Crop Advances:
Field Project Reports

Volume 1
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Field Crops Team
Crop Technology Branch
OMAFRA

Ontario

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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 OMAF Field Crop Staff that occurred during 2003.

The OMAF 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

“Agricultural Information Contact Centre” at 1-877-424-1300

The OMAF Website:

Main Page: http://www.gov.on.ca/OMAF/english/index.html

Crops Page: http://www.gov.on.ca/OMAF/english/crops/index.html

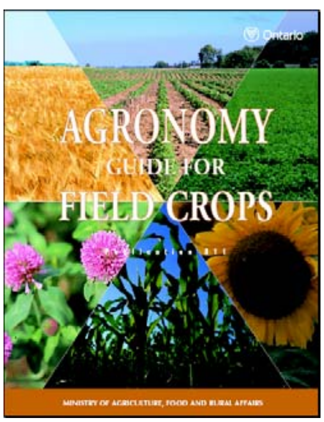
Crop Pest: http://www.gov.on.ca/OMAF/english/crops/field/news/news_croppest.html

Crop Talk: http://www.gov.on.ca/OMAF/english/crops/field/news/news_croptalk.html

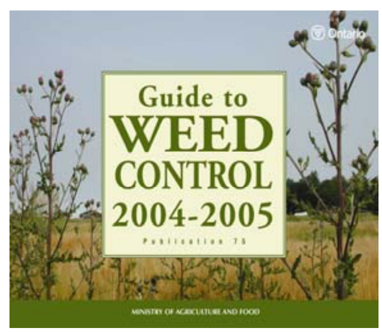
Valuable publications include:

Paid Publications: • Agronomy Guide For Field Crops (Publication 811) • Guide to Weed Control (Publication 75) • Field Crop Protection Guide (Publication 812) • Soil Fertility Handbook (Publication 611) • Ontario Weeds (Publication 505) **Other Publications:** http://www.gov.on.ca/OMAF/english/products/product.html	To order these paid publications please contact: Government Information Centre Ground Floor 1 Stone Rd. W., Guelph, ON N1G 4Y2 519-826-3700 888-466-2372 519-826-3633 fax products@omaf.gov.on.ca

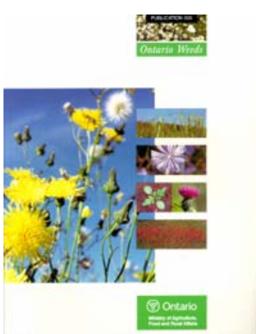
If you have general comments or concerns with the content or format of this report please forward these to the Field Crop Applied Research Coordinator Ian McDonald (Ian.McDonald@omaf.gov.on.ca.) or any of the Field Crop Team staff.



Publication 811



Publication 75



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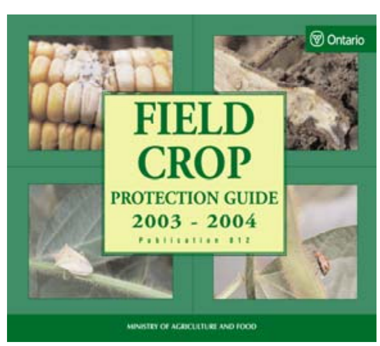

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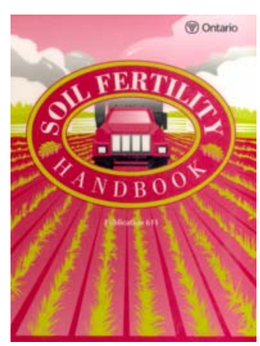


Publication 611

Aerial Photography to Assess Wheat Winter Survival

Purpose:

Every spring growers must decide whether a surviving winter wheat stand will make a viable crop. This has been a very subjective process, often done as a windshield survey from the road. Due to human error, the amount of wheat winter kill is commonly overestimated, often by a factor of 200%. To date, the only objective way to assess wheat stands is by a thorough field walk pattern, marking areas on a map, or simply counting paces of good areas and winter killed areas. Unfortunately, this process is tedious and time consuming, and can give erroneous results, dependent upon the number and location of field transects investigated.

In order to provide growers with a better, faster, and more accurate method of assessing stand survival, aerial photography and computer driven digital image analysis were investigated as a possible alternative.

Methods:

Aerial photographs were taken of several wheat fields with significant winter kill and winter injury. These photographs were then digitized and analyzed using the powerful Arcview 3.2 Geographic Information Processing System.

Ground truthing of digital images was accomplished using a backpack satellite global positioning system (GPS). Winter killed areas were mapped and geo-referenced with this system, to verify the accuracy of the digital imaging process. The accuracy between the digital image analysis and actual ground mapping was excellent, proving that the digital analysis method holds tremendous promise in accurately assessing wheat stands.

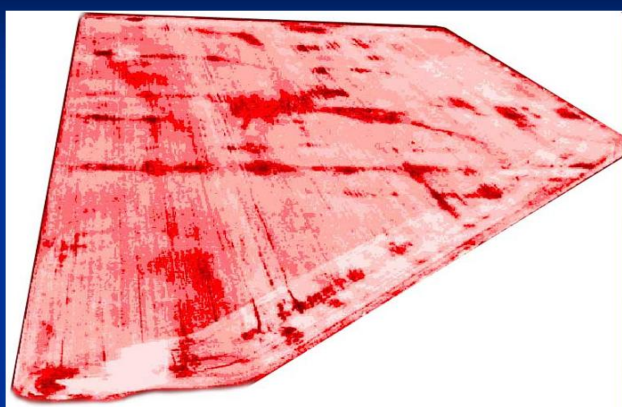
Results:

Figure 1 shows the original photograph, taken April 19th. Figure 2 and 3 show one analysis process utilized with the Arcview system, comparing only healthy wheat areas to areas of winter kill. This analysis showed that 8% (3 acres) of the field had no winter wheat left growing on it.

Figure 1 - Field Under Study Early Season

Original Photo - Taken April 19, 2003

Figure 2 - Photo run through *Arcview 3.2* filter to show just one colour scheme



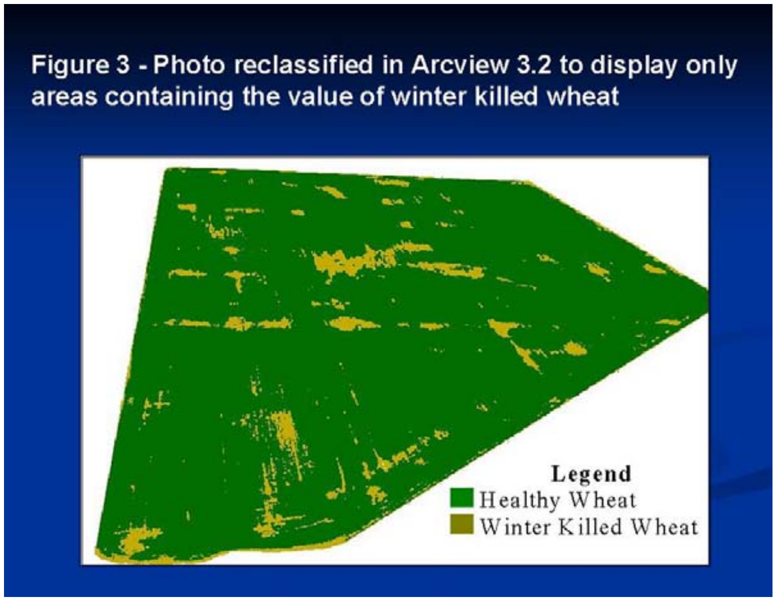


Figure 4 shows the excellent correlation of ground mapping compared with the digital analysis.

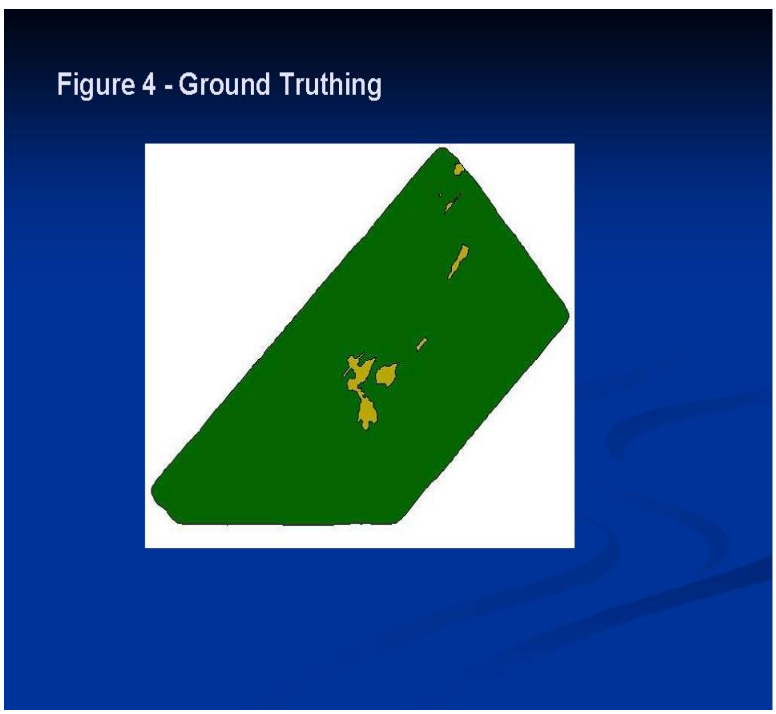
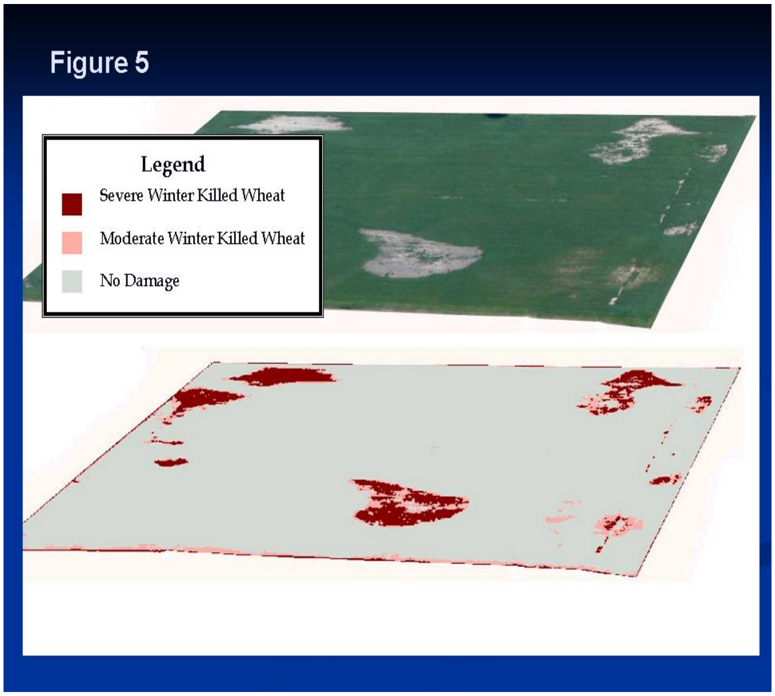
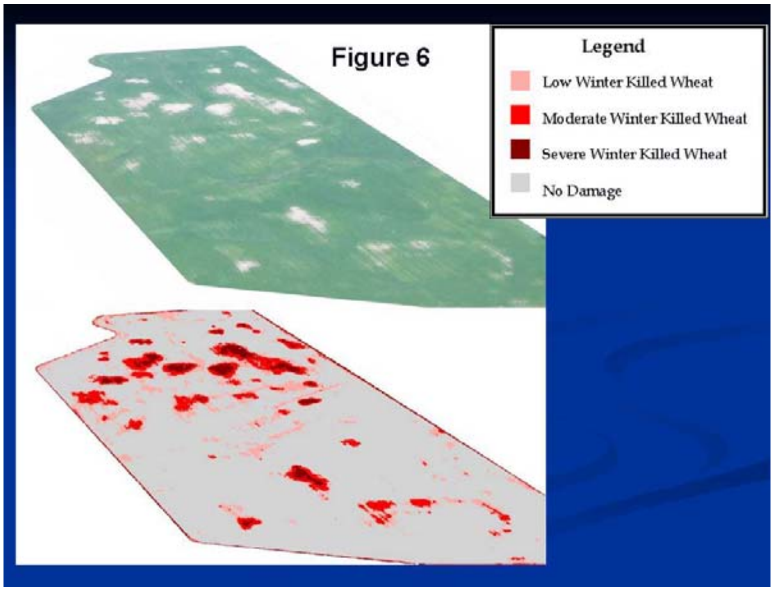


Figure 5 and Figure 6 show increasing levels of analysis within the Arcview program. Figure 5 delineates areas of damage into severe winter kill and moderate winter kill, resulting in 11.5% of this field being affected. Figure 6 delineates three levels of winter kill, low moderate and severe. A full 20.4% of this field is impacted by winter injury.





Summary:

Aerial photography is available across the province. High-end software packages such as Arcview through to free downloadable programs from the internet are available for image analysis of this nature. Growers should request digital photographs taken straight down over the field for best results from the analysis.

This approach holds great promise for assessing wheat stands, and making management decisions on the viability of winter damaged fields.

Next Steps:

Further field trials would help validate this initial study.

Acknowledgements:

The Ontario Wheat Producers' Marketing Board

Project Contacts:

Please contact Peter Johnson at peter.johnson@omaf.gov.on.ca for more information on this study or if you wish to be involved in similar trials in the future.

Incidence of Dwarf Bunt and Other Yield Limiting Wheat Diseases in Ontario

Purpose:

To survey and monitor the occurrence, distribution, and severity of diseases of wheat in Ontario.

Methods:

A survey for foliar diseases, root diseases, fusarium head blight (FHB), and other diseases was conducted in 16 fields of spring wheat and 31 fields of winter wheat from June to early August, 2003. The fields surveyed were chosen at random throughout Ontario (Tables 2 and 3).

Results:

Table 2. Incidence and severity of foliar and root diseases in spring wheat in eastern Ontario

DISEASE	NO. FIELDS AFFECTED	DISEASE SEVERITY IN AFFECTED FIELDS	
		Mean	Range
Leaf rust	2	0.60	0.13-1.00
Septoria leaf blotch	12	0.27	0.07-1.07
Spot blotch	12	0.26	0.07-1.20
Tan spot	3	0.21	0.07-0.33
Common root rot	15	0.60	0.20-2.20
Pythium root rot	6	0.34	0.20-0.60
Rhizoctonia root rot	5	0.25	0.20-0.40

Table 3. Incidence and severity of foliar and root diseases in winter wheat in Ontario

DISEASE	NO. FIELDS AFFECTED	DISEASE SEVERITY IN AFFECTED FIELDS	
		Mean	Range
Leaf rust	2	1.77	0.06-3.07
Mosaic virus	6	2.16	0.33-4.27
Powdery mildew	9	0.47	0.07-2.20
Septoria leaf blotch	28	0.61	0.07-2.67
Spot blotch	15	0.64	0.07-3.13
Strip rust	1	1.28	0.04-2.20
Tan spot	2	1.42	0.40-2.87
Pythium root rot	7	0.20	0.20
Rhizoctonia root rot	4	0.20	0.20
Common root rot	31	0.81	0.20-3.20

Summary:

Common root rot was more prevalent then Rhizoctonia and Pythium root rots in both spring and winter wheat. Fusarium was the most prevalent root pathogen or organism isolated from the crown and sub-crown internodes of spring wheat (59.4%) and winter wheat (68.87%). Fusarium head blight continues to be the most important and yield limiting disease of wheat in Ontario. These results support the ubiquitous distribution of the fungi associated with FHB. Environmental conditions are critical to the development of the disease and the presence of the fungus is not limiting.

Next Steps:

This project will be repeated in 2004.

Acknowledgements:

Ontario Wheat Producers' Marketing Board, Agriculture and Agri-Food Canada, OMAF, Agricultural Adaptation Council, CORD Program and industry partners (C & M Seeds, Hyland Seeds, Pioneer Seeds, Bayer CropSciences, Gustafson Partnership and Syngenta Crop Protection).

Project Contacts:

For more information on the results reported above or if you wish to be involved please contact Albert Tenuta at albert.tenuta@omaf.gov.on.ca.

Management of Fusarium Head Blight in Spring Wheat

Purpose:

To introduce and assess a Fusarium Prediction Model for spring wheat in eastern Ontario and to evaluate the feasibility of using Folicur to manage Fusarium in spring wheat. The infection of fusarium head blight is very dependent on the weather conditions from 7 days prior to heading to 5 - 10 days after the wheat heads have emerged. The Fusarium Forecasting Model is to be used to predict the risk of fusarium infection during this period. The prediction is based on the weather forecast and updated with actual weather as the season progresses.

Methods:

The predicted risk information was presented as colour-coded maps. These maps forecast the amount of toxin (DON in ppm) that would accumulate if the wheat was at Zadok's Stage 59 (75% of the heads in a canopy completely emerged from the flag leaf) on the date of a map. The Fusarium Risk Prediction Model information was updated 3 times per week (Monday, Wednesday & Friday afternoons) from June 15th to July 15th. The colour-coded fusarium prediction maps were available to growers and crop scouts on the Ontario Weather Network (OWN) at Ridgetown College - Fusarium Information web site at:

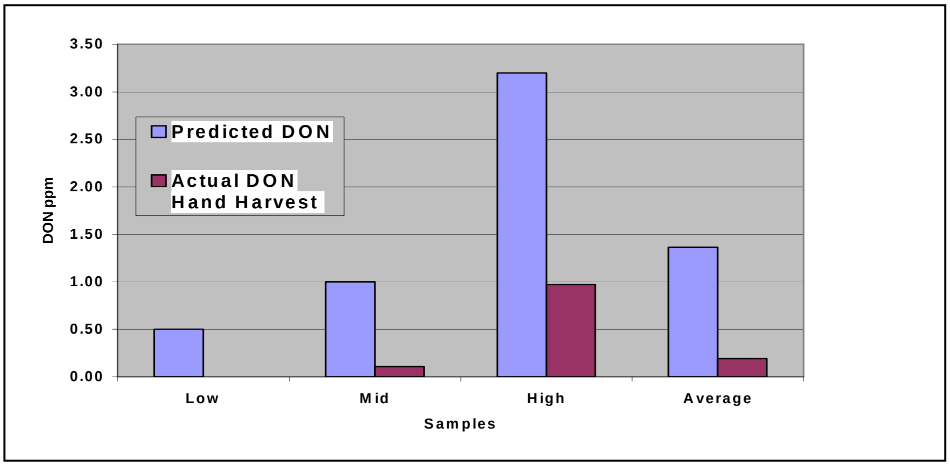
http://www.ownweb.ca/models/public/fusarium/default.cfm?location=none

The project ran in 2001 and 2002, and was completed in 2003. In each of the 3 years there were 25 to 30 side-by-side, on-farm comparisons of No Folicur (check strip) compared to a Folicur strip. Folicur was sprayed at approximately 2 to 3 days following Day 0 (75% Heads Emerged stage). Accessing each field to get the timing of application for Day 2 to Day 3 was a challenge as the sudden increase in daytime temperature shortened the time that the wheat plant was at the 75% Head Emerged to the Flowering stage.

Results:

It is worth noting that the highest percent fusarium damaged kernels (FDK) and DON level samples were from fields heading during periods of high rainfall and/or humidity. Only in 2003 were the weather conditions poor enough to result in high FDK and DON levels. It is also important to note the variety susceptibility, as was the case with the spring wheat variety 5700 PR, which is known to be more genetically susceptible to fusarium infection. The model prediction maps were able to provide an indication, but generally predicted higher then the actual DON levels in the samples.

Figure 1. DON ppm - Predicted vs Harvest Hand Samples Spring Wheat 2001 by category, as of day 0



3 Year Summary - Fusarium in Spring Wheat

Table1. Comparison of Folicur and Untreated Spring Wheat for Yield

Yield (bu/ac)	Check	Folicur	Difference	High	Low
2001	68.2	70.1	2.0	11.5	-10.2
2002	68.2	68.9	0.7	7.5	-10.5
2003	60.8	63.1	2.3	10.5	-4.9
		Average	**1.7**		

There was considerable field variability as shown by the negative yield response when comparing Folicur to the no Folicur check strips (Table 1). Yield was calculated excluding the sprayer tracks. As shown in the table, the average yield benefit to Folicur is only 1.7 bushels per acre, although some growers with heavy crops and/or disease pressure found 3 to 4 bushels per acres. The lack of yield response in 2002 can be attributed to the generally lower leaf disease pressure as compared to 2001 and 2003.

Table 2. Comparison of Folicur and Untreated Spring Wheat for Fusarium Levels

Fusarium %	Check	Folicur	Difference	High	Low
2001	0.014	0.009	-54.3%	0.1	-0.2
2002	0.055	0.036	-33.3%	0.4	-0.3
2003	8.596	5.843	-32.0%	9.3	-4.6
		Average	**-39.9%**		

Folicur reduced the percent fusarium levels by approximately 30 to 50% (Table 2). However, in 2001, the percent FDK in both strips was very low. In the first year, hand-samples collected before combining were compared to the samples taken from the combine showed that combining significantly reduced the number of FDK in the sample. This is important to producers because over 1% FDK results in Feed Grade and a $30 to $40 per tonne discount.

Table 3. Comparison of Folicur and Untreated Spring Wheat for DON Levels

DON ppm	Check	Folicur	Difference	High	Low
2001	0.831	0.767	-8.4%	0.4	-0.3
2002	0.700	0.500	-28.6%		
2003	0.831	0.767	-7.8%	1.59	-1.76
		Average	**-14.9%**		

DON toxin level is measured by the millers and depending on the intended usage, the acceptable level is 1 to 2 parts per million (ppm). In this project, the DON toxin levels were only reduced by about 15% on average (Table 3).

Summary:

The experience from this project would indicate that Folicur applied under the conditions of the last 3 years can be effective in reducing the percent fusarium to less the 1% FDK when the expected fusarium levels are moderate (ie. 1.3 to 1.5%). However, it did not sufficiently reduce the % FDK to make food grade wheat when the fusarium conditions are high as experienced in the later heading fields of 2003.

Overall, the project has further improved the understanding of how to manage fusarium head blight in spring wheat with the use of Folicur fungicide, the use of the Fusarium Prediction Model and other factors, such as variety selection and crop rotation.

Next Steps:

This study has now been completed.

Acknowledgements:

Thank you to the Farm Cooperators for taking the time to setup and report the results for this project, the local agri-business for their cooperation and support of the project. A special thank you to the summer Crop Technicians Cara Berends, Anna Armstrong and Cheryl Hazenberg for their work in collecting the field data. Also thank you to the Ontario Wheat Producer's Marketing Board, Ottawa Valley Seed Growers Association and Eastern Valley Regional Soil & Crop Improvement Association for supporting this project.

Project Contacts:

For more information on the above results please contact Scott Banks at scott.banks@omaf.gov.on.ca.

Benchmarking For Local Nitrogen Application Recommendations – Soil Nitrate Studies

Purpose:

To determine if the Pre Side Dress Nitrogen Test (PSNT) can be better calibrated for use under Ontario conditions through monitoring the release of organic N from the soil pool during the period from early spring through until early July.

Methods:

Thirty farm cooperators were selected from across the province to represent a broad cross section of field crop production scenarios. Sites were selected based on a range of geographies, soil types, tillage practices and cropping systems. At each site fields were selected that were going into corn in each of the 3 years of the study (2001, 2002, 2003). In some cases the same field was used while in others a different field was used each year.

For each year, 3 benchmark positions were selected in the field along a straight line and positioned to represent distinct soil typic or topographical zones within the field. Benchmark positions were marked with telephone near surface markers so that the exact location of the centre point could be found at any time. Eight soil cores 2 x 30cms were extracted at each sampling event and the cores composited to make a 250 gram sample that was bagged, labeled and moved to frozen storage as soon as possible.

Samples were collected from each benchmark on a 7-10 days schedule from early spring until early July, then at physiological maturity of the crop and fall freeze up.

In the years following the establishment of a set of benchmarks, the sites were sampled ~5 times (thaw, early May, Mid June, physiological maturity of the crop grown, and fall freeze up) to evaluate if the mineralization pattern varied considerably between crops.

Soils were analyzed for NO3 and NH4 by the Land Resource Science Dept. of the University of Guelph. Results were tabulated and graphed.

Results:

Summary statistics for ammonium and nitrate nitrogen concentrations in the soil samples collected for this project are shown in the following tables.

Table 1: Summary Statistics for Ammonium N in Benchmark Soil Samples

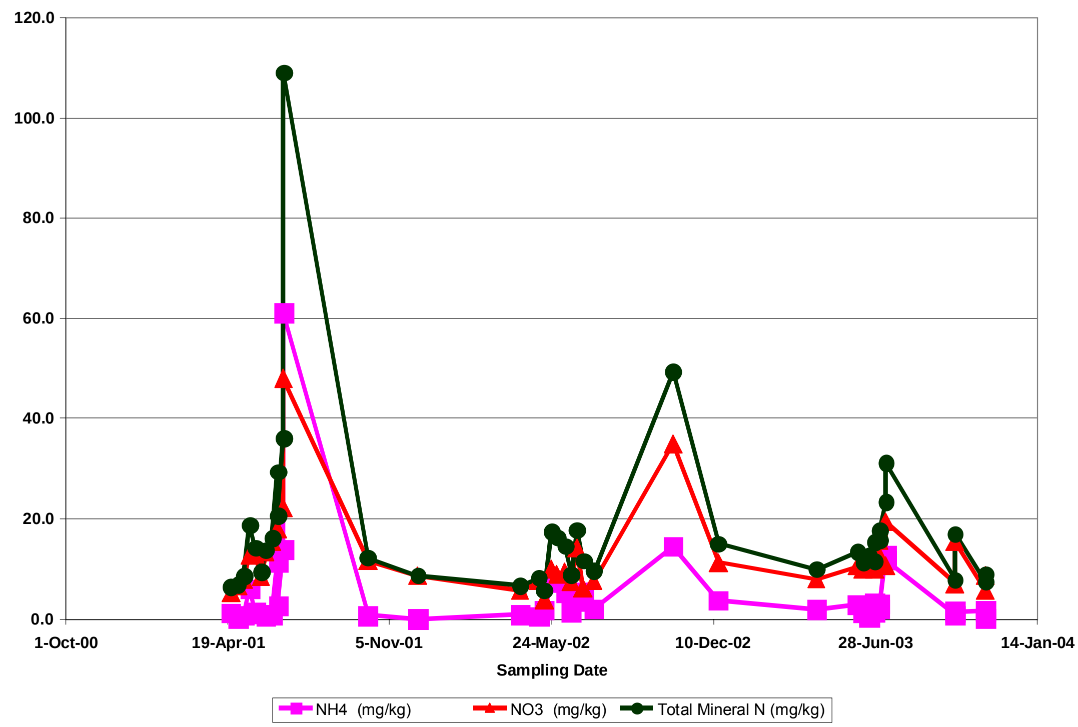
NH4-N (mg/kg)	2001	2002	2003	2001-03
Mean	2.9	3.3	1.2	2.3
Standard Deviation	13.2	8.3	4.3	8.9
Median	1.1	1.2	0.0	0.7
Minimum	0.0	0.0	0.0	0.0
Maximum	346.7	71.5	88.4	346.7
# of Samples	1425	1738	2031	5194

Table 2: Summary Statistics for Nitrate N in Benchmark Soil Samples

NO3-N (mg/kg)	2001	2002	2003	2001-03
Mean	17.2	15.7	18.2	17.1
Standard Deviation	11.6	10.8	12.2	11.6
Median	13.5	12.9	14.9	13.8
Minimum	1.7	1.3	0.0	0.0
Maximum	87.3	103.3	106.1	106.1
# of Samples	1425	1737	2031	5194

The data for both ammonium and nitrate are highly skewed, so the median is a better indicator of the central tendency of the data than the mean. Ammonium N levels were, as expected, generally low, except where manure or anhydrous ammonia had been applied shortly before sampling.

Figure 1: Example of Mineral N Contents of Field Soils Over Three Growing Seasons



Mineral N levels in general followed a pattern of accumulation through spring and then a decline towards harvest and freeze up. On initial observation there was not a significant impact of topographical benchmark position on the levels of N found.

Summary:

The seasonal pattern of nitrate N accumulation was generally a gradual increase from early spring through the early part of the growing season, peaking in early July. Other studies have shown a decline in soil nitrate concentrations when the phase of rapid corn growth commenced, but this did not appear in many fields in this study, presumably because the sampling period ended before this decline was evident. There was a significant decline in soil nitrate concentration between the end of spring sampling, and corn maturity. Roughly 25% of the sites showed either no change in nitrate N concentration over the season(10%), or a decline (15%). Possible mechanisms for this decline include denitrification or leaching, but further analysis of the data will be required to make any conclusions.

Next Steps:

The results of this study are being further analyzed with more sophisticated statistics to filter through the massive data set that exists. This analysis will take into account the type and timing of various management practices on the cooperating farms including manure application and amounts, tillage system, cropping sequence etc. The data summarized thus far is being extended through meetings and written reports to the farm community.

Acknowledgements:

OMAF Field Crop Technology would like to acknowledge the farm cooperators who made land and other resources available for conducting these projects. Various members of Ag Industry across the province provided application equipment, nitrogen and access to weigh wagons at harvest. This contribution was greatly appreciated and essential to the success of the project

The project was done in partnership with Dr. Ivan O'Halloran of RCAT, University of Guelph. Other members of the University and OMAF communities were involved in the study. University of Guelph Laboratory Services and Agri-Food Laboratories conducted various components of the soil analysis. Funding was supplied by the Stewardship Fund administered by OSCIA and OMAF.

Project Contacts:

Ian McDonald , OMAF, ian.mcdonald@omaf.gov.on.ca
Keith Reid, OMAF, keith.reid@omaf.gov.on.ca

Location of Project Final Report:

See Project Contacts above.

Benchmarking For Localized N Recommendations – Yield Response Studies

Purpose:

To determine if the Pre Side Dress Nitrogen Test (PSNT) can be better calibrated for use under Ontario conditions through monitoring the release of organic N from the soil pool during the period from early spring through until early July.

Methods:

Thirty farm cooperators were selected from across the province to represent a broad cross section of field crop production scenarios. Sites were selected based on a range of geographies, soil types, tillage practices and cropping systems. At each site fields were selected that were going into corn in each of the 3 years of the study (2001, 2002, 2003). In some cases the same field was used while in others a different field was used each year.

At each field site, strips with four rates of supplemental N were applied, replicated twice, to allow the determination of the Maximum Economic Rate of N (MERN) for each field. Each field had starter N applied to the entire field, at rates up to 40 kg/ha of N. Supplemental rates were targeted at zero, 50%, 100% and 150% of the farmer's normal rate of nitrogen. Yields were measured from each rate strip using either a combine yield monitor or commercial weigh wagon, and the results were fit to a quadratic equation. This was then used to calculate the MERN for the field. Yield measurements were not available for all fields, due to mechanical problems or poor planting or harvest conditions, but on average, 22 yield measurements were available each year.

Results:

Table 1. Summary of Maximum Economic Rates of N (MERN), 2001-03

	MERN (kg/ha)			
Cooperator	2001	2002	2003	Average
SF1-01-001	66	255	125	149
SF1-01-002	100			100
SF1-01-003	0		127	64
SF1-01-004		128	111	120
SF1-01-005	140	102	139	127
SF1-01-006	190	108	151	150
SF1-01-007	65	105	90	87
SF1-01-008	0	0	0	0
SF1-01-009	44	69		57
SF1-01-010	158	142		150
SF1-01-011	97		92	94
SF1-01-012	0	0	85	28
SF1-01-013	150			150
SF1-01-014	80	0		40
SF1-01-015	171	112	229	171

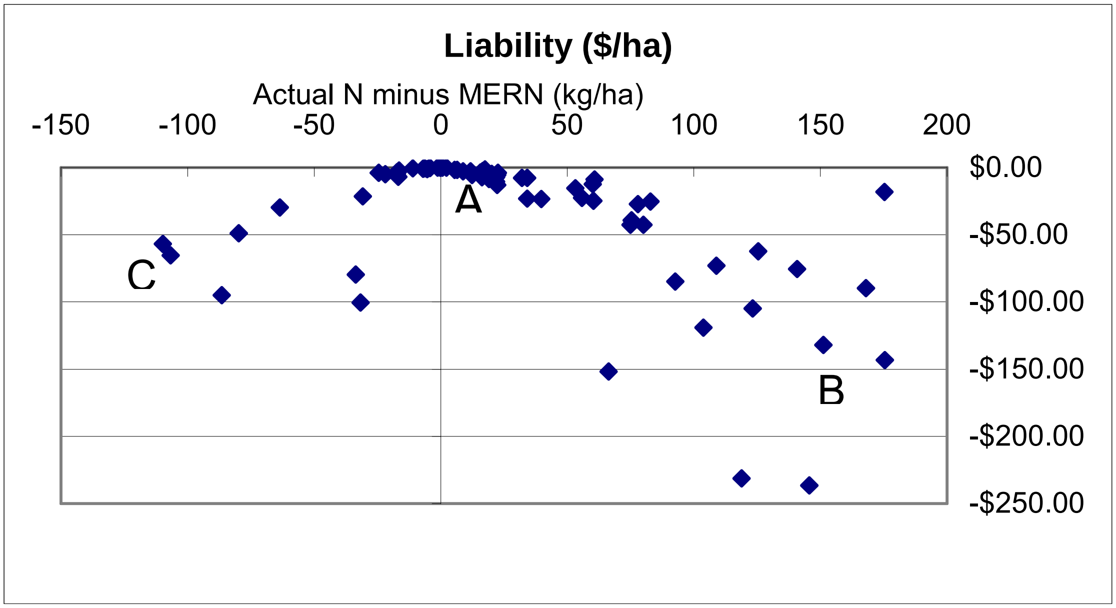
(continued)

	MERN (kg/ha)			
Cooperator	2001	2002	2003	Average
SF1-01-016	169	167	191	176
SF1-01-017	49	138	137	108
SF1-01-018		78	42	60
SF1-01-019	101	142	151	131
SF1-01-020	0	212	123	112
SF1-01-021	129	79	0	69
SF1-01-021		106		106
SF1-01-022	224	0	116	114
SF1-01-023	125	82		104
SF1-01-024	33	100		67
SF1-01-025	183		98	141
SF1-01-026			101	101
SF1-01-027		114		114
SF1-01-028		79	119	99
SF1-01-029		167	139	153
SF1-01-030	202	90	0	97
Average	103	103	108	104

Maximum Economic Rates of N ranged from zero to 255 kg/ha, with an average of all plots of 104 kg/ha. Interestingly, the average values for each year did not vary from this figure by more than 4 kg/ha. Averages across years for each co-operator should be treated with caution, and are provided for information only. Benchmark sites were often moved to different fields, and occasionally to different farms, so there could be significant differences in soil type, previous crop, or management between years. These influences will be considered in further evaluation of the data.

It is clear from Figure 1 that many farmers are applying rates close enough to the MERN (A) that their economic losses are small (<$5/acre). There are more farmers in this group who are losing money from over-application of N (B), than from under-application (C), and they are losing larger amounts of money because of it.

Figure 1: Comparison of Financial Liability for applications above or below the MERN with the variation of actual N rates from the MERN.



Summary:

Using on farm nitrogen strip trials with multiple rates of N is a cost effective method of determining field MERNS on a field to field or farm to farm basis. This method allows farmers to understand the N contribution from the overall management of the operation in terms of tillage, crop rotation, soil typic and addition of organic nutrients. The "zero" check strips determine this contribution. The other rates tested then allow the determination of the field MERN which suggests that rate of N that should be the target for greatest profitability in light of input costs and crop prices.

In general the vast majority of farmers in the project were targeting the N rates close to MERN levels as suggested by Figure 1. However, there were still a significant number of farms where the rate of N used was above profitable levels and was resulting in significant financial losses. It was also interesting to note that there were a number of farms where the N rate applied was too low and was resulting in economic losses since the crop was unable to attain its economic yield potential.

Next Steps:

The MERNs for this study will be recalculated using quadratic-plateau equations, which have been shown to provide a more accurate estimate of MERN. This data will need to be correlated to soil type, previous crop, and manure history, and compared with the predicted N recommendations from the corn N database. This will provide an independent check of the accuracy of this model.

Acknowledgements:
OMAF Field Crop Technology would like to acknowledge the farm cooperators who made land and other resources available for conducting these projects. Various members of Ag Industry across the province provided application equipment, nitrogen and access to weigh wagons at harvest. This contribution was greatly appreciated and essential to the success of the project

The project was done in partnership with Dr. Ivan O'Halloran of RCAT, University of Guelph. Other members of the University and OMAF communities were involved in the study. University of Guelph Laboratory Services and Agri-Food Laboratories conducted various components of the soil analysis. Funding was supplied by the Stewardship Fund administered by OSCIA and OMAF.

Project Contacts:

Ian McDonald , OMAF, ian.mcdonald@omaf.gov.on.ca
Keith Reid, OMAF, keith.reid@omaf.gov.on.ca

Location of Project Final Report:

See Project Contacts above.

Fall Strip Tillage and Fertilizer Placement

Purpose:

To evaluate the effectiveness of Fall Strip Tillage Systems and Fertilizer Placement on corn production in comparison to conventional and No-Tillage production systems.

Methods:

Corn yield response to timing and placement of P and K fertilizer were conducted on nine field sites located in West-Central Ontario during 2001 to 2003. The growing season is rated at 85 to 95 Relative Maturity Days.

Prior to application of fall fertilizer and tillage, soil-test P and K levels in the surface 6" were determined using Ontario Ministry of Agriculture and Food (OMAF) accredited procedures (OMAF Staff, 2002). Ontario accredited soil test for plant available P is based on extraction using Sodium Bicarbonate and soil-test K is based on extraction using Ammonium Acetate.

At each site, corn yield response to placement and timing of P and K fertilizer was evaluated for three tillage systems with the placement of fall applied fertilizer differing among tillage systems. The tillage systems, and associated placement of fall fertilizer, are described as follows:

1) Conventional tillage (Fall Plow): Fall moldboard plowing to a depth of 6 - inches with two passes of spring secondary tillage. Fall fertilizer was broadcast on the soil surface shortly before plowing.
2) Fall Strip-tillage (Fall Strip): Fall tillage was confined to strips approximately 8 inches wide on 30 inch centres. A modified Trans-till (Row-tech, Snover MI) was operated at a depth of 6-8 inches. The Trans-till applied fall fertilizer at a depth of 6 inches in the centre of the tilled strip.
3) No tillage (No-till): No tillage occurred. Fall fertilizer was broadcast on the soil surface.

Tillage system plots were split in order to evaluate two fall fertilizer treatments, which were 1) fall fertilizer not applied and 2) fall fertilizer applied. The same rates of fall P and K were applied to all tillage systems within a site. However, actual rates did vary across sites and are described in greater detail in Table 1.

The fall fertilizer plots were also split in order to evaluate two planter-banded treatments which were 1) N only applied as U.A.N and 2) a combination of N applied as U.A.N plus a band of dry fertilizer containing P and K. The rate of starter N was 30 lbs/ac for both starter treatments at all sites. The rate of starter P and K was the same for all tillage and fall fertility treatments within a site, but actual rates of P and K did vary across sites and are described in Table 1.

Corn at all sites was planted in 30" rows at a seeding rate of 30,000 seeds/ac. The planter was equipped with unit-mounted tine row cleaners and a single disk fertilizer opener positioned to deliver starter dry fertilizer 2 inches below and 2 inches beside the seed. This same opener was also designed to apply the U.A.N. in the same band as the dry fertilizer.

Appropriate weed control measures were used at each site which ensured that yields were not affected by the presence of weeds. Supplemental N was sidedressed applied as U.A.N., when corn was at the 7 to 9 leaf stage, to ensure that the total rate of applied N at each site was at least 150 lbs/ac. Grain corn yields were calculated to 15.5% moisture.

Table 1: Experimental Site Details

Field Group	Number of site/years	Fall Fertilizer	Planter Fertilizer	P Soil Test (ppm)	K Soil Test (ppm)	Soil texture
		P @ lbs/ac (P_2O_5) K @ lbs/ac (K_20)				
Heartland	3	P: 42	P: 30	15 - 21	127 – 145	Loam
		K:100	K: 30			
Ancaster	3	P: 43	P: 30	15 - 18	75 – 111	Silt loam
		K: 100	K: 30			
Alma A	2	P: 43	P: 31	20 - 25	75 – 86	Silt loam
		K: 100	K: 31			
Alma B	1	P:62	P: 31	16	58	Silt loam
		K:62	K: 31			

Results:

Yield response to tillage and P and K fertilizer at the various experimental sites fall into three groups which are related to their soil test values. The groupings and their associated soil test values for P and K are presented in Table 1.

Sites with Minimal Yield Response

Yields at the Heartland sites were not affected by tillage or by the addition of P and K fertilizers (Table 2). Deep placing P and K within the zone tillage system did not result in higher corn yields than more traditional timing or placement methods. At each of the Heartland sites corn was planted following winter wheat and soil test values (Table 1) recommend application rates of 20 lbs-P_2O_5/ac and 0 lbs-K_2O/ac (OMAF Staff, 2002). The results of this study were consistent with the results of an earlier Ontario study where tillage and K fertilization did not affect yield of corn planted following winter wheat when soil-test K levels were high (Vyn and Janovicek, 2001).

Table 2. Impact of placement and timing of P and K fertilizer on grain corn yields for 3 tillage systems on loam soils following winter wheat. Average of three experiments. Heartland, 2001-2002.

Tillage		Fall Fertilizer		Planter Fertilizer	
Treatment	Yield	Treatment	Yield	Treatment	Yield
Fall Strip	134	None	132	N only	131
				N,P,K	133
		P and K	135	N only	137
				N,P,K	133
Fall Plow	144	None	146	N only	147
				N,P,K	145
		P and K	142	N only	139
				N,P,K	145
No-till	143	None	141	N only	139
				N,P,K	142
		P and K	145	N only	143
				N,P,K	147
LSD (.10)	Ns		Ns		Ns
Averages	140	None	140	None	139
		P and K	141	N,P,K	141
LSD (.10)	-		Ns		Ns

Note: Standard Error of Tillage by Fall Fertilizer by Spring Fertilizer yields is 3.4.

Sites with Moderate Yield Response

Yields at the Ancaster and Alma A sites were affected by tillage and application of P and K fertilizer (Table 3 and 4). At each of these sites corn was planted following soybeans and soil test values (Table 1) recommended application rates, on average, which were 20 lbs-P_2O_5/ac and 50 lbs-K_2O/ac.

The Ancaster sites took a "systems" approach and compared only two of the possible four fertilizer options which were 1) P and K applied only in the fall (no starter P and K) and 2) P and K applied only in the starter band (no fall applied P and K) (Table 3). Yields were generally higher in the Fall Plow system, regardless of the timing of P and K fertilizer application. In the Fall Strip system, fall applied P and K fertilizer produced yields similar to those obtained when P and K were applied in the starter-band. Also, No-till corn yields were lower where P and K was fall broadcast applied compared to where P and K fertilizer was starter-banded.

The Alma A sites also demonstrated that fall application of P and K fertilizer could provide yield increases similar to those obtained with P and K applied through the planter (Table 4). In general, P and K applied through the planter increased yields in all three tillage systems, but the size of yield response was significant only within Fall Strip and No-till systems. Fall application of P and K fertilizer in the Fall Strip system (no starter P and K) produced yields similar to those obtained in the No-till system with P and K applied as part of the starter fertilizer (no fall applied P and K).

Table 3. Impact of placement and timing of P and K fertilizer on grain corn yields for 3 tillage systems on a silt loam soil following soybeans. Average of three experiments. Ancaster, 2001-2003.

Tillage	Fertilizer Strategy	Yield
Fall Strip	Fall - P and K; Planter – N only	120
	Fall – none; Planter – N,P,K	120
Fall Plow	Fall - P and K; Planter – N only	126
	Fall – none; Planter – N,P,K	133
No-till	Fall - P and K; Planter – N only	109
	Fall – none; Planter – N,P,K	117
LSD (.10)		7.1

Table 4. Impact of placement and timing of P and K fertilizer on grain corn yields for 3 tillage systems on a silt loam soil following soybeans. Average of two experiments. Alma A, 2001-2002.

Tillage		Fall Fertilizer		Planter Fertilizer	
Treatment	Yield	Treatment	Yield	Treatment	Yield
Fall Strip	143	None	138	N only	133
				N,P,K	142
		P and K	147	N only	143
				N,P,K	150
Fall Plow	145	None	146	N only	144
				N,P,K	147
		P and K	143	N only	140
				N,P,K	145
No-till	141	None	142	N only	136
				N,P,K	147
		P and K	141	N only	137
				N,P,K	144
LSD (.10)	Ns		5.7		6.5
Averages	142	None	142	N only	138
		P and K	144	N,P,K	145
LSD (.10)	-		Ns		3.8

Sites with Large Yield Response

The Alma B site had dramatic yield responses to tillage and application of P and K fertilizer (Table 5). Corn on this site was planted following soybeans and the soil test P and K levels recommend application rates of 20 lbs-P_2O_5/ac and 100 lbs-K_2O/ac (OMAF Staff, 2002). In general, yields in the Fall Plow were higher than in either the Fall Strip or No-till systems. Yield differences among tillage systems were particularly large when P and K was not applied. Both fall and starter application of P and K fertilizer significantly increased yields in all tillage systems. Yields in the Fall Strip system where P and K was applied only in the fall did not produce yields as high as those obtained in the No-till system where P and K was applied only in the starter-band.

Table 5. Impact of placement and timing of P and K fertilizer on grain corn yields for 3 tillage systems on a silt loam soil following soybeans. Alma B, 2003.

Tillage		Fall Fertilizer		Planter Fertilizer	
Treatment	Yield	Treatment	Yield	Treatment	Yield
Fall Strip	87	None	66	N only	16
				N,P,K	116
		P and K	108	N only	91
				N,P,K	125
Fall Plow	121	None	106	N only	80
				N,P,K	132
		P and K	135	N only	125
				N,P,K	144
No-till	88	None	73	N only	33
				N,P,K	113
		P and K	102	N only	72
				N,P,K	131
LSD (.10)	19.8		15.9		16.8
Averages	99	None	82	N only	43
				N,P,K	120
		P and K	115	N only	96
				N,P,K	133
LSD (.10)	-		9.2		9.7

Summary:

The major observations and associated conclusions of this study are summarized as follows:

1. Corn yields were not affected by tillage or by application of P and K fertilizer on sites with soil test K levels sufficiently high such that application of K fertilizer is not recommended. This implies that on soils were planter applied P and K result in no additional corn yield that deep placement of P and K within a strip tillage also may not increase corn yield.
2. On sites where soil test recommended about 50 lbs/ac of K, fall application of P and K fertilizers produced yields similar to those obtained with no-till where P and K was starter-banded. This implies that on sites with a moderate requirement for P and K application that P and K requirements of conservation-till corn may be effectively met by fall banding P and K fertilizers in a fall strip-till system.
3. When the requirement for K fertilizer was high, applying P and K fertilizers only in the fall did not maximize corn yields. The requirement for P and K applications through the planter was not removed by placing the fall P and K in a band within the strip tillage system. On soils with a relatively large requirement for K (or P) fertilizer optimizing corn yields may require the application of P and K fertilizers in the fall as well as in the planter band, particularly in reduced tillage systems.

Next Steps:

New studies have been initiated to look at various other aspects of the strip tillage production system. These include adoption in clay soils, use in spring shortly before planting with and without N application as part of the strip tilling operation.

Acknowledgements:
Support for this project was provided by Heartland Regional Soil and Crop Improvement Association, Monsanto Canada, Ontario Soil and Crop Improvement Association, Ontario Corn Producers Association, Agricultural Adaptation Council - CanAdapt, The Ontario Agri-Business Association, Potash and Phosphate Institute of Canada, University of Guelph and the Ontario Ministry of Agriculture and Food.

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Western Corn Rootworm Variant On-Farm Survey

Purpose:

Corn rootworm damage has been observed in first year cornfields in some U.S. States, including parts of Michigan and Ohio. Starting in the early 1990's, in some regions, where a strict corn-soybean rotation was followed, a selection was made for a new variant of western corn rootworm (WCR) that lays at least a portion of its eggs in fields other than corn. With the strict corn-soybean rotation, larvae hatching from eggs laid in soybean fields emerge in first year cornfields, where they can cause root injury, lodging, and yield reduction. In 2003, 11 soybean fields in eastern Ontario were a surveyed in August to track the presence, density and distribution of adult WCR variant.

Methods:

The methodology employed was adapted from the survey protocol for WCR variant developed by the Department Of Crop Sciences (Integrated Pest Management), University of Illinois

- 11 soybean fields were randomly selected; each field was adjacent to a second year (or more) field of corn.
- The survey for adult WCR was conducted form the 1st to the last week of August.
- Each field was surveyed with 4 unbaited Pherocon AM yellow sticky traps set 50, 100, 200 and 300 feet respectively from the edge of the soybean field adjacent the corn field (see figure 1.).
- The traps were positioned just above the soybean canopy on 2 X 2 wooden posts
- After 4 weeks, the traps were removed and adult WCR on each trap were counted. The number of beetle per trap was divided by the number of days the trap was in the field to obtain the number of beetle trapped per day.
- Economic loss due to root feeding by WCR variant can occurs if trap capture in a soybean field the year before averages more than 3 beetles per trap per day.

Results:

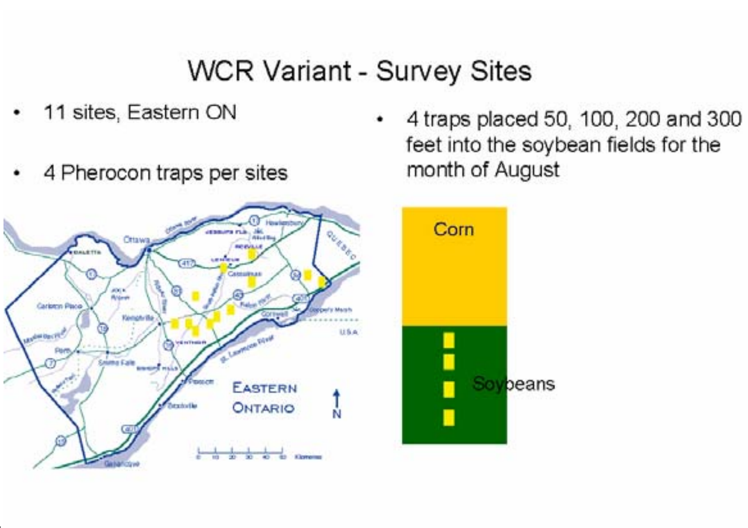

Figure 1:

Table 1: Average Trap Capture per Day

Field Location	Trap – 1 50'	Trap – 2 100'	Trap – 3 200'	Trap – 4 300'
Glengarry 1	0.07	0.15	0.00	0.00
Glengarry 2	< 0.05	0.10	< 0.05	n/a
Stormont 1	0.00	0.00	n/a	n/a
Prescott 1	0.20	0.00	0.00	< 0.05
Russell 1	0.20	0.07	< 0.05	0.00
Dundas 2	0.00	0.00	0.00	0.00
Dundas 3	0.30	0.07	0.00	n/a
Dundas 4	0.20	0.01	n/a	0.00
Dundas 5	0.05	0.00	< 0.05	n/a
Dundas 6	0.05	0.05	< 0.05	0.00
Dundas 7	0.15	0.15	0.00	n/a

Summary:

The maximum trap capture was 0.3 beetle per day, which is only 10% of the economic threshold of approximately 3 beetles per trap per day. The extremely low trap capture levels seem to indicate that the variant WCR is not present in the areas surveyed.

Next Steps:

Monitoring will continue as new information about the WCR variant spread is received.

Acknowledgements:

The willingness of various cooperators in eastern Ontario for allowing traps to be established on their farms is greatly appreciated.

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Nitrogen Survey And Verification Of A Cross Section Of Farm Types Across Ontario - A Survey And Sampling Approach

Purpose:

This study surveyed the amounts of mineral nitrogen remaining in the top 30 cm of soil at specific points in the year. It is assumed that this mineral N could be lost from the rooting zone prior to subsequent crops being able to utilize the residual nitrogen. The study was conducted over a 3 year period to look at the impact of different cropping system and management practices on the amounts of residual nitrogen remaining in the various systems.

Methods:

Approximately 200 sites were chosen with farm cooperators across the province. Site selection was crucial to the success of the project. Cooperators were selected based on criteria of geographic location, soil type, primary enterprise type and tillage systems employed. The goal was to select a minimum of 10 farms in any category to ensure enough data was collected to allow for summarization of the data.

Sites were established in the fall of 2001 for Field crop sites and the spring of 2002 for Hort crop sites. Each site was set up as a 1 acre area within a larger field. A centre point was established for each area, and 25 cores were collected from within a circle surrounding this point at each sampling time. Samples were collected four times during each year: Crop maturity (for grain crops) or harvest (for crops harvested before maturity); Late fall, just before freeze-up; Early spring, as soon after thaw as possible; and late spring/early summer, to correspond to the maximum soil N contents during the year. Each site was sampled for three years, finishing in the fall of 2003 for the field crop sites, and the fall of 2004 for the hort crop sites.

Results:

Results for the soil samples collected at Thaw, Crop Maturity/Harvest, and Freeze are shown in the following table. The late spring results are not shown, since they are highly variable according to whether the samples were collected before or after fertilizer application. The data for both ammonium and nitrate nitrogen is highly skewed, so the median is a better indicator of the central tendency of the data than the mean.

There was not a large spread in nitrate or ammonium contents between horticulture and field crop sites. The one consistent pattern was that the soil nitrate contents were higher at crop maturity/harvest than at either freeze, or thaw. This indicates that mineral N was lost from the soil during the period from the end of crop uptake of nitrogen to the end of the season, although it is not clear whether this is from leaching, denitrification, or uptake by cover crops. The change in mineral N content was much smaller over the winter period, when the soil was frozen.

Table 1: Number of mineral soil sites with soil nitrate-N and ammonium-N values of less than 10 mg/kg, between 10 and 20 mg/kg, between 20 and 30 mg/kg and over 30 mg/kg for the 2001-2003 average, for thaw (T), crop maturity/harvest (CM/H) and freeze (F) sample times. Including the average, median, min and max for each. For all sites, field crop sites and horticulture crop sites.

	All Sites						Field Crop Sites						Hort Crop Sites					
	Average 2001/2002/2003						**Average 2001/2002/2003**						**Average 2002/2003**					
N Type	**NH_4+**	**NO_3-**	**NH_4+**	**NO_3-**	**NH_4+**	**NO_3-**	**NH_4+**	**NO_3-**	**NH_4+**	**NO_3-**	**NH_4+**	**NO_3-**	**NH_4+**	**NO_3-**	**NH_4+**	**NO_3-**	**NH_4+**	**NO_3-**
Sample Timing	T	T	CM/H	CM/H	F	F	T	T	CM/H	CM/H	F	F	T	T	CM/H	CM/H	F	F
mg/kg	# of sites																	
<10	324	146	493	131	499	226	236	96	389	104	386	172	88	50	103	27	113	54
10 - 20	10	156	14	243	17	218	8	124	12	202	15	177	2	32	2	41	2	41
20 - 30	5	35	1	80	3	56	4	28	1	65	3	43	1	7	0	15	0	13
>30	3	5	1	55	5	24	3	3	1	32	5	17	0	2	0	22	0	7
Total #	342	342	509	509	524	524	251	251	403	403	409	409	91	91	105	105	115	115
	mg/kg																	
Average	2.6	12.4	1.8	17.1	2.3	13.0	2.7	12.9	1.9	16.5	2.7	13.0	2.3	10.9	1.3	19.1	1.1	12.9
Median	1.0	11.0	1.0	14.1	0.7	10.8	1.2	11.5	1.0	13.9	0.7	11.1	0.8	9.5	0.3	14.5	0.0	10.2
Min.	0.0	1.5	0.0	2.4	0.0	1.8	0.0	2.3	0.0	3.2	0.0	1.8	0.0	1.5	0.0	2.4	0.0	3.0
Max.	35.1	47.9	34.2	70.3	68.9	46.9	35.1	35.4	34.2	70.3	68.9	46.9	26.4	47.9	17.7	54.1	11.7	40.2

Considering all sites, the at harvest or crop maturity levels of ammonium in the system were minimal and levels showed 97% of samples being less then 10 kg/kg. On the nitrate side, 25% of sites had levels below 10 mg/kg and 77% had levels below 20 mg/kg. On average the levels were below 14 mg/kg at crop maturity

Table 2: Soil Nitrate Levels by Sampling Time Across All Sites, Field and Hort Sites 2001-2003

Value	**Sample Timing**	All	**Field**	**Hort**
Max	Thaw	192	140	192
	Harvest	280	280	216
	Freeze	188	188	160
Median	Thaw	44	46	38
	Harvest	56	56	58
	Freeze	43	44	41

Table 2 shows that although maximum levels for soil Nitrate were excessive, the median values show acceptable levels of N at harvest and freeze up. Although the thaw values seem close to the freeze values, there would be a tremendous leap of faith to suggest that there was no N loss over the winter period as suggested by the data.

Table 3: Soil Nitrate Levels by Sampling Time by Soil Textural Class Across All Sites 2001-2003

Value	Sample Timing	Coarse	Medium	Fine
Max	Thaw	124	192	108
	Harvest	232	248	280
	Freeze	164	188	168
Median	Thaw	32	48	52
	Harvest	44	60	64
	Freeze	36	44	48

Table 3 shows that soil type on average had very little impact on residual N levels across all field and hort sites in the study. Median levels were almost equal for medium and fine textured soils. Maximum levels were very high, but represented a small portion of the overall data.

Summary:

On the first analysis of the data, in general, the amount of residual N left in the various systems is less then 14 mg/kg at harvest and drops to levels around 10 mg/kg by freeze up suggesting that not much nitrogen is being lost as nitrate at the end of the growing season. Regardless of the system, considerable N is available in the spring and should be accounted for in adjusting N rates to meet specific crop demands. Soil type did not have as big a factor as anticipated with the N levels in medium and fine soil being very similar at all sampling times during the season. Course textured soils did contain lower levels but the difference is likely not significant.

The maximum levels of residual N, although representing a low number of the total sites, is problematic and needs to be evaluated further.

Next Steps:

Data has been collected on management practices at each of the cooperating farms, and these will be correlated to the soil mineral N concentrations at each site. This will be used to validate whether the risk of high residual N concentrations predicted by the N Index within NMAN is reflected in the field. The data will also be analyzed to determine which management practices are related to low residual soil N concentrations.

Acknowledgements:

OMAF Field Crop Technology would like to acknowledge the farm cooperators who made land and other resources available for conducting these projects. The project was done in partnership with Dr. Ivan O'Halloran of RCAT, University of Guelph. Other members of the University and OMAF communities were involved in the study.

University of Guelph Laboratory Services and Agri-Food Laboratories conducted various components of the soil analysis. Funding was supplied by the Stewardship Fund administered by OSCIA and OMAF.

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Utilization Of Biosolids As A Nutrient Source In Crop Production In Ontario

Purpose:

This project was initiated to demonstrate to growers in the Golden Horseshoe Soil and Crop Region (GHSCIA) and beyond the value of biosolids utilization in a crop fertility programs. This was accomplished through the establishment of a series of field demonstrations to document and communicate the benefits and impacts of using biosolids as a source of nutrients and organic matter in field crop production systems

Methods:

The project established 7 co-operator sites across the GHSCIA region and utilized 4 Municipal Biosolids (MBS) sources and 2 types (liquid or dewatered) and one Paper Mill Biosolids (PPMB) source. Each site generally used only 1 biosolids type in a multiple replicated field length plot design.

At each site soil quality parameters including pH, plant available phosphorus, and the 11 regulated metals were measured prior to the biosolids application and 2 years after application. The concentration of the 11 regulated metals was also measured in the crop leaves and harvested grain.

Plots were replicated and a commercial fertilizer standard was used as a check of production yields.

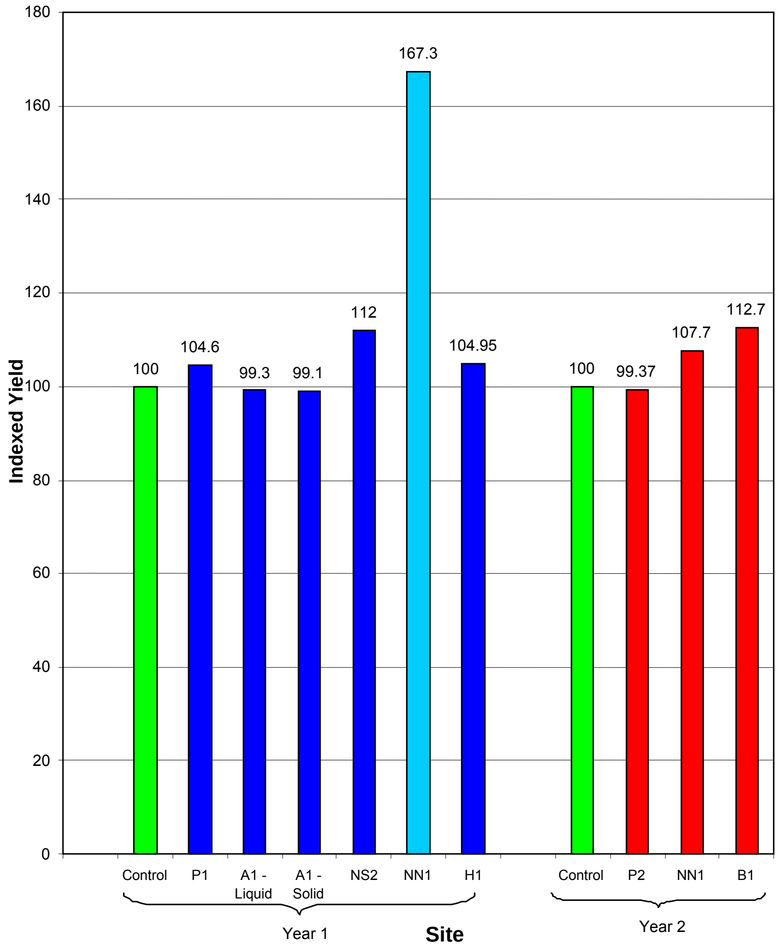
Table 1: Site Information

County	Site ID	Biosolids Source	Biosolids Type
Peel Site #1	P1	Toronto	Dewatered MSB
Peel Site #2	P2	Toronto	Dewatered MSB
Halton	A1	Halton Region	Liquid & Dewatered MSB
Niagara South Site #1	NS1	Niagara Region	Liquid MSB
Niagara South Site #2	NS2	Niagara Region	Liquid MSB
Brant	B1	Hamilton	Dewatered MSB
Haldimand	H1	Hamilton	Dewatered MSB
Niagara North	NN1	Abitibi, Thorold	PPMB

Results:

The analysis results showed no elevated concentrations of the 11 regulated metals and no change in soil pH in the biosolids treated plots compared to control plot that received commercial fertilizer. At 4 of the 6 MBS sites the biosolids application resulted in higher concentrations of plant available phosphorus measured 2 years after the biosolids application. The PPMB application site had lower plant available phosphorus. Although most sites showed no increases in the concentrations of the regulated metals in the tissue samples, the tissue samples at one site had high concentrations of copper and zinc in the treated compared to the control samples. The higher concentrations were 85% and 75% respectively of what would be considered the normal maximum concentration of these elements in plant tissue.

Figure 1: Indexed Crop Yields Comparing Biosolid and Commercial Fertilizer Plots



At all the MBS application sites the crop yield was comparable to the commercially fertilized control plots. The PPMB plot out yielded the commercial fertilizer plot and this may have partially been due to the very dry growing season and the moisture holding ability of the PPMB material.

Summary:

Use of biosolids and commercial fertilizer resulted in similar responses in soil quality, crop quality and crop yield. No detrimental effects were observed or detected in the utilization of biosolids as a nutrient source as compared to commercial fertilizer.

Next Steps:

The results from this project have been and will continue to be presented at various meetings and conferences such as FarmSmart and OSCIA Annual meetings where appropriate. The final report has been presented to the project partners for their use in further explaining the benefits of biosolids utilization in crop fertility programs and to the urban municipal governments local to the project sites to improve their understanding of the use of biosolids generated and utilized in the their community.

Acknowledgements:

Funding for this project was through an OSCIA Regional Partner Grant in partnership with matching funds from American Water Management (Terratec). The project leads would like to thank the farm cooperators who participated in the project for their involvement in providing land and conducting field operations leading to the success of the project. The involvement of those in Ag industry who provided weigh wagons and other resources is greatly appreciated. The GHSCIA would like to thank the Project Coordinator Rebecca Malo for her work and dedication to the success of the project.

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Survey Of Regulated And Non-Regulated Metals In A Range Of Ontario Agricultural Soils

Purpose:

To determine the concentrations of regulated & non-regulated metals in a range of agricultural soils across Ontario. Furthermore, the results will be used to evaluate if the concentrations of metals in agricultural soils across Ontario have any potential to pose a risk in the use of biosolids as a nutrient source. (A parallel project administered by MOE measured the concentration of the same metals in municipal sewage biosolids)

Methods:

Multiple fifteen centimeter (6 inch) cores were extracted from 178 row crop and horticultural crop fields in the fall of 2002 in conjunction with the ongoing Benchmarking N and N Verification studies conducted by OMAF Crop Technology staff. A minimum of 32 cores or 24 cores were extracted from Benchmark and Verification sites respectively. The cores were composited to 400 grams of a well mixed sample. Duplicate samples were packaged and forwarded to the Land Resource Dept. of the University of Guelph and the Ontario Ministry of Environment for metal concentration analysis.

Results:

Table 1. presents the metals data summarized over the range of farm types evaluated. Data is presented to show metals levels in overall sites and broken out by row crop and hort crop related sites.

Summary:

The concentrations of the regulated metals were with few exceptions, lower than the maximum permissible levels as stated in the *Guidelines for the Utilization of Sewage Biosolids and Other Wastes , March 96.*

Next Steps:

The data will be further scrutinized to determine if any of the unregulated metal concentrations found pose any potential negative impacts regarding the utilization of municipal biosolids or other regulated materials as nutrient sources or soil amendments.

Acknowledgements:

OMAF Field Crop Technology would like to acknowledge the farm cooperators who made land available and provided permission for sampling their field sites in conducting this project. Technical assistance and analytical components of the project were supported by Dr. Bev Hale, Dept. of Land Resource Science, University of Guelph and Mr. Tony Ho, Ontario Ministry of Environment.

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Table1: Concentration of Regulated and Non Regulated Metals in Ontario Farm Fields Compared to the Ontario Typical Range for Metals Based on MOE Standards

Site Types	Chloride	Mercury	Beryllium	Magnesium	Aluminum	Calcium	Vanadium	Chromium	Manganese	Iron	Cobalt	Nickel
	ug/g	ug/g	ug/g	ug/g	ug/g	ug/g	ug/g	ug/g	ug/g	ug/g	ug/g	ug/g
1*	23.32	0.07	1.1	10000	29000	23000	62	45.1	984	35100	17.1	37.4
2	2.8	0.02	0.5	4850	15000	6800	39	23	570	20000	7.7	17
3	232.6	0.12	0.56	11040	26260	61920	53.3	40.3	870	27780	14	37.5
4	3.6	0.02	0.25	2900	8950	5450	27	14	320	13500	4.6	13
5	45	0.13	1.1	20000	30000	55000	77	58	2200	35000	16	38

Site Types	Copper	Zinc	Molybdenum	Cadmium	Barium	Lead	Strontium	Boron	Silver	Sodium	Total Potassium	Sulphur
	ug/g	ug/g	ug/g	ug/g	ug/g	ug/g	ug/g	ug/g	ug/g	ug/g	ug/g	ug/g
1	33	120	3.04	1.1	197	22	56.8	28	0.2	505	5870	0.05
2	14	63	0.25	0.45	71.5	10	20	9.7	0.075	120	2000	0.026
3	309	142.6	7.07	1.03	181.2	31.9	97.1	34.5	0.11	290	4912	0.34
4	16	56	0.25	0.25	43	11	17	9.2	0.05	95	1300	0.03
5	41	120	1	0.71	160	45	64	30	0.27	660	6500	0.079

Site Types	Total Nitrogen	Total Phosphorus	Total Solids	Uranium	Arsenic	Selenium	Antimony	Fluoride	Titanium	Tin	Thallium	
	ug/g	ug/g	ug/g	ug/g	ug/g	ug/g	ug/g	ug/g	% dry wt	ug/g	ug/g	
1	3.1	1.6	91.7	3.04	9.79	0.57	0.8	187	0.567	1.37	0.89	
2	1.8	0.92	50	0.65	3.5	0.2	0.2	57	0.42	0.61	0.29	
3	30.3	2.9	825.2	4.61	15.52	1.63	0.619	474	0.53	9.02	10.66	
4	1.6	1	42	0.8	4.15	0.18	0.1	78	0.33	0.96	0.598	
5	5.7	1.9	na	2.1	11	0.93	0.43	61	0.52	na	0.81	

1*	This value is the 98th percentile value from 134 Field Crop Sites from across Southern Ontario.
2	This value is the median value from 134 Field Crop Sites from across Southern Ontario.
3	This is the 98th percentile value from 44 Horticultural Field sites from across Southern Ontario.
4	This is the median value from 44 Horticultural Field sites from across Southern Ontario.
5	The Ontario Typical Range is the average value for Rural Parkland (parks, cemeteries, forests, woodlots and other undeveloped areas) as determined by a MOE survey published in 1993 (ISBN O-778-1979-1).

The 98th percentile values presented in Site Types 1 and 3 are the points where 98% of the samples have values lower than this value, and 2% have values higher...in other words, it represents the highest values you are likely to find in the data set.

Biological Control of the Soybean Aphid, *Aphis glycines*

Purpose:

The objective of this project is to identify and assess the potential of native parasitoids, predators and pathogens to control soybean aphids. The long term objective is to implement biological control as part of a soybean aphid IPM program in Ontario.

Methods:

Field surveys for native natural enemies were conducted in southwestern Ontario from June to September 2003. 100 plant samples (1 sample = top, middle and bottom trifoliate) and 200 sweeps (50 sweeps x 4 areas) per week were taken at 4 soybean fields (Mitchell's Bay [2], Arva and Ballymote, Ontario). All material was collected in ziploc bags (plant samples) and collection cages (sweep samples) and were brought into the lab for assessment. Each sample was examined for the number of aphids and the insect stage, parasitized aphids, dead aphids due to fungus, all predators and parasitoids. These numbers were recorded and voucher specimens were prepared for identification.

Results:

Figure 1. Proportion of natural enemy abundance in plant and sweep samples at all locations in 2003.

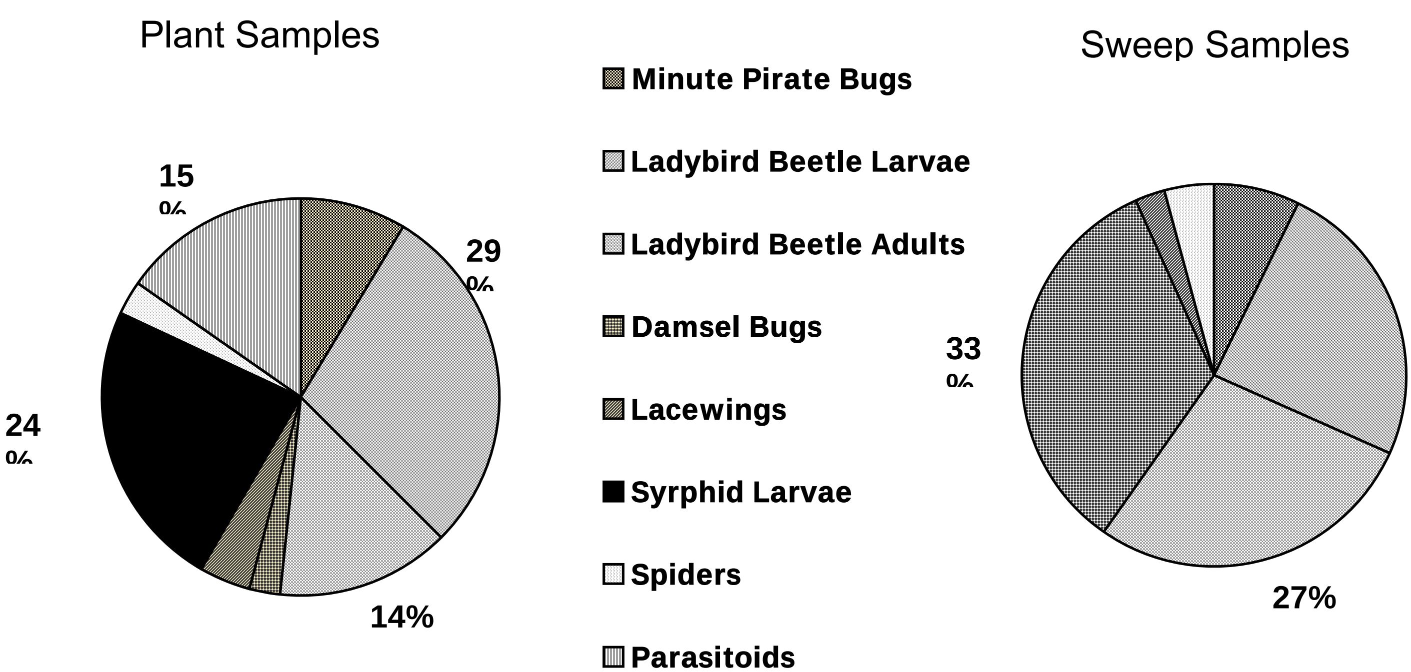
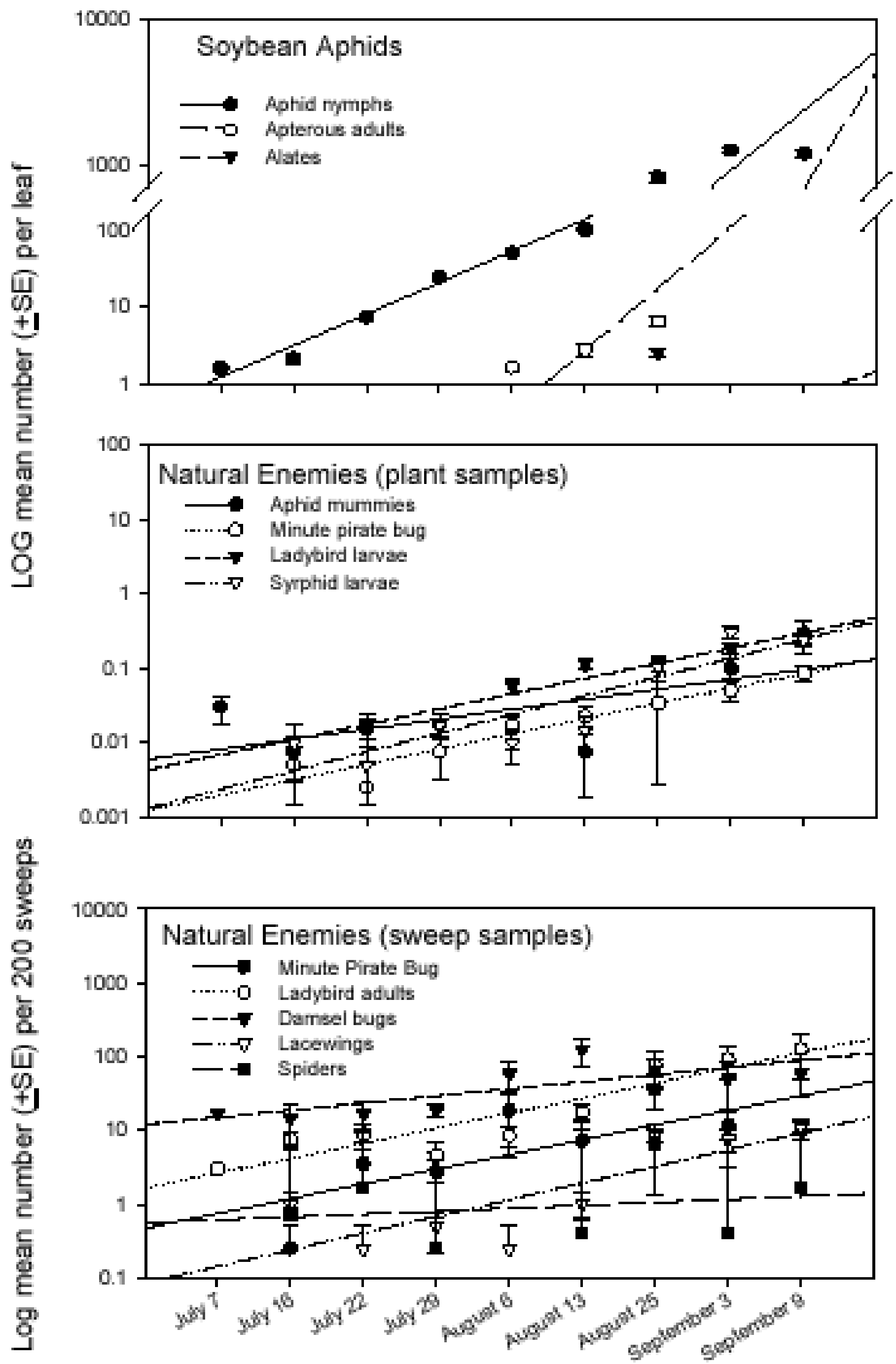


Figure 2. Mean numbers of soybean aphid and natural enemies collected in southwestern Ontario soybean fields in 2003 (Linear regression).



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Summary:

Soybean aphid populations increased steadily through the season with a mean peak infestation of 815 aphids per trifoliate occurring the week of August 25th. Predators were the dominant natural enemies collected (Figure 1). Ladybird beetles represented 43.2% (28.9% larvae and 14.3% adults), followed by syrphid larvae (23.6%) as the dominant predators in plant leaf samples. In sweep samples, damsel bugs (32.9%) were most abundant followed by ladybird beetle adults (27.4%). Weekly responses of these natural enemies were documented (Figure 2). These results suggest that at high populations (i.e. >269 aphids per plant leaf) ladybird beetles, damsel bugs, and syrphid larvae are the most important predators when compared to low population results from 2002. Syrphid fly larvae, damsel bugs and ladybird beetle larvae numbers increased in response to aphid populations, with ladybird larvae increasing the most rapidly. Spiders (families Salticidae, Thomisidae, Theriidae, Tetragnathidae and Araneae) were also abundant (up to 5%) and analysis of their importance as an aphid predator is underway. Aphid parasitoids (still being identified but probably *Aphidius* sp.), not present in 2002, represented 15.3% of natural enemies in plant leaf samples. No pathogens were recovered in 2003.

Next Steps:

The role of natural enemy refuge habitats will need to be determined. Laboratory studies will be conducted to assess the impact of important predator and parasitoid species found during field surveys. Prey consumption and host preference will be assessed for each predator and parasite. Laboratory studies will be conducted to assess the potential of field-collected and commercially available pathogens for soybean aphid control. Field studies will be conducted to verify impacts predicted by laboratory experiments of promising predators, parasitoids and pathogens identified.

Acknowledgements:

Research collaborators include Bruce Broadbent, AAFC London, Peter Mason, AAFC Ottawa and Henri Goulet, AAFC Ottawa. Funding was provided by the Ontario Soybean Growers and the AAFC Matching Investments Initiative. Dawn Campbell, Connie Chan, Ana Maria Farmakis, Lola Gualtieri, Mike Sarazin, Jocelyn Smith, Laura Timms and Cheryl Van Herk provided technical assistance.

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Location of Project Final Report

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Soybean Aphid Distribution in Ontario

Purpose:

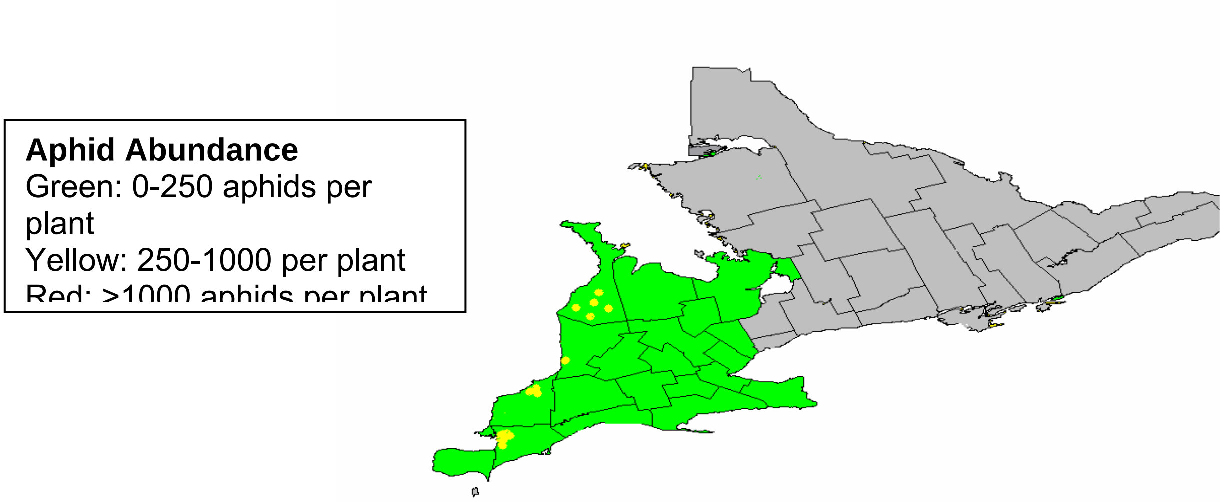
The objective of this study was to determine the abundance of soybean aphids in the major soybean growing counties of Southern Ontario. A properly timed survey would help warn growers of the potential need for insecticide control.

Methods:

Eighteen counties (6 fields from each) in Southern Ontario were sampled for soybean aphids (SBA). Six plants in five areas of each field were visually inspected during the first and second week of August 2003. Crop stage, total number of aphids per plant, plant health and presence of alate adults, mummies, predators and type were documented. 50 SBAs per field were collected and sent for DNA analysis to determine source population and detect genetic differences amongst the Ontario and other North American populations.

Results:

Figure 1. Distribution and abundance of soybean aphids found in 2003 survey during the week of August 3rd to 15th.



Summary:

SBA populations ranged from low to moderated levels (0-250 aphids per plant) with the exception of a few fields that averaged up to 1000 aphids per plant (Figure 1). The average crop stage at the time of the survey was R1 to R2 (flowering to early pod set). The survey was conducted at this stage because previous research showed the biggest yield advantage to spraying when thresholds were reached at the R1 to R2 stage. Unfortunately, shortly after the survey was conducted, SBA numbers increased and treatment was required at several locations based on threshold numbers. DNA analysis to date is indicating that all populations in North American collected to date are homogeneous and differ from specimens collected in Japan and China, indicating that the NA populations may not have originated from these two countries.

Next Steps:

A soybean aphid survey will be conducted again next year to determine population levels in 2004. Sampling will be conducted at the early reproductive stages, while monitoring temperatures and running prediction models to determine if populations have the potential to increase above thresholds. Plant specimens for the soybean virus survey and aphid specimens for DNA analysis will also be collected. SBA specimens from other countries will be assessed to determine if they are the source of the NA invasion.

Acknowledgements:

Research collaborators include Albert Tenuta, OMAF, Roberto Michelluti, AAFC-Harrow, Robert Foottit, AAFC Ottawa, Peter Mason, AAFC Ottawa and Dave Hunt, AAFC Harrow. The Ontario Soybean Growers and the Agricultural Adaptation Council provided funding. Eric Maw, Dana Gagnier, Jocelyn Smith, Cheryl Van Herk and Dan Bechard provided technical assistance.

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Limiting Losses to Phytophthora sojae in Ontario and the North Central U.S. Soybean Region

Purpose:

Phytophthora sojae is a soil borne disease that causes significant losses to Ontario soybean production every year. This project was undertaken to:

1) Develop materials on Phytophthora sojae for the Plant Health Initiative, OSG and OMAF websites including fact sheets, disease management guidelines and PowerPoint presentations.
2) Identify the *Rps* genes that may exist in soybean Plant Introductions that are currently being incorporated into northern soybean germplasm.
3) Determine the pathotypes (races) of *Phytophthora sojae* that exist in Ontario and each state and compare them across the North Central region.
4) Determine which cultural practices limit losses to *Phytophthora sojae* on varieties with different levels of partial resistance (tolerance). In addition, test isolates for tolerance to Apron.

Methods:

(1) Materials have been developed on Phytophthora sojae for the Plant Health Initiative Website at www.planthealth.info *and the Ontario Soybean Growers. These materials* include information on i) screening results of *Rps* genes in commercial varieties for Ontario and the specific states; ii) information on the biology, identification, and management of *P. sojae*; and iii) factsheets which explain management tools across the region for different pathotypes as well as soil types. Phytophthora root rot is caused by the soil-borne fungus, *Phytophthora sojae* and the disease continues to be a major threat not only in Ontario but also in the entire north central U.S. Participation in this joint proposal allows Ontario researchers and producers full access to the research results, materials and products that are derived from this study.

(2) Each state and Ontario are responsible for a specific set of Plant Introductions appropriate to its region. PI's will be screened with a number of isolates to determine if there are any *Rps* genes present and, if so, to possibly narrow down the beneficial (candidate) genes. This complexity of *Rps* gene deployment makes screening and resistance characterization much more difficult. The ultimate goal would be to identify Plant Introductions that have not only Phytophthora resistance but multiple disease resistance which would speed-up variety development.

(3) A uniform set of soybean differentials were used to characterize the isolates within the region. Each participant (Ontario/states) inoculated these differentials from their collection of isolates. A database will be established, which outlines the races or pathotypes that exist within Ontario and each state. This information will be used by public and private breeders to assist in soybean variety development.

(4) Isolates of *P. sojae* collected from multiple locations in Ontario, Illinois and Ohio were tested in the laboratory for sensitivity to metalaxyl and mefenoxam.

Results:

Soil samples (120) were collected from central and southwestern Ontario during the summer of 2003 and are being processed. Results from eastern Ontario and Quebec survey of Phytophthora isolates can be found in Table 1. The effectiveness of the various genes for resistance are expressed as a percent. The higher the percentage the less effective the Phytophtora gene is. For instance, Rps 1a provides little protection to producers since 100% or all of the isolates isolated were able to bypass this gene (cause infection).

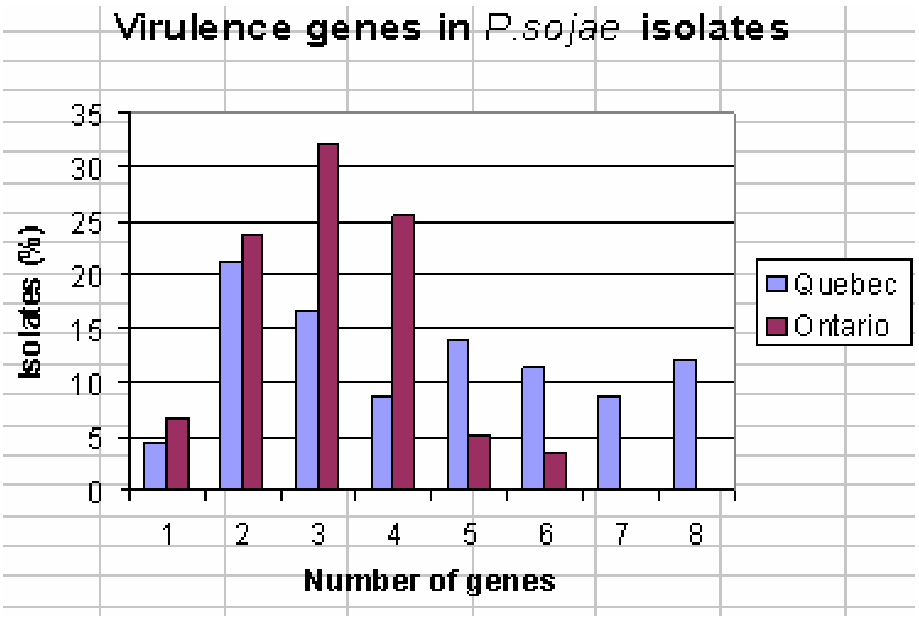
It appears that the populations of *P. sojae* are shifting or have adapted many of the *Rps* genes that have been deployed in the last 10 years. For a soil-borne pathogen, what we are seeing is the beginning of some stand failures, more in season Phytophthora stem rot and more complex pathotypes (isolates that cause disease on soybeans with a greater number of *Rps* genes as shown in Figure 1).

Table 1: Frequency and distribution of *Phytophthora sojae* isolates from eastern Ontario with virulence on selected genes for resistance and putative new genes in Harrow isolines.

Resistance gene/isoline	Genes for virulence Distribution (% of farms)		Frequency (% of isolates)	
	2001*	2002**	2001*	2002**
Rps1a	100	100	100	97
Rps1c	25	29	8	20
Rps1k	75	79	46	47
Rps6	100	86	100	41
Rps8	-	21	-	5
OX744	-	36	-	17
OX939	-	21	-	5
OX940	-	79	-	53

In Illinois, 34 isolates from 20 different counties were tested and all were sensitive to 1 ug/ml metalaxyl and mefenoxam. In Ohio, 33 isolates from different locations were tested, and all were sensitive to 5 µg/ml of metalaxyl. In Ontario, 40 isolates of *P . sojae* from 6 counties in eastern Ontario have been evaluated on 5ug/ml of mefenoxam and all were sensitive at that concentration.

Figure 1 – Phytophthora isolates from Eastern Ontario and Quebec with 1 to 8 virulence genes.



Summary:
Some of the Phytophthora isolates obtained from this study have been able to bypass the newest source of resistance (Rps 8) developed in Ohio. This ability comes naturally in these isolates since the Rps 8 gene has not been used in Ontario soybean varieties but Ontario Phytophthora isolates are able to bypass the Rps 8 gene. This is one of the difficult challenges when dealing with this disease. It has many inherent disease causing genes that are present in the fungus genome even when it has never come into contact with a new resistance gene. The potential to stack multiple resistance genes (Rps) into Ontario soybean varieties may overcome this problem.

Considerable progress has been made in collecting and screening of Ontario Phytophthora isolates. *Phytophthora sojae* populations are in the process of shifting towards more complex pathotypes (isolates that can kill plants with 4 or more *Rps* genes)**.** Partial resistance or tolerance will become more important in the long-term management of this pathogen. The development of new races that can by-pass Rps 1k resistance has been occurring in Ontario and recent work at Harrow has found that for example in Essex county, 44% of the Phytophthora races present in producer fields could cause disease in soybean varieties with Rps 1k. During this study we have found that a similar situation exists in Eastern Ontario where 47% of the isolates are able to damage Rps 1k.
Concern has arisen recently that the increased damage from Phytophthora in Ontario and the North Central region of the US could be the result of the development of tolerance to chemical seed treatments (Metalaxyl or Metalaxyl-M, also known as mefexonam). Isolates obtained in Ontario were found to have no tolerance and are still

susceptible to these seed treatments. Therefore, these seed treatments remain effective management tools for Ontario producers. Similar results were found in Ohio and Illinois.

Next Steps:

This project is now completed and the information obtained is being extended to producers and agribusiness across Ontario.

Acknowledgements:

Ontario Soybean Growers, Agriculture and Agri-Food Canada (Terry Anderson), OMAF (Albert Tenuta), Agricultural Adaptation Council, CORD Program, the U.S. North-Central Soybean Research Program, Ohio State University (Anne Dorrance) and 11 other U.S. state extension personnel.

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Distribution of Soybean Viruses in Ontario

Purpose:

Soybean viruses, especially Bean Pod Mottle Virus (BPMV) and Soybean Mosaic Virus (SMV) have caused significant losses to producers and the soybean industry in North America by reducing seed weight and quality. Food grade soybeans are most affected, due to seed coat blemishing or discolourization.

In Ontario, soybean viruses often go undetected or are misdiagnosed for other causes. The cost and time associated with submitting samples for laboratory analysis also limits producer and industry participation. A soybean virus distribution survey was initiated by AAFC and OMAF to increase awareness amongst producers and the soybean industry of the extent of virus infection in Ontario.

Methods:

All soybean producing regions of Ontario were sampled for Soybean Mosaic Virus (SMV), Bean Pod Mottle Virus (BPMV), Tobacco Ringspot Virus (TRSV) and Alfalfa Mosaic Virus (AMV) in 2002 and 2003. A composite sample of young leaf tissue was obtained from 35 plants in each field. Over four hundred field sites were processed and virus testing was conducted through ELISA.

Results:

1. **Previous Surveys:** An initial survey in 2001 detected BPMV for the first time in Ontario and Canada. A follow-up survey found that soybean virus levels increased in 2002 (Table 1).

2. **2003 Survey:** Of the over 300 commercial fields tested, 17 were found infected with AMV, 16 with BPMV, 15 with SMV and 19 with TRSV. The number of commercial fields infected were higher than the previous year with the exception of BPMV. However 16 commercial fields that tested negative for BPMV were resampled a month later due to the high incidence of insects, especially bean leaf beetles, and 11 of these fields were found positive (69% increase) for BPMV. This suggests that the time of sampling is very important and could impact future management strategies.

Table 1- Virus Survey Results for 2002 and 2003

Virus	Number of Positive Fields	
	2002	**2003**
TRSV	16	19
SMV	13	15
BPMV	20	16
AMV	15	17

Summary:

Ontario Soybean fields were monitored for the presence and spread of the following soybean viruses: Alpha Mosaic Virus (AMV), Bean Pod Mottle Virus (BPMV), Soybean Mosaic Virus (SMV), and Tobacco Ringspot Virus (TRSV). All these viruses were found to be present in Ontario. From the surveys conducted to date the relative frequencies of these viruses are increasing in commercial fields. Possible explanations for this increase include seed-borne infection and the increase in insect vectors such as the soybean aphid and bean leaf beetle. These viruses are dependent on insects vectoring for movement and infection of the plant.

In addition to determining the distribution and frequency of these viruses, the survey increased awareness amongst producers, ag-business and soybean breeders concerning the significance of these viruses.

Next Steps:

Future virus surveys will need to be conducted to assess the spread and extent of soybean viruses in Ontario. Continued education on soybean viruses and the spread of these viruses will be important to minimize their impact to the Ontario soybean industry.

Acknowledgements:

Ontario Soybean Growers, Agriculture and Agri-Food Canada (Roberto Michelutti), OMAF (Albert Tenuta, Tracey Baute), Agriculture Adaptation Council, and the Canada-Ontario Research Development Program.

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Location of Project Final Report:

Contact Albert Tenuta, OMAF Field Crops Pathologist at albert.tenuta@omaf.gov.on.ca.

Eastern Ontario Soybean Disease Survey

Purpose:

During the past 15 years, soybean production has expanded dramatically in eastern Ontario and Quebec. Few soybean disease surveys have been reported from these new production areas. A comprehensive disease survey would provide information to producers and ag-business regarding the production problems in the area and could provide basic information for research planning and variety development. The purpose of this survey was to obtain basic information on the incidence and severity of soybean diseases in eastern Ontario and Quebec over a 3 year period to advise agronomists, breeders and growers on diseases that may impact soybean production.

Methods:

Early Season Disease Survey: Soil was collected at 10 random locations at each field in July-August (Ontario) or September-October (Quebec) at a depth of 0-10 cm. Soil samples were stored under cool conditions until processed. Large debris and stones were removed and sufficient soil was crumbled by hand to a uniform texture and soybean seeds were planted into the soil. Soil was maintained in a moist condition for two weeks in the greenhouse prior to planting.

Midseason Stem and Leaf Diseases: Soybean fields were surveyed for mid-season diseases in late July and August depending on year and location. Three soybean plants were collected from each of 10 locations in each field. Plants were cut approximately 15-20 cm from the soil line and placed in plastic bags. Samples were maintained under cool conditions until examined in the laboratory. Ontario samples were evaluated visually for foliar disease and insects. Stem sections from 10 randomly selected plants were removed from the lower half of each stem.

Diseases of Seed: One hundred seed from harvested sample fields were surface sterilized in 1.25% sodium hypochlorite for 3-4 min, plated on selective media at the rate of 5 seed/petri dish. After 7-10 d incubation, fungi were identified. A seed was considered germinated if the radicle length exceeded the length of the seed.

Results:

P. sojae was isolated from eastern Ontario soil samples in 2001 and 2002. In 2001, 13 isolates were obtained whereas 59 isolates were isolated in 2002 from the soil samples. For a list of these isolates and the resistance genes that they can infect refer to Table 1 in the section "Limiting Losses to Phytophthora in Ontario and the U.S. North Central Region". *Phytophthora sojae* was found in 43 and 47% of Quebec soil samples in 2001 and 2002, respectively and 15 and 42% of Ontario samples in 2001 and 2002, respectively. The percentage of plants that died after emergence (% dead plants) in samples from which *P. sojae* was isolated was slightly higher in Ontario samples than Quebec samples although *P. sojae* was not isolated from all plants. This suggests that Ontario soils may have higher populations of other unidentified pathogens for example *Fusarium* spp. And *Pythium* spp. Mid Season foliar and stem disease incidence can be found in Table 1 and 2. Pathogens isolated from seed can be found in Table 3.

Table 1. Incidence of foliar disease on soybeans in eastern Ontario, 2001-2002.

Year	Disease / Insect	Plants infected %	Range %	Fields infested %	Leaf area %	Range %
2001	Bacterial blight[a]	12	0-100	46	3	0-70
	Brown spot[b]	47	0-100	85	12	0-63
	Downy mildew[c]	17	0-100	35	3	0-33
2002	Bacterial blight[a]	67	0-100	79	5	0-15
	Brown spot[b]	33	0-100	42	1	0-10
	Downy mildew[c]	3	0-100	3	0.1	0-2
	White mold[f]	0.1	0-0.2	9	-	-

Table 2. Incidence of fungi isolated from soybean stems from eastern Ontario, 2001.

Fungi	Distribution (% of fields)		Frequency (% of plants)
	2001	2002	
Alternaria spp.	100	100	93 (52-100)
Phomopsis / Diaporthe spp.	96	100	28 (0-72)
Fusarium oxysporum	46	42	2 (0-14)
Fusarium Ared@	46	76	5 (0-63)
Fusarium spp.	92	89	40 (0-68)
Gloeosporium sp.	88	94	20 (0-73)
Colletotrichum sp.	23	48	0.3 (0-2)
Trichoderma sp.	58	36	1 (0-8)
Other fungi	42	27	1 (0-14)

Summary:

Soybean Cyst Nematode was not found in these Eastern Ontario or Quebec samples. In 2001, *Alternaria* spp. were isolated from 93% of all stems and these fungi were present in 100% of fields sampled. *Phomopsis* / *Diaporthe* spp. were found in 28% of stems and 96% of all fields sampled. *Fusarium* spp. and *Gloeosporium* sp. were common on soybean stems. In 2002, *Alternaria* spp. was isolated from 53% of stems and 100% of fields. As in 2001, *Phomopsis* / *Diaporthe* spp., *Fusarium* spp. and *Gloeosporium* sp. were most commonly isolated.

Table 3. Incidence of fungi and bacteria on soybean seed samples harvest from eastern Ontario, 2001-2002.

Fungus/ bacteria	2001			2002		
	Seed infection (%)	Range (%)	Fields infested (%)	Seed infection (%)	Range (%)	Fields infested (%)
Phomopsis / Diaporthe sp.	1.59	0-7	50	0.48	0-3	33.33
Alternaria spp.	23.81	0-82	95.46	5.15	0-28	88.89
Fusarium sp.	11.38	0-50	77.27	0.59	0-3	40.74
Cladosporium sp.	13.62	0-56	72.73	5.44	0-22	85.19
Other fungi	6.43	0-41	95.46	1.30	0-7	40.74
Bacteria	1.43	0-26	36.36	0.81	0-7	44.44

The incidence of fungi isolated from all seed samples in eastern Ontario and Quebec in 2001 and 2002 were similar (Table 3). *Alternaria* spp. were the most prevalent in seed samples from both locations and each year. *Phomopsis* / *Diaporthe* spp. were prevalent in sample fields but the incidence of these pathogens was relatively low.

Early season soil borne diseases, midseason foliar and stem diseases are increasing in Eastern Ontario. As is often the case, new areas of production often go through a Cinderella period of little disease infection. The longer soybeans are in production and as acres increase diseases will become more frequent.

Next Steps:

This survey is now completed. The information will be conveyed to producers in the region and the seed and seed protection industries.

Acknowledgements:

Ontario Soybean Growers, Agriculture and Agri-Food Canada (Terry Anderson), and OMAF (Albert Tenuta, Gilles Quesnel and Scott Banks)

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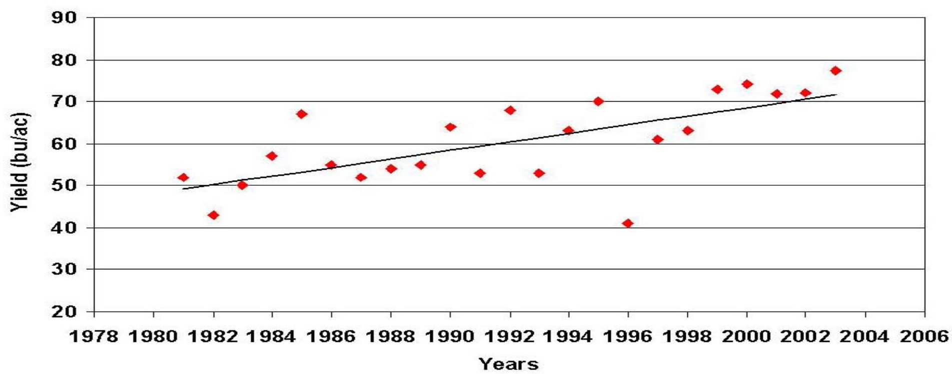
Nitrogen Management In Ontario Wheat Production
(Interim Report)

Purpose:

Many questions have been raised regarding nitrogen rates and timing options on the wheat crop. Most of the available Ontario nitrogen research was conducted 20 years ago when average yields were only 50 bu/ac, vs the 70 bu trend line yield of today (Figure 7). Other wheat producing regions of the world (U.K., Eu, Australia) are moving towards later nitrogen applications and split applications to increase yield and protein. A re-evaluation of current Ontario recommendations is necessary.

Figure 7 - Provincial Winter Wheat Yields 1981 - 2003



27%

Methods:

Thirteen co-operators agreed to participate in this project. Locations included Kent, Lambton, Perth, Middlesex, Elgin, Halton, Niagara counties. Most trials were two replicate trials. The Girodat and Fonger locations were intensive locations, investigating rates, timings, and split applications in two replicate tests.

Protein analysis was conducted on grain samples from each plot. Nitrogen is a key component of protein, and protein is a key quality parameter in wheat. Interestingly, high protein is desirable in hard (bread) wheat's, while low protein is desirable in pastry wheat's. Thus, impacts of nitrogen applications on protein are a major consequence, at opposite ends of the spectrum, depending on market class.

SPAD meter readings were taken at many locations. SPAD readings are a measure of the "greenness" of the crop, which is well co-related to nitrogen. It is hoped that these measurements may be able to help determine additional nitrogen requirements at some point in the future.

Results:

Table 1 - Standard Rates

Co-operators	N Rates (lbs/ac)		
	60	90	120
	Yields (bu/ac)		
Elgie	99.8	95.9	94.8
Davies	86.0	86.7	84.5
VanGorkum	90.0	94.3	94.3
Girodat	57.9	61.5	62.1
Jeramel Farms	92.5	100.7	102.5
Fonger	88.1	95.3	99.5
VanGorp	90.9	85.0	97.0
Annett	81.0	93.7	94.1
Average	**85.8**	**89.1**	**91.1**

Table 2 and 3 show significant yield loss when rates were reduced below 60 lbs/ac.

Table 2 - Nitrogen

Co-operators	N Rates (lbs/ac)			
	0	60	90	120
	Yields (bu/ac)			
Jeramel Farms	70.3	92.5	100.7	102.5
Fonger	64.8	88.1	95.3	99.5
Average	**67.6**	**90.3**	**98.0**	**101.0**

Table 3 - 30 lbs Rate Comparison

Co-operators	N Rates (lbs/ac)			
	30	60	90	120
	Yields (bu/ac)			
Girodat	43.3	57.9	61.5	62.1
Deschamps	70.8	--	--	88.8
Fonger	79.3	88.1	95.3	99.5
Average	**64.5**			**83.5**

Table 4 shows no benefit to increased nitrogen rates at one location with hard wheat.

Table 4 - Top of the Scale

N Rates (lbs/ac)		
120	140	160
Yields (bu/ac)		
87.0	**89.7**	**88.5**

Summary:

Table 1 summarizes the yield data from 8 locations using common rates. The standard provincial recommendation is 90 lbs N/ac. In 2 of 8 locations, wheat yields showed no response above 60 lb/ac, and in 4 more of the 8 locations there was no response above 90 lb/ac. Only at the Fonger site was there a consistent yield trend indicating economic response to the 120 lb/ac rate.

Based on this limited data set, the provincial recommendation of 90 lbs/ac on soft wheat appears adequate. There is potential for some growers to use even less nitrogen than this recommendation and still optimize yields.

Next Steps:

Further field trials will be required to validate this study over a number of years.

Acknowledgements:

The Ontario Wheat Producers' Marketing Board.

Project Contacts:

Please contact Peter Johnson at peter.johnson@omaf.gov.on.ca for more information on this study or if you wish to be involved in similar trials in the future.

Location of Project Final Report:

This project is not yet completed, data collected to present resides with Peter Johnson, OMAF, Stratford, peter.johnson@omaf.gov.on.ca

Phosphorus Response in Wheat Production

(Interim Report)

Purpose:

Wheat is known as a crop that has an extremely high demand for phosphorus in the early growth stages. A healthy wheat crop takes up 15 lbs/ac of phosphorus (P_20_5 equivalent) in the first 30 days of growth, compared with soybeans that require only 1 lb/ac of phosphorus in the first 40 days of growth.

Phosphorus is less available in cool soils than in warm soils, with soil available phosphorus 5 times greater in 25° C soil than in 5° C. Cool soils result in less root growth, which further limits phosphorus uptake. Wheat is planted when this combination of factors is most likely to occur - under cool soil conditions in the fall, when soil temperatures are cool and getting colder. Thus the potential for response to phosphorus should be very high with the wheat crop.

It's estimated that up to 95% of the wheat crop is now planted using no-tillage. The "corn row" syndrome is a development that has been concurrent with the uptake of no-till. Wheat plants respond dramatically to the band of starter phosphorus applied with the corn crop, even two years after the corn was planted and the fertilizer applied. The corn row syndrome appears as strips of healthy wheat every 30 inches, corresponding with the old corn row, and much poorer wheat in between. This response is a further indication that wheat should respond to applied phosphorus.

The objective of this study was to determine the response of wheat to different rates and sources of phosphorus.

Methods:

Eight sites were planted in the fall of 2002, to evaluate phosphorus response. Five rates and sources of phosphorus were applied, in two replication field scale trials. The treatments included: Zero, 5 gal/ac Alpine 6-24-6 liquid, 50 lbs/ac 11-52-0 dry seed placed, 100 lbs/ac 11-52-0 dry seed placed, 200 lbs/ac 11-52-0 broadcast. Soils were tested for phosphorus levels to investigate the impact of phosphorus soil test with crop response.

Results:

Table 1 shows the yield results of these trials. In 7 out of 8 trials a significant response to starter phosphorus was found. A greater response was observed with 200 pounds of dry 11-52-0 broadcast than with 50 lbs of seed placed 11-52-0 in all seven locations that had this comparison. In 4 of the 8 trials (50%), response continued beyond the 50 lb seed placed rate, with higher yields from the 100 lb/ac seed placed rate.

Table 1 - Phosphorus Trials - Zero vs 50 MAP vs 100 MAP

Co-operators	P Rates (lbs/ac)		
	0	**50**	**100**
	Yield (bu/ac)		
Ryan	77.3	88.1	86.7
Jeramel Farms	97.5	103.9	112.9
Johnston	89.6	87.1	86.1
Bloomfield	81.5	106.7	100.3
Willemse	94.3	107.5	110.3
Devries	91.8	92.3	95.1
Sutherland	62.3	68.8	73.5
McCallum	69.0	81.4	75.1
Average	**82.9**	**92.0**	**92.5**

Summary:

The yields reported in Table #1 above appear to show a classic response curve. The broadcast rate appears less effective, despite the higher level of applied phosphorus, due to the less efficient application method. This data supports the use of seed placed starter fertilizer with wheat seed as a profitable way to increase wheat yields.

Next Steps:

Further field trials will be conducted to validate this initial study.

Acknowledgements:

The Ontario Wheat Producers' Marketing Board

Project Contacts:

Peter Johnson, OMAF, Stratford, peter.johnson@omaf.gov.on.ca . To be involved in similar trials in the future please contact Peter.

Management of Dwarf Bunt and Other Yield Limiting Wheat Diseases in Ontario

(Interim Report)

Purpose:

To select and compare the effectiveness of fungicidal seed treatments for the control of dwarf bunt and to evaluate Ontario winter wheat cultivar lines for potential resistance to dwarf bunt.

Methods:

1. Research plots were established and inoculated in two locations (Bornholm and Palmerston) in the fall of 2002. Although dwarf bunt also developed at a third research location (Perth County demonstration farm) disease levels were too low to properly compare treatments. Six treatments were included: three rates of Dividend (low, medium, high), Vitaflo280, a biological agent (ACM941), and an untreated control. The results from 2002-2003 trials are summarized in Table 1.

2. 168 winter wheat lines were provided by 9 research programs in 2002/2003 and evaluated at two inoculated sites (Bornholm, Palmerston) against dwarf bunt.

Results:

Table 1. Effect of seed treatments on emergence, dwarf bunt infection, and yield of winter wheat at Bornholm and Palmerston in 2003*

Treatment	Emergence (%)			Dwarf bunt infection (%)			Yield (kg/ha)		
(mL/kg seed)	Bornholm	Palmerston	Mean	Bornholm	Palmerston	Mean	Bornholm	Palmerston	Mean
Untreated	47.8 b	73.0 d	60.4 d	11.8 a	11.8 a	11.8 a	4242 a	4678 a	4460 b
Dividend (3.25)	56.6 a	81.6 c	69.1 b	0.1 c	0.1 c	0.1 d	4499 a	4807 a	4653 a
Dividend (6.50)	57.3 a	87.4 a	72.4 a	0.0 c	0.1 c	0.1 d	4443 a	4686 a	4565 ab
Dividend (9.75)	56.8 a	85.8 ab	71.3 ab	0.2 c	0.1 c	0.2 d	4489 a	4767 a	4628 a
Vitaflo 280 (2.60)	56.8 a	83.1 bc	69.9 ab	3.7 b	6.9 b	5.3 c	4493 a	4780 a	4636 a
ACM941 (10^6cfu/mL)	47.7 b	83.9 abc	65.8 c	9.1 a	9.4 ab	9.2 b	4280 a	4663 a	4472 b

*Data are means of eight cultivars and four replicates per cultivar at each site. Means in a column followed by the same letter are not significantly different at *P* = 0.05 (LSD).

Summary:

All seed treatments increased emergence by 8.9 to19.8%, which was significantly better than the untreated control plots. The three rates of Dividend (14.4-18.8%) and Vitaflo 280 (15.7%) were all more effective than the biological agent, ACM941 (8.9%) in improving emergence. All seed treatments significantly reduced the incidence of dwarf bunt. Dividend was significantly better at controlling dwarf bunt (98.3 to 100%) then the other treatments but there were still trace amounts in some of the plots. No statistical differences were observed among the three application rates used for Dividend. Vitaflo 280 reduced the disease incidence by more than 55%, while the biological agent (ACM941) was partially effective and only reduced the disease by 22% when they were compared to the untreated controls. Dividend and Vitaflo 280 seed treatments increased yield by 2.4 to 4.3% (average of two sites) compared to the untreated control (Table 1). The biological agent (ACM941) increased yield by only 0.5% when compared to the untreated control. These trials are being repeated in 2004 in three locations (Palmerston, Parkhill and Perth Soil & Crop Demonstration Farm).

Sixty-one lines showed a 0% incidence of dwarf bunt at both sites and were tentatively assigned a resistant rating. These results suggest that resistance to dwarf bunt is available in Ontario and can be incorporated into new cultivars.

Next Steps:

This project will be repeated in 2004.

Acknowledgements:

Ontario Wheat Producers' Marketing Board, Agriculture and Agri-Food Canada, OMAF, Agricultural Adaptation Council, CORD Program and industry partners (C & M Seeds, Hyland Seeds, Pioneer Seeds, Bayer CropSciences, Gustafson Partnership and Syngenta Crop Protection).

Project Contacts:

For more information on the results reported above or if you wish to be involved please contact Albert Tenuta at albert.tenuta@omaf.gov.on.ca.

Location of Project Final Report:

Project still in progress, please contact Albert Tenuta, OMAF, Ridgetown, albert.tenuta@omaf.gov.on.ca.

Cover Crops for Carbon Sequestration and Nitrogen Management in Field Crops – GHG Approaches.

(Interim Report)

Purpose:

This 3 year project was initiated in the late summer of 2003 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 with the cover crops and the subsequent timing of N release for utilization by succeeding crops such that inorganic N requirements can be reduced. The work will reflect the ability of cover crops to improve N use efficiency in corn production with the concurrent benefit of reducing N2O emissions from agricultural practices.

Methods:

The ability of various cover crop species to establish and sequester soil nitrogen remaining following cereal harvest was evaluated on six sites located in Perth and Oxford counties in 2003. On five of the sites, manure was applied during the last week of August and the various fall seeded cover crop species were established during the first week of September into manured and non-manured plots at each site. The cover crop species evaluated at each site were combinations of Oats, Annual Ryegrass, Oilseed Radish, Peas and Red Clover. The red clover was present only at one of the sites and was established by underseeding into the cereal crop in early spring.

Soil N levels were evaluated prior to and 10 days following manure application and prior to freeze up in each of the cover crop treatments. Following November 1st, tissue samples were taken from each cover crop and analyzed for plant N levels. Plant biomass of each cover crop was evaluated in late fall to determine the growth potentials of the various cover crops.

In the spring of 2004, soil N levels were taken as close to spring thaw as practical and again in mid June. Corn was planted at most of the sites and 2-4 rates of inorganic N were applied to evaluate the ability of the cover crop to meet the subsequent corn crops needs for N.

Results:

Application of manure increased growth of each of the fall seeded cover crops. Where manure was applied, above-ground cover crop yield was increased by 25 to 40 percent. Where manure was applied, end of season Oat and Oilseed radish yield averaged about 2500 kg/ha whereas the pea and ryegrass yields averaged about 1700 kg/ha. Red clover growth was unaffected by manure application, with above ground yields by November which were over 3000 kg/ha.

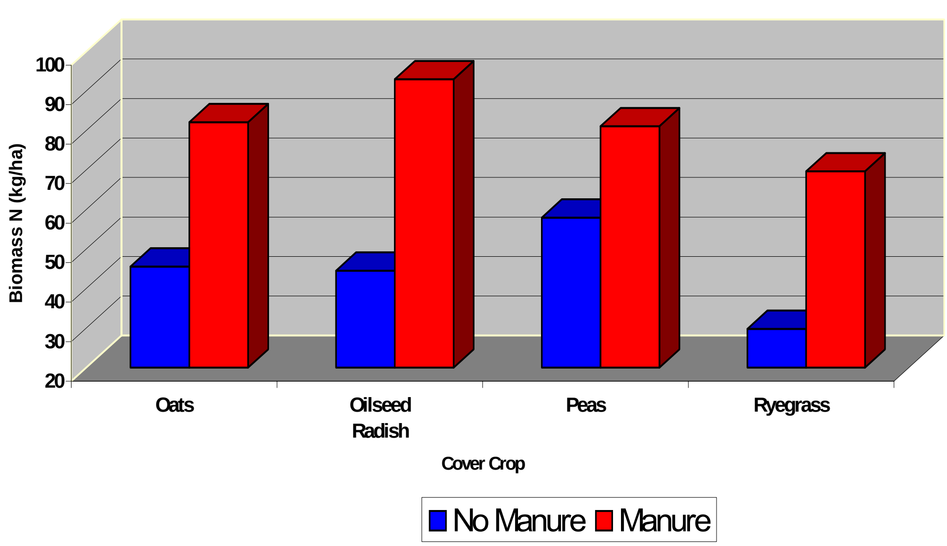
Each of the cover crops also had greater nitrogen content in above-ground biomass where manure was applied (Fig. 1). The non-legume species (Oats, Ryegrass, and

Oilseed Radish) accumulated about 40 to 50 kg/ha more nitrogen in above-ground biomass where manure was applied.

The legume species (Peas and Red Clover) also accumulated more nitrogen in above-ground biomass where manure was applied; but the actual increase was only about half of the non-legume species (Red clover data not presented). The smaller increase in N content because of manure application associated with the legume species should not be interpreted as suggesting that they are less capable of sequestering soil (or manure) N. The smaller increase in N content of legume species is probably due to their ability to fix atmospheric N when soil (or manure) N is not available.

Soil mineral N (nitrate and ammonium) content in early November was usually not significantly affected by either manure or cover crop treatments. Generally in the No Cover area, (control strips, where manure was not applied and cover crops not established) soil mineral N concentrations were not more than 2 ppm lower compared to where manure was applied; this occurred in spite of application of significant rates of manure (e.g. 45,000 l/ha of liquid hog or 45 t/ha of solid cattle). The presence of cover crops marginally decreased November concentrations by up to 2 ppm (on average). In some situations the No Cover treatment was allowed to grow up in volunteer cereals and/or weeds. In these cases the overall impact of the seeded cover crop may have appeared greater if compared to strips that had been kept free of plant growth. The lack of measurable effect of cover crops on November mineral N content should not be interpreted as the cover crops failing to sequester N. October and early November had numerous, and significant, rainfall events which probably contributed to environmental loss of soil and (or) manure N through either leaching and (or) conversion to gaseous N forms (including Greenhouse Gases).

Figure 1. Total Nitrogen Sequestration in Above Ground Cover Crop Biomass



Summary:

Where manure had been applied, each of the cover crop species had ~ 80 to 95 kg/ha of nitrogen in the above ground biomass. he average increase in above-ground N content was ~ 20 to 25 kg/ha for the legume species and 40 to 50 kg/ha for the non-legume species. Assuming that N yield in cover crop roots was also increased by manure application, it is reasonable to assume that 40 to 60 kg-N/ha of manure N was sequestered by the various cover crop species evaluated. Therefore, the cover crop species evaluated demonstrated an ability to potentially reduce Greenhouse Gases since they clearly tied up 40 to 60 kg/ha of soil and (or) manure N which was potentially subject to some form of environmental loss.

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 further detail in the remaining years of this project.

Acknowledgements:

OMAF Field Crop Technology would like to acknowledge the farm cooperators who made land and other resources available for conducting these projects. The partnership with the Cropping Systems Laboratory of the Plant Ag. Department of the University of Guelph has been instrumental in the success of the project to date. Funding for the project has been provided by the Greenhouse Gas Mitigation Project for Canadian Agriculture supported by AAFC in conjunction with OSCIA, IFAO and others.

Project Contacts:

Greg Stewart, OMAF, Guelph, greg.stewart@omaf.gov.on.ca
Ian McDonald, OMAF, Guelph, ian.mcdonald@omaf.gov.on.ca

Location of Project Final Report:

Advancing Nitrogen Use Efficiency on Livestock Farms – GHG Reduction Approaches

(Interim Report)

Purpose:

This project was initiated to demonstrate best management practices associated with maximizing nitrogen use efficiency on farms having a history of manure use and thus potentially reduce the levels of GHG emissions by matching corn N requirements to the N supplying capability of the manure containing production system. Tools to be evaluated and demonstrated include the soil nitrate N test for determining corn nitrogen requirements and the end of season corn stalk N test as an indicator of nitrogen sufficiency for the recent corn crop.

Methods:

Ten sites were established across the livestock intensive regions of Ontario including Bruce/Grey/Huron, Central and Eastern Ontario. Farms were selected from a number of livestock types including dairy, beef, swine and poultry. The fields chosen required a history of receiving manure. Where no manure test was available, no manure application to the site in the previous year was required. Some sites had a recent manure analysis and fields with applications the previous year were excepted. Fields were chosen where clearly identifiable zones within the field could be distinguished including knolls, depressions, slopes etc.

Growers were encouraged to recommend fields where manure application had occurred uniformly and where the area had the same field history of cropping and inputs.

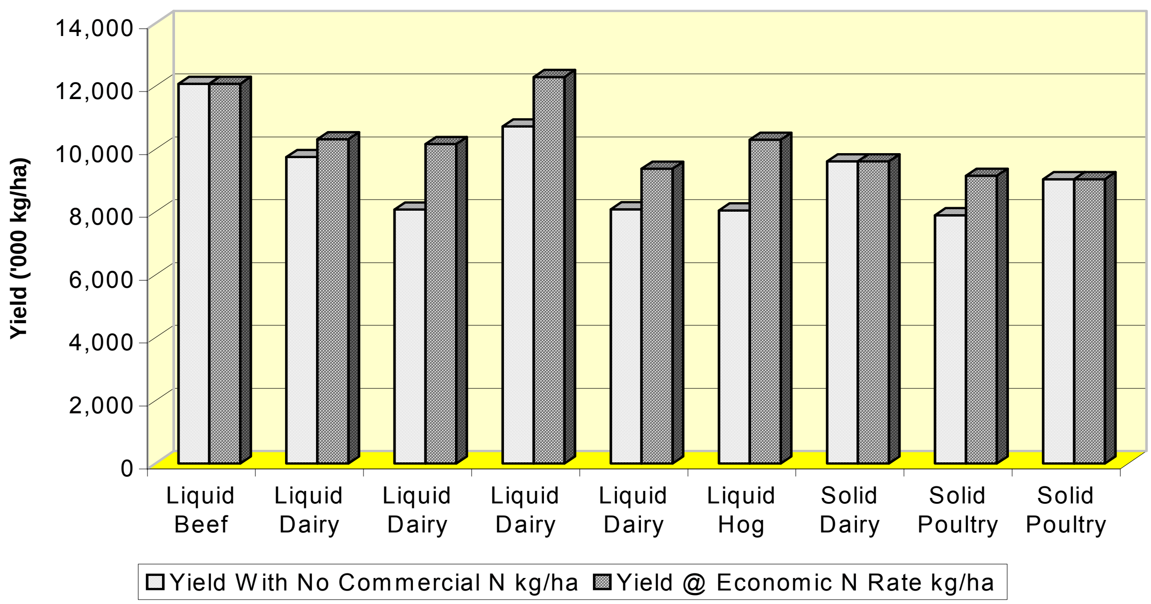
Four rates of fertilizer N (0, 50, 100, and 150 lbs./ac) were established by sidedressing the appropriate rate of U.A.N (28%) sometime during the latter part of June. The yields from the various fertilizer N strips were used to estimate the most economic N rate (MERN). Within plots for the 0 and 100 lb./ac N rates, 3 benchmarks were established from which soil sampling would occur at preplant, and side dress timings. Benchmarks were located in obvious distinct zones that crossed the plot area. At maturity soil N samples were collected from benchmark positions in all plots. Additionally, samples of corn stalks were taken according the to the protocol for the “lower stalk N test” to estimate the sufficiency of the earlier season N applications to meeting crop needs.

In the following spring the benchmarks were also sampled at thaw for estimating GHG losses.

Results:

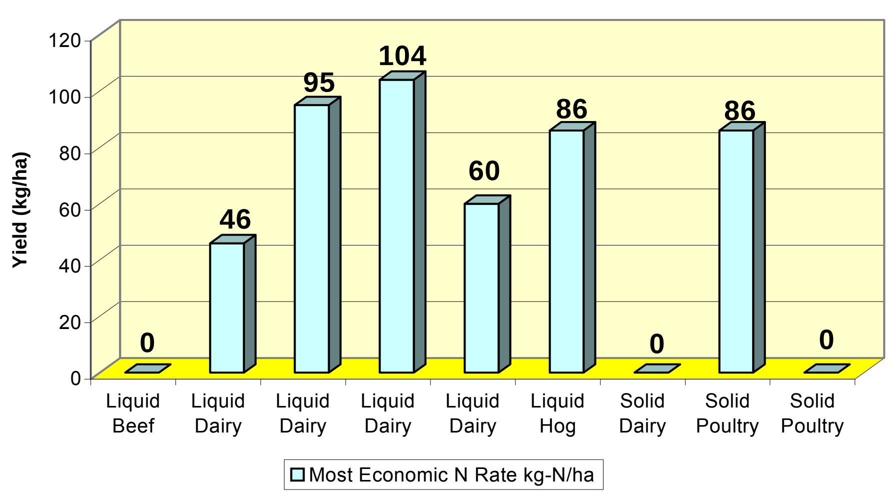
Corn yields at each of the nine sites were relatively high, with yields at the most economic N rate ranging between 9000 to 12000 kg/ha (140 to 190 bu/ac) (Table 1). In fact, yields rarely were less than 8000 kg/ha (127 bu/ac) even where sidedress fertilizer N was not applied; ranging from a low of 7900 kg/ha (125 bu/ac) to 12000 kg/ha (191 bu/ac).

Table 1. MERN for Corn Yield on Livestock Farms



The estimated most economic N rate (MERN) did not exceed 105 kg-N/ha (95lb-N/ac) on any of the nine demonstration sites (Table 2). Three of the nine sites actually did not

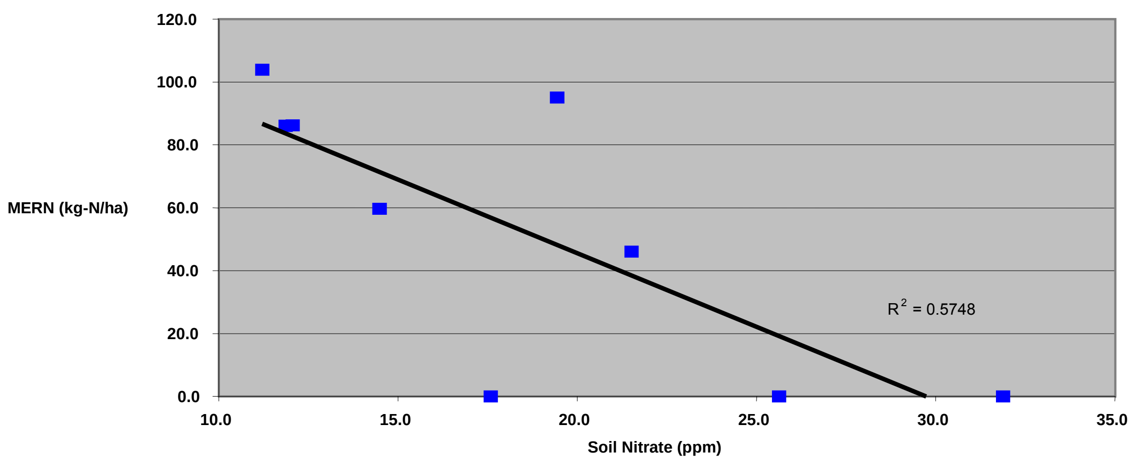
Table 2. Most Economic N Rate kg-N/ha



require any sidedress fertilizer N to achieve most economic yields.

Spring soil nitrate concentrations in the surface 30 cm (1 foot) in late May (May 20 to May 31) ranged from 11 to 32 ppm (Fig. 6). There was a relatively clear relationship between spring soil nitrate-N concentrations observed in late May and most economic N rates. At about 11 to 15 ppm about 70 to 100 kg/ha (65 to 90 lb-N/ac) of fertilizer N was required. As soil nitrate-N concentrations increased, fertilizer N required to achieve most economic yields decreased to 0 once soil nitrate-N concentrations exceeded about 25 ppm (Figure 1).

Figure 1. Relationship Between Site MERN and Spring Soil Nitrate Values



Summary:

In the first year of this 3-year study, the results suggest that relatively high corn yields can be produced with relatively low (or no) fertilizer N when grown on fields where manure had been recently applied. There was a clear relationship between late May soil nitrate-N concentration and the fertilizer N rate required to produce the most economic yield; supporting the idea that a N test can be utilized to predict the need (and perhaps amount) of fertilizer N for corn grown on fields where manure had been recently applied. A properly calibrated soil nitrate-N test will not only improve economic returns of corn grown where manure was recently applied; but also will reduce the quantity of soil mineral N remaining at the end of the growing season. This will minimize the likelihood of soil N loss to the environment, including minimizing the production of Greenhouse Gasses.

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 further detail in the remaining years of this project.

Acknowledgements:

OMAF Field Crop Technology would like to acknowledge the farm cooperators who made land and other resources available for conducting these projects. The partnership with the Cropping Systems Laboratory of the Plant Ag. Department of the University of Guelph has been instrumental in the success of the project to date. Funding for the project has been provided by the Greenhouse Gas Mitigation Project for Canadian Agriculture supported by AAFC in conjunction with OSCIA, IFAO and others.

Project Contacts:

Greg Stewart, OMAF, Guelph, greg.stewart@omaf.gov.on.ca
Brian Hall, OMAF, Stratford, brian.hall@omaf.gov.on.ca

Optimizing Environmental Efficiencies with Precision Toolbars – GHG Mitigation Approaches

(Interim Report)

Purpose:

This project was initiated to evaluate through on-farm demonstrations that spring strip tillage, combined with precision nitrogen applications provides significant opportunities to reduce fuel consumption and soil disturbance, increase fertilizer nitrogen use efficiency, and harmonize equipment needs in an effort to reduce greenhouse gas emissions from agriculture and the input costs of crop production. The project is to demonstrate the potential for various tools including: corn plant reflectance, the PSNT (Pre-Sidedress Nitrogen Test) and timing of sidedress N application and dividing fields into nitrogen management zones in order to more precisely target N application rates.

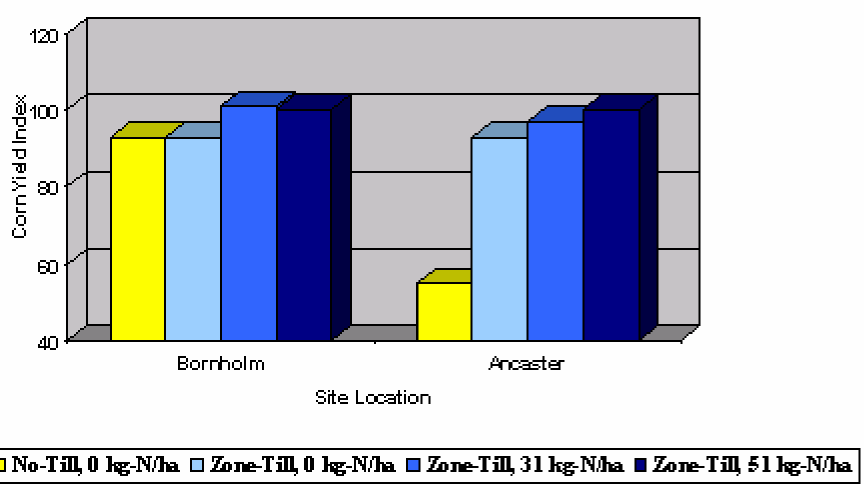
Methods:

Spring strip tillage was compared to conventional and no-tillage systems for optimizing planting and reducing

Recent research and producer experience has shown that spring zone tillage (6-12 hours prior to corn planting) can be a very cost-effective tillage system for corn production. This system works best on reasonably well drained ground when soybeans are the previous crop. It often provides a seedbed that is more favorable than strict no-till under a range of soil moisture conditions. Using this same (strip tillage) toolbar to precision-apply nitrogen in both the pre-plant and sidedress window provides an opportunity to reduce tillage and improve nitrogen use efficiency.

Results:

Figure 3. Impact of Preplant Strip Till and N Application on Corn Yields



Summary:

This project will continue to demonstrate that on medium textured soils, following soybeans or cereal crops were the straw is removed, very little tillage is required to optimize corn yields. A spring pre-plant strip tillage may improve planting timeliness and disturbs significantly less of the field than in a full width tillage system, which may contribute to building organic matter and reducing Greenhouse Gas emission. Further examinations of a strip tillage/N banding system will be carried out in 2004 with the aim of improving overall N use efficiency and reducing N losses into the environment.

Next Steps:

The demonstrations conducted in 2003 will be repeated in 2004 and 2005.

Acknowledgements:

OMAF Field Crop Technology would like to acknowledge the farm cooperators who made land and other resources available for conducting these projects. The partnership with the Cropping Systems Laboratory of the Plant Ag. Department of the University of Guelph has been instrumental in the success of the project to date. Funding for the project has been provided by the Greenhouse Gas Mitigation Project for Canadian Agriculture supported by AAFC in conjunction with OSCIA, IFAO and others.

Project Contacts:

Greg Stewart, OMAF, Guelph, greg.stewart@omaf.gov.on.ca
Ian McDonald, OMAF, Guelph, ian.mcdonald@omaf.gov.on.ca

Location of Project Final Report:

Managing Nitrogen with Strip Tillage Corn Systems in Heavy Clay Soils – GHG Mitigation Approaches.

(Interim Report)

Purpose:

This demonstration project was established to determine if a fall strip tillage system would benefit corn growers on heavy clay soils by offering a wider window for planting corn in the spring and providing greater opportunities for nitrogen management within the strip tillage system. Crop rotations in heavy clay soils have suffered with poor spring planting conditions leading to continuous soybean production or narrow soybean with occasional winter wheat rotations resulting in reduced organic matter and crop yields leading to a potential increase in GHG emissions from these practices.

Methods:

The first year's sites were established in Nov./Dec. of 2003. Treatments of strip till, no-till and conventional till were located at a number of sites. Conventional tillage treatments were fall moldboard plowing or spring cultivation.

At two sites the fields were monitored in the spring to determine the earliest date for which each system could be planted based on soil conditions. Nitrogen was applied at planting or side dress depending on the site. Fields were monitored to evaluate growth differences between the tillage treatments.

In another set of plots, all planting for strip till and conventional tillage occurred at the same time. Various rates and/or timings of N application were made at appropriate times. Rates of N were repeated at both planting and side dress timings. In one site Urea was applied preplant and incorporated through cultivation. At the other site UAN was applied one day after planting with a side dress applicator and then again at side dress time.

Assessments will include planting date, general vigor, plant stand, grain yield.

Results:

There were different planting dates for the tillage systems. In both cases the strip tillage system was in planting condition before the other two systems. This ranged from 5 days to 3 weeks depending on if rain occurred between when strip till plots could have been planted and when the next system was ready. The difference in planting date between the conventional and no till systems was less this year then expected since the soil had rapid dry out during that period of the spring. Conventional treatments on the clay soil dried out rapidly once it could be worked and worked up into a fine powder, which was susceptible to crusting.

Summary:

The strip till system proved to be the treatment that was earliest to be in condition to plant in most cases. This did not always apply depending on the site.

Next Steps:

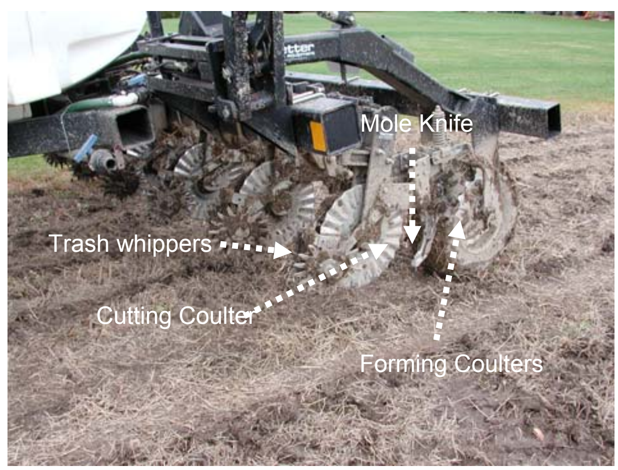
The economics, feasibility and systems approach to cover crop management including the impact on subsequent soil nitrogen status and corn crop growth will be studied in further detail in the remaining years of this project.

Acknowledgements:

OMAF Field Crop Technology would like to acknowledge the farm cooperators who made land and other resources available for conducting these projects. The partnership with the Cropping Systems Laboratory of the Plant Ag. Department of the University of Guelph has been instrumental in the success of the project to date. Funding for the project has been provided by the Greenhouse Gas Mitigation Project for Canadian Agriculture supported by AAFC in conjunction with OSCIA, IFAO and others.

Project Contacts:

Greg Stewart, OMAF, Guelph, greg.stewart@omaf.gov.on.ca
Ian McDonald, OMAF, Guelph, ian.mcdonald@omaf.gov.on.ca Location of Project Final Report:



Development Of A Multi-Scale Approach To Site-Specific Nitrogen Management

(Interim Report)

Purpose:

The technology is available to variably apply nitrogen to a corn field. To date there has not been a simple inexpensive way to determine how much nitrogen should go in each part of the field. This will evaluate the suitability of using field-strip nitrogen (N) response trials to predict a field based most economic rate of nitrogen (MERN) for grain corn production. The project will also look at the use of a yield stability index and corn grain yield response strips to predict variable N applications. The inter-relationships between remotely sensed imagery, yield stability patterns and soil properties will be examined with respect to N rate prediction. Apart from the potential to reduce nitrate leaching to ground water by applying a nitrogen rate that closely matches crop needs the environmental benefit to the air will be assessed through measurement of N_2O emissions.

Methods:

Field length strips of different nitrogen application rates were used to establish a "field based" N response curve and estimate the most economical rate of N (MERN). All study sites received N rates considered appropriate based on OMAF recommendations. Yield monitor data with global positioning (GPS) was collected for the whole field and a method of determining yield stability was developed and assessed for identifying N management units. Each of the fields had aerial imagery collected in bare soil conditions and in crop. Nitrous oxide emissions (N_2O) were collected along the nitrogen rate strips on two sites.

Results and Summary:

The field MERN estimates indicated that producers were either applying the appropriate nitrogen amount or were over applying fertilizer N. In instances were fertilizer N was over applied, N rates could be reduced by up to 80 kg/ha without yield reductions. Temporal (year to year) variations in MERN values for certain fields did exist, varying by as much as 60-70 kg/ha. These differences could in part be related to the growing season conditions, especially when drought resulted in no profitable response to applied N. As a result data should be collected over several growing seasons before drastically altering N rates.

Management unit delineation has been and remains the greatest challenge in developing site-specific N management systems. Patterns of crop yields often show spatial relationships with slope position and soil type, however, these delineations do not always identify N management units. N management units are defined as areas within a field that have a similar fertilizer N requirement (i.e. similar most economic fertilizer N rates, but may vary by yield). Evaluation of yield response to applied fertilizer N in zones of yield stability gave mixed results. On some sites, the method appears to be promising while for others the response to N within a given management unit was extremely variable and/or did not indicate a significant change in the level of fertilizer required across the field. Although most sites displayed reasonably strong relationships between slope position and yield, this relationship was influenced by growing season conditions and yield responses to fertilization did not always indicate that this would properly identify the N management units.

Over application of fertilizer N can result in the increase in N_2O emissions from the soil. Yield responses to applied N were variable and differed between slope positions (i.e. significant slope by N rate interaction). The response at the knoll was linear (which is atypical) and quadratic at the mid slope and depression. The MERN for the depression and mid slope was 55 and 78 kg/ha respectively, while a MERN for the knoll could not be calculated although yields did not appear to significantly increase above 100 kg/ha. Fertilizer N recommendations based on the pre-sidedress N tests were 34, 47, and 47 kg/ha for the knoll, mid slope and depression, respectively. Thus the N test under estimated the amount of fertilizer N required for this site. Grain protein content and stover tissue N concentrations indicated that differences between the 100, 150 and 200 kg/ha treatments were small and not significant. Thus, from a yield and N uptake status applications above 100 kg/ha for this site could be considered excessive. The 150 and 200 kg/ha rates also resulted in residual soil nitrate nitrogen levels (fall 2002) in the soil profile (0-70 cm) that were approximately twice as high as the other fertilizer treatments (14.9 mg/kg versus 6.5 mg/kg).

Although fertilizer N application rate affected the N_2O flux from the soil, this effect was limited to the sampling period within 30 days after fertilizer application, and no treatment effect was observed in the later sampling times in the fall or following spring period, even though soil N levels were higher in the greater than 100 kg/ha fertilizer treatments. Application of fertilizer N rates at or slightly above the MERN did not significantly increase N_2O fluxes in the mid slope or depression compared to the 0 kg/ha N treatment. However, all fertilizer treatments increased the N_2O flux relative to the 0 kg/ha N treatment at the knoll. Variable application of N based on the landscape position and crop MERN could significantly reduce the amount of N_2O lost from the soil.

Bare soil imagery reflects differences in soil colour presumably due to differences in texture and soil organic matter content (SOM), while crop imagery may illustrate areas of similar yield and/or N status. Only 25% of the soils from the study sites indicated that there was a useful correlation between SOM level and imagery data. The low percentage may be due to limitations of the camera or to the fact that most SOM levels were in the less than 2% range. Field based relationships between imagery data and SOM contents were poor. This would in part be due to the fact that although there was no crop present at the time of imagery collection, there was surface crop residue as most farm cooperators practiced some form of conservation tillage. Imagery data did not adequately identify regions of yield response to applied N, indicating that it may not be a useful tool for N management. The extremely dry growing seasons may also have limited the applicability of this type of data for delineating N management units. Different methods of image classification may also improve these relationships.

Next Steps:

The data analysis will be completed and a final report of this project will be completed in 2004.

Acknowledgements:

Dr. Ivan O'Halloran, Ridgetown College, University of Guelph was the principal researcher, Peter Von Bertoldi, University of Guelph assisted. Doug Aspinall and Adam Hayes of OMAF were also involved. Funding was received through the Resource Management and Environment program of the OMAF/University of Guelph contract, Ontario Corn Producers, Innovative Farmers of Ontario and CanAdapt.

Project Contacts:

For more information on the results reported above please contact Adam Hayes at adam.hayes@omaf.gov.on.ca.

Assessing Nitrogen Requirements in Corn Using the Quadratic Plateau Model
(Interim Report)

Purpose:
To develop a method that will allow a farmer to assess the profitability of current rates of nitrogen (N) application on a field and the potential for variable N application. The Quadratic Plateau model of statistical analysis will be compared to the Quadratic model for predicting the maximum economic rate of nitrogen (MERN) for a field.

Methods:
The project was setup on a field scale basis in a corn crop on cooperator's fields. A representative area in the field was chosen for the treatments. Field length strips consisting of several nitrogen rates with the full rate in between (in most cases) were established. The treatments consisted of several rates of nitrogen, 3 or 4 nitrogen rates below the field's full or normal rate of nitrogen, and one rate above. If the full rate was 120 lbs N/ac or less, or if equipment settings were limiting, fewer rates were used. The check strips (zero nitrogen strip) were to have up to 30 lbs N/ac in a starter and no sidedress N.

One-foot soil nitrate samples were taken from the plots in June. The plots were monitored throughout the season to identify any potential problems that might affect yield. The strips were harvested and weigh wagon weights for each strip were recorded. The yield data was analyzed using the quadratic and quadratic plateau statistical models.

Results:
See Table 1. below.

Summary:
The weather had an impact on the results of this project, particularly in 2001 and 2002. This method of determining the nitrogen rate for a field appears to be a good one. Yield monitor data was not collected so it is difficult to determine if there were opportunities for variable N application.

Five of the cooperators identified the potential to reduce their nitrogen rate. Several could reduce rates by 20-30 lbs. N /acre while some had potential reductions of 70-80 lbs. N/acre. Some of these cooperators made adjustments to their N rates based on the results of this project. One cooperator who had cattle manure and red clover in a good crop rotation consistently did not get a response to sidedresss nitrogen. They apply about 60-70 lbs of N on corn which seems reasonable as this would compensate for uneven manure application or areas of reduced stands of red clover. Others were able to confirm that the rate they were using was correct for the field. Amherstburg H (Essex SCIA demo farm) had the plot in the same area for 2 years. The first year showed they were over applying by about 30 lbs. and the reduced rate was the correct rate the second year.

Table 1. Comparison of Nitrogen Recommendations – 2000-2003

Cooperator	Normal N[1]		Pre Sidedress N Test		Quadratic MERN	Q. Plateau MERN	Potential N Rate Change
	(kg/ha)	(lbs/ac)	(kg/ha)	(lbs/ac)	(lbs/ac)	(lbs/ac)	(lbs/ac)
Wallaceburg 2002	145	130	69[2]	61[2]	89	75	-50
Wallaceburg 2003	175	156	22	20	120	118	-35
Bothwell 2000	157	140	149	133	138	126	-15
Bothwell 2000	157	140	138	123	141	118	-20
Bothwell 2001	170	150	32	28	113	97	-50
Bothwell 2003	170	150	84[2]	75[2]	148	147	0
Watford 2001	170	150	107	95	117	66	-80
Watford 2002	140	125	53[2]	47[2]	102	91	-35
Amherstburg D 2003	200	180	11	10	0	0	-180
Dresden 2000	135	120	0	0	73	---	-60
Dresden 2002	124	110	NA	NA	70	70	-40
Dresden 2003	74	66	41[2]	36[2]	30	30	-35
Tilbury 2000	202	180	161[2]	143[2]	214	---	0
Tilbury 2003	202	180	107[2]	95[2]	146	102	-80
Amherstburg H 2002	170	150	36[2]	32[2]	119	118	-30
Amherstburg H 2003	139	124	101	90	126	122	0
Thamesville 2003	200	180	84	75	0	0	-180
Mooretown 2003	180	160	29[2]	26[2]	70	55	105
Dresden R 2003	170	150	145	130	154	155	0
Wallaceburg S 2000	202	180	112	97	146	107	-70
Wallaceburg S 2001	170	150	60	53	134	---	-15
Wallaceburg S 2002	170	150	90[2]	80[2]	114	109	-40
Corunna 2003	165	147	67[2]	60[2]	0	0	-145

Notes:

1. Normal N is the usual rate of nitrogen the cooperator applies to that field.
2. The nitrate samples were taken after the ideal pre-sidedress nitrogen test (PSNT) timing

The Amherstburg D plot had 10 tons per acre of turkey manure applied the previous fall so no response to nitrogen would be expected. The Corunna plot has had regular applications of hog manure so no response would be expected there. Both cooperators could reduce their nitrogen rates significantly.

The soil nitrate test was taken every year on the plots. Samples were taken along some of the treatments and slope position was noted. Some of the plots were sampled later than the ideal time period for the pre-sidedress nitrogen test. There were 10 plots were the PSNT could be related to a yield determined nitrogen recommendation. In only 3 of the sites did the PSNT come close to recommending the correct amount of nitrogen. In 4 sites it under recommended by 25 to 100 lbs. N/acre and in 3 it over recommended by 30 to 75 lbs. N/acre. There tended to be a wider range of soil nitrate levels in the sites where the PSNT over or under recommended nitrogen. There was not a consistent trend in nitrate levels between the slope positions. This could be partly due to the fact that the samples were taken along nitrogen rate strips and may not represent the lowest or highest point in the topography.

The quadratic plateau model was a good method for calculating the maximum economic rate of nitrogen. It tended to give a lower nitrogen recommendation than the quadratic model but seemed to fit the response curve better.

Next Steps:

The project will continue for one more year. The data will be included in other nitrogen databases. A database of the 5 years of data will be put together and further analyzed. The response curves from this year and next year will be tested in the nitrogen recommendation spreadsheet the Greg Stewart is working on.

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 Ivan O'Halloran Ridgetown College, University of Guelph for calculating the MERN's and generating the graphs for this project. Also thanks to David Williams who was the project coordinator and to the summer students who worked on this project.

Project Contacts:

Adam Hayes, OMAF, Ridgetown, adam.hayes@omaf.gov.on.ca.

Location of Project Final Report:

See Project Contacts above.

Advancing No-till Soybean Production
(Interim Report)

Purpose:

This project was designed to evaluate the potential for minimal (shatter) tillage in no-till soybean fields. Over the past few years some growers have reported lower yields with no-till soybeans as compared to conventionally tilled fields. This problem is most often reported on heavier soil types and during extreme growing seasons. A low level of pre-tillage prior to planting may help to prepare a more fit seedbed and increase yields while preserving the environmental and economic benefits of a no-till system. A light amount of tillage, no more than 7.5 cm (3 inches) deep may improve the seedbed by aerating, drying and warming the soil as well as managing previous crop residue. A traditional disc or cultivator is not adequate for this operation since this equipment cannot effectively handle the significant residue of a no-till system. A newly designed tillage tool called the RTS (Residue Tillage Specialist) was used in this project to evaluate the potential of shatter tillage.

Another aspect of this study was to assess the value of coulters on a seed drill for soybeans. John Deere drills are not equipped with standard coulters. Some producers have reported increased yields when attaching a coulter cart to their no-till John Deere drill. Coulters were operated in the seed row at the time of planting to assess plant stand and yield differences. The depth at which coulters should be operated at the time of seeding to maximize yields was also examined.

Methods:

A shatter harrow Salford RTS (Residue Tillage Specialist) was operated a few days prior to planting to prepare a lightly worked seedbed for no-till soybean planting. The RTS unit was run 1-3 days prior to planting. The RTS is equipped with 1¾ inch wavy coulters at 7 inch spacing with tine and rolling harrows. Please see Figure #1. The coulters were operated at a depth of approximately 7.5 cm (3 inches).

Figure #1. RTS (Residue Tillage Specialist)

Other treatments in the experiment involved equipping a no-till 1560 John Deere with a Yetter coulter cart. One ¾ inch wavy coulter was set to run in front of each seed row. Please see figure #2. These coulters were tested at two operating depths. (1.5 inches and 3.5 inches).

Figure #2. Yetter Coulter Cart assembled onto a 1560 John Deere No-till Drill.

Treatments included:
1) No-till 1560 drill (no coulters)
2) Shatter harrow operated 1-3 days before planting (Salford RTS)
3) No-till 1560 drill utilizing in-row tillage (¾ inch coulters) set at planting depth (4 cm, 1.5 inches)
4) No-till 1560 drill utilizing in-row tillage (¾ inch coulters) set deeper than planting depth (9 cm, 3.5 inches)

Fourteen trials were conducted in 2003 in the following counties: Middlesex, Lambton, Huron, Perth, and Wellington.

Results and Summary:

This was the first of a three year study (2003, 2004, 2005). Results and conclusions will be reported after the second and third years of the study.

Next Steps:

This study will be conducted for two more years.

Acknowledgements:

Special thanks to all those who participated in the project:
The SCIA members that helped conduct the trials,
The Heartland Regional SCIA which initiated this study,
Salford Farm equipment for providing the Salford Residue Manager (RTS),
Middlesex Soil & Crop Improvement Association for making available their no-till drill,
and Podolinsky Equipment for providing a tractor at a reduced cost.

Project Contacts:

Horst Bohner, OMAF, Stratford, horst.bohner@omaf.gov.on.ca .If you wish to be involved in 2004 and 2005 contact Horst.

Alternate Herbicides For The Control Of Canada Fleabane In Soybeans

(Interim Report)

Purpose:

Glyphosate resistant Canada Fleabane is now prominent in nine American states. It is probable that in Ontario this resistant species will become a concern as well, given the increased use of glyphosate. Alternatives to glyphosate for the control of Canada Fleabane were evaluated in 2003.

Methods:

The trial was set up as a randomized complete block design with 4 replications. Herbicide treatments were applied when Canada Fleabane ranged from 1 to 10 cm in height.

The treatments were:
1. Untreated Control
2. Glyphosate (360 g/L) at 1 L/ac
3. Glyphosate (360 g/L) at 1.5 L/ac
4. Classic (25 DF) (chlorimuron-ethyl) at 14 g/ac + Agral 90 at 0.2% v/v
5. First Rate (84 DF) (cloransulam-methyl) at 4.25 g/ac + Agral 90 at 0.25% v/v + UAN at 2.5% v/v.
6. First Rate (84 DF) (cloransulam-methyl) at 8.5 g/ac + Agral 90 at 0.25% v/v + UAN at 2.5 % v/v.
7. 2,4-D Ester (600 g/L) at 0.37 L/ac
8. 2,4-D Ester (600 g/L) at 0.75 L/ac
9. MCPA Amine (500 g/L) at 0.28 L/ac
10. Pardner (280 g/L) at 0.48 L/ac
11. Amitrol 240 (231 g/L) at 1 L/ac
12. Amitrol 240 (231 g/L) at 2 L/ac
13. Sencor (75 WG) at 0.6 kg/ac
14. Broadstrike Dual Magnum (923 g/L) at 0.624 L/ac

Evaluations of % visual Canada Fleabane control were conducted at 6, 13, 22 and 27 days after application. Weed Control Ratings at 27 days after application are presented in the results section below.

Results:

Table 1. Visual control (expressed as a percentage out of 100) of Canada Fleabane using 13 different herbicide treatments.

Herbicide Treatment	% Visual Control
Untreated Control	0
glyphosate (1 L/ac)	98
glyphosate (2 L/ac)	99
Classic (14 g/ac)	94
First Rate (4.25 g/ac) - half rate	99
First Rate (8.5 g/ac)	99
2,4-D Ester (0.37 L/ac)	87
2,4-D Ester (0.75 L/ac)	94
MCPA Amine	36
Pardner (0.48 L/ac)	50
Amitrol 240 (1 L/ac)	83
Amitrol 240 (2 L/ac)	97
Sencor (0.6 kg/ac)	73
Broadstrike Dual Magnum (0.624 L/ac)	99

1 field trial and 1 growth room trial conducted (2002, 2003).

Summary:

The herbicides Classic, FirstRate, Amitrol 240, and Broadstrike Dual Magnum all provided acceptable levels of Canada Fleabane control and would be suitable options in soybeans. The most economical level of control was provided by the reduced rate of FirstRate. Due to the potential risk for soybean crop injury, and lack of legal registration, pre-plant applications of 2,4-D (a common U.S. practice) are not recommended in Ontario. There are other safer, more cost effective and efficacious products for the control of glyphosate resistant Canada Fleabane pre-plant in soybean.

Next Steps:

This trial will be repeated in 2004 and 2005.

Acknowledgements:

Dr. François Tardif and Peter Smith, Department of Plant Agriculture University of Guelph. The financial support from Monsanto is greatly appreciated.

Project Contacts:

Mike Cowbrough, OMAF, Guelph, mike.cowbrough@omaf.gov.on.ca . Contact Mike if you wish to be involved in the study.

Soybean Aphid Yield Impact

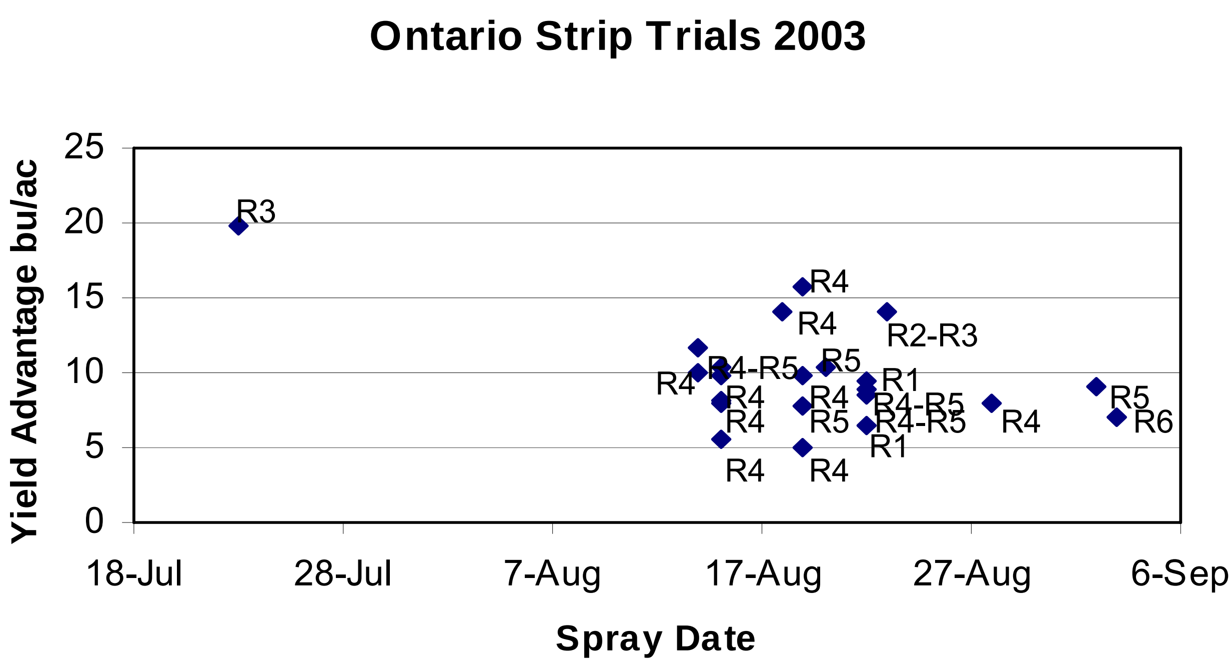
(Interim Report)

Purpose:
On farm insecticide trials were evaluated to determine the yield impact soybean aphids caused in 2003.

Methods:
On farm strip trial data was collected from Ontario growers and ag business operations using an online and pdf form available on the OMAF website. Yield advantage to insecticide application was determined.

Results:

Figure 1. Yield advantage (bu/ac) demonstrated from 21 on farm strip trials conducting in Ontario in 2003. Soybean growth stages at time of application are also provided.



Summary:
Yield data comparing untreated versus treated areas were collected from 21 on-farm strip trials. An average of 9 bu/ac advantage was demonstrated even when fields were sprayed as late at the R5 stage (Figure 1). Results were presented to the North American soybean aphid research team. Having demonstrated a yield response in the

later R stages of soybeans, 2004 thresholds and spray timing recommendations were lengthened to include the R4 stage of soybeans, thanks to the Ontario data set.

Next Steps:

Yield data from on farm spray trials will again be collected to assess the yield impact of soybean aphids at various plant stages. Thresholds and spray timing intervals will also be validated.

Acknowledgements:

Research collaborators include Horst Bohner, OMAF, Peter Johnson, OMAF and Gilles Quesnel, OMAF. Many thanks to the Ontario growers and ag. business reps for taking the time to provide us with their valuable data sets.

Project Contacts:

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The Benefits of Soybean Fungicide Seed Treatments
(Interim Report)

Purpose:

The use of seed treatments on corn and wheat are standard practice in Ontario. The majority of Ontario soybeans, on the other hand, do not receive a fungicide seed treatment. Since soybeans tend to be planted later than corn, soil conditions are generally more favourable for rapid crop germination and emergence. However, when conditions are wet and cool, soil borne diseases may cause considerable seed and seedling damage.

The extent of the damage these diseases may cause depends on moisture, temperature, overall plant health, and soil type. One of the most damaging scenarios can result from a wet spring followed by extremely dry summer, because of reduced root system development. Seed treatments are most beneficial when seedlings are stressed, during the first couple of weeks after planting. Cold wet soils, crusting, heavy rains, compaction, and even postemergent herbicides may all cause plant stresses, which make the seedlings more susceptible to diseases.

The purpose of this project is to investigate the benefits of newer fungicide seed treatments. The main question concerning soybean fungicide seed treatments that should be addressed is: Should fields at high risk of root rots (i.e. a history of disease, early planting, no-till, heavy soils, etc.) be planted with treated seed or should all soybean seed be treated with a fungicide.

Methods:

Full-length field strips were used to compare treated and untreated yields. Two replications were used in each trial. Eight sites in Perth, Huron, Middlesex, Lambton, and Wellington counties were compared in 2003.

Treatments included:

1. Untreated Seed Control
2. Seed Treated with a Fungicide Soybean Seed Treatment

Results/Summary:

This was the first year of a three-year study. Final results will be published at the end of the study period.

Next Steps:

New insecticide seed treatments will also need to be evaluated along with fungicide seed treatments. Soybean aphids have caused considerable damage since the first outbreak in 2001. New insecticide seed treatments have shown considerable promise in controlling this pest during the first 6-8 weeks after planting. Since lindane will no longer be available for the control of seed-corn maggot insecticide seed treatments also need to be tested to evaluate their potential to control this pest. Both insecticide and fungicide seed treatments will be evaluated in 2004.

Acknowledgements:

Thanks to all those co-operators who participated in the project. Special thanks to Syngenta Crop Protection and Gustafson for providing the seed treatments and Ridgetown College for treating the seed.

Project Contacts:

Horst Bohner, OMAF, Stratford, horst.bohner@omaf.gov.on.ca. If you would like to be involved in this project please contact Horst.

Southwest Agricultural Conference 2003

The Ontario Ministry of Agriculture and Food, the Southwest Soil and Crop Improvement Association, Ridgetown College/University of Guelph and Agribusiness supporters take pride in presenting Eastern Canada's premiere crops conference. This conference, held at Ridgetown College, University of Guelph in early January, is the first opportunity of the year to take in the latest crop information. High profile speakers from across North America gather to present the latest in agricultural information.

Sessions are designed to provide practical "take home" information. A number of sessions are presented in a workshop format giving participants an opportunity to get hands-on with farm equipment, weed identification, soils, nutrient management and a variety of other topics. Workshops at the last conference included precision application of nitrogen, a hands-on planter clinic, weed identification and tools or toys (a look at the tools available to growers like pH meters, quick nitrogen tests and more).

Here is a sample of the more than 40 sessions that were offered concurrently over two days to the approximately 1500 participants at the last conference:

Bin Busting Soybeans
Herbicide Additives and Adjuvants
Timely Tax Tips
Micronutrients – Level II
On Farm Energy Production
Hot Bugs
Wheat Marketing – The New World
Warming up No-till
Managing Buffers
Machinery at What Cost?

There is also an opportunity to visit agribusiness displays at the industry trade show to see what new products or services are available.

One participant noted: "Good array of topics and were well presented by knowledgeable instructors. This day was well worth it."

Event Contact

Adam Hayes, OMAF, Ridgetown, adam.hayes@omaf.gov.on.ca .

FarmSmart Agricultural Conference 2003

FarmSmart is an agricultural conference designed to address the needs of agriculture in the midwestern to central Ontario regions of the province. Over 400 participants attended and in total, nearly 600 people were involved in the conference.

The FarmSmart Agricultural Conference is a partnership between OMAF, Golden Horseshoe and Heartland Regional Soil and Crop Improvement Associations and the Ontario Agricultural College of the University of Guelph, and is also supported by Ontario's Agricultural Industry.

The FarmSmart Conference was held January 17, 2004 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 45 sessions held in concurrent sessions throughout the day. Topics included crop and livestock production sessions along with nutrient management, alternative energy, business management, general interest and others. New this year was a series of computer workshops in the OAC multi media laboratory including NMan, farm accounting and precision agriculture software sessions. Additionally, facility tours of the Plant Agriculture's Biotechnology program and Environmental Biology's Space program occurred. Participants chose their own program from the diverse topics available, tailor-making the day to meet their individual needs and interests.

Col. Chris Hadfield of NASA and the Canadian Space Agency enlightened participants on his experience as the first Canadian to "walk in space". He shared his views on agriculture since his early years growing up on a Halton County farm and the present planning of manned space travel to Mars.

FarmSmart 2004 was an outstanding success and all the partners are looking forward to bringing you FarmSmart 2005 on January 15th, 2005. Mark it on your calendars now and see you then!

Event Contact

Ian McDonald, OMAF, Guelph, ian.mcdonald@omaf.gov.on.ca .

Eastern Ontario Crop Conference 2003

The Eastern Ontario Crop Conference is a co-operative effort between the Ontario Ministry of Agriculture & Food and the Eastern Ontario Crop Advisory Committee. This annual one day conference is held the third week of February in Kemptville 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 to select up to 7 sessions from approximately 20, presented concurrently throughout the day. This allows participants to select topics of importance to them. Certified Crop Advisor credits are available for most sessions.

Recent topics offered at the last conference included:

Maximizing Weed Control in Herbicide Resistant Crops!
Problem Weeds
Site Specific Crop Management
Pest Management Update
What's New in Cereals?
Corn Silage Management Tips
Spray Drift and the Law
Organic Farming
Market Outlook
Planter Clinic
Drill Clinic
Combine Clinic

Comments from a participant:

"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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Gilles Quesnel, OMAF, Kemptville, gilles.quesnel@omaf.gov.on.ca

Southwest Crop Diagnostic Day 2003

Where do seed, fertilizer and chemical industry personnel and agricultural consultants go every year for practical training in diagnosing crop problems? To the Southwest Diagnostic Days program held every July at Ridgetown College. Technology transfer, research and teaching staff from the Ontario Ministry of Agriculture and Food, Ridgetown College/University of Guelph, agribusiness and Agriculture and Agri-Food Canada are involved in presenting sessions each year. July 7-8, 2004 marks the 10th anniversary of this outstanding technology transfer program. Organized by the Ontario Ministry of Agriculture and Food, the day is designed specifically to improve 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.

Some of the highly rated topics from last year were herbicide injury in corn, soybeans and edible beans; speed spraying; legume diseases; and “hoppers and weevils”. The featured crop for 2004 will be soybeans. In addition to soybean issues, topics being considered for 2004 are: root diseases, seed treatments and herbicide interactions on soybeans and edible beans; soybean insects; soil compaction; herbicide injury; weed identification; and more. Returning this year will be an optional horticultural crop stop.

To facilitate discussion with speakers, participants are assigned to small groups of no more than 20 people. Each group will rotate through twelve locations, six in the morning and six in the afternoon. 99% of participants rated the day as moderate to highly beneficial to their business.

“Excellent day, very informative” - Diagnostic day participant

Event Contact

Adam Hayes, OMAF, Ridgetown, adam.hayes@omaf.gov.on.ca .

Eastern Ontario Crop Diagnostic Day 2003

The Eastern Ontario Crop Diagnostic Day is a co-operative effort between the Ontario Ministry of Agriculture and Food, 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 in Corn & Soybeans, Fertility Diagnostics, Planter Problems, Air Induction Nozzles & Spray Drift Management, Cereal, Soybean and Corn Diseases and Insects, Forage Establishment and Management and Soil Compaction and Management. Special topics such as Bt Corn Management, New, Emergency & Annual Forages, Precision Agriculture, Biosolids, Chickpeas - Today & Tomorrow, Tillage-in-Action and Scouting Tips, Techniques and Tools have also been added.

Participant comments:

“Topics and speakers were all excellent”.
“Well presented and interesting topics.”
“Excellent cross section of what can be grown and specific problems in Eastern Ontario”

Event Contact

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Canada’s Outdoor Farm Show 2003

Canada's Outdoor Farm Show is one of Canada’s leading outdoor agricultural showcases. It offers producers "one-stop shopping" and demonstrates the newest and most innovative advances in agricultural products and services. The Ontario Soil and Crop Improvement Association (OSCIA) and OMAF crop technology staff have set up a demonstration site at Canada's Outdoor Farm Show each year since the show's inception in 1993. The objective of this display is to highlight and showcase the latest and most effective crop management strategies, with a view to improving productivity and environmental sustainability for Ontario growers.

In 2003, the OSCIA/OMAF display attracted thousands of growers over the three-day show. Interactive demonstrations on spray coverage, strip tillage and weed control timing as well as insect, disease and weed identification proved to be very popular with visitors. Tree shelterbelts for sustainable agriculture and cover crops have been a yearly attraction. The highlight of the display for many was the daily "production pundits" showcase whereby growers would receive answers and tips regarding their most challenging management issues from a panel of industry experts.

Some of the key demonstration plots that will be set up in 2004 include:

1) Roundup Ready Corn Spray Timing
2) Weed, Insect, and Disease Identification
3) Soybean Seed Chilling Injury
4) Soybean Seed Treatments / Planting Date
5) Red Cover Establishment
6) Leafhopper Control in Alfalfa
7) Soil Compaction/ Tire Pressure
8) Manure Injection Systems
9) Cover Crops
10) Shelterbelts for sustainable farming

Next year's show will be held in Woodstock, Ontario on September 14, 15 & 16, 2004. Stop by to get the latest information related to crop management.

Event Contact

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