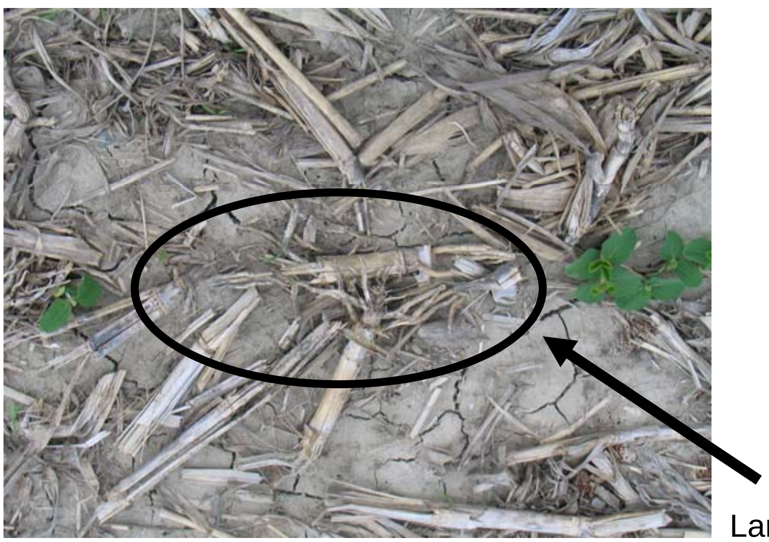
Reducing Soybean Seed Costs through Precision Seeding (2006 Interim Report)

Purpose:

Traditional seed drills do a poor job of distributing seed evenly resulting in clumping of seed, leaving large gaps within the row. See Picture #1. A planter allows for precise seed metering, resulting in more uniform stands. It also allows for better depth control. There has been speculation that more accurate seed placement may allow for lower seeding rates compared to a drill and result in higher yields. In the case of glyphosate tolerant varieties soybean seed has become the largest single input in soybean production (approximately $50/acre). Lower seeding rates could significantly reduce this input cost.

This study investigated the most profitable soybean seeding rate for 15 inch row spacing using a row planter. It also compared 15" rows seeded with a planter, to 15" rows seeded with a drill and 7.5" rows seeded with a drill.

Picture #1 Emerging seedlings seeded with a no-till drill.



Methods:

Eight large scale replicated trials were conducted over the past two growing seasons. Various 15" row planters were compared to a JD 1560 no-till drill with every other run plugged (15" row spacing) and all runs open (7.5" rows). All sites were no-till and different seeding rates were tested.

Each treatment was 20 feet wide with a minimum length of 1200 feet. Most sites were field length strips (>1500 feet). In total, 8 sites were harvested with a minimum of two replications per site.

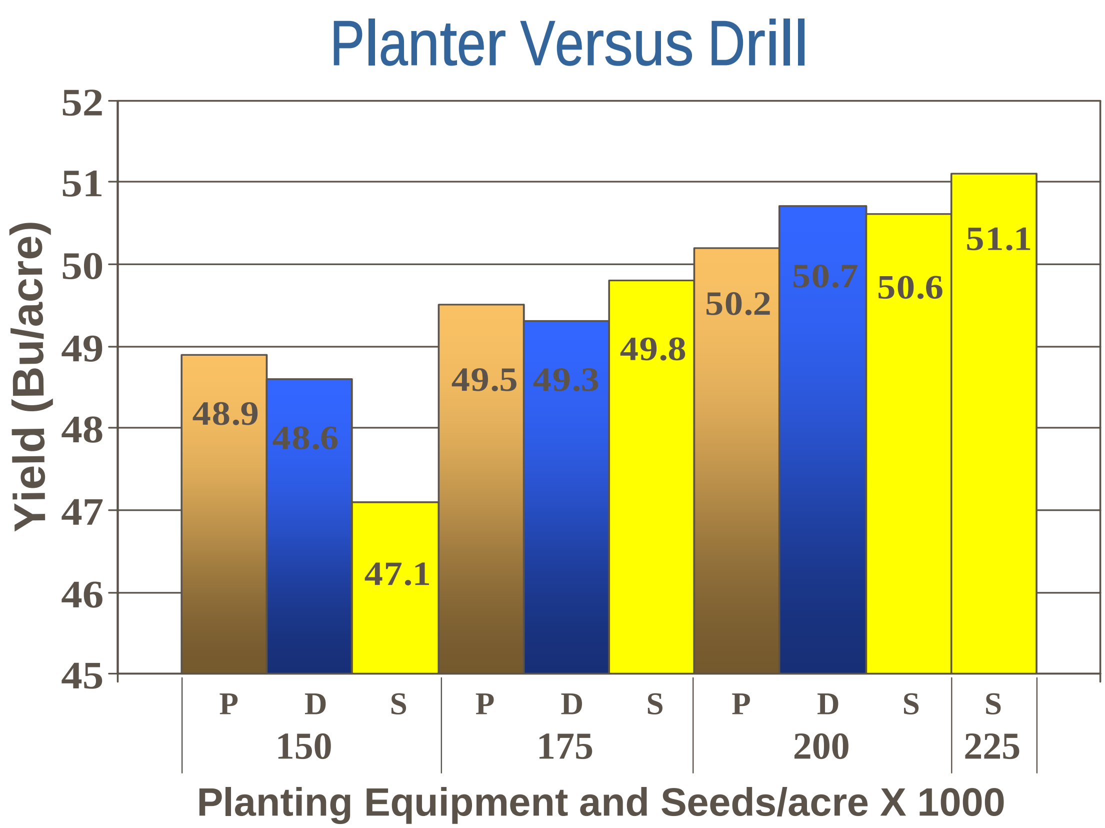
Trials included all the following treatments:

Row Width	Seeding Rate (x 1000)			
7.5 inch drill	150	175	200	225
15 inch drill	150	175	200	
15 inch planter	150	175	200	

Fields were treated as a whole when applying herbicides, fertilizers, and tillage practices. Crop inputs were applied perpendicular to the direction of the treatments. This ensured that mistakes or misses in field operations occurred across all trial treatments.

Results:

Figure 1



P = Planter (15" rows), D = Drill (15" rows), S = Solid Seeded Drill (7.5" rows)
LSD 10% = 1.9

Although the planter units did a superior job in seed distribution, that did not translate into higher yields compared to the drill at the same seeding rate. The 15" drill produced equivalent yield to the three seeding rates as did the 15" planter averaged across all sites. At 1 out of the 8 sites there was a 3 bu/ac advantage to the planter. At all the other sites the increased accuracy of the planter compared to the drill had no significant impact on yield. This is surprising, especially at the lowest seeding rate. 30 days after seeding the planter rows looked superior because of better spacing. But the gaps resulting from using the drill did not reduce yields. This is likely because of the soybean plant's ability to compensate for gaps and may also be a reflection of the good growing conditions over the last two years. We intend to conduct these trials one more year before final conclusions are drawn. Keep in mind, that a planter is superior when using very low seeding rates. This has been shown in other research studies. Under extremely low seeding rates (50 000 – 100 000 seeds/acre) the planter will provide significantly better yields compared to a seed drill.

This study has also showed an increase in yields with increased populations from 150 000 seeds/acre to 200 000 seeds/acre. In each case when seeding rates were increased yields increased. It's worth noting that the benefit from increasing the seeding rate was different for the planter compared to the drill. Raising the seeding rate from 150 to 200 with a planter only increased yields by 1.3 bu/ac. Increasing the rate from 150 to 200 with a 15" drill increased yields by 2.1 bu/ac and increasing the seeding rate from 150 to 200 in 7.5" rows increased yields by 3.5 bu/ac. This confirms that higher seeding rates are important for drills but not as crucial for planters. Assuming a seed cost of $32 per unit, a seed size of 2700 seeds/lb, and a selling price of $7.00 per bushel, the return for increasing the seeding rate from 150 000 seeds/acre to 200 000 seeds/acre is significantly different for the two pieces of equipment. Increasing the seeding rate for the 7.5" drill increased profits by $12.65/acre. Increasing the seeding rate for the 15" drill increased profits by $2.85/acre. However, increasing the seeding rate with a 15" planter actually reduced profits by $2.75/acre.

Table 1: Gross Return Minus Seed Costs at Various Seeding Rates

	Increased Return of 200 000 over 150 000 seeds/acre
Solid Seeded (7.5")	$12.65
Drill (15")	$2.85
Planter (15")	$-2.75

Numbers based on $32.00/unit, 2700 seeds/lbs seed, $7.00/bushel selling price, and yield results from Figure 1. All inputs except for the cost of seed are assumed to be the same regardless of seeding rate and are not included in this comparison.

Summary:

The conclusions from this study so far are clear:

1) At normal seeding rates (175 – 200) there was no significant yield difference between the 15" planter compared to the drill seeded in either 7.5" or 15" rows.
2) Lower seeding rates yielded less than higher seeding rates in this study but reductions were relatively small.
3) The highest statistical yield was at 200 000 seeds/acre for all three implements
4) The highest economic return for the drill was at 200 000 seeds/acre but was 150 000 seeds/acre for the planter.

Next Steps:

This study will be conducted for one more year and will be completed by the fall of 2007. In 2007 even lower seeding rates will be compared.

Acknowledgements:

The Ontario Soil and Crop Improvement Association (OSCIA) members that conducted the trials, the *Heartland Regional OSCIA* and the *Ontario Soybean Growers* for funding this project, and the Middlesex Soil & Crop Improvement Association for making available their no-till drill at a reduced cost.

Project Contacts:

Stay tuned for future results and contact Horst Bohner, horst.bohner@ontario.ca if you wish to be involved in 2007.

New Soybean Inoculant Technology
(2006 Final Report)

Purpose:

New inoculant technology called "pre-inoculants" allow for a shelf-life of up to four weeks of inoculated seed. Not only do these inoculants contain new highly efficient strains they also allow for an extended shelf life when using a pre-inoculant together with a fungicide seed treatment. These inoculants have extenders that enhance the survival of *B. japonicum* following treatment for 21 to 30 days without fungicides and 7 to 21 days with fungicides. Seed is treated before it is delivered to the farm. Reduced inoculation procedures at planting time and excellent coverage are significant advantages to the grower compared to drill box application.

There is limited field research data on possible yield gains in fields that have had a history of soybeans. There is considerable debate over the efficacy of new soybean inoculant strains on fields with a history of soybeans. Researchers from Ohio State have found that economic returns are high enough that most soybean fields including those with a history of soybeans should be inoculated. To date Ontario Ministry of Agriculture, Food and Rural Affairs recommendations are that economic returns are most likely on virgin fields, sandy or low ph soils. Field scale verification trials are required to assess these new inoculants on a wide range of soil types, crop rotations, and environmental conditions.

Methods:

Ten large scale replicated trials were set up in Perth County to assess possible yield benefits from using this product. Treatments included the untreated check and the pre-inoculant Cell Tech SCI.

Each treatment was 20 feet wide with a minimum length of 1200 feet. Most sites were field length strips.(>1500 feet) In total, due to wet harvest conditions eight of the ten sites were harvested with a minimum of two replications per site.

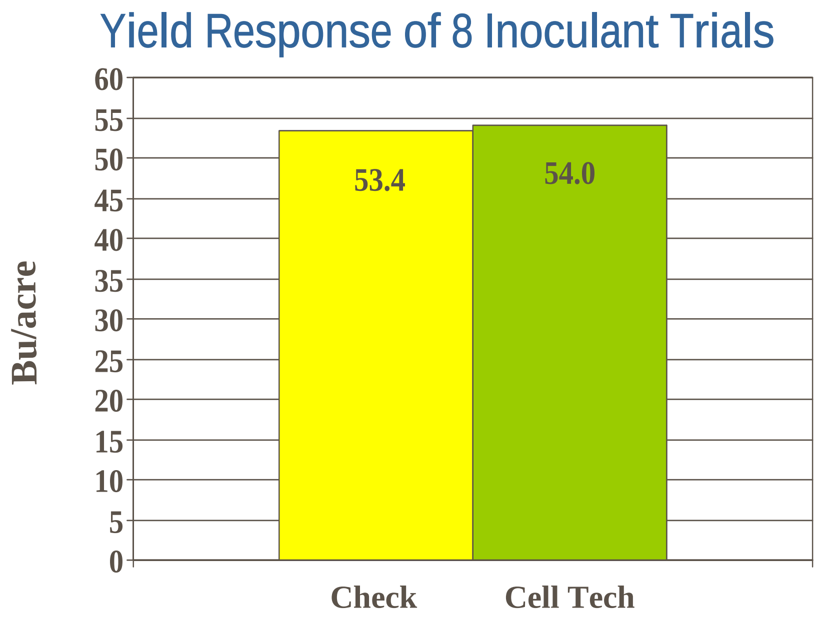
Fields were treated as a whole when applying herbicides, fertilizers, and tillage practices. Crop inputs were applied perpendicular to the direction of the treatments. This ensured that mistakes or misses in field operations occurred across all trial treatments.

Results and Summary:

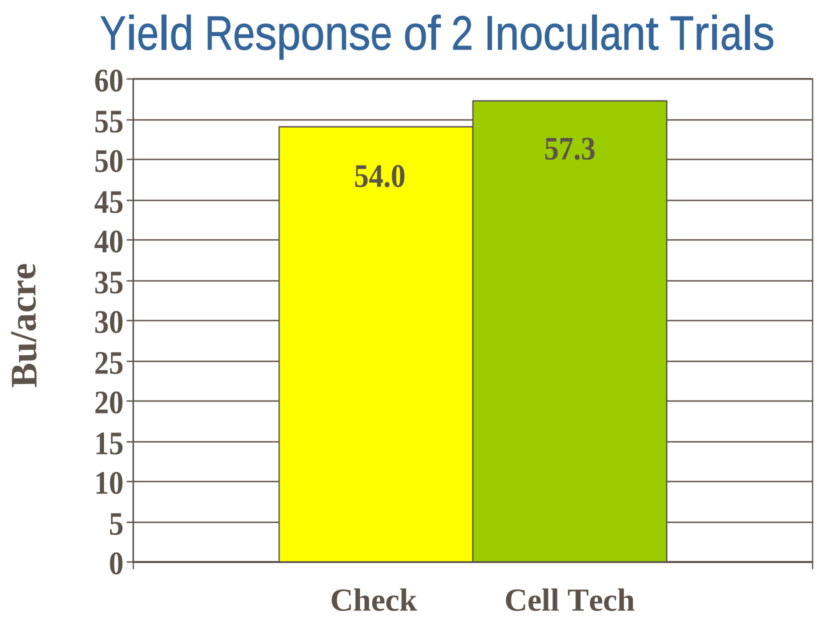
Plant stand counts were taken at 30 days after seeding. There was no statistical stand difference in the treated compared to the untreated seed.

Averaged across all sites no statistical yield benefit was observed in 2006. See graph #1. However at two of the eight sites there was a yield benefit of 3.3 bu/ac. Graph #2. It should be recognized that growing conditions in 2006 were extraordinary. Yields were approximately 5-10 bu/ac above long term averages. These excellent growing conditions may have influenced the results.

Graph #1. (Yields not statistically different)



Graph #2 (Yields statistically significant at p=0.01)



Six of the eight sites showed no yield response to the inoculant. At the two sites that showed a statistical response the use of the "pre-inoculant" was very profitable.

Table #1: Profit per acre at the 2 sites with a statistically significant yield response.

Yield Benefit of 3.3 bu/ac	$23.10
Cost of product, $2.25/bag	$3.38
Return per acre	$19.72

Numbers based on a seeding rate of 200 000 seeds/acre and a selling price of $7.00/bu

The two sites that showed a response were both long term no-till fields with a three year crop rotation of corn-soybeans-wheat. The previous crop at both sites was corn. One site was a silty clay soil and the other was a clay loam soil. Why these two sites responded so well to the inoculants is unclear but warrants further investigation.

Next Steps:

This study was conducted with funding from a one year OSCIA major grant. Due to the high yield response at two sites further investigations may be warranted.

Acknowledgements:

Special thanks to all those who participated in the project:
The Perth Soil and Crop Improvement Association members that conducted the trials and the Ontario Soil and Crop Improvement Association for providing the major grant to conduct the trials.

Project Contacts:

Stay tuned for future results and contact Horst Bohner, horst.bohner@ontario.ca if you wish to be involved in 2007.

Foliar Fungicides on Soybeans
2006 Report

Purpose:

With the introduction of Asian soybean rust (a new invasive disease) into the US in the fall of 2004 and its subsequent establishment in the southern US and Mexico, the risk to Ontario soybean production has increased. As the disease continues to establish in North America, spread into Ontario and the Midwest US corn belt will become more likely. In 2006 rust was detected as far north as Indiana and Illinois. For the foreseeable future, the primary management option for North American producers will be fungicides since other alternatives such as resistant varieties are not presently available. In Ontario various fungicides have received registration against soybean rust and these have been shown to be very effective in US trials against soybean rust.

A number of North American trials have shown a significant yield boost with the use of a fungicide, even in the absence of rust. This yield boost may be a function of controlling bean diseases that have previously been ignored, or may result from plant enhancements resulting from the application of the fungicide. Scientists now believe that these plant enhancements in the absence of disease are associated with a reduction in plant respiration, a reduction in the plant hormone ethylene, a change in nitrogen processing and a number of changes in the anti-disease, anti-stress systems in the plant. The main question for soybean growers is whether yield benefits are large enough to warrant spraying in the absence of major disease outbreaks. In 2006 trials were conducted to assess the possible yield benefits of foliar fungicides on soybeans in Ontario.

Methods:

On-farm strip trials were set up by OMAFRA and various agribusinesses across Ontario and data was collected from 31 sites in Ontario. Trials were set up across a wide variety of soil types, environmental conditions and geography.

With the exception of fungicide applications, fields were treated as a whole when applying herbicides, fertilizers, insecticides, and tillage practices. Whenever possible, crop inputs were applied perpendicular to the direction of the fungicide treatments. This ensured that mistakes or misses in field operations occurred across all trial treatments.

The majority of trials were sprayed with the fungicide at the R2 soybean plant growth stage (full bloom) which has been promoted in plant health literature.

Leaf samples were taken from 11 sites and sent to the University of Guelph Pest Diagnostic Clinic for disease detection and identification.

Results:

Figure #1: Soybean Yield Response to Foliar Fungicides in Ontario. (2006)

Summary:

The cost for strobilurins (Headline and Quadris) is approximately $16.00 per acre, excluding application costs. Assuming an application cost of about $8.00 per acre and a tramping loss of 1.0 bu/ac, a 4.4 bu/ac yield increase would be required to break even ($16.00 product + $8.00 application + $7.00 tramping loss). This assumes a tramping loss of 1 bu/ac and a selling price of $7.00/bu. Late season spraying tramping losses have been reported from as low as 1% to as high as 4% depending on the width of the boom, etc.

Of the 31 trials in this study, 21 trials (68%) showed a yield gain but only 8 of these yield gains were high enough for a positive economic return. In other words 26% of the trials increased profits while 76% of the trials showed an economic loss. An average yield gain of only 0.8 bu/ac was realized across these 31 strip trials. In 2005 an average yield response of 3.6 bu/ac was realized in similar trials conducted in Ontario.

The 2006 growing season was relatively wet with above average Crop Heat Units. These excellent growing conditions increased average yields across the province by 5-10 bu/ac. These extraordinary yields may have influenced the results. When growing conditions are excellent yield response to crop inputs are often masked. This may explain the lower yield benefits to spraying in 2006 compared to 2005.

The variability or inconsistency in these results are very similar to other foliar fungicide strip trials conducted in the US. For instance, in a 2005 University of Minnesota study, a positive economic return to fungicide application occurred on roughly 1/3 of the trials.
http://www.extension.umn.edu/cropenews/2005/05MNCN59.htm

Considerable work is underway across North America to understand when and where positive economic returns can be found with the use of foliar fungicides on soybeans. Yield response may be associated with the amount of stress a plant is under but even this theory has yet to be proven. Economic yield results have been inconsistent when applying foliar fungicides.

Next Steps:

Similar studies should be conducted including fungicide/insecticide tank mixes to assess the economic value of using these products on soybeans.

Acknowledgements:

Special thanks to all those who participated in the project.

Project Contacts:

Stay tuned for future results and contact
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Gilles Quesnel gilles.quesnel@ontario.ca, or
Albert Tenuta albert.tenuta@ontario.ca for further information.

Soybean Fungicide and Insecticide Seed Treatments (2006 Final Report)

Purpose:

The objective of this study was to investigate new insecticide seed treatments for soybeans. Cruiser was registered recently and Gaucho has yet to be registered in Canada. Widespread infestations of soybean aphids across Ontario in 2001 and 2003 drastically reduced yields. Although foliar insecticides can effectively control this pest, new management options such as seed treatments could aid in their control. Other insect pests are also on the rise in Ontario. The spring of 2006 saw very high over-wintering bean leaf beetle populations in the province. Fields reached threshold levels as far north as Huron County for the first time in 2006. Little research has been reported on the activity of new insecticide seed treatments on aphids, bean leaf beetles and other insect pests across multiple field locations.

In addition to the insecticides tested, a fungicide seed treatment was also included in the treatments. The use of a fungicide seed treatment on corn and wheat are standard practice. But, the majority of soybeans planted in Ontario do not receive a fungicide seed treatment. Since soybeans tend to be planted later than corn, soil conditions are generally more favorable for rapid germination and emergence. However, when conditions are wet and cool, soil borne diseases cause considerable seed and seedling damage. The extent of the damage these diseases will cause depends on moisture, temperature, overall plant health and soil type. Cold wet soils, crusting, heavy rains, compaction and even post-emergent herbicides can all cause plant stresses, which make the seedlings more susceptible to diseases.

This project was initialed in 2004 by the University of Guelph, Ridgetown College and Ontario Ministry of Agriculture, Food and Rural Affairs to evaluate the efficacy of soybean seed treatments on new and expanding pests such as aphids, bean leaf beetles, pythium root rot etc.

Methods:

Experiments were established on more than 30 fields across southern Ontario from 2004 to 2006. Multiple locations across a wide geographical area were necessary to increase the potential for fields with varied insect and disease levels. Treatments were arranged in a strip plot design, 10 feet wide by 410 feet long with 3 replications per treatment. Check plots were monitored twice a week from soybean emergence to the V2 stage for the presence of root disease and soil pest insects such as European chafer, wireworm, and seed corn maggot. Plant populations were determined in all seed treatment strips approximately 21 days after emergence. Vigor ratings were determined subjectively on a scale of 0-100%. The plots were monitored once-a-week from late-June until mid-August for additional insect pests such as bean leaf beetle, potato leafhoppers, and soybean aphids. When aphids were detected in the plots, counts were recorded. Seed yield and harvest moisture were taken.

TREATMENTS INCLUDED:

1- UNTREATED CHECK (no fungicide or insecticide seed treatment)
2- MAXIM APRON
3- MAXIM APRON + CRUISER @ 50 g per 100 kg of seed
4- MAXIM APRON + GAUCHO @ 120 g per 100 kg of seed

Bean Leaf Beetle

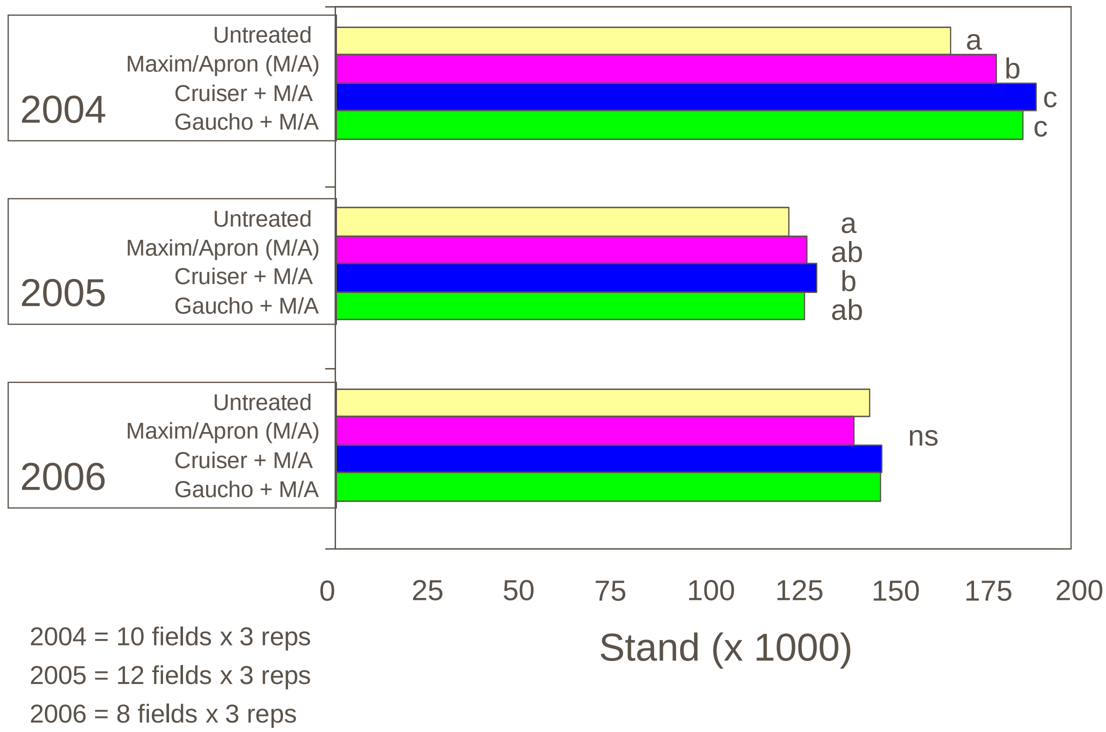
Soybean Aphids

Results and Summary:

Plant stand counts were taken approximately 21 days after seeding. Averaged across all sites plant stand counts were higher by approximately 5000 plants/acre for the Maxim

Apron, 12 000 plants/acre for the Maxim Apron + Cruiser and 10 000 for the Maxim Apron + Gaucho compared to the untreated check. See graph #1.

Graph #1: Seed Treatment Effects on Soybean Plant Stand



The fungicide seed treatment showed a numerically greater plant stand count at 20 out of the 30 sites, but was only statistically significant at 5 of them ($p < 0.10$). Visual vigour ratings mirrored plant stand counts and were significant at 5 out of the 30 sites.(data not shown) Insecticide seed treatments stand counts were numerically higher at 23 of the 30 sites, but only 5 of these were statistically significant at the p=0.10 level.

Averaged across all the sites and years, modest but significant yield advantages for both the fungicide and insecticide seed treatments are notable. See table #1.

Yields were numerically higher for Maxim-Apron in 17 out of 30 trials compared to the untreated check, but yields were statistically significant at only 3 out of the 30 sites. ($p <$ 0.10). Maxim Apron plus an insecticide seed treatment yielded numerically higher at 23 out of 30 sites and 4 of these were statistically significant at p=0.10. See graph #2 for yield responses.

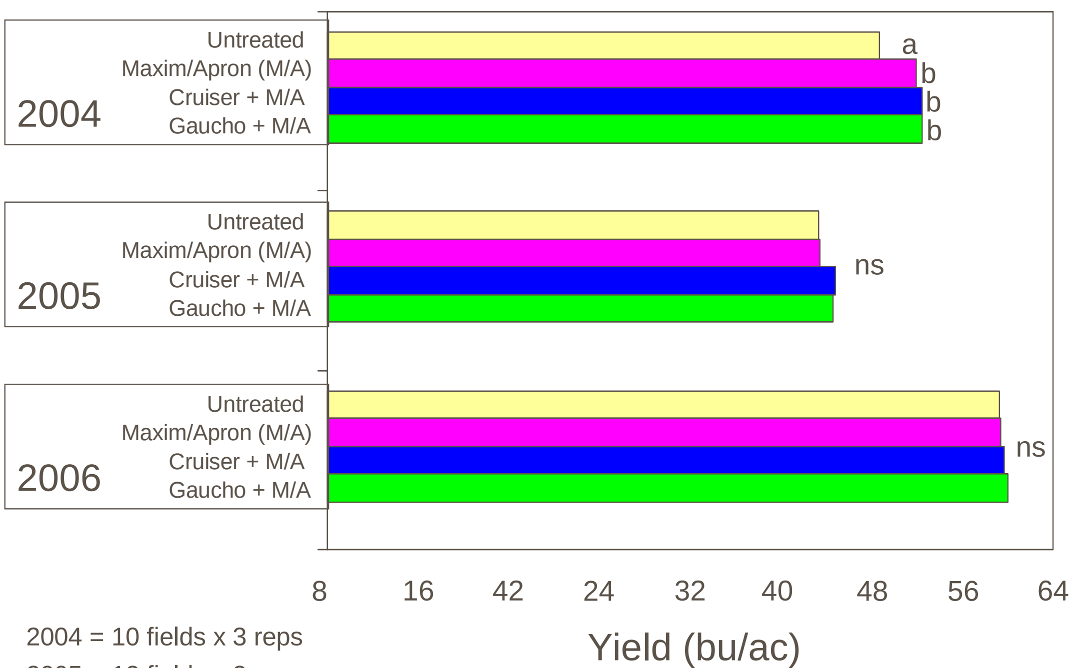
Table #1: Soybean Seed Treatment Yields (2004-2006)

	Yield (bu/ac)	Advantage (bu/ac)	
Untreated	48.7		
Maxim/Apron (M/A)	50.0	1.3	**
Cruiser + M/A	50.6	1.9	***
Gaucho + M/A	50.6	1.9	***

2004 = 10 fields x 3 reps
2005 = 12 fields x 3 reps
2006 = 8 fields x 3 reps

, * = statistically significant from untreated at p=0.01 and p=0.001

Graph #2: Seed Treatment Effect on Soybean Yields



2004 = 10 fields x 3 reps
2005 = 12 fields x 3 reps
2006 = 8 fields x 3 reps

The magnitude of soybean response to seed treatments depended mainly on the presence of root rot diseases, insect pressure, soil type and weather. Maxim-Apron increased plant stands by approximately 5000 plants/acre, and yields by an average of 1.3 bu/ac. The greatest yield response was on clay and clay loam soils. Fields that suffered from soil crusting after planting had a greater response than those with little or no emergence problems. At one site where crusting was evident, Maxim-Apron increased plant stands by 38%. At the sites with a statistically significant yield response, rhizoctonia and pythium root rot were the main diseases problems. At two sites where pythium reduced plant stands, yields were increased by an average of 32% or 11 bu/ac. Maxim Apron + Cruiser increased plant stands by 12 000 plants/acre and increased yields by 1.9 bu/ac. Maxim-Apron + Gaucho increased plant stands by 10 000 plants/acre and increased yields by 1.9 bu/acre. Seed treatments containing insecticides significantly reduced early populations of bean leaf beetle when they were present (up to a 60% reduction). Significant aphid populations were only observed during the 2005 growing season in these trials. Insecticide seed treatments kept aphid levels lower than the untreated check for the first 60 days after planting, but they had little affect on aphids after that point. Typically, soybean aphid populations have not reached threshold levels in Ontario until July or August. For this reason, insecticide seed treatments have not been an effective control measure for this pest.

In this set of experiments, the fungicide Maxim-Apron increased yields by up to 32% when high levels of root rot were present and when fields suffered from crusting. This occurred in 3 out of 30 fields across 3 years in these trials. When conditions were excellent for emergence and early growth, no yield benefit was realized. Likewise, the use of an insecticide was only beneficial when early season bean leaf beetle or seed corn maggots were a problem. Insecticide seed treatments were not effective in controlling soybean aphids beyond 60 days after planting.

Acknowledgements:

This project was conducted collaboratively among the following researchers:

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SCN Detection in Non-Infested Counties of Ontario
(2006 Report)

Purpose:

Soybean cyst nematode (SCN) is often described as a “silent yield robber”. In many cases, farmers are not even aware of their losses until SCN populations have become well established in the field. Once SCN reaches this point it will continue to have long term yield implications. SCN has become the number one yield robbing disease for soybeans in Ontario. Unless SCN is managed properly it will reduce yield every year, even when visual symptoms are not obvious.

SCN symptoms are often confused with other common problems such as nutrient deficiencies, chemical injury, soil compaction, drought, flooding or root rots. SCN symptoms are also more pronounced when soybeans are under stress from drought, soil compaction, aphids, low soil fertility or other stresses. Being able to distinguish SCN from these other problems is imperative to limiting further losses from this disease.

Since the diseases first detection in 1988, surveys have proven to be irreplaceable and an effective tool in the management of SCN. Unfortunately, as with other soybean production areas around the world, soybean cyst nematode does not stop moving and will eventually spread to all soybean production areas of Ontario. In 2005 both Bruce and Brant counties were added to previous identified counties with SCN: Essex, Kent, Lambton, Elgin, Middlesex, Huron, Haldimand-Norfolk, Oxford and Peel. Early detection of SCN in new areas of the province is critical and allows OMAFRA and the OSG to target activities and implement management strategies. These activities will aid in preventing the dramatic losses in yield and quality experienced in Southwestern Ontario.

Methods:

The objectives of this 2 year project include:

1) Survey the remaining non-infested counties of Ontario for Soybean Cyst Nematode in 2006 and 2007 to determine the extent and population levels.
2) Determine the race (Hg-type) associated with these new areas and how they compare with previous identified areas.
3) Provide soybean breeders (private and public) with the necessary information to increase development of early maturing SCN resistant varieties.

Results:

Over 300 soil samples were collected from counties not yet identified to be infested with soybean cyst nematode (Oxford county border to the Ottawa Valley). These samples have been submitted to the Canadian Food Inspection Nematology Laboratory in Ottawa. Results will be available in March 2007. This information will update the distribution of Soybean Cyst Nematode in Ontario.

New SCN populations are developing in southwestern Ontario which are able to infect soybean varieties containing the SCN resistant gene (PI 88788). This means that new SCN resistance genes (such as Peking) would need to be incorporated into soybean varieties for these areas. Fortunately, more SCN varieties with new sources of resistance are being released to Ontario producers. The table below shows one field from Essex County and another from Chatham-Kent County. The Essex county field has had a long history of SCN and many years of SCN resistant varieties.

Growers need to rotate SCN resistant varieties since SCN will adapt to the resistance genes of the same variety planted repeatedly in the same field. Rotating varieties will help to reduce this resistance development to the same varieties. Rotating to a Peking or Hartwig source of resistance would be ideal as these become available to growers. But, until they are more accessible it is still important to avoid the resistance breakdown in PI 88788 by rotating between different SCN varieties.

SCN Population: Essex 240
HG Type 2.5.7
Race 1

	Mean	FI
Lee74	286	
PI548402 (Peking)	2	1
PI88788	60	21
PI90763	0	0
PI437654	0	0
PI209332	41	14
PI89772	0	0
PI548361 (Cloud)	125	44
Pickett	2	1

SCN Population: Chat 35
HG Type 0
Race 3

	Mean	FI
Lee74	180	
PI548402 (Peking)	1	1
PI88788	1	1
PI90763	0	0
PI437654	0	0
PI209332	3	2
PI89772	1	1
PI548361 (Cloud)	8	4
Pickett	8	4

Summary:

The soybean cyst nematode (SCN), Heterodera glycines, can be found in all major soybean-producing countries and is the most economically significant pathogen of soybeans. Although SCN has occurred in the United States since 1954 (North Carolina), it was not identified in Ontario until 1987 when several fields near Chatham Ontario (Kent County) were found to be infested. Subsequent surveys in 1987, 1988 and 1989 found the nematode in four other southwestern Ontario counties (Essex, Lambton, Elgin and Perth). In 1995 and 1996, SCN was identified in Haldimand-Norfolk and Middlesex Counties, as a result of grower complaints of unhealthy plants. A survey targeting non-SCN infested counties in 1996 identified the nematode in Huron County. In 1999, Oxford County was found to have SCN based on field observations. In 2001, a survey of eastern Ontario was conducted in cooperation with the Canadian Food Inspection Agency (CFIA) which did not detect any soybean cyst nematode at the time. In 2003, a number of fields in Peel County (near Brampton) were confirmed to have soybean cyst nematode. These fields were displaying typical SCN symptoms (stunting, yellowing of the leaf margin, wavy field appearance, rows slow to close, weed escapes, cysts, poor nodulation, etc.). As is often the case, the severity of the symptoms and the number of cysts on the roots would indicate that the nematode had been present for a number of years (10 or more).

Bruce and Brant County were added to the list of SCN infested in 2005. The Bruce county infestation was of particular concern since for a new infested area the SCN population levels were surprisingly high (12,000 eggs per 100 grams of soil). This would indicate that SCN was not a recent introduction but as with the southwest in the late 1980s and the early 1990s, SCN infection had been misdiagnosed or gone undetected for many years. SCN will always be a major threat to soybean production in Ontario and continues to move east into the shorter season soybean production areas. It will spread to new areas of the province but with early detection and the initiation of the management strategies (resistant varieties and rotations) SCN losses can be minimized.

The 2006 SCN survey will help target these activities to any new infested areas of the province.

Next Steps:

Finish processing the SCN samples collected in 2006. Target potentially new infested areas with a more intensive survey and target these areas with extension management information.

Acknowledgements:

This survey was supported by the Ontario Soybean Growers which obtained funding through contributions by Canada and the Province of Ontario under the Canada-Ontario Research and Development (CORD) Program. The Agricultural Adaptation Council administers the CORD program on behalf of the province. We would also like to thank the soybean seed companies and growers for access to their fields plus the Canadian Food Inspection Agency for processing the soil samples.

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Improving Yield of Second Year Soybeans

(Interim Report)

Purpose:

The purpose of this project is to determine the value of a rye or winter wheat cover crop in fields where soybeans follow soybeans. Many growers find themselves in a situation where for cropping, economic or other reasons they plant soybeans in a field two or more years in a row. This results in yield loss and can increase pest and disease pressure in the field.

The rye or wheat is planted immediately following soybean harvest and killed off in the spring prior to planting soybeans. Hopefully enough growth will be generated to provide some benefits to the soil and increase the yield of the succeeding soybean crop. There is some research from Pennsylvania indicating that cover crops can improve soybean yields in these situations. The intent of the project is not to replace a good crop rotation for soybean production but to provide a tool for growers who find themselves growing multiple years of soybeans.

Methods:

The project will be established in the St Clair Region Soil and Crop Improvement Association (OSCIA) area (Essex, Kent and Lambton) with some sites in the Huron-Perth area and possibly a few sites in the Niagara and Haldimand areas. Fields will be selected which have had one or more years of soybeans previously and will be going into soybeans. Immediately following soybean harvest the winter wheat and rye cover crop will be drilled in or broadcast and worked in. Main project sites will have both cover crops and secondary sites will have a minimum of one cover crop. Each site will have at least two replications. The cover crop will be left over winter and be killed prior to soybean planting.

At cover crop establishment soil samples will be taken to determine fertility, organic matter content and soybean cyst nematode levels. Other soil quality measurements may be taken either at establishment, the next season or both. Soybean growth and yield measurements will be taken for the strips.

Results:

The soybean crop was later maturing this year and then the fall became very wet, so plots were only able to be planted in Essex County. One main and two secondary sites were planted in the first week of November. The main site had a corn strip in it and has two reps of the rye and wheat cover crops. One secondary side has both wheat and rye and the other has just rye. Cover crop growth was slow due to the late planting and by the end of December 2006 there were only one or two leaves on the plants. Fertility, organic matter and soybean cyst nematode (SCN) samples were taken and analyzed. The three sites have adequate fertility and organic matter averages about 3.5%. The main site SCN samples were generally in the low to moderate risk range. The two secondary sites had no SCN present. Bait lamina strips were inserted in four treatments of the main site. These strips are inserted into the soil about 8 cm or 3” and have “soil life food" in holes at different depths. They are removed from the soil after 10 days and give an indication of the amount of biological activity in the soil. Results are not available yet.

Essex main plot, summer 2006. After harvest wheat and rye strips were planted on both sides of the corn strip.

Summary:

Due to the wet fall the cover crops will not achieve the growth expected so yield differences in the 2007 soybean crop due to the cover crop are unlikely.

Next Steps:

Soybeans will be planted following the cover crops in the spring and yields will be taken in the fall. The rye and wheat cover crops will be planted following the 2007 soybean harvest for another cycle of the project. The St Clair District SCIA will be pursuing funding to complete three full cycles of the project.

Acknowledgements:

Funding for this St Clair District Soil and Crop Improvement Association project was received from the Ontario Soil and Crop Improvement Association Partner grant and a grant from the Southwest Soil and Crop Improvement Association (Southwest Agricultural Conference). Thanks to the cooperators and to Henry Denotter, Marc Rivest, Earl Elgie, Terry Vanderveen, Don VanGorkum and Roy Searson for helping to develop and coordinate the project. Also, thanks to Agri-Food Laboratories for assistance with the soil analysis.

Project Contacts:

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Location of Project Final Report:

Monitoring and Reporting Soybean Aphid Infestation Levels in Ontario Soybean Fields

Purpose: To monitor and report soybean aphid infestation levels weekly across Southern and Eastern Ontario. Providing timely and accurate reporting of aphid levels and provincial specialist's recommendations each week to Ontario growers and consultants alerts them to potential pest problems, allowing them to be proactive in making sound management decisions within their field, applying pesticides only when necessary. This project was also tied into a larger North American soybean aphid monitoring and extension program to aid in the collection of pest and predator data for future aphid prediction models and for a greater understanding of pest and natural enemy dynamics.

Methods:

75 soybean fields were monitored for soybean insects and diseases across Southern and Eastern Ontario by Ontario Ministry of Agriculture, Food and Rural Affairs (OMAFRA) staff and key consultants. 37 of these sites were soybean rust sentinel plots that were planted specifically for early rust detection, but utilized for additional soybean pest monitoring by OMAFRA staff. In addition to these sites, 38 "mobile" sites were set up in regions of Ontario where sentinel plots did not exist. These mobile sites represented typical grower fields that were planted at normal planting dates for their region, more likely suited for soybean aphid infestations.

Fields were scouted weekly from May to early September. Pertinent cropping information was recorded including variety, planting date, latitude, longitude, row spacing, crop stage etc. 20 random plants were selected each week and the average number of aphids per plant was recorded. Natural enemies, other insect pests, plant health and plant diseases if present on these plants were also recorded.

Based on the scouting results each week, the OMAFRA Field Crop Entomologist and Field Crop Plant Pathologists would provide commentary, including scouting and management recommendations for pertinent soybean pest issues that would arise based on the monitoring program. Timely articles were also written for CropPest newsletter and other media sites to help distribute key pest information to Ontario soybean growers.

Results:

Aphid data from these sites were entered into a mapping program on the USDA Pest Information Platform for Extension and Education (PIPE) at www.sbrusa.net. The same data was also used to create Ontario maps by Laresco that were then placed on the Ontario Soybean Growers website at www.soybean.on.ca by OMAFRA staff. The rust and plant disease information was utilized by the OMAFRA Field Crop Plant Pathologist for the Soybean Rust sentinel plot monitoring program.

Although soybean aphid populations were relatively low for most fields in Ontario, there were a few sites in eastern Ontario that came close to threshold levels (Fig. 1). By including our on the USDA PIPE network, we were able to identify pockets of similar infestation levels in NY, that were directly across from these eastern Ontario sites. This indicates that these two areas experienced similar conditions that allowed for aphid populations to increase, providing us with the opportunity to further investigate why this may have occurred and would not have been evident without our partnership in the USDA pest monitoring network.

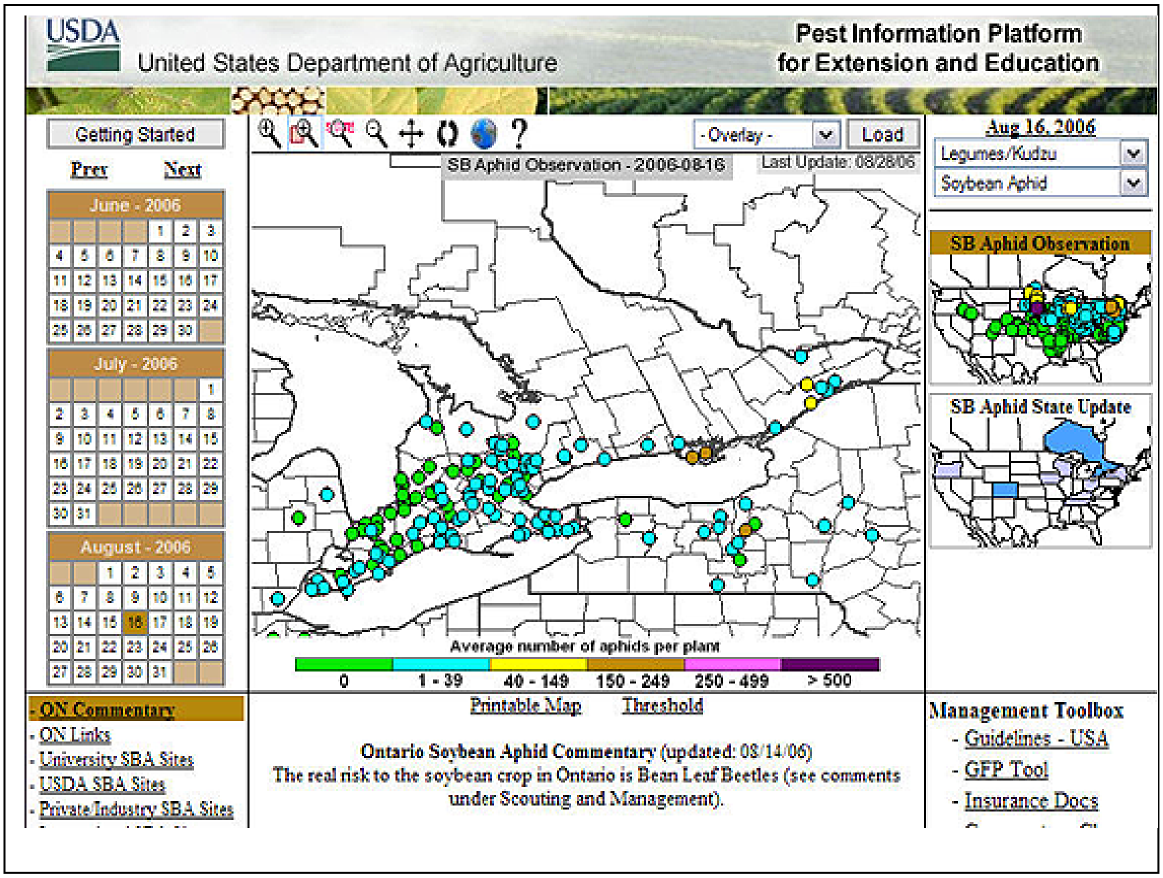

Figure 1. Map taken from the USDA PIPE website (www.sbrusa.net) indicating our soybean aphid scouting results in Ontario for the week of August 16th, 2006. Clients can zoom in on their county to view our results, read the OMAFRA specialist's weekly commentary, recommendations and see what aphid populations are doing across North America.

Monitoring fields evenly spread across southern and eastern Ontario gives growers and consultants an indication of could be happening within their own fields. Seeing aphid population levels rise within their regions encourages them to get out and scout their own fields and to determine if management is necessary. Despite our extensive scouting efforts, grower and consultants must still scout their own fields to ensure that conditions have not allowed aphid populations to reach thresholds there.

Summary:

This project was a large collaborative effort by OMAFRA staff, ag. industry, consultants, growers and US extension specialists. Partnering with and having access to pest data across Ontario and from neighbouring states allows us to stay alert to any potential pest issues that could arise here in Ontario. This collaboration gives OMAFRA extension specialists the ability to provide growers with early warnings and recommendations to key soybean pests, giving our growers to opportunity to respond quickly. Continuing this project into the future, including monitoring for several different insect and disease pests will also increase the chance of discovering any new invasive species that arrive in the US or Canada, allowing us to respond quickly, potentially reducing it's impact to our crops.

Next Steps:

The soybean aphid and rust sentinel plots will be monitored again in 2007 with scouting results mapped and management recommendations provided on both the USDA PIPE website and the Ontario Soybean Growers Website.

Acknowledgements:

Many thanks to all of the ag. industry reps and consultants how provided us with our mobile site locations and in some cases did the scouting for those sites. Chad Anderson, private consultant, Chris Armstrong–Thompsons Limited, Jim Barclay – Hensall District Co-op, Gordon Barrie and Sons, Luc Bourgeois – Bayer CropScience, Deb Campbell – Cargill AgHorizons, James D'aoust, Pioneer Hi-Breds, Leanne Freitag – Cargill AgHorizon, Jeff Jacques - Cargill, AgHorizons, Gerald Mailloux - AGRIS co-op, Francois Meloche – AAFC, Brad McAlpine - LARESCO, Al McCallum, private consultant, Don McLean – North Wellington Co-op, Istvan Rajcan – U of G, Reesor Seed and Grain LTD, Colin Smith – Waterloo-Oxford Co-op, Tom Tyhurst - Pioneer Hi-Breds, Tri County Agromart, Nic Walby - LARESCO, Jerry Winnicki – Clark Agriservices, and Nick Zwambag – AGRIS Co-op. Also thanks to our OMAFRA summer staff Martha Rempel, Catherine Walsh, Brittany MacAlpine, Cheryl Van Herk, Kristen Founk, Jo-Ellen Burns and Stefanie Nagelschmitz who help scout these fields and thank you to LARESCO for developing our weekly Ontario maps for the OSG website.

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Location of Project Final Report:

Influence of Variety & Seeding Rate on Alfalfa Stem Firmness

Purpose: To determine if alfalfa stem fineness (diameter) for hay can be improved by variety selection or seeding rate.

Background:

Hay producers want alfalfa that is fine stemmed, rather than course stemmed. This is thought to minimize "sorting", and improve palatability, forage quality (digestibility) and marketability. Stem fineness is more important when alfalfa is harvested as dry hay rather than haylage. Hay producers are likely willing to sacrifice some yield potential for an improvement in stem fineness, whereas haylage producers are not. Are hay producers inadvertently selecting unsuitable varieties? There are anecdotal differences between varieties with regards to stem fineness. There is also anecdotal evidence that stem fineness can be improved by a high seeding rate, although this effect may not last past the first year.

While the historical OFCC (Ontario Forage Crops Committee) registration trials included new and experimental varieties compared to a check, this is a side-by-side performance trial where we will get to see the commercially available varieties together in one plot. This provides an excellent site for Soil & Crop Tours to discuss variety selection, as well as alfalfa management. Information gained from the project will be shared with the U of G, Ontario Forage Crops Committee, and the Ontario Forage Council.

Methods:

<u>Trial #1 – Variety</u>

Side-by-side alfalfa performance variety (yield) trials were seeded in May 2005 near Enniskillen by the University of Guelph. However, without the Ontario Soil and Crop Improvement Association Regional Grant, there would have been no funding to harvest these plots and obtain the data. The trial consists of 49 varieties, in 1 X 6 m plots that are replicated 4 times. In 2006, 2007 & 2008, these plots will be harvested and evaluated for yield and stem diameter.

Plot Harvest

East-Central S&C uses the Centrailia plot harvester and is responsible for the transportation and insurance of the machine for the 3 harvests each year. A transport company is used to transport the machine to the site and back. Harvest timing targets the early-flower stage.

Stem Diameter

Two harvests of 1 square foot are made of each variety. The stems are “staged”, and the number of stems/stage counted. Theses are put in paper bags, dried, and weighed to determine “mean stage by weight”. Stems at “stage 4” (early flower) are to be measured for stem diameter between the first internodes from the base, using electronic calipers.

Yield Measurements

The entire plot is then harvested using the plot harvester, with the sample weights being added back in.

Preliminary Results

Varieties have been ranked according to a "maturity index" and a "diameter index". While there appears to be a relationship between the two, maturity does not account for all the differences between varieties in stem diameter. Further analysis of the data will be done. Data will not be published until we have more than one year of data.

Trial #2 – Seeding Rate

Seeding preparation was done by farm co-operator. The Elora forage plot planter was used. It was transported to the site and back by East-Central S&C.

Varieties & Seeding Rates

Five varieties were planted – some that are anecdotally known as "fine stemmed" and some that are known as "course stemmed". Seeding rates were 6, 12, 18, 24 and 30 kg/ha. The plots were replicated 4 times, similar to Trial #1.

Results:

Yield data was added to composite index data that is published on the 2007 OFCC Forage Variety brochure.
www.plant.uoguelph.ca/performance_recommendations/ofcc/pdf/ofcc_performance.pdf
Stem diameter and maturity index data will be published when analysis is finalized.

Summary:

Year 1 of this 3 year trial is complete.

Acknowledgements:

University of Guelph

Project Contacts:

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Manure on Forages

Purpose:
This project attempted to put an economic value from yield and quality on the application of liquid manure on forage stands using surface application and partial incorporation.

1. document yield impact of manure on forages
2. determine the impact of partial incorporation
3. determine quality impact of manure on forages
4. determine tire damage and damage from incorporation equipment

Methods:
This project was implemented at 8 forage fields. They ranged from 1st full production year to 3rd production year and most fields had a mix of legumes and grasses. Four of the sites had partial incorporation comparisons – three fields with 4 replicated treatments as shown below. The other sites compared surface application on different varieties and/or used different application rates. One site had manure partially incorporated before 1st cut; 5 sites had manure applied after 1st cut and 3 sites applied manure after 2nd cut.

Soil samples were taken on each treatment to determine field fertility levels. Harvest was done using a 3' diameter hoola-hoop/scissors cut method prior to each cut. The goal was to take three hoola-hoop samples per treatment, but this was modified based on time and weather. Samples were weighed and analyzed for feed value. Some samples had grass-alfalfa separated to determine approximate ratios. The limiting factor came from weather (frequent showers) resulting in short notice for when a field would be cut. A manure analysis, was obtained at time of spreading when possible. Observations and yield comparisons of plant regrowth on wheel tracks and on manured vs. non-manured treatments

Results:

Manure applied to forages after 1st or 2nd cut gave both a yield and quality advantage for the 8 sites involved in this study. The details are provided in the tables below. Table 1 gives some site details around dates of forage harvest(s) and nutrient application. All but one field had a significant mix of grasses with the alfalfa. 1st cut growth was lush and most fields at time of first harvest were lodged. Frequent rain events during late May and throughout June, July and August made strict cutting times for a 4-cut system difficult to accomplish. Overall forage quantity was higher than normal which resulted in most sites only taking 3 cuts.

Table 1: Site Details

Location	Mix	Rate	Applied	1st cut harvest	2nd cut harvest	3rd cut harvest	4th Cut harvest	Total Yield
	Alfalfa-grass	gal/ac	Date	Date	Date	Date	Date	Wet ton/ac
Alymer	100-0	4,000	June 12	June 7	July 9	---	---	---
Innerkip 1	85-15 o-rg-t	3,000	May 25	May 23	Jun 20	Jul 25	---	26.37
Innerkip 2	85-15 0-rg-t	3,000	April	May 19	Jun 20	Jul25	---	22.37
Braemer	85-15	2,500	July 14	~May 31	July 8	Aug 10	---	---
Brooksdale	90-10 rg-rc-b	4,000	July 18	~May 31	July 7	Aug 10	---	---
Holbrook	85-15	4,500	June 14	June 5	July 7	---	---	---
Salford	Pioneer 85-10 t	2,500	June 11	June 6	July 6	Aug 8	Sept 22	26.7
Salford	Pro Rich 90-10 t	2,500	June 11	June 6	July 6	Aug 8	Sept 22	32.0

rg= ryegrass; rc=reed canary; b=brome; o=orchard; t=timothy

Table 2: Soil Analysis Results

Location	pH	OM %	P ppm	K ppm	Mg ppm	CEC
Alymer	7.4	3.1	27	166	323	23.5
Innerkip 1	7.4	4.2	27	60	296	18.4
Innerkip 2	7.1	3.6	16	168	283	16.7
Braemer	7.2	4.8	30	85	344	22.0
Brooksdale	6.5	3.1	7	61	305	15.5
Embro	7.5	4.1	37	122	253	28.0
Holbrook	7.1	3.6	22	99	306	20.0
Salford -Pioneer section	7.4	7.3	24	104	312	32.5
Salford - ProRich section	6.2	4.2	27	110	238	18.0

Table 3: Manure Nutrients Added							
Location	Manure	Rate	Dry Matter	Nitrogen	Phosphorus	Potassium	N-P-K Value
		gal/ac	%	lbs/ac	lbs/ac	lbs/ac	$/ac
Alymer	dairy	4,000	8.0	65	45	60	65.70
Innerkip 1	dairy	3,000	4.8	42	22	65	46.30
Innerkip 2	dairy	3,000	4.8	42	22	65	46.30
Braemer	dairy	2,500	9.4	35	15	60	38.70
Brooksdale	dairy	4,000	3.6	50	37	56	54.10
Embro	dairy	2,500	11.8	88	55	81	86.40
Holbrook	hog	4,500	2.6	83	83	63	91.10
Salford	dairy	~3,000	~3.5	~45	~40	~55	~50.00
Salford	fertilzer	225 lbs/ac		6.5	30	100	41.72

Table 4 gives the summary of yield and quality comparing manured treatments (surface applied and using partial incorporation tools) to non-manured treatments (aeration only and controls) taken from 1st, 2nd 3rd and 4rth cuts over all the project sites. Overall there is an 8 percent yield increase in yield. Wet yield represents samples weighed after scissors cut at about 85% moisture. Quality averages are shown for protein, acid detergent fibre (ADF), neutral detergent fibre (NDF), potassium (K), calcium (Ca) and Weiss total digestible nutrients (WTDN).

Table 4: Yield/Quality Response to Manure				Quality Data (%)						
Treatment (# samples)	Yield/cut (wet tons/ac)	Yield/cut (dry tons/ac)	Advantage %	Protein	ADF	NDF	Lignin	K	Ca	WTDN
With Manure (68)	6.97	1.05	8.0	22.1	35.1	45.9	7.0	3.14	1.49	61.0
Without Manure (60)	6.41	0.96	---	21.8	36.0	47.0	7.5	2.84	1.55	60.1

The calcium values are an indication of grass versus alfalfa content in the sample. In separated samples, there was an average 4% increase in grass content where manure had been applied. Alfalfa has higher calcium content. Any sample over 1.5% calcium is considered high alfalfa content while anything lower indicates significant grass in the sample. A pure grass sample has a calcium level near 0.3%.

Protein content is expected to be higher where manure is applied due to its nitrogen content. Nitrogen will have a greater impact on the grasses in the stand, however can also improve the yield and protein content of alfalfa. The nitrogen added from manure saves the plant energy in obtaining nitrogen from the root nodules which results in higher yield. Similar results have been seen from addition of commercial nitrogen, but would not be economical.

ADF, NDF, Lignin and WTDN are all quality indicators. The ideal protein – ADF – NDF for a pure alfalfa sample would be near 20-30-40% respectively. Grasses, even at ideal maturity are often higher than 30% ADF and 40% NDF. Lignin content greater than 7% decreases digestible nutrient quality.

Surface application of manure had the highest yield in almost every site. In table 5 the yield and quality comparison is broken down by surface application of manure compared to commercial fertilizer or nothing and are also broken down into 2nd, 3rd and 4th cuts.

Table 5: Surface Application vs. Commercial Fertilizer (or nothing) (6 locations)			Quality Data (%) (ave of 32+ samples/treatment)						
Treatment	**Average Yield/Cut** (wet tons/ac)	**% Increase**	**Protein**	**ADF**	**NDF**	**Lignin**	**K**	**Ca**	**WTD N**
No manure (33 treatments)	**5.3**	**---**	**22.0**	**35.8**	**46.3**	**7.40**	**2.56**	**1.61**	**59.8**
Surface Applied (39)	**6.1**	**12.8**	**22.3**	**34.7**	**44.6**	**6.96**	**2.90**	**1.56**	**61.7**
2nd cut no manure (22)	5.57	---	22.2	37.9	48.4	7.70	2.63	1.71	59.5
2nd cut surface manure (22)	7.28	23.4	22.1	36.5	46.8	7.35	3.06	1.66	60.7
3rd cut no manure (13)	5.95	---	21.3	33.7	44.8	6.79	2.44	1.42	60.7
3rd cut surface manure (16)	6.23	4.4	21.9	33.4	43.7	6.36	2.72	1.43	62.3
4rth cut no manure (4)	3.81	---	25.3	31.1	35.9	6.98	2.79	1.92	63.8
4rth cut surface manure (4)	4.13	7.7	25.4	31.0	37.5	7.44	2.88	1.68	63.4

Although this would vary for a year with less rainfall, it demonstrates that the affect of the manure application lasts beyond just the cut after application. This also suggests that manure applied to a forage field during the growing season will have a higher yield advantage than manure applied during the fall after critical harvest period.

Table 6: Grass-Alfalfa Response to Manure		Quality Data (%)									
Treatment – 1st Cut	**Yield (wet tons/ac)**	**CP**	**ADF**	**NDF**	**Lignin**	**P**	**%K**	**Mg**	**Ca**	**RFV**	**WTD N**
No Manure alfalfa	**13.08**	24.0	30.6	38.2	7.48	0.39	3.59	0.30	1.61	158	63.8
No Manure grass		16.2	35.4	61.2	6.47	0.29	3.35	0.15	0.30	93	57.2
Aeration with manure alfalfa	**11.46**	24.6	32.6	36.4	6.77	0.37	3.69	0.30	1.52	162	63.9
Aeration with manure grass		19.5	35.9	58.8	5.95	0.24	4.00	0.16	0.29	97	58.1

Table 6 looks at the comparison of grasses to alfalfa, both in quality as separate species and when manure is applied. From samples where grasses and alfalfa were separated (not shown in table 6), there was a 4% increase in grass content where the manure had been applied. The advantage of the manure to improving the nutrient quality of the grasses is bigger than the advantage of the manure to the alfalfa.

Comparisons were done to assess the affect of partial incorporation to surface application to aeration effect to a control. At one location the slot injection (Kaweco) was compared to surface application and a control. Coulters in 7 inch row spacing's made slots no more than 2 inches into which manure was placed with a shoe-type attachment. The results show a greater than 30% advantage to the manure applied into the slots compared to no manure and surface application (which was done with a tanker). However, with just one location and one harvest this shows a promising trend, but must be repeated for confidence. The comparison was done to a pure alfalfa stand and there was a visual difference between the treatments.

Table 7: Surface Application vs. Partial Incorporation (Aerway) **3 locations**			**Quality Data (%)** (ave of 14 samples/treatment)						
Treatment	**Average Yield** (wet tons/ac)	**% Increase**	**Protein**	**ADF**	**NDF**	**Lignin**	**%K**	**Ca**	**WTDN**
No manure – No Aeration	6.11	---	21.7	37.4	49.2	7.40	2.98	1.50	59.61
Aeration only	6.39	4.4	21.3	36.8	49.0	7.49	3.00	1.43	59.25
Surface Applied Manure	7.31	16.4	21.6	37.0	48.5	7.40	3.40	1.43	59.42
Aeration with Manure	6.72	9.1	22.1	36.4	48.2	7.15	3.42	1.48	60.14

In table 7 the implement used for incorporation was an aerway – at two sites manure was applied behind and into the slots of the rotary tines, while at the other site the manure was applied in front of the rotary tines. In each case, there was a yield decrease compared to surface applied manure. Aeration technology was introduced in Ontario as an implement that would aerate pastures and stimulate secondary root function. Compared to the control there is a 4% increase in yield just from aeration. When comparing the aeration to surface application the difference could be most logically explained by plant damage from the rotary tines. Observations such as the picture below, show that although the alfalfa crowns affected by the rotary tines did regrow, the regrowth seems to less vigorous than crowns not affected by the rotary tines. One factor may have been a wetter than normal summer where compaction damage was more prevalent. Repeating this comparison in a drier summer would help determine if this trend is real.

Alfalfa crown affected by airway rotary tine

Slot injection (Kaweco) of manure

If aeration tines do decrease yield compared to surface application then the benefits versus the economics would need to be evaluated. Does the difference in nitrogen saved from partial incorporation by rotary tines save enough nitrogen to pay for the yield difference and cost of equipment and application on forages? An interesting study done near Elora by Greg Stewart, Ian McDonald (OMAFRA) and Neil McLaughlin (AAFC) looked at various tillage tools, incorporation, pre-tillage and ammonia loss from manure applied at the end of August onto wheat stubble. The accumulated ammonia loss was measured using calibrated enclosed ammonia meters. The results show relative differences and suggest very little difference in ammonia N savings with pre-tillage systems. The comparison of N loss when comparing immediate incorporation options showed the lowest N loss with complete incorporation such as cultivation. This is not realistic in a forage stand.

Table 8: Incorporation and Ammonia Loss

Manure Incorporation	**Ammonia Gas Release** (ppm)
No manure	8
Broadcast – incorporated 6 hrs	47
Broadcast – incorporated 24 hrs	75
Injected with Rotary Tine	108
Pre-till with Turbo Till then injected with Aerway	92
Injected with S-Tine	2
Source: Power Demo Day – Wellington SCIA, OMAFRA, AAFC	

Table 9: Pre Tillage and Ammonia Release		**Tillage Implement Depth, Draft and Power**		
Pre-tillage Implement	Ammonia release ppm	Depth inches	Draft lbs/ft	Power hp/ft
Sunflower offset disc	233	2.3	220	3.0
Sunflower disc ripper	137	6.5	560	7.5
Tandem Aerway	**185**	4.4	420	5.6
Salford CTS	287	6.4	770	10.3
Salford RTS	285	4.1	570	7.6
Great Plains Turbo Till	**187**	2.2	360	4.8
None (Surface application)	**175**	---	na	na
Source: Power Demo Day – Wellington SCIA, OMAFRA, AAFC				

The results of this study as shown in table 8 and 9 indicate that surface application, coulters and rotary tines have similar ammonia release. Manure incorporated using rotary tines did not save nitrogen. Would the results be similar if ammonia loss was measured in an alfalfa stand where plants are actively growing? If ammonia is not saved, then is odour reduction enough reward to pay for equipment costs if yield is not improved over surface application? Another year of study would help answer these questions.

Impact from tire tracks from manure application equipment is significant both for yield and quality. This can be observed in Table 10. In both these examples the manure was applied 11 and 9 days after the field had been cut. Regrowth for both these fields was significant.

Table 10 : Tire Track Impact to Manure Application			Quality Data (%)						
Treatment	**Yield/cut** (wet tons/ac)	**Advantage** %	**Protein**	**ADF**	**NDF**	**Lignin**	**K**	**Ca**	**WTDN**
Manure 1	5.80	32	22.7	30.8	42.2	5.01	2.43	1.46	63.4
Tire track 1	3.96		23.7	26.8	33.7	6.12	2.50	1.52	67.2
Manure ave 2	7.73	41	20.7	42.5	52.5	9.12	2.65	1.64	56.0
Tire track 2	4.59		24.5	32.9	38.9	7.32	2.69	1.69	60.8

The key to manure application on forages is to apply the manure as quickly after forage harvest as possible. The forage regrowth is both from the crown and from the apical buds on the stem; so when regrowth is damaged by tire traffic, the regrowth must begin anew from the crowns.

Alfalfa regrowth undamaged by tire tracks

Regrowth after damage from tire tacks

This puts the forage in the wheel track behind in maturity to the rest of the field. This is evident from the quality comparison

In fields where application of manure was within 5 days of cutting, the wheel tracks were difficult to find in the regrowth.

Summary:

Manure application to forage crops is a benefit from an economical perspective. The best option is still to apply manure to corn crops where there is a higher economic return from the nitrogen. However, when a livestock producer is looking to spread out workload, reduce storage requirements, or to prevent compaction damage or is looking for alternative crops or more opportunities in which to apply manure, then manure applied to forages will meet those objectives while providing N-P-K that will save commercial fertilizer inputs. The greatest difficulty is in timely application. Manure applied to haylage crops is usually more timely than dry hay crops, but labour and equipment is required to be able to combine timely forage harvest with timely manure application.

From 8 sites over 4 cuts during one summer, there is a greater than 12% yield advantage to surface application of manure to an alfalfa crop. In addition, forage quality is at least equal and usually slightly higher than non-manured treatments. Aeration incorporation did not show as high a yield advantage probably due to plant damage resulting in less regrowth. Timing of manure to as soon after cutting is critical to regrowth and yield

Next Steps:

The results show a trend to improved yield from manure application. Final stand counts this spring should reveal over wintering differences between manured and non-manured treatments. Aeration incorporation does not show as good a yield improvement as surface application of manure on legumes. The power demo day near Elora tested ammonia losses from various incorporation tools and results indicated that surface application and aeration tools have similar ammonia losses. The ideal next step to this project would be to repeat the project to increase confidence that the trend to yield and quality improvement is real and to repeat the incorporation treatments with ammonia loss meters to determine the economics, including nitrogen savings, from partial incorporation of manure into legumes

Acknowledgements:

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Corn Nitrogen Calculator – Infield Trials
(Final Report)

Purpose:
The purpose of the project was to compare the corn nitrogen (N) calculator rate to the rate of nitrogen a cooperator normally applies to a field. In 2005 the general corn nitrogen recommendations were revised, based on 40 years of research, and presented in the form of a nitrogen calculator. The calculator assesses a number of factors (soil type, yield expectation, crop heat unit accumulation, previous crop, manure N credits and application timing) to determine the nitrogen rate for a field. As the cost of nitrogen increases it becomes more important to apply the correct rate of nitrogen.

Methods:
The project planned to establish 12 sites in Lambton County on a range of soil types under different management practices. 15 showed an interest in participating and were sent cooperator packages. The packages included the paper version of the nitrogen calculator, project protocol and plot data forms to record plot information. The cooperators calculated their nitrogen rate using the worksheets. The plots were laid out with the cooperator's normal rate of nitrogen and the calculator rate of nitrogen replicated twice. There was also a strip left where only starter nitrogen was applied. The nitrogen rates were applied at sidedress time. The plots were field length or at least 300 m (1000') long and the width of the treatments at least two combine header widths. The strips were marked and harvested with a weigh wagon.

Results:
Ten plots were taken to harvest (one couldn't be used) and the results are presented in the table below.

Table 1. Nitrogen rate, yield and net profit loss comparison for grain corn.

Plot Location	Calculator N Rate (Yield)	Normal N Rate (Yield)	Yield Difference Calc - Normal	Net $
Watford*	82 lbs/ac (162 bu/ac)	120 lbs/ac (172 bu/ac)	-10 bu/ac	-$12.76
Forest	106 lbs/ac (187 bu/ac)	160 lbs/ac (196 bu/ac)	-9 bu/ac	-$1.98
Wyoming**	6 lbs/ac (202 bu/ac)	51 lbs/ac (194 bu/ac)	0 bu/ac	$21.60
Florence	166 lbs/ac (240 bu/ac)	180 lbs/ac (241 bu/ac)	-1 bu/ac	$3.62
Sombra	130 lbs/ac (189 bu/ac)	160 lbs/ac (190 bu/ac)	-1 bu/ac	$11.30
Arkona	106 lbs/ac (151 bu/ac)	144 lbs/ac (165 bu/ac)	-14 bu/ac	-$25.16
Ipperwash	88 lbs/ac (200 bu/ac)	110 lbs/ac (197 bu/ac)	0 bu/ac	$10.56
Petrolia***	74 lbs/ac (145 bu/ac)	108 lbs/ac (159 bu/ac)	-14 bu/ac	-$27.08
Average	(87 lbs/ac) 185 bu/ac	(121 lbs/ac) 189 bu/ac	-6 bu/ac	**-$2.49**

Notes: * 2,500 gallons hog manure applied in the spring of '06 and incorporated, ** 4,000 gallons layer manure applied in the fall of '05, *** alfalfa plowed down fall of '05.

Table 2. Nitrogen rate, yield and net return to nitrogen for silage corn.

Plot Location	Calculator N and Normal N Rate (Silage Yield)	Lower N Rate (Silage Yield)	Yield Difference Normal (Calc) less lower rate	Benefit to Nitrogen Net $
Wyoming 2*	(110 lbs/ac) 20 tons	(77 lbs/ac) 17.3 tons	2.7 tons	74.91

Note: * moisture and protein was the same for the crop for both N rates.

Summary:

The corn nitrogen calculator (table 1) recommended 14 – 54 lbs/ac less nitrogen than the cooperator's normal rate of nitrogen, an average of 34 lbs/ac less than the cooperator's normal N rate. The yield difference ranged from -14 to 0 with an average of -6 bu/ac. The net return for nitrogen and yield ranged from -$27.08 to $21.60 and the average was a loss of $2.49 per acre. Overall the calculator did well coming out positive or within a few dollars on five out of the eight plots. It is hard to determine why the calculator was not as close for the other three plots. The Watford plot had manure added in the spring so maybe it was credited for more nitrogen than it actually supplied. The alfalfa that was plowed down in the Petrolia plot may have been give a larger N credit that it actually supplied. The corn nitrogen calculator recommended the same rate of nitrogen as the grower's normal rate so a lower rate was used as a comparison. The results in table 2 show that the grower's normal rate of nitrogen is correct and the calculator agreed. The calculator is intended to determine general nitrogen recommendations so it may not predict the right rate for some fields and management systems. The N calculator or the worksheets can be found at www.gocorn.net or www.omafra.gov.on.ca/english/crops/field/corn.html#Fertility

Next Steps:

The results will be communicated in the regional newsletter and a meeting of the cooperators is being planned.

Acknowledgements:

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Project Contacts:

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Location of Project Final Report:

The Value of Peas as a Cover Crop

(Interim Report)

Purpose:

Investigations into the opportunities for various cover crops after winter wheat harvest have been ongoing since 2004. From these trials, peas have shown great promise to either replace red clover as a cover crop, or be used to fill in gaps in a clover stand. Of note, trials in 2006 at one location near Lucan showed peas far outperforming either oat or oilseed radish when biomass production was significant, and fall tillage (fall 2005) was difficult due to the volume of cover crop production. Corn yields following peas were significantly higher in this situation than following any other treatment.

However, it is not well established if corn yields significantly improve following peas planted as a cover crop, as initial results have been extremely variable. To further investigate this potential, the Thames Valley Regional Soil and Crop Improvement Association (TVRSCIA) initiated a three year project in the summer of 2006. Strips of peas were planted in fields following winter wheat harvest throughout the region. Corn will be planted in these fields in 2007, along with two replicate tests of nitrogen rates on both the pea strips and the check strips (no peas planted). These plots will be repeated in 2007/2008.

Methods:

23 plots were established across south western Ontario, with wide geographic distribution (from the Niagara peninsula to Lake Huron to Kent County). Pea seed was sourced from either western Canada (dry pea seed), or from by-pass fields that canners in Ontario had been unable to utilize (processing peas). Pea planting dates varied widely, from late July to early September. While most co-operators drilled the pea seed in, several growers broadcast the pea seed and disced it in, to attempt to reduce seeding costs. In one location disced pea seed was compared to drilled seed to determine relative establishment.

Results:

1. Establishment: Pea stand establishment was much less than expected. Seeding rates were targeted at 75 pounds/acre, but stands were thin at most locations. Even growers that bumped seeding rates to 100 pounds/acre had disappointing stands. It is unknown as to the reason for poor establishment. Seed source did not appear to have an impact, nor did baling straw vs. spreading straw. There is some suggestion that slugs may have been feeding on and killing pea seed seedlings, but there is no proof of this hypothesis.

2. Seeding Date: Seeding date had a huge impact on the amount of growth achieved by the pea crop. Peas seeded in late July showed excellent growth, with plants flowering and setting seed before freeze-up. In the best fields, peas could have been harvested as fresh table peas just prior to killing frost. However, peas seeded in early September had minimal growth, and in many cases were only 4 inches (10 cm) high when killing frost occurred. This wide differential in growth is partly due to the extremely cool, wet fall conditions experienced, but also indicates that early planting will be essential if peas are to be successful.

3. Seeding method: Broadcast peas followed by discing showed significantly poorer establishment than drilled peas. In fields that were packed following the disc, establishment did improve but still did not equal that of drilled peas. Alternate, cheaper methods of pea establishment still need to be developed, in an effort to make this a more economical endeavor.

4. Grower feedback: Despite disappointing stand establishment, most growers where encouraged by what they saw. In many cases, green pea strips stood in stark contrast to unplanted strips, and the potential for increased corn yields and decreased nitrogen requirements have co-operators intrigued as to the outcome next corn harvest.

Summary:

Next Steps:

Two replications of nitrogen rates will be imposed on the corn planted into these fields in 2007. Nitrogen rates will include both a zero N treatment, along with a “full rate” nitrogen treatment, and most economical rate of nitrogen (MER-N) will be calculated using the delta yield concept, for both the corn following peas as well as the corn following no cover crop. In fields that allow, 4 nitrogen rates will be replicated (0, 50, 100, 150), and MER-N will be calculated using the quadratic plateau method.

Sites will again be planted to peas following wheat in the summer of 2007. Good co-operators are always welcomed. Anyone interested in this project should contact their local Soil and Crop director, or Peter Johnson.

Acknowledgements:

The project orgaizers would like to thank OSCIA and OMAFRA for the OSCIA Regional Partner Grant approved for this project.

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Location of Project Final Report:

Survey Of Seed And Commercial Corn Diseases And Pests In Ontario And Québec In 2006

(2006 Report)

Purpose:

Ontario is a world-class producer of seed corn, due to the region's exceptional combination of climate, soils, production expertise and infrastructure. As with other production areas, the competitive nature of the North American seed corn industry has had a significant impact in Ontario. The Ontario seed corn industry has gone through significant changes in recent years and challenges to the industry will remain. Environmental concerns with nutrient and pest management and competition for land base with other rotational crops are part of these production challenges. One advantage the Ontario seed corn industry possesses is "quality". Maintaining our productivity and quality under variable growing conditions in the future is critical to the ongoing viability of the Ontario industry.

There are many yield limiting factors such as diseases and understanding these factors are critical to the future health and growth of the seed corn industry in Ontario. An enhanced understanding of the barriers to yield and the compensatory management techniques for Ontario seed corn production is key to a sustainable and dependable Ontario seed corn and commercial corn production industry.

With the potential expansion of corn acres in Ontario and other areas within North America the increase in disease and insect pests we have been observing will only increase with a reduction of rotation crop alternatives. The information obtained on disease and insect impacts in Ontario seed corn and commercial corn fields will assist both private and public breeders in hybrid development which will help meet this challenge and potentially reduce loses to diseases and other pests.

Methods:

From August 17 to September 11, 2006, a corn pest survey was conducted in Ontario and Quebec. As usual [1, 2, 3, 4, 5, 6, 7], the emphasis of this years survey was to determine the distribution and severity of the bacterial disease Stewart's wilt (*Pantoea stewartii = Erwinia stewartii*). The distribution and severity of other diseases and insects including eyespot (*Aureobasidium zeae*), common rust (*Puccinia sorghi*), northern leaf blight (*Exserohilum turcicum*), anthracnose leaf blight (*Colletotrichum graminicol*a), common smut (*Ustilago maydis*), head smut (*Sporisorium holci-sorghi = Sphecelotheca reiliana*), ear rot (*Fusarium spp*.), stalk rot (*Fusarium spp*., and *C. graminicol*a), European corn borer (*Ostrinia nubilalis*), corn rootworm (*Diabrotica longicornis* and/or *D. virgifera*), and corn flea beetle (*Chaetocnema pulicaria*) were also recorded. In addition, scouting for any newer pests in Canada was conducted, especially for gray leaf spot (*Cercospora zeae-maydis*) in Ontario.

At each of 164 fields in Ontario and 96 fields in Québec surveyed, the incidence of each pest and the severity of the predominant pests were recorded. Thirty-one Stewart's wilt-like leaf samples were collected in this survey from Southern Ontario. ELISA tests for the pathogen *P. stewartii* (Stewart's wilt) were done in the Central Experimental Farm laboratory by using reagent sets, protocols, and antibodies provided by AGDIA Inc. (Elkhart, Indiana 46514, USA).

Results:

Fungal leaf diseases: Eyespot was found in 69 fields in Ontario and 86 fields in Québec (Table 1). Eyespot was rarely found in the surveyed fields in Southern Ontario. Fourteen fields in Québec and three fields in Eastern Ontario had intermediate severity. In most cases, yield losses caused by eyespot were limited; however, in two fields the leaves were necrotic (drying) because of eyespot alone and in five fields the leaves were necrotic (drying) because of both eyespot and anthracnose leaf blight infection. The estimated yield losses for those fields were 5-15%. Some hybrids entered in the Ontario Corn Committee (OCC) trial at Winchester and Lancaster, Stormont Dundas and Glengarry, ON were moderately susceptible to eyespot. Common rust was found in 102 fields in Ontario and 31 fields in Québec (Table 1); only three grain corn and one sweet corn field showed intermediate severity. Southern rust (*Puccinia polysora* Underw.) was found at one field in Elgin, Ontario this year. Typical symptoms of gray leaf spot were found in 78 fields in 14 counties of Ontario (Table 1). As in 2004 and 2005, most gray leaf spot was only found on the lower leaves and symptoms were not severe. Gray leaf spot was one of the most common leaf diseases in Essex, Chatham-Kent, Elgin, and Middlesex counties, Ontario in 2006. Moreover, gray leaf spot was found spreading to Eastern Ontario in Ottawa-Carleton, and Stormont, Dundas and Glengarry areas. In 2006, gray leaf spot observed in 4 fields would be sufficient to caused significant yield losses. No gray leaf spot was found in Quebec. Anthracnose leaf blight (ALB) was found in 131 fields in Ontario and 83 in Québec (Table 1). Unlike 2005 [7], there were 15 corn fields with intermediate to severe ALB in Eastern Ontario and Québec while only two fields were intermediate in Southern Ontario. ALB was the most important leaf disease in Québec in 2006. Northern leaf blight (NLB) was found in 91 fields in Ontario and 31 fields in Québec. This number was higher than 2004 [6] and 2005 [7]. There were 17 fields with intermediate and severe severity in Ontario, including two grain corn fields in which all of plants were dying by the end of August in Huron, and Stormont Dundas and Glengarry counties. The yield losses were estimated up to 20%. This was the fourth year since 2003 that severe NLB was found around Erie Beach, Chatham-Kent County, ON. Of the five seed corn fields surveyed approximately, 3-5 km from this area, three were almost dead on August 18, 2006, while in the other 2 fields, the female parent appeared to have a resistant gene to NLB. In Quebec, three fields planted with the same highly susceptible corn hybrid as in Ontario exhibited an intermediate NLB rating. The results of 2004 [6], 2005[7], and 2006 corn disease survey indicated that northern leaf blight is a more serious problem in Canada and losses are increasing and may pose a significant risk in the future.

Fungal Ear and Stalk diseases: Gibberella/Fusarium ear rots were observed in 34 fields in Ontario and 21 fields in Québec (Table 1) at the survey time late August and early September. Unlike 2005 in which ear rot symptoms showed up earlier than usual because of a warm corn season [7], ear rot symptoms progressed and were very noticeable by late September and early October in 2006, especially in southern Ontario. Subsequent surveys taken after August indicated that 2006 was an outbreak year for ear rot damage and myctoxin production (DON). Common smut was widely distributed across 101 fields in Ontario and 61 fields in Québec in 2006 (Table 1). There were 4 fields which had more than 2% incidence of common smut in Ontario, including one hybrid with 40% incidence in an Ottawa-Carleton farm. Deer damage could have had impact on the incidence of common smut on this hybrid since 80-90% of damaged plants were located 2-3 rows from the field border while the incidence in the field was 40%. In Québec, there were four fields with a relatively high incidence of common smut, from 5-20%. Head smut was only found in 3 fields with very low incidence (<1%), one in Ontario and two in Québec (Table 1). Head smut could not be found in some fields which had head smut in 2004 and 2005, this might be the results of warmer May in 2006 resulting in fast germination. As in 2005, few Aspergillus ear rot and Cladosporium rot ears were found at harvest time in Ottawa-Carleton, ON in 2006. Many ears had black mold/spores on kernels damaged by birds or insects.

Stalk rot, including Anthracnose stalk rot/top-die back, *Fusarium* stalk rot, and *Pythium* stalk rot were found in 60 fields in Ontario and 47 fields in Québec (Table 1). None of these occurrences amounted to any serious damage in Southern Ontario at the surveying time; however, seven fields in Québec and two fields in Eastern Ontario had incidence of top-die back of up to 50-90%.

Bacterial diseases: Unlike 2003, 2004, and 2005 [5, 6, 7], Stewart's wilt was much more frequent in 2006, but the yield losses were limited because of low severity. Of the 31 Stewart's wilt samples, all were positive to *P. stewartii* by ELISA test. Stewart's wilt were found at 21 fields in Southern Ontario in the counties of Essex, Chatham-Kent, Elgin, Huron, Lambton, Middlesex, Perth, and Lennox and Addington (Table 1). Stewart's wilt was also found at 10 fields in Eastern Ontario in the counties of Leeds and Grenville, Lanark, Renfrew, Ottawa-Carleton, and Stormont, Dundas and Glengarry. The same hybrid from a seed company showed Stewart's wilt symptoms at three demonstrations in Renfrew, Lanark, and Ottawa-Carleton. It was observed that the insect populations of Corn flea beetle were still very low in Southern Ontario in 2006 as they were in 2003, 2004, and 2005 [5, 6, 7]. No Stewart's wilt was found in Québec.

Holcus leaf spot (*Pseudomonas syringae*) was found once in Stormont, Dundas and Glengarry, ON.

Viral diseases: Maize dwarf mosaic symptoms were observed in one seed corn field in Chatham-Kent, ON in 2006. No other viral disease was observed, including late seeded sweet corn fields which were at silking stage at survey time.

Insects: European corn borer (ECB) damage was observed at 127 fields in Ontario and 72 fields in Québec (Table 1). As usual, ECB damage was higher in Eastern Ontario and Québec than in Southern Ontario. ECB damage incidences ranged from 10-25% with some hybrids at OCC trials in Waterloo, Ontario in 2006. Corn rootworm (CRW) damage was observed at 123 fields in Ontario and 88 fields in Québec (Table 1). As in other years, the main damage of CRW in most fields was leaf feeding and silk pruning; however, western corn rootworm was found causing 85-90% root lodging and heavy silk pruning at one field in Oxford, ON; the grain yield losses of this field estimated up to 35%.

As in 2004 and 2005, aphid populations were lower than usual, but were numerous in three fields in Québec in 2006 and one field in Eastern Ontario. Corn blotch leaf miner

(*Agramyza parvicornis* Loew), the most common insect of corn in Canada, was found in all fields surveyed in both Ontario and Québec, but damage was very low. Grasshoppers, most likely red-legged grasshopper [*Melanoplus femur-rubrum* (De Geer)], had decreasing populations as in 2005 in both Ontario and Québec. Brown stink bug (*Euschistus servus*) was found in a few fields in both Ontario and Québec, but populations were very low.

Three kind of black beetles were found causing damage on corn kernels. Picnic Beetle (*Glischrochilus quadrisignatus*) was found at one field in Lambton, ON. Milk weed beetle (*Labidomera trimaculata*) was found once in Maskinonge and red head flea beetle (*Systena frontalis*) was found once in D'Argenteuil in Québec.

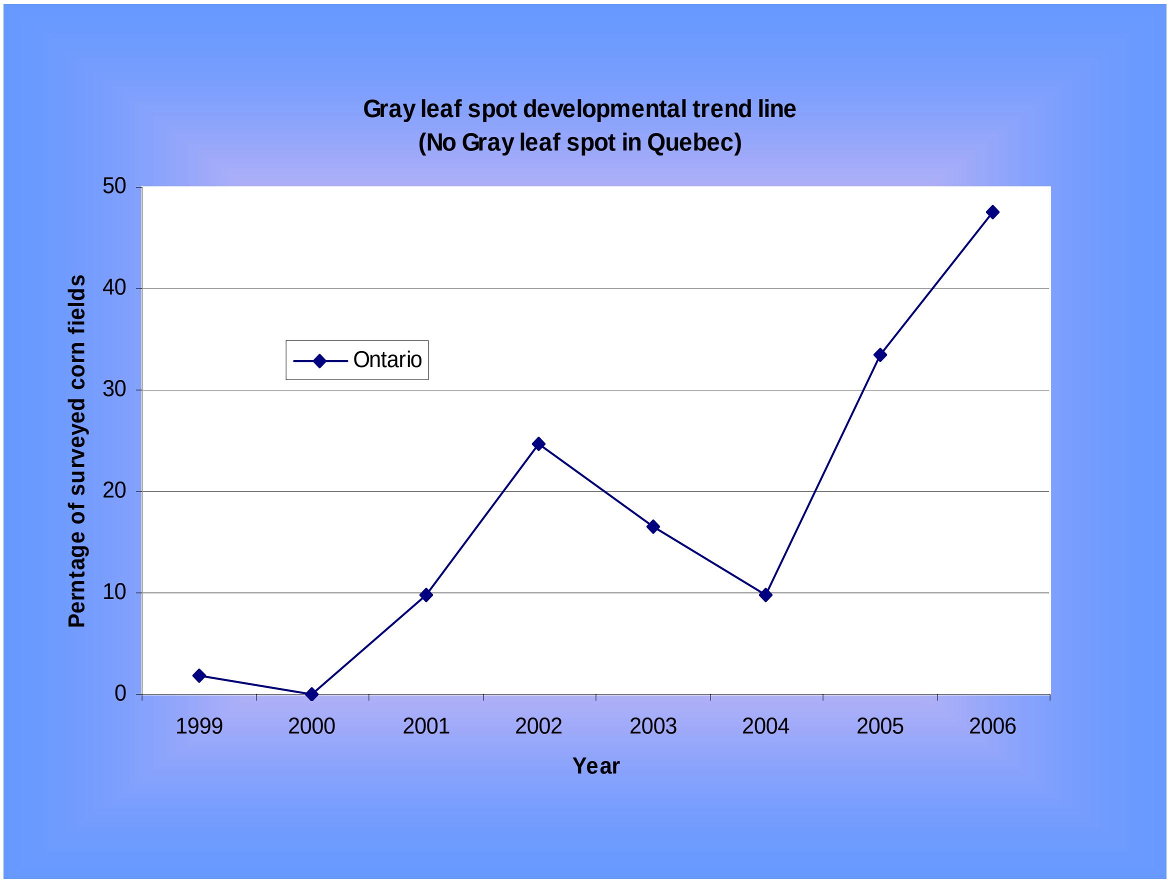
Mites: Two-spotted spider mite (*Tetranychus urticae* Koch = *T. bimaculatus* Harvey) populations was relatively low in 2006 and no severe damage in both Ontario and Québec.

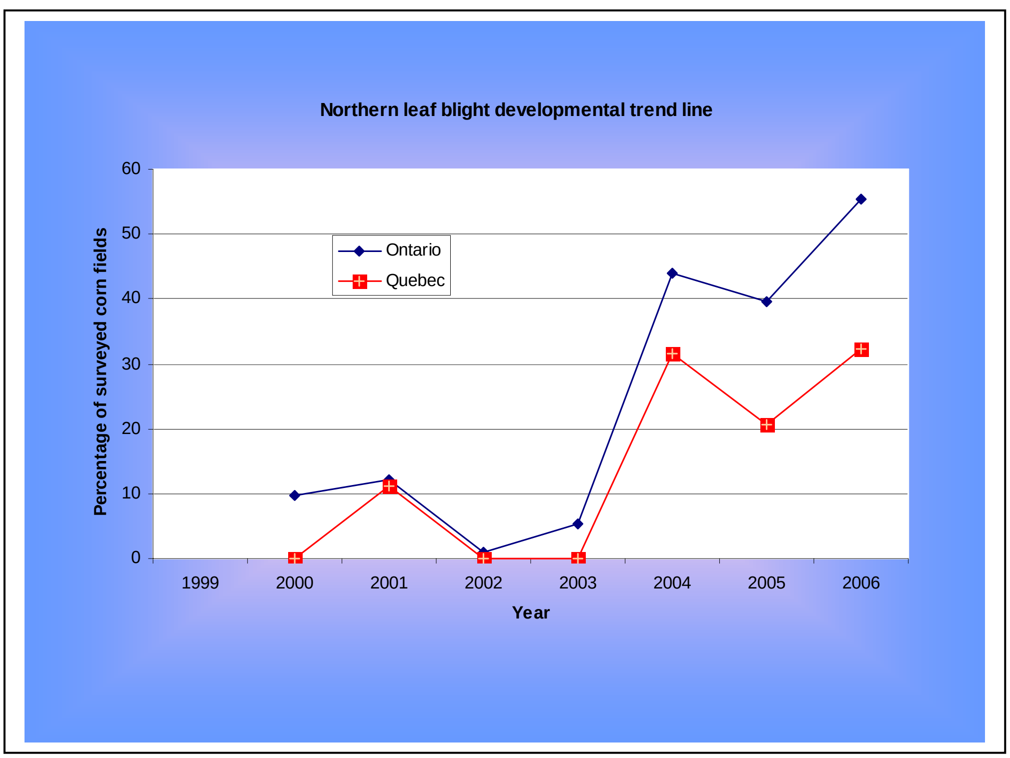
Others: Bird and other animal damage were severe in many fields in both Ontario and Québec.

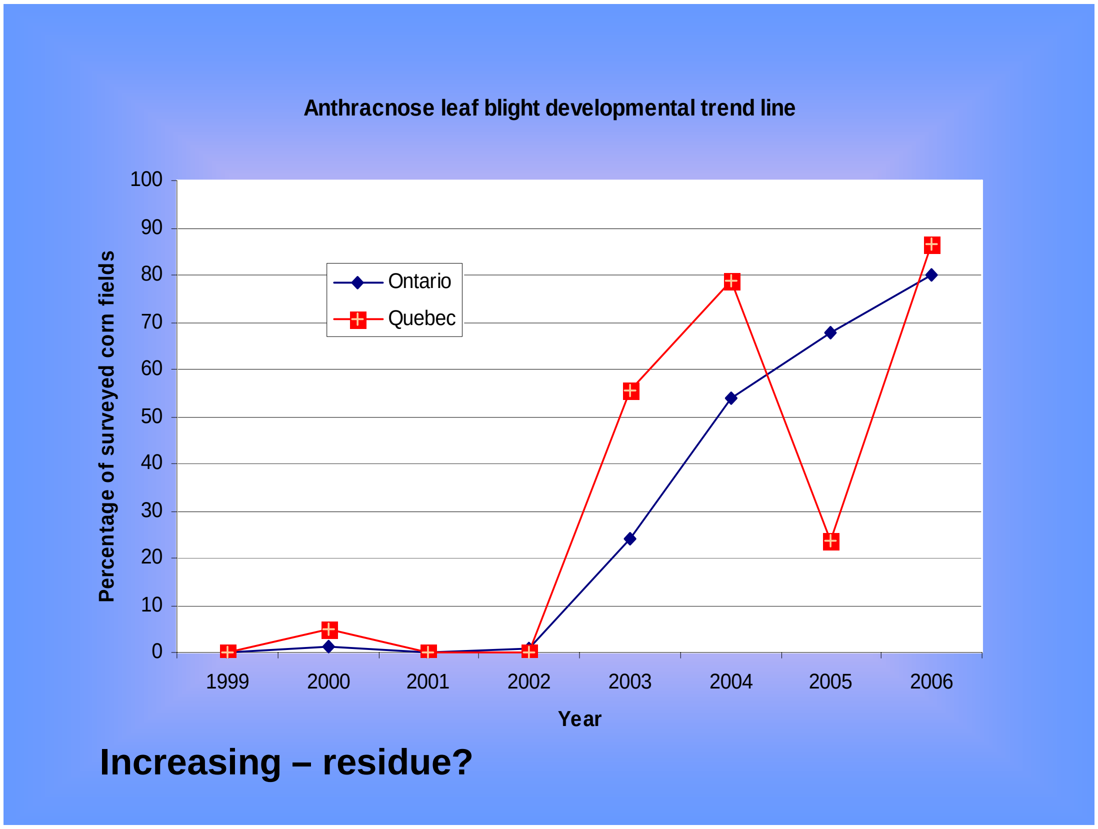
Summary:

2006 was a warm and moist corn season from May to October. The corn germinated fast and grew normal. A warm season was detrimental for smut disease development as we observed (less head smut and common smut were found in 2006). Conditions in 2006 were however favorable for leaf disease development. Northern leaf blight continues to increase and sporadic NLB outbreaks were observed in Ontario. The damage from anthracnose leaf blight and eyespot has increased in Québec. Gray leaf spot was one of the most common leaf diseases in Southern Ontario and is now established (spread) in Eastern Ontario. Stewart's wilt was found more in Southern Ontario and Eastern Ontario, but was related with specific hybrids. Common rust was not as prevalent as in other years. Excess rain from mid-September slowed grain dry-down creating a Gibberella ear rot outbreak in Southern Ontario. There were substantial differences in severity to Gibberella amongst commercial corn hybrids. Stalk rot, European corn borer, corn rootworm, mites, and grasshopper were less problematic in 2006 in both Ontario and Québec.

Gray Leaf Spot, Northern Leaf Blight and Anthracnose leaf blight are three economically and potentially destructive seed and commercial corn disease that are increasing. The increase of corn acres and the potential for more corn on corn will increase these and other disease.


Gray leaf spot developmental trend line
(No Gray leaf spot in Quebec)
Perntage of surveyed corn fields
Ontario
0
10
20
30
40
50
1999
2000
2001
2002
2003
2004
2005
2006
Year


Northern leaf blight developmental trend line
Percentage of surveyed corn fields
Ontario
Quebec
0
10
20
30
40
50
60
1999
2000
2001
2002
2003
2004
2005
2006
Year



Next Steps:

Seed corn and commercial corn pest survey of Ontario and Québec will be conducted in 2007.

Report Location:

The seed corn growers of Ontario website (**www.seedcorngrowers.on.ca**)

Acknowledgements:

This survey was supported by the Seed Corn Growers of Ontario which obtained funding through contributions by Canada and the Province of Ontario under the Canada-Ontario Research and Development (CORD) Program, an initative of the federal-provincial-territorial Agricultural Policy Framework designed to position Canada's agri-food sector as a world leader. The Agricultural Adaptation Council administers the CORD program on behalf of the province. Dr. François Meloche at Eastern Cereal and Oilseed Research Centre, Agriculture and Agri-Food Canada who helped to identify three black beetle species. We would also like to thank the seed corn companies and growers for access to their fields.

Project Contacts:

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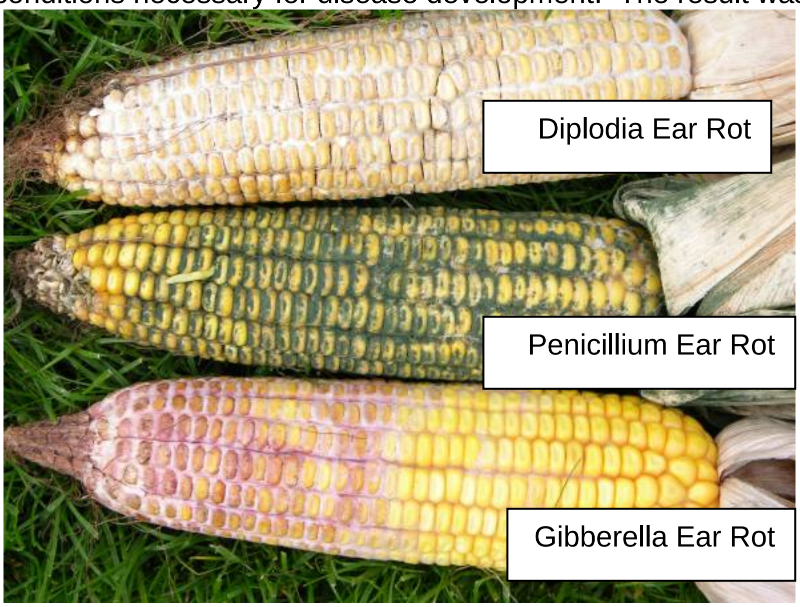
X. Zhu, L. M. Reid, and T. Woldemariam, AAFC – Ottawa

Corn Ear Mould and Vomitoxin (DON) Survey

(2006 Report)

Purpose:

There are various ear molds that occur in Ontario and identification is critical since many of these fungi produce mycotoxins that can have detrimental consequences if feed to livestock and in some cases humans. The persistent wet weather during September, October and November 2006, European corn borer injury, bird damage, poor pollination, and other factors provided the various corn ear rot fungi with the favourable growing conditions necessary for disease development. The result was elevated ear moulds in many fields across the province. Proper ear mould identification is critical since not all of these fungi produce toxins.



A pre-harvest assessment of these ear moulds and their corresponding mycotoxins were necessary since determining the extent of the ear mould problems prior to harvest was critical to managing and minimizing the impact of these diseases through timely harvest and proper drying/storage conditions. In addition, determining the levels of deoxynivalenol (vomitoxin or DON) is important to swine and other livestock producers since DON can have a detrimental affects such as poor weight gain and feed refusal. Increasing awareness amongst livestock producers to the potential problems would allow them to segregate or obtain alternative corn grain.

Therefore, OMAFRA, in conjunction with Dr. Art Schaffsma, (University of Guelph – Ridgetown Campus) surveyed commercial corn fields from across the province during the fall (2006) to determine the occurrence of corn ear moulds and an assessment of vomitoxin (DON) mycotoxin levels that could be associated with these fields. As with all survey data, the information only gives a picture in time but the results do provide a general view of the corn ear mould situation in the province.

Methods and Results:

The survey consisted of collecting twenty corn cobs from 94 commercial corn fields at various times (3 times) throughout the fall. In addition, combine samples were collected from many of these fields. These fields and each ear were assessed for the presence and severity of mould. In addition, vomitoxin (DON) levels were determined for these fields (Table 1).

As expected the most common ear mould detected in 2006 was ***Gibberella zeae*** (the sexual reproductive stage of *Fusarium graminearium). Gibberella* is the most important corn ear mould in Ontario but the fungus also causes Fusarium head blight in wheat. Infection begins through the silk channel and thus, infection in most cases starts at the ear tip. In severe cases most of the ear may be covered with mould growth. Corn silks are most susceptible 2 to 10 days after initiation. Environmental conditions during pollination and through the fall were ideal for Gibberella infection.

Of the 94 fields tested, 61 or nearly 65% of the fields were at or below 2 ppm DON, 17 the fields (18%) were in the 2 to 6 ppm range, while the remaining 18 fields (19 %) were over 6 ppm (see Table 1).

However, if you look exclusively at the fields sampled in the extreme southwest portion of the province (Chatham-Kent, Middlesex and Elgin counties) 13 of the 34 fields examined had DON levels over 6 ppm. Corn with DON levels in the 2-6 ppm may be utilized effectively but will take some additional management (blending, cleaning, combine adjustment, etc). Fields with more than 6 ppm DON would best be directed away from feeding uses, especially hogs.

The results tend to indicate that there is a significant percentage of the provinces corn that was relatively free of vomitoxin. However, in nearly all parts of the province there are fields that could have high levels of DON and that the chance of this occurring increases significantly in the south-west portions of the province. It is important for producers to access each of their fields individually.

Summary:

OMAFRA, in conjunction with Dr. Art Schaffsma, continue to survey corn fields across the province. 20 corn cobs were selected from these fields and assessed for the percentage of ears that had any visual mould growth as well as tested for vomitoxin (DON) production. As with all survey data it gives you a picture in time but the results do provide a general view of the corn ear mould situation in the province. Although the southwestern counties have consistently shown the highest levels of mycotoxins and DON levels decreases as you go east, ear moulds and DON can be found in all regions of the province.

The production of toxins is a major concern when these ear rots are present but it is not always the case that mould growth equates to high toxin levels and vice versa (high toxin levels can occur with little visible fungal growth or ear rot). For this reason, it is essential to examine individual fields and determine which ear molds and to what extent.

This will allow for the implementation of grain harvest, storage and feeding management options to minimize toxin development and maintain grain quality. Fields with significant mould should have a representative sample collected and tested for toxins, especially Deoxynivalenol (DON) prior to storage and feeding. If necessary feed to less sensitive livestock species such as beef cattle or poultry.

Table 1. Corn ear mould survey, samples taken October 16-25, 2006.
20 representative corn ears taken from each field, scored for visual mould, shelled and tested for vomitoxin (DON).

Area/Counties	Fields with Test Completed	Fields with less than 2 PPM DON		Fields with 2 to 6 PPM DON		Fields with more than 6 PPM DON	
		# of fields	Avg. DON (PPM)	# of fields	Avg. DON (PPM)	# of fields	Avg. DON (PPM)
Area 1 (Prescott and Russell Stormont, Dundas and Glengarry, Lanark, City of Ottawa)	**20**	**20**	**0.2**	**0**		**0**	
Area 2 (Northumberland, Durham)	**5**	**4**	**0.2**	**1**	**3.4**	**0**	
Area 3 (Wellington, Halton Hamilton, Brant)	**12**	**8**	**0.5**	**4**	**3**	**0**	
Area 4 (Bruce, Huron)	**9**	**6**	**0.7**	**3**	**3.1**	**0**	
Area 5 (Oxford, Perth)	**13**	**9**	**0.7**	**2**	**2.7**	**2**	**7.5**
Area 6 (Elgin, Chatham-Kent, Middlesex)	**34**	**14**	**0.7**	**7**	**4.8**	**13**	**11.2**
Totals	**93**	**61**	**0.5**	**17**	**3.4**	**15**	**9.4**

Gibberella ear rot resistant or tolerant commercial corn hybrids can reduce disease and potential mycotoxin production. For next year, check with your seed corn company not only for hydrid ear mould ratings but other stresses such as leaf disease resistance, insect resistance, etc that could increase ear mould problems under favourable conditions. In addition, plan a multiple hybrid on-farm strip trial in the future which compares various hybrids under your specific field conditions.

The importance of collecting a "representative" sample can not be emphasized enough, since 90% of the variability associated with mycotoxin test results comes from incorrect sample collection! The accuracy of a mycotoxin test is dependent often on a little elbow grease and some inconvenience. Although taking a sample from the top of a storage bin, truck or combine may be easy and very convenient, you will most likely not be happy with the results since mycotoxin distribution is rarely distributed evenly in a load of corn.

When it comes to sampling and an accurate mycotoxin test – THE MORE SAMPLES TAKEN THE BETTER!

If the sample is come from a bin, truck, V-box, or other stationary load of corn, a sample probe is recommended. Although 10 probes are recommended, 5 probes will do if necessary. Mix the grouped sample and take a representative sample from this pooled sample. If you are dealing with a moving stream of grain, either use a diverter or randomly collect cupfuls (handfuls will work as well) of grain. Regardless of how the sample is taken, it must be processed quickly! Therefore ship or deliver the sample promptly. The longer the sample sits around the greater potential of an inaccurate results.

Next Steps:

Combine samples continue to be processed.

Report Location:

Report in Croppest (www.omafra.gov.on.ca/croppest).

Acknowledgements:

We would like to thank Dr. Art Schaafsma's lab at the University of Guelph Ridgetown Campus for their participation. In addition, OMAFRA staff, the growers and ag-business representatives that assisted in the selection of the fields surveyed in this study. Funding for this project was obtained through OMAFRA.

Project Contacts:

Stay tuned for future results and contact
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Albert Tenuta, OMAFRA, albert.tenuta@ontario.ca , 519-674-1617

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:

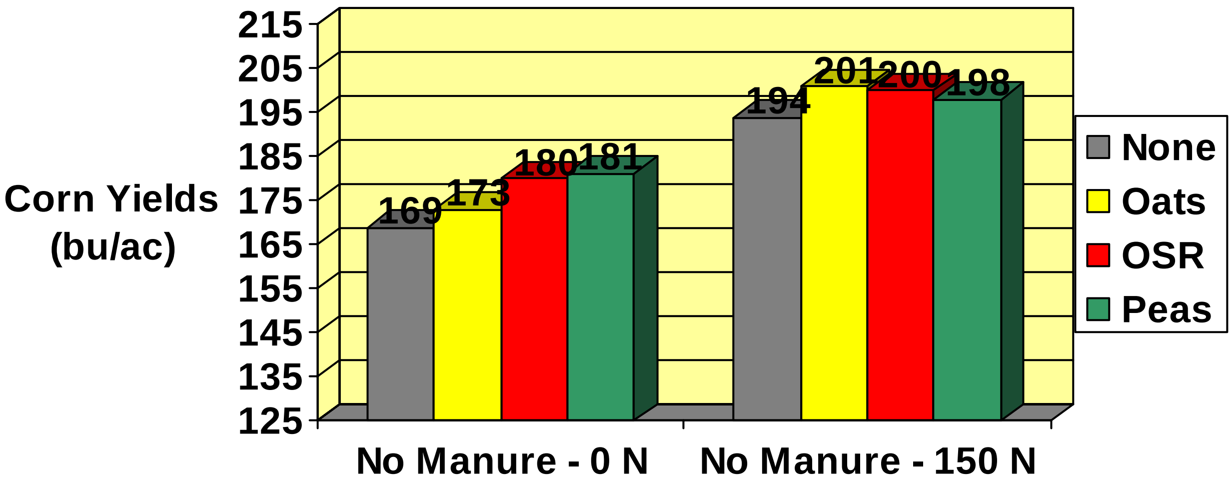
Corn Response following 2005 Cover Crops

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

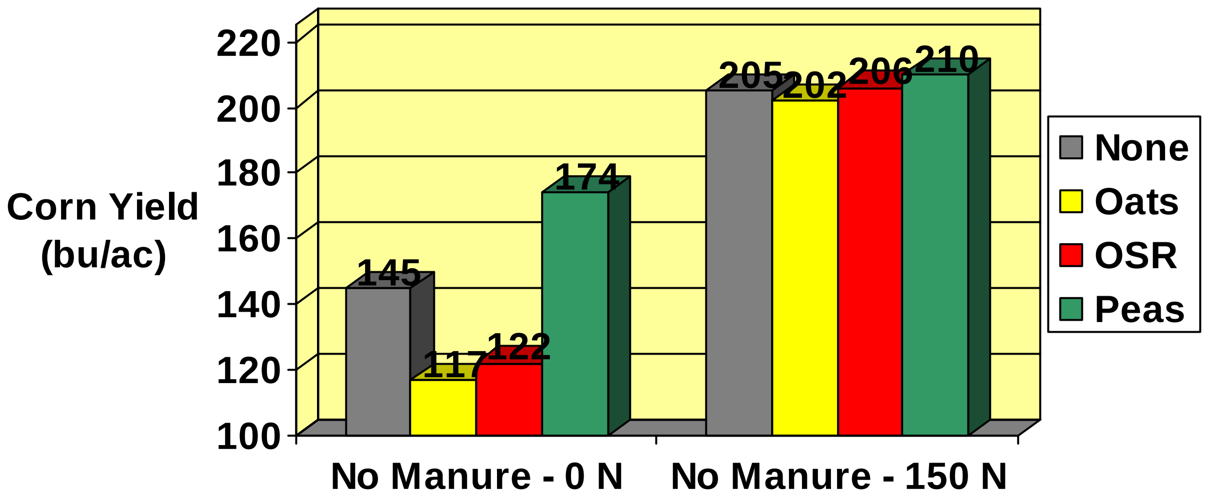


Table 1. Cover Crop Biomass And Late Fall Soil Nitrogen Levels. Fall 2006 Sites.

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.

Acknowledgements:

OMAFRA Field Crop Technology would like to acknowledge the farm cooperators who made land and other resources available for conducting these projects. Funding for the project has been provided by the Greenhouse Gas Mitigation Project for Canadian Agriculture, AAC- AESI, and OSCIA.

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Starter Sulphur Yield Impacts on Corn

Purpose:

To evaluate the impact of sulphur fertilization on Corn yields since Sulphur is a key macronutrient, essential for crop growth and development. Sulphur is a key component of protein quality in wheat. Historically, sulphur additions were a key component of fertilizer programs. Sulphur has not been required in Ontario for the last 50 years.

Recent studies have shown response to sulphur that was not found in previous studies. Sulphur deposition from acid rain and dry deposition, a result of air pollution, has dropped dramatically as efforts to reduce sulphur emissions have been implemented. Sulphur additions from the atmosphere have dropped from a high of ~30 pounds/acre/year in the 1970's, to approximately 10 pounds/acre/year from 1998 to 2003.

Methods:

Side by side on-farm trials were conducted to evaluate the yield response of corn to additions of suphur in starter fertilizer blends at 15 sites.

Results:

Yield results from 10 sites .are expressed in Table 1 and show that no difference in corn response to addition of sulphur was observed.

Table 1: Harvest Moisture and Yield Associated with Sulphur Addition

Treatment	Moisture	Yield
	%	bu/ac
Sulphur	21.2	168.3
No Sulphur	21.3	169.0

Soil test S levels were not different between treatments when sampled in late May to June period.

Summary:

No differences in corn response to additions of Sulphur fortified starter fertilizer could be detected in this project.

Next Steps:

The results

Acknowledgements:

OSCIA-OMAFRA Major Grant via Middlesex SCIA.

Project Contacts:

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Carbon Sequestration and Soil Quality in Long Term Tillage and Rotation Plots

(Interim Report)

Purpose:

Long term tillage plots were established by Doug Young and Tony Vyn at Ridgetown Campus, University of Guelph in 1991 on a Brookston clay loam soil. The tillage treatments initially consisted of moldboard plow, chisel plow, ridge till and two no-till treatments. The ridge till treatment was later converted to no-till. The plots are in a corn-soybean crop rotation. These plots are to be plowed up in the fall of 2006 and put into weed control research plots.

Long term rotation plots were established by Doug Young and Tony Vyn at Ridgetown Campus, University of Guelph in 1995 on a Brookston soil. Five rotations were studied including continuous corn, continuous soybeans, soybeans-winter wheat, corn-soybeans and corn-soybeans-winter wheat underseeded to red clover in moldboard and no-till. Each corn and wheat plot has several nitrogen rates applied.

The purpose of the project is to take soil samples from both these plots for carbon content to determine if the crop rotations and tillage practices have contributed to carbon sequestration in these soils. Nitrogen, phosphorus and soil health measurements will also be studied.

Methods:

A Giddings soil sampling machine was used to take 1.2 m cores from the plots. Four cores per treatment were taken from each of three tillage treatments (moldboard plow, chisel plow and no-till with coulters and trash whippers) in all six reps of the tillage plots. Three cores were taken per treatment in the rotation plots. Cores were taken from the continuous corn (0 and 120 lbs N/ac N rates), continuous soybeans, the corn treatment of the corn-soybean (0 and 120 lbs N/ac), the corn treatment of the corn-soybean-wheat rotation (0, 120 and 180 lbs N/ac), and the soybeans in the soybean-wheat rotation.

The cores were divided into 11 segments (0-5, 6-10, 11-15, 15-20, 21-30, 31-40, 41-50, 51-60, 61-80, 81-100, 101-120 cm) and processed by treatment. The samples were weighed to determine bulk density. A small sample from each treatment was frozen for nitrate and ammonium analysis. The samples were air dried and are waiting to be sent for remaining analysis.

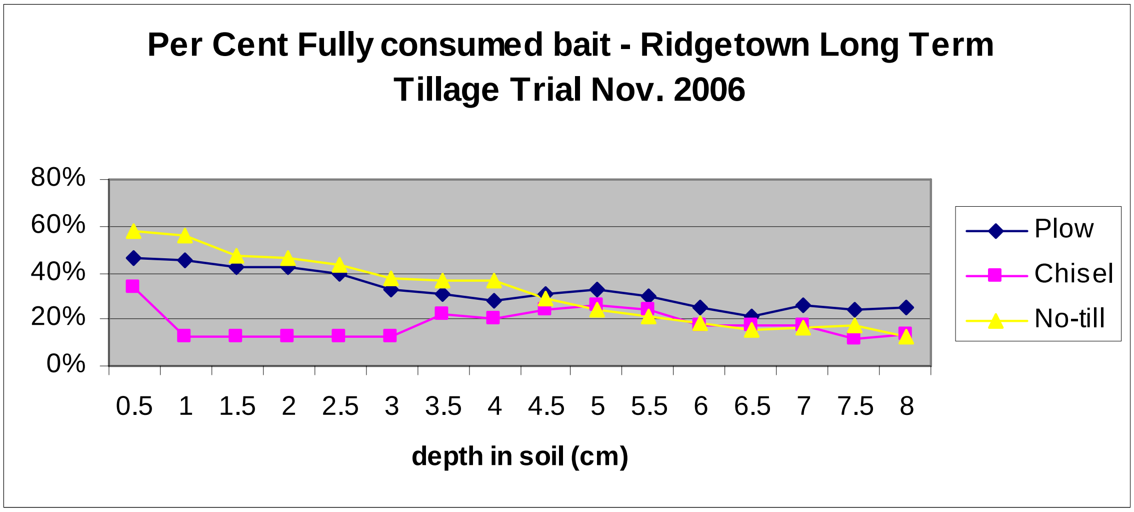
Soil quality measurements were conducted on the tillage plots in the moldboard plow, chisel plow and one of the no-till treatments. Earthworm counts were done by laying a 30 cm by 60 cm frame on the soil surface and counting the number of earthworm middens within the frame. Two counts were done in each plot of five of the reps. Bait lamina strips were inserted into the first five reps of the three tillage treatments. Ten strips were inserted in a 15 cm by 30 cm area in each plot.

Results:

Table 1

Tillage Treatment	Number of Earthworm Middens/sq m
Moldboard plow	13
Chisel plow	26
No-till	74

Figure 1



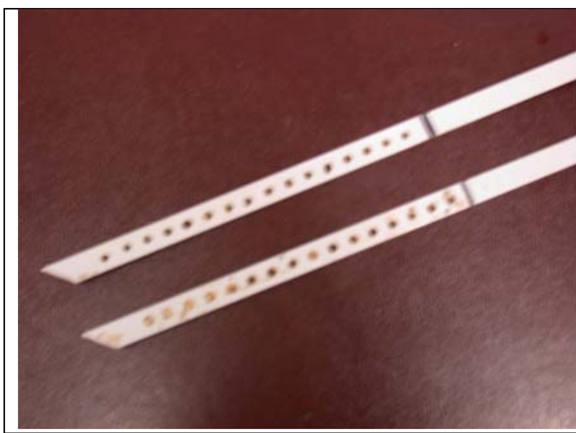


Figure 2

Figure 3

Summary:

The analysis is yet to be completed on the soil from the plots. Some soil life measurements were completed on the tillage plots this fall. Counts of earthworm middens were done on the moldboard plow, chisel plow and one of the no-till treatments. Middens are piles of residue and soil found on the top of large earthworm burrows. The results in Table 1 show that the no-till had almost 6 times as many large earthworms as the moldboard and 3 times as many as the chisel plow.

Bait lamina strips, about the size of a coffee stir stick, Figure 2, were inserted into the long term tillage trials in the moldboard, chisel and no-till treatments in November. Bait lamina strips were developed in Germany to give a measure of biological activity at depth but does not indicate what is doing the feeding. The conditions at that time were cold and wet so there was less feeding than might have been expected. Figure 1 shows the results from the strips. The graph shows the percentage of the holes that were completely eaten out. The no-till generally had more feeding than the moldboard or chisel treatments especially in the top 4 cm. The chisel plow treatment had less feeding than might be expected.

Figure 3 shows the crop rotation plot. The soybeans in the fore ground are continuous soybeans and the taller soybeans in front of the corn are in the corn-soybean-winter wheat rotation. Both are in the moldboard plow tillage system.

Next Steps:

The soil samples will be analyzed for organic carbon, nitrogen and phosphorus. Some other soil health measurements will be taken from the rotation plots this season. The yield data from all years of the tillage and rotation plots will be analyzed along with the carbon data.

Acknowledgements:

This project received funding from Canadian Agricultural Producers Addressing Environmental Issues program. Thanks to Ivan O'Halloran, Ridgetown, University of Guelph and Ron Beyaert, Agriculture and Agri-Food Canada for their assistance with analysis of the samples and the data.

Project Contacts:

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Location of Project Final Report:

Manure Tankers: Tires and Toolbars
(2006 Wellington County SCIA Major Grant Project)

Purpose: To examine the impact of tire types and application systems on manure tanker efficiencies.

Manure Tanker Tires: Radial tires have proven to highly effective in distributing weight, lowering soil contact pressures and improving traction on farm tractors. Over the last few years radial tires have become available for towed vehicles such as manure tankers and grain carts. On a fully loaded manure tanker a radial tire inflated to its lowest warranted pressure exhibits a significant sidewall bulge. This bulge has left some producers with the concern that they might be harder to the same tanker equipped with bias ply tires and higher inflation pressures. This project set-out to compare the draft requirements for two identical manure tankers equipped with comparable size tires in either bias or radial formats.

Figure 1. shows the two tankers, the tire weights, inflation pressures, and footprint size. An experiment was designed were each tanker was pulled through 8 replicated plots. Four of the plots were undisturbed wheat stubble; four were chisel plowed to a depth of 8 inches (20 cm). An instrumented tractor courtesy of Dr. N. McLaughlin, AAFC, Ottawa was used to pull the tankers through each plot while recording draft forces. Table 1 highlights the draft results and points to the fact that the tanker with radial tires was easier to pull than the bias tire equipped tanker in both the firm, untilled ground and in the worked ground. The myth is busted. Radial tires reduce soil contact pressure and although they may give the appearance of being similar to pushing a wheel barrow with a flat tire - the draft requirements were actually lower than traditional bias ply tires.

Figure 1. Bias ply and radial tire configurations

Bias ply tire.
Front axle weight 10,400 lbs, 23 PSI
Rear axle weight 12,200 lbs, 27 PSI
Tire footprint:393 sq. in.

Radial tire.
Front axle weight 10,400 lbs, 15 PSI
Rear axle weight 12,200 lbs, 20 PSI
Tire footprint: 611 sq. in.

Table 1. Impact of tire design and inflation pressure on draft.		
Soil Surface Conditions	Bias Front 23 psi Rear 27 psi	Radial Front 15 psi Rear 20 psi
	------ draft (lbs) -------	
Tilled (chisel plow 8" deep)	2500	2100
No-Till (short wheat stubble)	1700	1300

Manure Application Systems: Various liquid manure application systems were also compared for draft, fuel use, and ammonia losses. Application systems included: 1) broadcast, incorporate with tillage after 6 hours, 2) broadcast, incorporate with tillage after 24 hours, 3) rotary spike (aerate the soil) immediately ahead of broadcast manure with no further incorporation (see Figure 2), 4) vertical tillage using Great Plains – Turbo-till to loosen soil ahead rotary spike application system, and 5) s-tine injection of manure (see Figure 2).

Figure 2. Application system comparisons at Wellington County Manure Day

Nuhn S-tine injector.

Nuhn Rotary spike

The ammonia losses were examined by placing ammonia "traps" over portions of the plot area immediately after manure application. Ammonia losses were measured for one week following application. The results from the ammonia loss measurements are illustrated in Table 2. It was apparent that shallow pre-tillage at this study did not reduce ammonia losses from the manure compared to broadcast and incorporation at either the 6 or 24 hour post-application mark. The s-tine injection system did however show significantly lower ammonia losses than any of the other approaches.

Table 2. Ammonia Loss Measurements		
Manure Application System	**Ammonia Gas Release (accumulated PPM)**	**Nitrogen Equivalent (approximate kg N/ha lost)**
Broadcast - 6 hour incorporation	47	14
Broadcast - 24 hour incorporation	75	22
Applied behind Rotary Spike	108	31
Pre-tillage with Turbo-till, then applied with Rotary Spike	92	27
Injected with S-tine	2	0.6

Conclusions and Next Steps: Producers considering the purchase of a manure tanker or grain buggy should weigh the potential advantages of radial tires (which include both lower soil compaction risk as well as lower draft requirements) against the additional costs. Those producers on soils with higher clay contents, who need to spread manure and/or harvest at points in the season when soil moistures are often high, and/or those trying to reduce tillage intensity stand to see the greatest benefit.

It appears that relatively rapid incorporation of manure with a tillage pass (within 6-24 hours), or light pre-tillage ahead of a broadcast liquid manure application are not as efficient in reducing nitrogen loss as a direct injection system.

Further data from this project including fuel consumption, other pre-tillage impacts and the draft requirements for a range of tillage and injection system will be available in a subsequent report.

Acknowledgements: Support for this project by the following is gratefully acknowledged.

Wellington SCIA	Husky Farm Equipment
Ontario SCIA	DeBoer’s Equipment
Dr. Neil McLaughlin, AAFC, Ottawa	EMS Farm Equipment
Soil Conservation Council of Canada	Great Plains Manufacturing
Brian Dunk Farms	Sunflower Manufacturing
University of Guelph	Salford Farm Machinery
Michelin Tire	Swanston Farm Equipment
Nuhn Industries	Canadian Agricultural Producers Addressing Environmental Issues Program

Project Contact:
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Demonstration of Renewable Energy Production

Purpose:

To demonstrate the potential of on farm wind and solar energy production equipment, including an analysis of both capital and operating costs.

Methods: Agriculture is in a somewhat unique situation when it comes to our potential to participate in alternative energy production. From methane digesters, to wind and solar generation, to biodiesel & ethanol; agriculture has many of the resources required, already at our disposal. This has many producers interested in the potential for alternative energy systems across our industry. With this in mind, the Halton Region Soil and Crop Improvement Association (HSCIA) have constructed a demonstration project focused on small scale wind and solar powered electricity production for 2006 and beyond.

There are many unanswered questions around these two technologies, and it is our intention to demonstrate to members of our organization, as well as the general public, the potential that exists.

To ensure the maximum exposure for this demonstration project, the HSCIA has partnered with Country Heritage Park, Milton, to both host the equipment, and also incorporate alternative energy production into its educational and awareness programming.

Results: The project began with a search for the most appropriate and affordable equipment we could find. As this technology was new to all of our directors, we felt it was important to also find a dealer who was willing to provide a high level of support.

The decision was made to purchase a Lakota windmill and additional solar equipment from True North Power Systems of Lions Head, Ontario. One of the main reasons for choosing this supplier was that True North offers 2 day training sessions to their customers as part of the package. Cecil Patterson attended this training in June and found it quite valuable. True North has also been in the industry for several years.

The equipment consists of a Lakota 12V 1KW turbine, a 60' tower, Commander voltage controller, 1000AH battery pack, 1200w voltage inverter and 2-115W Evergreen solar panels. This will provide approximately 900W of power for 10 hours per day on average (see energy budget below).

The biggest challenge we faced was getting the necessary approvals to begin construction. Country Heritage Park is located within the Niagara Escarpment Commission (NEC) planning area. Following an initial inquiry, it was indicated that this project would require a NEC development permit. We were told that the process would take about eight weeks. After submitting the lengthy application form we waited for several weeks for any response. During the summer months we responded to several enquiries from commenting agencies such as MTO and Ministry of the Environment.

This process was quite frustrating as it took a lot of effort to react to these requests and there did not seem to be any distinction between a small demonstration project such as this, and a full scale commercial development. There were several times when we were close to dropping the project.

Finally in early September we received our NEC development permit with no fewer than 14 conditions attached. It took several weeks to wade through these, but finally by late September we picked up the equipment and were ready to proceed with construction.

The tower sits on a concrete base with 4 guy wire assemblies connected to 4 outlying pillars. The tops of each of these must be at the same level. Milton Hydro generously donated the use of one of their auger trucks to drill the holes in which we used 24” Sono Tubes as forms. The two pillars to the left and right of the centre are slightly ahead of the centre line of the base so that the cables attached to them loosen as soon as you start to drop the tower.

The site chosen drops off towards a drainage ditch requiring that pillar to be more than three feet above grade. A laser level was used to ensure that everything was level.

After the concrete had cured for a couple of days we assembled the tower and generator and prepared all the cables to estimated lengths. Three lengths of 6 gauge copper wire plus a ground were drawn up the centre of the pipe.

As you can see the tower base is constructed with a hinge design to facilitate raising and lowering. A gin pole which is half the height of the tower is inserted into the base at a right angle to the tower. The cables from the front anchor are transferred over to this pole which acts as a lever. A cable is then attached to the pole which goes down to a pulley attached to the anchor which we hook to a truck to raise and lower the tower.

It only takes a few minutes to drop the tower to perform maintenance on the head. It took a couple of hours to adjust all the cables to the correct length after the initial erection, but these should not require much attention in the future. We used a transit to straighten the tower from both directions.

All of the hardware in the tower kit worked reasonably well with the exception of the cable clamps. Several of the clamps had bad castings and required replacement. The overall design is simple and practical and should provide years of trouble-free service.

The wires coming down the centre of the mast go into a box attached to the base and from there to a shed which we renovated and relocated to the site. The power is regulated by the Commander Load Diversion Controller. This panel takes the AC power from the alternator and rectifies it to 12V DC. When the storage device (battery) is fully charged, the commander diverts the excess power to a series of fan cooled resistors at the top of the panel. This maintains a load on the windmill to keep it from turning too fast, which will result in damage to the components, while keeping the battery fully charged.

The battery is a 1000 AH unit which is fully enclosed and will not be damaged by freezing. The unit is quite heavy. The battery feeds a 1200 W voltage inverter which converts the 12V DC power to 120 V AC. This is not a true sine wave unit so it is only used for certain applications. Most of what we intend to use the power for will be done at 12 V DC to simplify the system.

Due to the delays in construction we have been unable to set up the solar panels. Our plan is to mount them on the roof of the shed. They will be used to supplement the wind energy (we have had several periods of up to 5 days with very little wind).

Project Budget:

The following chart provides a general outline of the costs involved in this project and the potential energy produced. The revenue estimates were calculated using provincial Standard Offer Contract rates for wind and solar energy. There is no labour component in this budget as it was all donated.

Lakota Wind Generator & Controller	$2,600
Tower Kit	$1,680
Battery Pack	$2,640
2X115W Solar Panels	$1,600
Pipe for mast	$1,000
Concrete	$600
Concrete Forms	$250
Wire & Electrical	$1,000
Total Cost	**$11,370**

Electricity Produced

Wind
900W @ 33% efficiency = 7.2 kwh/day @ $.11/kwh = $0.79/day

Solar
230W @ 33% efficiency = 1.8 kwh/day @ $.42/kwh = $0.76/day

$11,370 ÷ $1.55/day = 20 years payback

Electricity produced able to operate 9 - 100W light bulbs running 10 hours per day on average.

Summary: This has, and will continue to be, an interesting project. We have certainly learned a lot about the challenges of the approval process. This experience will, unfortunately, probably have us choose sites outside of the NEC planning area in the future to conduct demonstrations. Although NEC staff was helpful in getting us through this, the process was frankly something we would prefer not to have to endure again.

The equipment itself has proven to be well received. There have been hundreds of visitors to the project, ranging from school tours, to farmers, the general public and politicians. There is an extremely high level of interest in “Green” energy.

The high initial capital cost is detrimental, we expect, to large scale adoption of this size of setup. Certainly it doesn’t appear the economics work if there is easy access to conventional hydro. However, if you needed power in a remote area, the situation would be different. With high efficiency lighting etc. available today, you could probably function quite well on the power this system will generate.

Next Steps: Over the winter we will design and manufacture the frame to mount the solar panels on the roof of the shed. These panels are about 24 X 42 inches in size, and should be oriented due South at the same pitch as the location’s latitude.

In the spring we will move the shed to the other side of the road closer to the well from which we will pump water to supply the livestock in that area of the Park. This will require some trenching etc. We are also going to provide predator deterrent lighting for the sheep area.

Another option that we would like to explore is the possibility of using the energy to recharge the battery in an electric utility vehicle such as the electric JD Gator.

The local Horticultural Society has also been approached about the possibility of setting up a demonstration of a high intensity vegetable garden in the vicinity, utilizing water pumped from our system for sub irrigation.

We would also like to add one more solar panel to the system to keep things fully charged on those calm days. Our hope is to also develop some sort of device that will record how much energy is produced so that we can keep records of the systems output.

Acknowledgements: We would like to take this opportunity to acknowledge and thank the many people and organizations that have made this project a reality. Many of the Directors of the Halton SCIA have been active in the planning and construction of this project. Milton Hydro also came and drilled the holes for the pillars for us.

The following organizations have provided financial assistance to this project:

- Ontario Soil and Crop Improvement Association
- Ontario Ministry of Agriculture, Food and Rural Affairs
- Town of Milton Community Fund
- Region of Halton Agricultural Development Fund
- Country Heritage Park
- True North Power Systems

Project Contacts:

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Location of Project Final Report:

Muskoka Lime Study

2006 Report

Purpose:

The study addresses 4 questions:

1. Are recommended rates of Lime optimal for Muskoka soils?
2. Can higher than recommended rates maintain adequate pH levels longer?
3. Can lower than recommended rates maintain adequate pH?
4. Is macro - micro nutrient availability affected by lime rate?

Methods

- Ontario Soil and Crop Improvement Association Major Grant awarded April 2005. Grant extended to 2006.
- Study to continue to 2008
- Six participating farmers; grant covers half of their additional costs
- Plot size varies from 0.5 to 2.5 acres at different sites (yields reported on per hectare basis). Visually observed differences recorded when yields cannot be obtained
- Single source of lime - calcitic - 70% agr. index used by all farmers
- Lime rates: recommended, 1.5, and 2 times. Most farmers set out two replications. One farmer tested lower than recommended rates.
- Base pH tested prior to lime application,
- Subsequent soil samples taken each fall after harvest - full soil test at end of trial is planned
- Support from Agri- Food Labs – advance payment for 3 years of tests arranged
- Five Farmers have reported to date

Results

Site 1. Allensville (2 years of trial completed)

Background

- Sandy soil - limed 12 years ago - history of grass-trefoil hay/pasture
- Base pH 5.6 (sampled in spring 2005)
- Recommended lime 6 t/ha
- Lime applied May 2005 using belt broadcaster
- Rate 20% too low because lime delivered wet
- Barley/oats underseeded to grass legume
- Results measured for green cut cereal 2005
- Pastured 2006 , no yield data but good pasture observed

Table 1a. Allensville. Soil Test pH Values (unreplicated)

Date of Sampling	No Lime (Base pH)	Recommended Lime (6 /ha)	Double Rec. rate
Spring 2005	5.6		
Fall 2005		6.5	6.3
Fall 2006		6.3	6.1

Table 1b. Green Cut Cereal. 2005 Large Round Bales/ha

Recommended Lime (6t/ha)	Double rec. rate
5	6

Discussion: Site 1

- The lower pH in the in the plot receiving more lime appears due to soil variation
- Consistent drop in pH by 0.2 between first and second years of trial (2005 to 2006). This may indicate that double recommended rate of lime may not be conferring any advantage in sustaining higher pH levels at this site.
- No yield differences observed between lime rates in either year
- Farmer will continue as hay/pasture for 2 more years and test pH yearly

Site 2. Beatrice

Background

- History:15 yrs hay/pasture
- Clay - Sandy soils
- No knowledge of lime being applied to this field.
- Base pH 5.8 - sampled fall 2005
- Recommended lime rate 7 t/ha
- Lime applied fall 2005 with manure spreader
- 2006 planting. Oats underseeded clover and grasses. Fair-poor crop

Table 2a Soil test pH Values (2 replications)

Date of Sampling	No Lime . Base pH	Recommended Lime (7t/ha)	1.5 times rec. rate	Double rec. rate
Fall 2005	5,8			
Fall 2006		6.3	6.5	6.5

Table 2b Yield of Oats. kg/ha (bu/ac). Fall 2006

Recommended Lime (7t/ha)	1.5 times rec. rate	Double rec. rate
1250 (27.5)	1250 (27.5)	1295 (28.5)

Discussion: Site 2

- 1.5 times recommended rate has improved pH level over recommended rate
- No yield differences in 2006
- Farmer plans to continue trial as ha/pasture for 2 more years and test pH yearly.

Site 3. Huntsville site

Background

- Field had received lime every 5 years – sandy loam soil
- Base pH 6.4 – tested fall 2005
- Recommended rate 3t/ha
- Applied with lime spreader fall 2005
- .5 acres/plot
- Planted April 2006 Oats underseeded to Orchard grass.
- Good crop and catch of grass
- Oats green cut Aug 2006 and bailed

Table 3a.Huntsville site .Soil pH test values (2 replications)

Date of Sampling	No Lime Base pH	Rec. Lime rate (3 t/ha)	1.5 times Rec .lime	2 times rec lime
Fall 2005	6.4			
Fall 2006		6.75	6.8	6.65

Table 3b. 2006 Yield of Oats (green cut). Square bales/ha

Recommended lime rate	1.5 times rec lime	2 times rec, rate
115	117	123

Discussion Site 3:

- Recommended lime increased pH to fully adequate level - no further increase in pH with higher rates.
- Upward trend in fodder yield with higher lime, but differences not likely significant.
- Farmer will continue as hay/pasture for 2 more years and test pH yearly

Milford Bay Site

Background

- Sandy loam field, limed 10 years ago. History of Corn/cover crop/strawberries
- Base pH 6.3 Sampled Fall 2005
- Recommended lime 4 t/ha
- Lime applied May 2006 using Manure spreader

- Part of trial area planted to sweet corn the rest planted to oats then rye cover crop

Table 4a. Soil test pH values - 2 replications

Date of Sample	No Lime	Rec Lime 4t/ha	1.5 times	2 times
Fall 2005	6.3 (entire field)			
Fall 2006	5.9 (single plot)	6.5	6.6	6.5

Table 4b. 2006 Sweet corn dozens/ha – unreplicated

1.5 times recommended lime	2 times recommended lime
1300	883

Discussion. Site 4

- No visual differences between plots. Fair corn growth, good cover crop growth
- Recommended lime raised pH to adequate level - no further increase with higher rates
- Variation in sweet corn yield likely due to soil variation
- Variation in pH in unlimed treatments in 2005 and 2006 likely due to soil variation also.
- Farmer to continue trial with strawberries for 2 more years and test pH yearly

Site 5. Raymond Site

Background

- Clay loam field, no record of previous lime application
- 2005 base soil test 5.3 pH.
- 15 t/ha lime was recommended
- Farmer wished to test lower than recommended rates, as he felt that higher than recommended rates would be too high.
- Lime applied spring 2006, with manure, then incorporated
- Oats, under-seeded with hay mixture, planted in late June

Table 5a Soil test pH values - unreplicated

Date of Sample	Percent of Recommended Lime applied (t/ha)				
	0% No lime	15% (2.24 t/ha)	45% (6.7 t/ha)	75% (11.2 t/ha)	105% (15.7 t/ha)
Fall 2005	5.3 (entire field)				
Fall 2006	5.9	6.5	6.8	7.1	6.8

Table 5b.Yield of Oats 2006. kg/ha

Percent of Recommended Lime applied				
0	**15%**	**45%**	**75%**	**105%**
279	297	270	196	290

Discussion. Site 5

- Lower than recommended rates (down to 15%) increased pH to adequate level at this site
- Progressive increase of pH with lime up to 75% of recommended level
- Oat yield only fair,: no apparent differences in yield
- The observed variation in pH at the 0 rate from 2005 to 2006 may be due to soil variation
- Farmer to continue as pasture for another 2 years and test pH yearly

Summary

- Recommended lime rates raise pH to satisfactory levels in first year at all 5 sites at these Muskoka sites
- No first year benefit from increasing rates above recommended level.
- Lower than recommended rates at one site increased pH to satisfactory levels
- No yield differences between rates during first year
- Importance to continue study for 2 - 3 more years

Next Steps:

- Participants will continue with the trial for another two years, including growth and yield comparisons, and soil tests
- Attempts will be made to secure funding in 2008 for a tissue analysis comparison for macro and micro nutrient levels from the different lime rates
- Agri-food laboratories continue to undertake soil sample reports
- Full report to be prepared in 2008 - 9

Acknowledgements:

Agri-Food Laboratories in Guelph kindly agreed to provide soil reports at half price. They have also received advance payment to undertake necessary soil analysis for another 2 years.

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Location of Project Final Report
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Forage Turnips As A Pasture Alternative

Purpose:
To evaluate the use of Forage Turnips as a pasture substitute as a means of extending the pasture season.

Results:

In 2005 (5 cooperators) and 2006 (4 cooperators) participated in the project.

2005—5 co-operators, purple top, good success, but maybe a better variety

2006 - 4 co-operators, 3 varieties - Purple Top, Dynamo, Barkant
Mid Summer Planting = after mid July and before mid August
- after cereal baleage or winter wheat

David McKague—Turnips seeded after cereal baleage, but with foxtail pressure he baled and wrapped the foxtail with the turnip tops, and then grazed turnips late Oct/Nov using electric fence feeder

Controlled fencing used to introduce the cattle to the turnips

Different leaf structures were observed from the 3 varieties

Gail Johnson plots planted after grazing fall rye, July 24, seed 4 lb/ac. On left root comparison after 70 days, above October 10, 4 samples note blight is appearing on purple top from each plot were harvested

Yield of Tops & Bulbs Peter Peeters, Oct 26, 2006 Planted July 25, seed 3 lb/ac			
Variety		**% DM**	**Kg DM/Ac**
Purple Top	Tops	13.2	1996
	Bulbs	10.7	1950
Total			**3946**
Barkant	Tops	11.8	2729
	Bulbs	9.4	1596
Total			**4325**
Dynamo	Tops	10.7	2112
	Bulbs	8.9	1515
Total			**3627**

Summary

Forage Turnips are an excellent option for late season forage. Be sure to plant into a fine firm seed bed with 2 lbs of seed/ac. Timed before a rain event is ideal. Target a July planting if possible to minimize seedling competition. Be prepared to scout for flea beetles. The results were not significantly better for the two newer varieties tested this year (Dynamo and Barkant) over Purple Top. Purple top is a few days earlier and seed is cheaper.

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Victoria Soil and Crop Improvement Assoication Local Project

Eastern Ontario Crop Conference 2006 – February 23rd

The Eastern Ontario Crop Conference is a co-operative effort between the Ontario Ministry of Agriculture, Food and Rural Affairs and the Eastern Ontario Crop Advisory Committee. This annual one day conference is held the third week of February at Kemptville College, University of Guelph.

The program is designed to provide growers and agri-business personnel with the latest in-depth crop management information. Participants have the option of selecting up to 8 sessions from approximately 25, presented concurrently throughout the day. This allows participants to select topics of importance and relevance to them. Certified Crop Advisor credits are available for most sessions. About 250 participants attended the 2006 Eastern Ontario Crop Conference.

Recent topics offered at the last conference included:

- Edible Beans and Weed Control
- Factors Affecting Herbicides
- Corn Production 2006
- Do Guidance Systems Pay? Autosteer, Lightbars,
- How to Optimize Farm Trials
- Yield Monitor Putting Technology to Work –
- Market Outlook
- Marketing 101
- Crop Cost of Production - machinery, land, fuel
- Nutrient Management, EFP Update,
- Improve Manure Management
- How Much Fertilizer Can You Afford?
- No-till Drill Clinic
- Pitfalls and Promise of Alternative Crops
- Opportunities in Organic Production
- Getting Soybean Off With a Bang!
- Hay as a Cash Crop
- Banishing Bugs in Bins
- Your Farm Yard “Au Naturel”
- Soybean Rust and Fungicides
- Soybean Diseases
- Soybean Aphids and Other Pests
- Corn and Soybean Insect Seed Treatments
- Wildlife Damage - impact and management
- Weed ID Clinic

Comments from a participant:
“good variety of topics”
“good topics covered this year. hard to go to them”
“Very timely topics, well organized, good variety of topics, well put together and planned, excellent handout literature and the conference program was highly effective.”

Event Contact

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Eastern Ontario Crop Diagnostic Day 2006 – July 18th

The Eastern Ontario Crop Diagnostic Day is a co-operative effort between the Ontario Ministry of Agriculture, Food and Rural Affairs, the Eastern Ontario Crop Advisory Committee and Kemptville College. The Eastern Ontario Crop Diagnostic Day is an annual event held in mid-July, designed specifically to improve the problem solving skills of seed, fertilizer and chemical industry personnel, agricultural consultants and farm managers. Certified Crop Advisor credits are available for most sessions.

The Eastern Ontario Crop Diagnostic Day provides growers and agri-business personnel with "hands-on" learning experiences to assist in the correct identification and treatment of crop problems common to eastern Ontario. The program provides a "real-world" environment where agriculturists can hone their crop trouble-shooting skills and evaluate new and alternative management strategies.

Popular topics include Weed Identification, Herbicide Injury, Annual Forages, Cheap Herbicide Programs for Corn, Herbicide Diagnostic Challenge, Soybean Diagnostic Challenge, Cereal Pests, Insects in Corn & Soybean, Diseases in Corn & Soybeans, Soil Bugs - the Good and the Bad, and Early Corn Management. About 225 participants attended the Eastern Ontario Crop Diagnostic Day in 2006.

Participant comments:
"Greater understanding of many factors affecting crop management"
"Hands on knowledge of speakers - good speakers"
"Topics and speakers were all excellent".
"Excellent cross section of what can be grown and specific problems in Eastern Ontario"

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Southwest Agricultural Conference 2007

The Ontario Ministry of Agriculture, Food and Rural Affairs takes pride in presenting Eastern Canada's premiere crops conference held each year at Ridgetown Campus, University of Guelph in Ridgetown. The 14th annual Southwest Agricultural Conference was held on January 3&4, 2007 and over 1800 farmers, agri-business and government personnel attended.

The theme of this year's conference was "Celebrating Agriculture in Ontario and featured a reception at the end of the first which included a presentation of images of the history and promise of Ontario agriculture. The 2007 conference was also the first major event to be held in the Rudy Brown Rural Development Centre, the latest addition to the Ridgetown Campus. The new building provided much needed space for the conference including three classrooms, a lecture theatre and a large gymnasium. The gym provided a larger venue for the trade show and registration.

Comedian Derek Edwards had the crowd roaring with laughter the first day and Brad Gilmour, Agriculture and Agri-Food Canada had many thinking about China's growth in agricultural production and implications for the world market. For the first time at the conference an Energy Forum was held with topics on Ethanol, Biodiesel & Bio-Digesters, Biofuels Workshop and Renewable Energy Case Studies.

The format of the program is seven 50 minute concurrent sessions plus the feature speaker so it is a full day of learning! The presenters are a mix of farmers, researchers, government extension staff and agriculture industry personnel. The goal of the conference is to bring in the best speaker possible for a topic, by whatever means. Once again a video conference featuring Palle Pedersen gave a great presentation on the "Top Ten Yield Limiting Factors in Soybeans" gave Ontario growers excellent access to information.

Here is a sample of the more than 40 sessions that were offered concurrently over two days at the conference:

- Big Yields, Bigger Profits
- The Organic Experience – Successes and Challenges in Organic Farming
- Marketing Strategies
- More Bugs and Slugs
- Five Steps to Better Weed Control
- Healthy Soils for Healthy Crops
- Growing Your Own Nitrogen
- Hay! Think Before You Grow
- Reducing Drying Costs
- Ontario Clean Water Act
- Grow Op's and Meth Labs in Rural Ontario

The conference is a cooperative effort between the Ontario Ministry of Agriculture, Food and Rural Affairs, the Southwest Soil and Crop Improvement Association, many agribusiness supporters and Ridgetown Campus, University of Guelph.

Visit our website www.southwestagconference.ca for conference information.

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Images from the 2007 Southwest Agricultural Conference

Moving to the next session, double digit temperatures

Growing your own nitrogen session

A session in classroom of the Rural Dev. Centre

Radio broadcast from the conference

Trade show in Rural Dev. Centre Gym

Marketing strategies for 2007

Southwest Crop Diagnostic Day 2006

The Southwest Diagnostic Days program provides seed, fertilizer and chemical industry personnel and agricultural consultants with training in the diagnosis of crop problems. It was held at Ridgetown Campus, University of Guelph, July 5&6, 2006 the 12th year of this outstanding technology transfer program. Organized by the Ontario Ministry of Agriculture Food and Rural Affairs, the day is designed specifically to hone the problem solving skills of agribusiness representatives through "hands-on" activities related to the correct identification and treatment of crop problems common to southern Ontario. The goal of the Diagnostic Days program is to provide quality training in all aspects of crop production and management.

The featured crop for 2006 was cereals with topics on wheat physiology, nitrogen rates and timing in wheat, cereal insects and diseases. Other sessions discussed included thistles and other prickly problems, alternate crop production challenges, herbicide injury in corn, soybeans, and specialty beans, stored grain pests, early season problems in corn and soybeans, water and nutrient movement through macropores, forage IPM, soil water dynamics for irrigation and drainage and early season establishment problems in tomatoes and peppers. The optional Diagnostic Challenge was offered with a chance for participants to test their skills and win prizes. Technology transfer, research and teaching staff from the Ontario Ministry of Agriculture, Food and Rural Affairs, Ridgetown Campus, University of Guelph, agribusiness and Agriculture and Agri-Food Canada are involved in presenting the sessions.

For the second year in a row one of the area agri-businesses organized a day (July 7th) for a number of their farmer clients to attend a shortened version of the day on. 97% of participants rated the day as moderate to highly beneficial to their business.

Visit our website www.diagnosticdays.ca for conference information.

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Scenes from Southwest Crop Diagnostic Days 2006

FarmSmart Agricultural Conference 2007

FarmSmart is an agricultural conference designed to address the needs of agriculture in the midwestern to central Ontario regions of the province. Over 500 participants attended and in total over 700 people were involved in the conference. In 2007 the conference theme was “Ontario Agriculture From A Global Perspective” which provided many sessions which highlighted Ontario’s place in the greater global economy.

The FarmSmart Agricultural Conference is a partnership between OMAFRA, Golden Horseshoe and Heartland Regional Soil and Crop Improvement Associations, The University of Guelph and is supported by Ontario’s Agricultural Industry.

The FarmSmart Conference was held January 20, 2007 in Rozanski Hall at the University of Guelph. The conference mandate is to provide an opportunity for farmers, extension, academics and industry to interact and learn from a series of approximately 49 sessions held in concurrent format throughout the day. Topics included crop and livestock production sessions along with nutrient management, alternative energy, business management, general interest and others. A series of computer workshops in the OAC multi media laboratory including various financial and precision agriculture software tools. Participants chose their own program from the diverse slate of topics allowing each participant to tailor the day to their interests and requirements.

This was the second year for our dedicated Youth Program and over 35 rural youth participated. We have high hopes to growth this segment of our program and encourage all farm families to consider this terrific event. The kids had an opportunity to make ice cream, potato chips, participate in demonstration of cow insemination and view the inside of a live cow's stomach. They toured the University Space program and got to design a greenhouse for Mars.

Author Ronald Wright who penned the excellent book "A Short History of Progress" gave a sobering talk on some of the issues facing the planet today. It was not a message many of us wanted to hear but is a "reality check" that maybe we would be well advised to consider.

FarmSmart 2007 was an outstanding success and all the partners are looking forward to bringing you FarmSmart 2007 on January 19th, 2008. Mark your calendars today, so as not to miss the exciting and informative chance to join fellow producers, industry, extension and academics at next year's event.

Stay current with FarmSmart Ag Conference news by monitoring our website at: http://www.uoguelph.ca/farmsmart

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FarmSmart Farming Systems Expo 2006

The FarmSmart Farming Systems Expo began in the summer of 2004. This event grew from the success of the FarmSmart Agricultural Conference and similar diagnostic days held at Ridgetown and Kemptville colleges. The purpose of these diagnostic days is to highlight current issues in crop and livestock production. This was done through creating and exploring "field issues" which provided participants with skills and knowledge needed to identify and solve problems as they become evident, or better yet, identify and correct issues before they become problems.

The first event was hampered by one of the coldest July days on record where consistent drizzle kept the 150 participants away from the field plots until the end of the day. In 2005, 185 participants and hosts/sponsors and others endured one of the hottest day in history (biggest single day for electrical usage in the history of Ontario Hydro).

In 2006 we were back to the rain, but over 100 hardy soles beat "Mother Nature" at her own game and endured the conditions to participate in a series of sessions including forage insects, corn planting problems, manure and fertilizer management in corn, weed control in cereals and soybeans, edible bean disease management, nitrogen timing in corn, 20 years of tillage research among others.

Thanks to all those who contributed to the success of the day , with a special mention for Peter Smith of the Plant Ag Dept. and Office of Research for his enthusiastic activities that kept on top of much of the site.

In 2007 we have made a change in the event timing to the last week of August. This will give us the opportunity to show various demonstrations and diagnostics that are not possible with a mid July date. So join us on Tuesday August 28th for the next edition of the FarmSmart Farming Systems Expo again at the University of Guelph Elora Research Station. Consult our event website to keep current with this and other associated events: http://www.uoguelph.ca/farmsmart

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Figure 1. Part of the "Soggy" FarmSmart Team


Figure 2. New Techniques in Aqua Weed Management


Figure 3. Edible Beans or Bust!


Figure 4. Soggy Corn Production Options


Figure 5. Not Your Typical Liquid Lunch!

Figure 6. One of Our Hearty Sponsors Greets Some Guests

Soil Management Workshop 2006 ***"Digging beneath the surface"***

Approximately 30 agri-business and interested producers participated in the 2006 Soil Management Workshop held on June 21st on a farm just north of Bowmanville. The day was designed to enhance the skills and techniques needed for diagnosing soil quality problems in field and horticultural crops. Participants were also informed about practices that could be used to improve and maintain soil health and productivity.

The topics covered included:

- measuring soil health
- the implications of soil textures
- structure and compaction
- on-farm nutrients & manure application
- role of soil organic matter
- tools for diagnosing soil problems

Participants had the opportunity to have a close up look at a couple of soil pits and to practice hand texturing on a variety of soils. They also had the opportunity to try some tools used to identify compacted layers in the field.

The afternoon program focused on water movement through the soil and water holding capacity, soil life and fertility and nutrient relations.

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Manure application and preferential flow

Simulating rainfall to assess a soil's potential for erosion

Canada's Outdoor Farm Show 2006

Canada's Outdoor Farm Show offers producers an opportunity to learn about innovative advances in farm equipment, agriculture technology and ag-sector initiatives. Each year since the farm show started thirteen years ago, OSCIA and OMAFRA Crop Technology staff have prepared and participated in an interactive demonstration site.

The objective of the display in 2006 was to highlight and showcase beneficial management practices (BMP's) that can be used on the farm, their economic potential and possible environmental impacts. Both the field plots and the tent display were designed to invite farm show goers over the three days to visit the displays, discuss and ask questions of the OSCIA and crop technology specialists.

Some of the interactive demonstrations featured in 2006 included displays of potential energy crops, biodiesel, exploring beneath the surface in a soil pit, in-expensive weed control solutions, corn and soybean replant decisions, pumpkins inter-seeded between a direct seeded tree lot, compaction displays, manure partial incorporation into alfalfa, and weed, insect and plant disease displays.

Next year's show will be held in Woodstock, Ontario on September 11 to 13, 2007. There are always exciting new technologies to explore, so come and enjoy the show where "farmers meet".

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Scenes from the 2006 Outdoor Farm Show OMAFRA-OSCIA Demonstrations


Trees on Farms