ONTARIO FIELD CROPS
RESEARCH AND SERVICES COMMITTEE

2006 ANNUAL REPORT

TO

ONTARIO AGRICULTURAL SERVICES COORDINATING COMMITTEE

February 15, 2007

Table of Contents

Executive Summary

The Ontario Field Crops Research and Services Committee (OFCRSC) reports directly to the Agricultural Research Institute of Ontario (ARIO). The role of the Ontario Field Crops Research and Services Committee and its eight constituent subcommittees is to recommend strategic research and service directions. These include research and service initiatives to improve the efficiency of crop production; reduce the environmental "foot print" of these production practices and improve the competitiveness of, and opportunities for Ontario agriculture in world markets. The role of this committee is to identify and prioritize research and service initiatives to insure the effective allocation public funds for research. Our members include industry partners and growers representing the Ontario Field crop sector as well as, university and government research, policy and extension personnel.

Field crops grown in Ontario had an estimated value of $2.5 billion and produced farm cash receipts totaling $1.5 billion in 2004. This represented approximately 42% of the total cash receipts for crops grown in Ontario in 2004, which was calculated to be $3.6 billion. The acreage of field crops grown in Ontario continues to be dominated by soybeans, corn, cereals, and forages (Figure 1). Based on available data for Ontario from 2004, soybeans and corn were grown on 27.9% and 24.0% of the land available for field crops and produced 28.9% and 29.2% of the total farm gate value, respectively. Cereal crops were grown on approximately 17% of the land seeded and produced 11.7% of the total farm gate value. Hay was grown on 28.1% of the seeded acreage and produced 19.7 % of farm gate value (Figures 1 and 2). The estimated farm value (value per hectare) from the field crop sector in Ontario for 2004 was approximately $2.5 billion (Table 1). This is in comparison to farm cash receipts of $1.5 billion from dairy, $2.8 billion from other livestock, and farm values of $0.27 billion from commercial fruit crops, and $0.79 billion from commercial vegetables (including green house crops and mushrooms).

In addition, Ontario field crops are a major source of exports. In 2004, $2.4 billion in grains and oilseeds products and animal feeds were exported and $2.5 billion imported. Ontario produces approximately 80% of the Canadian soybean crop. Quantities of soybeans equivalent to 23% and 32% of the annual production are imported and exported, respectively. Although 2.8% of the corn crop is exported, Ontario is a net importer of corn. Of total corn usage in Ontario, 19% was imported and 26% was industrial use. In order to maintain the viability of agriculture in Ontario the efficiency of production and the quality, safety and marketability of all field crops need to continually improve both to enhance domestic markets and to compete globally. These are the primary goals of our agricultural research programs.

Highlights and issues related to the Ontario field crop industry in 2006:

- Field crop producer organizations continue to lament the decline in support for applied research and variety testing. There is also a steady decline in number of researchers in Field Crop Pest Management and Field Crop Agronomy especially on the applied side.
- Winter wheat yields: INCREDIBLE!! A record acreage of 1.1 million acres harvested coupled with a new yield record of 85.5 bu/ac. Fall plantings: DISMAL at about 475,000 acres, barely ½ of intentions, with nearly all wheat planted later than desirable and into less than ideal conditions.
- Spring Cereals: Acreage of all spring cereals increased this year, with poor crop prices and high input costs for other crops. Spring wheat increased the most at 40%, with barley showing the least increase at 10%. Frost seeding of spring wheat shows 40% yield boost
- Corn yields continue to surge, trend line slope is now 1.7 bu/ac/yr. Highest provincial yields ever at 150 bu/ac.
- The consumption of corn by the ethanol industry on both sides of the border are strengthening prices, Planting of upwards of 2 million acres of corn are expected for next year, coupled with some new optimism that some better years are ahead.
- Soybean acreage increased and provincial yield records were set.
- Soybean aphids were sparse in soybeans fields across the province with very little spraying required
- So far Asian soybean rust has not been detected in Ontario soybean and pulse crops
- Both spring and winter canola are struggling because of invasive pests problems resulting in poor yield and quality
- Declining tobacco production and sustainability of the industry are of significant concern to Ontario tobacco growers. Imperial Tobacco Canada closed its Canadian manufacturing operations in Guelph in 2006.
- new research efforts need to be directed towards the development of bio-based industrial products from Ontario field crops
- research needs for northern Ontario agriculture continues to be an issue
- Reliance on glyphosate. About 15-20% of the corn acres and 65% of the soybean acres in Ontario were planted with glyphosate-tolerant seed. Glyphosate drift onto non-target crops was a significant concern this past season as well
- Alien invasive species continue on the rise in field crops. Monitoring, forecasting and management strategies have to be in place to ensure readiness when problems arrive.
- Backwards shift in pesticide usage, digressing from IPM. "Lower risk/cost" pesticides are being marketed towards insurance applications rather than responding to economic thresholds. Includes a trend toward promoting pesticide use for non pest control yield benefits. Need to determine how to respond to such shifts and bring an optimizing prescription to the situation, not to mention the concern about resistance management.
- Organic crop production is on the increase. Research into pest management in organic crops should also follow suit.

The Ontario Field Crop and Service committee has identified three research priorities and one service priority. These research and services priorities encompass four main themes, which are building economic strength by adding value, providing solutions to societal changes, strong leadership/ industry renewal and safe, nutritious food. All priorities whether specific to commodities or disciplines address one or more of these themes. Specific research priorities and service priorities are grouped under the following headings:

Research Priorities

1. **Agronomic Systems and Environmental Stewardship.**
   Research leading to production systems, which enhance competitiveness, food quality and safety and environmental sustainability and engages agriculture in the bio-economy.

2. **Innovative and enhanced germplasm development and utilization.**
   This section will include crop breeding, performance evaluation, physiology and the development of new molecules, gene discovery, genomics, and bioinformatics to produce knowledge and materials to advance the food, feed, and bioproducts industries.

3. **Market Responsiveness**
   Research and economic analysis to address existing and potential market opportunities, new product development, food safety and related issues.

Service Priorities

1. **Efficient and effective technology transfer.**
   Development and implementation of strategies to ensure the verification and uptake of appropriate technological advancements by the field crop sector.

   These core areas are detailed in the section on Strategic Directions in which specific research/service recommendations are identified. These recommendations represent the areas of research and technology transfer that FCRSC considers essential to the strengthening of the field crop industry in Ontario. Within each core area are commodity and pest management specific priorities (see Table 2 Research Priorities by Commodity and Discipline).

Fig. 1 Field Crop Trends 1985 - 2005

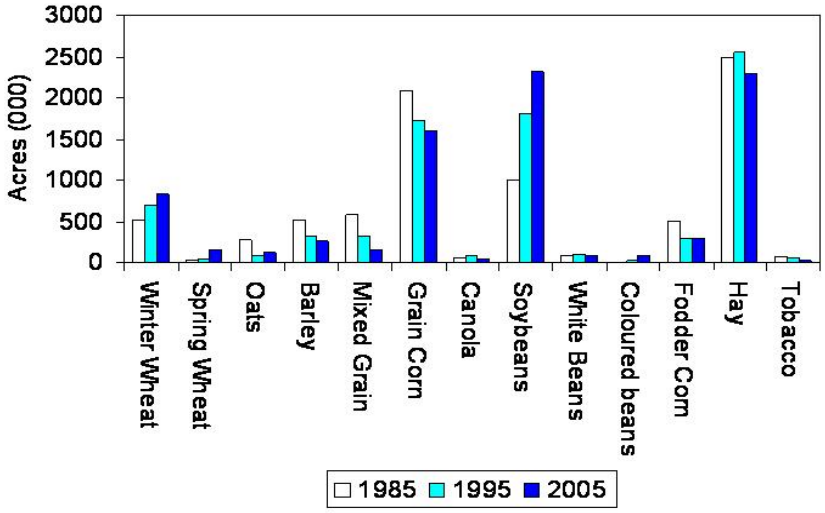
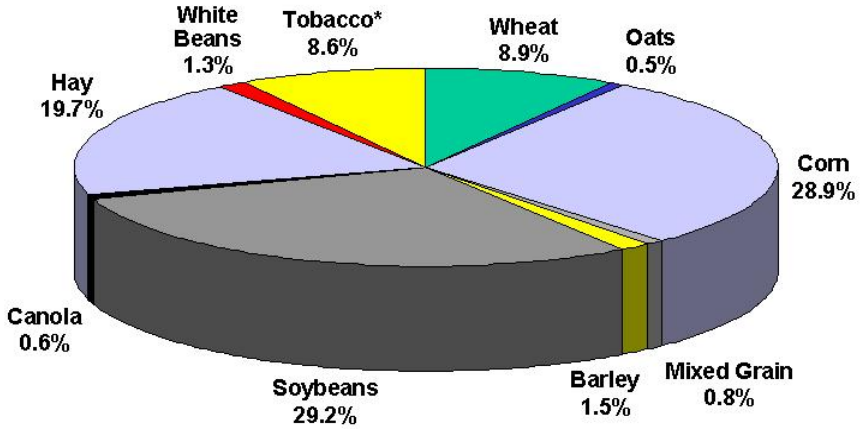


Fig. 2 Major Field Crops
Relative Farm Gate Value - 2004



* 2003 value

Table 1. Estimated Area, Production and Farm Value of Specified Field Crops Grown in Ontario, 2003, 2004 and 2005.

Crop	Year	Units	Area		Production		Farm Value	
			Seeded	Harvested	Yield	Total	Per Unit	Total
			(acres)	(acres)	(units/ acre)	('000 units)	($)	($'000)
Winter	2003	bu	990,000	990,000	76.3	75,500	4.04	304,800
Wheat[a]	2004	bu	750,000	750,000	72.5	54,400	3.54	192,800
	2005	bu	830,000	830,000	70.0	58,100	…	…
Spring	2003	bu	115,000	115,000	52.2	6,000	5.10	30,600
Wheat	2004	bu	120,000	120,000	50.8	6,100	4.62	28,200
	2005	bu	155,000	155,000	43.2	6,700	…	…
Fall Rye[a]	2003	bu	65,000	60,000	40.0	2,400	3.64	8,700
	2004	bu	65,000	65,000	36.9	2,400	…	…
	2005	bu	60,000	60,000	36.7	2,200	…	…
Oats	2003	bu	120,000	110,000	72.7	8,000	2.25	18,000
	2004	bu	105,000	90,000	70.0	6,300	2.16	13,600
	2005	bu	125,000	115,000	58.7	6,750	…	…
Barley	2003	bu	265,000	255,000	63.5	16,200	2.76	44,800
	2004	bu	255,000	235,000	63.8	15,000	2.47	37,100
	2005	bu	26,5000	250,000	53.6	13,400	…	…
Mixed Grain	2003	bu	190,000	175,000	66.9	11,700	2.17	25,400
	2004	bu	155,000	140,000	67.5	9,450	1.99	18,800
	2005	bu	160,000	145,000	59.3	8,600	…	…
Grain Corn	2003	bu	1,800,000	1,725,000	127.0	219,000	3.62	793,700
	2004	bu	1,700,000	1,600,000	131.3	210,000	2.94	618,300
	2005	bu	1,600,000	1,565,000	145.0	227,000	…	…
Canola	2003	bu	50,000	50,000	36.0	1,800	7.93	17,300
	2004	bu	55,000	55,000	37.3	2,050	7.73	15,800
	2005	bu	50,000	44,000	25.0	1,100	…	…
Soybeans	2003	bu	2,000,000	1,990,000	31.9	63,500	9.87	627,000
	2004	bu	2,325,000	2,300,000	39.6	91,000	7.99	726,800
	2005	bu	2,325,000	2,315,000	41.0	95000	…	…
Dry White	2003	cwt	55,000	55,000	20.0	1,100	30.10	33,100
Beans	2004	cwt	60,000	60,000	19.0	1,140	28.78	32,800
	2005	cwt	90,000	90,000	20.6	1,850	…	…
Coloured	2003	cwt	50,000	50,000	21.0	1,050	…	…
Beans	2004	cwt	65,000	65,000	20.5	1,330	…	…
	2005	cwt	100,000	100,000	21.0	2,100	…	…
Fodder Corn	2003	tons	325,000	320,000	14.4	4,600	23.60	108,600
	2004	tons	300,000	290,000	15.9	4,600	21.80	100,300
	2005	tons	290,000	285,000	16.7	4,765	…	…

Hay (b)	2003	tons	2,360,000	2,320,000	2.4	5,650	85.63	483,800
	2004	tons	2,340,000	2,275,000	2.4	5,400	90.72	489,900
	2005	tons	2,300,000	2,235,000	2.3	5,030		
Tobacco	2003	lbs	35,700	35,700	2,625	93,955	2.28	214,000
Flue Cured	2004	lbs	36,600	36,600	2,400	87,852	2.25	198,000
	2005	lbs	…	…	…	…	…	…

[a] Area seeded represents area remaining as of June 1
Source: OMAFRA Statistics

Table 2. Research Priorities by Commodity and Discipline

Priority	**Cereals**	**Corn**	**Oilseeds**	**Forages**	**Pulse crops**	**Tobacco**
1	Breeding for fusarium resistance	Breeding for improved cold tolerance	Genetic improvement and cultivar development	Reducing climate related risk	Genetic improvement and cultivar development	Breeding for cultivar quality
2	Cultivar performance evaluation	Breeding for pest and disease resistance	Pest and disease control	Genetic improvements for feeding value	Breeding for special quality and use traits	Breeding for pest and disease resistance
3	Nitrogen management	Genetic improvement of corn	Breeding for special quality and use traits	Cultivar performance evaluation	Integrated pest management for insects and diseases	Pest and disease control
4	Breeding for yield and quality traits	Enhanced energy and environmental efficiencies	Cultivar performance evaluation	Breeding for yield	Weed management	Weed management
5	Reducing climate related risk	Develop value added markets	Weed management	Forage preservation and storage	Agronomic and market development	Nitrogen management
6	Market development and grain grading systems	*Cultivar performance evaluation**	Cropping systems research	Forages and the environment		Water use efficiency
7	Production and crop rotation systems	*Weed management*	Soil fertility, quality and management	Corn silage		Harvesting systems
8	Micronutrient management	*Pest and disease control**		Market grading system		
9	*Pest and disease control**			Weed management		
	*Weed management**			*Pest and disease control**		

** Discipline priorities not addressed within commodity*

Mandate of Field Crops Research and Services Committee:

The Ontario Field Crops Research and Services Committee and its constituent subcommittees are empowered to review and direct research and services leading to the improvement in crop production efficiencies and competitiveness of Ontario agriculture in world markets. Specifically the mandate of the committee is:

(a) To review reports submitted by Commodity and Pest Management-based subcommittees.

(b) To assess requirements for Field Crop Research and Services

(c) To establish priorities for Field Crop Research and Service programs

(d) To assess progress in Field Crop Research

(e) To develop and present reports and recommendations to the Ontario Agricultural Services Coordinating Committee describing the needs for Field Crop Research and Services including as appropriate information in relation to:

(i) cost-benefit
(ii) research facilities and personnel required
(iii) location best suited for the investigation
(iv) how funds might be obtained or freed to conduct new research or services
(v) operation of crop committees

(f) To consider and approve Chairs and membership of each Crop Committee

(g) To appoint representatives to other OASCC Research and Services Committees when requested and to liaise with the Ontario Pest Management Research and Services Committee.

(h) To provide an inventory of the research effort in field crops

(i) To take a lead role in the documentation of Research Accomplishments and Proposed New Research Directions for ARIO program reviews on a 4-year basis.

Industry/Sector Scan

Ontario Field Crop Research Coalition

Innovative Farmers of Ontario
Oat & Barley Council of Ontario
Ontario Canola Growers' Association150 Research Lane, Suite 205
Ontario Coloured Bean Growers' AssociationGuelph, Ontario N1G 4T2
Ontario Corn Producers' Association
Ontario Forage Council
Ontario Soil & Crop Improvement Association
Ontario Soybean GrowersPhone: (519) 767-1919
Ontario Wheat Producers' Marketing BoardFAX: (519) 767-2466
Ontario White Bean Producers
Seed Corn Growers of Ontario

In 2006 the reps of our 12 member organizations, most of whom are farmers, have been preoccupied with the current farm income situation. This situation has forced farmers into a survival mentality. Basic “do’s” such as crop rotation, certified seed usage and adoption of new technologies and production practices are being set aside. Our members are stewards of some 8 million acres of Ontario farmland and this trend away from the basics is disturbing to say the least.

In spite of this the OFCRC still maintains a wide area of research focus. Many projects ranging from applied agronomic research, disease research such as the battle with fusarium and mycotoxins in wheat and corn to bioproducts research all aimed at improving the competitiveness of Ontario farmers.

OFCRC was recently invited to participate in the AAFC science consultation regional meeting in London and the symposium wrap up of this consultation process in Gatineau QC. OFCRC members are concerned over new directions in research which place less importance on applied research, the benefits of which accrue directly to farmers in favour of very lofty research goals which to our relief were viewed rather skeptically by those in attendance. A notable comment to this was “How do you expect to get the glory if you don’t do the grunt work?” Skepticism was further bolstered by non-committal ministerial comments such as “would like to see funding increased”. The AAFC budget has been virtually static for 10 years.

The new research funding landscape under the OMAFRA/UofG Enhanced partnership has left research support of several of the field crop commodities in a state of uncertainity. In the quest for creating value chains and unclear definition of what value chains actually were, several field crop sectors were left without a well-defined home. Interestingly, a Field Crop Pest Management project which was least like a value chain was successful as a Tier one application, while several of the field crops were not.

OFCRC is pleased to still have many avenues available for research funding as well as the topnotch researchers, scientists and agronomists who work on behalf of Ontario's farmers. It is our hope that we can count on these things as we move toward the future.

OFCRC members were pleased with the announcement of the 4th round of the Canada-Ontario Research and Development Program (CORD IV). This program will provide $4.47 million for field crop research in Ontario from April 2005 until December 2007. OFCRC members are pleased to play a key role in initiating, reviewing, and approving research projects funded by the CORD IV program. This is seen as a very effective way to ensure that agricultural research is directed toward projects that maximize benefits to the sector. As of December 1, 2005 just over 50% of the field crop CORD IV funds were allocated into 44 research projects.

Sub-Committee Reports

OMAFRA Crop Technology

Crop Technology Branch is part of the Innovation and Competitiveness Division which includes Livestock Technology, Client Services, Market Development and Food Industry Competitiveness.

The focus for Crop Technology Branch within the division is to support the competitive position of the Agri-Food sector. The mission statement is: "Explore, develop and deliver innovative solutions to enhance the economic development of Ontario's agriculture and food sectors" The division ties together the emphasis on the value chain from science to innovation, investment and marketing to strengthen the competitiveness of the Agri-Food Sector.

Staffing:
There were no staff changes over the past year in the Field Crops unit. Michael Payne continued his secondment with the Nutrient Management Branch.

Staff continue to value a close working relationship with researchers, field crop commodity organizations and funding agencies that allow for projects to be carried out on a commercial in-field basis. The focus of the unit is on collection of data/research/experience from other jurisdictions, verification of recommendations under Ontario conditions, development of applied tools and recommendations and transfer of the information to maximize adoption rates. The focus on the team is to gather, verify and transfer information to allow Ontario producers to be leading edge in availability to technology and techniques ahead of their competition in other jurisdictions.

Technology transfer is carried out in a wide variety of channels, with a strong emphasis on the training and development of consultants. The Certified Crop Advisor program has approximately 500 practicing consultants in Ontario that provide most of the one on one direct farm advice. The Ontario Soil and Crop Improvement Association continues to be a delivery agent for information through a grassroots approach of local educational meetings,

tours, demonstrations and workshops. Crop Technology staff work with farm and commodity organizations and the Innovative Farmers Association of Ontario, providing updates and information at key meetings including the corn/soybean/wheat production meetings.

Tools for Technology Transfer

CROPLINE
This is a taped message available twice per week in season and once per week during the winter. The information provided is largely driven from questions and comments left on the tape that are circulated to staff and responses are made from the relevant staff on each issue. This service records over 20,000 calls annually. The Cropline is coordinated by Peter Johnson.

PodCast of Cropline is a relatively new tool. Crop Technology staff are exploring this opportunity as it allows users to focus on specific areas of interest they may have compared to having to listen to the entire cropline report. It also allows for additional materials to be linked to key topics, including pictures or written resource information.

CROP REPORT:
This report is issued weekly from April to October, reviewing the progress of the crop, issues that arise due to weather, pests and general growing conditions. The report is carried weekly in the Ontario Farmer (circulation 36,000), on the OMAFRA website and is sent directly to over 1000 individuals on the OSCIA list serve. Seasonal summaries are prepared and have been picked up and used by various consultants in newsletters and weekly reports that they have for their clients. Crop Report is coordinated by Joel Bagg

CROPPEST ONTARIO
Approximately 20 issues are prepared annually highlighted current pest management concerns in field crops across Ontario. It features new and emerging pests, recommendations, new registrations, emergency registrations, articles on new research findings and current cropping issues. CROPPEST is distributed to interested agribusinesses and private consultants, through the OSCIA list serve and many articles are printed or become the basis for articles in the farm press. It is also posted on the OMAFRA website. CROPPEST provides the field crops team with a tool to rapidly respond to emerging issues, providing timely information for immediate action. Albert Tenuta acts as the editor for CROPPEST.

CROP TALK:
Crop Talk is a newsletter produced 4 times per year by Field Crop unit staff that provides new information in an in-depth approach including data, pictures in addition to interpretation and recommendations. The newsletter is delivered by the Ontario Soil and Crop Improvement Association as part of their provincial newsletter to their 4000 members either electronically or by hard copy. Editor is Joel Bagg.

In addition numerous articles are written and distributed through commodity newsletters, and regular information updates from agri-business suppliers and marketers.

ISSUES:
Ongoing issues:

- Increasing input costs associated with higher energy prices
- Use of livestock manure as an important resource rather than a waste
- Threat from invasive pests
- Winterkill of forage crops (particularly eastern Ontario)
- Corn – quality and marketability
- Climate change – weather extremes – greenhouse gas mitigation
- Value added opportunities – IP systems – traceability

ISUES – new emphasis

- Bio products - can growers share in the benefits that may accrue to the processing industry
- Bio energy
- Organics

New products include the approval of the N calculator as a recommendation for Nitrogen on corn taking into account more variables and geography of the province. Work has started on incorporating organic Nitrogen sources into the calculator including forages and manures. Next challenge is taking this tool out to the industry to gain adoption of its use to target N rates to field productivity and thus reduce input costs and reduce risk to the environment.

Crop Advances:
This is a new report containing information on all the projects conducted by staff in the field crops unit, including protocols, data, summaries and interpretation of results. Crop Advances will be prepared annually (distribution February).

Primary publications

Publication 812: Field Crop Protection Guide Tracey Baute is the editor of this publication. It is also available on the OMAFRA website www.omafra.gov.on.ca

Publication 811: Work is beginning to produce an update to Publication 811, the Agronomy Guide, planned for release in March 2008.

Provincial Technology Transfer events:
Farm Conferences
Three major farm conferences are held at Ridgetown (SWAC), Guelph (Farm$mart) and Kemptville (Eastern Ontario Crop Day) Field Crop staff provide leadership, planning and implementation roles to these conferences and appreciate the contribution made by the University of Guelph, regional groups of the Ontario Soil and Crop Improvement Association and sponsors. As well, many OMAFRA Crop Tech staff speak at these conferences All 3 conferences were well attended in 2005 with strong positive feedback on the evaluations.

Diagnostic/Demo Days

Staff also contribute to 3 Diagnostic Days held at Ridgetown, Elora and Kemptville that focus on hands on training of consultants and interested growers. The Campuss and the Dept of Plant Agriculture are key to developing useful teaching plots and demonstrations.

A grower field day was held to profile the research being conducted under the federal Greenhouse Gas funding program administered by the Soil Conservation Council of Canada. The tour was held in the Niagara area in partnership with the Golden Horseshoe region of the Ontario Soil and Crop Improvement Association. Approximately 90 people attended this event organized by Ian McDonald.

Meetings:
The team provides information to producers through variety of meetings and events. A partial list of these includes; Forage Focus, Soil Quality Workshop, Green House Gas Road show, Corn/Soybeans/Wheat production meeting, Innovative Farmers Association of Ontario, Ontario Soil and Crop Improvement Association, commodity groups and industry events, etc.

The Field Crops Unit of Crop Technology Branch is committed to providing input into research and services needs and assisting to provide solutions to the needs identified by the Field Crop Research and Services Committee.

Cereals

State of the Industry

From INCREDIBLE to AWFUL. The record acreage and record yields of 2006 have given way to dismal plantings into extremely poor conditions for the crop next year (2007). Spring cereal acreage blipped up nicely in 2006, with average to above average yields. Quality was generally good across all cereals, although oat test weights tended to be lower, and hard red winter wheat had very low protein levels. The shift in rust to new races, overcoming genetic resistance for both winter wheat and oat, is of concern for production next year and into the future.

Winter cereals: INCREDIBLE!! A record acreage of 1.1 million acres coupled with a new yield record of 85.5 bu/ac. The fall of 2005 was nearly ideal for wheat plantings, with warm temperatures through early October and an early soybean harvest. Of the 1.1 million acres planted, at least 80% was planted early or on-time, giving excellent yield potential. Growth in the fall was excellent on early plantings, although cool weather through the last half of October and November resulted in less growth on crops planted in a more normal time frame. Mild conditions in early January destroyed the snow cover, and cold temperatures through late January without snow raised concerns over low temperature injury. However, the crop showed virtually no injury from this weather stress as the season progressed.

Warm temperatures again took the snow away in March, and between January and March conditions there was more frost heave injury than normal. Shallow planting depths exacerbated this problem. Many crops were extremely thin right through to harvest from this injury, and yield predictions on these thin fields by most agronomists missed the mark

widely. Early planting and mild winter temperatures had the wheat crop 10 days ahead of normal at this time. The exception was in eastern Ontario where lack of snow and icing conditions destroyed over 50% of the winter wheat crop.

April was ideal for timely nitrogen applications. Several severe cold spells (as low as -8C) through late April and May destroyed all green tissue in some locations. These cold spells made herbicide applications a bit tricky, but not impossible. With the wheat crop still 7 to 10 days ahead of normal, these freezing night temperatures in late May were a major concern with the earliest heading fields in the southwest. In a few isolated locations freezing temperatures did interfere with pollination and small areas of these fields yielded ZERO. A near miss for a major impact on the crop!

Overwintering rust was found by Cargill crop scouts in a few fields in the Woodstock to Mount Forest corridor. Overwintering rust is unusual, and was a harbinger of things to come. As the season progressed, rust was the main disease concern, although the source of the rust outbreak was not related overwintering. The resistance of several major varieties, particularly Vienna and FT Wonder, was overcome as the rust race shifted to be able to attack these varieties. Both of these varieties are among our most Fusarium tolerant lines. Huge yield responses were seen in these varieties to foliar disease control products, while responses in other varieties were extremely small.

The other diseases of note this year were the viral diseases (wheat soil borne mosaic, spindle streak mosaic) and Cephalosporium stripe. Cephalosporium stripe was more prevalent than ever before, and quite related to variety. Yields dropped by 10% or more in severely affected fields. There are no effective control options for these diseases.

Fortunately, fusarium was a non-issue in this year's wheat crop. Dwarf bunt, while not ubiquitous, was present at much higher levels than expected, showing that seed treatments are not giving 100% control. Armyworm was the only insect of note, and did cause significant damage in a few isolated locations, but the overall impact of all three of these was not significant.

Harvest was a tough go, particularly through the London-Woodstock corridor. Rainfall prevented harvest for a two week period for a greater circle around this area, and for three to four weeks in this band. As a result, mildew downgraded some crop across the southwest, with sprouting and low falling number lowering grade in the heart of the affected area. The soft white winter crop was affected the most, with almost no top quality soft white harvested.

As harvest unfolded, yields were spectacular, ending up a full 10% above the previous provincial record, at 85.5 bu/ac (previous record in 2003 of 77.5). Protein levels were a full point below year ago levels, meaning that much of the hard red winter crop did not achieve protein premiums. All other quality parameters were excellent, with the 2006 Ontario winter wheat crop being well received by all end users.

Fall plantings: Wheat acreage this fall is dismal, at about 475,000 acres, barely ½ of intentions, with nearly all wheat planted later than desirable and into less than ideal conditions. This fall has been the complete opposite of the fall of 2005, and almost NO wheat looks pretty as of this report. Many growers have been forced to roll futures contracts forward to the 08 harvest, as they simply were unable to plant wheat. Fall conditions have continued unusually wet and cool, giving rise to the potential for more acres of fall kill (drownout) than normal. This is extremely disappointing given the mainstay that wheat has become in many growers profit column.

Spring Cereals: Acreage of all spring cereals increased this year, with poor crop prices and high input costs for other crops. Spring wheat increased the most at 40%, with barley showing the least increase at 10%. Amazingly, and almost disturbingly, mixed grain acreage spiked up 20%, even though this crop has very limited marketability.

Planting moved ahead rapidly into excellent soil conditions, with 65% of the crop planted by April 25th and fully 80% of the crop planted by May 5th. There was not as much opportunity for frost seeding as some growers would have hoped for, but acreage that was frost seeded in late March once again showed huge yield gains for this practice (40%).

The crop enjoyed predominantly cool, dry conditions across much of the growing region. These conditions kept leaf disease levels extremely low until late in the year, when spot blotch (barley), rust (oat and wheat), and fusarium (wheat) became a concern. Dry conditions allowed both fertilizer and herbicide applications to be done in a timely manner, making it a relatively easy start to the season. Unfortunately, the dry weather continued in some areas, with crops on eroded knolls withering and producing very little in these regions. Weed pressure also developed in these regions, particularly foxtail, forcing growers to spray for annual grasses that they do not normally have to control.

Physiological fleck was prevalent in many fields this year, and many growers confused this for disease. Disease pressure was significant in barley on barley fields, but this is simply a rotation issue. Spot blotch developed late in the season on barley, and did give rise to some shrunken kernels, but was not of major impact. Fusarium hit the spring wheat crop, with a near miss in many areas. While the bulk of the crop was clean, some fields did reach as high as 9% fusarium. Again, in most of these fields the spring wheat was grown on corn residue, and rotation played a major role in this outcome.

RUST! The race of leaf (crown) rust has shifted in oat, and has overcome much of the genetic resistance growers have relied upon over the past years. While new genetics are in the pipeline, oat growers will need to scout closely in the short term, and the benefit from foliar fungicides will likely increase. Test weight was significantly reduced in many oat fields due to rust infestations. Similar to winter wheat, rust also hit the spring wheat crop, with genetic differences again becoming more defined.

European chaffer destroyed some spring cereal fields on sandy soils along Georgian Bay. Wireworm was another insect pest in specific fields causing severe injury. Armyworm was a significant problem in some areas in the Ottawa valley and Alliston area, with some fields requiring control measures. Fortunately, natural parasites were sufficient to destroy the pest in many locations. Cereal leaf beetle was found at a number of locations, but similar to armyworm, natural parasites were effective in limiting damage in most fields.

Dry weather took its toll as harvest results came in. Yields are only average for the barley, oat and mixed grain crop, at about 2600 lbs/ac (2900 kg/ha). Test weights were barley marginal for the oat crop, with the importance of early planting for high quality oat again being driven home. Spring wheat yields were somewhat better, about 6% above average at 49.2 bu/ac. Protein and quality of the spring wheat crop was excellent, although some downgrading due to mildew did occur in later harvested fields. Much of the improved yield of spring wheat can again be attributed to early planting, and the fact that a higher proportion of the crop is grown in the areas that were less affected by the dry weather.

As always, this report would not be complete without discussing straw yields from barley, the only reason many growers have for growing the crop. With the exception of the driest

areas, most growers were pleased with good straw yields due to cool conditions, and thus, will grow barley yet again next year, despite spring wheat being more profitable.
Acreage intentions for 2007 are much increased for spring wheat, with heavy soil areas that were unable to plant winter wheat now banking on frost seeding spring wheat into those acres. As prices improve for corn and soybean, acreage intentions for barley and mixed grain continue to slide. Oat acreage intentions appear to be less impacted by prices for these other commodities, although intentions appear down slightly. All this, of course, may change drastically by spring!

A) **Emerging Issues and Needs for 2007**

Evolution of the Performance Testing System

The OCCC recognizes the importance of performance testing and is endeavouring to adapt the system to secure its future. Several groups within the committee are developing proposals on protocols and procedures, orthogonality, and cost recovery for performance and fusarium testing.

Hard White Spring Wheat

Hard White Spring (HWS) wheat acres have expanded in Western Canada to a point where over 1 million MT were produced last year. As more Flour Mills in Ontario start to grind this wheat the opportunity for the use of Ontario Grown HWS in blends increases. The HWS varieties available for the planting are currently Western types and not well suited for Ontario. Investment in breeding, screening and testing in Ontario should be considered.

Barley Breeding

The committee thanks AAFC for filling the oat breeding position at ECORC vacated when Dr. A. R. McElroy retired. We look forward to working with Dr. Weikai Yan. However, Dr. K.M. Ho, the barley breeder, has retired leaving only ½ of a breeding position (Dr. A. Choo) for Ontario. The committee strongly encourages AAFC to quickly fill the barley breeding position vacated by Dr. Ho so that the priority areas on barley breeding can be undertaken (food uses, fusarium resistance, etc.)

Spring Wheat Fusarium

The need for improved fusarium tolerance in spring wheat varieties has become critical. Ontario grinds 1.3 million tonnes of hard red spring quality wheat every year. Current Ontario production supplies only about 0.1 million tonnes. Low yields and immature crops are forcing farmers in shorter season heat unit areas (below 2650 CHU) to search for alternative crops. Spring wheat should be the obvious choice.

Unfortunately growers are not willing to increase spring wheat acres due to high incidence of fusarium. Fungicides to control fusarium (folicur) do not appear as effective in increasing yield and decreasing DON in spring crops thereby reducing use of this technology by

growers. While significant progress has been made with winter wheat and improved fusarium tolerance, the best spring wheat varieties would still be considered susceptible to very susceptible.

The need to fill this void, and provide growers in this heat unit zone with an economically viable crop, is critical. Without better options soon, many growers may find it nearly impossible to continue in agriculture. There was more fusarium in the 2006 spring wheat crop than in the winter crop.

Wheat Falling Number

Temperature stress (low temperature) has been found to cause alpha amylase activity in specific genetic breeding lines. Increased alpha amylase results in lower falling number in the harvested grain, even in the absence of rain during harvest. Varieties that contain this genetic trait need to be identified, and growers made aware of this concern.

Black Hole Concept

Agricorp sets planting deadlines by region for coverage under the crop insurance program. This often drives producers to plant wheat in poor conditions in late October, to beat the deadline, with disappointing results.

There is sound physiological science that suggests this may be incorrect. November or December planted wheat may be a better option, and yield higher, than late October wheat. This hypothesis needs to be evaluated, and if correct, crop insurance deadlines should be adjusted accordingly.

Durum Wheat

Ontario does not grow any of the durum wheat used to make pasta consumed by Ontarions. A new variety is under development. Agronomic practices are needed to support this emerging opportunity.

Crop Insurance

Groundwork is needed to be able to include emerging crops such as hard white spring wheat and durum wheat in crop insurance plans to reduce producer risk associated with uptake of these new-to-Ontario crops.

B) **Service Priorities for 2007**

Frost Seeding research has shown up to 42% yield increase. Extension and demonstration of this technology is required to increase uptake.

DONCAST: Improve grower confidence and understanding of improved model.

Extension and Information Validation: tillage, seeding rates, herbicide and fungicide information, timing and placement of fertilizers, benefits of fungicides in oat production.

Segregation of Wheat Types: articles, presentations on the need and reasons to maintain purity in the various classes of wheat.

Development of an interactive website for performance testing data to improve timeliness, ease of access and use of the data.

C) **OCCC Objectives for 2007**

1) Fusarium ratings system for spring wheat and barley that offers breeders, researchers and growers better information
2) Replacement of the Barley Breeding position at AAFC
3) Education of growers, elevators and millers on the need to maintain class (type) purity
4) Improved nitrogen management
5) Continued delivery of performance test information
6) Expansion of market opportunities, especially in food uses of cereal grains
7) Input on the regulatory framework for variety registration to reflect Ontario's needs
8) Removal of KVD as a registration requirement for white wheat in Ontario

Corn

State of the Industry

Production

Grain corn yields in Ontario were at an all time high in many parts of the province in 2006 with the provincial average reaching 150 bu/ac. These record breaking yields can be attributed to ideal corn planting conditions, timely rainfall, increased photosynthetic rates, and above average CHU accumulation.

Table 1. Grain corn acreage, production and value statistics for Ontario 1991-2006

Year	Area Harvested ('000,000 acres)	Yield (bu/acre)	Production ('000, 000 bu)	Estimated Value ('000,000 $)
2006/07*	2.0	135	270	1,040
2005/06	1.6	150	240	880
2004/05	1.6	131	210	572
2003/04	1.7	127	216	782
2002/03	1.9	113	215	841
2001/02	1.9	102	194	684
2000/01	1.7	105	179	576
1999/00	1.8	128	230	654
1998/99	1.9	129	245	702
1997/98	1.8	115	207	800
1996/97	1.8	108	194	838
1995/96	1.7	117	199	929
1994/95	1.6	121	194	619
1993/94	1.7	108	184	602
1992/93	1.4	97	136	371
1991/92	1.9	111	211	558

*Estimated Yield

Corn Price Recovery

Weekly Average Ontario Commodity Prices: Dec 1, 2006

	THIS WEEK (Nov 27 – Dec 1)	LAST WEEK (Nov 20 – Nov 24)	1 YEAR AGO
Corn Spot Price (Chatham $/bu)	$3.47	$3.33	$2.39
Corn Futures Fall '07 (Chatham $/bu)	$3.79	$3.67	$2.84
CBOT Corn Spot Price (US$/bu)	$3.87	$3.66	$2.02

Note: CBOT significantly higher, basis dragged down by higher Canadian dollar and market instability caused by elevated mycotoxin levels in corn

Corn 2006 Production Notes:

- producers chased early planting opportunities hard again this year with most planting completed by May 12.
- early crop suffered from some moisture and temp stress, but ideal conditions in July and August resulted in good pollination, uniform ears and high yields

- Northern Leaf blight was the dominant leaf disease in 2006 and in many areas it became quite significant. Some premature senescence was noticed in 2006 which was attributed to large sink (yield potential) and limited source (due to leaf diseases). Fear mongering about weak stalks and lodging that would come as a result of this did not materialize.
- corn leaf disease survey was conducted again in 2006 by AAFC and OMAFRA and of note was the increased presence of Gray Leaf Spot which up until 5 years had not been detected.
- ear moulds and the resulting mycotoxins became the black eye on what might have been a Cinderella year for corn

Corn Ear Moulds and Mycotoxins

- weather condition in the pre-silk and pollination period contributed to infection via silk channel
- humid conditions and frequent rainfall in September promoted the development of the mould and the production mycotoxins
- DON levels were quite low - to undetectable in the areas east of Toronto, the situation worsened as you move towards the extreme southwest. OMAFRA / UGAR field sampling indicated that nearly 50 % of the field in the Chatham-Kent, Essex, and Elgin had DON levels higher than 6 PPM
- much of the early harvested was grade 2 (visual grade and test weight) but may have had DON levels in many cases in the 2-5 range
- Agricorp to date has not paid a single claim for mouldy corn as the industry continues to blend and market corn.
- the fact that the ethanol plants are accepting corn at 4 and 5 PPM DON has provided an some outlet for the trade to move corn that is not suitable for feed
- hybrid evaluation for mould resistance is mainly in the hands of the seed companies as OCC, UGAR, and the seed companies have not been able to agree on a path forward to evaluate OCC trials for mould susceptibility or mycotoxin levels

Ethanol Continues to Gain Momentum

- renewable fuels new standard will require an average of 5% ethanol in all gasoline by January 1, 2007.
- ethanol plants in Chatham and Sarnia capable of using 38 million bushel of grain corn per year.
- new plants under construction (IGPC, Aylmer) or proposed (Hensall) could nearly double this amount.
- new technology provides edge to ethanol production. According to National Corn Growers Association research has increased the recovery of ethanol from 10.1 litres per bushel to 10.6 litres per bushel. The much disputed net energy balance of corn-based ethanol has risen from 1.35 in 2002 to 1.67 in 2004.

OCC Performance Trials

Private sector development and evaluation of corn hybrids for Ontario continues to be very active. Seed company support for and participation within the OCC hybrid performance was strong in 2006. 19 out of 21 trials produced good data and were included in this years report. All data was made available on the internet at www.gocorn.net on November 28, 2006! Given that most seed companies have early order deadlines of the end of November this information came out in excellent time.

2006 also represented the first year where OCC directed “Hybrid Management Trials” that were supported by OCPA and the seed industry. These trials set a new precedent in providing additional information to growers and the seed industry over and above the traditional yield, moisture and broken stalk measurements.

Funding from OCPA allowed for the creation of a web-based data set of the OCC data. This data set includes all hybrid yield data from 1987 to 2006. The database can be searched for multi-year/multi-hybrid comparisons.

SOYBEANS

State of the Industry

The 2006 overall provincial yield average will be a record high. Some producers have harvested their highest soybeans yields ever this year. With 30% of soybean yields reported the provincial average to date is 48 bu/ac. Last year's record setting yield was 41.5 bu/ac. Although overall seed size and quality was normal, there was considerably more phomopsis seed decay, downy mildew and weathering of seed than normal. Some producers lost IP premiums because of reduced seed quality. Despite the wet fall, overall seed size, colour, and quality has held up well.

Planting:

Excellent early spring weather and good soil conditions resulted in an early start to soybean planting. Approximately 30% of Ontario acreage was planted between May 1st and May 10th. Rain which started on May 11th, halted planting progress until May 22nd in Southwestern Ontario. Planting resumed in late May with most producers finishing their planting by the end of May. Due to the cold wet conditions that started May 11 ,a considerable amount of replant was necessary especially on heavy clay soils. About 5% of the Ontario crop was replanted due to poor emergence and these fields emerged well. Beans planted after May 22nd took advantage of excellent soil and weather conditions for quick emergence and a good start to the growing season.

Growing Season:
Soybeans have incredible yield potential given the right amount of heat (crop heat units) and rainfall. Soybeans are well known to respond to timely rainfall especially during July and August. The 2006 growing season was above average for Crop Heat Units (CHU) and precipitation. From May 1st to August 31st weather stations across Ontario recorded an average of 75 CHU's more than the 30 year average. Timely rains during July and August resulted in excellent pod set and good seed size. Most areas received significantly more rain in 2006 compared to 2005 during the May 1st to August 31st period.

Soybean Insects:
Bean leaf beetle pressure was high this spring and late summer. Some areas in Essex and Kent needed foliar insecticide application to control this pest. Leaf feeding (below economic thresholds) was evident in many fields west of Toronto and as far north as Grey county. Late season economic thresholds were reached in localized areas as far north as Huron county. Bean leaf beetles have not been a problem this far north in previous years. This pest will require close scrutiny in 2007 and control measures taken once economic thresholds are reached.Soybean aphid populations were observed in south western Ontario but fields stayed well below economic thresholds. Aphid numbers were higher in eastern Ontario with some fields almost reaching threshold by late in the season. However, aphid populations fell in late August so no fields were sprayed in the province. The soybean aphid spray threshold is based on observing 250 aphids per plant with increasing aphid populations.

Harvest was frustrated by excessive rainfall and cloudy weather during most of the September through November period. The 2006 harvest season was the wettest and cloudiest in recent memory. As of December 151 approximately 5-10% of the crop has still not been harvested due to wet conditions.

Production Challenges for 2007

Increased Acreage:
Wet weather has significantly reduced winter wheat acreage planting intentions. Some of those intended wheat acres will likely be planted back into soybeans and this lack of rotation may increase disease and insect pressure in 2007. SCN is present in counties as far east as Brant and Peel and as far north as Bruce. Growers in these areas will need to minimize the impact and spread of this pest through good management practices. Growing susceptible varieties back to back will increase SCN populations in affected fields and greatly reduce yields. Monitoring individual fields for this pest will be important next season so that the right management decisions can be implemented in coming years.

Soil Compaction:
Many fields were harvested under wet soil conditions this fall resulting in ruts and other damage. Many producers turned back to the plow to level ruts and help reduce compaction. More tillage increases costs, soil erosion, and decrease overall soil health. Compaction is likely to be evident in 2007 and management decisions should be implemented to reduce

other stresses which may over emphasize the compaction effects.

Soybean Rust:
Soybean rust was not found in Ontario in 2006. Soybean rust did however move further north in the United States, especially late this fall. Currently rust has infected soybeans in 231 different counties in 15 states: the most northern infection being reported in LaFayette, Indiana. Increased soybean and host plant infection will result in more spore formation. Close monitoring of this disease is essential. Ontario will need to be vigilant in 2007 to monitor the spread of rust, and be prepared to apply control measures if necessary.

Maple Leaf Foods has announced they will no longer export IP soybeans. They have been one of the major exporters over the last 20 years. Other Canadian exporters are expected to pick up some of this market share. The impact on the Ontario soybean IP sector will not be known until next year. There is expected to be continued downward pressure on IP premiums farmers are being paid. There has been increasing competition in Asia for the IP soybean market. Variouscountries including China and the US are making headway into the Asian market and overall demand seems to have softened. . There has been renewed interest in IP soybeans due to low soybean prices.

Update on soybean aphid resistance: The University of Guelph and AAFC at Harrow and Ottawa have been collaborating on the development of aphid resistant soybean lines for several years now. A number of crosses have been made at both institutions using old southern U.S. varieties, Jackson, Palmetto and Downling as published sources of resistance. At Harrow, Dr. Poysa has tested the progeny of crosses with Dowling and Palmetto in the field in 2005 in which the population of aphids was dramatically greater than in 2006. The results indicated that the progeny which was supposed to be resistant to aphids, showed only slightly better results than the susceptible variety Harovinton. There was approximately 40% aphid kill on Harovinton vs. 60% aphid kill on the resistant progeny obtained from the University of Illinois (maturity group 2 lines from Brian Diers), which were grown at Harrow. That is probably still significant but not nearly as good as the published papers would suggest. Dr. Poysa Vaino continued to evaluate this material in the field in 2006 year but the data are of little use since the aphid populations were very low. The material will be further tested in 2007. Beside the above-two sources, the third southern variety, Jackson also carries apparently different resistance gene(s). Both Vaino and AblettlRajcan at Guelph have made crosses with all three sources and indications are that Jackson might have something different, potentially better. At Guelph, Ablett/Rajcan have made crosses and backcrosses a couple of years ago, which material is now at selfing stages. The backcross populations were evaluated by Dr. Art Schaafsma using his indoor aphid rearing evaluation system
at the Ridgetown greenhouses. The material showed promising results at the time but now we have to confirm that on the progeny. It may take another 3-4 years away to release that material to our growers, provided the resistance is confirmed.

The OOPSCC website www.oopscc.org has been renamed more conveniently towww.gosoy.ca . It continues to be a valuable tool for producers and plant breeders.

Sponsors enter required data on the web, which significantly improves efficiency over the paper system. The data is also available on the web site for producers. It is now possible for producers to use this interactive tool to create head to head comparisons of specific varieties that are of interest to them. For

the first time this year, the preliminary tables and summaries are available to sponsors for viewing prior to publication. We have also streamlined data entry and uploading onto just one web site managed by Tom Welacky and Dale Andreson at Harrow. This has simplified the process tremendously.

A strong performance testing system is key to the continued success of the soybean industry in Ontario. With the development of new traits through biotechnology, this performance data is critical in evaluating the potential of new varieties.

Canola

State of the Industry

Spring Canola:

In 2006, Ontario farmers planted one of the smallest canola crops on record of approximately 13,000 acres because of concerns with marketing options and higher input costs. This seasons weather conditions were much more favourable than in 2005, resulting in above average yields, ranging from 1700 Ibs/ac to a phenomenal 3500 Ib/ac. Crop quality was generally excellent, although there were a couple of reports of canola not being accepted by ADM due to brown seed content. The early planting of the crop in mid to late April into ideal soil conditions contributed to the good yields experienced. Early planting promotes earlier canopy growth and row closure when conditions are cooler and more favourable for canola development. In particular, the optimum daytime temperature for canola is 20 - 25°C, with nighttime temperatures in the mid teens. Moderate temperatures and adequate soil moisture conditions during July and August in most canola growing areas allowed for good pod set and grain fill. The lower stress experienced this year compared to 2005 contributed to higher yields and improved quality of grain.

Green stems at maturity resulted in a delayed and slower harvest in some cases. The exact cause of green stem syndrome is not known. One explanation is that plants accumulate excess nitrogen and sugars in the stalk relative to the sink capacity of the pods and seeds. Without sufficient sink volume, sugars accumulate in stems leading to the green stem syndrome.

Insect and disease pressure was lower than normal, although sclerotinia pressure was high in some stands. Swede midge injury was identified in several fields of late planted canola in counties with known infestation. Swede midge is a relatively new pest of canola, and its potential to impact the crop is not yet well understood. Further information and updates on swede midge can be found on the OMAFRA Canola Page at http://www.omafra.gov.on.ca/english/crops/facts/03-035.htm

Winter Canola

Survival of winter canola tended to be poor in the southwest on heavier clay soils, and better in other areas which had well drained soils. Heaving and root rot appeared to be the principal factors affecting survival. Cool temperatures through most of May and June favoured development of a thick canopy and resulted in early pollination and good pod set.

Populations of cabbage seedpod weevil were lower than in previous years. Sclerotinia pressure was generally low in most stands. Yields of winter canola generally ranged from 1 - 1.5 t/ac, with good quality (Grade 1).

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Dry conditions through August and early September allowed timely planting of winter canola this fall. Extremely wet conditions following emergence delayed plant development, with some stands not reaching the 4- 6 leaf stage considered ideal for winter survival. Slug pressure was incredibly high in places, resulting in the complete loss of some stands on conventionally tilled land, which is rare. Acreage is estimated to be similar to previous years (4 - 5,000 ac).

Emerging Needs and Issues

1. Continued strong support of genetic enhancement for production stability and risk management is essential. Continued support of public soybean breeding programs is required to ensure new varieties suited for Ontario's unique climate are bred. With the emergence of new pests such as soybean aphids and now the possibility of soybean rust resistance varieties to these pests will be an important tool to both reduce their impact and to reduce the amount of pesticides that will be used. Resistant varieties to these two new pests would significantly reduce the amount of pesticides required in Ontario.

2. Reliable third party performance data is vital information to Ontario farmers. All levels should support performance Testing of Soybeans and Canola.

3. Current support of agricultural plant genomics is low in Ontario and needs improvement. The science of Genomics is the study of the activity of many genes in time and space. The information generated from genomics will be available to scientists studying individual genes or processes. Genomics funding needs to be broad based and come from both the provincial and federal levels.

4. Best Management Practices concerning new and emerging pests such as soybean aphids and soybean rust must be established as quickly as possible. Lower production over the last few years in soybeans has been largely due to pests.

Oil Seed Recommendations

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Forages

State of the Industry

Most areas in southern Ontario had excellent seasonal forage yields with good quality. Alfalfa winterkill was again experienced in eastern Ontario, although not as extensive as 2005.

Fast tracking has become very popular where acceptable US and other Canadian data has been available. Fast tracking has been extended to other forage species provided the use of checks follows the guidelines of the OFCC. Fast tracking has resulted in a number of varieties being recommended in the province without any public data appearing in the recommending brochure. The committee had attempted to alleviate this problem by requiring companies to enter into OFCC trials at the time of registration. CFIA has rejected this procedure as a condition of registration. The dilemma has not been solved with the likely result that many more varieties will appear without data in the brochure.

Manpower issues dominated the discussion of the future of the committee. Simply put there are not enough persons on the committee to sustain the committee in the event of further reductions in staffing. The chair person who had previously represented New Liskeard was replaced by the representative from the Ontario Forage Council. The forage position at Kemptville was vacated in

2004 and has not been refilled. The earlier vacated forage position at New Liskeard has likewise not been refilled.

One variety in each of alfalfa, timothy and orchard grass were supported based on OFCC data. Five alfalfa varieties were supported on the fast track procedure. Five alfalfa varieties were deleted from the recommending list.

There were 19 new forage entries in 2006 of which 18 were alfalfa and one was orchardgrass.

A new trial at Thorndale under the direction of Ecologistics was established in 2006. This site will be inspected and treated as any other OFCC public trial.

Performance trials are well publicised by the committee with 38,000 brochures printed. The brochures were inserted in dairy, beef and sheep producer's publications as well as circulation by seed companies and OMAF. In addition one newspaper printed 13,000 copies at no cost to the committee.

Ontario Forage 2006 Seasonal Summary

Most areas in southern Ontario had excellent seasonal forage yields with good quality. Stored hay and haylage inventories are at average to very high levels, with downward pressure on prices compared to a year ago. The most notable exception was the north-west, where significantly reduced yields and inventories were experienced in Rainy River and Kenora. Lower yields due to dry weather were also experienced in parts of Algoma, Manitoulin, Bruce, Grey, Simcoe and Huron. Wet weather in May and June frustrated attempts at making quality first-cut in some eastern Ontario counties. High forage yields provided a great recovery in some parts of the province, such as the east-central counties, after the dry weather and hay shortages of 2005.

Alfalfa Winterkill In Eastern Ontario

Alfalfa winterkill was again experienced in eastern Ontario, although not as extensive as 2005. Up to 40% of the alfalfa was winterkilled with some fields totally destroyed. The most affected area extended from Brockville to the Quebec border and up to the Ottawa. Stands north of Ottawa survived and yielded well in 2006. Poor winter hardening was the result of warm fall temperatures and a late frost, followed by wet weather and saturated soils in December 2005. Extremely cold weather with little snow cover in early January likely resulted in extensive freezing damage. Fields cut during the Critical Fall Harvest Period were more severely affected. Other contributing factors included ice sheeting, alfalfa root disease complexes and crown heaving on heavier soils. Diseased older stands on flat, clay soil types were most susceptible to damage. Where alfalfa winterkill occurred, there was extensive new alfalfa seedings, some "patching", as well as the seeding of emergency annual forages such as cereals, cereal-pea mixtures, corn silage and sorghums.

Alfalfa winterkill was not significant in most other parts of the province; even in areas where there was extensive harvesting during the 2005 Critical Fall Harvest Period occurred because of low forage inventories and good harvest weather.

New Seedings

Winter survival of 2005 summer seedings was poor where extended dry conditions in August and September reduced or delayed emergence going into the fall.

Seeding conditions in April and early-May of this year were excellent. Most new forage seedings were in the ground in excellent time. While most areas received adequate moisture in May and June, some areas were dry, such as parts of Huron, Bruce, Grey and Simcoe. Where rainfall was delayed, the success of new forage seedings was less consistent. Annual broadleaf weed control was generally good.

Summer seedings that were completed during optimum seeding dates appear to be in good shape. Some alfalfa seedings that were done later experienced delayed emergence because of the drier August weather and are at a higher risk of reduced stand establishment.

Insects

Some alfalfa weevil was reported at threshold levels in the southwest, but very little spraying was required. Potato leafhopper levels were above threshold levels in many parts of the province, particularly in the counties bordering Lake Erie. Very few of these acres were sprayed, but an increasing number of affected farmers are considering the use of available PLH resistant alfalfa varieties.

Hay Inventories Tight In Some Areas

Hay yields and inventories are reduced in some of the cow-calf areas of north-western Ontario because of dry weather, particularly Rainy River and Kenora. Forage rainfall crop insurance claims were also received in parts of Manitoulin, Algoma, Huron, Bruce, Grey and Simcoe counties. Agricorp paid out $2.2 million this year to 400 customers, down significantly from 2005. Rainfall data can be viewed on the Agricorp website at www.agricorp.com.

First Cut Yields and Quality

The break in alfalfa dormancy occurred about as expected in late-March to early-April, depending on location. Similar to 2004, there was a lag in temperatures in early-April, followed by a gradual increase into May.

Optimum harvest dates of first-cut “dairy quality” alfalfa haylage typically occurred about the third week of May for much of southern Ontario. Yields of early-cut alfalfa haylage were generally excellent. Rain during the last week of May delayed silo filling for some farmers, resulting in slightly lower than desired crude protein levels with higher fibre levels than the benchmark 20 - 30 - 40 targets. However, according to data supplied by Agri-Food Laboratories, fibre digestibilities (NDFD) were generally higher than expected.

Weather conditions for making dry hay were generally good in early-June, but periods of rain in late-June created challenges for some farmers. Parts of eastern Ontario had some difficulty making dry first-cut hay without rain-damage due to excessive June rainfall. Some horse hay producers making hay in late-June and early-July were frustrated by rainy weather. Inventories of “horse quality” hay with no rain damage or dust appear to be adequate. With the good conditions for making dry hay in early-June, the need for propionic acid application or making baleage was reduced.

Second and Third Cuts

Second and third cut yields were variable, depending on rainfall in localized areas, but were typically well above average. Second-cut laboratory analysis indicates that most samples have adequate protein, but higher than normal fibre levels. Many of the third and fourth-cut analysis indicate very high protein with very low fibre levels.

Pastures

Pasture growth started a little slow, with cool temperatures and limited rainfall during April and early-May. By mid-May, soil moisture levels were restored allowing pastures to progress well. In much of the cow-calf areas, particularly Bruce, Grey, and Simcoe counties, June and early-July were typically hot and drier, resulting in low soil moistures levels, Timely rains by mid-July restored moisture levels. Growth continued at above average levels through late July, August and September. Livestock gains on pasture have typically been reported as above average with good quality grass available over the grazing season.

There were several exceptions to these good growing conditions. Rainy River, Algoma and Manitoulin were dry to extremely dry throughout the summer months and supplemental feeding by mid-season. The Algoma Community Pasture removed cattle from pasture in August.

An increased adoption of rotational grazing practices has resulted in increased forage productivity. Increased sales of portable and temporary fence components have been reported by the fence supply industry. These management tools allow the producer to increase forage utilization and provide rest periods for forage re-growth to occur.

Annual forages, such as sorghum-sudan grass, turnips and late-planted oats, are increasingly being utilized in grazing and summer feeding programs. These crops provide an opportunity to fill some of the low spots that occur in the perennial forage growth curve, and extend the grazing season further into the fall.

Critical Fall Harvest Period

Hayfields looked excellent in September in most areas, with strong fall regrowth. Some forage acreage in parts of the province with a lower risk of alfalfa winterkill was harvested during the Critical Fall Harvest Period. With heavy growth, some producers took a final cut after the killing frost, which typically occurred the first week of October.

Corn Silage

Corn silage yield and quality were generally good. There was a great deal of variation in moisture and maturity between fields. Some corn silage was ready to harvest in early-September, while others continued harvest into the first week of October. Some corn silage was harvested at moisture that was too low, while some was too wet. With high yields, some producers increased cutting height to improve digestible energy. There is some concern about ear moulds creating a potential for high mycotoxin levels in corn silage, and subsequent nutritional problems in dairy herds.

Challenges for 2007

Managing Alfalfa Winterkill

Alfalfa winterkill continues to be a serious issue in some parts of the province, particularly in eastern Ontario. There are many contributing risk factors, including the weather, soil type, drainage, disease complex, potato leafhopper damage, variety selection, fertility, and cutting management. Options to reduce winterkill involve lowering plant stress to a minimum. These include improved drainage and soil structure, controlling insect pressure, ensuring adequate fertility, selection of varieties that are winter hardy and highly disease resistant, avoiding very short cutting intervals, and respecting the Critical Fall Harvest Period.
www.omafra.gov.on.ca/english/crops/facts/91-072.htm

Potato Leafhopper

Potato leafhopper (PLH) levels are frequently high in some parts of the province (such as the Lake Erie counties), resulting in significant damage, yield loss and seeding failures. New alfalfa seedings are particularly vulnerable. Potato leafhopper damage in alfalfa is frequently underestimated. More scouting of alfalfa fields needs to be done, with insecticide applied when scouting thresholds are exceeded. PLH resistant varieties should be considered in areas where PLH levels are typically high.
www.omafra.gov.on.ca/english/crops/facts/info_potatoleafhopper.html

Strategies To Ensure Adequate Forage Inventories During Dry Weather

Dry weather impacts pasture and forage yields and reduces forage inventories. Farmers must develop management strategies in the event of dry weather that include rotational grazing, the use of drought resistant forage species, and the use of annual forages including corn silage. For more information refer to the following website.
www.omafra.gov.on.ca/english/crops/facts/info_fordry.htm

Rotational Grazing

Changing from a continuous grazing to rotational grazing system by subdividing fields and moving livestock frequently can result in significantly more production. A rotational grazing system can double the forage production over a continuous grazing system, and reduce the

amount of hay fed during the dry summer slump. Rotational grazing with 5 or 6 paddocks, 5 to 7 days grazing, and 28 to 30 days of rest works well. Even a less intensive 4 paddock, 10 days grazing, 30 day rest system can increase production over continuous grazing. www.omafra.gov.on.ca/english/crops/pub19/p19toc4.htm

Harvest Management For Quality Dry Hay

Frequent rains and narrow haying windows result in reduced amounts of quality dry hay without rain damage or mould. Predicting the weather can be frustrating, but proper conditioner maintenance and adjustment, strategic windrow management and raking, and the use of propionic acid as a hay preservative, can assist producers in reducing the risk of poor hay quality.

Variety Committee Concerns

Fast tracking has become very popular where acceptable US and other Canadian data has been available. Fast tracking has been extended to other forage species provided the use of checks follows the guidelines of the OFCC. In the case of perennial ryegrass acceptable checks have been established for testing outside of Ontario. Fast tracking has resulted in a number of varieties being recommended in the province without any public data appearing in the recommending brochure. The committee had attempted to alleviate this problem by requiring companies to enter into OFCC trials at the time of registration. CFIA has rejected this procedure as a condition of registration. Interim registration was discussed, but discounted due to the perennial nature of the crop and resulting company long term commitments. The dilemma has not been solved with the likely result that many more varieties will appear without sufficient Ontario public data to provided brochure recommending data.

Manpower issues dominated the discussion of the future of the committee. Simply put there are not enough persons on the committee to sustain the committee in the event of further reductions in staffing. The chair person who had previously represented New Liskeard was replaced by the representative from the Ontario Forage Council.

OFCC issues were again dominated by the budgeting and funding challenges of the Elora Research Station variety testing program in the wake of the 25 per cent increase in Elora testing fees with a 15 per cent increase at the Campuss.

Ontario ForageSuccesses

One variety in each of alfalfa, timothy and orchard grass were supported based on OFCC data. Five alfalfa varieties were supported on the fast track procedure. Five alfalfa varieties were deleted from the recommending list.

There were 19 forage entries in 2006 of which 18 were alfalfa and one was orchardgrass.

Performance trials are well publicised by the committee with 38,000 brochures printed. The brochures were inserted in dairy, beef and sheep producer's publications as well as circulation by seed companies and OMAF. In addition one newspaper printed 13,000 copies at no cost to the committee.

All variety trials at Centralia, Elora, Kemptville/Pakenham , New Liskeard and Thunder Bay were inspected.

A new trial at Thorndale under the direction of Ecologistics was established in 2006. This site will be inspected and treated as any other OFCC public trial.

Dates for meetings in 2007
S. Ontario - May 16 for the south west and May 17 for Kemptville/Pakenham
N. Ontario - May 28 - 30, please book with J. Rowsell.
Annual meeting tentatively set for October 30.

Ontario Forage Cuts and Losses

The forage position at Kemptville was vacated January 30, 2004 and has not been refilled. The earlier vacated forage position at New Liskeard has likewise not been refilled.

Thunder Bay now remains open as an independent station run by the Thunder Bay Agricultural Research Association, a not-for -rofit corporation, with funding from the Ministry of Northern Development and Mines through NOHFC plus in-kind support from OMAFRA and the U.of Guelph.

Although Kapuskasing has been retained as a research station, there have been no entries at Kapuskasing for a number of years.

Committee Finances

An emergency meeting in February addressed the impending financial crisis at the University of Guelph. A contract providing a minimum fixed yearly sum of $23,000 in addition to Cord iv / OFC funds was drawn up to support the standard management forage performance trials program at the Elora research station for fiscal years 2006/7 and 2007/8. In order to sustain committee finances testing fees for Elora and the general membership was increased to $815.00 and $2,250.00 respectively.

A fortuitous combination of entries to Guelph and lower costs subsequently enabled the committee to lower the membership cost for 2007 to $2,000.00.

Fast tract varieties which are submitted for Nov 01 and Feb 01 are covered by the OFCC contract with Guelph. A fee for fast tracking varieties which are submitted at times other than prescribed has been implemented at $240.00 per entry to cover the added costs.

Pulse Crops

State of the Industry – Edible Beans

2004 and 2005 had good yields and prices, which kept momentum going so 2006 acreage was high. Edibles (whites) seen as a process crop, whereas colored beans still sold under contract. Crop quality was maintained, despite late harvest, possibly due to cool weather. About 95% of crop was harvested, and few claims are expected. Prices are down due to increase in CDN dollar.

Crop scouting and good availability of fungicides are improving consistency of quality. Cruiser as a seed treatment has helped edible beans for leaf hopper control. Yields have not been increasing like in corn or wheat. Input costs have been increasing so risk-reward premium is in decline, and there is the possibility that edible bean acreages will also decrease.

Performance trials were harvested and only one trial was lost due to hail damage. Bean growers are continuing to work with researchers to focus research efforts and they are marketing health aspects of beans with educators – recipe books.

There is no strong dry bean breeding program, and growers concerned that the industry is at a competitive disadvantage. Industry is concerned about glyphosate residues in the seed if applications are made too early. White mold continues to be a problem and research needed. However some companies push to prove plant health benefits of certain pesticides in the absence of insect or disease pressure. Bean groups want performance trials supported.

Important work to obtain registration across market classes of edible beans (Dual II Magnum), as well as Cruiser for leafhopper control.

Agronomics for specialty bean types and preharvest glyphosate applications (timing, etc.).

Table 2. Coloured Bean Acreage (Major classes)*

Year	Acres Insured	Average Yield (cwt)
1991	15,182	18.4
1992	13,547	7.9
1993	19,108	15.9
1994	20,837	16.9
1995	25,781	17.1
1996	22,315	12.5
1997	23,527	17.1
1998	24,885	17.3
1999	43,666	16.2
2000	44,244	10.2
2001	53,377	-

2002	56,000	16
2003	60,000	20
2004	55,000	20
2005 (preliminary)	60,000	21.2

- Figures supplied by Agricorp

Significant Research/Service Accomplishments

a) Weed control

Accomplishments. Several effective control strategies were found for the following problem weeds in white and kidney beans; lamb's quarters, red root pigweed, common ragweed, proso millet, green foxtail, green smartweed and wormseed mustard. Each of these weeds is a major concern in at least part of the dry bean production region in Ontario.

Field studies evaluated the response of 6 market classes (Black, Pinto, Berna, Cranberry, Kidney and Yellow Eye) to four potential new herbicide options. Of the 24 possible combinations of herbicide and market class, 10 combinations were found to provide an adequate level of crop safety, and an URMULE submission will be made to the PMRA.

URMULE Registrations received in 2005:

- Pursuit(ppi) – weeds in adzuki beans;
- Basagran Forte (post) – Cranberry, Black beans;
- Frontier, Poast Ultra, Reflex, Dual II Magnum – Otebo beans;

Why was the work undertaken?
- Control of problem weeds;
- Weed control in Niche market classes;

Who Did the Work?
Peter Sikkema, RCAT, U of Guelph;

b) IPM of Seedcorn Maggot, Wireworm, Potato Leafhoppers.

This project has identified three new seed treatment control strategies, and four new foliar control strategies. These strategies are effective, economical and provide a positive environmental impact, compared to current control strategies. Pest threshold research has measured the impact that PLH has at various stages of crop development, and measured the impact that various control strategies have on the pest and the crop. For instance, the new seed treatment control strategies provide an effective control of PLH for 4-6 weeks. This is considered season long control in some years, but not in others. The development of pest thresholds in combination with this seed treatment technology will allow growers to select the most appropriate foliar control measure, and apply them only when they are needed to

adequately control the pest. A final area of research has developed a better understanding of the interaction between PLH and dry beans. It has shown that PLH are attracted to dry beans based on leaf colour. There is some potential to use this information, along with new control strategies, to develop a trap cropping system that will reduce damage from the pest, and reduce the need for repeated application of foliar insecticides by dry bean growers.

Why was the work undertaken?

- Find an alternative seed treatment to Lindane;
- Develop an IPM strategy for leafhoppers that included seed treatments, alternative foliar controls, control strategies to reduce pesticide usage;

Who Did the Work?

- Chris Gillard, RCAT, U of Guelph;

c) Biological Control of Seeding Root Rot in Dry Edible Beans

A number of biological compounds have been evaluated for their ability to control early season root rot in dry beans. Most of the products contained *Bacillus subtilis*, as the active ingredient. After conducting more than 20 studies over four years, it is felt that these products will only control a mild root rot infection. In side by side comparisons, nitrogen fertilizer was found to be a more effective control for root rot.

Why was the Work Undertaken?

- Root rot is one of the most serious and difficult to mange diseases of dry beans. Research at North Dakota State University indicated positive results using a biological (*Bacillus sp.)* seed treatment;
- Evaluation of Apron – MAXX, and other seed treatments that also offer reduced risk;
- Support registration of Apron – MAXX seed treatment that would be harmonized with USA registration;

Who Did the Work?

- Chris Gillard, RCAT, U of Guelph;

Foliar Fungicide Application Field Day – July 2005.

A successful field day was held at the Huron Research Station, RCAT to demonstrate application technology for foliar fungicides.

d) Evaluation of White Beans for New Value Added & Alternative Markets

What Was Accomplished?

- Literature review of white bean traits of value to food and industrial markets. Completed in 2004.

Why Was the Work Undertaken?

- Review completed research on compositional analysis of white beans that may have value to end markets

Who Did the Work?
- Dr. Lorna Woodrow, AAFC, Harrow

e) Mining Pick Beans for Bioproducts

What Was Accomplished
- Literature review and compositional analysis of white beans for components of value to bioproducts industry.

Why Was the Work Undertaken?
- Tonnage of pick beans varies significantly between years depending on harvest weather. Estimated tonnage varied from a low of 3200 t to over 10,000 t. "Pick beans" are non marketable beans due to insect, disease, weather or mechanical damage.
- Identifying a market for pick beans would improve returns to industry

What Was Accomplished?
- Literature review and some compositional analysis

Who Did the Work?
- Mia Tulaga, Student, University of Guelph

Emerging Needs and Issues

- Harmonization of registered pesticides and MRL's in North America is a priority of Ontario dry bean growers and Pulse Canada. The high cost of registration of pesticides is a barrier for expansion of 'niche market' dry beans.

- **NEW *IPM Bacterial Blight***. Bacterial blight (common & halo) is a significant disease in dry beans each year. The disease was widespread in 2005 affecting both yield and quality. A new National Bacterial blight project was started in 2005 between AAFC, Pulse Canada, RCAT (U of Guelph) that addresses developing resistant lines. A replacement seed treatment product to Streptomycin is also required. Preliminary research also indicates that further work on epidemiology is needed. Control of blight would support expansion of dry bean seed production in Ontario.

- **NEW *Pulse Innovation Project*** was developed by the pulse industry in Canada and brought to life early in 2005 through the injection of $3.2 million from the Government of Canada under the 'Agri Innovation' initiative. The project, which will run over the next three years (2005-2008), will develop a strategic approach to product innovation leading to new market outlets for lentils, beans, peas and chickpeas. The Pulse Innovation Project will be head-quartered at Pulse Canada. The project's objective is to increase pulse utilization in North America through innovation in product development, adding

value to Canada's pulse crops by moving them up the value chain. The Ontario bean grower groups contributed funds to this project.

- Anthracnose was widespread in white beans in 2004. No Ontario varieties of edible beans are currently resistant to race 73 identified in 2004. Research priorities include: Screening of Ontario bean varieties for resistance; breeding to incorporate genes for resistance; IPM strategy using seed treatments and foliar fungicides and evaluation of seed treatments.

- IPM Strategy for Sclerotinia(White Mould). Ronilan (vinclozolin) fungicide trade restrictions. The USA announced in 2004 trade restrictions on import of beans from Canada on which Ronilan fungicide is used. Ronilan has been the product of choice for white mold control in dry beans, soybeans, and canola in Ontario. Vinclozolin has been associated with adverse health effects, including its ability to disrupt normal hormonal function. The product has come under review in a number of countries and a number of these have withdrawn it from the market. Ronilan is very effective on white mold, and growers liked its 'curative' effect. A new fungicide registered for 2004, Lance (boscalid), must be applied differently than Ronilan. Lance must be applied as a protectant. In 2004, growers reported control using Lance was not as good as they had become accustomed too. Research/service priorities for white mould IPM strategy needs to be reviewed

- Soybean Rust has been confirmed in several soybean-growing regions of the USA. In limited research studies, it appears dry beans are more tolerant/resistant to rust than soybeans. Further work is required to determine market class differences.

- Soybean Cyst Nematode is expanding its geographic area through the main dry bean growing areas of Ontario. Dry beans are a host for SCN, but little is known on its impact on dry beans. In order to develop effective IPM strategies for SCN including crop rotation sequences, information is required on host interaction with various classes of dry beans. A preliminary research study in 2005 conducted by AAFC, Harrow indicated a surprising level of infection on several varieties/market classes of dry beans. Yield data for the trial was to be summarized, and a greenhouse study will be undertaken this winter.

Emerging Issues with specific research priorities

1. Genetic Enhancement for Yield, Quality and Risk Management
2. Edible Bean quality evaluation and utilization
3. Integrated Pest Management for Insects and Disease
4. Integrated Weed Management
5. Agronomic & market development for existing and emerging market types

Emerging Issues without specific research priorities

1. IPM of insects and Diseases – anthracnose, potato leafhoppers, Sclerotinia, bacterial blight, soybean rust
2. Evaluation of Value Added Genetics in Dry Beans
3. Improved Nitrogen Management.
4. Direct Harvest Technologies

Tobacco

State of the Industry

Problems with hail damage, as a result this reduced yield and quality. One widely grown variety – CT-157 in particular was hard hit. This hybrid has problems with root-lesion.
Blue mold was a major concern, which reduced yield in many fields. Crop size is about 35% less than 2005 target. Prices were better in 2006, and will give gross value of $125 million, which is about $50 million less than 2005. Proposal to government to address needs of tobacco growers to help provide transition support to communities that in the past relied on tobacco industry. There is uncertainty about whether a complete exit strategy will be in place. Emerging issues include leaf drop, pesticide re-evaluation. Alternative uses of tobacco project to examine potential to use it for bio-products and residual for energy production. The production target for 2005 was 85.314 million pounds with an additional 5 million pound trigger. The target price for 2005 is $2.21/lb., slightly lower than last year's price of $2.2365/lb. The growable percent for producers' Base Production Quota was 31%.

The future sustainability of the tobacco industry is of significant concern to Ontario tobacco growers. In April of 2005, both the federal and provincial governments contributed to the Tobacco Adjustment Assistance Program (TAAP) reverse auction that was managed by the Ontario Flue-Cured Tobacco Growers' Marketing Board (OFCTGMB). About half of Ontario tobacco quota holders submitted bids to the TAAP program. The total payment per pound for basic production quota for successful applicants to the TAAP program was $1.7190. Under this program 51 million pounds of quota representing 150 growers, were retired.

Imperial Tobacco Canada has decided to close its Canadian manufacturing operations in Guelph and Aylmer, Ontario by 2006 and 2007 respectively. Imperial is moving its manufacturing operations to Monterrey, Mexico. This will eliminate 555 positions in Guelph, 80 positions in Aylmer, and approximately 15 positions in the Montreal head office.

The OFCTGMB is currently initiating discussions with government and other key industry stakeholders regarding a full exit plan for all Ontario tobacco farmers.

Table 1: Area, market volume and total value of tobacco grown in Ontario

Year	Area (acres)	Quantity Sold		Total Value
		'000 lb	'000 kg	$ '000
2005*	34,389	-	-	-
2004	36,603	87,851	39,884	197,788
2003	35,725	93,955	42,656	213,827
2002	41,342	108,060	49,059	244,146
2001	52,977	117,094	53,161	267,683
2000	52,050	106,422	48,316	244,204
1999	56,425	142,379	64,640	308,929
1998	63,520	150,576	68,361	326,525
1997	64,005	154,913	70,330	341,928
1996	57,872	142,241	64,577	317,890
1995	62,181	152,196	69,097	316,814
1994	57,260	129,627	58,851	271,476

*Marketing of crop not yet completed

Significant Research/Service Accomplishments

Breeding

- Development of CTH2 - In 2005, yield, agronomic, chemical and quality traits of CTH2 were collected from regional and registered trials. In addition, CTH2 was tested at 9 farms as part of a small scale on-farm evaluation. The results strongly suggest that CTH2 has high yield potential, good quality traits and high economic return. It is also immune to Black Root Rot. The yield potential of CTH2 is of special interest to some of the growers who are concerned about the low yielding ability and higher production costs associated with CT157 - the most dominant tobacco variety grown in Ontario. CTH2 will be proposed for registration during the annual variety meeting on March 2, 2006.

- Development of CTH14 and CTH15 hybrids - These hybrids have potential of producing high yield and good quality traits. The economic returns of both hybrids are similar to

CTH2. CTH14 will be recommended for 2006 small scale on-farm seed release. Similar to CTH2, both CTH14 and CTH15 will be of interest to those growers concerned about the low yield and higher production cost of CT157.

- The breeding program has identified a sister line of CT572 that is less susceptible to leaf spots and which is at the final year of testing.

- Haploid plants were recovered from crosses between F1 hybrids and *Nicotiana africana* and chromosome numbers of the haploid plants were doubled using leaf midvein culture. Double haploid lines immune to Tobacco Mosaic Virus (TMV) were developed and tested in the field in 2005. The haploid breeding technique is becoming an integral part of the breeding program. The advantage of this method is that it shortens the time required to develop varieties. Stable lines can be produced in one generation.

Agronomy

- Chemistry evaluation of grower leaf samples has resulted in more balanced chemistry levels of tobacco produced by growers.

- New nitrogen recommendations have been published in the Flue-Cured Tobacco Production Recommendations, 2005 supplement. This information was prepared by CTRF and OMAFRA, based on a number of recently completed studies.

- Forage millet cultivar CFPM-1 and grain millet hybrid CGPMH-1 have met industry requirements for use as a biological alternative to chemical fumigation.

- A research program is now in place to identify the N fertility requirements of potential cultivars.

- A new grower information material was drafted. It is entitled, *Flue-cured tobacco best management practices – plug tray seedling production*.

- A two-year field study at Delhi, Ontario, showed that the application of supplemental calcium, either at planting or as foliar sprays, did not ameliorate leaf bruising. However, it was found that cultivar selection is an important management tool for minimizing the problem of bruised green leaves.

- Initial germination percentage appears to be slightly higher in size #7 pelleted seed than the size #9 pelleted seed. However, very little difference was found between these pelleted sizes for final emergence percentage, number of leaves per seedling, root and shoot lengths or root and shoot dry weights.

- Results of an observational trial examining the possibility of using vapor gard to manage flue-cured tobacco productivity and quality, showed no indication of a possible beneficial effect of the product.

- The agronomy program has begun conducting $NH4^+$ - N and NO_3^- - N determinations of soil samples in its own lab.

Protection

- It was found in 2005 that treatments employing strobilurin fungicides or boscalid or Actigard lessened the occurrence of Target Spot disease (*Thanatephorus cucumeris* causal agent) in the field.

- Greenhouse applications of strobilurin fungicides (Cabrio, Quadris or Flint) to control Rhizoctonia Damping-Off disease (*Rhizoctonia solani* causal agent) could alter subsequent plant development in both the greenhouse and the field, leading to reduced plant height. The growth of boscalid or Pristine-treated plants was similar, however, to plants which were not treated or were treated with Benlate. Although growth effects were observed, the use of any of these fungicides did not adversely affect grades or yield.

- Steaming Black Root Rot (*Thielaviopsis basicola* causal agent) contaminated Styrofoam transplant production trays provided the best control of this disease in plants later grown in the field. Applications of the fungicide Senator 70WP (thiophanate-methyl active ingredient) provided intermediate levels of control.

- The Tobacco Moth (*Ephestia elutella*) and the Indian Meal Moth (*Plodia interpunctella*) were captured in on-farm pheromone traps and were widely distributed through the tobacco growing region of Ontario. The Tobacco Moth is a known pest of tobacco; the Indian Meal Moth may be resident in storages as a pest of grain products and is not known to affect tobacco.

- Blue Mold disease (*Peronospora tabacina* causal agent) was not detected in trials or on-farm in Ontario in 2005.

- Tobacco Mosaic Virus resistant breeding lines produced using haploid breeding techniques were evaluated in the field for the first time in 2005.

Alternative Uses of Tobacco - Update

Two research projects are being proposed for the 2006 field season at the Delhi research station by Dr.'s Chris Hall, Jim Brandle and Jim Todd. These projects will draw on resources from the public and private sectors to address the potential of using tobacco as a "plant factory" for production of bio-products and use of the residual biomass as a feedstock for ethanol production. Growing tobacco as a biomass crop has the potential to be economical, but only if value can be captured by marketing the high quality protein. Both bio-product and biomass uses require tobacco to be grown at high density (~100,000 plants/ac vs. the current practice of ~6000 plants/acre), and this research will address the details of planting, growing, harvesting and processing high density stands of tobacco, and amaranth, another plant that produces high quality protein and large amounts of biomass. In parallel, tobacco genetically engineered to produce recombinant antibodies with medicinal or industrial utility, will be grown

at high density in the greenhouse and in the field, to determine the most cost effective and efficient way to isolate small, high value proteins from large amounts of plant material.

Emerging Needs and Issues

- Leaf Drop – There was a significant amount of leaf drop in the 2005 crop, especially with the variety CT157. Deep sucker control burn can be a contributing factor to leaf drop. There appears to be an increase in the number of applications of sucker control with the change to mechanical harvesting. Currently there are no other options besides the fatty alcohol-based sucker controls in Canada. Fatty alcohol-based sucker control products are expected to increase in price in 2006. Also, these products can be sold for more money to the lumber industry (wood preservation). Possible alternatives are: BASF 131 (diflufenzonpyr); MH (maleic hydrazide) at lower application rates; butralin and flumetralin. There were concerns raised as to the future availability of the sucker control products.
- Sucker control – *concerns are outlined above in "Leaf Drop" section*
  There is a lot of construction taking place in the US due to the hurricane damage. Therefore, the fatty alcohols are in demand from the wood industry; where the fatty alcohols can be sold for more money.
- Tobacco Moth (*Ephestia elutella*) – still a concern. More information about this pest is needed to better understand the situation. AgriCorp does not insure carryover tobacco. The current recommendation is to destroy any infested tobacco; preferably by burning. A burning permit is needed in some tobacco-growing areas. Also, MOE has received some complaints regarding the burning of tobacco.
- Re-evaluations of 1,3-dichloropropene and acephate – These products are under re-evaluation by PMRA. Many growers use these products for control of major diseases and insects in Ontario. The loss of these products is of great concern to the tobacco industry.
- Tobacco Mosaic Virus (TMV) – this continues to be a problem. The number of growers with TMV is rising and there is no geographical isolation of this virus.
- Weed control – concern was expressed by a grower that Devrinol doesn't seem to work as well as it did before. Extra time and money was invested into hoeing weeds. There are problems with both broadleaf and grassy weeds, in particular summer grass (crabgrass).
- Energy costs – the 2005 crop was an expensive crop to harvest. Also, input costs (i.e. fertilizer, fuel) are going up.
- Kiln fires – there were reports of kiln fires again this year.

Pest Management – Insects and Diseases

A) Revisions to the OMAFRA Publication 812, Field Crop Protection Guide

All product submissions were accepted this year. 2007 is a full publication year. The committee agreed to maintain the current product ranking system according to the terms of reference. A section will be added to the book to explain our ranking system as well as provide information on resistance management practices including proper rotation of crops and chemistries. Tables in Chapter 1 will be adjusted to ensure there is no confusion regarding aerial applications as per request from MOE.

B) State of the Industry/ Research and Services Accomplishments in 2006

RESEARCH AND ISSUE REPORTS

Corn Art and Gilles: Results from trapping and root samples indicate that the corn rootworm rotation variant has not yet reached pest status yet in Ontario and will not be a threat for next year's first year corn crop. Monsanto's trapping system indicates same results. Corn rootworm populations were high this year and should continuous corn acreage increase next year due to reduce wheat plantings, injury could be noticeable. Canadian Corn Pest Coalition is funding a baseline study for rootworm Bt and ECB Bt stewardship. Jocelyn Smith will be conducting this research at Ridgetown. Tenuta/Art- Corn leaf diseases were higher than expected this year, in particular Northern leaf blight, Stewart's wilt, gray leaf spot, and anthracnose leaf blight. The weather conditions were favourable for ear mould development, especially Gibberella. Differences among hybrids were evident and the impact on the quality was problematic. Tenuta and Greg Stewart (OMAFRA) and Art Schaafsma, (U of G) surveyed corn fields across the province. Of the 94 fields tested, 61 or about 65% of the fields were at or below 2 ppm DON, 17 the fields (18%) were in the 2 to 6 ppm range, while the remaining 18 fields (19 %) were over 6 ppm. Fields sampled in the extreme southwest portion of the province (Chatham-Kent, Middlesex and Elgin counties) had 13 of the 34 fields having DON levels over 6 ppm. The results tend to indicate that there is a significant percentage of the province's corn that is relatively free of vomitoxin. However, in nearly all parts of the province there are fields that could have high levels of DON and that the chance of this occurring increases significantly in the south-west portions of the province. Although this year the impact of ear moulds was significant for many producers, the industry is confident they will find uses for this year's crop.

Soybeans Soybean aphid did not reach thresholds in Ontario, though a few fields in Eastern Ontario did come close to thresholds by the end of the season. 75 fields across Ontario were monitored weekly for all soybean pests by Baute, Quesnel and Tenuta staff; 38 "mobile' sites in grower fields, and 37 rust sentinel plots. Scouting results were mapped and uploaded to both the Ontario Soybean Growers and the USDA PIPE network websites. We will be continuing this monitoring program in 2007. Study on the impacts of predators on SBA continued this year (Broadbent, Baute and Mason). Two years of cage studies are indicating that Multicoloured Asia ladybird beetle is the most effective predator at keeping soybean aphid populations in check. Bean leaf beetles were found in a larger geographical region than past year due to the milder winter, with some areas reaching thresholds in the R5 to R6

stage. Work still needs to be done on refining the thresholds for late season soybeans. Despite heavier populations, yield is good this year with some quality issues due to the prolonged wet fall and pod feeding injury due to the beetle. Early season root rot diseases such as fusarium, and rhizoctonia, were common in many fields this year due to the favourable weather conditions. Resistant varieties to these diseases are limited. Soybean cyst nematode damage was evident early on in the season but the visual symptoms in many of these fields diminished with the frequent rains. Soybean cyst races are changing and in Essex/Kent area Race 1 is developing in certain fields. This has implications in terms of the durability of current resistant varieties. New sources of resistance such as PEKING are being incorporated in Ontario lines and other sources of resistance will be available in the future. Soybean rust risk to Ontario in 2006 quickly diminished with the hot, dry conditions that persisted throughout the lower states. However, favourable weather conditions this fall resulted in 234 counties in 15 US states testing positive for SBR by November 7th. Rust was confirmed to have moved as far north as Purdue University in Indiana.

Wheat/Barley/Oats/Rye Tenuta/Johnson - Damage associated with cereal leaf rust was very noticeable this year. The mild winter and heavy snow fall in November 2005 resulted in conditions favourable for leaf rust overwintering. Varieties such as Vienna that previously were thought to be tolerant to leaf rust had substantial infection this year. This could be due to the early disease establishment which illustrated the susceptibility of these varieties and/or the establishment of new rust races. Samples were collected this year and sent off to the cereal disease lab in Winnipeg for race profiles. These results have not yet been obtained. Fusarium head blight this year was very sporadic and did not develop to have a substantial impact. The DonCast forecast model for fhb was available again this year. Grower uptake for the DonCast model system appears to be stalling and many growers are presently making their fungicide recommendation early in the season prior to the maps being generated. Art S - Research testing Bayer's Proline and BASF's product looks promising for fusarium going from 50% control of DON to 70% - cost effective???? There is a response to foliar fungicides in wheat. Growers should budget for one application but will need to decide when to apply it. Fusarium control should still be their main focus, targeting the crop at heading.

Forages White grubs (June beetle and European chafer) are continuing to cause problems in hay fields. Some growers lost most of their stand, causing them to replant to corn so that they could use Poncho insecticide to try to knock down their grub populations. No control options are available in forages at this time though a research proposal is being submitted to address our grub issues in field crops. Alfalfa snout beetle was found in an area of Eastern Ontario not known for having this pest. Surveys by CFIA and OMAFRA will continue in the spring to determine the spread, potential impact and solutions. This pest had been restricted to only one region in Ontario but appears to have spread, potential via soil movement. NY State is also dealing with this pest.

Edible Beans *C. Gillard* - Research on Dynasty (azoxistrobin) alone and in combination with Apron Maxx, provides equivalent control of anthracnose as DCT. A minor use submission has been made for Dynasty for anthracnose and rhizoctonia root rot control in dry beans. Allegro is equivalent to Lance for white mold control and a minor use submission has been made for Allegro for white mold control in dry beans.

A rapid ID test for anthracnose has been developed, using PCR based DNA analysis. This test will be evaluated on field samples in 2007. Tarnished plant bug continues to be a concern in edible beans. Future research is needed and newer products.

Canola Research on Swede midge in canola continues (R. Hallett, M. Sears, H. Earl, T. Baute). Swede midge injury was very noticeable in canola this year. It appears that the midge does enter winter canola but does not impact the overwintering success of the crop which eventually grows out of the injury. Spring canola, however can be heavily damaged. Some foliar products tested look promising. Planting date is a key factor for spring canola. The earlier the planting date, the more likely that swede midge injury can be avoided. Variety testing is indicating some resistant lines but this work needs to continue. Cabbage seedpod weevil work also continued. Some foliar products are looking promising. Application timing has been a key issue. Spray trials this year are indicating that one application is not enough, two applications are needed in winter canola. More work needs to be done to determine the exact timing for these two applications but timing the first application to beginning bloom is important. Brown seed seems to be in some ways associated with weevil damage though further investigation is necessary. Tarnished plant bug is also becoming a concern in canola. More chemistries need to be made available in canola as the number of applications on canola each season is increasing because of the many insect pests issues.

Emerging Needs and Issues

Alien Invasive species continue on the rise in field crops. Monitoring, forecasting and management strategies have to be in place to ensure readiness when problems arrives.

Seeing a shift in pesticide applications. "Lower risk" pesticides are being registered and marketing strategies are tending towards the concept of insurance instead of controlling the pest when it is present at economic levels. Need to determine how to respond to such shifts and bring an optimizing prescription to the situation. Thresholds and monitoring strategies, prediction models and economic evaluation of treatments are necessary.

Non pest control benefits in the absence of the targeted pest (plant health) - seeing marketing/promotion of pest control products and their plant health properties (growth promotion). Yield enhancement in the absence of the pest. Might require research and clarification.

Pesticide Stewardship – Risk of resistance with use of similar seed treatments and foliar chemistries across commodities. Need to go back to promoting IPM and finding solutions to make IPM practical for the grower.

Researchers in Field Crop Pest Management - Fewer and fewer positions/researchers working on field crop pests. More retirements are approaching and positions are not being filled. Effort is going into the value added side and is no longer going into the production side of field crop research. Emphasis on field applied research must continue.

Organic crop production is on the increase. Research into pest management in organic crops should also follow suit.

Pest Management – Weeds

State of the Industry

In general, weed control with herbicides was inconsistent in 2005. Soil applied herbicides worked well in those areas that received timely rains, but early season moisture was not adequate in all areas of the province. In particular, the southwestern portion of Ontario faced a dry spring. The efficacy of post-emergent herbicide programs was also inconsistent, as weed growth was slowed during application in some areas due to hardening off of weeds caused by temperature and moisture stress.

Weed Control Results and Overall Crop Report

Overall weed control was fair, as there was poor moisture during the spring months, and extremely dry conditions through mid-summer, which caused stress to plants, reducing herbicide efficacy. Those who were able to get the crop and PRE herbicides in with timely rains did find the weed control to be acceptable.

Delayed crop establishment combined with poor PRE herbicide performance allowed weeds to escape, which put greater stress of POST herbicides. The hot, dry weather reduced the activity of POST herbicides, as the weeds were not hardened off.

About 15% of the corn acres and 60% of the soybean acres in Ontario were planted with glyphosate-tolerant seed. Glyphosate drift onto non-target crops was a significant concern this past season as well, and extension was conducted (i.e. articles and presentations) across the province on methods and technology useful for drift mitigation.

Problem Weeds

The University of Guelph (Guelph and Ridgetown campuses) continues to do a number of herbicide trials on problem weeds including:

- Tufted vetch
- Perennial sowthistle
- Downy brome
- Wild garlic
- Wire-stem muhly
- Dandelion
- Wild carrot
- Large crabgrass
- Yellow whitlow grass
- Prostrate knotweed

Waterhemp (*Amaranthus tuberculatus* var. *rudis*), the scourge of Midwest growers, appears to be spreading further in Ontario. After three sites were initially found in 2002 and 2003 in Essex, Lambton and Kent Cty, a survey conducted by Susan Weaver (AAFC Harrow) has revealed 16 additional sites in Essex Cty. This confirms this weeds ability to spread rapidly. A team including Susan Weaver, Peter Sikkema and François Tardif has begun work to better understand the biology molecular genetics and control of water hemp. Native populations also exist and may cross-pollinate with resistant types. A Problem Weed CD is now available online in English, and the French is in preparation. The following is the link for the English version:
http://www.omafra.gov.on.ca/english/crops/field/weeds/problem_weed.htm

A number of weeds attracted attention this summer in the form of requests to the OMAF Weeds Lead. Many of those are the subjects of research as outlined above: wild carrot, prostrate knotweed, annual and spiny annual sow-thistle, tufted vetch, common chickweed and field violet. Spotted knapweed, downy brome and cleavers were also identified as potential future problem weeds. Giant hogweed and dog strangling vine are two invasive species that are triggering more inquiries, especially following the presentation by Dave Bilyea on poisonous or shelterbelt weeds given at the Southwest Diagnostic Days early in July. Palmer amaranth was found in Hamilton on a rail bed.

Herbicide Resistance
Dr. François Tardif reported that samples provided through OMAFRA Call Centre continue to show Gr. 2 resistant pigweed, with some nightshade as well. Six samples of Green foxtail showed resistance to Gr. 2 herbicides. No ragweed samples were submitted, but Gr. 2 resistance is likely widespread in this weed.
Peter Sikkema reported on a Glyphosate Resistance Update he attended last month. Glyphosate-resistant waterhemp and ragweed are common in Missouri; glyphosate-resistant ragweed and lamb's-quarters are suspected to be widespread in Ohio. It is recommended to use a PRE residual herbicide in all RR crops, as well as planning herbicide rotations between crops. The Herbicide Resistance Working Group met at the CWSS conference in Niagara Falls on Nov. 29th to discuss research needs and priorities, as well as update everyone on the status of resistant weeds across the country.

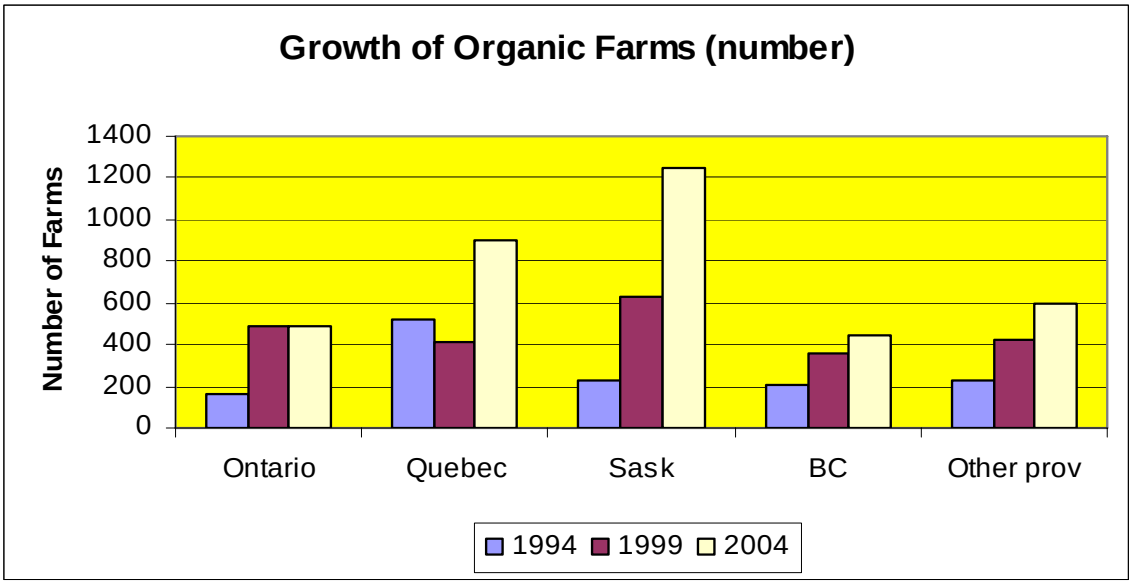
Minor Use Program for Herbicides
Jim Chaput is the OMAF Minor Use Coordinator, located in Guelph, who maintains a website with updated information on Minor Use Proposals at
http://www.gov.on.ca/OMAFRA/english/crops/minoruse/index.html .

Organic Field Crops

State of the Industry

In 2005 there were 497 certified organic farms reported for Ontario compared to 3,618 for Canada. In addition to those farms indicated as certified, it is generally understood there are many farms are not currently certified but are generally using organic practices. There is a high turnover in the sector. Each year numerous growers fail to renew their certification, and many new farmers enter the transition period and proceed to become certified organic. The total certified organic acreage in Ontario has grown steadily in recent years (see Figure 1) and was estimated at 82,000 acres in 2005. The size of organic farms is increasing as medium sized organic farms expand and some smaller farms do not renew their certification. The average size of organic farms in Ontario is the same as for conventional farms (187 crop acres per farm). The number of organic farms in Ontario however has not grown as fast as in other provinces in recent years.

Figure 1: Growth of Organic Farms in Canada



(Adapted from Macey 2004, reports from prevous years)
Note: 1994 and 1999 include both certified and transitional organic farms, 2004 includes only certified organic farms.

The number of certified acres in Ontario has grown from 55,000 acres in 2000 to over 82,000 acres in 2005. Saskatchewan had 730,000 organic acres in 2005 compared to 362,000 in 2000. Most other provinces increased their acreages but slower than in SK and ON. In the USA there were 2.2 million organic acres in 2003 which represented a 71% increase from 1997 to 2003. In the EU there were over 12.5 million acres of organic cropland in 2003 which was a 243% increase over 1997.

The farmgate value of organic sales is difficult to estimate but in 2003 was reported at over $100 million for SK, $45-$65 M for QC and is approximately $40 M for Ontario.

Table 1: Organic Farms in Canada in 2005 by Province (Macey, 2006)

Province	Number of farms	% of total	Organic Acreage
BC	484	2.8	33,079
AB	238	0.5	322,414
SK	1230	2.5	730,164
MB	232	1.2	67,948
ON	497	0.9	81,974
QC	816	2.7	69,024
NB	36	1.4	3,956
NS	50	1.5	2,080
PEI	29	1.7	1,005
NF	4	0.8	45
YK	2		240
Canada	**3,618**	**1.5**	**1,311,929**

*The acreage in Ontario, Quebec and the Maritimes is underestimated. Wild land, woodlots, and community rangelands are not included in acreage totals.

Figure 2 illustrates some comparable data in the US. Note that California, the Upper Midwest States as well as New York all have significant organic acreage.

Figure 2: Number of Certified Organic Operations in the US, 2003

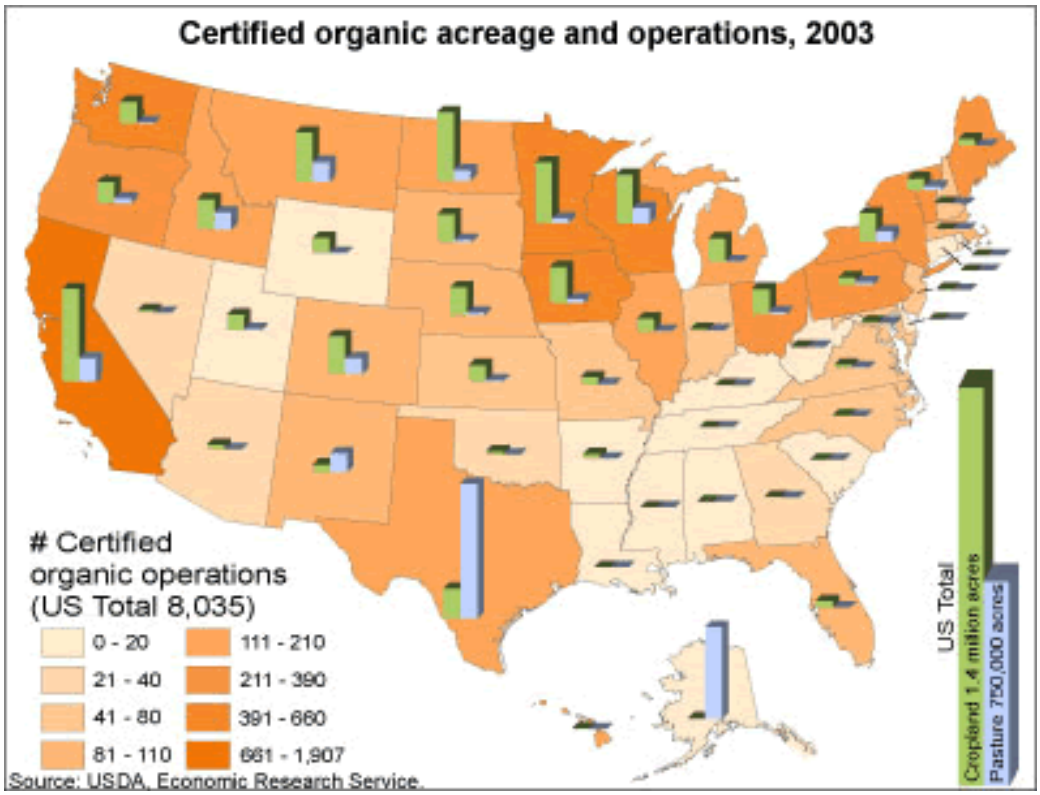
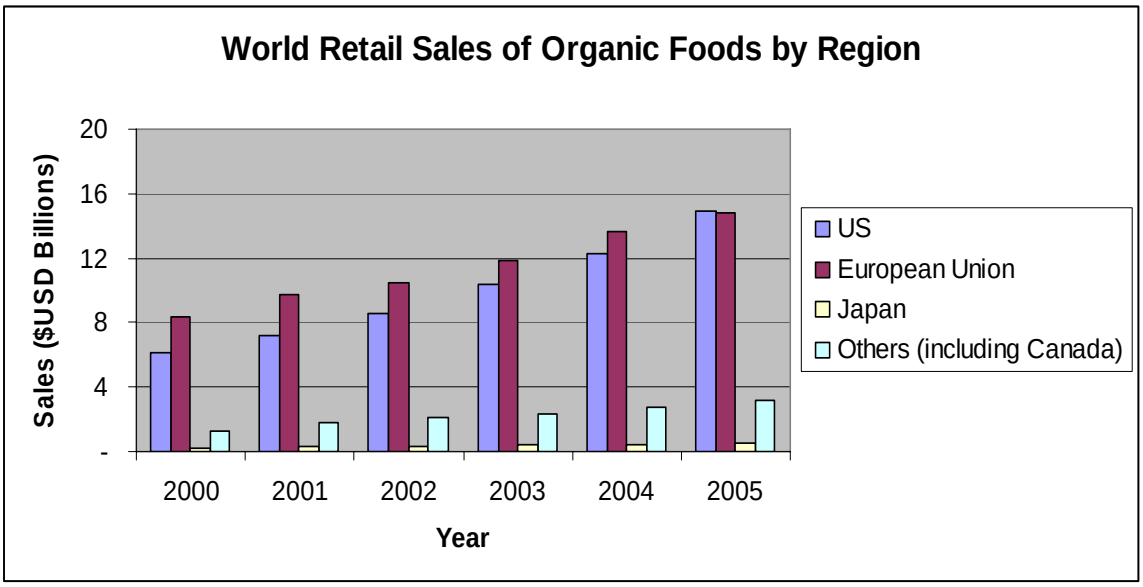


Figure 3: Global Organic Food Markets



Source: OTA, SOEL, Organic Monitor, Future of Global Organic Food

The retail value of organic food sales has continued to grow over the past 15 years. The European Union and USA make of the majority of global sales of organic products with each region recording approximately $14 Billion in sales in 2005. US organic food sales are predicted to reach $24B and $60B by 2025.

Canadian organic retail sales are estimated at $911M in 2005 in mainstream retail stores (approx 1.5%) with additional sales in small stores (health food stores), farmers markets, and farm gate. Canadian retail sales are estimated at $65-$70B per year and the food service industry represents a similar value of sales. To date organic sales in the food service industry have been very small but this represents a future growth area with some health and educational institutions reviewing their menu options and some restaurants beginning to offer some organic and natural food selections.

Figure 4: US Organic Market Share by Category, 2005 (OTA, 2006)

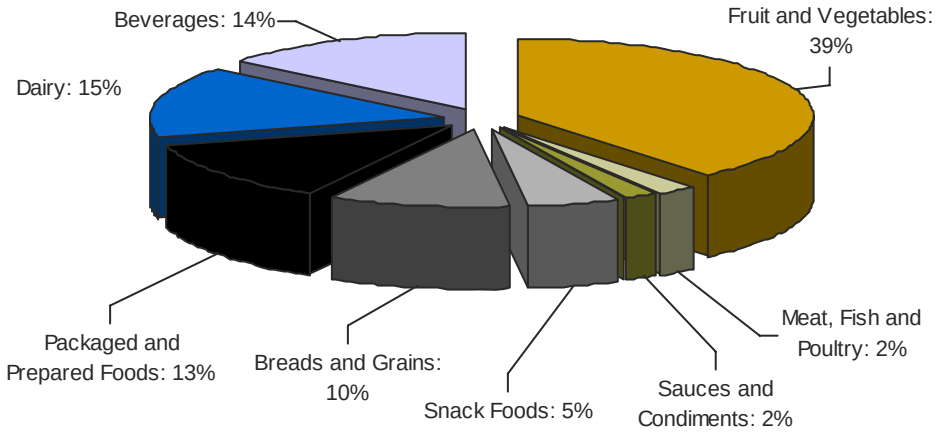


Table 2: US Organic Food Share Categories 2005 (OTA, 2006)

Categories	Sales (millions)	% Growth (2005)
Fruit and Vegetables	$5,369	11%
Dairy	$2,140	24%
Beverages (non-dairy)	$1,940	13%
Packaged and Prepared Foods	$1,758	19%
Bread and Grains	$1,360	19%
Snack Foods	$667	18%
Sauces and Condiments	$341	24%
Meat, Fish and Poultry	$256	55%
Total	**$13,831**	**16%**

The market share shows a much larger share for organic fruits and vegetables than in conventional foods and a much smaller share in the meats category than for conventional. However the organic meat and dairy sectors have shown excellent growth in recent years.

Concerns

- **Lack of supply**

Across North America there continues to be a large demand for organic foods, feeds and ingredients that is much greater than the current supply. Despite market premiums, producers are reluctant to convert to organic production. Fear of change, age of growers, peer pressure, and costs of transition are all significant barriers to growers making this move. Some processors are exploring the feasibility of organic food products but lack of supply is a barrier to developing these products. In some cases products are being processed with imported ingredients that could be produced here. The organic grains sector has grown significantly in recent years but cannot keep up to the growing demand for organic food grains (largely for export) and for the rapidly expanding feed grain markets in North America.

- **Genetically modified crops**

The co-existence of genetically modified crops and organic continues to be an issue. Ontario produces a large acreage of GMO corn and soybeans and some canola. Seed purity, equipment cleaning – especially in the grain handling system, and appropriate measures to prevent pollen spread are challenges for the agricultural sector. Buffer zones, especially for cross pollinated crops such as corn and canola need to be quite large to prevent pollen spread. Who, in the neighborhood, is responsible for pollen contamination – the grower who owns the GMO crop or the grower who needs to maintain the GMO free integrity of his crop to meet markets requirements and has no control over the pollen source or dispersal? These

personal relationships between neighbours are similar whether the GMO-free grower is organic, or supplying other GMO-free markets, or a grower of non-GMO seed varieties.

- **Lack of organic research**

Researchers continue to have problems accessing funds to do research that will enhance the organic sector. Industry partnerships are limited due to a lack of companies with funding capacity and due to the lack of an organic growers association with stable funding. Most conventional growers associations have not been supporting organic research, even though organic farmers pay fees to those groups for their commodity. The dairy sector has shown significant support and now is early on the road to success at U of G (Alfred Campus) but the needs are also great in other commodities. The organic sector now has approximately 2% of the food marketplace but feels it is not getting it fair share of the research dollars.

Emerging Issues

- **Canada Organic Regulation**

In September 2006, the Canadian government introduced Organic Products Regulations. This will give the Canadian Food Inspection Agency oversight of organic certification in Canada and give assurance to Canadian consumers and foreign customers of the adherence to the Canadian Organic Standard. The introduction of similar regulations in other countries (over 55 countries worldwide) has boosted the sales of organic products. This regulation will be an opportunity for Canadian organic food producers to expand their markets. Canada's regulation is expected to enhance exports, give more enforcement opportunities to protect producers from imports and to reduce confusion in the marketplace on labels and logos. The new regulations will allow certification bodies to continue many of their traditional operations but under Canadian accreditation. Ontario needs to be prepared to take advantage of the new opportunities offered by the Canadian Organic Regulation. The new regulations also introduce a new Canada Organic mark to organic products meeting federal regulations.

- **Transition to organic**

The fear of transition holds many producers back from switching to organic production. During the first 2-3 years the growers produce crops using organic methods of production but are usually unable to secure any premium prices. Yields and revenues are decreased. This is a time when they are learning new technologies, new crops, and innovative approaches to production problems. Transition also requires investments in new machinery or buildings and storages to accommodate new enterprises. There are few consultants or information resources available. Neighbours and family are frequently negative to their endeavours. This peer pressure places a large stress on some families during transition. Additionally many farmers are late in their careers and fear risk at a stage when they are nearing retirement. Organic production is now less than 1% in most commodities and organic products account for approximately 2% in the retail marketplace and growing 15-20% per year. Ontario needs to encourage producers to transition to organic to meet current market demands and future expansion.

- **Crop Insurance**

Crop Production Insurance has generally not been available for organic crops. In 2006 Agricorps introduced a Production Insurance option for organic soybean growers which has had some success but needs to be expanded to a broader range of crops. Production insurance usually covers 70-90% of the expected yield at the expected market price. For organic crops their expected yields are lower and expected organic prices are often 1.5-3 times conventional prices, but traditional crop insurance has only covered the expected organic yield at the conventional prices. As a result coverage of the organic crop is less than 50% of the expected crop value. Spelt (very similar to winter wheat) is a popular organic crop but has not been eligible for any crop insurance. Agricorps should be encouraged to expand the range of Production Insurance options for organic growers.

Emerging Needs and Issues

Research Issues for 2006:

Research for organic agriculture needs to reflect the systems approach taken by organic growers. On-farm research and research on certified organic lands should be encouraged whenever possible to take advantage of the in-situ factors.

Research for organic agriculture will also have usefulness for all agriculture, and in some cases the solutions will become Best Management Practices for all farmers.

1. **Livestock Management**

Nutrition – NRC standards have been developed for conventional farms but on organic farms, ingredients are sometimes limited either by the organic standards or by availability of supply. We need more information on balancing feeds in order to maintain animal health and promote growth. How to balance the diet using forages and pasture for ruminants. Organic dairy production requires less reliance on concentrates and more on forages and pasture. However, the problem in dairy production becomes how to meet the nutrient requirements when cows are grazing, especially if they are at the peak of lactation. Not being able to meet their requirements can cause health and welfare problems, as well as a lower milk nutritional quality (for example protein content). High protein diets, for example, have been reported to promote higher levels of internal parasites and perhaps other illnesses, therefore compromising an animal's health when the feed is not medicated. What are the effects of diet, including pastures on CLA content of the product? What is the role of forages pasture on non-ruminants?

Welfare standards and effect on animal behavioural needs – Research is needed on requirements for housing, exercise and health. Questions should be raised on the effects of the organic no-antibiotic policy: Does it risk hurting the animals, when antibiotics are not used when they really should for the animals' well being? Welfare standards are being reviewed by a European Task Force and their research and findings should be reviewed for their appropriateness and impact in Ontario.

Herd health – There is a need to evaluate alternative medicines and health therapies that are appropriate on organic farms. Homeopathy is an example of a practice used with reported

success on many organic farms. Control of internal parasites and various external insects and diseases is challenging on organic farms. New approaches that are compatible with organic practices and standards need to be researched. Are animals (flocks) raised with organic practices (housing and space allotments, feed, indoor/outdoor access, etc) less (or more) susceptible to health risks, particularly those known to impact human health (E. coli, avian flu, parasites, etc.). How is herd health influencing milk quality and components?

Long term performance – How do organic livestock systems compare over the longer term to other farm systems? What is the lifespan and performance of animals produced in organic systems? When looking at the whole farm system how does livestock complement and integrate with other operations on the farm*?*

Genetic Selection – What are the desired traits or breeds that are most adapted to organic? Selection goals for organic livestock can be quite different than conventional farms. Need to identify characteristics to be improved, such as resistance to parasites and diseases, as well as growth rate and milk production in extensive production systems, with little or no concentrate. Research should be carried out to identify which breeds are best suited for organic production. Animal breeding research should identify not only which traits and breeds, but also which mating systems (pure vs. crossbreeding) are best suited for production systems within the organic sector. What is the role of heritage breeds or species in organic production? Are there opportunities to develop new markets with these products*?* Research can identify which breeds can be tied to heritage or specialty foods. This has been successfully used in France to promote some heritage breeds*.* Do heritage breeds have genetics for parasite resistance or higher feed conversion on pasture, for example?

2. Food Safety and Quality

Pathogens – Some reports have indicated there is an increased risk of pathogens in organic foods due to greater use of manures in crop production. There have been few reports so far of food safety issues on organic farms. What are the risks of pathogens on organic produce? Are current composting procedures effective strategies to manage pathogens on organic farms? Research is needed to identify food safety risks and appropriate management practices for organic farms.

Antioxidants – Some research has indicated increased levels of antioxidants or similar health promoting compounds in organic foods. Some antioxidants are effective to reduce human disease. What management practices are effective to elevate antioxidants and other beneficial food components in organic foods? For example organic standards require organic livestock to have access to pasture and pastured animals have been reported to produce products with higher levels of conjugated linoleic acid (CLA).

Nutritional Quality – Research summaries have been inconclusive to indicate if organic foods have nutritional advantages for various nutrients when compared to other farming methods. Research is needed to identify potential nutritional benefits of organic foods for consumers.

3. Markets and Farm Economics

Barriers – There are many barriers to growth of the organic industry as reported by organic farmers. These include a variety of infrastructure policies that are part of the Ontario agri-food industry that was designed before organic growers were part of the industry. These policies inadvertently create obstacles and barriers to the success and growth of the organic food production sector. Barriers to growth also come from lack of support for the organic industry through formal education, research, extension education, demonstration projects, etc.

Economic Analyses – There is need for more statistical collection on the organic sector in Ontario to assist with policy and market development in the growth of the sector. Enterprise budgeting tools (for example crop and livestock budgets) that take into account whole farm systems need to be developed for appropriate use on organic farms. At the farm level, there is a need to collect data on the acreage of various crops being grown, crop yields per unit area, total production tonnage or volume, numbers of breeding livestock, numbers and liveweights of market animals, livestock access to pasture, grazing management (techniques for livestock control, grazing season, re-seeding procedures, etc.). Beyond the farmgate, there is a need to determine market opportunities and growth potential in domestic and foreign markets for a wide range of organic products in raw, semi-processed, and fully processed form (e.g., flax, flaxseed oil, margarine and salad oils based on flaxseed oil).

Market Research – There is a need for more consumer research to look at who is buying organic products and why, what the characteristics of organic product consumers are, what the characteristics of organic products are that makes them attractive to consumers. This will assist the industry with developing improved marketing strategies for organic products, and with determining areas with best growth potential. What is the benefit and effect of private labels in the market place? What is the marketing margin (between farmgate and food retail) for different organic products, what are the marketing costs, and how are the marketing margins shared amongst the various participants in the supply chain?

4. Plant Genetics

Breeding for resistance – Organic farmers need new cultivars that are resistant to pests and have good agronomic traits and market oriented qualities that are appropriate for organic farms. Growers need a diversity of genotypes available for managing pests.

Co-existence of organic and GEO – The interface of organic and genetically engineered crops creates problems to maintain genetic purity in organic crops at the low levels demanded by the marketplace. Production techniques need to be developed to assist producers on methods of reducing ‘contamination’ to maintain the value of the crop. Adequate buffer zones and equipment cleaning procedures are examples of information needed by growers. These issues extend to both the commercial crop and to seed production systems.

Adaptiveness to organic – Is the relative performance of varieties different in organic and conventional production systems. Do differing levels of fertility or plant protection materials common in conventional variety evaluation methodology affect this? Can particular plant traits such as height, plant type, root characteristics, pubescence, or other leaf parameters be key indicators of adaptiveness? For example, is there a difference in the tolerance of

varieties to weeds which can be characterized by leaf structure or architecture types so that growers can select varieties that may be adapted to organic based on these plant traits?

Heritage species/varieties – There are some unique markets in organic that can best be served with heritage species or varieties. There are reports of enhanced taste, quality, pest resistance or tolerance to soil conditions. We need to quantify and validate this information.

5. Soil Management

Soil Health – Need to identify soil health indicators to help growers understand nutrient cycling and testing. How do we identify "healthy" soils. What are the factors (and farm management practices) to improving the health of soils? Are healthy soils more suppressive of diseases, weeds and insects? What effect do they have on long-term productivity? Are there human health implications (benefits) to eating crops grown on healthy soils?

Manure/compost – What is the role of manure and compost to improving the health of soils? What are the best management practices to optimizing the use of manures and composts?

Soil amendments – Some non-Ontario labs now test for various soil biological factors. How reliable are these tests and their recommendations under Ontario conditions? What are the benefits of various soil amendments to the productivity of soils?

6. Pest Management

Pest management on organic farms requires a systems approach incorporating the benefits of cultural techniques, mechanical methods and beneficial organisms, and appropriate biopesticides when necessary.

Weeds are one of the largest limiting factors to yield on organic farms for many crops. There is a need for more information on the interactions of crops and weeds on organic farms. An evaluation of various types of mechanical weed management to complement other weed management approaches is needed. The development of practical alternatives to weed management and how to reduce trips over the fields with mechanical tools are needed.

Bio pesticides and new products – Research effort is needed to evaluate and facilitate the registration of new pesticides with PMRA. This is especially true of minor use products as permitted for use in organic farming, many of which are already registered for use by US organic farmers. This would include bio-pesticides, pest deterrents, and bio-stimulants. The limited expertise in this area and difficulty to register new products are limiting the choices available to organic farmers in Ontario and Canada.

Integrated pest management and beneficial organisms – There is a need for more information and technology transfer on various beneficial insects, fungi, bacteria, that may assist in the control of various insects (or pathogens). As well, other potential methods for management of pests, adapted from conventional farming, may help organic farmers, as long as they are complementary with their agricultural practices. More knowledge transfer from

conventional or organic research programs is needed. Which farming practices (such as field border effects) can enhance beneficial organisms? What homeopathic/herbal methods of weed/pest management are efficient and can be used in crops or livestock production? Examples of difficult to control pests in organic production are Hemiptera in pomes and strawberries, swede midge in cole crops (broccoli, cabbage etc), scab in apples, and black rot in grapes

7. Whole Farm Planning Systems

Ecosystems – There is a need for more research into the ecological footprint of farms in Ontario including organic farms. This would include a study of various life cycles documenting the biodiversity of organisms on the farm as well as a variety of other environmental impacts such as water quality.

Socio-Economic – What are the socio-economic impacts of organic farming in rural communities? Organic farming internalizes many of the input costs by using fewer off farm inputs and revenue factors are frequently quite different from non-organic farms.

Energy – Energy use on the organic farm is very important to the basic philosophy of organic farming. This includes using energy efficient methods of production on the farm and an accounting of the whole energy cost of food production. There needs to be more research on the use of energy alternatives on the farm including methane digesters, wind power, hydrogen fuel for tractors and the diversity of energy sources used on the farm.

Transition to organic – The transition to organic farming takes at least 3 years. During this time the organic farmer is exposed to financial hardship due to lower yields during this adjustment period and there is limited opportunity for organic price premiums. Research is needed on appropriate strategies to make the transition. Research is also needed to document the changes in soils, pests, livestock and crops during this transition period.

Design of farm systems – There is a need for research into the design of farm systems to look at how various farm crops and livestock species complement each other and how to capture the synergies between enterprises. An example is to look at beneficial crop rotations to examine the beneficial and the negative factors. There is a “conventional wisdom” among organic growers that many pest and fertility problems can be avoided by correct design and management of the farming system. More research is needed to document the design and integration of these systems to optimize benefits on the farm.

Northern Stations Report

Variety Evaluation:

- *Barley:* Over the years, 2001-2005, *AC Klinck* (~7300 kg/ha) had an edge over *Chapais* and *Brucefield* in grain yield, had 2% point higher grain protein than *Chapais* and 20-30 % higher straw yield than that of *Brucefield* and *Chapais*. In the early maturing barley, OBS 4714-1 had the highest grain yield of 6266 kg/ha in 79 days.
- *Oats: AC Rigodon*, best variety based on the mean yield during 2003-2005, had poor grain yield (4893 kg/ha) during 2005. *QO.685.48* (~6400 kg/ha in 84 days), has been giving consistently high grain yield for the past 3 years.
- *Wheat:* Over the past 3 years, *Superb* (~5800 kg grains/ha) produced lower yield than *Sable* (6600 kg/ha) and *Hoffman* (7200 kg/ha). *Superb* (18.06% grain protein) surpassed *Sable* (16.94%) and *Hoffman* (15.81%) in protein content, but not in protein yield/ha.
- *Soybean: Gaillard* at 3438 kg/ha lagged behind *Pembina* (3911 kg/ha), *Gentleman* (3847 kg/ha), 24-51R (3693 kg/ha) and *Drako RR* (3678 kg/ha) in grain yield. *Gaillard* was, however, 2-6 days earlier in maturity than the other varieties.
- *Forage grasses:* In Timothy, *Richmond* (16.2 tonne/ha) equaled *Itasca* (16.3 tonne/ha) and was better than *Climax* (13.3 tonne/ha) in total yields for 2004 and 2005. In the 3 year (2003-2005) totals, *Brome A* (Brome grass) yield was 5, 19 and 23 % better than those of *Fleet, AC Knowles* and *Baylor*, respectively. In other grasses (orchard grass, fescue and reed canary grass) all tested varieties performed equally well.
- *Alfalfa:* In OFCC 2003 seeded trial, *Pioneer 5312* had an edge over other varieties (*Hybriforce 400, Magnum IV* and *GH777*) in the first (4474 kg/ha) as well as in the second (3225 kg/ha) cut yield. In OFCC 2004 seeded trial, highest first (5315 kg/ha) and the second (2758 kg/ha) cut yield was obtained with *Oneida VR*; though the other varieties, *Magnum IV, NS04-44* and *NS04-25*, were statistically at par with *Oneida VR*. In another set of experiments, considering a yield index of *2065 MF* as 100, the yield indices of other varieties were *NK 711 MF*: 140, *8925 MF: 118, OAC Superior: 112, Stealth*: 111 and Macon: 106*. It appeared that if a variety had a higher yield, it had the higher protein content as well.*

Crop Nutrition:

- Canola that was seeded on April 25 and was flooded with rain water after seeding gave higher seed yield with ammonium nitrate than that with urea. Whereas in corn, for silage, seeded on May 19, yields from ammonium nitrate and urea were similar though urea produced better quality forage, as indicated by protein and NDF contents. Rates above 100 kg N/ha had no additional yield advantage in corn. In both the crops, Agrotain failed to improve the efficiency of urea.
- Sulphur appeared to be limiting the response of alfalfa to N and B (and may be other nutrients, including K, as well). Ammonium sulphate, on an average, gave 1101 kg/ha higher dry matter yield of alfalfa than ammonium nitrate and 1456 kg/ha higher yield than urea. Protein content in first cut alfalfa was higher (18.7%) with ammonium sulphate than with ammonium nitrate/and urea (~15%). Similar trend was observed in

the second cut, though the protein content differences, between the fertilizers, were found to narrow down. Both N and B improved the alfalfa protein content.
- Application of Zn @ 14 kg/ha tended to increase grain yield of wheat.

Natural Resources Management:
Lime and Wood ash:

- Wood ash maintained its lead over lime/and lime + wood ash in dry matter yield of alfalfa; the latter two were not better than the check (no lime or wood ash).
- In the first cut, there was more than 2.0% point increase in protein content with wood ash and 2.5% point increase with lime + wood ash over check. Lime alone increased the protein content by only 1.15% point as compared to the check. In the second cut, treatment differences in the protein content were not as marked as in the first cut.
- Lime lowered the alfalfa tissue B content in both the cuts and S content in the second cut. Wood ash appeared to improve the tissue B and S contents, but lowered the Mn content. Increase in tissue P and K concentration was more with wood ash than that with lime.
- Mid season soil tests indicated that both lime and wood ash increased the available Ca in the soil and raised the pH by 0.5-0.6. Wood ash also improved available P, Mg, Mn and B contents in the soil.

Dairy Manure and Wood ash/Fertilizer Nutrients:

- Wood ash increased protein content in the first cut alfalfa, by more than 2.5% point when applied alone and by 3.5% when applied with manure, over check. Manure alone increased the protein content by only 1.5% point as compared to the check. In the second cut, wood ash, but not manure, sustained its favourable effect on the protein content.
- Mid season soil tests revealed that wood ash, with or without manure, increased pH (by 0.5-0.6) and available nutrients (P, K, Ca, Mg, Zn, Mn and B). Both wood ash and manure improved the soil organic matter. Mg availability was more with manure than that with wood ash; the manure didn't improve the available Ca, P, Zn, and B contents as compared to the check (no manure or wood ash).
- Integrated use of N, S, B, Zn, Mn, manure and wood ash resulted in an 80% increase in alfalfa yield (23% by N alone @ 45 kg/ha) as compared to the application of only P and K. Deduction of NPK contribution by manure significantly lowered the alfalfa yield.
- Grain yields were in the order of oats > wheat > barley and the straw yields were in the order of wheat > oats > barley. Deducting N and NPK contribution by the manure in the fertilizer program reduced the cereals' grain yields by 24 and 28%, respectively. Grain yield with manure alone was only 66.5% of that with manure + NPK fertilizers.

Other Management Practices:

- Barley grain yield was 33.3% higher after clover than that after oats. Spread of tillage between fall and spring or various intensities of tillage starting with zero to chisel or sub-soiling or ridging or harrowing/cultivation didn't affect the barley grain yield

significantly. However, one harrowing in the fall followed by spring harrowing and cultivation, before seeding, produced the maximum grain yield.

- Herbicides, such as Puma (not registered in Ontario) @ 0.77 L/ha and Achieve @ 0.5 L/ha, gave almost 100% control of wild oats in an on-farm trial at Henry Janssens's farm.
- Winter wheat (seeded on August 25) grain yield, with *25R47,* was nearly 3000 kg/ha higher than the spring, *Superb*, wheat. Frost seeding of wheat in the fall was almost a failure and spring frost seeding didn't prove better than the normal spring seeding.
- Fall seeded canola gave 23% higher yield as compared to spring seeded canola.

Strategic Directions: Research

Recommendation 1

Agronomic Systems and Environmental Stewardship

Research leading to production systems and their components which enhance competitiveness, food quality and safety and environmental sustainability.

Successful field crop production requires the integration of many complex components. The target of high yields and high quality with low environmental impact while maintaining profitability is extremely difficult in biological – based systems which operate in global markets subject to political influences. The ability to integrate decisions on cultivar/hybrid with those on planting date, tillage system, row width, seeding rate, weed management, pest management, heat unit area, soil type and a host of others plus all of the interactions between these components requires solid reliable research information. Research not only on individual components of production systems but research on the integration of those components (systems approach). Thrown into the equation are the inevitable shifts in pressures from new pests (aphids, european chafer, western corn rootworm variant), expansion of old pests (SCN, fusarium) new weed species (problem weeds, herbicide-tolerant weeds), soil management concerns and new issues of carbon sequestration and reduction of greenhouse gases. Imposed on this background is the fundamental requirement to maintain a competitive industry.

The research priorities described below attempt to address these issues through both strategic, integrated approaches and individual targeted goals.

Specific Commodity / Discipline Based Priorities

Ontario Cereal Crop Committee

1. Agronomic Technologies and Environmental Impact

Background: Research developing and evaluating new agronomic techniques is essential to determine strategies which will maximize returns for growers and processors, yet minimize or remove any environmental impact. These technologies are far ranging in nature, from fertilizer rates, placement, and timing to tillage techniques. This is a high priority for public funding as there is little impetus or benefit for private research in this area.

Where appropriate, environmental aspects of these technologies should be an integral part of the research undertaken. An excellent example of this type of research would be the investigation of nitrogen rates for higher protein wheat production. The research could determine appropriate nitrogen rates, predictive tools like the nitrogen soil test, use of combine protein monitors, value to the end user, and also investigate any environmental impacts on groundwater.

Economic importance: The cost of tillage and other inputs makes up a large part of the cost of production of cereal crops. Reduction of these costs, or increased efficiencies of inputs, would have a positive economic impact on all producers.

Competitiveness: Increased efficiencies or reduced costs will allow the industry to be more competitive.

Environmental: Targeted applications and increased efficiencies will reduce environmental impact of agronomic practices that are investigated.

2. Reducing Production Risks

Background: Control of risk factors is critical to ensure a stable supply of sufficient quantity and quality of cereal crops. Factors such as winterkill, fusarium, sprouting, rust and other problems can cause havoc with both quantity of product available, and quality to meet market requirements. Techniques and strategies to overcome or manage these risks would have a huge positive impact on the stability of the industry.

Examples of research which fits in this category is the development of the fusarium prediction model, the rust monitoring model, improved winterhardiness techniques, and others.

Economic impact: Risk factors are responsible for many of the critical situations that occur in cereals. If techniques can be developed to overcome these risk factors, the added stability of supply should have huge economic benefits, not only to producers but throughout the processing sector.

Competitiveness: Consistent supply of quality product will allow the sector to out compete other competing jurisdictions.

Social benefit: Consistent supply will allow stability for jobs involved with the sector.

Ontario Cereal Crops Committee Research Priorities for 2007

Rating System

A: High Priority, major concern	1: Increase existing or establish new funding
B: Moderate Priority	2: Maintain funding
C: Low Priority	3: Reduce funding (the Death knell!)

A1:Fusarium resistance in spring wheat, barley and oats: Breeding

A1: Performance Testing: adaptation, agronomic traits, competitive agriculture, quality attributes, market potential.

A2: Fusarium: resistance breeding, fungicide control, management options, improvement or prediction models (all cereal crops)

A2: Nitrogen Management and Environmental Impact: agronomic rate determination, nitrogen timing, nitrogen fate, split nitrogen impacts on quality and environment, manure utilization on cereals crops, green seeker technology

A2: Cereal Breeding: yield, quality traits, protein fractionation, phytase in feed grains, dormancy/vernalization requirements, milling yield

B1: Reducing Risk Factors: winterkill, winter hardiness traits, sprouting tolerance (especially in white wheat and malt barley), falling number impacts, stripe rust management and leaf rust in spring wheat, rust in oats.

B1: Market Development: Food uses of cereal grains

B1: Rotation Impacts: long term benefits of cereal included in the rotation, consequence of straw removal, carbon sequestration, soil quality parameters- Long term rotation studies are no longer being funded.

B2: Grading Systems: DON (deoxynivalemol or vomitoxin) quick test, computer scanning technology for fusarium damaged kernels, mildew grading and impacts.

B2: Production Management: planting dates, frost seeding, plant depth and uniformity, tillage impacts, Barley Yellow Dwarf and aphid management, herbicide impacts, European chafer, cereal leaf beetle, dwarf bunt management

C1: Cereal Crop Micronutrient Nutrition: manganese, magnesium, copper, sulphur, chloride

C2: Underseeding Establishment: double cut and single cut red clover, sweet clover, cereal row widths, seeding rates, nitrogen management

Ontario Corn Committee Research Priorties

1. Greater Energy and Environmental Efficiencies

Increasing energy use efficiency is critical to the health of the corn industry in Ontario. Specifically, research must continue to result in improved nitrogen use and grain drying efficiencies.

Nitrogen fertilizer represents a major input cost in corn production, is a significant component in many animal manures, and has the potential to adversely affect the quality of surface water and groundwater. Cropping system research must take an integrated approach to combine tillage, crop rotations, cover crops, manure management, soil testing, site specific technology, etc. to enhance productivity while protecting the environment.

Grain drying costs represent a competitive disadvantage to the corn industry in Ontario compared to many other jurisdictions. Research must continue to develop grain drying systems that represent reasonable capital investments while significantly improving energy use efficiencies.

OCC Research Priorities (2002-2007)

The OCC did not review its research priorities in 2006. There continues to be increasing emphasis on bio-economy and on post-production research. OCC will spend time in 2006 discussing what type of research results in improved returns to rural Ontario and primary producers. The current OCC research priorities are:

1. Improved Cold Tolerance in Corn

2. Breeding For Pest Resistance, Fusarium Ear Rot, and Leaf Diseases

3. Genetic Improvement of Early Corn

4. Enhanced Energy and Environmental Efficiencies

5. Develop Premium Markets for Corn

Ontario Oil and Protein Seed Crop Committee Research Priorites

1. Genetic Enhancement for Production Stability and Risk Management.

Issue: Continued genetic enhancements are required to maintain competitiveness in international and domestic markets.

'Background:
Genetic enhancements lead to significant increases in productivity and economic gain without large increases in production inputs. Lower provincial soybean yield averages in 2001, 2002, and 2003 have emphasized the need for the continued improvement in plant genetics.

Biotechnology and genomics research offers new opportunities for soybean and canola improvements. The continued development of biotechnology tools is necessary for use in breeding and to provide understanding of the genetic control of traits, especially complex traits. Conventional breeding programs and the processing/distribution chain will increasinglv rely on molecular markers for selection of complex traits, for stacking multiple traits

(especially disease resistance genes), and for cultivar identification.

There has been renewed interest in winter canola in the last two years due largely to the registration of improved cultivars from Europe. Further winter canola variety development is required to improve yield, winter hardiness, and disease tolerance.

2. Control of Current and Potential Diseases and Pests.

Issue: Protecting soybean and canola production from disease, nematode, and insect losses is fundamental to high productivity and quality.

Background:
The impact of soybean aphids in 2001, 2003, and in Eastern Ontario in 2004 is a prime example of how a single pest can significantly reduce yields and adversely affect seed quality across a wide geographic area. **In** 2004 soybean aphids were found to overwinter in Ontario for the first time which increases the possibility of an early infestation. Effective control measures are vital for both existing and emerging diseases and pests.

Significant Diseases and Pests include:

Soybeans:

a. Soybean Aphids
b. Soybean Cyst Nematode (SCN) c.
Soybean Rust
d. Phytophthora/ Rhizoctonia/Fusarium root rots e.
Sclerotinia (White Mould)
f. Brown Stem Rot
g. Phomopsis
h. Slugs

Canola:

a. Sclerotinia (White Mould) b.
Cabbage Seed Pod Weevil

Potentiallv Significant Diseases and Pests:

Soybeans:

a. Sudden Death Syndrome b.
Soybean Mosaic Virus
c. Bean Pod Mottle Virus
d. Pod and Stem Blight
e. Alfalfa mosaic Virus (AMV) f.
Soybean Dwarf Virus (SBDV)

Canola:

a. Swede Midge
b. Diamond Back Moth

c. Black Leg

Background:
The impact of a new soybean pest (soybean aphids) in 2001 demonstrates how a single pest or disease can drastically affect the industry. Although the degree of yield loss sustained from soybean aphids varied greatly from region to region, yield decreases in excess of 15 Bu/ac were reported in 2003, with average losses of about 710 bu. High aphid populations under dry soil conditions also significantly reduced seed size, reducing yield and seed quality for the **IP** market. Soybean aphids decrease yield by sucking plant juices from the plant, stunting and weakening it. The honeydew excreted by the aphids' causes a secondary fungal disease and the aphids are a primary vector for SMV and other viruses. More work is necessary to understand and develop tolerance and better management practices to control this devastating insect pest.

Although SCN has been present in the province for over 10 years, it remains a high priority. New resistance/tolerance traits and effective management practices are required. As SCN spreads to additional counties in Ontario and races change, a continuous effort in breeding for resistance will be required to ensure high productivity. Not enough SCN resistant varieties are present in the marketplace. There is also concern that present sources of resistant are beginning to be less effective than anticipated. An effort to incorporate multiple lines of resistance will become increasingly important.

Considerable success has been achieved in controlling phytophthora root rot by developing disease resistant cultivars. Resistance genes can be identified and incorporated into soybean varieties by relatively simple screening techniques. However, the development of new races necessitates the continuous development of new varieties with tolerance and monogenic resistance.

Sclerotinia stem rot is increasing in importance. The incidence and severity of the disease in 2003 was much higher than experienced in the last number of years in Ontario. Varieties differ in tolerance to the disease but monogenic resistance has never been identified.

3. Development of Speciality Soybeans and Alternative Uses

Issue: Research is required to develop areas that will increase the utilization and value of Ontario soybeans.

Some of the main areas of interest include:

a) Industrial Utilization
   I) Biodiesel
   II) Enzymes
   III) Solvents
   IV) Waxes
   V) Plastics
b) Health Benefits

c) Food Use
  I) Food grade soybeans
  II) Food Ingredients
  III) Organic production
d) Functionality
e) Nutraceuticals and Pharmaceuticals
f) Increasing crush value

Background:
Soybean oil and protein are used in the manufacture of human food, animal feed, and various industrial products. New and existing areas must be explored to increase the utilization and value of Ontario soybeans.

4. Performance Testing of Varieties

Issue: Information for variety selection decisions must be available to maximize production.

Background: The variety registration process continues to be under review. With the imminent loss of both merit and performance data requirements for soybean variety registration, even more emphasis will need to be placed on generating data which allows producers to make profitable variety decisions. Benefits to a strong variety testing system include:

a) Ontario soybean producers can grow new varieties with confidence.
b) Performance data for the shorter season areas of Ontario is especially important, as little or no other data may be available.
c) All new varieties, whether they are derived from conventional breeding programs or from biotechnology, need performance data to succeed in the industry.
d) Growers need unbiased performance data to explore the potential benefits or drawbacks to new market classes.

5. Weed Management

Issue: The management/impact of herbicide tolerant crops in a sustainable cropping system and conventional herbicide research are still required.

Background:
The increased use of herbicide tolerant soybean varieties has resulted in concerns of weed resistance and weed population shifts. With the use of a single chemistry to control weeds on so many acres, weed resistance to glyphosate in Ontario is almost inevitable. There are also concerns over the possible environmental impacts of plants with novel traits. The control of herbicide. tolerant volunteer plants in subsequent crops is also a concern.

Most food grade soybeans are conventional varieties that have not been genetically modified

to tolerate specific herbicides. Weed escapes that adversely affect the quality of the harvested crop continue to be a problem, especially in years where poor weed control is widespread as it was in 2001. Nightshade staining in soybeans is a problem in some fields every year.

6. Cropping Systems Research

Issue: Developing sustainable production systems.

Background:
During the last 15-20 years important changes have occurred in Ontario soybean production practices. Production systems must be investigated for sustainable production. Some of the major trends are as follows:

a) Increased acreage - A significant increase in soybean acres has occurred in the last 15 years from the expansion of soybean production into more northern and eastern regions. A reduction in rotation in the more traditional growing areas has also increased the yearly soybean acreage. 2004 saw an estimated Ontario soybean acreage of 2.35 million acres, which is well above the previous few years.

b) Reduced tillage - Soybeans are readily adapted to a variety of tillage practices. The introduction and widespread acceptance of RR soybean varieties as well as the development of the no-till seed drill has facilitated reduced tillage for soybeans, with its beneficial environmental impact. This is especially true in the shorter growing season areas of the province. However, 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 9n heavier soil types and during extreme growing seasons. No-till soybean production systems must be studied and enhanced if the growth in the no-till system is to continue.

c) Narrow rows - Soybeans were traditionally grown in 30-inch rows in Ontario. The majority of soybeans are now grown in less than 22-inch rows with a large percentage grown at only 7 inches. Decreasing row widths has been shown to increase yields with no other significant increases in production costs. Narrow rows have an effect on the climate within the crop canopy and can directly affect weed populations, foliar, and root diseases. For example, white mould is more likely to thrive under narrow row conditions.

d) Reduced rotation - Although the importance of crop rotation has been shown time and time again, soybeans are still being grown too frequently in many parts of southwestern Ontario. The effect of this practice on soil structure, fertility, weeds and diseases requires additional research. The benefits of increased cereals in the rotation need to be further considered.

e) The interaction between production systems and crop diseases and insect pests needs further investigation.

The following areas need further consideration:

Soybeans

a) Increasing no-till/minimum-till success - Production difficulties have occurred with reduced tillage on fine textured soils. The exact causes of these difficulties have not been well identified to date. Soil structure, soil moisture, and plant diseases may all playa role in these production problems.
b) Soil improvements and energy efficiency under different cropping systems. c) Inoculation improvement for cool-season new production areas.
d) High slug populations have caused some long time no-till producers in the US northeast to revert to conventional tillage because no other effective slug control measures are available.

Canola

a) Agronomic studies on new winter canola types for nitrogen and phosphorous requirements, plant populations, planting date, etc. b) Increasing no-till/minimum-till success

7. Improvement of Soil Fertility, Soil Quality, and Soil Management.

Issue: Optimizing crop production while protecting soil and water quality.

Background:
Water quality has become a major concern for many Ontario residents. The nutrient management act (NMA) will impact Ontario soybean growers. Residual fertilizer has become an increased concern for the farmers' return and the impact on water quality. Continuous fertilization with use efficiency as low as 15-20% during the year of application has resulted in large accumulation of phosphorus (P) levels in some soils. With the increased phosphorus level in soil, no-point source pollution from agricultural soils has been a concern on water quality. Knowledge gaps exist as to the effects of soil residual phosphorus management and manure application. Both agronomic and environmental gaps need to be filled. Soil P test methods are also needed for high P soils.

Canola is most often grown in livestock areas and viewed as an important crop for nutrient management. Further studies on nutrient (N, P, K, etc) management are needed.

Ontario Forage Crops Committee

1. Managing Climatic-related Risk in Perennial Forage Crops –

I) Genetic/Biotechnology Improvements with respect to winter survival

II) Develop management techniques for improved winter survival of conventional and genetically altered alfalfa, and develop management techniques to enhance production of grasses during drought conditions.

Background:
Perennial forages occupy more farmland than any other crop in Ontario. They provide the feed base for virtually all dairy, beef, sheep, goat and horses farms. Winterkill can range from no significance to severe losses in all areas of Ontario. Clearly variety selection and management have a resounding influence yet producers are still concerned and always fear another bad winter will result in a shortage of hay and higher prices. Since a secure supply of forage is critical to the operation of these industries, the OFCC feels that researchers have to concentrate more effort on methods to ensure that forage supply will be adequate.

Forage and livestock producers have stated quite clearly that climate related issues, especially winter kill of alfalfa are their number one concern. Genetic progress in alfalfa over the past 20 years has focussed on disease resistance, increased yields and improved quality. However, specific efforts are required by conventional or biotechnology means to improve winterhardiness of alfalfa without deterring from other traits, especially yield, that have been improved in the past. To complement this work, improvements in the winterhardiness of orchardgrass should be made, since this grass is increasing in use with alfalfa and is the key grass species used in sown pastures in much of the province.

In addition to genetic improvements, producers want management techniques that improve the continuity of forage supply over the growing season. This would include techniques in pasture management to even forage supply during spring and summer, cope with dry weather and extend the grazing season in the fall. Certain annual forage crops have potential to produce pasture or stored forage when the growth of perennial forages is reduced by drought or the onset of autumn. For stored forages, efforts should be concentrated on ensuring that management techniques are properly matched with the needs of new genetic material introduced into the marketplace. When new traits are introduced to alfalfa or other species, the management package may need to be re-evaluated. In other cases, what is considered normal management may need to change to better ensure winter survival of currently used varieties.

The OFCC recommends that research be directed at ensuring the security and continuity of forage supply with respect to climate related risk through improved genetics and management practices.

2. Forage Preservation and Storage

Forages in Ontario are either made into stored feed as dry hay, silage, or grazed. In stored feed systems, many losses occur from the standing crop to offering the stored feed to the animal. Attempts to minimize these losses have been the subject of previous research projects in Ontario and elsewhere. New efforts in equipment design may further reduce losses during forage preservation.

The goal of making “hay in a day” has been expressed by commercial hay producers. Such a system might incorporate hay maceration plus preservatives, or microwave hay drying. Hay maceration is being studied in Quebec and in western Canada, while work on preservatives is widespread, although mostly in the private sector.

In the area of storage, much knowledge is available and extension is likely the key to progress in this area.

3. Forages and the Environment

Forages are generally quite beneficial to the environment. Studies in the past have shown improvements in soil structure, reduced soil erosion, and less runoff from fields with a perennial forage cover. New issues have arisen which need to be addressed. The use of forages as buffer strips along watercourses is common, but it is unclear what type of forage works the best or how large the buffer should be. The use of forages as a crop to store carbon in the soil is also an issue that seems likely to increase in prominence over the next few years. As the concept of full accounting gains prominence (including indirect costs of a practice or activity), the beneficial nature of forage crops on the soil, water and air could increase their value in modern crop production systems.

Another societal benefit associated with forages is the value of having livestock grazing pastures. In some parts of Europe, farmers are paid to maintain livestock on certain pastures because it increases the value of the area for tourism. While outside the scope of the OASCC system, it is reasonable that we should acknowledge the non-agricultural value of grazing livestock in the same way that we acknowledge the value of forages for soil quality and carbon sequestration.

A potential negative association between forages and the environment is the large volume of waste plastic that is generated each year from wrapped or bagged silage. It is imperative that more effort is put into recycling waste silage plastic or into creating biodegradable or photodegradable plastics that will not require land filling.

4. Corn Silage Issues

There has been a resurgence of interest in corn silage over the past number of years. This is especially true for the dairy industry. One of the key areas of interest has been corn silage varieties with modified quality traits (high digestibility or protein). However, no organized system for comparing silage hybrids exists and there has been considerable pressure to do so. Some have proposed that corn silage be recognized as a forage crop and thus responsibility for testing and extension be turned over to the OFCC. With regards to variety testing, the OFCC supported the concept that corn silage should be evaluated as a forage crop, but also acknowledged that the Ontario Corn Committee (OCC) had the geographic locations, experienced personnel, and equipment to carry out corn silage variety testing. This was expressed by the OFCC to the chair of the OCC in writing. In the area of production and management, the OFCC production sub-committee was quite strong in stating that corn

silage is a forage and that research and extension efforts are needed on this aspect of the corn crop. It was felt that the OFCC could take on this role if necessary (non-variety testing issues).

5. Weed Management in Forage Crops

Background:
As in any crop, weeds are ubiquitous in forages. During the life of a forage stand, weeds can reduce yields, affect hay drying and reduce palatability. Weeds such as witchgrass in timothy or black medick in birdsfoot trefoil and red clover fields grown for seed can make seed cleaning difficult which affects the acceptability and quality of the seed. In pastures, weeds that invade the desired forages limit productivity and carrying capacity. As well, some weeds in pastures may lower animal productivity due to toxic compounds, prickles that scratch the throats of grazing animals, weeds that impart foul odour or taste to milk and structures like burrs that cling to wool. Weed management is an integral part of overall crop management because weeds have a profound effect on productivity and feeding value. The importance of weeds in forage management is such that it needs to be specifically addressed. Forage producers are concerned with controlling the annual broadleaf and grass weeds at establishment that can impede successful implantation of the stand. Another issue of major importance is control of perennial weeds such as dandelion, quackgrass, smooth bedstraw and Canada thistle. Weed management has an impact on several other areas deemed as priorities such as yield, environmental benefits, forage crop longevity, feeding value and grading system.

Research needs: Research efforts must continue to address the effects of weeds on yield, stand longevity and forage feeding value. The environmental impact of various weed management methods for forage crops should be assessed. In addition to investigating weed management in forages, work should also be conducted on using forages as a weed management option.

- The problem of weeds at stand emergence still needs to be addressed. Some of the commonly used broadleaf herbicide products restrict grazing or feeding of the forage in the year of treatment. The manufacturers are working toward removing that restriction. New formulations of products are currently under test and should continue to be monitored.
- New products, tank mixes, adjuvants, rates and application methods must continue to be evaluated to provide forage producers with as many options as possible to control weeds at all stages in the life of a stand.
- Continued investigation is needed into integrated approaches to weed control in hay, pasture and seed crops focussing on cultural, mechanical and chemical methods. Additionally, the role of forage species, mixtures, varieties, seeding rates and dates as means of cultural control is necessary given the expanding uses for forage crops and the introduction of new forage species.
- Using forages as cover crops, inter-crops and living mulches in other crop and non-crop situations is another aspect of weed management that would promote work on forage varieties and environmental benefits.

- The effects of weeds on forage feeding value in terms of nutrients and palatability should be assessed.
- Identification of new emerging weed problems in forages, their impact on productivity and options for their management is important.

Field Crop Pest Management Committee

1. Strategic Approach to Controlling Field Crop Pests

The following list of field crop pests are placed in order of priority in terms of research needs. Strategies differ for each pest and include management, chemical controls, breeding, economic thresholds and pest biology. In most cases no single approach is warranted, but rather an integrated long-term strategy involving several approaches is advised. This should involve collaborative work with pathologists, entomologists, breeders and agronomists.

Rating system:A=High priority i.e. major concern
B -Moderate priority
C - Low priority
1 - Increase existing or establish new funding
2 - Maintain funding
3 - Decrease or drop funding

A1 **Soybean rust:** monitoring, spray application and timing, breeding for resistance, fungicide resistance, prediction methods, alternate hosts

A1 **Soybean aphid** - econ. impact, threshold evaluation, control, life cycle, wintering on primary host, prediction and monitoring presence, virus vectoring, biocontrol, release of parasitoids for organic crops and food grade soybeans

A1 **Canola insect pests:** Cabbage Seedpod Weevil, Swede Midge, Lygus spp. surveys and potential biological control agents, threshold/yield interaction, evaluation of control products especially seed treatments, management practices, resistance breeding, climate modeling for prediction of dispersal potential

A2 **Soybean Cyst Nematode** – biocontrol, population dynamics, race-shifts, spread of SCN, management procedures

A1 ***Fusarium:*** resistance breeding, new chemistries, validation of prediction models

A1 **Grub complex (June, Japanese, Chafer) in wheat, corn, alfalfa and soybeans** – decision thresholds, biology, control measures, practical foliar seed treatment rates

B1 **Millipedes, Garden Symphylans in Corn**

B1 **Soybean Viruses**

B1 **Yield enhancements from products in the absence of pest**

B1 **Seed stinging pests on soy, and edible beans:** Tarnished plant bug, Lygus spp., Stink bugs thresholds and management

B1 **Slugs:** management strategy for no-till field crops, edible beans, soybeans, alfalfa and corn, monitoring technique for prediction method, impact of tillage practices – how much is sufficient?

B1 **White mould:** across many field crops, resistance management, clonal types in relation to varietal types, early warning (prediction) and management tools

B1 **Anthracnose on edible beans:** seed treatments, evaluate new products

B1 ***Fusarium* crown rot, brown root rot** in alfalfa: surveying, testing?, economic impact assessment
B2 **Bacterial blight on soybeans:** econ. impact, resistance breeding, seed treatments
B2 **Corn leaf diseases:** (Gray leaf spot, Stewart's wilt, Northern leaf blight) monitoring, prediction of outbreaks, resistance breeding, selection of resistant varieties
B1 **Bean leaf beetle:** econ. impact, threshold, vector importance model
B1 **Dwarf bunt:** resistant varieties
B1 **Cereal Rusts:** changes in race populations and resistance implications, other tools for management
B1 **Corn Ear Rots and Moulds** – breeding for resistance, mycotoxins
B2 **Western corn rootworm** - monitoring for variant continues, transgenic stewardship
B2 **Root rots on soybeans and edibles**– (*Pythium, Phytophthora, Rhizoctonia, Fusarium*) threshold, management tools, biology
B1 **Planting Dates and Pests in Wheat** – economic impact, prediction forecasting, effect of changing cropping/rotational practices, seed treatment, best management practices, plant resistance
C1 **Alfalfa weevil**: survey to determine status of biocontrol agents,
C3 **Corn stalk rots:** (*Anthracnose, Fusarium, Gibberella*) management and relationship of cropping systems to disease incidence

Ontario Weed Committee

Field crop priorities:

1. Evaluate weed control effectiveness and crop safety of herbicides to assist registration of new products, allow minor use registration in field crops and provide information on environmental impact.

2. Develop methods to improve weed control efficiency and reduce weed control costs by determining weed specific postemergence herbicide rates and critical factors affecting their performance, and evaluating site-specific methods of application.

3. Optimisation of Integrated Weed Management (IWM) systems that incorporate the components of alternative management methods, critical period, weed thresholds, competitive cultivars and planting patterns, cropping systems and alternative non-chemical control measures to reduce the negative impacts (e.g. weed shifts and resistance) that result from dependence on single weed control strategies.

4. Develop management strategies that will be sustainable in the long term for emerging problem weeds.

5. Document occurrences of herbicide resistance in Ontario and characterize their resistance spectrum and biology so as to develop effective management guidelines and strategies.

6. Determine the impact of nutrient management programs and of soil nutrient levels on weed thresholds, weed germination patterns weed population dynamics and the effectiveness of control measures on annual weed species.

7. Develop weed control strategies within organic cropping systems.

The issues and priorities encompassing multiple commodities have been grouped in the Pest Management category:

1. To continue to evaluate new herbicides, new herbicide tank mixtures and new herbicide application timings for herbicide efficacy and crop tolerance in field and in horticultural crops.
2. Develop improved methods for the rapid and efficient detection of herbicide residues in relation to: (i) herbicide carry-over and crop rotation (ii) off-site contamination (drift, run-off, leaching), and (iii) applicator, grower, bystander exposure to dislodgeable foliar residues on plants.
3. Evaluate and monitor the ecological and environmental impact of herbicide tolerant crops, including (i) shifts in weed populations, (ii) development of herbicide resistant weed biotypes, (iii) transfer of recombinant genetic material to other plant or microbial species, and (iv) changes in the composition of soil microbes.
4. Study the biology of herbicide resistant weed biotypes so as to optimize prevention and management strategies in order to prevent the development of multiple-resistance.
5. Evaluate the effectiveness of cultural (e.g. crop rotation) and mechanical methods of weed control in combination with weed specific herbicide rates (minimum lethal dose) to minimize herbicide use within integrated weed management (IWM) systems.
6. Develop weed management strategies within organic cropping systems.
7. Establish economic thresholds for problem annual and perennial weeds, with consideration for crop quality, dockage, harvest moisture, and weed seedbank issues.
8. Investigate weed biology and ecology including basic research on biology, physiology, population dynamics, and weed-crop interactions.
9. Evaluate advanced sprayer technologies, including site-specific applications, which have the potential to reduce herbicide rates, spray drift, spray volume, sprayed area and effects on non-target organisms, to meet the needs of custom applicators and growers.
10. Evaluate and monitor the impact of unsprayed buffer zones along field margins on weed population dynamics and crop yields, and develop vegetation management systems for field margins, roadsides and rights of way
11. Identify new invasive weed species that displace native vegetation in non-crop habitats and are difficult to control in field and horticultural crops and, and develop management strategies.
12. Determine the environmental variables affecting the production, release and dispersal of pollen from allergenic weed species such as ragweed and develop a model predicting the timing and severity of pollen load near major metropolitan areas. This will permit the development of an accurate Pollen Load Index ensuring medication is taken at the optimum timing so it retains its effectiveness.

Ontario Pulse Committee

1. Integrated Pest Management for Insects & Disease

Issue*:* Developing reduced risk strategies for IPM of dry bean pests

Significant Pests include
- Potato leafhoppers
- Tarnished plant bug/stink bug
- Soybean Cyst Nematode
- Anthracnose
- Bacterial Blight
- Soybean Rust (?)
- Sclerotinia
- Fusarium Root Rot

Target Agency: University of Guelph, OMAF, AAFC, and OCPC;

Title: Development of IPM Strategies for Pest Management for Edible Beans;

Details:

- Develop IPM strategy for Bacterial Blight, Anthracnose, Sclerotinia incorporating reduced risk pesticides. Second goal of the project is harmonization of seed treatments in North America for dry beans.
- Evaluation of impact of soybean cyst nematode on various bean types.

Background

Bacterial Blight (Common & Halo) is a significant disease that occurs annually in Ontario dry beans. Trials indicate that the disease can reduce yields by 7 – 10% in addition to quality losses. OAC REX is the first white bean cultivar released that has resistance. Incorporation of genes for resistance into other varieties and market classes needs to be expanded. This work is expensive and time consuming, particularly since dry beans utilize conventional breeding technology. A replacement to streptomycin seed treatment is required. Streptomycin has an emergency use registration on imported seed only until 2008.

Anthracnose : A new seed treatment Apron – Maxim has received registration on edible beans. On imported seed, this product is expected to be the product of choice in the future. Most dry bean seed is imported from the U.S. This product does not provide adequate control of anthracnose. Alternative seed treatments show significant promise as a reduced risk pesticide.

Soybean Cyst Nematode continues to expand across soybean growing areas, including major dry bean areas of the province. Dry beans are a known host of SCN, but little research has been conducted of their impact on various dry bean classes, and to IPM strategies.

2. Weed management in edible beans

Target Agency: AAFC, U of Guelph, OMAF, and OCPC;

Title: Expand research funding to include emerging niche edible bean types;

Details:

- Evaluation of new chemistry for control of weeds in edible beans;
- Evaluation of safe rates of new/existing products on various edible bean classes. Expand research to include other niche classes including Otebo, Kintoki, and Adzuki;
- Control of problem weeds including strategies to manage resistant biotypes;

Background:

A limited number of herbicides are presently available and little new chemistry is expected to become available in the foreseeable future. Large differences in bean type tolerance to available chemistry needs further work. Research into control of problem weeds also requires additional research. Edible beans are not as competitive a crop against weeds as soybeans; thus weed control is often more difficult. Further, weeds present at harvest will cause severe staining of beans if a pre-harvest desiccant is not used. Effective weed control during early growth stages may reduce/eliminate the need for a pre-harvest spray. Having a strong IPM program for weeds increases the appeal of edible beans with end market users.

Knowing the biologically effective herbicide rate for control of problem weeds will help growers minimize herbicide use by adjusting the dose to the particular weed problem. Research trials conducted by RCAT have documented significant differences in tolerance to herbicides amongst various bean types.

Ontario Tobacco Committee

Pest management

1. Development of integrated strategies for the monitoring and control of the Tobacco Moth (*Esphestia elutella*) in the tobacco production chain (CTRF) (Short term research priority, new).

2. Evaluate and develop control measures for Bacterial Soft Rot, *Aspergillus* and moldy tobacco including the evaluation of sucker control products with improved efficacy and refinement of sucker control practices for use in a pest management program (CTRF) (Short term research priority, ongoing project).

3. Development of fumigant replacements, i.e. millet, or other nematode suppressing crops to control nematodes. Integrate biological control of nematodes into a pest management program (CTRF) (Short term research priority, ongoing project).

4. Fungicide screening for Damping-Off of tobacco caused by *Rhizoctonia solani* with a focus on resistance management (CTRF) (Short term research priority, ongoing project).

5. Investigate and test products that inhibit the growth of algae and control Black Root Rot in used plant production cell trays (i.e. algae - copper products) (CTRF) (Short term research priority, ongoing project).

6. Herbicide screening in tobacco and rye crops. (CTRF) (Short term research priority).

7. Investigate insecticides with different chemistries for the control of aphids, wireworms, white grubs, seed maggots and cutworms for the purpose of resistance management, reduced active product per hectare, and integrate into a pest management program (CTRF) (Short term research priority).

8. Fungicide screening for control of metalaxyl-insensitive blue mold, and greenhouse and field control of Target Spot and *Alternaria* with a focus on resistance and integrate into a pest management program (CTRF) (Short term research priority, ongoing project).

Crop management

1. Development and evaluation of improved methods of sucker control that are economical and longer-lasting, and minimize leaf drop and the occurrence of injury related disorders (i.e. Bacterial Soft Rot) (CTRF) (Short term research priority, new).
2. Determine the effects of different nitrogen rates on recommended and promising varieties on tobacco yield and quality (CTRF) (Short term research priority, ongoing project).

3. Identify the cause(s) and solution(s) of tobacco bruising (CTRF) (Long term research priority, ongoing project).

Ontario Organic

Soil Management

- **Soil Health** - Need to identify soil health indicators to help growers understand nutrient cycling and testing. How do we identify “healthy” soils. What are the factors (and farm management practices) to improving the health of soils? Are healthy soils more suppressive of diseases, weeds and insects? What effect do they have on long-term productivity? Are there human health implications (benefits) to eating crops grown on healthy soils?

- **Manure/compost** - What is the role of manure and compost to improving the health of soils? What are the best management practices to optimize the use of manures and composts?

- **Soil amendments** - Some non-Ontario labs now test for various soil biological factors. How reliable are these tests and their recommendations under Ontario conditions? What are the benefits of various soil amendments to the productivity of soils?

Pest Management

- Pest management on organic farms requires a systems approach incorporating the benefits of cultural techniques, mechanical methods and beneficial organisms, and appropriate biopesticides when necessary.

- **Weeds** are one of the largest limiting factors to yield on organic farms for many crops. There is a need for more information on the interactions of crops and weeds on organic farms. An evaluation of various types of mechanical weed management to complement other weed management approaches is needed. The development of practical alternatives to weed management and how to reduce trips over the fields with mechanical tools are needed.

- **Bio pesticides and new products** – Research effort is needed to evaluate and facilitate the registration of new pesticides with PMRA. This is especially true of minor use products as permitted for use in organic farming, many of which are already registered for use by US organic farmers. This would include bio-pesticides, pest deterrents, and bio-stimulants. The limited expertise in this area and difficulty to register new products are limiting the choices available to organic farmers in Ontario and Canada.

- **Integrated pest management and beneficial organisms** – There is a need for more information and technology transfer on various beneficial insects, fungi, bacteria, that may assist in the control of various insects (or pathogens). As well, other potential methods for management of pests, adapted from conventional farming, may help organic farmers, as long as they are complementary with their agricultural practices. More knowledge transfer from conventional or organic research programs is needed. Which farming practices (such as field border effects) can enhance beneficial organisms? What homeopathic/herbal methods of weed/pest management are efficient and can be used in crops or livestock production? Examples of difficult to control pests in organic production are Hemiptera in pomes and strawberries, swede midge in cole crops (broccoli, cabbage etc), scab in apples, and black rot in grapes

Whole Farm Planning Systems

- **Ecosystems** - There is a need for more research into the ecological footprint of farms in Ontario including organic farms. This would include a study of various life cycles

documenting the biodiversity of organisms on the farm as well as a variety of other environmental impacts such as water quality.

- **Socio-Economic –** What are the socio-economic impacts of organic farming in rural communities? Organic farming internalizes many of the input costs by using fewer off farm inputs and revenue factors are frequently quite different from non-organic farms.

- **Energy** - Energy use on the organic farm is very important to the basic philosophy of organic farming. This includes using energy efficient methods of production on the farm and an accounting of the whole energy cost of food production. There needs to be more research on the use of energy alternatives on the farm including methane digesters, wind power, hydrogen fuel for tractors and the diversity of energy sources used on the farm.

- **Transition to organic** - The transition to organic farming takes at least 3 years. During this time the organic farmer is exposed to financial hardship due to lower yields during this adjustment period and there is limited opportunity for organic price premiums. Research is needed on appropriate strategies to make the transition. Research is also needed to document the changes in soils, pests, livestock and crops during this transition period.

- **Design of farm systems** - There is a need for research into the design of farm systems to look at how various farm crops and livestock species complement each other and how to capture the synergies between enterprises. An example is to look at beneficial crop rotations to examine the beneficial and the negative factors. There is a “conventional wisdom” among organic growers that many pest and fertility problems can be avoided by correct design and management of the farming system. More research is needed to document the design and integration of these systems to optimize benefits on the farm.

Recommendation 2

Innovative and Enhanced Germplasm Development and Utilization.

This section will include crop breeding, performance evaluation, physiology and the development of new molecules, gene discovery, genomics, and bioinformatics to produce knowledge and materials to advance the industry.

The research described within this recommendation strives to develop the raw materials and the knowledge base leading to a vibrant and diverse field crop sector. It includes breeding for increased competitiveness, new markets, life-science based products and processes and improved quality. It includes basic research in the areas of genomics and bioinformatics to discover new applications and uses, to increase efficiencies of breeding systems and to dramatically broaden the utility of basic commodities. The overall goal is to produce new, higher value products for the industry and to do it quickly and more efficiently. The priorities listed also include research programs in the area of crop and plant physiology and document strong support for enhanced performance testing systems.

Ontario Cereal Crop Committee

1. Performance Testing – Ontario Cereal Crop Committee

Background: Development of new varieties for Ontario conditions is paramount to a strong agricultural sector. Registration requirements have been reduced, in order to allow for a more rapid entry into the marketplace for varieties with special traits and/or higher yield potential. While entry of these new genetics is positive, evaluation of area of adaptability and other agronomic traits is essential to allow the industry to prosper. A strong performance testing system is the most efficient method of determining the best way to use new genetic developments. Without performance testing, it will be very difficult for the industry to move forward to the benefit of all.

Economic importance: The value of this system is difficult to determine. Conservative estimates place the increased production and quality potential at $20 million dollars annually.

Competitiveness: The identification of better yielding and area specific cereal varieties gives Ontario growers a competitive advantage to areas that do not have broad based, well designed performance testing systems. This leads to a more competitive milling and baking industry, as quantity and quality of needed products can be produced close to home, reducing transportation and storage costs.

Social benefits: Growers are less dependent on support programs with high yielding, premium quality crops. Further development of the handling and processing industry will be encouraged, leading to increased employment and prosperity.

Environmental benefits: Higher yielding crops sequester more carbon, add organic matter back to the soil, and help reduce potential erosion through improved soil structure and canopy effects.

Ontario Corn Committee

1. Genetic Improvement of Corn for Ontario

The existence of an efficient continuum from inbred development through to commercial hybrid evaluation is critical to the Ontario corn industry. Elite germplasm may be developed to increase productivity, meet specific needs of a bio-based industry, or to confer nutritional improvements. However, these advances will have little impact on the provincial economy unless a system exists for ensuring that these advances can be integrated, refined and tested across Ontario.

Many of the priorities for the corn industry depend upon the successful incorporation of genetic traits, natural or modified, into superior breeding lines (e.g. cold tolerance, pest resistance, premium market traits, etc.) Although there are large hybrid development programs in the private sector, inbred/hybrid development must also continue to be part of the public breeding programs, since it is only through locally adapted germplasm that the true value of genetic enhancements to corn growers can be properly evaluated.

Within Ontario these public programs are important sources of "early" germplasm to be fed into the private sector breeding programs and they serve as the backbone for identifying the most efficient commercial hybrids.

2. Enhanced Pest Resistance in Corn

Fusarium

Corn grown in Ontario continues to be prone, periodically, to severe infection by Fusarium ear rots. The toxins produced by these moulds seriously affect the performance and health of hogs, in particular, and may also affect the performance and/or health of other livestock, and humans. Livestock feeds still represent the greatest usage of corn in Ontario and the usage of corn for human consumption is increasing. Thus, high priority must continue to be given to the development of corn lines with resistance to Fusarium ear rots.

Work at ECORC and University of Guelph have investigated the mechanisms of ear rot infection and identified sources of resistance. Continuing funding is needed, however, to assist with the incorporation of genes for resistance into breeding lines and then into commercial breeding material, using both conventional breeding methods and biotechnology.

Leaf Diseases
In recent years there has been a substantial increase in the use of cultural practices that leave higher levels of crop residues on the soil surface throughout the winter and subsequent growing season. The presence of corn residues on or near the soil surface increase the risk and/or severity of infection from various fungal leaf diseases, such as eyespot, leaf blights and rust. In addition, leaf diseases not currently present in Ontario are threatening to move into this province from adjacent States in the USA. Hybrids currently grown in Ontario may have little resistance to these diseases.

Sources of genetic resistance to leaf diseases need to be identified and rapidly incorporated into superior inbred lines, using both traditional breeding methods and biotechnology. Success of this breeding effort and the prevention of devastating disease infestations will require the support of a plant pathologist with expertise in corn diseases.

3. Improved Cold Tolerance in Corn

This research area is key to enhancing competitive advantages for Ontario corn production as US based breeding programs have less interest in the genetics or physiology of cold tolerance.

There is a distinct need to develop reliable techniques to assess tolerance of corn hybrids/inbreds to chilling during grain filling, and determine if chilling tolerance during grain filling is correlated to early season cold tolerance.

More information is required regarding the conditions that limit corn growth, germplasm that will prosper in cool conditions, and the relationships that exist between traits that provide superior performance under both warm and cool conditions.

Ultimately, the goal is to incorporate superior cold tolerance into superior lines in corn breeding programs.

Ontario Oil and Protein Seed Crop Committee

1. Genetic Enhancement for Production Stability and Risk Management.

Issue: Continued genetic enhancements are required to maintain competitiveness in international and domestic markets.

Background:
Genetic enhancements lead to significant increases in productivity and economic gain without large increases in production inputs. Lower provincial soybean yield averages in 2001, 2002, and 2003 have emphasized the need for the continued improvement in plant genetics.

Biotechnology and genomics research offers new opportunities for soybean and canola improvements. The continued development of biotechnology tools is necessary for use in breeding and to provide understanding of the genetic control of traits, especially complex traits. Conventional breeding programs and the processing/distribution chain will increasingly

rely on molecular markers for selection of complex traits, for stacking multiple traits (especially disease resistance genes), and for cultivar identification.

There has been renewed interest in winter canola in the last two years due largely to the registration of improved cultivars from Europe. Further winter canola variety development is required to improve yield, winter hardiness, and disease tolerance.

2. Performance Testing of Varieties

Issue: Information for variety selection decisions must be available to maximize production.

Background:
The variety registration process continues to be under review. With the imminent loss of both merit and performance data requirements for soybean variety registration, even more emphasis will need to be placed on generating data which allows producers to make profitable variety decisions. Benefits to a strong variety testing system include:

a) Ontario soybean producers can grow new varieties with confidence.
b) Performance data for the shorter season areas of Ontario is especially important, as little or no other data may be available.
c) All new varieties, whether they are derived from conventional breeding programs or from biotechnology, need performance data to succeed in the industry.
d) Growers need unbiased performance data to explore the potential benefits or drawbacks to new market classes.

Ontario Forage Crops Committee

1. Improving feeding values of forages for stored feed and pasture.

I) Genetic/biotechnology improvements to energy content and/or other desirable quality traits.

II) Management of forage crops to optimize feeding potential

Background:
High quality forage is the engine that drives the dairy industry in Ontario. Similarly, the beef and sheep industries rely to a great extent on high quality pasture and hay to ensure both milk production and proper rebreeding. Efforts to increase quality in both stored feed and pasture must be made to ensure that increased animal performance can be achieved from forages.

Alfalfa is the main stored forage used in Ontario. It supplies adequate amounts of crude protein when harvested at the correct stage of maturity, but it is significantly lower in energy than grains such as corn or barley. Alfalfa that has been selected or genetically modified to have higher digestible energy content would allow it to fill a higher proportion of the ration for milking cows and thus reduce feed costs. Progress has been made in the production and assessment of alfalfa varieties with reduced NDF levels and increase cell wall digestibility.

Another area of interest would be to modify the types of protein found in common forage plants.

High quality forage harvested as pasture can be a very economical method to feed beef cattle, develop beef and dairy breeding heifers, and grow market lambs. If these enterprises are to grow and prosper, more emphasis needs to be placed on managing the pasture resource to produce higher quality forage. Researchers need to focus on the forage quality requirements of the whole farm to integrate various methods and times of forage harvest into one complete system. Annual forage crops for stored feed or grazing should be considered here as well. The goal of the complete forage system should be to provide the maximum amount of nutrition from forages on a year round basis, supplementing with other feed sources only when the forage resource cannot provide those nutrients.

New species of forages need to be investigated for their ability to provide high quality forage in either pasture or stored feed systems. Before new types of alfalfa or other species are introduced to the marketplace, work should be done to ensure they can provide similar quality to existing material or else determine what management regime is needed to achieve the desired quality.

The OFCC recommends that research be directed at improving forage quality through genetic improvements, changes in management practices or evaluation of new species.

2. Continue and improve the public system of forage variety testing in cooperation with industry stakeholders.

Background:
The OFCC has been conducting unbiased evaluation of varieties for yield and persistence since the committee was established in 1956. The work was undertaken to: i) Identify the varieties which merit use by forage producers in Ontario ii) Provide relative performance information among forage varieties available in the marketplace, and iii) Provide data to Canadian Food Inspection Agency to allow the legal sale of these varieties. In 1991, the OFCC was the first provincial recommending committee to undertake quality evaluation of forage varieties in addition to yield performance.

Forage yields and quality samples are collected from OFCC registration trials at public testing centres. The OFCC worked with the Seed Trade and the Canadian Food Inspection Agency during 1997 to improve the system of support for variety registration. This allowed varieties that meet OFCC performance criteria to be supported for registration using some or all data from outside Ontario. This allowed producers to have access to these varieties 2 years earlier than under the previous system. The OFCC still conducts performance testing and still provides performance data from public trials in Ontario to producers as in the past.

A significant change could occur over the next year as the CFIA has proposed that merit-based registration be eliminated for all forage crop species. Whether a requirement for some data on agronomic performance will be required is not clear at the time of writing. This could significantly affect the performance testing system since new varieties may no longer have a legal requirement to be tested in public Ontario tests. The OFCC has prepared a position

paper to present to CFIA which recommends that some agronomic data be available to producers at the time of registration. (Appendix I) The OFCC has essentially accepted that quality testing cannot be made financially viable through the committee structure and has decided to eliminate that option for the near term. At the same time, the OFCC has redesigned its fee structure in an attempt to secure enough funds to continue public testing while still extending the results of the testing to the end user. (Appendix II) The new fee system should eventually incorporate not only the seed trade, but also commodity groups and other interested parties.The OFCC recommends that variety testing for yield and persistence be continued.

3. Forage yield

In the current situation, very little plant breeding work is being done on alfalfa or trefoil in the province. In other legume species and in the grasses there is no varietal breeding effort at the present time. Most alfalfa varieties on the recommended list are now coming from one of five breeding programs in the United States. In all other species new varieties are random arrivals from any other temperate agricultural part of the world. In other words the competitive advantage of Ontario's forage industry in terms of superior varieties is largely a lottery of arrivals.

It is a concern of the OFCC that so little effort is directed at improvements in the yield of forages being grown in the province. Clearly advances have been made from multiple pest resistance in alfalfa to improvements in winter hardiness of red clover. Some varieties have been truly outstanding, such as Climax timothy released in 1947 and still on the list....but is it time to reemphasize the importance of remaining competitive in all of the forage species? The grass breeding program at the Ottawa station has been terminated. None other exists in eastern Canada.

Ontario Pulse Committee

- **Genetic Enhancement for Yield, Quality and Risk Management**

Issue: Continued Genetic enhancements adapted to Ontario are required to maintain competitiveness in International and domestic markets

Source**:** Variety Subcommittee, Ontario White Bean Producers, Ontario Coloured Bean Growers, Ontario Bean Dealers, Pulse Canada.

Target Agency: AAFC, OASCC, U of G, OMAF

Title: Funding support for bean-breeding position located at the University of Guelph. Continue to fund bean breeding and food quality evaluation of edible beans at AAFC, Harrow.

Details**:** Full funding for a bean breeding position located at the University of Guelph. The detailed objectives are listed in order of priority; cultivar release and germplasm improvement through intra- and inter-specific hybridization followed by conventional and biotechnology-aided selection methods.

In 2003 registration of the first bacterial blight resistant variety of white beans OAC Rex is a significant step forward for the dry bean industry. A new national NSERC project with AAFC researchers in Manitoba and Saskatchewan to develop other bean types with resistance to CBB was started in 2004. Results from 2004 indicate that CBB resistance increased yields, on average by 7%.

1) Conventional breeding of cultivars for:

- Yield and yield stability;
- Quality traits include cooking and canning quality, seed colour and size, mechanical damage, etc.;
- Agronomic traits including upright plant architecture, harvestability, row spacing, disease resistance, environmentally friendly production;
- Improved yield potential with early to full season maturity and upright plant archetype;
- Cooking and canning quality acceptable for domestic and international trade;
- Increased resistance to common and halo bacterial blight, white mold and root rot diseases;
- Pyramiding resistance to anthracnose and bean common mosaic virus races prevalent in Ontario and other major genes controlling resistance to pests;
- Transfer of resistance to potato leafhopper to dry beans adapted to Ontario;
- Testing lines/cultivars in cooperative trials to identify superior lines for registration and to generate performance data;

2) Application of biotechnology to improve efficiency in cultivar development through:

- Identification of RAPD markers linked to common bacterial blight resistance genes aiding molecular marker assisted selection;
- Integrating selection methods based on molecular estimates of genetic distance with conventional selection techniques to accelerate simultaneous improvement of yield, adaptation, quality and pest resistance;

3) Germplasm improvement and utilization through:

- Multi-cycle intermatings of adapted and donor germplasm sources (within and between Meso-American and Andean races, and utilization of tepary bean and scarlet runner beans) to widen the germplasm base;
- Release of improved germplasm to breeders of private and public institutions.

<u>Background.</u>

University of Guelph removed funding support for bean breeding position and pathology work. Cultivar development of varieties best suited to Ontario growing conditions is critical for Ontario to retain its competitive advantage and international reputation for dry edible beans. Although white bean acreage has been shrinking over the past 10 years, coloured bean acreage is expanding. Bean breeding programs in Ontario has been highly successful in producing high yielding, high quality cultivars, with improved disease tolerance/resistance. Dry edible beans have a value of $40 M to Ontario producers. Over 85% of the dry bean crop produced is exported. Buyers are moving toward ISO9000 trade specifications that demand

accountability for high bean quality. In order for Ontario to remain competitive, identification of superior varieties is paramount. Some markers have been found in recent years and are now being used in breeding programs. There is currently no di-hploidy development or transformation research occurring. Pulse Canada in its research strategy proposal is proposing that edible bean breeding focus in Ontario be on white beans, kidney, cranberry, and black beans, and alternative types. Gene mapping and marker assisted selection was identified as a high priority under biotechnology section of the Pulse Canada strategy. Edible beans add to the diversity of crops, which supports good crop rotations, agricultural diversity and risk management principals.

Ontario Tobacco Committee

Development of high quality cultivars with: a) good manageability, balanced leaf chemistry, mature leaf style, and less off-grades; b) resistance to pests and diseases (Root-Lesion Nematode; Black Root Rot; Blue Mould, curing disorders- Bacterial Soft Rot, Pole Rot, Aspergillus; Target Spot; Rhizoctonia Damping- Off; Tobacco Mosaic Virus (TMV); Aphids; and White Mould) and, c) suitability for machine harvesting. Traits to consider are: uniform leaf maturity, reduced sucker growth, minimal leaf drop, high yield and returns (CTRF) (long term research priority, ongoing project).

1. Development of high quality cultivars with: a) good manageability, balanced leaf chemistry, mature leaf style, and less off-grades; b) resistance to pests and diseases (Root-Lesion Nematode, Black Root Rot, Blue Mould, curing disorders (Bacterial Soft Rot, Pole Rot, Aspergillus), Target Spot, Rhizoctonia Damping- Off, Tobacco Mosaic Virus (TMV), Aphids, and White Mould) and, c) suitability for machine harvesting. Traits to consider are: uniform leaf maturity, reduced sucker growth, high yield and returns (CTRF) (long term research priority, ongoing project).

2. Determine the effects of different nitrogen rates on recommended and promising varieties on tobacco yield and quality (CTRF) (short term research priority, ongoing project).

Ontario Organic Committee

Plant Genetics

- **Breeding for resistance** – Organic farmers need new cultivars that are resistant to pests and have good agronomic traits and market oriented qualities that are appropriate for organic farms. Growers need a diversity of genotypes available for managing pests.

- **Co-existence of organic and GEO** - The interface of organic and genetically engineered crops creates problems to maintain genetic purity in organic crops at the low levels demanded by the marketplace. Production techniques need to be developed to assist producers on methods of reducing ‘contamination’ to maintain the value of the crop. Adequate buffer zones and equipment cleaning procedures are examples of

information needed by growers. These issues extend to both the commercial crop and to seed production systems.

- **Adaptiveness to organic** – Is the relative performance of varieties different in organic and conventional production systems. Do differing levels of fertility or plant protection materials common in conventional variety evaluation methodology affect this? Can particular plant traits such as height, plant type, root characteristics, pubescence, or other leaf parameters be key indicators of adaptiveness? For example, is there a difference in the tolerance of varieties to weeds which can be characterized by leaf structure or architecture types so that growers can select varieties that may be adapted to organic based on these plant traits?

- **Heritage species/varieties** – There are some unique markets in organic that can best be served with heritage species or varieties. There are reports of enhanced taste, quality, pest resistance or tolerance to soil conditions. We need to quantify and validate this information.

Recommendation 3

Market Responsiveness

Research strategies to address market development, new product development, food safety and enhancement.

Competing in traditional commodity markets will become more difficult for Ontario producers in the next several years. This will require increasing emphasis on the development of new higher-value markets for Ontario field crops with the integration of the producer up the value-chain. Research in these areas has been ongoing for several years, however, with the increasing emphasis on life-sciences and food quality and safety, further targeted efforts are required. Most of this work will strive to take advantage of the history of I.P. crop production in Ontario and the existing and developing infrastructure to support these markets.

Ontario Cereal Crop Committee

1. New Markets

Background: Development of new markets is a way to expand acreage and value of the crops grown. When successful, efforts of this nature often have great benefit. Milling oat and malting barley are two areas that are currently underway within the sector. This has the potential to expand production by up to 100,000 acres, into a premium market. Other opportunities exist that should be investigated.

Economic importance: Premiums for this type of market often run from $10 to $40 per tonne to the producer, and can develop whole new processing opportunities. Care must be taken, however, to discern actual acreage that could be affected by these developments. Development of high value biotech components that require very small acreage, while beneficial, have far less overall economic impact to the sector.

2. Improvement to Grading System

Background: Grain grading has tremendous impact through the industry. Grain downgraded reduces the price paid to the producer, may restrict export options, and grain that is not graded properly due to factors like fusarium can become unusable by millers once actual vomitoxin levels are known.

Despite the importance of grain grading to the industry, it has remained a subjective test, relying on visual inspection for colour and other parameters. With the vagaries of human eyesight, this has led to many inconsistencies within the grading system. This was proven by a study undertaken in 2000 by Dr. Art Schaafsma.

Development of an objective grain grading system is essential to ensure proper streaming and returns of grain produced and processed across the industry.

Economic importance: Grain graded as feed that is actually of milling quality reduces the price paid to the producer by $15/tonne. Grain that is accepted as milling quality, which is subsequently found to be above acceptable limits for vomitoxin, is of no value to the miller and must be removed from the system at significant cost.

Competitiveness: A consistent and accurate grain grading system would ensure that buyers of Canadian grain abroad would receive the quality of product that they expected. This would further enhance the Canadian reputation for quality, and premiums attached. This grading system would also ensure that both producers and end users in the province are treated fairly.

Ontario Corn Committee

1. Develop Value Added Markets for Corn

Food grade quality corn represents a major value-added market for Ontario corn that has the potential to expand significantly. Currently, much of the market is being filled with corn or corn products from the U.S.A. Development of food grade quality corn suitable for production in Ontario represents a significant import-replacement opportunity, as well as an important export market.

Research has begun within the University of Guelph, primarily at Ridgetown Campus, directed toward breeding early white, food grade corn inbreds and hybrids, suitable for production in Ontario and toward identifying yellow corn hybrids of food grade quality, in co-operation with the private sector.

Long-term funding is required to enhance the technical support for these programs and to ensure the continuation of this work.

Ontario Oil and Protein Seed Crop Committee

1. Development of Speciality Soybeans and Alternative Uses

Issue: Research is required to develop areas that will increase the utilization and value of Ontario soybeans.

Some of the main areas of interest include:

a) Industrial Utilization
   I) Biodiesel
   II) Enzymes
   III) Solvents
   IV) Waxes
   V) Plastics
b) Health Benefits
c) Food Use
   I) Food grade soybeans
   II) Food Ingredients
   III) Organic production
d) Functionality
e) Nutraceuticals and Pharmaceuticals
f) Increasing crush value

Background:
Soybean oil and protein are used in the manufacture of human food, animal feed, and various industrial products. New and existing areas must be explored to increase the utilization and value of Ontario soybeans.

Ontario Forage Crops Committee

1. Forage Grading System

- The importance of a well defined grading system in the buying and selling of agricultural commodities is undisputed. In contrast, no uniform grading system for legume, grass or mixed hays exists in Canada nor in the U.S. Hay purchasers located in areas with no consistent hay grading system must evaluate each hay lot purchased. They can apply the hay grading system of their choice, sample hay and run chemical analyses to evaluate hay quality, or visually inspect hay and make an informed opinion of the hay. The best method involves combining visual judging with chemical analyses. With many components to evaluate the problem becomes one of simplifying the values to establish a grade that satisfies both seller and buyer.

- The problem is particularly acute in Ontario where hay may be shipped long distances. Markets exist not only in the southern U.S., but also overseas. The OFCC regards this issue as an important one that requires a system parallelling the benefits of other commodity grading systems such as corn or wheat. The OFCC defines this issue as one of pulling existing information together and arriving at a consensus rather than one that requires an expansion of research efforts.

Ontario Pulse Committee

1. Edible Bean quality evaluation and utilization

Issue: Edible beans have significant health benefits that can improve the Health of Ontarians. Research into the health benefits, compositional analysis needs to continue/expanded to identify traits that may have special value;

Source: Variety Sub-committee;

Target Agency: AAFC, U of Guelph, CARC, Pulse Canada, ARIO, and OASCC;

Title: New funding is required to conduct literature review, and compositional analysis of dry beans;

Details:
Funding is required to conduct a literature review of research on quality components, compositional analysis, traits that may have special value.
Research to address standard methodologies in conducting analysis.
Compositional analysis to identify unique inherent traits that may have health benefits, neutraceutical, or industrial uses.

Background:

The Ontario government has identified improving the health of Ontarians as a priority. Dry beans can play a role in a healthy diet of consumers.

Health Benefits identified include:
- Circulation System – reduced risk of atherosclerosis, heart attack, high blood pressure
- Complex Carbohydrates, Low fat, and lowers cholesterol – Weight control, Diet, low risk of food allergy to beans; Reduced risk of osteoporosis
- Diabetes
- Digestion system health
- Reduced risk of colon and breast, ovarian cancer.

Customers of edible beans are placing more value on quality traits. The industry needs to examine the composition of edible beans for traits of special value for food, neutraceuticals, or industrial uses. Examples would include screening for components such as Biofavonoids,

Saponins, Oligosaccharides. Ontario is well positioned to grow premium priced speciality bean types and have the identity preserved production system and marketing to support them.

There is a shift from producing a commodity to a 'market or buyer' driven bean that has unique or novel output traits. The value of such traits must return incremental margins to all sectors of the industry. The special quality characteristics for food and industrial use are largely unknown. It is recognized that edible beans contain some unique starch, protein and fiber characteristics. Health professionals have recognized the value of edible beans for their health benefits. However only a few researchers have studied pulse utilzation for food and industrial uses. Little is known of the compositional traits that may be of special value.

Current Research/Extension Activities

Work at AAFC, Harrow and University of Guelph has focused on developing, and evaluating germplasm and varieties for canning quality. Efforts have also been directed to factors that have an influence on flatulence, and altered sugar content and quality. Ongoing research is working on expanding the germplasm base.

2. Evaluation/development of alternative pulses, specialty market types.

Target Agency: AAFC, U of Guelph, Pulse Canada, OMAF, ARIO, CARC;

Title: Expand present research funding of alternative pulses to also include niche market types currently being grown on a limited number of acres in Ontario;

Details:

Expand breeding/agronomic research to include other niche pulses grown in Ontario. Examples include Kintoki, Otebo, Adzuki, and large white.

Background

Statistics Canada estimates that Ontario acreage of specialty type dry beans (eg. Kintoki, Adzuki, Otebo, Large White, etc.) has expanded significantly to 36,000 acres in 2005. This represents 1/3 of the acreage of coloured bean types. Acreage of several niche market classes of dry beans including Adzuki, Otebo, Kintoki has expanded in Ontario. AAFC, Harrow has developed varieties of Mung Beans and Pigeonpeas suitable for Ontario. Several other market classes grown on limited acres offer new market opportunities. However no breeding/ agronomic research into expanding the market opportunities of these high value pulses is being done. Good demand for these market types exists both domestically and internationally.

Ontario Tobacco Committee

Improving crop quality

1. **Quality Assurance Priorities**

2. Leaf Quality Assurance Program (including control of the Tobacco Moth) (CTRF) (ongoing project).
3. Non-Tobacco Related Materials program.
4. Analysis of green and cured tobacco leaves for the presence of Blue Mold oospores (CTRF) (ongoing project).
5. Further development of measures to reduce TSNA's in cured tobacco (CTRF).

Ontario Organic Committee

Food Safety and Quality

- **Pathogens** – Some reports have indicated there is an increased risk of pathogens in organic foods due to greater use of manures in crop production. There have been few reports so far of food safety issues on organic farms. What are the risks of pathogens on organic produce? Are current composting procedures effective strategies to manage pathogens on organic farms? Research is needed to identify food safety risks and appropriate management practices for organic farms.

- **Antioxidants** – Some research has indicated increased levels of antioxidants or similar health promoting compounds in organic foods. Some antioxidants are effective to reduce human disease. What management practices are effective to elevate antioxidants and other beneficial food components in organic foods? For example organic standards require organic livestock to have access to pasture and pastured animals have been reported to produce products with higher levels of conjugated linoleic acid (CLA).

- **Nutritional Quality** – Research summaries have been inconclusive to indicate if organic foods have nutritional advantages for various nutrients when compared to other farming methods. Research is needed to identify potential nutritional benefits of organic foods for consumers.

Markets and Farm Economics

- **Barriers** -- There are many barriers to growth of the organic industry as reported by organic farmers. These include a variety of infrastructure policies that are part of the Ontario agri-food industry that was designed before organic growers were part of the industry. These policies inadvertently create obstacles and barriers to the success and growth of the organic food production sector. Barriers to growth also come from lack of support for the organic industry through formal education, research, extension education, demonstration projects, etc.

- **Economic Analyses** -- There is need for more statistical collection on the organic sector in Ontario to assist with policy and market development in the growth of the sector. Enterprise budgeting tools (for example crop and livestock budgets) that take into account whole farm systems need to be developed for appropriate use on organic farms. At the farm level, there is a need to collect data on the acreage of various crops being grown, crop yields per unit area, total production tonnage or volume, numbers of breeding livestock, numbers and live weights of market animals, livestock access to pasture, grazing management (techniques for livestock control, grazing season, re-seeding procedures, etc.). Beyond the farmgate, there is a need to determine market opportunities and growth potential in domestic and foreign markets for a wide range of organic products in raw, semi-processed, and fully processed form (e.g., flax, flaxseed oil, margarine and salad oils based on flaxseed oil).

- **Market Research** -- There is a need for more consumer research to look at who is buying organic products and why, what the characteristics of organic product consumers are, what the characteristics of organic products are that makes them attractive to consumers. This will assist the industry with developing improved marketing strategies for organic products, and with determining areas with best growth potential. What is the benefit and effect of private labels in the market place? What is the marketing margin (between farmgate and food retail) for different organic products, what are the marketing costs, and how are the marketing margins shared amongst the various participants in the supply chain?

Service Priorities

Service priority 1: Extension and information validation

Background: As new technologies become available, information about these technologies must be disseminated throughout the sector. These technologies must also be assessed for wide area adaptability, or specific geography or situations were they perform to the benefit of the user. Without this extension and validation of new technologies, advancements may never be accepted by the industry, or uptake may be slowed dramatically.

While extension efforts are often assumed to be intrinsic within the development of new technologies, this is rarely the case. Many research personnel are simply too busy to make this occur, or lack the network to promote the technology effectively. It is essential that this extension link exist, both to speed uptake and to make the research community aware of new and emerging problems and opportunities.

Economic importance: promoting uptake of the best new innovations ensures rapid acceptance and adoption of these technologies. This ensures that the full value of new enhancements is realized. Extension services are considered “GATT green”, indicating that all countries accept the tremendous value that extension efforts have.

Ontario Cereal Crop Committee

- Frost Seeding: research has shown up to 42% yield increase. Extension and demonstration of this technology is required to increase uptake.
- DONCAST: Improve grower confidence and understanding of improved model.
- Extension and Information Validation: tillage, seeding rates, herbicide and fungicide information, timing and placement of fertilizers.
- Segregation of Wheat Types: articles, presentations on the need and reasons to maintain purity in the various classes of wheat.

Ontario Oil and Protein Seed Crop Committee

1. Publication and Distribution of Educational Material

Issue: One of the most efficient ways of transmitting information to producers is through educational material either through printed publications or the Internet.

Background:
In the past information was primarily distributed through printed publications. Although this continues to be the primary means of getting information to producers the World Wide Web has become increasingly important. The following list of publications are key sources of new information to Ontario producers.

a) Printed publications such as The Ontario Soybean Variety Trials Report
b) Web based information such as The OOPSCC web page, the OMAF web page and the Plant Health Initiative
c) Extension publications such as regular newsletters.

2. Field Scale Validation/Demonstration Trials

Issue: As new pests emerge pertinent information must be communicated to stakeholders.

Background:
As new and emerging pests become a significant production issue in Ontario producers must be made aware of the biology and best management practices to control these pests. For example although these insects are relatively new they have quickly become a major economic concern to growers. Best management practices must be conducted “in the field” to demonstrate and verify to producers these BMP’s. This requires field scale verification/demonstration trials whenever feasible. New technology to address existing production difficulties must also be assessed in the field. The following is a list of the main issues that need to be addressed.

a) Soybean Aphids - foliar insecticide applications
- Insecticide seed treatments

b) Soybean Rust-foliar fungicide application

c) Soybean Cyst Nematode
- evaluation of races and site specific variety performance

d) Root Rots (Phytophthora/ Rhizoctonia/Fusarium)
- fungicide seed treatments

3. Educational Conferences

Issue: Conferences are key sources of information for producers and agribusiness.

Background: Although publications distribute information efficiently meetings and conferences are important to explain topics and issues more in depth. They are also vital in educating Agi-business and establishing contacts with industry members. Some of the key meetings in Ontario include the Southwest Ag Conference, Excellence in Soybean Production, Diagnostic Days, Farmsmart etc.

Field Crop Protection

- **Field crop pest monitoring and prediction models**- summer monitoring for pests such as E. chafer, slugs as an early warning tool and wireworm densities in summer monitoring program. This will help aid growers in making seed trt decisions at seed sale time in the fall to promote sound IPM.

- **Fungicide Education**: application methods, proper timing, resistance management, IPM, rotation of chemistries, impact of each disease

- **Research Updates at Annual Meetings** - continue presenting field crop protection research funded from last year's priority list

Ontario Pulse Committee

Extension of research information through field trials/ demonstrations, educational activities that promote sustainable agronomic practices that enhance returns for dry bean industry.

Issue: Extension of information to Ontario dry bean industry is vital for it to remain competitive, responsive and environmentally sustainable

Activities/efforts

- Printed publications including: Crop Pest, Ontario performance trials, information bulletins (eg. Anthracnose Scouting Guide 2005)
- Web based information. – eg. Agronomy Guide, Insect Disease Guide, OMAFRA Edible Bean page
- Field days/ events : eg Fungicide Application Day, SWAC, Farm Smart, Diagnostic Days

Field Evaluation/Demonstration Trials

Issue: Field validation and demonstrations to support extension of research and best management practices to ensure industry remains competitive.

Issues include:
- Sclerotinia control – fungicide(s) with/without calcium
- Nitrogen rate
- Root Rot Control with Biologicals
- Harvest Desiccants – evaluation of timing, products.

Niche Market Classes

Issue: Niche market classess often carry increased production risks due to lack of management information and experience, adaptability of varieties, fewer registered pesticides.

Activities/efforts. Support management practices for niche market classes through field tours, field diagnostics, trials, education.

IPM for Insects/Diseases

Issue: As new and emerging pests become a problem, it is critical to be at the leading edge in scouting, field surveys, field diagnostics, and management to control these pests. For example a field survey by OMAFRA in 2004 identified Race 73 of anthranose in Ontario. In 2005, a field survey identified fusarium as the main root rot present in dry beans.

- Anthracnose was common in white bean fields in 2004. In addition a new race of the disease has been confirmed in Ontario. Few white bean varieties carry resistance genes to known strains of anthracnose. In 2003 two new foliar fungicides were registered that control anthracnose. Scouting and management strategies need to be field tested and refined. Samples of infected seed will need to be collected and tested for race identification.
- IPM of tarnished plant bug/stink bugs.
- Extension of white mould management strategies
- SCN is becoming more widespread in dry bean growing regions, with little knowledge of its impact on dry beans, SCN populations, or management strategies.

Ontario Tobacco Committee

- OMAFRA to provide consultative extension and act as the lead in transferring research results to growers.
- OMAFRA to continue to provide adequate staffing levels and farm visits.
- Increase OMAFRA tobacco PY's to historical levels.
- Continue the publication of Publication 298: Flue-Cured Tobacco Production Recommendations every year if required, and include the year of publication on the front cover (OMAFRA).
- Publication 298 should be made electronically available on the OFCTGMB website (OMAFRA/OFCTGMB).
- Consultative services to be provided to growers to assist with curing techniques and skills (OFCTGMB).

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January, 2006

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