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2002 Annual Report to Ontario Agricultural Services Coordinating Committee

Author: Annette Anderson - Chair/Ontario Horticultural Crops Research and Services Committee
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OHCRSC EXECUTIVE SUMMARY

The Ontario Horticultural Crops Research and Services Committee (OHCRSC) held its annual meeting on January 9, 2003 at the Ontario Government Complex in Guelph, Ontario.

In 2001, discussion at the OHCRSC focused on the strategic plan for research priorities for Horticulture. In 2002, discussion of the sixteen OHCRSC subcommittees focused on Service issues and priorities for the Ontario Horticultural Industry. The focus of discussions for 2003 will be on technology transfer.

In early September, subcommittee chairs were invited to participate in a conference call to prepare for the fall subcommittee meetings, in particular, to set the context for the discussions on service issues and priorities.

On December 12, 2002, the chair of OHCRSC presented a summary of the OHCRSC pest management priorities and recommendations to OPMRSC. Minor use priorities for pesticide registration for horticultural crops are also discussed within the OHCRSC subcommittees. A complete listing of these priorities is available at:
<http://www.gov.on.ca/OMAFRA/english/crops/minoruse/>

The OHCRSC subcommittee reports form the body of this report and provide an annual update on the state of the industry, emerging issues, research and technology transfer accomplishments, and particularly research and services priorities and recommendation on a commodity/sector basis. The format of this year's annual report has been changed to maintain the subcommittee reports as separate reports. The appendices in this report provide a summary of Research priorities and recommendations forwarded to the OHCRSC.

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2002 OVERVIEW

In 2002 the Census data was released and allows the industry to take stock of overall commodity/sector health within and outside the province. Many of these highlights are reflected in the commodity reports, but statistics are also available

at : <http://www.gov.on.ca/OMAFRA/english/stats/census/index.html>

Weather was a significant factor in horticultural crop production with a cool wet spring. There was also significant crop damage from a spring frost in May. This information is reported in the subcommittee reports.

Pests also had a significant impact on horticultural crops in 2002. The list of new introduced and quarantineable pests continues to not only have pest management implications, but also potential trade implications if movement of horticultural commodities is restricted.

2002 was also a very significant year in terms of legislation and policy that is either passed or under development that will have a significant impact on horticulture and agriculture in the longer term.

In 2002, legislation and government policy were a prominent part of the discussions within the agricultural community. The federal and provincial governments held consultations on the Agricultural Policy Framework. The federal government announced funding for the Minor Use Development Centre. Provincially, the Food Safety Act and the Nutrient Management Act were passed into law. Concern about the impacts of legislation as well as identifying research that needs to be done to address gaps related to nutrient management and to a lesser extent food safety was a common theme of the subcommittee reports.

The renewal of the University of Guelph/OMAF Partnership also occurred in 2002. There was also some reorganization relocation of research programs within the University of Guelph Plants Program. There has also been significant reorganization of the federal research program moving to national research themes and teams as well as a significant in-kind contribution to the Minor Use program.

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Services Discussion

The OHCRSC provided the subcommittees with the following definition of a service to initiate discussion at the fall subcommittee meetings.

"Typically services can be thought of as transactions, for example, the purchase of a licence or a haircut. Most services has an association cost borne by the purchaser of the service. In addition, the benefit of a service accrues mostly to an individual rather than to a group. Services tend to be distinct entities with a defined beginning and end result"
ref: OARSC 2001 Annual Report.

Examples of services that could be of interest to many horticultural commodities are pest diagnostics services, pest scout services, soil testing, etc. The provision of general information about growing a crop or dealing with a pest would seem to fall more closely under the category of technology transfer" which will be discussed more closely in 2003 meetings.

Although it was suggested that subcommittees spend at least part of their meeting talking about services, this was not done at the exclusion of research or technology transfer. As last year's report dealt with development of strategic research priorities, this year chairs would be encouraged to report on changes/revisions to research priorities.

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Common themes Related to Services

The following is a summary of the services priorities that were mentioned in more than one subcommittee report. Subcommittee recommendations related to these services followed similar themes. The numbers in brackets represent

the number of subcommittees that identified these topics as priorities. The details and implications are within the body of the subcommittee reports.

IPM Personnel - Scouting Services (8)
Nutrient Management Planning (9)
Pest Diagnostics (7)
Minor Use Registrations (including .Biological Control concerns)(7)
Water Quality/Quantity/Irrigation Information and Assistance (5)
Financial Information - Cost of Production Date (3)
Access to Weather Data (4)
Tech Transfer/Information Services (3)
Energy Planning (2)
Post Harvest facilities (2)

Research Themes for Horticulture (not ranked)

These have not changed significantly from 2001:

Environment
Food Safety and Quality
Infrastructure
New Product and Market Development
Productivity and Sustainability/Competitiveness
Pest Management

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Recommendations of the OHCRSC

Recommendations of the OHCRSC have not changed significantly from 2001:

Nutrient Management
Integrated Approach to Horticultural Research
Diagnostics -Marc Sabourin of the University of Guelph Pest Diagnostic Speaker provided an overview of some of the existing diagnostics as well as entertained discussion on looking at new diagnostic services that may be needed by the horticultural sector.

Acknowledgements

The OHCRSC subcommittee chairs have made a significant contribution in time and leadership to this annual research and services priority setting process. The subcommittee reports are important documents that guide research priorities within the province and also contribute to development of national priorities at the federal level.

The OHCRSC membership is comprised of over 400 representatives from grower organizations, industry, and government and we thank all individuals for taking the time to attend the meetings and carry out further work within the subcommittee membership to address issues and needs within your commodity/sector.

OHCRSC would like to acknowledge the ongoing support provided by Stuart Budd, Research Analyst, Innovation and Risk Management Branch, OMAF. His skills and advice to the committee have proven to be invaluable.

Brooke Misasi, Crop Technology Branch, OMAF assisted in compiling this report.

Respectfully submitted on behalf of the OHCRSC,

Annette Anderson,
Chair

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MANDATE

Main Committee

1. To review reports submitted by commodity committees.
2. To assess the requirements for horticultural crops research and services.
3. To establish priorities for horticultural crops research and services.
4. To assess progress in horticultural crops research and services.
5. To present reports and recommendations to OASCC describing the needs for horticultural crops research and services including information in relation to:
 - o cost-benefit;
 - o research and service facilities and personnel required in the investigation(s);
 - o location best suited for the investigation(s);
 - o how funds might be obtained or freed to conduct new research and services;
 - o operation of subcommittees.
6. To consider and approve chairs, vice-chairs and members of subcommittees.

Terms of Reference

- To prepare research and service summaries and to recommend research and services priorities in Ontario for appropriate horticultural crops.
- To disclose problems that face the appropriate industry which require investigations.
- To coordinate research and services planning and cooperation.
- To assess and suggest priorities for new programs and recommend which programs presently underway should be expanded or terminated.
- To estimate, where possible, costs involved in the conduct of new research and services programs and to supply cost-benefit information.
- To suggest, where possible, how funds might be obtained or freed to conduct new research and development.

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OASCC Structure, Duties and Terms of Reference

Ontario Agricultural Services Coordinating Committee

A provincial committee, the Ontario Agricultural Services Coordinating Committee (OASCC) was formed in 1965, with four major subcommittees, namely, Field Crops, Horticultural Crops, Livestock, and Soil and Water. Later, four new

major subcommittees were added: Agricultural Economics, Agricultural Engineering, Food, and Pest Control. In 1986 "and Services" was added to the names of all the major subcommittees, and two names were changed to reflect more closely the scope of their activities. A new mandate and structure for the Food Research and Services Committee was approved in January 1990, and in 1993 its name was changed to the Ontario Food Processing Research and Services Committee. In 1998-99 OASCC was restructured again to include the following 9 OASCC committees - Animal, Field Crops, Horticultural Crops, Food Processing, Rural Development, Agriculture and Food Engineering, Agricultural Economics, Pest Management, Soil Water and Air.

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Terms of Reference

1. Regular review of the broad aspects of agri-food and rural research, extension, and education in Ontario with the object of:
 - a) facilitating intergroup communication and coordination at management levels;
 - b) assessing immediate and future needs and developing proposals to meet them;
 - c) advising on joint uses of available facilities and personnel; and
 - d) contributing information and ideas bearing on regional and national policies affecting agri-food industry.
2. To carry out special assignments on behalf of CARC appropriate to the above objectives.
3. To meet at least annually and to report through a designated representative to the annual meeting of CARC. Summary reports shall be sent to the Chair of CARC with copies to the Deputy Minister of Agriculture and Food for Ontario.

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OHCRSC 2002 Report - Summary of 2002 Priorities

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Agroforestry Research and Service Needs

Part 1. Research Needs

PRIORITY GROUPING "A"

Issue #1: Importance of Agroforestry Research at the University of Guelph in Helping Meet Environmental Management Objectives.

Issue #2: Lead Contamination in Maple Syrup

Issue #3: The process for handling minor use registrations is currently being revised. It is extremely important that the new arrangement be finalized as soon as possible.

Issue #4: The Emerald Ash Borer, an exotic wood boring insect, has been found in the Windsor area of Ontario.

Issue #5: Several native and exotic wood boring insects have potential to cause serious damage to Ontario's forests.

Issue #6: Registration of Insecticides for Tree Nut Orchards

Issue #7: Registration of Herbicides for the Christmas Tree Industry

Issue #8: Approved and Safe Use of Chemicals in the Production of Maple Syrup

Issue #9: Development and Use of the Health Spout in Ontario's Sugar Bushes

Issue #10: Producing High Quality Maple Syrup and Maintaining it in Storage.

Issue #11: Determining the Nutrient Status of Maple Pure Maple Syrup

Issue #12: Summary of Research Findings: Sugar Bush Management

Issue #13: Need to Continue Aspects of Ice Storm Recovery Research in Ontario

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PRIORITY GROUPING "B"

Issue #1: Vegetative Propagation of Maple Sweet Trees

Issue #2: Investigation of a Vapour Compression System for syrup Production

Issue # 3: Intercropping Focus

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Part 2. Service Needs

Issue #1: Support Facilitating Agroforestry Research Projects, and Transferring the Results of Research and Extension Activity to Farmers

Issue #2: Given that Conservation Authorities have 64 staff delivering agroforestry extension, an opportunity exists for the OMAF agroforestry extension team to strengthen their linkage with this force.

That the agroforestry extension team at OMAF leverage the Conservation Authorities' capacity in this area by forging an even stronger link with this group of extension staff

Issue #3: Need to Develop a Comprehensive Policy to Support and Guide the Planting of Trees and Shrubs in Rural Ontario

Issue #4: Need to Ensure an Adequate Supply of Genetically Appropriate Trees and Shrubs for Afforestation on farms and in other Rural Areas.

Issue #5: Need to Harmonize Grade Names and Standards for Pure Maple Syrup

Issue #6: Maintenance of OMAF Website for Agroforestry

Issue #7: Packaging and Transferring Information Related to Agroforestry

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Apiculture and Pollination Research Priorities

Research Priority 1: Development of Varroa Mite-Resistant Bee Stocks Using Different Selection Approaches and Integrating Resistance into Ontario Tracheal Mite-Resistant Existing Bee Stocks.

Varroa mites continue to be a major concern. These mites can annually kill 50-70% of bee colonies if infested colonies are not treated. Breeding bees resistant to varroa is the long-term solution to this problem. Research has shown that hygienic behaviour, grooming behaviour, and low mite reproduction is important natural traits possessed by honey bees for varroa control. We need to continue the selection program for breeding these traits into the Ontario tracheal mite-resistant bees to reduce the effect of Varroa in Ontario. The continued import of the "Russian" stock from the United States is a priority to widen the genetic base of this Varroa resistant bee. Thus, Ontario bee stocks will be resistant to both mites, and beekeepers will gain the benefits of using these bees in the IPM program.

Research Inventory

These four items have been part of the OBA Tech-Transfer Program and need to remain as priority items. The importation of the Russian Bee Stock needs to continue as long as the U.S. project keeps releasing new genetic lines of this stock.

Gap/Barriers/Opportunities

The development of resistant stocks to mites is a tedious and expensive process. It requires a long period of time for selection, development and implementation. We have personnel who are trained in the use of instrumental insemination techniques for breeding. This allows the transfer of genetic materials (eggs and semen) without bringing any other possible pests and diseases. This research is well under way but continuing resources are needed to complete this project. The Tech-Transfer Program should carry on another importation in 2003.

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Research Priority 2: Further Development of an Effective Integrated Pest Management (IPM) Program for Controlling Parasitic Mites, Small Hive Beetles and Infectious Diseases of Honey Bees.

Apistan® is currently effective on varroa mites in most of Ontario. Resistance has been shown in Cornwall, Niagara and Haldimand-Norfolk areas. The continuous use of Apistan® on varroa is leading to the development of resistance across the province. Development of new miticides to be alternated with Apistan® will help to reduce the emergence of resistance to Apistan®. We have developed an effective single application method for Formic Acid to be used in rotation with Apistan®. However, Apistan® is nearing the end of its life expectancy. Therefore, we need to find a replacement strategy for Apistan®. If possible it would be good to develop other "softer" chemical controls that work in Ontario i.e. oxalic acid or non-chemical methods like screened bottom boards and drone brood removal.

Terramycin resistant strains of American Foulbrood have been found in parts of Canada on a large scale. It has not been found yet in Ontario. There is a need to develop an IPM strategy to deal with AFB.

Research Inventory

The IPM program for Varroa and Tracheal mites has been part of the OBA Tech-Transfer Program. The development of the IPM component for AFB is new addition to this program. Therefore, the IPM program remains as an important priority issue.

Gap/Barriers/Opportunities

Recent research by the OBA Tech-Transfer program has shown that Oxalic acid is a promising chemical to be used for varroa control. More research is needed to study the side effects on bees and to try to register this product to use in honey bee colonies. Formic Acid needs to be fully registered and more work needs to continue on application methods. Other tools can also be evaluated against mites.

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Research Priority 3: Concern over how Imidocloprid affects honey bees.

The beekeeping industry is still concerned about the sub-lethal effects being reported out of France. The debate as to whether it is a problem to honey bees has not been resolved.

Research Inventory

There has been some research conducted in this area but more is needed to resolve the question. Sub-lethal effects of all new pesticides need to be investigated before they are registered.

Gap/Barriers/Opportunities

The Canadian Beekeeping Industry would like to see research projects conducted by researchers independent of the registering company, to answer the question of sub-lethal affects of all new crop protection products, and how honey bees are affected. This should be a requirement of the registration process and should be financed by some agency other than the registering companies to give complete impartiality.

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Pollination Issues

Research Priority 1: Management Strategy for Machine Harvested Cucumbers.

Cucumber is a crop grown in south - western Ontario. Large acreage has been grown every year. The pollination requirements are not well defined. To ensure a high quality crop, pollination is needed. Studying factors affecting pollination efficacy and requirements is needed to serve both cucumber growers and beekeepers.

Research Inventory

The University of Guelph, Pollination laboratory has the trained expertise in the field of pollination ecology and biodiversity. So far, in order to solve this issue, the cucumber growers and the beekeepers have sponsored research.

Gap/Barriers/Opportunities

More research funds need to be allocated to conduct the necessary research. The OMAF research program at the University of Guelph can focus on providing some resources to study this problem. Any increase in cucumber pollination will help increase the cash return to beekeepers and growers.

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Research Priority 2: Pollination Requirements of New Varieties of Apples.

Mites have exterminated feral honey bees. This part of the pollinator force available for crops has disappeared. Wild bee populations have also been extensively reduced. High-density apple orchards are annually increasing. Therefore, the apple pollination requirements should be reevaluated. Examination of the genotypes of apple seeds in ripe fruit is needed to map and quantify the extent of gene and pollen movement in orchards.

Research Inventory

The University of Guelph, Pollination laboratory has been working on this issue.

Gap/Barriers/Opportunities

Financial support from the industry and the OMAF program at the University of Guelph are needed. The OMAF research program at the University of Guelph stopped their support in 1999-2000.

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Research Priority 3: The importance of actively encouraging education and research on alternative pollinators.

Research Inventory

Dr. Peter Hallett continues to work on designing nesting materials to utilize native pollinators in a managed environment, in order to provide pollination services.

Gap/Barriers/Opportunities

Dr. Hallett is encouraged by this committee to continue this work.

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Apiculture and Pollination Service Priorities

Service Priority 1: Maintenance and Enhancement of the Apicultural Laboratory Services through the Bee Inspection Program.

Service Inventory

Brenda Perrin and Jim Anderson provide Lab services to the beekeeping industry of Ontario. The new microscopes that were added during the past two seasons added greatly to this program ability to function efficiently.

Gap/Barriers/Opportunities

With the mites and now the resistant mites, this is a critical service and needs to be maintained and enhanced.

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Service Priority 2: Continued support for the ban on the importation of honey bees to Canada from mainland United States. Ontario beekeepers feel that there are too many problems with American bees to consider opening the border to them.

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Service Priority 3: Registration of CheckMite™ (Coumaphos). This pesticide is the only registered product for controlling the small hive beetle in the world. It is also effective against Varroa. As Ontario has Apistan® resistance and Check-Mite® was given an Emergency Use Permit the committee supports full registration of CheckMite™.

Service Inventory

Beekeepers have some concerns about this product but this is the only product registered in the world to control the Small Hive Beetle and Varroa mites that are resistant to Apistan®. We encourage finding a safer, friendlier product to be used.

Gap/Barriers/Opportunities

Dr. Don Wilson of Bayer has worked on registration of CheckMite™ (Coumaphos). If full registration can not be achieved for this product the committee supports a renewal of the Emergency Use of CheckMite® through Health Canada - Pest Management Regulatory Agency (PMRA).

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Service Priority 4: Federal Registration of Formic Acid Mite-Away. This product can be used under the current exemption of formic acid as allowed by the PMRA. A full registration is required to maintain the use of this product. The committee supports the full registration of Mite-Away through PMRA.

Service Inventory

The OBA Tech-Transfer specialist and NOD Industries have developed the Formic Acid Mite-Away pad.

Gap/Barriers/Opportunities

Beekeepers have been using Mite-Away for tracheal and Varroa mite control. The use of the pads is covered under the PMRA memorandum for use of Formic Acid in bee colonies in Canada. NOD Apiary products is pursuing the full registration of this product. The committee supports the full registration of this product to be added to the approved tools for the IPM program.

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Apicultural Tech-Transfer Priorities

Tech-Transfer Priority 1: Maintenance of the Apicultural Regulatory and Extension Programs in Ontario.

The Apicultural Regulatory and Extension Programs have played an important role in the beekeeping industry in Ontario. New problems such as resistance of Varroa to Apistan®, SHB and the possibility of resistant AFB are important issues that could seriously affect the beekeeping industry. Inspection and monitoring of diseases and pests have become very important in implementing the IPM program in areas where it is needed. Educating beekeepers about new techniques for management of bee diseases and pests remains critical across the province.

Tech-Transfer Inventory

OMAF has a Provincial Apiarist and 22 part time bee inspectors. These personnel are deployed across the province to inspect, monitor and educate beekeepers.

Gap/Barriers/Opportunities

With the finding of new pests and diseases just across the US border, the Apiculture Regulatory and Extension Program has become very important to the beekeeping industry. This team has tremendous experience in sampling and monitoring pests and diseases. Any additional hours available in this program area would help to maintain the industry ahead of the potential problems.

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Tech-Transfer Priority 2: Maintenance of the OBA Tech-Transfer Program

The OBA Tech-Transfer Program has played a crucial role in developing the current Integrated Pest Management Program for Honey Bees in Ontario. Breeding of bees resistant to Honey Bee

Tracheal Mites, hygienic behaviour, non mite reproduction and introduction of Russian stock are all examples of Tech-Transfer items that have been developed through this program in the last nine years that have contributed to the health of the beekeeping industry in Ontario.

Tech-Transfer Inventory

The OBA has run a very successful Tech-Transfer Program where they have been able to have a full time researcher work with student assistants to carry out projects that are high priority for the industry. This has been a very efficient use of the resources and the industry is very proud of the Bee Breeding and IPM Programs that have been developed and delivered in close co-operation with the OMAF Apiculture Program.

Gap/Barriers/Opportunities

The committee supports continued financial support by OMAF to the OBA to maintain this critical program.

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Tech-Transfer Priority 3: Monitoring for Varroa Resistance to Apistan® and Check-Mite®.

The development of resistance to Apistan® by Varroa mites is expected. It has now been confirmed in Cornwall, Niagara and Haldimand-Norfolk regions. Resistance to Check-Mite ® has not been shown in Canada to date but is wide spread in the US. Ontario could either develop Check-Mite ® resistance from within or it could spread across the border to Ontario. Continuous monitoring of the efficacy of Apistan® and Check-Mite ® and resistance by mites is a very important issue. Beekeepers would not like to be surprised by the fact that Varroa has survived the treatment and killed their colonies.

Tech-Transfer Inventory

The bee inspectors of Ontario are involved in the monitoring process. The OBA Tech-Transfer Program has been following up the monitoring for resistance across Ontario with follow-up conformation testing.

Gap/Barriers/Opportunities

Testing of monitoring methods needs to be ongoing. Resources dedicated to this critical area.

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Tech-Transfer Priority 4: Registration of Tylosin and Lincomycin

The development of resistance to Oxy-tetracycline in Canada is a real concern.

Research Inventory

Research has been done in the United States to show that these two products are safe and efficacious for controlling r-AFB and residues are not a problem. Beaverlodge Research Station in Alberta is taking the lead on this project in Canada.

Gap/Barriers/Opportunities

The Provincial Apiarist is working with Beaverlodge Research Station, CHC, Elanco and Pharmacea-Upjohn to bring about the registration of these products. These products, once registered, will be recommended to Ontario beekeepers in an IPM Program to rotate all three so we do not develop resistance to any particular one of them. The committee supports the registration of these antibiotics for use in honey bees through Health Canada - Veterinary Drugs Directorate.

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Tech-Transfer Priority 5: Quality of Hive Products to Meet Consumers Expectations.

The continuous use of miticides and antibiotics in bee colonies increases the risk of contaminating the hive products (honey, wax and propolis) with residues. If the residues exceed the allowed limits, the products cannot be marketed. Monitoring residues in hive products needs to continue to ensure high quality and no contaminants as expected by the consumers.

Tech-Transfer Inventory

As each new product or method of application is developed for a specific problem, the residue work must be done. Once the product is on the market follow up surveys are necessary to see if over time accumulation of the product is occurring.

Gap/Barriers/Opportunities

The cost of sample analysis is very high although this issue is an important issue for food safety and quality. More resources need to be allocated for monitoring the program to ensure food quality. Finding any residues will affect marketing of hive products. It also can be a concern for consumers.

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Apple Issues and Service Issues Ranked in Priority

Sustainable IPM Systems

- Internal Lepidoptera (OFM, CM)
- Fireblight Strategies with impending loss of Streptomycin
- Emerging Pests (Dogwood Borer, Sawfly)
- Alternatives to Organo Phosphorus and Carbamate Insecticides
- Resistance Management of Insect pests
- Disease Management Strategies

Post Harvest Strategies for Quality and Safety Assurance

- 1-MCP, Storage Technology
- Disease Control, Fungicide Resistance
- Antioxidants and Bioflavanoids

Production Management

- Cultivars Specific Recommendations
- Thinning and Growth regulators
- Rootstocks and Systems
- Nutrient Management

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Berry Crops

No changes for 2002. See 2001 report

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Crucifer Crops Research Issues (Prioritized)

Development of Pest Control Strategies

There is a need to investigate, develop and transfer practical pest control methods for crucifer crops. Both established pests and new pests continue to plague crucifer crop growers everywhere. Access to effective IPM tools and strategies remains a barrier to competitive production in Ontario.

Current Activities

There is some research activity underway by University of Guelph and Agriculture and Agri-Food Canada personnel on some of the established pests such as cabbage maggot, Lepidoptera, thrips, weeds, clubroot and soft rot as well as the pests: Swede midge and pea leafminer.

Gaps/Barriers/Deficiencies

There is a major effort needed in the area of developing IPM strategies for cabbage maggot on rutabagas. In addition there is a need for continued research into alternative management options for cabbage maggot on the entire crop group. The evaluation of plant species as trap crops for flea beetles, thrips, caterpillars and other insects, evaluation of varieties with resistance to pests, evaluation of biological and cultural control methods for the entire pest complex affecting crucifer crops is needed. The major diseases of current focus include black rot, clubroot, Alternaria, downy mildew and powdery mildew.

The two new pests affecting crucifers in Ontario that will require a long-term research commitment are swede midge and pea leafminer. Swede midge research work is of the most immediate concern due to the quarantine of host species movement from eight counties in Ontario. All growers in these counties will need to participate in the CFIA certification program before shipment of Swede midge host species into non quarantined zones within Ontario, Canada and the United States will be allowed.

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Nutrient Management

Because of concerns about current recommendations and impending legislation regarding nutrient management, the crucifer crops sector wishes to take a proactive approach to develop an integrated fertility program.

Current Activities

Limited work has been undertaken in the past few years to investigate the nutrient response of the major crucifer vegetables and to relate this to nutrition's role in pest management programs. Most of this research is either completed or poorly funded.

Gaps/Barriers/Deficiencies

A far more comprehensive and integrated fertility management program needs to be developed for crucifer crops which takes into account the complete soil nutrition regime and nutrient management planning. Studies on crop uptake, crop removal, growth stage models, the effects of irrigation and a review of current recommendations are needed.

Because soil-borne diseases (clubroot, Rhizoctonia, Fusarium) and some insect pests may be greatly affected by fertility practices, evaluation of disease and insect management strategies should be an integral part of any fertility research.

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Minor Use Registrations

There exists a serious need for minor use pest control product registrations for improved control of insects, diseases and weeds of crucifer crops, especially specialty crucifers. In light of the effects of the US FQPA and continuing lack of a 'level playing field' for Ontario growers, the registration of new, 'reduced risk' and 'biopesticide' active ingredients as well as new seed treatments is also urgently needed. Increased cooperation with the US IR-4 program is strongly encouraged.

Current Activities

In May, 2002; AAFC and Health Canada announced \$ 7.3 million for 'reduced risk initiative'. \$3.3 million for AAFC to develop crop profiles and IPM strategies, \$4.0 million to PMRA to increase review staff for minor uses and establish position of minor use advisor

In June, 2002; AAFC announced a 6 year, \$54.5 million commitment to improve access to pest control products with the focus on reduced risk products.

- AAFC to establish an "IR-4-like" structure to prioritize minor use needs nationally, make minor use submissions, manage submissions, generate necessary field data and laboratory data
- Establishment of at least 6 GLP compliant research facilities in BC, Prairies, Ontario, Quebec and Maritimes to cover all zones
- Proposed establishment of headquarters in Ottawa with executive director, IR-4 liaison, study directors and administrative assistants
- Establishment of a national minor use website, improved liaison with PMRA and IR-4 and coordination of an annual national priority setting meeting

Gaps/Barriers/Deficiencies

AAFC will be establishing at least 6 GLP compliant research facilities in BC, Prairies, Ontario, Quebec and the Maritimes to cover all zones. However, there is concern from the University of Guelph's Ridgetown, Kettleby and Simcoe Research Stations whom have obtained GLP certification. Ridgetown, Kettleby and Simcoe need a commitment from AAFC that they will still receive funding for URMULE GLP research trials. If these stations do not receive GLP work to complete, they will not maintain their GLP certification.

Until the new system is fully functional, AAFC should continue to provide minor use research funding to other institutions which have research underway on URMULE projects.

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Specialty Crucifer Crops

The crucifer crops sector remains concerned that the continued introduction of new crucifer species from Asia could introduce new and devastating pests and diseases to Canada, threatening our traditional crucifer crops. There remains a need to continue to survey and detect these problems before they become epidemic.

Current Activities

Other than limited and informal OMAF field activities, no research is currently being conducted in this area.

Gaps/Barriers/Deficiencies

Because no research is being conducted the industry remains at risk from unknown introductions of diseases and pests as well as from a lack of management strategies for such new pests. The primary concern presently involves the introduction and spread of crucifer viral diseases.

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Variety Evaluation

There remains a need for the evaluation of crucifer crop varieties suited to Ontario growing conditions, storage conditions, market demands, pest complex and fertility requirements.

Current Activities

Other than some work by University of Guelph researchers in Kettleby and Simcoe, no major variety evaluations independent of seed companies is underway.

Gaps/Barriers/Deficiencies

Because little or no work is planned for variety evaluations by public institutions, growers in Ontario and Canada generally will have less reliable information about suitable varieties to grow for various Ontario conditions. A more integrated approach to variety evaluations is also needed which takes into account differences in pest resistance and fertility requirements.

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Post Harvest Handling

There remains a need for the evaluation of crucifer crop post harvest handling practices to increase the shelf life and storability of crucifer crops to increase the competitiveness of the industry.

Current Activities

No work is underway and no work is planned.

Gaps/Barriers/Deficiencies

Because no work is planned for post harvest handling evaluations, growers in Ontario and Canada generally will have less reliable information about suitable storage conditions.

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Value Added Products

There remains a need for the evaluation of value added products to maintain the competitiveness of the crucifer crop industry.

Current Activities

No work is underway and no work is planned.

Gaps/Barriers/Deficiencies

Because no work is planned for value added products, growers in Ontario and Canada will continually lack any competitive advantage over the United States.

Crucifer Crops Service Issues (Prioritized)

Certification of Greenhouse Growers

Certification of greenhouse growers is a top service priority due to CFIA quarantine of Swede midge host species and equipment movement from eight counties. All greenhouse crucifer growers (including ornamentals) will be encouraged to participate in the certification program. OMAF and consultants will need to help relay the certification program to all growers and the CFIA will be required to audit and certify.

Current Activities

OMAF and U of G are currently working with the CFIA to establish a certification protocol for all growers of Swede midge host species by January 15th, 2003.

CFIA is scheduled to speak about the certification program at the Swede Midge Workshop held at the Ontario Fruit and Vegetable Convention on February 18, 2003.

Gaps/Barriers/Deficiencies

Numbers of personnel able to help transfer certification protocol requirements to growers in the field is extremely limited. There is only a small window of time in February and March where growers in quarantined areas will need to be certified.

Swede Midge Identification

Identification of Swede midge is required so growers can take timely action to manage this quarantine pest. Growers and crop consultants will need a system in place to send samples and traps for immediate identification and confirmation of the presence / absence of Swede midge. This is imperative if we are going to be successful in confining the spread of this extremely destructive insect.

Current Activities

There will be a Swede Midge Workshop held at the Ontario Fruit and Vegetable Convention on February 18, 2003. All growers, inspectors, consultants and scouts have been strongly encouraged to attend.

OMAF conducts in class IPM / ICM training for crucifer crops.

OMAF provides in-field training for inspectors, consultants and scouts throughout the season.

Gaps/Barriers/Deficiencies

Numbers of personnel able to positively identify this pest are extremely limited. Also, the personnel able to identify this pest have many other responsibilities, therefore, turn around time can not be guaranteed

Degree day emergence model for the Swede Midge

A degree day emergence model for Swede midge needs to be verified in Ontario conditions. Until this research is complete, consultants and OMAF should set up a network of soil temperature probes in order to help identify time of emergence of the first generation of the Swede midge (based on the European model) in all known infested counties across Ontario. This information will help growers predict emergence times across the province. This will help growers better time there spray applications and control population increases in areas where known populations exist.

Current Activities

U of G will continue to work on the verification of the European model in York county.

Gaps/Barriers/Deficiencies

The temperature probes will need to be placed in the field by mid-April. At this time summer assistants and scouts have not completed school, so it will be very difficult to get daily readings.

Consistency of Scouts

Consistency of scouts from year to year will help to increase grower confidence in IPM / ICM programs. Stable expertise is needed to have good IPM / ICM programs. Increased training of personnel is required.

Current Activities

Depending on the company, wage increases and scholarships may be provided.

Gaps/Barriers/Deficiencies

Limited number of Agriculture students available and all companies are competing for the best students. Increased wages and benefits will encourage students to stay for more than one year and will attract more students to Agriculture.

Quick Turn Around Time and Accuracy of Diagnostic Testing

Growers require quick turn around time and accuracy of diagnostic testing. Quick field tests and bioassays would help to identify pests and determine management strategies quickly.

Current Activities

OMAF and U of G have met with GAP Environmental Services and there is potential for this service.

Gaps/Barriers/Deficiencies

Unless a guaranteed number of samples can be given to the lab and coordinated through Provincial specialists, consultants, scouts and industry the budgetary constraints will be too high.

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Quick Access to OWN

Growers across the province would like quick access to weather information, relevant to their area in order to monitor degree days to help predict emergence of insects and utilize disease forecasting systems.

Current Activities

OWN distributes weekly temperature and participation data to OMAF staff. OMAF staff then distributes this information to industry, consultants and scouts.

Gaps/Barriers/Deficiencies

OWN does not start monitoring until May 1. There are many crops where weather monitoring should start April 1, and many over-wintering diseases and insects where soil temperature and moisture play a significant factor in time of emergence.

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Ginseng

New Priorities

1. To evaluate the use of irrigation and its impact on nutrient uptake and cooling.
2. To determine how to relieve environmental stresses associated with ginseng production under low cloth shade.
3. To identify a means of removing "S" hooks from fields after ginseng production.

Ongoing Priorities

1. To determine the crop removal numbers for N and P in Ontario ginseng.
2. To determine the effectiveness of manure application to ginseng in the preplant year. Past evidence has indicated that manure is applied excessively in terms of nutrients to ginseng. It's affect on root shape, however, has not been explored and should be. There is some evidence that excess manure is associated with symptoms of Rusty Root.

Service Needs

1. To develop an adequate crop insurance program for Ontario ginseng
2. To determine appropriate N and P levels for ginseng production

3. To learn how to identify high risk fields that may contain populations of Cyndrocarpon or high levels of unacceptable residues
4. To establish safety nets that better address the needs of perennial crops
5. To have crop scouting more widely available (AIMS provides field scouting)
6. To maintain OMAF support through the specialist position in Simcoe.

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Ontario Grape and Wine Research and Services Subcommittee

Summary of Research Priorities 2002

1. Development of nutrient management guidelines through research of Ontario grape and wine production systems.
2. Development of advanced integrated pest management tools.
3. Vineyard management to minimize vine stress and maximize productivity, quality, and environmental sustainability.
4. Fruit quality and factors affecting wine quality and acceptance.
5. Variety, clone and rootstock evaluation.

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Grape and Wine Research Priorities

Development of nutrient management guidelines through research of Ontario grape and wine production systems.

- Determine nutrient requirements and nutrient budgeting for grapes (including juice, table and wine grapes) recognizing the particular characteristics of our climate and the wide range of soil types on which grapes are grown in Ontario.
- Determine availability, losses and tracking of nutrients in Ontario grape and wine production systems.
- Develop soil testing standards and nutrient recommendation standards.
- Evaluate soil amendments and crop nutrition.

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Development of advanced integrated pest management tools.

- Evaluate alternative pest control products (including conventional, biopesticides, biologicals and pheromones) to replace organophosphate and carbamate insecticides, as well as fungicides that will be lost as a result of FQPA and re-evaluation of pesticides.
- Conduct Good Laboratory Practices (GLP) residue trials to support minor use registration applications for pesticides including herbicides.
- Develop and validate predictive and management models for pests of grapes including but not limited to grape berry moth and various diseases of grapes.
- Develop efficient, rapid monitoring methods and economic action thresholds for insects, mites, weeds and grape

diseases.

- Develop appropriate, systems-based resistance management strategies especially for pests with the potential for rapid development of resistance including but not limited to botrytis, powdery mildew, and mites.
- Evaluate area-wide mating disruption for control of grape berry moth in different areas of Ontario.
- Efficacy testing of growth regulators for table grapes.
- Evaluate appropriate product use to minimize pesticide residues on fresh market grapes.
- Evaluation of bird control techniques.
- Development of integrated pest management strategies for pests including, but not limited to mites, leafhoppers, crown gall, Asian ladybird beetle etc.

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Vineyard management to minimize vine stress and maximize productivity, quality, and environmental sustainability.

- Training and other cultural practices to regulate vigour while maximizing productivity, ensuring good fruit composition and high wine quality.
- Determine parameters and need for irrigation while ensuring food quality; e.g. E. coli contamination in water.
- Develop accurate systems for measurement of soil water and water relations in wine, juice and table grapes.
- Develop accurate scheduling for irrigation and fertigation of grapes.
- Develop and encourage the adoption of systems of efficient water use.
- Application of precision agriculture; e.g. GPS and GIS to support various disciplines and help growers make better decisions.
- Mechanization of vineyard operations and reduce labour costs.

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Fruit quality and factors affecting wine quality and acceptance.

- Marketing and consumer preferences.
- Aroma and flavour profiles as influenced by terroir, fermentation etc.
- Improved vintner methods for ice wine product.
- Yeast and bacterial metabolism in the fermentation and wine making process.
- Colour stability.

Variety, clone and rootstock evaluation.

- Evaluations of varieties, clones and rootstocks for wine, juice and fresh market grapes throughout the province.

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Issues and Notes from 2002 Services Discussion

The reports in the following section cannot easily be separated between the categories of 'research' and 'services'. Many of the personnel involved in grape and wine work provide both research and services to the industry.

Service providers who had not normally been involved in, or even aware of this committee were encouraged this year to provide reports of their service activities to give a better picture of the extent of service activity in the province.

The 2002 meeting also included some discussion of the issues surrounding services and brief notes on the issues identified are below. These issues are not listed in order of importance.

Issue: Information transmission to growers.

Notes: There is concern about the delivery of information to growers especially in regards to interpreting research results and making them accessible to growers. There is also a need for growers to know what topics of research are being pursued. An effort to provide complete information on this topic will be through the delivery of copies of this years' OGWRSSC report to the OGGMB Research Committee for sharing with interested growers. The OGGMB now have a website that will also contribute to this effort. The Tender Fruit Grapevine and Hort Matters newsletters continue to be routes for OMAF and others to deliver information to growers; discussions with growers may help determine future information needs for the newsletters. The Lake Erie regional grape program provides email updates to growers (1-3/week) but is a large investment in time for the New York extension personnel.

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Issue: Funding of phone service for the regional agriphone messages.

Notes: OMAF has supported the regional agriphone through the University of Guelph, Vineland campus. With the changes to the structure of the Vineland campus, these phone lines will be lost. This is an extremely important tool for growers in Ontario and efforts should be made to prevent any interruption of this service. The OGGMB funds KCMS to provide the messages but may not be willing or able to pay for the phone lines. Some infrastructure is required for the agriphone to handle multiple calls simultaneously. That infrastructure may already be locally available through private companies.

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Issue: Service and information availability for eastern Ontario grape growers.

Notes: The Prince Edward County Winegrowers' Association (PECWA) feel they are still not well recognized and seem to spend an inordinate amount of time trying to find the information their grower members need. The changes in OMAF extension efforts in eastern Ontario were identified as one reason for this knowledge gap but the fact that many growers in that region are relatively new to the industry was also identified as a reason for lack of contacts with information and service providers. The OGGMB has a 'starter kit' available for new growers and will provide them to any new growers as soon as they know of their existence. Growers need to contact the marketing board though, as the board may not know of the growers until their third or fourth year of operation.

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Issue: Niagara Agricultural Weather Network (NAWN) funding expired.

Notes: NAWN is an area wide weather service providing information from 13 locations in the Niagara region. The information generated by NAWN was extremely useful to industry, research, extension and consulting personnel to help interpret weather differences and their effects on pest activity, crop phenology etc. across the region. This information was also useful when testing and using models to predict disease activity. NAWN was funded by a consortium of groups including Grape and Tender Fruit Ontario Limited, AAFC, OMAF, the University of Guelph and Brock University. Additional funding for the last three years through Healthy Futures paid for a Systems Supervisor but as of September 1, 2002, that funding ceased. This situation now leaves the original consortium members with the decision of whether to continue funding of the network but presently, it does not appear that any one of the members is taking the initiative to fund the network. Data is still being collected but there is no maintenance, supervision or quality control of the

information recorded.

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Greenhouse Floriculture

Research

Issues identified in last year's report continue to reflect the industry's research needs. The priorities have been listed below in abridged form from last year. (Refer to 2001 Report for details on the priorities listed below). The only change that the committee felt that needed to be added was in the issue of pest management, where the need for rapid disease diagnosis, particularly in irrigation water in recirculating systems, was identified as a priority.

List of Issues

1. Integration of Nutrient, Water and Disease Management Strategies from an Environmental Perspective Border Issues
2. Development of Improved Floricultural Crops and Production Techniques
3. Post Harvest Handling and Shelf-Life Issues with Potted and Cut Flower Crops
4. Development and Implementation of IPM programmes in Floriculture
5. Optimisation of the Greenhouse Environment
6. Communication

Services

The focus for this year's meeting was on services used by the industry, and identifying gaps and needs. The issue resulted in some excellent discussion and extensive industry contributions. The committee felt that services could be divided into those that are voluntary (and usually of primary benefit to the individual grower, e.g. soil and nutrient analysis, disease diagnosis) and those that were mandatory or legislated (e.g. Pesticide certification courses, boiler certification, future requirements around nutrient management). There was also discussion around educational services, in particular to service an urgent need for skilled labour, but also for courses to allow existing industry personnel to upgrade their own skills. The following list of services identified by the committee is presented in no particular order of importance or priority.

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Energy Audits - Energy audits provide an assessment of the energy use and efficiency of individual greenhouse operations.

Current Activities

As a result of the rapid inflation of energy prices in the last 2-3 years, a number of workshops on energy management was held across the province. As a follow-up to this initiative, energy audits were carried out as part of a cost-sharing partnership between IRAP (Industrial Research Assistance Program), utility companies and individual growers, to help growers identify areas where energy efficiencies could be gained. Approximately 20 growers requested that they be included in the audit program, and of those, about half have been included in two rounds of audits, one in Leamington

and one in Niagara.

Gaps/Barriers/Deficiencies

There is a need for improved efficiency of electricity usage. However, grower concerns about energy efficiency are directly related to its cost. Two years ago, natural gas was the primary concern, this year it was electricity until recently when the price was capped. Grower demand for this type of auditing service will likely fluctuate depending on the overall availability and price of energy.

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Pest and Disease Diagnosis - Provides a service to growers for identification of pest and disease organisms which is essential for choosing appropriate control strategies. There are gaps however, in the extent of these services.

Current Activities

Disease and pest diagnosis through the University of Guelph is currently servicing the individual grower needs of the industry adequately in most cases. There are also diagnostic labs in the USA and Europe that are occasionally used by some Ontario growers. Diagnostic kits for diagnosis of some diseases are available through Agdia Labs in the US, and some growers make extensive use of these.

Gaps/Barriers/Deficiencies

With the advances in irrigation technology over the last 10 years, and with increasing concerns over nutrient management, a significant percentage of the industry is now using recirculating irrigation systems. As a result however, this has led to problems of disease management in these closed loop systems. Growers need a rapid diagnostic service that would allow them to identify disease pathogens in recirculating systems. Ideally growers would like a 'litmus paper' type test kit to provide rapid on the spot identification.

Apart from the needs of individual growers, the industry also has a need for insect and disease diagnostic expertise at US border crossings to confirm or refute US concerns about exported floriculture product. A number of growers have experienced delays and product loss at the US border when insects or diseases found in shipments have had to be sent to labs in other cities for identification (a process that can take a number of days). The industry is currently in no position to counter (at short notice) US concerns that the insects may pose a risk. (See Recommendation 2)

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Nutrient analysis - regular analysis of soil and nutrient solutions is a tool that supports the crop production programs of many flower growers. Nutrient analysis of plant tissue is less commonly used but has an important function in resolving nutritional problems.

Current Activities

Many Ontario growers currently send samples for nutrient analysis to OMAF certified labs in Ontario. A significant percentage however (estimated at 30-50%) send samples to Europe for the same analysis.

Gaps/Barriers/Deficiencies

One of the reasons given for the use of European labs, despite the fact that the service is more expensive, was their

provision of recommendations to support the analytical data. In this respect, they are going a step further than the Ontario labs which simply provide the numerical information. This is a service that used to be provided by OMAF crop specialists, but with changing extension responsibilities over recent years is not routinely done.

The growers on the committee did not necessarily feel that there was a cause for concern over the use of European laboratories, although a service offering recommendations to support local labs would obviously be appreciated. Most growers felt that the market should be left to sort itself out.

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Ethylene testing - the impact of ethylene on flower quality is probably the most important post harvest issue facing growers. However, it can also be a problem in production, particularly during winter months.

Current Activities

The Horticultural Products Lab at the University of Guelph in Vineland currently runs an ethylene testing service for growers.

Gaps/Barriers/Deficiencies

There are concerns over what the move of the post harvest research program from Vineland to Guelph may mean for the future of ethylene testing. Will the service still be offered? Will it be as user friendly as it currently is? It fulfils an important need for the industry and one that should be retained if possible. (See Recommendation 1)

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Pesticide Certification Courses - mandatory requirement for growers to renew their pesticide safety certification every 5 years.

Current Activities

Certification courses are run out of Ridgetown College and growers must renew if they are to retain their certification that allows them to buy pesticides.

Gaps/Barriers/Deficiencies

The general opinion was that these are excellent courses that provide growers with a valuable review of the safe and effective use of pesticides.

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Boiler Certification Courses - mandatory requirement TSSA - Technical Standards and Safety Authority. These courses were put in place as a service to the greenhouse industry. Without certification greenhouse operations would be required to employ Stationary Engineers to operate and maintain their boilers.

Current Activities

The TSSA is currently in the process of running boiler certification courses in Vineland and Leamington.

Gaps/Barriers/Deficiencies

The opinion of growers who have taken the course is that it is aimed at a very basic level, with emphasis on boiler maintenance and care. For growers, the boiler is their single most important piece of equipment, especially during the winter months and proper maintenance is critical. Grower comments suggest that the instructors were surprised at the level of sophisticated safety equipment, backups and alarms in use on greenhouse boilers. However, the certification course is an excellent option to the alternative of employing engineers to be on-site 24 hours a day.

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Education - Educational programs in greenhouse production are important for the continued growth and strength of the industry.

Current Activities

Courses at Niagara College and the University of Guelph offer students training in horticulture, but for many growers the training was not aimed specifically enough at greenhouse production. Flowers Canada (Ontario) has recently formed an Education Committee to address some of these concerns, to determine what educational programs are available, what the needs of the industry are, and the skill sets they are looking for. The committee hopes to work with universities and colleges to develop appropriate programs.

Gaps/Barriers/Deficiencies

The industry has a shortage of skilled labour to meet its expanding needs. It is not uncommon to find growers being hired from Europe to meet the needs of greenhouse operations in Ontario. Educational programs designed for greenhouse production are needed to provide new graduates with the necessary skills for a career in greenhouse floriculture. Additionally, a promotional campaign aimed at schools to increase awareness of the industry, is needed in order inform more young people of the opportunities that exist in the industry and to foster their interest (See Recommendation 5).

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Consultants - Private consultants provide an important service, with many growers making use of them for advice and recommendations on production and pest management issues.

Current Activities

There are only a few Ontario based consultants, and by their own admission, have heavy workloads and the potential for more clients than they can handle. Also, there are many growers who use European consultants, often on a quarterly basis.

Gaps/Barriers/Deficiencies

One of the concerns over the use of European consultants is their lack of knowledge of Ontario production, and factors affecting it. These can be quite different from the European situation. It was suggested that educational needs of the industry described above could have additional carryover benefits in consulting services.

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Greenhouse and Protected Crops

GREENHOUSE VEGETABLES

Research Priorities

1. Evaluate new and old pest (thrips, whiteflies, lygus bugs, tomato bug), disease (powdery mildew, pythium, bacterial canker, Fusarium stem&root rot of cucumber), and virus (Pepino mosaic virus) control measures (including application methods) and implement IPM strategies for control of powdery mildew in cucumbers, tomatoes and peppers, Pythium root rot and Penicillium in cucumbers, and, Botrytis in all vegetables.
2. Develop and evaluate energy use and environmental strategies that optimize plant growth, productivity, and fruit quality, as well as integrated pest management techniques in greenhouse vegetables. Specifically, evaluate the production of greenhouse vegetables on raised gutters, with or without artificial lighting.
3. Development of strategies such as trap crops, insect exclusion via screening of vents, and new biological control agents, for improving control of new and old pests that disrupt IPM programs, such as thrips, lygus bugs, cucumber beetles, and whiteflies.
4. Maintain research on soilless culture with emphasis on recycling nutrient solutions and disease management to improve profitability and sustainability. Also, develop strategies to manage greenhouse waste (growing media, plant material, nutrient solution, plastic etc.) and to ensure the sustainability of the greenhouse industry. Explore opportunities for the biological production of greenhouse vegetables.
5. Investigate the potential for the use of disinfectants such as chlorine bleach, Virkon, Physam 20, and the fungicide Phyton 27, as protectants against diseases, particularly bacterial and fungal diseases. Also, Identify sites and form of dormant stages of bacterial and fungal pathogens in order to effect rational control between crops with disinfectants and modification of cultural practices.
6. Evaluate new types of crops, cultivars, and post-harvest technology procedures (including packaging and labelling) to optimize yield and fruit quality. Explore the potential for the biological production of greenhouse vegetables and investigate the benefits of grafting.
7. Investigate strategies to reduce efficiency of insects as vectors of plant diseases such as CMV by aphids, Beet Pseudo Yellows Virus by whiteflies etc.

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MUSHROOMS

The working groups elected NOT to rank them. They defer to the research committee of the CMGA to decide the important priorities at the time research funds become available.

Commercial mushrooms - Long term priorities (2 to 4 years duration)

The working group established the following as long term priorities.

- Compost odour management, especially treatment techniques
- Improvement of mushroom quality, especially sliced mushrooms
- Influence of mushroom farming practices on surface and underground water
- Control products for management of Green mold and Verticillium diseases
- Enhancement of value to mushrooms
- Food safety issues

Specialty mushrooms- Long term priorities (2 to 4 years duration)

- Develop "best practices" procedures for packaging and storage of specialty mushrooms to improve the shelf life and quality at the retail store level.

Commercial mushrooms - Short term priorities (within two years)Insect and Disease

- Determine the effectiveness of fungicides, fungi static materials and barrier techniques to manage Trichoderma green mould and dry bubble
- Provide the necessary information required by AAFC for registration of products already registered in the USA and Europe
- Determine relationship between virus (La France and patch disease) and browns (portabella and crimini)

Production

- Determine the effect of water quality on mushrooms
- Develop criteria for the "best" casing soil, e.g. black peat, sugarbeet lime, flour lime
- Determine influence of straw cultivars, poultry litter bedding, feed additives, ammonia suppressants and pesticide residues on composting, mushroom production and human health
- Prepare a literature review of the nutritional benefit of mushrooms
- Enhance mushroom quality through minimal treatment at the farm level

Specialty mushrooms - Short term priorities (within two years)Insects and diseases

- Develop controls for blotch and trichoderma diseases

Production

- Optimize environmental management techniques to maximize production and quality
- Evaluation strains to optimize mushroom production and quality
- Develop marketing strategies and retail presentations to improve profitability to mushroom growers

Greenhouse and Protected Crops Service Priorities

The working groups discussed the issues surrounding 'service' to the mushroom industry. Their primary concern is the availability for virus testing and compost analysis in Canada. Compost analysis is a routine practice for most farms. Samples are analyzed on-site, within Canada and in the USA. There is no single lab to which the growers send samples. There are no labs in Canada that do virus testing for mushrooms. (They have been done infrequently by AAFC in Vineland.) Samples are sent to spawn suppliers or to The Pennsylvania State University. Virus is currently not a serious

problem on mushroom farms in Canada; however, there are significant virus or virus-like problems in UK. Thus, the growers are concerned with the absence of domestic labs should a problem occur here. At the same time, they realize that a market is necessary for any lab to develop the skill sets for the testing.

Commercial mushrooms

- Identification of insects, diseases and weed moulds
- The use of internet as means for providing technology transfer from own research and published work of others
- Workshops

Speciality mushrooms

- Identification of insects, diseases and weed moulds
- Telephone consultations
- Be an information centre on advances in specialty mushroom production
- Deliver Trichoderma control information on Shiitake mushrooms
- The use of internet as means for providing technology transfer from own research and published work of others
- Internet training courses
- Workshops

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Low Acreage Research and Services Priorities

Research Priorities

Nutrient Management Information Gaps and Plan Implementation Costs

The Issue: Nutrient management legislation is in the process of moving forward. Growers and industry personnel associated with production and processing of Low Acreage and Special Crops indicate a shortage of reliable and current information available on which to base fertility recommendations. Furthermore the agri-business community has expressed concern over the shortage of human resources dedicated to implementation of nutrient management planning for Low Acreage and Special Crops. The dollar cost to the grower and industry associated with implementation of nutrient management planning is a concern. Can the industry remain competitive with imports from countries that grow similar produce without regard for nutrient management? Will the Ontario grower be able to compete in future market without financial assistance?

Current Research/Extension Activities

Some research is being conducted in Ontario with respect to nutrient management recommendations for Low Acreage and Special Crops (i.e. nitrogen trials in melon, cucumbers (Beyaert, AAFC)). However there are many Low Acreage and Special Crops with no research being done with respect to nutrient management recommendations (i.e. sweet potatoes, herbs). Technology transfer specialists (extension) within Crop Technology, OMAF have commenced an evaluation of recommended fertility rates and nutrient crop removal rate for certain Low Acreage and Special crops.

Gaps/Barriers

Agronomic research with respect to all aspects of nutrient management planning criteria for all Low Acreage and Special Crops requires completion. The criteria for soil nutrient deficiencies, pH, different soils, nutrient removal rates, nutrient values for waste, cull piles and wash water, for respective yields of those crops considered Low Acreage and Special must be developed as soon as possible at a reasonable cost to the agri-business community.

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Food Safety

The Issue: Food safety is not just a post-harvest issue. The market is expressing concern over the exceeding of chemical residues, wash water quality, irrigation water quality and worker hygiene. Grocery chain store retailers and agriculture industry processors indicate need for HACCP certification or equivalent from grower to consumer. If a food safety certification program were in place, would it be a "whole" farm approach or "commodity" approach? Growers of Low Acreage and Special Crops have expressed concern over the added cost of record keeping, grower liability insurance and the ability to compete in the market place with imported produce from countries that they do not enforce post harvest quality food safety standards. Also, growers are concerned with the lack of information available from the marketplace and government on food safety.

Current Research/Extension Activities

Both federal and provincial governments continue to address the food safety issue. Federally such a mandate is addressed through the CFIA, PMRA, Health Canada and Agriculture and Agri-Food Canada. Provincially a fresh market quality Program Lead Position within Crop Technology, OMAF has been set in place. In addition, all crop technology specialists working in the area of Low Acreage and Special Crops extension do appreciate the need for improved post harvest strategies to ensure food safety and quality.

Gaps/Barriers

The Low Acreage and Special Crops fresh market and processing sectors could benefit from increased human resources and financial assistance towards implementation of food safety programs. Although some industry players have taken a pro-active approach to the implementation of HACCP, others have not.

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Export Marketing Restrictions

The Issue: There are barriers to exporting Low Acreage and Special Crops, which include zero tolerance pesticide residues, quarantiable pests and bioterrorism issues.

Current Research/Extension Activities

Jim Chaput, OMAF's Minor Use Coordinator is aware of the zero tolerance pesticide residue issue. When setting minor use priorities for Ontario, current pesticide registrations and submissions from other countries are taken into account. Joint submissions with the U.S. are encouraged. Herbicide trials are being conducted on some of the low acreage and special crops (i.e. sugarbeets, peppers).

Gaps/Barriers

With the limited research conducted in some low acreage and special crops, it is difficult to register new products that already have residue limits set in other countries. Sometimes Ontario growers are forced to use products that are registered in Ontario, but not registered in the country they are exporting to, due to lack of options for registered pesticides.

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Water Management

The Issue: Dry growing conditions were experienced in the last two years. More awareness is being drawn to using water efficiently as possible. There is concern that watering restrictions could become enforced if dry conditions persist.

Current Research/Extension Activities

Water management issues are currently being addressed in some areas: (i) hiring of Rebecca Shortt, OMAF's Irrigation Specialist, (ii) grants provided for trickle irrigation (tomatoes) and (iii) Water Stewardship Enhancement Program.

Gaps/Barriers

Some gaps still remain for identifying critical irrigation times for crops. It is important that research continues for trickle irrigation, its scheduling and fertigation practices.

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High Energy Costs

The Issue: There is great concern with increasing energy costs for natural gas, diesel and electricity. All production practices, such as field operations, irrigation, fertilizer input costs and post-harvest conditioning (heating and/or cooling of agricultural produce and its products) will be affected and costs will increase.

Producers need more assistance on how to decrease energy costs.

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Acceptance Of Genetically Modified Organisms (Gmo)

The Issue: A select but limited number of Low Acreage and Special Crops (e.g. Sugar beets, asparagus, cucurbits) could potentially benefit from continued research and acceptance of GMO varieties. This is important to the grower/processor to ensure yield and quality and to remain competitive and in the market place with their USA counterparts.

Current Research/Extension Activities

Very little if any research is taking place with respect to GMO development of Low Acreage and Special Crops in Ontario. Information with respect to GMO variety development is left to private research seed companies primarily located in the USA. Extension activities in this area too are rather limited however supported in principle by OMAF Crop Technology specialists providing the market exists for GMO products.

Gaps/Barriers

Consumer demand for GMO products in some countries has diminished. Market opportunity has been lost. For Ontario producers to remain competitive with USA counter parts, it is important to recognize the advantages of GMO varieties.

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Low Acreage Service Priorities

Scouting Services

The Issue: More growers are expressing a need for well-qualified pest scouting services at an affordable cost.

Current Service Activities

A.I.M.S. and some private consultants provide pest-scouting services to growers.

Gaps/Barriers

A.I.M.S. reported that there are new summer students each year that require training. There are not too many students that return the next summer due to the low wages that are offered. Also, the cost for pest-scouting services can be expensive.

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Nursery Landscape Turfgrass

2002 Research and Service Priorities for OHCRSC Subcommittees

1. Development of Nutrient Management Strategy and Plan
2. Registration of Reduced Risk Pesticides and IPM
3. Management of Water Quality and Quantity
4. Biology and Management of New and Emerging Pests
5. Acquisition of Current Industry Economic Data
6. Educating the Regulators
7. Increase Resources for Pest Diagnostic Clinic

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Potato Research Priorities

Potato Productivity: Nutrient Management, Soil Improvement and Irrigation

Growers must consider many factors to produce a high quality potato crop. Fertility, soil tilth and water availability are the most important factors that influence crop productivity. Ontario potato growers must achieve high yields of high quality tubers to remain competitive. Proposed legislation on nutrient management and the reduced availability of water for irrigation are issues that need to be addressed.

Growers need to know the optimal fertility levels for new varieties entering the marketplace. Growers also require long-term trials to determine the effect of crop rotation, drainage and cultivation on soil tilth and potato production. Research on irrigation such as drip irrigation and irrigation scheduling would help conserve water.

For the past 10 years, no potato research addressing nutrient management, soil improvement or irrigation has been conducted in Ontario either by the University of Guelph or by AAFC.

Control of Soil and Seed-Borne Diseases

Every year, potatoes are affected by soil and seed-borne diseases that reduce yields or make the crop unmarketable. Fusarium, Rhizoctonia, scab, early dying (Verticillium wilt and nematodes), late blight, early blight, pink rot, leak and soft rot are among the most important diseases attacking the potato crop in Ontario.

There is only one plant pathologist in Ontario conducting research on the control of soil-borne diseases, Dr G. Lazarovits at AAFC, London. Dr. Lazarovits is evaluating the use of organic amendments to reduce scab. His lab has also developed a laboratory method to predict the level of scab infestation in fields from soil samples.

The Potato Board has supported surveys conducted by Dr H. Platt from AAFC in Charlottetown to identify the late blight strains that have been found in Ontario. Such studies provide an early warning of changes in races which may affect control methods.

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Evaluation of New Varieties for the Ontario Market

To remain competitive, potato growers must grow varieties that meet consumers' demands. Testing under Ontario conditions is crucial for the selection of new varieties that the provincial market requires. It is important that AAFC continue to make selections for the Ontario market and evaluate them under Ontario conditions.

New varieties need to be evaluated for their tolerance to disease and physiological disorders, their dry-matter content, yield and performance under adverse growing conditions. Variety testing is being conducted by the Potato Board Cooperative Variety Trials, the University of Guelph and OMAF. New varieties evaluated in these trials have been adopted and are being grown successfully by Ontario growers.

This type of research is invaluable for potato growers and should continue as new varieties with improved traits would allow them to expand markets and reduce inputs of pesticides and fertilizers. Replacements are required for a number of the main varieties currently grown in Ontario. For instance, Superior, the most common early variety, does not perform well under dry conditions requiring weekly irrigation. It is also very susceptible to nematodes and Verticillium wilt. In the Shelburne area, a replacement is required for Shepody the main processing variety used for soups, stews and pre-peel sales. Chieftain, the main red-skinned variety grown in the province, is susceptible to heat necrosis and its red skin color fades in storage turning brownish.

Post-Harvest Physiology

The potato-chip market is very competitive, and processors require high-quality potatoes to satisfy consumers' demands. One of the main problems growers and processors face is the formation of reducing sugars in tubers induced by low temperature storage. Reducing sugars cause the darkening of potato chips when fried. Specific gravity or dry matter content is also an important factor in process quality.

The University of Guelph has conducted research to identify factors regulating process quality in potatoes, to elucidate the mechanism of low temperature sweetening in potatoes and to develop models for prediction of end-product color from harvested and stored potatoes.

Further research is needed to allow growers to better manage the crop in storage and to suppress the formation of reducing sugars in tubers which lead to dark chip color.

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Integrated Pest Management and Insecticide Resistance

Potato insects and diseases are a constant threat to the potato crop. The management of potato insects and insecticide resistance monitoring are ongoing issues. Alternative methods of pest control needs to be researched.

The Colorado potato beetle (CPB) is one of the most serious pests in the province. If left uncontrolled and weather conditions are favorable, beetles can devastate a field in a few weeks. Colorado potato beetle populations have developed resistance to most of the insecticides used for their control. Admire is the only insecticide currently registered in Ontario that is effective against all CPB stages.

Monitoring for the development of resistance to Admire is extremely important. The testing and registration of new insecticides with different modes of action would reduce the likelihood of resistance developing.

Aphids can cause serious economic losses if present in fields. They also vector virus diseases. Aphids have developed resistance to insecticides in other potato production areas. Monitoring aphid insecticide resistance in Ontario is important before problems develop.

Wireworms are a problem in potato fields rotated with hay, a desirable practice because rotation reduces soil-borne diseases and improves yield. There are, however, no reliable procedures to determine the extent of wireworm infestations nor are there effective products for wireworm control.

Cutworms are becoming a problem with the changing climate in Ontario.

Greenhouse Minituber Production for Seed Potatoes

The Ontario seed potato industry is based on Nuclear minitubers produced by the Seed Potato Upgrading and Distribution (SPUD) Unit and the contract greenhouses in northern Ontario. Research to improve greenhouse yields and minituber size, and to minimize the risks associated with Nuclear seed production, benefits seed potato producers by reducing the cost and increasing returns in the field while maintaining the highest quality possible.

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Potato Service Priorities

Extension Services

The industry in Ontario feels that the services of the Ontario potato specialist are essential to their industry. This includes educating producers on new and existing potato pests and current potato issues, the Potato Agriphone, training potato field scouts, conducting technology transfer trials and organizing field days.

Registration of Pesticides for Potato Pest

Pesticide registration is an issue for Canadian potato producers. Producers in other countries, namely the US, have access to pesticides not currently registered for potatoes in Canada. New pesticides often pose a reduced risk or are effective resistance management tools. Many times the pesticide company will make a submission for registration of one of these pesticides in Canada. However if they don't, IR-4 data is usually not available as potatoes are not a minor crop in the US. It is very costly to obtain the data required for residue levels, occupational exposure, crop tolerance, efficacy, etc to support registration.

In 2002, this committee requested the registration of 5 insecticides, 4 fungicides and 1 herbicide on behalf of the industry. These products replace old technology, reduce risk and provide tools for IPM, reduced pesticide use and to manage resistance.

Nuclear Seed Potato Production

The Seed Potato Upgrading and Distribution (SPUD) Unit is the foundation of the Ontario seed potato program supplying producers with high quality Nuclear minitubers. This service is essential to the industry in Ontario.

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Root, Bulb & Leafy Vegetables Research Priorities

Research Issue # 1: Crop Fertility Issues

Issue

A. Fertility Recommendations. In light of developing provincial nutrient management legislation, research is required to review and revise current information and provincial recommendations for root, bulb & leafy vegetable crops. Only limited research specific to root, bulb & leafy vegetables has been undertaken, so the accuracy and suitability of current recommendations to these crops is unknown.

B. Micronutrient and Tissue Analysis Recommendations. Increasing attention is being placed on the use of micronutrients in crop production. However, for many of the micronutrients in question, there is a lack of sufficient research to either support or counter their use. The feasibility and accuracy of the use of tissue analyses in making micronutrient recommendations must be evaluated.

Current Research/Extension Activities

- Research on nitrogen management of carrots, onion and cabbage has been undertaken by Drs. M.R. McDonald, A. McKeown and C. Scott-Dupree (Departments of Plant Agriculture and Environmental Biology, University of Guelph) over the last 3 years. This research has largely focused on application rates and timing and the effects of nitrogen on insects and diseases.
- Kessel and K. Callow began micronutrient studies on cole crops and Asian crucifers in 2001; however there is no plan to extend these trials to root, bulb & leaf vegetable crops.

Gaps/Barriers/Deficiencies

A) Fertility Recommendations. Special emphasis should be placed on an integrated fertility program which takes into account the complete soil nutrition regime and nutrient management planning; validation of crop uptake, crop removal, and growth stage models specific to root, bulb & leafy vegetable crops are required as well as a revision of current Provincial recommendations.

Of particular concern is the applicability and accuracy of current nutrient parameters in assessing nutrient input/output of vegetable production practices on muck soils.

B) Micronutrient and Tissue Analysis Recommendations. Improvements in fertilizer recommendations for root, bulb and leafy vegetable crops with particular emphasis on in-field evaluation of new micronutrient formulations and the use of tissue analysis. The evaluation of commercially available micronutrient formulations for solubility and availability of micronutrients to plants is needed in order to permit accurate recommendations to be made to growers.

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Research Issue # 2: Disease Management

Issue

The presence of diseases in field and in storage greatly impacts the quality of vegetable produce, and causes serious post-harvest losses of stored produce. Certain diseases such as Sclerotinia and Sclerotium are no longer adequately prevented by existing fungicides and the incidence of some diseases such as downy mildew on onions has been increasing in recent years.

Current Research/Extension Activities

- Research on Sclerotinia of carrots has been undertaken by Drs. G. Boland and M.R. McDonald over the last 4 years. This research has largely focussed on the biology and epidemiology of Sclerotinia sclerotiorum, but includes a component on cultural control practices.
- Research on the control of disease in storage is also being addressed. This research is largely focussed on determining if the wooden boxes are an infection source for stored carrots.
- Research on Sclerotium of onions has been undertaken by Drs. T. Hsiang and M.R. McDonald over the last 3 years. This research has focused on the use of Vesicular Arbuscular Mycorrhizae (VAM) as a biological control of Sclerotium cepivorum
- There is some research on biological controls for Sclerotinia on lettuce being initiated at MCRS.

Gaps/Barriers/Deficiencies

Effective management practices are needed for foliar and soil-borne diseases of all root, bulb and leafy vegetable crops, with particular emphasis on Sclerotinia, Pythium, Sclerotium, Fusarium, and Rhizoctonia spp.: leaf blight, early and late blight, corky root rot, bacterial leaf spot, downy mildew, white rot, violet root rot, crown rot and crater rot. Approaches

may include cultivar resistance, fungicides, biological controls, and soil amendments, among others. Information on the biology and epidemiology of these diseases is also needed.

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Research Issue # 3: Integrated Insect and Nematode Management.

Issue

Effective management of insect pests is complicated by the anticipated loss of older pesticides, by reduced efficacy of existing pesticides, by lack of access to new pesticides, and by the presence of several new insect pests in Ontario vegetable crops. In addition, effective management practices for nematode pests of vegetable crops have not been defined.

Current Research/Extension Activities

- Pea leafminer research was begun by Dr. R.H. Hallett, University of Guelph, in 2000. This research is focussing on: whether pea leafminer can overwinter in Ontario field conditions; the host range of the Bradford pea leafminer population; protocols to improve sticky trap monitoring of populations; and insecticide evaluations. A factsheet for growers on leafminers of vegetable crops was prepared by Jim Chaput in 2000.
- Dr. M.R. McDonald conducted insecticide efficacy trials for aphids in 2002.
- There are no active research projects on tarnished plant bug or cutworms.
- Drs C. Scott-Dupree and M.R. McDonald have completed a project on the interactions between onion maggots and onion smut, including implications for control recommendations.
- Drs. C. Scott-Dupree and J. Tolman are currently investigating the presence of insecticide resistant onion thrips populations in the Thedford-Grand Bend region.
- Nematode research being conducted in Ontario, does not focus on crops of concern to this committee. With the retirement of Dr. J. Potter in 2002, the future of nematode research capabilities in Ontario is in jeopardy.

Gaps/Barriers/Deficiencies

An integrated crop management or systems approach is needed to ensure the successful implementations and adoption of new management practices developed for both insect and nematode pests of root, bulb & leafy vegetable crops. IPM is a systems approach; control of one pest element can influence the balance of others within the system. Therefore, the development and evaluation of sustainable IPM programs to address the dynamic arthropod pest complexes (insects, mites) of vegetable crops is required.

Insect Pests

Development of appropriate management practices including, but not limited to, cultivar resistance and alternatives to pesticides, must be developed for control of insect pests.

Group 1 (Established pests) including tarnished plant bug, aphids, cutworms, onion maggot, carrot rust fly and onion thrips.

Group 2 (New and emerging pests) including pea leafminer, leek moth, and carrot weevil. Provincial surveys of pea leafminer in multiple crops and of leek moth in onions and garlic are also needed.

Existing research programs must be expanded and supported over the long-term in order to permit the development of

effective management programs and specific control recommendations for these insect pests. Special consideration should be given to:

- control and population dynamics of major pests (including, but not limited to, onion maggot, onion thrips, carrot rust fly, pea leafminer);
- secondary pest resurgence and control (including, but not limited to, carrot weevil, tarnished plant bug, aphids, cutworms);
- new pest introductions and/or developments (including, but not limited to, pea leafminer, leek moth; and Provincial surveys for new pests, including pea leafminer in multiple crops and leek moth in onions and garlic);
- evaluation of new pest control products;
- biological control agents and cultural techniques;
- economics of program implementation.

Nematode Pests

Integrated nematode management systems are required for carrots and other root, bulb & leafy vegetable crops, including methods such as crop rotations, soil amendments, band fumigation and late fall plowing. Damage thresholds and symptom expressions for species such as lesion and pin nematodes should also be considered.

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Research Issue # 4: Development of Integrated Weed Management Programs.

Issue

The control of weeds, and the increase in resistant weed populations, is an ongoing challenge for growers of root, bulb & leafy vegetable crops. Weeds of particular concern to this group are yellow nutsedge, common groundsel and grasses. In recent years an increase in resistant weeds (e.g. pigweed) has been observed.

Current Research/Extension Activities

- A number of weed-related research projects have been undertaken at the University of Guelph (Yellow nutsedge - Dr. Francois Tardif; weeds in no-till carrots and onion - Dr. Clarence Swanton), but these have received little or no funding and their future is uncertain.
- Dr. F. Tardif has been investigating examples of weed resistance on an unfunded basis, but the root, bulb & leafy vegetable sector cannot rely on the long-term continuation of this service.
- Dr. Diane Benoit (AAFC, HRDC- St Jean-sur-Richelieu) has collaborated on yellow nutsedge research with Dr. F. Tardif, but the current status of her research program is unknown.

Gaps/Barriers/Deficiencies

Research is needed to investigate: cultural practices, new pre- and post-emergence herbicides, herbicide banding, new weed introductions and changes in the weed complex. The weeds of special concern are yellow nutsedge, common groundsel and grasses. Practical short and long term solutions must be identified.

New product registrations for management of herbicide-resistant weed populations must be sought.

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Research Issue # 5: Minor Use Pesticide Registrations

Issue

The impacts of FQPA (USA) and re-evaluation (Canada) decisions are very great for Canadian growers because of a lack of access to alternative replacement products. The registration of new, 'reduced risk' active ingredients is urgently needed.

Due to the loss, or anticipated loss, of current pesticide products, there is a need for minor use pesticide registrations for improved control of insects, diseases and weeds. Increased demands from PMRA for multiple location efficacy and residue trials have greatly reduced the feasibility of obtaining many minor use registrations.

Current Research/Extension Activities

- Research towards the registration of minor use pesticides has been an ongoing concern of many researchers involved in this committee for many years.

Gaps/Barriers/Deficiencies

- Seek minor use pesticide registrations for improved control of insects, diseases and weeds of muck crops.
- Emphasis should continue to be placed on reduced risk active ingredients and replacements for organophosphates.
- There is a particular need for minor use research on herbicides for garlic and for new products to control herbicide-resistant weeds.
- Minor use research should continue over the next few years until AAFC completes establishment of the new Pesticide Minor Use Centre and Program.

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Research Issue # 6: Value-added Product Development.

Issue

Growers in the root, bulb & leafy vegetable sector would like to take advantage of the growing market-demand for value-added vegetable products. While the technologies for some of these products are well-established, the development of value-added products using fresh onions (e.g. sliced, diced, pureed) is currently restricted by shelf-life limitations.

Current Research/Extension Activities

- There are no current research activities in this area.
- Jennifer DeEll, Vineland, OMAF, has some experience with post-harvest handling of crops and may be able to help coordinate, or advise on the establishment of appropriate research program.
- Kristen Callow, OMAF, will be attending a conference on new agricultural products and will be able to share relevant information on new products with growers and potential researchers.

Gaps/Barriers/Deficiencies

Research is required to develop appropriate handling, packaging and processing practices for value-added fresh

vegetable products in order to improve product quality. Research is specifically needed on methods to enhance the shelf-life of value-added onion products.

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Research Issue # 7: Cultivar Evaluations

Issue

As most new vegetable varieties are developed in other regions of North America and in Europe there is a continuing need for the evaluation of varieties for suitability to Ontario growing conditions. The reduced number of registered pesticide products makes the evaluation of varieties for pest and disease resistance and for competitive ability against weeds particularly important over the next five years.

Current Research/Extension Activities

- Shawn Janse and Drs. M.R. McDonald and A. McKeown (University of Guelph, Department of Plant Agriculture) have undertaken the evaluation of root, bulb & leafy vegetable crop varieties at Bradford and Simcoe for many years.

Gaps/Barriers/Deficiencies

There is an expressed need within the grower community for continued evaluations of root, bulb and leafy vegetable crop varieties for suitability to Ontario growing conditions, storage conditions, market demand, and pest/disease resistance, with emphasis on, but not limited to, carrots and onions.

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Root, Bulb and Leafy Vegetable Service Priorities

Emphasis was given to Service Issues at the 2002 meeting of this committee. Four service priorities were identified and ranked in order of importance, as follows:

Service Issue #1: Access to weather data and degree day information

Issue

Timely and economical access to weather data and degree day information is of increasing importance to growers and crop consultants. This information is needed to effectively time pest monitoring efforts and pest and crop management practices. Weather data that is relevant to all regions in which horticultural crops are grown are required. Expansion of and increased access to the Ontario Weather Network (OWN) is needed, with reduced subscription rates offered to growers.

Current Activities

- OWN provides weekly air temperature and precipitation data to OMAF staff who distribute the information to consultants, scouts and other industry personnel.
- OWN monitoring begins May 1 each year.

Gaps/Barriers/Deficiencies

- For many over-wintering insect and disease pests, weather monitoring needs to begin by April 1, for accurate calculations of degree days and other predictions of developmental parameters. In addition, air temperature alone is not always sufficient for prediction of the development and emergence of soil dwelling pests. In these cases, soil temperature and soil moisture data may also be required.
- In Quebec, vegetable growers pay a flat \$50 fee for access to similar information. Subscription rates for growers in Quebec are subsidized by their provincial government.

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Service Issue #2: PCR Diagnostics

Issue

The availability of PCR Diagnostics, particularly for diagnosis of aster yellows in leafhoppers, has been an ongoing service issue for this sector for a number of years.

The methodology for detecting the aster yellows phytoplasma in leafhoppers has been available for a number of years. This research was conducted at the University of Guelph and was partially funded by OMAF through Food Systems 2002. This technology is essential to help growers make optimal management decisions on a timely basis.

Current Activities

- OMAF representatives discussed the provision of this service with the Uof G Pest Diagnostic Clinic in spring 2001. At that time the clinic was unwilling to add this technology to their diagnostic services.
- OMAF representatives met with GAP Environmental Services, London, ON, to discuss the possibility of aster yellows diagnoses being provided at their lab. The company is open to this possibility and in 2003 will operate a pilot project to determine aster leafhopper infectivity ratings across Ontario. OMAF personnel will help to coordinate the collection of standardized bulk samples from regions across Ontario for use in this project.

Gaps/Barriers/Deficiencies

- Growers have expressed willingness to pay for this service, but it is not offered through the UofG Pest Diagnostic Clinic.
- Unless a sufficient number of samples are submitted to the lab for diagnostic testing, the budgetary constraints will be too high.
- In other jurisdictions, this technique has been made available to growers free-of-charge.

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Service Issue #3: Timely and accurate plant diagnostic testing

Issue

Improved quality of plant diagnostic facilities available, particularly with respect to sample turn-around time and ability to provide accurate pest and disease diagnoses. Rapid and accurate communication of results is important to the selection

and implementation of pest and crop management strategies. A comparative evaluation of these qualities and service charges levied by the labs available to growers (e.g. UofG Pest Diagnostics Clinic, Agdias, etc) is needed.

Current Activities

- OMAF and U of G have met with GAP Environmental Services and there is potential for this service to be offered by GAP in addition to the other available labs.

Gaps/Barriers/Deficiencies

- Unless a guaranteed number of samples can be given to the lab and coordinated through Provincial specialists, consultants, scouts and industry the budgetary constraints will be too high.

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Service Issue #4: Continuity and consistency of crop scout expertise.

Issue

This sector suffers from high turnover in crop scouts which leads to lack of continuity and concerns about reliability of advice offered to growers. Improved training programs are needed to provide new scouts with comprehensive information on pest, disease and other plant symptoms prior to the occurrence of these conditions in the field. Efforts, possibly including incentives, should be made in the industry to retain crop scouts for multiple years. Consistency of scouts from year to year will help to increase grower confidence in IPM and ICM programs.

Current Activities

- Depending on the company, wage increases and scholarships may be provided.
- OMAF provides scout training workshops for a number of horticultural crops.

Gaps/Barriers/Deficiencies

- A limited number of agriculture students are available each year to hire and all companies are competing for the best students. Increased wages and benefits would help to encourage students to stay for more than one year and attract more students to agricultural studies and careers.
- The need to provide training to scouts early in the season means that they are often not able to see actual pest and disease damage symptoms in the field during training. Brief follow-up training sessions during the season and/or the provision of high quality graphic images and diagnostic keys could help to improve the ability of scouts to recognize and accurately diagnose pest and crop conditions in the field.

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Root, Bulb and Leafy Vegetable Emerging Issues

Concern was expressed about the following new and emerging issues:

1. Growers are concerned about the impact of nutrient management plans and legislation on production of root, bulb & leafy vegetable crops. Of particular concern is the applicability and accuracy of current nutrient

parameters in assessing nutrient input/output of root, bulb & leafy vegetable production practices.

2. Leek moth on onions and garlic.
3. Increasing problems with carrot rust fly late in the season and probably occurrence of a second generation of carrot weevil in Ontario.
4. The presence of new races of downy mildew on spinach, which current spinach varieties are not resistant to.
5. Increasing occurrences of herbicide-resistant weeds.
6. There is a growing and serious need for effective treatments to replace soil insecticides. A number of soil insects (including wireworms in carrots and onions, and cutworms in all crops) are becoming more damaging and/or more difficult to control due to a lack of soil treatments.

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Issues - Sweet Corn Research and Services Committee

Pest Management

Issue

Maintaining a good inventory of pest control products is essential for the success of the sweet corn, pea and bean industry. As products are deregulated, work needs to continue to fill the gaps created by these losses, as well as provide new products for new pest problems (rust, flea beetle, aphids, angular leaf spot, common mosaic virus). Sustainable approaches to pest management, and products with reduced environmental impact need to be developed and evaluated in order to reduce the impact on beneficial insects.

Research inventory/current activities

Weed management research is conducted at the University of Guelph facilities at Ridgetown and Simcoe. Insect and disease management research is also conducted at Ridgetown College. Extension services for the sweet corn, pea, and bean industries are offered from the OMAF office in Ridgetown. Several projects at the main campus of the University of Guelph benefit the sweet corn and bean industries: one to evaluate the impact of Bt corn and new sweet corn insect management products on bee colonies, and the other which is investigating the incidence, tolerance and control methods of angular leaf spot in snap beans.

Gaps/barriers/deficiencies/opportunities

Present efforts in the area of pest management for sweet corn, peas, and beans are meeting the needs of the industry to the extent that they can, but it is essential that they continue. Deregulation of pesticides by the PMRA, before new replacements are in place continues to be a concern for Ontario sweet corn, pea and bean growers and processors. Often the holdup for new product registrations is not the efficacy and crop tolerance research, but the speed at which PMRA processes requests. This came to light recently when Lorsban was removed as an insecticide for seed treatment on beans; no replacement product is available.

Research is required in the area of contaminants in pea fields (slugs, snails) and methods need to be developed to minimize the impact of these pests.

A survey of the incidence of angular leaf spot in beans is needed in order to assess how widespread this pest is in Ontario.

Nutrient Management**Issue**

Current data which documents the utilization of nitrogen and phosphorous by a sweet corn, pea and bean crop over the range of environmental and soil conditions experienced in Ontario is lacking. Present nitrogen recommendations for sweet corn, as outlined in OMAFRA Publication 363, are felt inadequate to grow a profitable crop, and considerably lower than that recommended in other sweet corn producing regions (for example, neighboring U.S. states). Research which evaluates nutrient application timing and the environmental fate of essential crop nutrients is also lacking for sweet corn, peas and beans.

Research inventory/current activities

Research on the uptake and utilization of nitrogen on sweet corn grown on plastic mulch vs bare soil is being completed at Ag-Canada, Harrow. A project evaluating the yield response of sweet corn to nitrogen rates on several soil types, and the environmental fate of soil N is ongoing at Agriculture and Agri-Food Canada, Harrow. This study will also assist in developing a pre-side dress soil nitrogen test for sweet corn.

Gaps/Barriers/Deficiencies

Given the pending nutrient management legislation, effort needs to be directed towards providing research data to document nutrient utilization by sweet corn, peas and beans. Information on the loss of nitrogen through leaching and other means during crop development and after the crop is off, and the use of cover crops to trap nitrogen is required, as well as the impact of manures and soil amendments on nutrient planning. It needs to be recognized that the horticulture industry in general does not have the data available documenting crop nutrient uptake and utilization, to the extent that the field crop industry does, and needs time and funds to compile this information. Any new information dealing with nutrient management on these crops needs to be incorporated into new recommendations.

Crop Culture**Issue**

In order to remain competitive, continued research is required on crop management to allow Ontario sweet corn, pea, and bean growers to provide a quality product in an efficient and economical manner.

Research inventory/current activities

Sweet corn management trials are presently being conducted at Ag-Canada, Harrow, and Ridgetown College. Variety trials are being conducted at Agriculture and Agri-Food Canada, Harrow (fresh and processing sweet corn, beans), and Ridgetown College (processing sweet corn, peas).

Gaps/barriers/deficiencies/opportunities

Research needs to continue in the following areas:

1. Evaluation of plant populations, in row spacings, row spacings and their impact of yield and quality in sweet corn. Specific production systems can be developed for certain varieties. This could include fertility programs as well.
2. Use of plastic mulches for advancing maturity; use of biodegradable mulches to offset environmental impact of conventional plastics
3. Identifying factors which contribute to stress and reduced productivity in sweet corn, peas and beans and identify varieties with tolerance to stressful growing conditions (moisture, air and soil temperature, soil characteristics, plant population). It is felt that certain varieties perform better under stressful growing conditions; these characteristics need to be identified and exploited.
4. Developing management systems for sweet corn, peas and beans with an emphasis on crop quality. Often earliness and yield are emphasized, at the expense of quality. Poor quality product on the market reflects poorly on the entire industry.
5. Soil management studies are required to maintain crop productivity. Studies on topics such as crop rotations, fertility, and the use of cover crops are needed
6. Variety evaluations need to continue in order to provide unbiased information to Ontario producers.

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Tender Fruit Research Priorities (Similar to those reported in 2001)

It is recognized by TFRSSC that there are inter-relationships between these priorities and integrated approaches will provide the best opportunities for progress. With the expansion of the peach industry into new areas, winter hardiness will be a consideration in breeding, orchard management and plant nutrition research objectives.

Breeding and germplasm improvement for resistance to pests, diseases and abiotic stresses

- an integrated approach to breeding and germplasm improvement will help sustain the tender fruit industry and maintain its prominent place in Ontario.
- Specific breeding objectives will include:
 - assess germplasm for PPV resistance and screen new potential imports
 - maintain input especially cling stone breeding program
 - fire blight resistance important for pear breeding
 - continuing need for suitable late season processing peach and pear cultivars
 - winter hardy processing peach cultivars for new plantings in the Lake Erie North Shore area

IPM for pests and diseases - include FQPA considerations

- maintain research on mating disruption trials for control of OFM and other pests

Orchard Physiology and Management

- An integrated approach to conducting orchard physiology and management research will help sustain the tender fruit industry and maintain its prominent place in Ontario.
- To meet the demand for processing peaches, it is anticipated that new orchards will be planted outside the traditional production areas, such as in the most favoured climates north of Lake Erie. Evaluation of productivity,

adaptability, and longevity of processing cultivars outside the traditional growing regions of the Niagara Peninsula and South-Western Ontario is required

- Additional research objectives include:
 - orchard training systems for higher density, improved fruit quality, production and harvest efficiency.
 - irrigation systems including trickle and sub-surface drip irrigation for water conservation and prevention of pesticide contamination into the groundwater.
 - scion-rootstock interactions in cherry, plum, peach and pear, for tree size control (dwarfing for high density orchards), disease resistance, improved tree habit, hardiness, and production efficiency
 - plant bio-substances
 - gibberellins to regulate flowering and fruiting in order to minimize hand thinning and optimize fruit size
 - ethephon and soybean oil to delay bloom and to construct models to estimate the reduction in risk of crop damage due to spring frosts.

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Plant nutrition and nutrient management

- need to review OMAF nutrient recommendations for orchards
- uptake and removal of nitrogen in a perennial crop (tree) system - impact on timing of fertilizer applications
- review nitrogen and nitrogen:potassium balance
- look into environmental and water quality issues
- interactions: effects of plant nutrition on winter hardiness, fruit quality, storage, etc

Post-harvest and fruit quality

- control of brown rot and other postharvest pathogens of all tender fruit
- regulation of fruit ripening for improved quality at harvest and extended storage and shelf life
- prevention of meakiness or chilling injury of peaches and nectarines
- modified atmosphere packaging
- value added products

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Tender Fruit Service Priorities (not ranked)

The provision of economic information for tender fruit crops

Training of IPM personnel

- pest and disease monitoring with consultants, no longer with OMAF
- need to ensure scouting personnel are trained sufficiently
- Assist in commercial implementation of mating disruption techniques for control of oriental fruit moth

PPV education

- Tender Fruit Marketing Board lead on prunus certification program

Servicing of Tender Fruit Growers Outside of Niagara

- Some growers from outside the Niagara region are concerned about the availability of adequate OMAF and/or private industry support to help service their tender fruit crop needs.
- It was the opinion of some that "AIMS" was not adequately meeting their needs. One example given was that growers need to be adequately educated with regard to new disruptive pheromone technology available for OFM and other pests. The availability of consultants and/or OMAF extension personnel is not meeting grower expectations.

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Safe and Healthy Food

- Food quality certification programs are becoming increasingly important in establishing a clear link between point of origin and the consumer. Continuation and expansion of food quality assurance programs will ensure that the tender fruit industry is able to address the high priority it places in this service.
- improved information on the value added nutritional and nutraceutical components of tender fruit crops is warranted

Water Quality/irrigation

- Provision of services to ensure efficient use of water, methods of reducing environmental impact from irrigation practices, and strategies to ensure a reliable and high-quality water source is available to the horticulture industry are paramount to the tender fruit industry.

Nutrient Management Plans and the Nutrient Management Act

- Provision of services to ensure adequate grower education of Act
- Grower participation in planning process
- Desire government research and support in determining the impact of forthcoming legislation on the tender fruit industry

Sound, Objective Financial Information for Growers

- many growers are not aware of and how to apply for government-funded programs
- improved and/or expanded financial services to help educate grower of, for instance, NISA, SDRM, and tax incentive programs are requested

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Tomato Research and Service Issues/Priorities

There is a need for ongoing research funding to support the tomato industry and technology transfer is also very important. The research and service issues/priorities have not changed and can be seen in full detail in the 2001 report on the OMAF web site. The following highlights the research and service issues.

Breeding and Cultivar Development

The availability of suitable cultivars is essential for the tomato industry to continue in Ontario. The Ontario breeding program has been a key factor in maintaining the competitiveness of the processing industry and has played a major role in yield and quality advances made over the last 15 years. Current research efforts are addressing the opportunities that will continue to provide a basis for sustained development of the Ontario processing tomato industry. Emphasis should be placed on earliness, disease and pest resistance, reduction in mould counts, fruit firmness, peeled colour, field storage capability and field and factory yield. Bacterial diseases have been a persistent industry problem and breeding to select for field resistance (horizontal resistance) should be emphasized. A change has occurred in that the tomato breeding program at Harrow was discontinued and the breeding objectives at Ridgetown have changed somewhat.

Cultivar evaluation for fresh market tomatoes should also continue.

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Access to Crop Protection Materials/Minor Use Registrations

Improved access to newer, safer, more environmentally friendly and biocontrol materials through the URMULE and URMUR programs is required. The following concerns need to be addressed.

1. Canadian growers require equal access to new pest control products available in the US and this can be accomplished with shared registration and residue levels set at the same time and at the same levels as the US. Canada still has a number of registration requirements unique to Canada which increases the cost of Canadian registrations, slows the process and often results in denial of access to products in Canada.
2. The registration process needs to be speeded up so that Canadian farmers have access to the newer products at the same time as their US counterparts.
3. An office for minor use should be established in Canada to expedite minor use registrations in Canada.
4. Adequate funding for the URMULE and URMUR programs is required. AAFC should continue to fund projects at the 75% level. It is also suggested that OMAFRA split the remaining cost with grower commodity groups.
5. AAFC and the University of Guelph need to provide GLP compliant facilities to ensure that residue and other data development work required to support the minor use program may be carried out.

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Pest Management in Fresh and Processing Tomatoes

The sustainability of the tomato industry depends on safe, blemish free produce. Continued research efforts are needed to address the current and new insects, diseases and weeds that compete with the production of tomatoes. The focus should be to identify safe and effective pest control materials such as herbicides, fungicides and insecticides, their proper rates, timing and application. Delivery mechanisms for the implementation of IPM programs in Ontario are required.

The following are the issues that need to be addressed:

1. Bacterial diseases are persistent problems for both processing and fresh market growers. The development of diagnostic tools and management/control strategies, including biological control, disease screening of seed and improved methods for detection of bacterial diseases in seed and transplants is a high priority.
2. New pest (insect, disease, weed) control product development should remain a focus for tomato research in Ontario.
3. Adequate diagnostic services for the identification of insects, diseases and weeds. An improved diagnostic service for bacterial diseases is required (PCR based).

4. Erosion of IPM support by the public sector.
5. Improved use of the Ontario Weather Network for delivery of pest modelled information, IPM programs, irrigation scheduling.
6. Pesticide registrations for the greenhouse tomato seedling industry.
7. The organic market for both fresh and processing tomatoes is generating interest. There is essentially no research to assist any of these growers to adopt this technology.
8. Food safety.
9. Effect of new cultural practices on pest management.
10. Effect of production practices on productivity of soils.

Crop Water Management Through Irrigation and Fertigation

Research in the area of crop water management through efficient and environmentally benign irrigation and fertigation techniques is required.

The following areas require more research:

1. Efficient use of irrigation water to maximize yield and quality. More research is needed on scheduling of drip irrigation for tomatoes on a variety of soil types. What is the effect on tomato fruit quality such as soluble solids? What is the cost effectiveness of fertigation?
2. Water use restriction. Under drought conditions, water use restrictions are likely. More research is required to determine the critical stages for irrigation and to determine the impact on yield, quality and crop returns with restrictions on water use at various times.
3. Water quality. More research is required in the area of impact of irrigation water quality on yield and crop quality and food safety concerns.
4. Irrigation use expansion - availability of water sources.

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Nutrient Management

Nutrient management research including evaluating current recommendations through crop response research (crop uptake/removal of nutrients and effects on nutritional aspects of tomato), assessments of nutrient application technology, best management practices, nutrient application timing and the environmental fate of essential crop nutrients, with particular attention to nitrogen and phosphorous, is required.

The following areas require more research:

1. Basis for the phosphorous recommendations. The nitrogen and potassium recommendations have had some work in the past 10 years, but few if any people appear to know the basis for the phosphorous recommendation. The phosphorous recommendation needs to be updated.
2. Losses/leaching. Information on the loss of nitrogen through leaching and other means during and after the crop and the use of cover crops to trap nitrogen is required.
3. Split application. Information on the efficient use of fertilizer and how to use split applications of fertilizer to best advantage with the least impact on the environment is required. The question of fertigation with many scheduled feedings is part of this.
4. Reduced tillage. The impact of reduced tillage on nutrient management is required.
5. Cover crops. Information on the uptake and predicting the release of nutrients is required.
6. Manure use and organic amendments. How does this impact on nutrient planning?

Availability of Suitable Land and Land Selection.

Some of the yield enhancement that has occurred in the last several years has resulted from growers renting or purchasing land that has never been used for tomato production. This land produces heavy crops of tomatoes for the first few times it is used, but production seems to decline rapidly after the 2nd or 3rd crops. Cost effective methods to combat the 'replant syndrome' should be investigated, including proper field selection, tillage systems, irrigation and fertility practises, the use of soil amendments including cover crops, fumigation, different crop rotations and choice of herbicides.

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Tomato Service Issues/Priorities

Diagnostic services

Diagnostic services for the identification of insects, diseases and weeds are presently provided by the Pest Diagnostic Clinic, University of Guelph as well as by OMAF personnel and private industry consultants. Diagnostic services for bacterial diseases using PCR technology is presently lacking. Bacterial disease control in tomatoes is based on using 'clean' seed and growing plug transplant in a 'clean' environment. Detection of small numbers of bacterial cells on or in seed and on greenhouse plug transplants is important to determine the need for seed treatment and to identify the risk of bacterial contamination in the crop from plug transplants. PCR techniques for bacterial disease identification have been developed by AAFC, London but

no PCR based diagnostic services are presently available to the tomato industry. Private laboratories that could offer PCR based diagnostic services are being investigated.

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Pest monitoring/scouting

Pest control programs in tomato are based on insect, disease and weed monitoring to determine the need for and timing of pesticide applications. Pest monitoring services are presently offered by private consultants hired by growers or industry consultants. OMAF offers training for IPM scouts. The following deficiencies were identified:

- a) A degree day model for variegated cutworm is required.
- b) Updated disease and pest monitoring information is required (OMAF).
- c) There is a need to pool information collected by OMAF, industry and private scouts and agreement was reached to do this.
- d) Good diagnostic services are required (see above).

Ontario Weather Network (OWN)

The OWN presently collects and provides important weather information for IPM and TomCast (tomato disease warning model) and should be continued. Weather data could be available and used for other purposes such as irrigation scheduling.

Soil testing

Existing services offered by private laboratories are considered adequate.

Nutrient Management Planning

Legislation passed in 2002 will require that all growers eventually have a nutrient management plan (NMP) for their farm. Regulations pursuant to the legislation are being developed. Publicity is required to ensure that all grower are aware of the act and regulations, as well as the time frame for implementation depending on their type of farming operation. Grower support and resources will be required for farmers to prepare the required NMP. Several private groups have indicated that they will be providing services or kits for the preparation of NMP.

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Summary of 2002 Subcommittee Recommendations Forwarded to OHCRSC

Author: Annette Anderson - Chair/Ontario Horticultural Crops Research and Services Committee
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Agroforestry

Recommendations are being addressed within the subcommittee

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Apiculture and Pollination Recommendations

Recommendations are being addressed within the subcommittee.

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Apple

Recommendation # 1

Issue

The postharvest facilities at Vineland have been closed, current facilities at Simcoe are outdated and not very extensive, and facilities at Guelph are over 40 years old and in poor shape. To ensure the long-term viability of this important research and teaching area new, state-of-the-art postharvest research and educational facilities need to be constructed at the University of Guelph (Guelph and Simcoe campuses). These would house current and future faculty (including a possible Canada Research Chair in Postharvest Physiology), technical staff, graduate students, postdoctoral researchers and visiting scientists.

Background

- The fresh tree fruit sector has indicated the need for construction of proper and more modern postharvest research space in Ontario.
- Spending on agri-food research, and postharvest research specifically, is limited even though the industries involved with fresh fruits, vegetables and ornamentals, and related food products (e.g., value-added, fresh-cut, minimally processed, etc.) contribute significantly to the economy. Canada imports fresh commodities and food products worth over \$ 3 billion to meet market demand. Ontario contributes greater than 50% of the national economy related to fruit, vegetable and ornamental crops, and thus has a vested interest and tremendous need to enhance the amount of strategic research performed in the postharvest sector. Ontario has export markets that could be enhanced by postharvest technologies that improve quality, shelf life, etc. Also, there is considerable public interest in the role of fruits, vegetables and plant products in disease prevention and health restoration, as consumption of fresh products containing functional food ingredients is on the rise.

- A thorough understanding of the physiological factors and biochemical changes affecting problems with postharvest storage, handling and quality of horticultural commodities are areas that need extensive investigation both at a fundamental and applied level. A facility dedicated to advanced research and education in postharvest biology and technology will bring together Ontario researchers in this field and should promote local, regional, national and international interaction and collaboration.

Recommendation

That the University of Guelph build and equip new, state-of-the-art Postharvest Research and Educational facilities with the support of fruit, vegetable, and ornamental sectors of the Ontario horticulture industry.

Target Agencies

Dr. Alan Wildeman, Vice-President (Research), University of Guelph
President, OF&VGA
Chair, Apple Growers' Steering Committee
Executive Director, Flowers Canada
President, CHC
Director, Crop Technology Branch, OMAF

OASCC Linkages

Ontario Horticultural Crops Research and Services Committee

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Recommendation #2

Gaps in Delivery of IPM to Ontario Apple Growers

Issue

The continuum of excellence in IPM for Ontario apple growers is in jeopardy of failing. Both the service and developmental components of IPM need to be maintained and strengthened. There appears to be a loss in usage of IPM programs by some segments of the industry. With these losses, any gains in practicing environmental sustainability could also be threatened.

Background

The Ontario apple industry has long been regarded as a leader in IPM acceptance and adoption in North America. Apple growers are well versed in IPM due to their commitment to attending workshops, schools, demonstration projects, Environmental Farm Plan workshops.

In 2000, the service and delivery component of the apple IPM program was passed over to independent consultants as result of the OMAF realignment. OMAF retained a role in continued development of IPM and support for field advisors. In many areas, these programs are well run. However, there are a few regions in Ontario where the program is weak or non-existent due to a lack of affordable or easily accessible and unbiased expertise.

In the last three years, Ontario apple growers have continued to have access, through funding from the provincial government, to an agriphone service that provides updates on pest population abundance and some basic elements of IPM strategies. With the end of this funding, the growers will now carry the cost of this service. This is an expense that many growers may not be able to afford due to difficult financial times.

IPM is a constantly changing and dynamic program. Growers and consultants need to be up-dated constantly. Growers need to be well versed in new techniques to manage resistance and require the confidence to adopt strategies on chemistries and techniques that are both beneficial to the environment and the economic health of the industry.

Ontario apple growers now carry the full cost of implementing of IPM on their farms. This cost will increase as growers continue to move towards using IPM friendly products, which are often more expensive than pesticide intensive programs. These newer strategies can require a more finely tuned usage recommendation. The benefits of IPM include a reduced environmental impact. This benefits all Ontarians as a public good. As a result, growers should not have to be responsible for the full cost of IPM programs. Included in the "public good" domain are the following:

- Cleaner air, water and soil
- Enhanced biodiversity within the orchard ecosystem
- Reduced risk disease, insect, and weed management programs.

Recommendation

- Innovative mechanisms need to be developed to maintain and increase the adoption of IPM by growers.
- IPM expertise in the field should be maintained and strengthened by providing training and mentorship opportunities for consultants.
- Ontario government continue to provide hands-on expertise for growers through demonstration trials
- OMAF be committed to the testing of newer non-pesticide technologies.
- The Ontario government must support the adoption of IPM through financial incentives to growers adopting IPM on their farms.

Target Organizations

OMAF

OASCC Linkage

OHCRSC

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Recommendation #3

Issue

Currently there is a misalignment of funding resources and research mandates with industry priorities.

Background

- OASCC committees spend a significant amount of time and energy determining which research priorities best

address the needs of the industry, and research projects undertaken by OMAF, AAFC, and U of G should address these priorities.

- OASCC recognizes the continued support of several key researchers in addressing industry priorities. However the committee feels that there are several important issues for the apple industry that have been identified in previous reports, and have not been adequately addressed by researchers (oriental fruit moth and codling moth). Research on these economically significant pests is critical to ensuring a viable pome fruit industry in Ontario.
- The pest management complex in apple orchards is both complex and dynamic. New and emerging pest issues may require a shift in the direction or primary focus of research activities. To develop sustainable IPM programs, research must address the pest complex (e.g. internal lepidoptera) rather than individual pests within the system.

Recommendation

- Research undertaken by OMAF, AAFC, U of G and other institutions should receive industry support and address the priorities identified by the OASCC committees. Research projects that do not address the OASCC priorities should not receive continued funding from public sources, until these issues are resolved.
- The Apple Research and Services Subcommittee strongly encourages researchers to attend and participate in the annual meeting and other meetings with stakeholders, and to provide ongoing updates on the status of their programs. Committee members have noted a trend of inadequate research representation at these events, and poor communication regarding existing research projects.
- Research mandates and funding resources should be flexible enough to allow researchers to address new pest management issues in a more timely manner, as the disruption caused by a new pests can undermine the success and sustainability of existing IPM programs.

Target Agency

Agriculture and Agri-food Canada, Attention Dr. Gary Whitfield

OASCC Linkages

Ontario Pest Management Research and Services Committee

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Recommendation #4

Issue

Lack of industry organization to represent growers

Background

Since the demise of the Ontario Apple Marketing Commission on October 23, 2001, the industry lacks the ability to analyze issues, formulate policy positions and inform and lobby various levels of government, institutions and other sections of the marketing chain. Growers are not able to access the funds and programs through matching funding to do the research required for several major production and storage issues. In addition, apples are not represented in discussions on safety net programs.

Objective

The Apple Growers Steering Committee has consulted growers through several province wide series of meetings and have developed a list of major priorities of growers. Support for an organization has been established through a petition and deposit of \$200.00 each by over 200 growers. The Steering Committee has placed its proposal before the Farm Products Marketing Commission. Establishment of a new organization is necessary before the 2003 season for the industry to move forward.

Recommendation

It is recommended that Ontario Ministry of Agriculture and Food officials (OFPMC) proceed immediately to carry out the processes required for growers to indicate their support for a new organization. Further to this action, if grower support is indicated, that the Minister approve the formation of a new organization.

Target Agency

Ontario Ministry of Agriculture and Food

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Berry Crops

Recommendation # 1

Issue

Virology support for the Ontario Berry Crop Plant Propagation Program

Background

The support of a virologist is integral to the success of this program. Such a person could also develop research projects that would be of interest to the national berry crops industry.

Details

The issue can be resolved by AAFC making a virologist available to the Ontario Plant Propagation Program and Eastern Canadian virus problems in berry crops

Recommendation

It is recommended that AAFC provide the support of a virologist to the plant propagation program

Target Agency

Dr. Wade Johnston, Director, AFHRC, AAFC

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Recommendation # 2

Issue

Continuity of Nematology Research

Recommendation

It is recommended that AAFC fill the nematologist research position at the Vineland facility of the Southern Crop Protection and Food Research Centre.

Target Agency

National Program Leader, AAFC. Mr. Jim Bouman, AAFC, London, please forward to appropriate person.

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Recommendation # 3

Issue

Nutrient Management

The cost sharing formula for funding for research has made it difficult for the smaller commodities to participate in New Directions program.

Recommendation

It is recommended that any fertility recommendations for crops in the guidelines and regulations of the proposed Nutrient Management Act be based on valid research applicable to Ontario. The funding formula be amended to reflect a lower contribution from grower associations.

Target Agency

Jim Wheeler, Assistant Deputy Minister, Agriculture and Rural Division, OMAF.

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Recommendation # 4

Issue

IPM for Raspberry

Background

The current information for scouting and diagnosis of raspberry diseases is lacking. The limited number of pesticides available for controlling insects and diseases is also limiting. Raspberry is an excellent candidate for integrated pest management. The deficiencies in scouting procedures and threshold values are barriers to implementing IPM.

Recommendation

The OMAF Berry Crop Specialist develop a "scouting guide: that outlines procedures that would enable growers and consultants to develop and exploit IPM for raspberry.

Target Agency

Bill Ingratta; Mike Celetti, Pam Fisher, OMAF.

OASCC Linkages

Ontario Pest Management Research and Services Sub-committee

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Crucifer Crops

Recommendation 1:

Issue

Resources to implement effective and leading-edge nutrient management programs are not available to minor crop producers such as crucifer crops. Without a financial commitment from the agencies developing this legislation, vegetable crop producers will not be able to effectively implement adequate nutrient management plans.

Background

The Ontario Crucifer Crops Research and Services Committee recognizes the need for the development of detailed nutrient management profiles for all vegetable crops including 'crucifer' crops. To utilize crop nutrition inputs effectively and still maintain crop yields and quality an integrated crop fertility program must be developed which takes into account crop removal data, crop uptake data and growth stage models. New recommendations may be necessary which reflect the results of new research. By implementing such research now, a proactive, detailed and responsible nutrient management plan can be developed.

Recommendation

The Ontario Crucifer Crops Research & Services Committee requests that OMAF and Agriculture & Agri-Food Canada establish dedicated funding for research in the area of 'Nutrient Management Planning' specific to Ontario's horticultural

crops including 'crucifer' crops.

Target Agencies

- OMAF
- Agriculture & Agri-Food Canada
- University of Guelph

OASCC Linkages

Ontario Horticultural Crops Research and Services Committee

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Recommendation 2

Issue

The rutabaga industry faces the prospect of major crop losses from cabbage maggot due to loss of currently registered pest control products, reliance upon only one control option and few if any available alternatives.

Background

Rutabaga growers in Canada have lost access to cabbage maggot control options in the past several years leading to reliance upon only one insecticide, Lorsban in the organophosphate group. Organophosphate insecticides are under review by the Pest Management Regulatory Agency and may be lost or restricted for this use. In addition, the use of one group of organophosphates repeatedly will lead to insecticide resistance and loss of control.

The OCCRSC wishes to emphasize the urgency of the situation to PMRA of Health Canada, AAFC Research Branch and the University of Guelph's Ridgetown College which conducts rutabaga research at the Huron station. Until suitable alternatives can be developed and registered in Canada, it is vital that the PMRA maintain registration of currently labeled pest control options which are presently the minimum required.

A comprehensive research program which identifies and evaluates effective alternatives to currently labeled insecticides and breeding resistance is urgently needed.

Recommendation

In light of the urgent need for the rutabaga industry to address an increasing problem with cabbage maggot control options, the OCCRSC recommends to Agriculture and Agri-Food Canada Research Branch, London and to University of Guelph's Ridgetown College and Plant Agriculture Department, Guelph that a comprehensive research program be implemented for cabbage maggot management and resistance breeding on rutabagas. Recognizing the response received to this recommendation in 2002, the OCCRSC wishes to see a clear and concise research plan put into place in 2003.

In addition the OCCRSC wishes to strongly remind the Pest Management Regulatory Agency of Health Canada that they must consider carefully any reviews of pest control products for rutabagas as there are presently no alternatives to currently labeled materials.

Target Agencies

- G. Whitfield, National Science Director for Theme 160 - IPM & Plant Protection, AAFC
- G. Ablett, University of Guelph, Ridgetown
- L. Kott, University of Guelph, Guelph
- I. Gerke, Health Canada, Pest Management Regulatory Agency

OASCC Linkages

Ontario Pest Management Research and Services Committee

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Recommendation 3

Issue

The crucifer crop industry faces severe losses from a newly identified pest called the Swede midge. Currently, the CFIA has quarantined the movement of Swede midge host species material, soil associated with host species and equipment from: Simcoe, York, Toronto, Halton, Brant, Wellington, Dufferin and Niagara counties. Growers in non-quarantined zones need quick methods to identify this pest to reduce spread of this insect.

Background

The CFIA will be quarantining the movement of crucifer crop transplants and related Swede midge host species, including ornamentals as well as the movement of soil alone or in association with plants and used farm machinery and equipment used in the cultivation or management of crucifer crop fields, including: tractors, harvesters, blowers, rakes, sprayers and cultivators from eight counties: Simcoe, York, Toronto, Halton, Brant, Wellington, Dufferin and Niagara.

Growers of crucifer crop transplants, or other Swede midge host species in the quarantined counties will not be allowed to move plants or equipment to non quarantined counties in Ontario, the rest of Canada or the United States.

The CFIA is currently working on a certification protocol for greenhouse growers. The CFIA are anticipating completion of this protocol by January 15th, 2003. Growers that comply and meet all protocol requirements in the quarantined counties will be allowed to move plants to non-quarantined zones in Ontario, Canada and the United States.

Currently, there are no phytosanitary requirements on the export of produce. However, the U.S. has not made this a formal declaration.

Recommendation

The Ontario Crucifer Crops Research & Services Committee requests that OMAF and the University of Guelph provide growers, consultants, the CFIA and other industry personnel with training and diagnostics to identify this pest. University of Guelph, Laboratory Services as well as other diagnostic labs in the Province should provide an identification service for growers, consultants and other industry personnel.

Target Agencies

- OMAF
- University of Guelph

OASCC Linkages

Ontario Pest Management Research & Services Committee

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Recommendation 4

Issue

With the new minor use initiative announced by AAFC in June, 2002, current University of Guelph GLP facilities (Ridgetown, Kettleby and Simcoe) are wondering if they will need to maintain their GLP status.

Background

In June, 2002; AAFC announced a 6 year, \$54.5 million commitment to improve access to pest control products with the focus on reduced risk products.

- AAFC will establish an "IR-4-like" structure to prioritize minor use needs nationally, make minor use submissions, manage submissions, generate necessary field data and laboratory data
- Establishment of at least 6 GLP compliant research facilities in BC, Prairies, Ontario, Quebec and Maritimes to cover all zones
- Establishment of headquarters in Ottawa with executive director, IR-4 liaison, study directors and administrative assistants
- Establishment of a national minor use website, improved liaison with PMRA and IR-4 and coordination of an annual national priority setting meeting

Recommendation

The Ontario Crucifer Crops Research and Services Committee (OCCRSC) requests that AAFC inform University of Guelph's Ridgetown, Kettleby and Simcoe Research stations if they need to maintain their GLP certification and inform them what types of projects they will be asked to complete if they maintain certification (ie. National priorities A, B, or C).

The OCCRSC also requests that the University of Guelph's Ridgetown, Kettleby and Simcoe Research stations be advised if they are to complete GLP studies in 2003 that have already been initiated at these facilities.

Target Agencies

- Agriculture & Agri-Food Canada
- Health Canada, Pest Management Regulatory Agency

OASCC Linkages

Ontario Pest Management Research & Services Committee

Recommendation 5

Issue

Funding for research which sustains a viable and healthy food supply has dwindled in recent years. Long term, stable and adequate funding is required so researchers can adequately address issues and develop improved integrated crop management programs for growers.

Background

During the course of the Food Systems 2002 program, many successful and economically sustainable research and development projects have led to significant improvements to IPM programs and pesticide reduction. According to recent figures, there has been a 40% reduction in the amount of pesticide used in Ontario and a concurrent 40% reduction in the risk associated with their use. It was also identified that further public resources be targeted to fruit and vegetable crops.

The development of IPM and more recently ICM (Integrated Crop Management) programs requires a stable and dedicated source of funding to ensure that new problems and serious on-going problems are addressed. In light of the general 'public good' that such programs have achieved to date, it is recommended that they be fully supported in the future.

Currently, researchers can apply to the New Directions in Agri-Food & Rural Research Program for funding.

Recommendation

The goal of improved integrated vegetable crop management strategies leading to high quality food supplies requires a long-term and dedicated commitment. Therefore, the OCCRSC wishes to request that annual funding be provided to ensure the success and competitiveness of the Crucifer crop industry is maintained.

Target Agencies

- University of Guelph
- OMAF, IRMB

OASCC Linkages

Ontario Pest Management Research and Services Committee

Ginseng

There are no recommendations for 2002.

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Grape and Wine

Recommendation #1

Issue

The nutrient management act will require growers to develop nutrient management plans but there is currently not enough information or standards to allow them to do so.

Background

- Nitrogen recommendations for juice and wine grapes differ both in timing and rate. Non-traditional organic matter sources (paper mill fibre residue, winery pomace, composted winery pomace and/or poultry manure combined) are being used in vineyards. Their impact on the seasonal nutrient cycle is not documented well enough to be used for good nutrient management planning budgets.
- Organic matter sources for vineyards include non-traditional materials such as papermill biosolids, winery pomace and various composted mixtures often including poultry manure. Their impact on the nitrogen cycle in a vineyard is not fully understood. Organic matter breakdown over winter is difficult to predict, and combined with the slow activity of vines and cover crops over winter, the early season nitrogen budget is difficult to calculate for the beginning of the season. This puts the subsequent nutrient plan calculations in doubt.
- Detailed seasonal budgeting of nitrogen use in grapes is not well developed for cool climates, such as Ontario, where cold soils will impact organic matter breakdown and root activity. Data already generated in the field of grapevine nutrient uptake and utilization is concentrated in warm winter areas, under irrigation and on coarse soils (California, Australia and South Africa). This data is therefore not readily translatable to Ontario with cold winters, natural but intermittent rainfall and heavy clay soils, where nutrient balance/imbalance can seriously affect fruit quality and over wintering capability.
- The use of fertigation is just now being investigated and the timing/rate of application needs to be documented for good nutrient planning.
- Growers are concerned about the time and money that will be needed to develop nutrient management plans and the applicability of these plans in light of the paucity of information (see above) relevant to Ontario grape and wine production systems.
- The Ontario Grape Growers Marketing Board Research Committee provides the following comment:
"The industry has identified this area as the number one area of concern for we understand the importance of this area in our immediate future. It is a regional, provincial and national concern. The industry needs to be an active participant in the on-going consultative process, the development and the implementation of nutrient management. We solicit government/research support in determining the impact of potential legislation on the grape industry."

Gaps/Barriers/Deficiencies

1. There is insufficient Ontario data to create accurate profiles of nutrient use and sequestering in grapes
2. There is insufficient Ontario data on the use of alternative organic matter sources and their fit in the nutrient cycle of a producing vineyard.
3. There is insufficient data from fertigation trials to document uptake and/or loss patterns of nitrogen as influenced

by irrigation.

4. Specific needs requiring research identified by the OGGMB Research Committee:

- Soil testing standards for perennial crops, particularly vineyards (Timing, position, depth, common analytical procedure for use in base calculations for nutrient planning)
- Specific nutrient requirements for horticultural crops
- Nutrient availability, losses and tracking for nutrient management plans
- The need for data re: "equal in and equal out" related to soil types pertinent to viticultural areas.

Details

- Research programs need to be encouraged to address the concerns of nutrient management act implementation.
- Nitrogen and manure management are strong programs with the UG Department of Land Resource Science but the crop focus is annual cash crops and implementation focus is on high risk land prone to surface erosion and overuse of fresh manures. Use of spring soil samples, manure analyses and legume crop credits along with predictable crop utilization/removal equations have been used to develop good nutrient management guidelines for these crops.
- Developing nutrient budgets for perennial crops is complicated by residual nutrients in the perennial structures, the use of slow release organic matter amendments not included in the conventional studies, permanent sods and intermittent cultivation strategies and the addition of irrigation/fertigation practices.
- The fruit crop nutrition program has been dropped from the UG Department of Plant Agriculture list of horticultural research programs and the research scientist in that program has been declared redundant.
- Mature plantings of grapes in vineyards under the control of the UG Department of Plant Agriculture and/or research grants held by faculty members of UG/Plant Agriculture and UG/Land Resource Science and CCOVI/Brock University are available for nutrition studies with appropriate additional funding.
- Soil and water research programs at other universities may be other useful avenues.

Recommendation

Resources and manpower need to be assigned to develop standards for creation and implementation of nutrient management plans in the Ontario grape and wine industry, from production through processing.

Target agencies

- University of Guelph
- Ontario Ministry of Agriculture and Food
- Brock University
- University of Waterloo

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Recommendation #2

Issue

The grape and wine industry requires timely harmonization for evaluation and registration for pest control products used in Canada and the United States to ensure all producers have access to effective materials for the development of sustainable resistance management programs that are viable and maintain competitive balance with international trading partners.

Background

- The enactment of the Food Quality Protection Act (USA) has resulted in the re-evaluation and removal of many pesticides in the US market. The US industry has undertaken the registration of new replacement products to offset product loss. To meet US standards many Canadian producers are losing current conventional products without adequate alternative replacements putting them at an economic and production disadvantage.
- Despite actions by regulatory agencies to "harmonize" the registration of new pesticides, there still exists a time lag between adoption and availability of new materials between Canada and the United States.
- In many cases US adoption and use of new effective reduced risk materials is far in advance of those adopted for use in Canada. In some instances new product registration is not pursued at all within Canada.
- Regulatory directive 2002-02 (31 May 2002), Section 1.0 states that the PMRA " recognized the need to encourage registration of new reduced risk pesticides and acted upon a government commitment to pursue harmonization as one of the key means of achieving efficiencies and facilitating access to new lower risk technology. It also understood the need for Canadian growers to have access to new technologies at the same time as their US counterparts." Several programs have been introduced as well as a process for joint review of minor use pesticides. However, the same time adoption has not occurred with Canadian registration of new reduced risk pesticides occurring significantly later and sometimes not at all.
- Registrants have indicated that the process used in Canada is too time consuming and excessively expensive to pursue bringing products to the Canadian market.

Gaps/Barriers/Deficiencies

- The response time for product review and acceptance by Health Canada - PMRA has been too long for many firms to consider product registration that respects patent length on proprietary materials and potential to recoup investment in the Canadian marketplace.
- Volume of registration requests cannot be reviewed and acted upon by existing staff at regulatory agencies within an acceptable time frame to ensure Canadian competitiveness with trade partners.
- There exists a need to streamline the regulatory process so that US and Canadian agencies can review similar information packages at the same time to ensure equal timing of adoption/availability to producers.
- AAFC Vineland does not have any personnel working on fungicides, nematocides or herbicides for the grape industry and limited resources for insecticide evaluation

Details

- Increase AAFC resources and personnel to perform the evaluations listed above for both efficacy and GLP residue trials (see Recommendation # 5)
- PMRA to improve harmonization process so that true harmonization of product availability can be achieved. PMRA should quickly identify and remove barriers to true joint reviews.
- PMRA to streamline registration process especially for reduced risk products.
- PMRA to increase staffing to deal with existing backlog of registration applications.

Recommendation

That PMRA, AAFC, and OMAF allocate additional personnel and resources to ensure that product registration for reduced risk pesticides be achieved at the same time as their US counterparts to maintain competitive balance and ensure sustainability of economically viable and environmentally responsible grape production.

Target Agencies

- Wendy Sexsmith, PMRA
- Dr. Gilles Saindon, Director of AAFC-SCPFRC, London

- Dr. Gary Whitfield, National Science Director for Theme 160 - IPM & Plant Protection
AAFC-GPCRC, Harrow
- Ontario Ministry of Agriculture and Food

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Recommendation #3

Issue

Water management is becoming an extremely important issue for grape growers but there is currently not enough information specific to Ontario's grape growing conditions to guide their irrigation and soil water management decisions.

Background

- In recent years, and especially the last two very dry summers, grape growers in Ontario have had to increasingly rely on irrigation to maintain the health of their vineyards.
- Wasteful, overhead systems are currently the common practice, but more efficient strategies such as trickle or subsurface irrigation will be necessary in the future to make the best use of available water.
- There is irrigation/fertigation information available from British Columbia, California, South Africa and Australia but it does not necessarily apply in Ontario because of their more arid, predictable climates, coarser soils and generally mild winters.
- Evapotranspiration calculations based on models developed in very arid regions do not take into account intermittent but profound droughts under high humidity conditions. Irrigation schedules in arid regions maintain vines at a relatively constant, benign deficit and the vines remain in a good physiological state, whereas vines in Ontario cycle at intermittent, unpredictable intervals from drought to ample to excess during rains, followed by ample to drought in its absence.
- Currently, there are no good physiological markers to use as drought indicators for vineyards, to be incorporated into pre-emptive irrigation timing schedules. Other than using individual rain gauges and noting absence of rain, early stages of drought stress are not readily measured in a vineyard and application of water is therefore haphazard.
- Soil moisture monitoring is difficult in heavy clay soils where drought can be aggravated by the soil physical condition of being difficult to re-wet and the small root volume developed in these restrictive soils. Currently, there are no good, economical soil moisture monitoring devices that can accurately measure soil moisture in a manner applicable to that particular vineyard.
- There are some winemakers who hold the view that ANY irrigation reduces fruit quality. Growers are concerned that, although this view is fundamentally untrue, excess irrigation could compromise fruit quality and vine hardiness but withholding water altogether will seriously impact both fruit and vine health.

Gaps/Barriers/Deficiencies

- No irrigation schedules have yet been developed for vineyards in Ontario and models developed in other parts of the world may not be applicable because of our humid climate.
- No irrigation studies have been completed with complete fruit flavour and wine flavour profiles to prove the effectiveness of appropriate irrigation in vineyard management.
- No irrigation studies have been completed to determine best management practices for different soil types in Ontario since grapes in Ontario are grown on a wide variety of soil types - many on the heavier clays - and many different soil/cover crop management systems are applied.
- Current overhead irrigation practices can have a negative impact on IPM systems management. Overhead irrigation can contribute to disease pressures (e.g. powdery mildew) and have an impact on timing of insecticide applications. More efficient trickle and subsurface irrigation systems need to be researched to give growers

options for better water delivery systems that will not negatively impact their pest management systems.

Details

- Currently, two studies are underway in the Niagara Region, but extensive research trials need to be established in grape growing areas where soil type and climatic parameters may be different.
- Good, practical, economical soil monitoring systems need to be developed for heavy dense lacustrine clays as well as clay based glacial tills and deep alluvial sands, all three present in the Niagara Region and elsewhere in the grape growing districts of the province. Information is needed to develop best management practices and water application rates tied to soil percolation, infiltration and absorption rates, to prevent runoff and/or leaching of nutrients.
- A good reliable set of calculations needs to be developed using the soil type, the present soil water conditions, the vine phenology and health, and an estimate of vine water demand. These need to be readily calculated at specific physiological stages in the vine's annual growth cycle so that stress is avoided at these key times (flowering, fruit set, veraison)
- The effects of appropriate irrigation on fruit and wine quality need to be well defined to allay the fears of some winemakers that irrigation will detract from wine quality.

Recommendations

Resources and personnel should be assigned to develop standards, protocols and schedules for irrigation management for specific soil types in the grape growing areas of Ontario.

Target Agencies

- University of Guelph (Plant Agriculture and Land Resource Sciences)
- Brock University (CCOVI)
- OMAF
- AAFC-GPCRC, Harrow
- AAFC-SCPFRC, Vineland

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Recommendation #4

Issue

There is a continuing need for enhancement of crop protection research capacity to address important insect, mite, nematode, weed and disease problems in grapes.

Background

- Recommendations on this issue have been made repeatedly by the Ontario Grape and Wine Research and Services Sub-Committee. The response from AAFC- SCPFRC to last year's recommendation was not seen by the committee as helpful or satisfactory.
- Several key research positions have been unfilled at AAFC-SCPFRC, Vineland for a considerable time and others will be vacant soon (see 'Gaps/barriers/deficiencies' below).
- The Ontario Grape Growers' Marketing Board challenges the research and extension services that the "critical mass" required to service the industry is shrinking and critical services are not being addressed.

Gaps/Barriers/Deficiencies

- AAFC-SCPFRC, Vineland. The entomology position (population ecologist) has been vacant since 1998. The initial request to fill this position was presented in 1998 and after two rounds of searches and interviews, the position remains unfilled. With continuing changes in the pest complex and in pest control options, the vacant ecology position leaves a critical gap in the entomology program at AAFC Vineland. With new technologies now available such as disruptive pheromone products, a reduction in available chemical control options and shifts in population dynamics, modifications of the grape IPM program are needed. There are currently no new field investigation projects or senior research scientists at AAFC Vineland addressing the mite and insect problems in grapes.
- AAFC-SCPFRC, Vineland. The nematologist position at Vineland (formerly Dr. John Potter - retired) remains unfilled.
- AAFC-SCPFRC, Vineland. The plant pathology position at Vineland (formerly Dr. John Northover - retired) was identified as a priority in the Plant Pathology Review of the Vineland Fruit Program in January 2000. Although there are plant pathologists/virologists employed at Vineland, their efforts are currently directed at non-grape issues, e.g. plum pox virus, fire blight.
- AAFC - SCPFRC, Vineland. The recent retirement of virologist Dr. Wayne Allen leaves another gap in the research capacity at Vineland.
- OMAF - Simcoe. The sprayer application specialist position (formerly at Simcoe) has been vacant for well over a year. This position is very important in providing education and training packages pertaining to sprayer application technologies. It is also important in prevention of pesticide residues on grapes.
- University of Guelph - Vineland. Work in grape integrated pest management ceased in 1999 at U of G, Vineland. There is significant work needed in this field on an ongoing basis.
- Brock University: NSERC, OGGMB, and WCO funding for the NSERC industrial Research Chair in Viticulture ceased in 2002. The Cool Climate Oenology & Viticulture Institute and the Dept. of Biology have the infrastructural capability to carry out pest management research, but ongoing funds and more staff are needed to completely fulfil their research mandate. More staff would also allow CCOVI to develop a cooperative extension program to fill the void left by the departure of staff from University of Guelph, OMAF, and Agriculture Canada.

Details

- Positions at facilities listed above need to be filled promptly so that important grape and wine research and services can be conducted and delivered in a timely fashion.

Recommendations

- AAFC-SCPFRC and Dr. Gary Whitfield, National Science Director for Theme 160 - IPM & Plant Protection, should work quickly to address the gaps in crop protection research at AAFC-Vineland by filling the existing vacancies. In addition, these parties should clarify the roles and responsibilities for grape disease research at the Vineland research facility.
- OMAF - Agriculture and Rural Division should work quickly to fill the vacant sprayer application technology specialist position which is seen as an important gap in services by the OGGMB.

Target Agencies

- AAFC- SCPFRC and Dr. Gary Whitfield, National Science Director for Theme 160 - IPM & Plant Protection
- OMAF - Crop Technology Branch
- University of Guelph
- Brock University: Prof. Ian Brindle, Dean, Mathematics and Science, and Dr. David Atkinson, President, Brock University.

Recommendation #5

Issue

Slowness of establishment of Good Laboratory Practices (GLP) compliant facilities to perform residue trials and other requirements for User Requested Minor Use Label Expansion (URMULE) submissions.

Background

- As of 2001, all new crop residue studies conducted in the field and laboratory must be conducted under GLP protocols.
- There are only 3 private companies in Ontario that have qualified staff and certification to conduct these trials.
- The implementation of the new GLP guidelines means more research funding will be required to conduct these labour intensive trials as a result of the increased documentation and data requirements and the need for separate residue and efficacy studies.

Gaps/Barriers/Deficiencies

The committee appreciates the response of AAFC in a similar recommendation in 2001. However, as of late 2002, only Agassiz and Harrow are GLP compliant while Vineland is not. Therefore, to date there are still no facilities with GLP certification able to conduct GLP residue trials on grapes in the primary grape growing area of Ontario .

Details

- Vineland is to be one of the AAFC GLP "hubs", therefore, increased effort is needed to get the GLP program organized and in place for the 2003 season.

Recommendation

AAFC prioritize the GLP certification process at Vineland and swiftly allocate additional budget and staff to have Vineland GLP compliant and ready to begin the work needed to support URMULE submissions.

Target Agency

- Dr. Gilles Saindon, Director of AAFC-SCPFRC, London
- Dr. Gary Whitfield, National Science Director for Theme 160 - IPM & Plant Protection, AAFC - GPCRC, Harrow.

Greenhouse Floriculture

Recommendation #1

Issue

Ethylene testing service for the greenhouse industry is a valuable service currently being provided by the Horticultural Products Lab at the University of Guelph, Vineland.

Background

Ethylene contamination (due to incomplete combustion of fossil fuels, faulty equipment or gas leaks) of greenhouses can cause significant losses in post-harvest storage and transportation, and in greenhouse production, particularly during winter months when greenhouses are not being vented. Detection of ethylene concentrations is essential for identifying the problem and determining corrective measures.

Details

With the move of research programs from Vineland to the main campus in Guelph, there is concern that the ethylene testing service will be discontinued or not as accessible to growers.

Recommendation

It is recommended that the University of Guelph continue to offer an ethylene testing service to greenhouse flower growers in Ontario.

Target Agency

- University of Guelph

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Recommendation #2

Issue

There is a need for rapid identification of insects and diseases at US border crossings.

Background

The success of the Ontario floriculture industry depends on its ability to compete globally and the strength of its export market. Most of the industry's production is currently exported and it has a positive trade balance with the US. With a perishable commodity such as flowers it is essential that border crossings are free of delays. Even a one day delay can compromise the quality of the product. There has been a number of instances in the last couple of years of product (especially cut flowers) being delayed at the US border because of the presence of insect or disease pests. USDA border officials, without the necessary expertise to differentiate between species, send samples to experts for identification, a process that can take several days.

Details

For the export market, there is a need for expertise (and/or equipment) at major US border crossings, allowing rapid

identification of insects and disease pathogens in a timely fashion.

Recommendation

It is recommended that:

- The Canadian Food Inspection Agency work with the USDA to investigate opportunities for the use of rapid diagnosis technologies for the identification of insects and diseases in major ports between the USA and Canada.

Target Agencies

- CFIA

OASCC Linkages

- Ontario Pest Management Research and Services Committee

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Recommendation #3

Issue

Constraints are being proposed on further development of the greenhouse industry in the Niagara region below the Niagara Escarpment.

Background

The focus of the greenhouse industry in Niagara has traditionally been located below the Niagara escarpment, to take advantage of factors such as:

- Access to transportation
- More moderate temperatures
- Infrastructure concentration

However, the soil below the escarpment is ideally suited for the production of tender fruit and grapes, leading to a number of recent conflicts on the best uses for this unique agricultural land.

Details

There is increasing pressure on the industry to locate new greenhouse construction above the escarpment, supposedly to reduce the pressure on agricultural land. Much of the push for this appears to be coming from the Wine Council. Committee concerns over these policies are twofold. Firstly, the committee felt that land use concerns directed against the greenhouse industry could not be substantiated. The 2001 Agricultural Census reported a total of 142 Ha of greenhouse flower production in the Niagara region, an insignificant area when compared with other agricultural production, or with urban development. Secondly, most new greenhouse construction in the industry comes from the expansion of existing

operations. Policies that would expect this type of expansion to occur away from the central location of a business, would unfairly disadvantage individual growers.

Recommendation

It is recommended that Flowers Canada (Ontario) lobby local and regional governments to address misconceptions surrounding greenhouse use of agricultural land.

Agencies

- Flowers Canada (Ontario)

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Recommendation #4

Issue

Registration of new pesticides for the industry through the minor use registration program

Background

The floriculture industry is at a disadvantage compared to its global competitors. There is a need for new pesticides that allow growers to manage pests using similar products to those available in the USA and Europe. Of primary importance are those products that have been classified as reduced risk in the US, or which have an IPM fit. The floriculture industry has been very successful and efficient in recent years in registering new products through the Minor use program, primarily through an industry-funded position focusing on new registrations. However, there are still many products that are needed to further enhance growers' pest management programs.

The lack of new pest control products also gives rise to concern about the potential for off-label use of pesticides. There is concern for two main reasons:

- The shortage of new pest control products, can make pest management programs very frustrating, with growers using ineffective products or trying to maintain a pesticide rotation (for resistance management purposes) with only 1-2 products that are effective.
- The price differential between products (with the same active ingredient) labelled for field use and those labelled for greenhouse use can be wide. The use of cheaper (field use) products with the same active ingredient as the greenhouse labelled product, may offer short-term monetary benefits for growers. However, it ignores the developmental costs required for registration, the liability issues around high value intensive horticulture, and the goodwill of chemical companies in committing time and resources to the registration process. The industry has developed good relationships with chemical companies over the last few years, with its commitment to the Minor Use Program and the registration of a significant number of new products during that period. If the industry is to continue to receive the cooperation of chemical companies in helping it meet its pest management needs, it must address this issue proactively to ensure all growers are fully aware of their responsibilities. The industry needs to address this issue if they are to get the co-operation of pesticide companies in pursuing registration of new products.

Details

Announcements in 2002 by AAFC and Health Canada of increased investment into the Minor Use Registration Program, were welcomed by the committee. The Minor use program has long been a subject of Recommendations from this committee and it is pleasing to see evidence of an increasing commitment to the program. The committee was concerned that any new funding for minor use initiatives be shared equitably between all agricultural sectors.

With regard to potential off-label pesticide use, Flowers Canada has put in place an information campaign to educate growers about the use of registered pest control products. This will involve a series of articles in the industry newsletter, and talking about the issue at grower meetings.

Recommendation

It is recommended that PMRA and AAFC ensure that the needs of all agricultural sectors are considered in determining how to move forward with plans to improve the Minor Use program. The committee also fully supports the action taken by Flowers Canada to address the issue of off-label use of pesticides.

Target Agency

- Pest Management Regulatory Agency
- AAFC
- Flowers Canada

OASCC Linkages

- Ontario Pest Management Research and Services Committee

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Recommendation #5

Issue

The need for educational programs aimed at providing graduates with the necessary skill set for a career in the greenhouse industry.

Background

The greenhouse floriculture industry has been expanding through the 1990's at a rate averaging about 10% per year. This level of expansion provides excellent career opportunities people with a range of skills, but there is a particular need for employees with horticultural training, specifically in greenhouse crop production.

Details

The industry has a shortage of skilled labour to meet its expanding needs. It is not uncommon to find growers being hired from Europe to meet the needs of greenhouse operations in Ontario. Educational programs designed for greenhouse production are needed to provide new graduates with the necessary skills for a career in greenhouse floriculture. Additionally, a promotional campaign aimed at schools to increase awareness of the industry, is needed in order inform more young people of the opportunities that exist in the industry and to foster their interest. Flowers Canada (Ontario) has recently formed an educational committee with the goal of reviewing the educational and training needs of the

industry, in terms of new employees. This committee proposes to work with colleges and universities to develop programs that provide graduates with the skill sets needed in the floriculture industry.

Recommendation

The committee supports the initiative of Flowers Canada (Ontario) in establishing its education program and recommends it continue to work with educational institutions in achieving its objectives.

Target Agencies

- Flowers Canada (Ontario)

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Recommendation #6

Issue

Proposal for registration of biological control agents by the OECD

Background

Biological control is a well-established component of pest management in greenhouse floriculture with 10-20% of the total production area in Canada, currently using biological control. The adoption of the strategy has played a major role in reductions in pesticide use in greenhouse floriculture in the last 15 years. In many cases, growers using biocontrol are using 80-90% fewer pesticides. Biocontrol agents coming into Canada currently need a permit from CFIA, which is granted after a pest risk assessment is carried out.

Details

A January 2002 proposal by an OECD Working Group (of which Canada is a member), recommends a registration system for biocontrol agents that is based on the pesticide model of registration. The data requirements as proposed are unrealistic and would almost certainly result in reduced research and development of new natural enemies by commercial biocontrol producers. If the full data package were produced, the cost of development would have to be passed onto growers, reducing their use, and resulting in an increase in pesticide use. The implications for the industry could be disastrous, setting back all the progress that has been made in biological control in the past 10-15 years. For greenhouse vegetables, the consequences would be even worse, with biocontrol currently being used in 80-90% of greenhouse in Canada.

Recommendation

It is recommended that PMRA work within the OECD working group to ensure that any regulation of biological control agents does not adversely impact the greenhouse industry in Canada. It is understood and appreciated that some regulation is required, but the pesticide model of registration is not appropriate.

Target Agency

PMRA

Greenhouse and Protected Crops

Recommendation #1

Whereas,

Biological control has been in use in greenhouse vegetables for the past two to three decades, and currently forms the mainstay of pest management programs for arthropod pests in the majority of greenhouse vegetable operations in Ontario. Growers choose biological control as their major strategy over chemical control for several reasons including improved efficacy because of development of resistance to pesticides, use of bumble bees, improved plant vigour and fruit quality, less concern about pre-harvest intervals, a more pleasant working environment, etc.

Despite the current regulation in place that is administered by the Canadian Food Inspection Agency, there is a move towards developing further requirements by OECD countries. In this regard, attention was recently drawn to a draft document dated January 9, 2002, entitled "Guidance for Registration Requirements for Invertebrates as Biological Control Agents." Some of the proposed data requirements prior to registration of a BCA in this document include information for assessing the following:

- Human health and safety
- Environmental risks
- Efficacy

Regulations that are currently in place for new BCAs have worked well to date and there have been no known adverse consequences as a result of release of any exotic BCA in Canada. There have, however, been incidences of alien and invasive arthropod pest species in greenhouse crops. Such species have disrupted biological control programs. With the global market place that exists, it is expected that more new invasive species will occur, and will have to be addressed. In addition to reasons cited previously, this is another reason for desiring the continued survival of biological control companies and the continuing development of new BCAs.

Most biological control companies are small and marginally profitable as evidenced by bankruptcies, change in ownerships, etc. If the proposed document for registration of BCAs is adopted by OECD countries, it is believed that the cost associated with fulfilling data requirements for registration would force some companies out of business. At the very least, the increased cost would severely restrict research and development of new BCAs needed to improve current control programs, or to address new problems. Another possible consequence of such increased costs is a switch in growers' current strategy of high reliance on BCAs towards increased reliance on pesticides in order to maintain economic viability.

It is Recommended That:

It is recommended that the status quo for regulation of new biological control agents be minimally changed, if at all. Any changes considered necessary by the Pest Management Regulatory Agency should not impose undue financial burden on biological control companies such that production and use of biological control agents become uneconomical.

Recommendation #2

Whereas,

Announcements for increased funding by the federal government for an improved structure for the minor use registration process is much appreciated by the industry. However, our industry lags far behind the greenhouse vegetable industry in some jurisdictions in having access to products, particularly those that are considered as reduced risk and that are compatible with use of natural enemies. Although harmonization of registration is supposed to be in place, differences in the registration process in the different jurisdictions, particularly between EPA and PMRA have delayed registration in Canada. Furthermore, such differences have served as a deterrent to joint registrations of new products by some chemical companies for fear of delayed registration and loss of market share.

It Is Recommended That:

It is recommended that the Pest Management Regulatory Agency continue to strive to expedite and truly harmonize the minor use registration process, particularly that for reduced risk products.

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Low Acreage Crops

Recommendation 1

The Low Acreage and Special Crops Sub-Committee requests that OMAF and AAFC establish dedicated funding for research in the area of Nutrient Management specific to horticultural crops including those considered "Low Acreage and Special".

Directed to Agriculture and Agri-Food Canada and Ontario Ministry of Agriculture and Food.

Recommendation 2

The Low Acreage and Special Crops Sub-Committee recognizes that both federal and provincial governments provide financial and technical support to growers in the area of food safety. However, this sub-committee continues to express concerns with limited financial support available to the Low Acreage and Special Crops. More support is needed in the areas of research, technology transfer and integrated crop management strategies to ensure that our Ontario growers can remain competitive and provide high quality food produce/products. In order to offset increased cost of production as a result of mandatory safety requirements, financial assistance should be made available to the producer.

Directed to Ontario Ministry of Agriculture and Food (Innovation and Risk Management Branch), Ontario Ministry of Agriculture and Food (Food Inspection Branch) and University of Guelph.

Recommendation 3

The Low Acreage and Special Crops Sub-Committee recommends that OMAF, AAFC and University of Guelph provide

assistance (financial support and resources) to producers on how to decrease energy costs. All production practices, such as field operations, irrigation, fertilizer input costs and post-harvest conditioning (heating and/or cooling of agricultural produce and its products) will be affected and costs will increase.

Directed to Ontario Ministry of Agriculture and Food, Agriculture and Agri-Food Canada and University of Guelph.

Recommendation 4

That variety and demonstration trials for Low Acreage and Special Crops be continued and enhanced. This work is vital for Ontario producers to be competitive in the marketplace and for continued economic viability of the agri-business community.

Directed to Agriculture and Agri-Food Canada and University of Guelph.

Recommendation 5

That research trials for Low Acreage and Special Crops be conducted to identify critical irrigation times. It is important that research continues for trickle irrigation, its scheduling and fertigation practices.

Directed to Agriculture and Agri-Food Canada and University of Guelph.

Recommendation 6

That leeks, Belgian endive and chives be included as part of the Root Crops and Leafy Vegetable Research and Services Sub-Committee commencing year 2003.

Directed to Ontario Ministry of Agriculture and Food, University of Guelph (Department of Plant Agriculture) and OASCC.

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Nursery, Landscape and Turf

Title: Development of Nutrient Management

Research/Service

Strategy and Plan

Recommendation

The subcommittee of Nursery, Landscape and Turf recommends a concerted effort to develop a Nutrient Management Strategy for container and greenhouse plant production as well as Nutrient Management Plans for nursery and sod production.

Details

OMAF is developing a Nutrient Management Strategy for producers of prescribed nutrients (e.g. container nurseries and greenhouses). The aim is to improve the ability of the nursery and turf industries to minimize the affects of fertilizer use on ground water and surface water. Research is needed to address quantification of nutrient uptake of crop groupings (e.g. field conifers), because of the diversity of plant material in ornamental nursery production.

Background

Research data regarding N and P uptake by ornamental nursery crops and sod is lacking. Data exists on various species of tree seedlings but not on other stages of plant production (e.g. whips, calipers, and shrubs). This type of data cannot be substituted when it comes to inputting N and P uptake values in the NMAN program for field production. The Nutrient Management Strategy needs to be practical to be useful for growers.

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Title: Registration of Reduced Risk Pesticides and IPM

Research/Service

Recommendation

The subcommittee of Nursery, Landscape and Turf recommends continued support for research on integrated pest management and registration of new, lower risk pesticides for the turf and nursery production and landscape.

Details

The aim of this recommendation is to improve the ability to manage insect, disease and other pests in the in the face of reduced availability of registered pesticides and increasing concern about their affect on the environment. Current initiatives by the nursery industry include a funding strategy to hire an IPM technician who will also deal with minor use coordination. The committee is looking for increased collaboration with government and universities to fill research gaps and product registration gaps.

Background

Despite the loss of older formulation pesticides (e.g. organophosphates) and possibility of municipal pesticide bans, landscape/turf maintenance and nursery growers are still expected to produce high quality plants with reduced pest management tools. Research should address improvements in integrating pesticides into IPM programs, as well as the development and adoption of low risk alternatives to current practices.

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Title: Management of Water Quality and Quantity

Research/Service

Recommendation

The subcommittee on Nursery, Landscape and Turf recommends continued research into irrigation water quality, delivery systems and water conservation in turf, landscape and nursery production. Also needed is the transfer of new technology to the industry.

Details

The objective of this recommendation is to identify water quality and water management as a high priority for research and service. Research and services should address mechanisms to reduce salinity in irrigation water, increased efficiency in irrigation delivery systems and overall water conservation practices.

Background

Water quality and quantity have been identified as limiting factors in the production of nursery crops (especially containers) in Ontario. Unless this issue is address, there will be increased crop losses and reduced quality and limitation on the expansion of this industry. The long-term changes in climate and weather (e.g. hot, dry growing seasons over the last five years) have resulted in low water availability, which is limiting production and harvest and sales of turf. Areas which could be addressed include irrigation delivery systems (e.g. fertigation and recycling), irrigation scheduling, use of gray water and the development of low water use systems.

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Title: Biology and Management of New and Emerging Pests

Research

Recommendation

The subcommittee on Nursery, Landscape and Turf recommends support of research efforts into the biology and control of emerging pests which have the potential to become economically damaging. Pests are of concern include sudden oak death, emerald ash borer, white grubs (in field nursery production), daylily rust, plum pox virus and anthracnose basal rot.

Details

Many of the emerging pests are new to Ontario and their biology and management are not well understood in our region. To insure the economic sustainability of the industry, these pests need to be managed. The industry needs access to more university level research into pest management solutions for these high priority pests.

Background

New and emerging pests are responsible for significant crop losses each year. Quarantinable pests have greater ramification on access to markets (e.g. moratorium on shipping). Registered pesticides are not available for two of the most significant quarantined nursery pests: pine shoot beetle and Japanese beetle. The economic future of this industry is at risk unless more rapid pest management solutions to these new and emerging pests are found.

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Title: Acquisition of Current Industry Economic Data

Recommendation

The subcommittee on Nursery, Landscape and Turf recommends that current economic industry data specific to nursery production and the overall value of the turf industry be acquired.

Details

There is a need for specific data regarding the land base dedicated to production of various crop groupings (e.g. number of acres in Ontario used for production of field grown conifer trees). Similarly, the total value of the turf industry in Ontario is not known. Quantification of the sizes of these two industries could justify more resources being diverted to deal with research and service needs.

Background

The nursery and turf industries in Ontario are large and are increasing in value every year. Turf industry statistics would help to designate the position relative to other commodities and its applicability for research funding. Statistics for individual nursery crop groups are required in data submission packages for minor use registrations. This type of data is often difficult to procure and often must be estimated.

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Title: Educating the Regulators

Service

Recommendation

The Nursery, Landscape and Turf subcommittee would like to host a tour of PMRA regulators to visit nursery operations and sod farms and golf courses to educate them about pesticide use in these settings.

Details and Background

PMRA staff are toxicologists by training and often have little knowledge of turf and nursery production systems. The subcommittee will make this suggestion directly to Jim Chaput (OMAF Minor Use Coordinator) for the 2004 growing season. Various committee members have volunteered to host the PMRA staff at their farms and places of business.

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Title: Increase Resources for Pest Diagnostic Clinic

Service

Recommendation

The Nursery, Landscape and Turf subcommittee would like to see increased resources available for the Pest Diagnostic Clinic.

Details and Background

Turn around time continues to be an issue for samples sent to the Pest Diagnostic Clinic.

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Potato

Recommendation # 1

Issue

Relocation of the Cambridge potato research program to the Elora Research Station

Background

As part of recent cost savings announced by the University of Guelph, the Cambridge Research Station will be closed effective March 31, 2003. Consequently, the potato research program conducted at this station over the last 50 years will be relocated to the Elora Research Station.

The evaluation of new potato varieties in Ontario is a high priority for the industry in Ontario and this research committee. New varieties with improved traits would allow the Ontario industry to expand markets and reduce inputs of pesticides and fertilizers. Replacements are required for a number of the main varieties currently grown in Ontario.

Details

This research program produces approximately 20 tons of potatoes which must be stored immediately after harvest under specific temperature and humidity conditions until they can be sorted, graded and evaluated. Following this sub-samples are removed and the remainder is discarded. The Cambridge Research Station was equipped with a potato storage with a capacity of 25 tons and a field lab to accomplish these tasks. As the Elora Research Station does not have similar facilities, a temperature-controlled potato storage with enough capacity for at least 20 tons and a forklift-accessible preparation area are required.

Recommendation

It is recommended that the University of Guelph provide the necessary facilities for the potato research program at the Elora Research Station.

Target Agency

Dave Hume, Associate Vice-President, Research, University of Guelph

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Root, Bulb & Leafy Vegetable

Recommendations Arising From Identified Issues

Recommendation # 1

Issue

Requirements for Nutrient Management Strategies and Plans

Background

Nutrient Management legislation is being phased-in in Ontario beginning in 2003. Horticultural operations, including those for root, bulb and leafy vegetable production, will become subject to this legislation within the next few years. Currently data generated in Ontario is required for the establishment of crop profiles and integrated crop fertility programs.

Details

The Ontario Root, Bulb & Leafy Vegetable Research and Services Committee recognizes the need for the development of detailed nutrient management profiles for all vegetable crops including those covered under its mandate. To utilize crop nutrition inputs effectively while still maintaining crop yields and quality an integrated crop fertility program must be developed which takes into account crop removal data, crop uptake data and growth stage models. This will require considerable resources and research activity, assuming all data must be generated in Ontario and all nutrients are governed by this legislation.

The capacity to conduct the required research for this sector does not currently exist in Ontario. In some cases, reliable and appropriate data is available from other regions, and may be applicable to Ontario growing conditions.

Recommendation

The Ontario Root, Bulb & Leafy Vegetable Research & Services Committee requests that OMAF direct Nutrient Management legislation pertaining to horticultural crops towards a few key nutrients (e.g. nitrogen and phosphorous), as opposed to the complete range of nutrients that may be found in this sector. In addition, this committee requests that OMAF accept the use of non-Ontario data, where appropriate and reliable data is available.

Target Agency

- Helen Johns, Minister, OMAF
- Derek Nelson, Minister's Office, OMAF
- Chris Stockwell, Minister, Ontario Ministry of the Environment
- Heather Capanelli, Minister's Office, Ontario Ministry of the Environment
- John Steele, Ontario Ministry of the Environment

OASCC Linkages

- OHCRSC

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Recommendation # 2

Issue

Modification of the Minor Use Regulatory Process

Background

In 2002, the federal government announced a new initiative under the auspices of AAFC to establish a Pesticide Minor Use Centre and Program, similar to the USA IR-4 program. Ontario is a major participant in the Minor Use process, and is responsible for approximately 40% of the total Canadian URMULE submissions annually.

Seven GLP-compliant facilities are to be established by AAFC for pesticide residue research, reportedly in time for the 2003 growing season. As of December 2002, several key positions have yet to be filled at both PMRA and AAFC, with the exception of the Minor Use Advisor.

Details

The Ontario Root, Bulb & Leafy Vegetable Research & Services Committee is pleased to see this initiative taken and hopes that this will resolve current difficulties including excessive residue trial requirements in both Ontario and Quebec, lack of use of crop groupings, poor interest by registrants in the URMUR program and lack of access to reduced risk, biopesticide and seed treatment pest control options. The removal of the crop residue subzones 5B, 7A, and 1A must occur if progress towards minor use is to be achieved.

The process to become GLP-compliant generally requires over a year, so it seems unlikely that AAFC facilities will achieve this status in time for research to be conducted in the 2003 growing season.

Researchers, extension personnel, industry and grower cooperators require adequate, consistent and stable funding to ensure completion of requirements under the minor use system. More flexibility with regard to funding minor use projects is required and more communication with the sponsors of minor use projects is needed.

Recommendation

The Ontario Root, Bulb & Leafy Vegetable Research & Services Committee recommends that AAFC make all reasonable efforts to 1. ensure that the new Pesticide Minor Use Program meets the needs of the horticultural sector in Ontario and, 2. ensure open communication between AAFC, the provincial minor use coordinator and other representatives of the horticultural sector in Ontario, in order to ensure that reasonable and effective policies and requirements are established for submissions to the new Minor Use program.

In addition, the Ontario Root, Bulb & Leafy Vegetable Research & Services Committee recommends that AAFC & PMRA act to ensure the rapid establishment of the Pesticide Minor Use Program, including completion of all necessary hirings in the first quarter of 2003.

Target Agencies

- Mary Comerenski, Bill Boddie, AAFC, Farm Financial Programs Branch
- Al Tomlin, AAFC, London Research Station
- Imme Gerke, Wendy Sexsmith, PMRA, Health Canada
- Jim Chaput, Bill Ingratta, OMAF

OASCC Linkages

- OPMRSC

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Recommendation # 3

Issue

Support for GLP-compliant facilities

Background

In 2002, the federal government announced a new initiative under the auspices of AAFC to establish a Pesticide Minor Use Centre and Program, similar to the USA IR-4 program. Seven GLP-compliant facilities (including Delhi, Vineland, St. Jean and Harrow) are to be established by AAFC for pesticide residue research, reportedly in time for the 2003 growing season. Under the Pesticide Minor Use Program residue trials, as well as some insecticide efficacy and plant tolerance trials, will be the responsibility of these facilities.

There are currently several non-AAFC GLP-compliant facilities in Ontario (Uof G Kettleby, Ridgeway and Simcoe Research Stations).

Ontario is a major participant in the Minor Use process, and is responsible for approximately 40% of the total Canadian URMULE submissions annually.

Details

AAFC has made a 6-year commitment to the Pesticide Minor Use Program. At this early juncture, its existence beyond the initial 6-year period cannot be considered a certainty.

The process to become GLP-compliant generally requires over a year, so it seems unlikely that AAFC facilities will achieve this status in time for research to be conducted in the 2003 growing season.

Many of Ontario's Minor Use submissions require pesticide residue trials that must be conducted at GLP-certified field sites in Zone 5 and by GLP-certified personnel. AAFC's horticultural research programs have traditionally been based at St. Jean-sur-Richelieu, Quebec. This site is in Zone 5b, and as a result, results from residue trials conducted at this location are not considered acceptable for Ontario conditions by PMRA. The AAFC facilities in Ontario targeted for GLP-certification are not suitable for the production of all root, bulb & leafy vegetable crops, particularly those grown on muck soils. If residue trials can only be conducted at AAFC stations under the Pesticide Minor Use Program, then some commodities under the mandate of this committee will be unable to obtain minor use product registrations.

Considerable effort and funds have been invested in obtaining GLP-certification of facilities and associated personnel at the University of Guelph. The cost of initial GLP-certification is approx. \$25,000, while the cost of maintaining GLP-certification is \$2,500 per year. If GLP-certification of facilities and personnel are allowed to lapse, then considerable investment may be required in the future if these facilities need to be re-certified.

Recommendation

The Ontario Root, Bulb & Leafy Vegetable Research & Services Committee asks that AAFC clarify how the minor use needs of horticultural crops grown on muck soils in Ontario will be addressed under the new Pesticide Minor Use Program. It is strongly recommended that AAFC consider designating GLP-compliant facilities at UofG as satellite field stations for conducting the residue trials needed for minor use submissions of those crops that cannot be grown at AAFC Ontario research facilities.

It is strongly recommended that the OMAF-University of Guelph Plants Program and AAFC commit to maintaining GLP-certification of MCRS and Simcoe research stations for at least 2-3 years until AAFC's Pesticide Minor Use Program is established and its success can be evaluated. Stable funding is needed from the University of Guelph and AAFC to provide base support to research facilities that have invested in GLP compliance in order that GLP-certifications are maintained.

It is recommended that AAFC act to obtain GLP-certification of its Ontario facilities as quickly as possible.

Target Agency

- Mary Comerenski, Bill Boddie, AAFC, Farm Financial Programs Branch
- Al Tomlin, AAFC, London Research Station
- Imme Gerke, Wendy Sexsmith, PMRA, Health Canada
- Jim Chaput, Bill Ingrassia, OMAF
- Swanton, Chair, Department of Plant Agriculture, University of Guelph
- M. Dixon, Chair, Department of Environmental Biology, University of Guelph
- David Hume, OMAF-University of Guelph Plants Program

OASCC Linkages

- OHCRSC and OPMRSC

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Recommendation #4

Issue

Loss of Nematode Research Capabilities in Ontario

Background

Previously, at AAFC- Vineland there were 4 nematologists active in research. In 2002, the last nematologist in Ontario retired. In the past, this committee was given assurances by previous directors of AAFC Southern Crop and Food Protection Research Centre that the capacity for conducting nematode research and addressing nematode concerns in this province would be maintained. The presence, introduction, and outbreaks of nematodes in Ontario vegetable crops

have the potential to result in serious quarantine and trade issues, and as such it is essential that a significant nematode research program is available to support the Ontario root, bulb and leafy vegetable sector.

There are currently nine nematodes regulated by the CFIA that have the potential to become established and threaten the production of horticultural crops in Ontario, including:

- *Ditylenchus destructor* Thorne - potato rot nematode
- *Ditylenchus dipsaci* (Kühn) Filipjev - stem and bulb nematode
- *Globodera pallida* (Stone) Behrens - pale cyst nematode
- *Globodera rostochiensis* (Wollenweber) Behrens - golden nematode
- *Heterodera glycines* Ichinohe - soybean cyst nematode
- *Longidorus* spp. Micoletzky - needle nematodes
- *Meloidogyne chitwoodi* Golden, O'Bannon, Santo & Finley - Columbia root-knot nematode
- *Trichodorus* spp. Cobb - stubby root nematodes
- *Xiphinema* spp. Cobb - dagger nematodes

On several occasions in the past correct identification of nematode species was crucial to the root, bulb and leafy vegetable sector. The lack of an 'in house' nematode taxonomist at AAFC will force Ontario producers to use US resources for identification which may lead to quarantine and trade issues on exported crops.

Although there is one nematologist at AAFC - Horticulture Crops Research & Development Centre (St-Jean-sur-Richelieu), that research program focuses on nematodes of potato, corn and turf and does not address vegetable crops.

Details

Very few nematologists are left at any AAFC locations throughout the country. Correct identification of all taxa of crop pest pests and the maintenance of a research effort is crucial for the adequate protection of root, bulb and leafy vegetables and the stability and competitiveness of the industry.

Recommendation

The Ontario Root, Bulb & Leafy Vegetable Research & Services Committee recommends that action be taken to ensure that the ability to conduct nematode research of relevance to vegetable growers is maintained after the retirement of Dr. John Potter.

Target Agency

- Gary Whitfield, Science Director, Theme 160 - IPM & Plant Protection, AAFC, Research Branch
- Carberry, Executive Director, Plant Products Directorate, CFIA

OASCC Linkages

- OHCRSC
- OPMRSC

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Ontario Sweet Corn, Pea and Bean Research and Services Subcommittee

Recommendation # 1

Issue

Lack of harmonization of pesticides between Canada and the U.S.

OASCC Linkage

OPMRSC

Target Agency

PMRA, AAFC, OMAF

Title: Minor use funding and coordination.

Details

The Sweet Corn, Pea and Bean Research and Services Sub-committee encourages the PMRA and OMAF to continue to work with the EPA and IR4 in order to reduce inconsistencies in availability of pesticides between Ontario and US producers

Background

Ontario growers continue to feel that they are at a disadvantage in terms of the availability of pesticides compared to U.S. producers. While there are still inequities, improvements are being made in coordinating the efforts of the PMRA and IR4. While this effort is recognized, there is a lot of work which needs to be done.

Overall, a system needs to be in place which will allow rapid evaluation and registration of new pesticide products. This is especially important when pesticides are deregulated, and new pest problems emerge.

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Recommendation # 2

Issue

The Sweet Corn, Pea and Bean Research and Services Sub-committee recommends that more funding be made available for research and on-farm implementation of nutrient management legislation.

OASCC Linkage

OSMRSC

Target Agency

OMAF, MOE, AAFC,

Title: Increase funding to support nutrient research and on-farm implementation in order to meet the requirements of the nutrient management planning legislation.

Details

Due to the all encompassing nature of the new Nutrient Management Legislation and its large potential impacts on many vegetable producers, and due to the significant requirements of new research information, Nutrient Management funding is required at two levels:

- a) to fund research programs necessary to fill gaps in the current agronomic knowledge base regarding nutrient sources, crop requirements, application timing and waste product utilization.
- b) to help defray the costs of nutrient management compliance to agricultural producers.

Background

Nutrient management planning requires information on crop nutrient response rates, crop uptake and utilization rates, and the fate of excess nutrients in the soil, to name a few. Coupled with the data required on a range of soil types and environmental conditions over several years, and the impact of manures, organic soil amendments, fertigation, and split applications on nutrient fate, a considerable amount of information needs to be collected.

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Recommendation # 3

Issue

The Sweet Corn, Pea and Bean Research and Services Sub-committee recommends that OMAF encourage its staff specialists to improve communications with private service providers (IPM, nutrient management), and establish a more formal approach to training activities

OASCC Linkage:

OPMRSC

Target Agency

OMAF

Title: Increase communication and training by OMAF staff specialists to private service providers.

Details

Presently, OMAF staff specialists do not provide individual on-farm services, such as IPM services, nutrient management consultation, or general agronomy advise. They are however, involved in training activities with service providers such as initial IPM training for AIMS scouts. It is felt that their expertise should be utilized more by providing in-field follow up to initial IPM training activities, which would be to the benefit of the entire industry.

Background

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Recommendation # 4

Issue

The Sweet Corn, Pea and Bean Research and Services Sub-committee recommends that on farm inspections for food safety and residue testing be coordinated.

OASCC Linkage

Target Agency

OMAF, CFIA

Title: Coordination of on-farm inspections

Details

There is grower concern over the number of different inspectors (at all levels of government) covering farm operations, particularly food safety and residue testing. There is a desire to see co-ordination in inspection activities and better information access for growers at the time of and following inspection activities. Inspectors need to better identify themselves and their purpose to growers

Background

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Tender Fruit

TFRSSC 2002-1 Critical Mass Staffing of Tender Fruit Personnel

Background

The OTFPMP challenges the research and extension services that the critical mass required to service the industry is shrinking and critical services are not being addressed.

Details

The TFRSSC is concerned about the erosion of research and service support in various aspects of tender fruit production. These concerns relate to:

- The OMAF sprayer application specialist position (formerly in Simcoe) is vacant. This position is very important in providing education and training pertinent to sprayer application technologies to prevent pesticide contamination and minimize pesticide residues (OMAF)
- Growers rely on research and recommendations for control of pests, diseases and nematodes in order to maintain a high level of fruit production. Several pests and diseases have been identified by TFRSSC, and IPM of pests and diseases is included in the research priorities of this committee. Alternative control measures are required as the industry faces review of currently registered materials. The vacancies at AAFC, Vineland to provide nematology, entomology and pathology research are an outstanding concern to the TFRSSC. The Nematology position became open when Dr. J. Potter retired in early 2002. TFRSSC recommends that staffing action be initiated and completed so that vacant positions in entomology and pathology are filled prior to the 2003 growing season. This is a revision and re-submission of TFRSSC Recommendation 2000-8 (OHCRSC 68) and TFRSSC Recommendation 2001-4
- With the recent loss of the plant nutrition program (Derkacz) at the University of Guelph, Vineland Campus, the TFRSSC reflected its grave concern for lack of research and support in plant nutrition in tree fruit and activities surrounding NMP for perennial horticulture crops. At a time when increased research inputs into nutrient management are needed, the University/OMAF have eliminated research in this area on tender fruit.

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TFRSSC 2002-2 Complete Tender Fruit Cost of Production Publication

The TFRSSC recognizes the importance of current economic information pertaining to the cost of production of tender fruit crops. Currently, some of this information is out of date and/or only available electronically. The committee requests that OMAF make available printed information on the current economics (cost of production, etc) of the tender fruit industry

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Ontario Horticultural Crops Research and Services Committee - Membership Lists

Author: Annette Anderson - Chair/Ontario Horticultural Crops Research and Services Committee
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Ontario Agroforestry Research and Services Subcommittee

Author:

Dave Chapeskie - Chair

Ontario Agroforestry Research and Services Subcommittee

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Executive Summary

Agroforestry has been defined as the wise and profitable incorporation of trees and woodlands into farming systems contributing to sustainable land use. At present, the industry is worth an estimated \$100 million to Ontario's economy annually. The industry remains unaffected by supply management quotas. There is considerable opportunity for growth in a number of commodity specific industries including high value timber production, maple syrup and edible nuts. Annual weather can have a dramatic affect on the yields of maple syrup and edible nuts. In 2002, the yield of maple syrup improved significantly over the previous year, particularly in interior areas away from the Great Lakes. In 2001, these areas were adversely affected by unseasonably cool temperatures which resulted in at best "weeping flows of sap". Much of Southern Ontario's nut growing area experienced a severe drought in the later part of the growing season. The lack of summer rains resulted in small crops and small nut sizes than achieved in 2001. The production of timber is influenced by longer-term weather patterns as well as a number of biotic and abiotic factors.

Good progress has been made in following up on the year 2001 recommendations of the agroforestry sub-committee and accomplishments are documented in detail in this report. The work activities are diverse because of the broad scope of agroforestry. Work of the University of Guelph, the Ontario Maple Syrup Producers' Association and the Ontario Soil and Crop Improvement Association is reported in detail. The Ministry of Natural Resources, the Ministry of Agriculture and Food and Conservation Ontario also provided reports.

Many recommendations for research and service in 2003 have been carried forward from the 2001 report. There have been a few amendments, additions and/or deletions. To the extent possible, issues related to global warming, nutrient management, water quality and quantity, food quality and safety, and the reclamation of fragile agricultural lands have been considered in the development of recommendations.

It is recommended that the Agroforestry Research activity recommended by the Department of Environmental Biology, University of Guelph be supported and that aspects of the Ice Storm Recovery Research for the maple syrup industry be extended for a few years. The Environmental Farm Plan and the Maple Seal of Quality Program are important initiatives which need to be encouraged into the future. There is a need to pursue Minor Use Registrations for insecticides for the nut tree industry and of herbicides for the Christmas tree industry in accordance with the recommendations contained in this report.

A number of emerging issues are outlined in the report. There is a need to continue the development of a comprehensive policy to guide tree planting activity in rural communities in the future. The importance of this initiative has been bolstered by Canada's recent endorsement of the Kyoto protocol.

In 2002, efforts were made to raise awareness regarding the OHCRSC Report in the forestry community and to broaden membership on the Agroforestry Sub-Committee. These efforts will be continued in 2003.

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Introduction

Because of the wide scope of Agroforestry values, the Agroforestry Sub-Committee is comprised of members with diverse interests. Commercial industries are represented by the Ontario Maple Syrup Producers' Association (OMSPA), the Christmas Tree Farmers of Ontario (CTFO), and the Society of Ontario Nut Growers (SONG).

The Ministry of Agriculture and Food (OMAF), the Ministry of Natural Resources (MNR), the Conservation Ontario (CO) and the University of Guelph (U of G) are also represented on the committee.

In 2003, additional efforts will be made in both the agriculture and forestry sectors to raise awareness regarding the OHRSC report. Many of the recommendations are multi-year and should be accomplished within the next two to five years. For many of the research recommendations, successful follow-up is highly contingent on the availability of funding.

A state of the industry report is provided for important commodities and activities falling under the broad umbrella of agroforestry. Progress achieved on research and service priorities outlined in the 2001 Sub-Committee Report is summarized. Research needs are also included in the report in priority groupings. The priority groupings were set in an attempt to be fair to all Sub-Committee members. Due to the broad scope of agroforestry activity, it is not possible to achieve full consensus regarding priorities for future research and service. All of the future activity recommended is seen as important and needed by the members of the Agroforestry Sub-Committee.

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State of Industry

University of Guelph

Submitted by: Naresh Thevathasan, Research Scientist, University of Guelph

Introduction

Agroforestry research at the University of Guelph is administered through the Department of Environmental Biology. The purpose of this report is to report on the progress made towards achieving the objectives outlined in the strategic plan for agroforestry research and service needs that was presented to this sub-committee in November 2001 and also to report on recent developments in agroforestry research and development. The main goal of the strategic plan was to address societal concerns related to: climate change mitigation and enhanced nutrient management and water quality through the adoption of agroforestry-based land-use practices in Ontario.

In this context, we are pleased to announce that the commitment from OMAF to continue to fund the agroforestry research at this institution has been realized. A proposal entitled "Enhancing carbon sequestration and reduction of nitrous oxide emissions in agriculture using tree-based agroecosystems" was submitted to the Plants Program and has been funded at the rate of \$ 32,500 per year for the next 4 years. The project milestones and the achievement to-date will be addressed in this report.

Further, the newly proposed Canadian Afforestation and Agroforestry Research Network (C.A.A.R.N.) under the BIOCAP Canada Foundation has recognized the contribution of agroforestry land-use systems and afforestation activities towards carbon sequestration potentials in agroecosystems. BIOCAP along with other major National funding agents such as NSERC, SSHRC and CFCAS will potentially fund this network. We are also pleased to announce that Professor Andrew Gordon has been appointed as Chair of the Afforestation and Agroforestry Research Network working group, the driving body of the above network. University of Guelph has been identified as the lead institution for eastern Canada and the agroforestry research site has also been identified as a key site to implement research activities. Additional funding in

order to allow this network to undertake research should be made available during the early part of 2003. Recently, a letter of intent (LOI) requesting funding was submitted to the New Research Network Initiatives Program, The BIOCAP Canada Foundation Queen's University, Kingston, Ontario, K7L 3N6. A detailed list of the National research objectives and the research program initiatives under this network is included in Appendix 3.

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Ontario Soil and Crop Improvement Association (OSCIA)

Submitted by: *Andrew Graham, Program Advisor, OSCIA*

Ontario Environmental Farm Plan (EFP)

The EFP will continue the status quo through to March 31, 2003 due to Federal funding made available through Agriculture and Agri-Food Canada and delivered in Ontario by the Agricultural Adaptation Council. The Ontario Soil and Crop Improvement Association (OSCIA) will continue with delivery in partnership with OMAF.

To date, 24,000 farm families have participated. Of those, 14,400 have voluntarily had their Action Plans deemed appropriate through peer review. Over 10,000 have taken advantage of the \$1500 EFP Incentive Program. \$14 million in Federal incentive grants have been matched by over \$40 in investment by the participating farmers into the same projects (1:3 ratio).

Another 3000 EFP workshop participants are expected in workshops before March 31/03. The future of EFP is very bright. In July 2002 Federal Minister Lyle Vancilief announced \$100 million had been committed to support environmental farm planning across Canada between 2003 and 2008. The Ontario share is about \$23 million, and does not require matching contributions from the Province. We have been told to anticipate more dollars for environmental programs once details of the Agriculture Policy Framework are finalized between Ontario and Ottawa.

The Ontario Farm Environmental Coalition (OFEC) is working alongside AAFC and OMAF officials to develop the evolved EFP program. The basic components of the Ontario EFP will remain intact and the initiative will remain voluntary and confidential.

OMAF will coordinate the development of the Third Edition of the EFP Workbook in preparation for fall 2003 delivery.

New ideas being considered for the evolved program include:

- Re-tooling of workshop format and agenda to cater to new participants and past participants wishing to gain additional information and update their action plans.

- Revising EFP incentives for new and past participants.

- An EFP deemed appropriate required for eligibility of all environmental cost-share dollars offered to the farm community by the Federal or Provincial government.

- Collection of more detailed information from new and updated plans to enable us to provide expanded and timely aggregate data on program performance and future needs.

Restoration of American Chestnut - Farm Response to a Species at Risk

This has been identified as an ongoing project in the 1999 Sub-Committee Report. This two-year demonstration project ended in March of 2000. Project goals were achieved through an educational and awareness campaign and a network of 24 planting demonstration sites, coordinated by OSCIA with assistance from many partnering agencies and organizations. The final report for the project, including a compilation of site data, photographs, maps, news releases and

other pertinent information, is contained on compact disc from OSCIA.

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Wildlife Impact Assessment for Ontario Agriculture

This work was conducted by OSCIA on behalf of the Ontario Agricultural Commodity Council, to investigate the economic impacts of wildlife on agriculture on a sector and species-wide basis. Wildlife impacts were quantified through a one-year scientific approach. The study focused on wildlife caused losses that occur directly to standing crops and livestock through a comprehensive survey of five commodity sectors: field crops (corn, wheat, soybeans, forages), fruits, vegetables, beef and sheep. While the full range of wildlife species was addressed, the major emphasis was placed on deer, geese, raccoons, coyotes, wolves, dogs, blackbirds and other species of birds. The study also investigated prevention measures, compensation mechanisms, access to advise and recommendations for next-steps. The issue of wildlife caused losses is not one to be faced by the farm population alone, but requires the attention of conservation groups and society as a whole wishing to protect species and enhance habitat. The final report is available on request from OSCIA.

Evaluation of Buffer Strips along Watercourses on Ontario Farms

This was identified as an on-going project in the 1999 Agroforestry Sub-Committee report. The investigation and analysis has been completed. Forty farm buffer projects were visited and the landowners were interviewed. The final report was submitted in February 2000 and is available on request from OSCIA.

Green Cover Program (pending)

The Federal government recently announced \$110 million nationally for a program to retire fragile agricultural land. Ontario's share is not known at this time. OSCIA is working with OFEC and the Riparian Working group to develop an effective program for the farm community. Current proposals are being fashioned after the very successful Permanent Cover Programs delivered by OSCIA and funded by AAFC in the early 1990's.

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Ontario Greenhouse Gas Mitigation Program (pending)

OSCIA has partnered with the Innovative Farmers Association of Ontario to organize a multi-year demonstration and awareness program for farmers to adopt economically viable best management practices (BMP) for greenhouse gas emission reductions that support Canada's Kyoto commitment. Federal funding has been provided through an arrangement with Soil Conservation Council of Canada. OMAF and University of Guelph experts are contributing to the Ontario project.

BMP's being considered for demonstration and evaluation are those aimed at reducing nitrous oxide emissions, carbon dioxide emissions, as well as those that sequester carbon. Major livestock sectors in Ontario have a similar initiative underway that will focus more on manure storage and application BMP's.

Conservation Ontario

<http://www.conservation-ontario.on.ca>

Submitted by: *Martin Neumann, Forest Resource Planner, Grand River Conservation Authority*

Conservation Ontario represents Ontario's 36 Conservation Authorities, which continue their role as primary delivery mechanism for tree planting programs and related in-field extension. The Part Two Report of the Walkerton Commission of Inquiry recommends certain measures that will impact upon the adoption of agroforestry practices, which implications are more fully discussed under "Emerging Issues".

The recommendations validate the historic agroforestry strategy of Conservation Authorities and point to an increasingly important future role for agroforestry and Conservation Authorities in source water protection. Conservation Authority planting programs typically focus on windbreaks, riparian buffers, fragile land retirement, carbon sequestration and landscape health and biodiversity. Other themes are addressed in some watersheds. The promotion of these "Best Management Practices" supports a collective drive toward healthier watersheds, healthier communities, and sustainable agriculture.

A recent Environics Poll of Ontario farmers revealed that Conservation Authority staff are their most trusted source of resource management information. This trust factor needs to be leveraged in future program design for planting programs. The Conservation Authorities of Ontario employ 64 professionals and technicians who spend all or part of their time delivering in-field extension to farmers.

Two noteworthy on-going initiatives in agroforestry as they relate to Conservation Authorities are the broader availability of cost-sharing opportunities for farmers contemplating "Best Management Practices" (particularly riparian buffers, fragile land retirement, and windbreaks), and the continued implementation of the first major tree planting initiative explicitly undertaken for the purpose of carbon sequestration. The former is funded mainly by municipalities and OMAF's Healthy Futures Fund, and is known by various names like "Clean Water Project" and "Rural Water Quality Program", and in its various permutations continues to broaden its geographic reach. Ontario Power Generation funds the carbon sequestration planting. In both cases, program delivery is primarily by Conservation Authorities. These initiatives continue to be very prominent on the agroforestry landscape in southern Ontario.

Conservation Ontario has documented its members' capacity to deliver tree planting programs and in-field extension. The Conservation Authorities are currently planting 1.6 million trees per year, and could "ramp up" readily to 5 million trees annually, and beyond, given appropriate resources. The report contains details on the number of staff involved, cold storage facilities, tree planting machines, etc.

Conservation Ontario has been engaged by the Canadian Forest Service to gather afforestation data for a Kyoto-related "backcast" to 1991.

It must be noted that Conservation authorities are not generally in a position to undertake agricultural research. Trends and needs are identified to the Agroforestry Sub-Committee of OHCRSC.

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Ontario Maple Syrup Producers' Association (OMSPA)

Submitted by: *Dave Chapeskie, R.P.F., Agroforestry Specialist, OMAF*

There are about 1,300,000 taps placed on 2,600 farms annually in Ontario. The commercial industry in Ontario generates an estimated \$15 million dollars from the sale of Maple products annually. The production and value of maple syrup will fluctuate annually, depending on the crop. The maple industry is seen as a growth industry with about two-thirds of the syrup consumed in Ontario being imported. Modest growth of the industry has occurred over the past

decade no doubt tempered by high establishment costs facing prospective producers.

The effects of drought over the 1998-2002 period on syrup yields in Ontario are unknown. Preliminary results from applied research designed to determine the effects of the 1998 ice storm on productivity in eastern Ontario are now available. This research shows some negative affect on productivity where damage is severe but the effects of the storm on overall production are not known.

The Ontario Maple Syrup Producers' Association (OMSPA) has been active in developing and promoting a voluntary quality assurance or Seal of Quality Program (SOQ) for its members.

About 100 maple producers have signed up for this program which is analogous to the Vintners Quality Assurance Program (VQA). A second edition of the SOQ Manual was released in 2001.

The 2002 crop of maple syrup was near normal (about .9 litre per taps, over much of the commercial range of the industry). Overall production increased significantly over the 2001 season with locations away from the Great Lakes faring noticeable better than in 2001. Total production of syrup in 2002 was estimated at about 1,100,000 litres.

OMSPA has an active research and technology transfer committee which works closely with OMAF Specialists to identify and guide research initiatives. In 2002, OMAF worked closely with OMPSA to deliver a series of seminars focusing on Best Management practices to reduce or eliminate any potential contamination in maple sap or syrup. OMAF and OMSPA also co-sponsored a series of seminars on the use of high pressure steam in maple production.

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Society of Ontario Nut Growers (SONG)

Submitted by: *Doug Campbell, Representative Society of Ontario Nut Growers*

Much of the southern Ontario nut growing region experienced a tremendous drought in the latter part of the 2002 growing season. The lack of summer rains accounted for smaller crops and also smaller nut sizes. Both of these restricting factors reduced incomes noticeably. Droughts also bring out differences between the good/deep nut tree soils and the soils which are marginal in tree growing capabilities. However, growers who have the various forms of irrigation found the crops were not only generous in weight but nut size was extremely good too! In 2002 irrigation may have returned its capital costs to growers in just one year!

Total commercial values for production from tree nuts Ontario has been estimated at about \$300,000.00 for the 2002 season. Chestnuts lead the pack in total values and several growers have reached the 1 ton per acre nut output per season. Since nut prices were about \$2.50 per pound at the farm gate, the seasonal per-acre incomes were upwards of \$5000.00 per acre. Since input expenses for chestnut is relatively low, most of the gross is in fact profit. Such performances have been realized on 10 year old nut groves.

The yield of heartnuts is now starting to accelerate. Ten year old orchards have yielded up to 500 pounds per acre. Some specialty markets are emerging which offer up to \$13.00 per pound for whole kernels. The kernels represent about 30% of the dried in-the-shell weight. There is cash to be made with heartnuts and the expense of production will be reduced considerably when an effective nut cracker is made for the heartnut. Currently, several individuals in the London area are working on cracker development.

Pecans came through the hot dry summer of 2002 the best of all the nut trees without irrigation. Irrigated pecan trees produced huge, well-filled nuts. Since the spring resulted in a late spring frost, much of the crop was destroyed by the

freezing of terminal buds. However, many pecans are "Lateral Bearers", so some cultivars produced quite reasonable weights of crop with good nut size too. Although the hot summer delayed the ripening of most nut crops, most of the pecans, even late cultivars, were able to ripen and fill kernels because of the long and warm fall. Several pecan groves in Ontario are approaching the 10-15 years of age which is the beginning of significant yields. Production rates of up to 1000 lb/acre should be realized in the next few years.

Black walnut production in 2002 was tremendous. Several entrepreneurs are trying to master the tough process of cracking the nuts. A good market exists for the kernels with up to \$12.00 per pound for kernel pieces.

Hazel and English walnut production was very limited in 2002, mostly because of very damaging spring frosts.

There were good crops on the hickories and almonds in Ontario but acreage is quite limited.

Pawpaw-fruit is proving to be a lucrative crop. Production to date is small but prices are at least \$1.00 per pound.

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Ministry of Natural Resources (MNR)

Submitted by: John Oatway, Administrator MFTIP, MNR

Managed Forest Tax Incentive Program (MFTIP)

<http://www.mnr.gov.on.ca/mNR/forests/mftip/htm>

The MFTIP evolved from the Managed Forest Tax Rebate Program in 1998. The goal of the MFTIP is to bring greater fairness to the property tax system by valuing forestland according to its current use. The program is designed to increase landowner awareness about forest stewardship. To qualify, woodlands must be a minimum of 9.88 acres (4 hectares) and have a management plan approved by a Management Plan Approver. Eligible properties are first re-classified from the Residential property class into the Managed Forest property class and then are taxed at 25% of the rate applied to residential property (i.e., the intent is similar treatment to farm land).

For 2002, the program has grown to include over 10,000 properties with 1.75 million acres. Twenty-nine percent of program participants indicate that they plan to conduct a commercial harvest, 51% planned to harvest trees for personal use and 48% ranked environmental protection as a primary objective.

The MNR is currently implementing the results of an internal program review.

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Ontario Stewardship (originally called Private Land Resource Stewardship Program) <http://www.ontariostewardship.org>

This program was initiated in 1995 in response to MNR's exit from the operational private land forestry program. Ontario Stewardship helps people find information, expertise, and funding to help ensure that good management occurs on private land. The program's strength lies in its 40 stewardship councils, which are volunteer groups of landowners and land interest agencies. Each stewardship council works with a MNR staff person known as a stewardship coordinator. Many stewardship councils have representatives from the agricultural community, but each council is generally reflective of the landscape it serves. Councils discuss, develop, and deliver local programs and projects.

The MNR provides \$10,000 per year in seed money to each Council. Seed money is invested in community level projects, and is often leveraged with other money. Volunteer hours are tracked and reported to show total amount invested in private land stewardship. In 2000/2001 program success:

11,000 volunteers

170,000 volunteer hours

1,900 partners

\$6.5 million partner in kind effort

\$14.5 million partner levered dollars

\$21. million total contribution and effort for natural resources

Stewardship councils have successfully applied to Trillium Foundation, Healthy Futures Program, Human Resources Development Canada, Ontario Works, Canada Trust and other programs. Examples of projects include: workshops on woodlot and wetland management; stream restoration projects; endangered species conservation, and; community tree planting. For information on Ontario Stewardship, visit their website at www.ontariostewardship.org. Three examples of provincial level projects are provided below.

Ontario Woodlot Association

www.ontariowoodlot.com is a partnership initiative, supported by Ontario Stewardship, and led by the Ontario Woodlot Association. The goal of the project is to connect landowners with the "right" woodland service provider (i.e. forest consultant, tree marker, logger, sawmill, nursery, etc.). By making this connection landowners will have access to the help they need to manage their woodlots in order to achieve there ecological, economic and or social (recreation) goals while protecting and enhancing woodlands for current and future generations. Other partners include Ontario Trillium Foundation and the Forest Gene Conservation Association. The Web site will be operational in early 2003.

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Ontario Demonstration Area Catalogue

Stewardship councils in southwestern Ontario have joined forces with community partners to create an interactive website that provides information on environmental demonstration projects. The catalogue will help ensure that the science and technology transfer values realized from projects are maintained.

Major funding partners include:

Canada Trust - Friends of the Environment Foundation

Environment Canada - Lake Erie Lakewide Management Plan

Grand River Conservation Authority

Long Point Region Conservation Authority

Ontario Ministry of Agriculture and Food - Rural Job Strategy Fund

Ontario Ministry of Natural Resources - Private Land Stewardship Program

Stewardship Councils in southwestern Ontario

Upper Thames River Conservation Authority

Other partners include: Huron Business Development Corporation, Long Point World Biosphere Reserve, Ontario Federation of Anglers & Hunters - Zone J, Ontario Soil & Crop Improvement Association - Stewardship Fund and the Oxford Federation of Agriculture.

Riparian Zone Rehabilitation

This past year, saw most stewardship councils focus much of their tree planting activities on enhancing riparian zones to benefit wildlife habitat and water quality through Healthy Waters. Councils across the province financially supported and promoted the "Healthy Waters" Incentive Program. Healthy Waters provides financial grants to rural landowner interested in implementing "Best Practices" to improve water quality. Councils also participated in more localized activity through initiatives such as Watershed Planning and Adopt a Stream programs.

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A Guide to Stewardship Planning for Natural Areas

The MFTIP along with Ontario Stewardship and the Conservation Land Tax Incentive Program have been working on a new guide to promote land stewardship planning for private lands in Ontario. A number of partners have been involved. The guide provides a framework for planning and will hopefully be used by a variety of groups to promote stewardship planning in current and future programs. Production is planned for early 2003 and partners are being approached who may want to customize the guide for their own use.

Tree Cutting By-laws

Tree cutting by-laws provide municipalities a tool to restrict inappropriate forestry practices on private land. In 2001, there were 24 municipalities with tree cutting by-laws passed under the *Forestry Act*, and approximately 12 local municipalities with tree cutting by-laws passed under the *Municipal Act*. However, these provisions were not applicable to all municipalities, and in particular not too many municipalities in northern Ontario. The new *Municipal Act*, 2001 provides tree cutting by-law powers to all municipalities. The *Municipal Act*, 2001 was given Royal Assent on December 12, 2001, and comes into effect on January 1, 2003.

Once the *Municipal Act* 2001 comes into force, all municipalities in Ontario will have access to tree cutting by-law provisions. However, it will still be up to the municipality to decide whether a by-law is required or even desirable, in their jurisdiction. Under the new Act, an upper-tier municipality will be able to pass by-laws for woodlands that are one hectare or more in area (as defined in the *Forestry Act*), while a lower tier municipality will be able to pass by-laws for trees found in woodlands of less than 1 hectare. The municipality will also have the power to impose and enforce conditions on how trees in a woodland are harvested, or to establish the qualifications of persons involved with woodland management. They may require that a permit be obtained prior to the commencement of any forest cutting operations.

Provisions in the *Municipal Act*, 2001 include:

- The right for a landowner to appeal to the Ontario Municipal Board if an application for a permit is delayed or denied
- The option for an upper-tier municipality to delegate it's authority to pass by-laws for woodlands to a lower- tier municipality
- The opportunity to issue "stop work orders" for operations that are not in compliance with the by-law
- Fines on a first offence to not more than \$10,000 or \$1,000 per tree, or \$25,000 or \$2,500 per tree on subsequent convictions.

Some exemptions from these by-laws are given in the *Municipal Act*, 2001. These include: activities undertaken by a municipality or a local board of a municipality; activities conducted under a license issued under the *Crown Forest Sustainability Act*; the injuring or destruction of trees by a person licensed under the *Surveyors Act*; or trees cut according to the approval of a plan issued under the *Planning Act*, *Electricity Act*, and/or *Aggregate Resources Act*. The municipality also has the option of including other exemptions in their by-law.

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The Forest Gene Conservation Association (FGCA)

The Forest Gene Conservation Association is using certification to help promote use of adapted sources of native species for the long term ecological and economic success of tree planting efforts. A program manual was finalized in May after feedback was gained through a series of Certified Seed Collector Workshops and introductory discussions and inspections with a select group of interested nurseries. The program involves certification of the participant (collector, grower, etc) and the product (seed and stock).

Otherwise efforts to date have resulted in:

- 145 people trained in eight 2-day Certified Seed Collector workshops since August 2000.
- 125 of those trained became Certified Seed Collectors after passing an exam and signing a Code of Ethics and Practices
- 0 Certified Seed Processors (currently working with the Ontario Tree Seed Plant who have been very supportive of the collector workshops)
- 1 Certified Nursery - Ferguson Forest Centre, Kemptville (4 other interested and reviewing their practices to conform to standards while others are waiting to see if demand exists for certified native species)
- 1 certified product - one seedlot from a white pine orchard was registered for certification in 2000. Otherwise the seedlot registration process was finalised in May and is currently in distribution. Demand for certified seedlots by the one certified nursery is expected to encourage certification of seedlots.
- 2 posters and brochures to help educate consumers of the importance of seed source
- 2 reports - Source Identified Stock - growers survey and contracts for sourcing stock
- A Review of Seedwhere - A GIS climate tool to help deploy seed and stock supplies - A Discussion Paper For Its Application Within Southcentral Ontario

For information on the FGCA contact Barb Boysen: (705) 755-3284, barb.boysen@mnr.gov.on.ca

Climate Change Research Activities

MNR continues to conduct background investigations into the role that afforestation could play in the sequestering of carbon (i.e. carbon sinks). Silv-econ consultants submitted a background report on historical tree planting programs and MNR is investigating nursery capacity and willingness to produce suitable planting stock in adequate numbers. MNR is working with OMAF as well as with partners such as Ontario Power Generation, Conservation Authorities and stewardship councils to determine best bets.

In June, a workshop hosted by the Ontario Ministry of Natural Resources, Canadian Forestry Service, Conservation Ontario and the Ontario Forestry Association, was held to discuss the challenges facing private land tree planting in Ontario. Workshop participants reviewed a market analysis and business plan titled *Ontario Private Land Afforestation Program* (dated June 18, 2002) prepared by the Ontario Forestry Association and Trees Ontario Foundation.

The market analysis and business plan identified a number of challenges to an immediate start up of a significant, broad-based tree planting initiative. These include:

status of seed and stock supply
current seed stores
current capacity of nurseries

The MNR will continue to work on this initiative to quantify the benefits of a renewed afforestation program and to ensure that challenges on the road to success are recognized by all and appropriately addressed.

The MNR is also providing information and assistance to federal counterparts to assist them in their project aimed at determining the level of tree planting from the early 1990's to the present across Canada.

Ontario Ministry of Agriculture and Food

Submitted by: *Dave Chapeskie, R.P.F., Agroforestry Specialist and Todd Leuty, Agroforestry Specialist*

Maple Syrup Industry

Regional weather patterns during the production season continue to be the predominant factor affecting yields of sugar bushes across Ontario. Overall provincial yield in 2002 was up by 11% over 2001, with a production of 1,095,000 litres worth \$13,314,000 in syrup sales. It is expected that most Ontario produced syrup will continue to be sold at the farm gate, retail and farmers market outlets without difficulty. It should be noted that at the present time, there is a surplus of syrup in Quebec, which could invariably increase the amount of syrup imported into Ontario, particularly the eastern areas. The main affect of this surplus is expected to be a depressed price for bulk syrup.

It is evident that a significant number of existing maple producers are considering expansion of their enterprises and a noticeable number of others are considering entering the industry for the first time. Expansion of the industry will be tempered by the level of capital investment required to establish or expand a maple enterprise.

A new publication entitled "Economics of Maple Syrup Production " was co-published by the Canadian Farm Business Management Council and the Ontario Ministry of Agriculture and Food. This publication is proving to be very popular in Ontario and elsewhere. It will be an important aid for maple producers considering expansion, new beginners and others.

OMAF continues to work with OMSPA to strengthen Ontario's contribution to maple research efforts.

Christmas Tree Industry

Ontario's Christmas tree industry is believed to be in a steady state at the present time. An estimated 600,000 trees are harvested annually. A variety of species are grown including scotch pine, white spruce, balsam fir, fraser fir and others. In recent years, consumers have shown a preference for fir over the other species.

Most Christmas tree growers in Eastern Ontario have largely recovered from the effects of the 1998 ice storm. Drought has been a problem in some areas and a few growers are evaluating the costs and benefits of trickle irrigation.

There continues to be a need for more weed control options. A minor use registration is being pursued for six herbicides. In this regard, two seasons of data have now been collected for white pine, Balsam Fir, Fraser Fir, and white spruce. Refer to Appendix B for detailed minor use listings.

Nut Tree Industry

The commercial nut tree industry has its greatest potential in southwestern Ontario where the regional climate is moderated. At present, an estimated 2,500 acres (1,012 hectares) have been established. Most of the plantations are less than 10 years of age. A variety of species are being planted including black walnut (highest yielding cultivars) english walnut, Japanese heartnut, northern pecan, hazelnut and sweet chestnut. In eastern and central Ontario, the potential for the

nut tree industry is more limited and has not been fully assessed. There are a number of demonstration sites in Eastern Ontario.

Testing of mechanized cracking equipment began this season following the purchase of equipment from Texas. SONG is most interested in commercial-scale cracking of heartnut walnuts and other mechanization of orchard management. SONG has made significant progress in engineering a cracking machine designed specifically for Japanese heartnuts.

Grower awareness regarding the need for good site selection and intensive management is paramount. There is a great need to test and register pesticide options for weed and insect control in nut tree plantations. In 2002, minor use registration of insecticide Dipel 2XDF has received a Canadian label registration for use on pecans, hazelnuts, walnuts and sweet chestnuts, for control of leaf rollers, spanworm, and spring feeding caterpillar complex.

Two new cultivars tolerant to Eastern Filbert Blight have potential to be evaluated in Ontario. These cultivars were developed at the University of Oregon.

Nut producers are beginning to adopt trickle-irrigation and soil moisture monitoring technology. Investments in irrigation can be extremely valuable to growers during periods of dry and/or hot weather.

Ontario's nut orchard industry may prosper faster if industry representatives associate themselves with an orchard commodity research subcommittee, such as the tender fruit or pome fruit research subcommittees, in addition to the agroforestry subcommittee.

Farm Woodlots

OMAF continues to provide technical support for regional woodlot conferences and to a lesser extent more local seminars and workshops.

OMAF has also worked closely with MNR in helping guide research designed to study the effects of the ice storm on woodlands. The ministry continues to promote the value of farm woodlots as an integral part of the whole farm enterprise as well as the value of windbreaks and shelterbelts on farms.

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Committee Activities

The Chair of the Agroforestry Sub-Committee participated in a meeting of the OHRSC to discuss the Committee process and strategic planning requirements for the 2002 report.

The Agroforestry Sub-Committee continues to hold only one annual meeting in the fall of each year. However, members of the committee interacted freely while working on specific projects throughout the year. Cooperative efforts occurred on a variety of policy, research and extension initiatives.

In 2003, opportunities to enhance the level of interaction among Committee members throughout the year will be explored. Members will be encouraged to involve their colleagues on the sub-committee in peer review of the technical publications and website materials they are developing.

Significant Research and Service Accomplishments

University of Guelph - Agroforestry Research Group

Submitted by: Naresh Thevathasan, University of Guelph

Completed Thesis Titles (M.Sc.)

- Richard Gray. 2000. Root Distribution of Hybrid Poplar in the Temperate. Agroforestry Intercropping System. 116 pp.

Refereed Articles

- **Oelbermann, M and A.M. Gordon. 2000.** Quantity and Quality of Autumnal Litterfall into a Rehabilitated Agricultural Steam. J. Envir. Qual. 29: 603-611.
- **Thevathasan, N.V., A.M. Gordon and G. Price. 2000.** Biophysical and Ecological Interactions in a Temperate Tree-based Intercropping System in Southern Ontario, Canada. p. 49-60. In: Sustaining agriculture in the 21st Century. Proceedings of the 4th Biennial Meeting North American Chapter. International Farming Systems Association. 342 pp.
- **Oelbermann, M. and A. M. Gordon. 2000.** Enhancing Wildlife and Water Quality in an Agricultural Landscape. A Case study of Riparian Buffer Zone Rehabilitation, p. 37-48: In Sustaining Agriculture in the 21st Century. Proceedings of the 4th Biennial Meeting North American Chapter. International Farming Systems Association. 342 pp.

Manuscripts in Preparation to be submitted to Refereed Journals

- Thevathasan, N.V., A.M. Gordon, G.W. Price and P.E. Reynolds..... Promoting the Stewardship of Soil and Water Resources through Biophysical and Ecological Interactions in a Temperate Tree-based Intercropping System in Southern Ontario. Canada. Ecosystem (Submitted).
- Zhang, P. and A.M. Gordon..... Nutrient inputs through hydraulic pathways and Litterfall in a Temperate Tree-Based Intercropping system in Southern Ontario. Canada.
- Simpson, J. A., P. Reynolds and A. M. Gordon..... Competitive Interactions and Their Effects on Maize and Soybean Productivity in a Tree-based Intercropping System in Southern Ontario. Canada.
- Price, G.W. and A.M. Gordon..... Image Analysis Methodology for Rapid field Earthworm Burrow Estimates in Soil Profiles under a Temperate Poplar Intercropping System. Agroforestry Systems (Submitted).

Abstracts

- **Oelbermann, M., R.P. Voroney and A. M. Gordon. 2000.** Elemental Leaching of Populous spp. Leaves Collected in Litter Traps in the North Temperate Zone. ASA, CSSA, SSSA Meeting, Indianapolis, U.S.A.
- **Thevathasan, N. and A.M. Gordon. 2000.** Intercropping Trees with Crops. Newsletter. Eco-Farm and Garden.

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Posters

- **Price, G.W., and A.M. Gordon. 2000.** Special and Temporal Distribution of Earthworms in a White Ash, Silver Maple, Poplar Intercrop in Southern Ontario. Canada. College Royal 2000. University of Guelph.
- **Price, G.W., and A. M. Gordon. 2000.** Effects of Tree-Based Land Use Systems on Earthworm Populations. International Plowing Match. 2000.

2001 References

- **Angers, D.A., R.P. Voroney and D. Cote. (1995).** Dynamics of soil organic matter and corn residues affected by tillage practices. Soil Sci. Soc. Am. J. 56:1311-1315.
- **Bezkorowajnyj, P.G., A.M. Gordon and R.A. McBride. (1993).** The effect of cattle foot traffic on soil compaction in a silvo-pastoral system. Agrofor. Syst. 21: 1-10.
- **Dixon, R.K. (1995).** Agroforestry systems: sources or sinks of greenhouse gases? Agrofor. Syst. 31: 99-116.
- **Dixon, R.K., J.K. Winjum, K.J. Andrasko, J.J. Lee and P.E. Schroeder. (1994).** Integrated land-use systems: Assessment of promising agroforest and alternative land-use practices to enhance carbon conservation and sequestration. Climatic Change 27:71-92.
- **Gordon, A.M. and P.A. Williams. (1991).** Intercropping of valuable hardwood tree species and agricultural crops in southern Ontario. For. Chron. 67(3): 200-208.
- **Loeffler, A.E., A.M. Gordon and T.J. Gillespie. (1992).** Optical porosity and windspeed reduction by coniferous windbreaks in southern Ontario. Agrofor. Syst. 17: 119-133.
- **Nair, P.K.R. (1993).** An Introduction to Agroforestry. Kluwer Academic Publishers. 499 pp.
- **Ntayombya, P. and A.M. Gordon. (1995).** Effects of black locust on productivity and nitrogen nutrition of intercropped barley. Agrofor. Syst. 29: 239-254.
- **Oelbermann, M. and A.M. Gordon. (1999).** Autumnal litterfall into a rehabilitated section of an agriculturally degraded stream. J. Env. Qual. (accepted)
- **O'Neill, G.J. and A.M. Gordon. (1994).** The nitrogen filtering capability of carolina poplar in an artificial riparian zone. J. Env. Qual. 23: 1218-1223.

- **Schroeder, P.** (1993). Agroforestry systems: integrated land use to store and conserve carbon. *Climate Research*, 3: 59-60.
- **Thevathasan, N.V., Gordon, A.M., and Voroney, R.P.** (1999). Effects of juglone (5-hydroxy- 1,4-naphthoquinone) on soil ammonification and nitrification. *Agroforestry Systems* 44(2):151-162.
- **Thevathasan, N.V. and Gordon, A.M.** (1997). Poplar leaf biomass distribution and nitrogen dynamics in a poplar-barley intercropped system in southern Ontario, Canada. *Agrofor. Syst.* 37:79-90.
- **Thevathasan, N.V., and Gordon, A.M.** (1995). Moisture and fertility interactions in a potted poplar-barley intercropping. *Agrofor. Syst.* 29:275-283.
- **Unruh, J.D., R.A. Houghton and P.A. Lefebvre.** (1993). Carbon storage in agroforestry: an estimate for sub-Saharan Africa. *Climate Research*, 3: 39-52.
- **Voroney, R.P., and Angers, D.A.** (1995) Analysis of the short-term effects of management on soil organic matter using the CENTURY model. *Advances in soil science* pp. 113-120.
- **Williams, P.A., A.M. Gordon, H.E. Garrett, and L. Buck.** (1997). Agroforestry in North America and its role in farming systems. In: Gordon, A.M. and S.M. Newman (Eds.). *Temperate Agroforestry Systems*. CAB International, Wallingford, U.K. 269 pp.
- **Williams, P.A. and A.M. Gordon.** (1995). Microclimate and soil moisture effects of three intercrops on the tree rows of a newly-planted intercropped plantation. *Agrofor. Syst.* 29: 285-302.
- **Williams, P.A. and A.M. Gordon.** (1994). Agroforestry applications in forestry. *For. Chron.* 70(2): 143-145.
- **Williams, P.A. and A.M. Gordon.** (1992). The potential of intercropping as an alternative land use system in temperate North America. *Agrofor. Syst.* 19: 253-263.
- **Young, A.** (1997). *Agroforestry for soil management*. CAB International, Wallingford, UK. 320 pp.

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Other Activities

Several tours for delegates from China, Sri-Lanka, Japan and Ghana were conducted in the past year. Also, several field tours for local delegates were also conducted (e.g. CRESTech members, Grand River Conservation Authority etc.)

University of Guelph - Alfred Campus

- **Lachance, S. 2001.** Sanitation and New Gleaning of Maple Tubing Systems. University of Guelph - Alfred Campus

Ontario Soil and Crop Improvement Association

Submitted by: *Andrew Graham, Stewardship Programs Coordinator, Ontario Soil and Crop Improvement Association*

(OSCIA)

Reports Available from OSCIA

- Environmental Farm Plan Indicator Study. 2000.
University of Guelph.
School of Rural Planning and development.
- Restoration of the American Chestnut-Farm Response to a Species at Risk. 2000.
A Demonstration Project.
Ontario Soil and Crop Improvement Association.
- Wildlife Impact Assessment for Ontario Agriculture. 2000.
Ontario Soil and Crop Improvement Association.
- Evaluation of Buffer Projects along Watercourses on Ontario Farms. 2000.
Ontario Soil and Crop Improvement Association.

The above referenced reports are available from the Ontario Soil and Crop Improvement Association.

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Eastern Ontario Model Forest

Submitted by: Brian Barkley, General Manager, Eastern Ontario Model Forest

Survey of Farmers, Ranchers and Rural Landowners-Attitudes and Behaviours Regarding Land Stewardship 2000.
Information Report # 48.

Introduction to Sustainable Forest Certification. 2000. Information Report #49.

The above referenced reports are available from the Eastern Ontario Model Forest office in Kemptville.

Ministry of Natural Resources

Submitted by: John Oatway, Administrator MFTIP, MNR

Publications Available

- Silvicultural Guide for Managing Southern Ontario Hardwoods. 2000.
Ontario Ministry of Natural Resources.

Science, Training and Technology

The MNR provides extension level courses and workshops geared towards farmers and rural landowners. Many stewardship councils offer local awareness and education opportunities for local landowners. MNR continues to sponsor or participate in woodlot shows such as the Outdoor Farm Show, the International Plowing Match, the Hastings Plowing

Match, and a number of annual woodlot conferences in southern Ontario.

MNR has released a publication entitled " A Silvicultural Guide to Managing Southern Ontario Forests". The Silvicultural Guide is provided electronically on line at the Ontario Woodlot Association (<http://ont-woodlot.assoc.org>). A hard copy can be ordered from the Natural Resources Information Centre (1-800-667-1940).

Tree marking courses, based on this guide, are held in targeted areas on a yearly basis. The courses are designed to implement best management practices. The guide also outlines special consideration when managing forests in a settled landscape where forest stands tend to be relatively small in size and fragmented. In addition, refresher courses that are required by certified tree markers to maintain certification are also held in select locations. Scott Reid at the MNR office in Bracebridge (705- 646-5547) can be contacted for information and for a list of future tree marking courses.

The 26th Annual Forest Health Review was held October 30, 2002 in Orillia. Forest health monitoring in Ontario is a joint effort between MNR and the Canadian Forest Service. The Forest Health Review is an annual event, hosted by the North Simcoe Private Land Stewardship Network and the Dufferin/South Simcoe Stewardship Council.

This year's meeting gave an overview of the current health conditions of Ontario's forests. Major forest disturbances in 2002 including forest insects such as forest tent caterpillar, gypsy moth, pine shoot beetle, pine false webworm, aspen decline, red pine mortality, and drought.

- Other items of interest include:
Exotic insect detection and eradication efforts - brown spruce longhorn beetle in Halifax, the Emerald Ash borer in Ontario and Michigan
- Regulation to limit movement of exotic forest insects and disease through international trade
- Current status of West Nile Virus in Ontario

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Ministry of Agriculture and Food

Submitted by: *Dave Chapeskie, Agroforestry Specialist, OMAF and Todd Leuty, Agroforestry Specialist, OMAF*

Publications Available

The publications are available from The Ontario Maple Syrup Producers' Association - Promotion store.

- High Pressure Boiler Selection for the Production of Maple Products. Coons, C.F. 2001. Ontario Ministry of Agriculture, Food and Rural Affairs. Unpublished Report
- Report on Economics of Maple Syrup Production. 2000. Ontario Ministry of Agriculture, Food and Rural Affairs and the Canadian Farm Business Management Council.
- Effects of Ice Storm Damage and other Stressors on Sugar Bush Health and Sap Productivity-Literature Review and Synthesis. Coons, C.F., 2000. Ontario Ministry of Agriculture, Food and Rural Affairs. ISBN 1-896392-63-6.
- Impact of the 1998 Ice Storm on Sugar Bushes and Summary Management Recommendations. Chapeskie, D. .2000. Ontario Ministry of Agriculture, Food and Rural Affairs. Extension Note. ISBN 1-896392-66-0.

- Tapping and Sap Collection Techniques in Ice-Damaged Sugar Bushes. Chapeskie, D. 2000. Ontario Ministry of Agriculture, Food and Rural Affairs. Extension Note. ISBN 1-896392-67-9.
- Harvesting and Maintenance in Ice-Damaged Sugar Bushes. Richardson, M. 2000. Ontario Ministry of Agriculture, Food and Rural Affairs. Extension Note. ISBN 1-896392-68-7.
- Operating to Minimize Ice Storm Impacts on Tree Health. Richardson, M. 2000. Ontario Ministry of Agriculture, Food and Rural Affairs. Extension Note ISBN 1-896392-69-5.
- Protection of Ice-Damaged Sugar Bushes. Richardson, M. 2000. Ontario Ministry of Agriculture, Food and Rural Affairs. Extension Note. ISBN 1-896392-70-9.
- Determining the Nutritional Health of Sugar Bushes and the Role of Fertilization and Liming. Wheeler A. 2000. Ontario Ministry of Agriculture, Food and Rural Affairs. Extension Note ISBN 1-896392-71-7.

Ice Storm Survey and Research Information

- 1998 Ice Storm Maple Producers Assistance Survey. 2000. University of Guelph.
- International Ice Storm Conference. 2000. Ministry of Natural Resources, Carleton University.

Agroforestry Brochure

- Ontario's Agroforestry Program. Bringing the Resources of the World to Rural Ontario. Revised 2001.

This brochure summarizes key resources available to farmers and other woodlot owners in eastern Ontario. Important information available on various aspects of agroforestry is described in this brochure e.g. maple industry, christmas tree industry, farm woodlots, windbreaks, shelterbelts and stream buffers. The brochure is updated periodically.

This brochure can be obtained from the Ministry of Agriculture and Food.

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Maple Agriphone

OMAF is working to provide farmers with a number of different alternatives to access information related to commodities of interest to them. Since 1999, a province wide toll-free phone line was established for maple. During the maple season, maple producers and others can dial in a toll-free line and listen to a short pre-recorded informational message for maple. Emphasis has been placed on informing maple producers on the status of crop production in the different parts of the province. Other messages which pass on production tips and the results of applied research are provided as well. The Maple Agriphone has been popular with maple producers and will be continued in 2003.

Agroforestry Industry Exhibit

An agroforestry industry exhibit which high-lights the importance of the agroforestry industry in Ontario was prepared in 2000. The exhibit has a section for the maple industry and a section for other aspects of agroforestry. The exhibit has

been used at the International Plowing Match, the Outdoor Farm Show, Annual MNR Stewardship Conference and a number of other meetings in since it was developed. Staffing is provided for the agroforestry exhibit.

Maintenance of Agroforestry Website

A website is maintained with linkages to other important websites (e.g. site of the Ontario Maple Syrup Producers Association). The site address is: <http://www.gov.on.ca/OMAF/english/crops/hort/agrofore.html>.

The website content was reviewed in 2002 and it is being updated at the time of the writing of this report. This is part of a broader review and updating of OMAF's website resources. The updating work will continue into 2003.

Information on many aspects of Agroforestry can be found on the site. The site now contains articles/infosheets on the following subjects:

- Tile Drainage and Tree Roots
- Trees for Livestock Pastures
- Tree Roots

Demonstration Sites

A maple orchard was established in Eastern Ontario by South Nation Conservation in cooperation with OMAF. The primary objective of the plantation was to evaluate tree shelters including the "free grow" shelter. Over time, this plantation will serve as a demonstration site.

OMAF and the Eastern Ontario Model Forest have discussed the strategic importance of agroforestry demonstration sites at University of Guelph-Kemptville Campus and the Ferguson Forest Station in Kemptville. In 2002, OMAF and the Grenville Stewardship Council supported some needed maintenance work in the demonstration areas at the University of Guelph-

Kemptville Campus. The Eastern Ontario Model Forest plans to invest significantly in agroforestry demonstration sites at the two locations over the next five years. Emphasis will be focused on the maintenance of specific sub-demonstration sites on the properties.

A farm shelterbelt-mulch as an alternative to herbicide demonstration site was established at the Outdoor Farm Show in Woodstock at the Ontario Soil and Crop Improvement Association site. Space has also been provided for two new demonstration sites for 2003 and 2004.

A diverse species plantation including black cherry, sugar maple, red oak, and black walnut, sheltered by spruce and hybrid poplar, was established by the Halton Region Conservation Authority in cooperation with OMAF.

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Study Courses Reviewed

- Independent Study /OAC ACCESS Course Conserving Woodlands. Hiltz, S. 2000. Centre for Land and Water Stewardship. University of Guelph.
- New Agroforestry Curriculum Documents. Moncton University, Edmundston, New Brunswick. 2000.

Extension- Advice and Information

The Agroforestry Specialists provide technical and promotional support for a number of industry meetings (e.g. OMSPA Summer Maple Tour, OMPSA Local Information Days, SONG Field Trips etc). The Specialists are heavily involved in the packaging of technical information and its transfer to producers and woodlot owners. For example, a manual on the Design Installation and Maintenance of Tubing Systems is being developed for the maple syrup industry. The Agroforestry Specialists also provide advice and information to a wide variety of clients on request.

Technical Presentations at Conferences

- Chapeskie, D.J. Maple Production School. 2001. Economics of Maple Syrup Production, Cornell University.
- Chapeskie, D. J. Biodiversity in the Sugar Bush. 2001. North American Maple Syrup Council Meeting, St. Cloud Minnesota.
- Lachance, S. 2001. Sanitation and Cleaning of Maple Tubing. North American Maple Syrup Council Meeting. St. Cloud, Minnesota.
- Chapeskie, D.J. Maple Production School. 2000. Maple Orchards in Ontario. Cornell University.
- Chapeskie, D.J., International Ice Storm Conference. 2000. Ice Storm Assistance for Maple Producers and Christmas Tree Farmers in Eastern Ontario. Carleton University.
- Chapeskie, D.J., North American Maple Syrup Council Meeting. 2000. Use of Steam in the Production of Maple Products. Burlington, VT.
- Chapeskie, D.J., North American Maple Syrup Council Meeting. 2000. Sanitation and Cleaning of Maple Tubing. Burlington. VT.

Posters

- Timmer, V., Y. Teng and D. Chapeskie. 2001. Soil Amelioration. Improves Nutrition of Ice Storm Damaged Sugar Maple Stands. North American Maple Syrup. Council Meeting, St. Cloud, Minnesota.
- Coons, C.F. and D. Chapeskie. 2001. High Pressure Boiler Selection for the Production of Maple Products. North American Maple Syrup Council Meeting, St. Cloud, Minnesota.
- Noland, T. 2001. Ice Storm Effects on Maple Sap and Syrup. North American Maple Syrup Council Meeting, St. Cloud, Minnesota.

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Report of Actions taken on Previous Years Recommendations

Part 1. Research Needs

PRIORITY GROUPING "A"

Issue #1: Importance of Agroforestry Research at the University of Guelph in helping meet Environmental Management Objectives

A major highlight from 2002 is that a commitment has been made to fund agroforestry research at the University of Guelph over the next 4 years. A proposal entitled "Enhancing Carbon Sequestration and reduction of Nitrous Oxide Emissions in Agriculture using tree-based Agroecosystems" was submitted to the Plants Program and has been funded for the next four years.

Recommendation 1(a):

Development of a GPS/GIS Database for all current land use activities in Ontario.

No progress in 2002.

Recommendation 1(b) and 1(c):

Quantification of C sequestration, reduction of nutrient loading and nitrous oxide emissions.

A study plan has been finalized which includes the following milestones:

1. Summarize the results of carbon sequestration in fast and slow growing tree species and their potential impacts on trapping atmospheric CO₂.
2. Summarize the effects on soil organic matter dynamics in tree-based intercropping systems as influenced by annual tree litterfall and fine root turnover.
3. Construct a carbon/budget balance for both systems.
4. Evaluate the effects of carbon inputs on special N₂O emission in both systems.
5. Summarize the results of nitrate-nitrogen losses from intercropped and monocropped systems over a 3-4 year period.
6. Summarize the results of N mineralization rates for both systems over a 4-year period.
7. Validate the hypothetical N cycling model for both systems.
8. Explore the possibility of growing shade tolerant alternative understudy crops-non-traditional products (value-added crops) along the tree rows.

Note: Milestone #8 has been proposed by 3rd party researchers.

Completion of this project is expected by April 2006.

Milestone # 1 has now been completed and soil samples have been analyzed in order to complete milestone #2. The remainder of the work is in progress.

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Recommendation 1(d):

Filtering mechanism of tree roots to filter harmful organisms such as coliform bacteria, including E. coli, especially from manure runoffs and soil leachates.

No progress to date.

Recommendation 1(e):

Remote Sensing Research Applications

Work on the CRESTech project entitled "The use of CASI-hyperspectral remote sensing data to quantify and model C sequestration and N fertilizer management in agroecosystems (Test research site, University of Guelph)" has been completed. The final project report can be made available upon request to interested parties. In order to further expand the knowledge and the use of remote sensing applications in agroforestry systems a new research proposal entitled "The use of CASI- hyperspectral reflectance data and canopy models to quantify C sequestration in trees and to quantify N transfer from trees to associated crops" has been submitted to the CRESTech core research program. The outcome will be announced towards the end of this year.

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Issue #2: Registration of Insecticides for Tree Nut Orchards

Recommendation 2(a):

That URMULE registration of insecticide products identified in the 2001 Agroforestry Sub-Committee Report be actively pursued.

Minor Use Registration of the insecticide Dipel 2XDF has received a Canadian label registration for use on pecans, hazelnuts, walnuts and sweet chestnuts, for control of leaf rollers, spanworm and spring feeding caterpillar complex.

Recommendation 2(b):

That any identified nutrient management issues in nut tree orchards be identified and addressed.

No activity in 2002.

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Issue #3: Registration of Herbicides for the Christmas Tree Industry

Recommendation(s):

That the URMULE registration of several herbicides identified in the 2002 Agroforestry Sub-Committee Report for Ontario's Christmas tree industry be actively pursued.

Minor use registrations are being actively pursued for six herbicides. Two seasons of field data have now been collected

for four Christmas tree species, white pine, balsam fir, Fraser fir and white spruce. At least one more season of measurements is needed to complete this work.

Dr. Nancy Cain remains the consultant for this project.

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Issue #4: Approved and safe use of chemicals in the production of maple syrup.

Recommendation 4(a):

Investigate alternative defoaming agents for the maple syrup industry.

Currently acceptable defoaming agents were identified as part of a Best Management Practices (BMP) review carried out in 2002.

Recommendation 4(b):

Investigate Alternatives to Sanitize and Clean Maple Tubing.

Dr. Simon Lachance has developed a three-year project plan for this proposed research. This plan is currently being reviewed by OMAF and by members of the Research and Technology Transfer Committee of the Ontario Maple Syrup Producers' Association (OMSPA). Once this review is completed, applications will be submitted to the Northern Ontario Heritage Fund and the North American Maple Syrup Council for funding.

It is proposed that this research activity be centered in north central Ontario near Sundridge.

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Issue #5: Development and Use of the Health Spout in Ontario's Sugar Bushes

Recommendation(s):

To encourage ongoing research into the health spout and to transfer the results of this work to maple producers

Continuation of this research activity was advocated at the Annual meeting of the North American Maple Syrup Council in North Conway, New Hampshire in 2002.

Technical information pertinent to the health spout is being actively disseminated to Ontario's maple producers by OMAF specialists. Ontario's producers continue to adopt the health spout at a modest pace and are very encouraged by this innovation. Based on research results to date, the health spout should lower any potential negative impact of tapping on the health of the maple trees while maintaining similar production levels to those attained using conventional spouts.

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Issue #6: Produce High Quality Maple Syrup and Maintain it in Storage

Recommendation 6(a):

That a comprehensive review of sap filters appropriate for use in the maple industry be undertaken.

OMSPA submitted a proposal to OMAF's Healthy Futures program to support this work. Unfortunately, this application for support was not approved due to other funding priorities.

The North American Maple Syrup Council has provided seed funding for this project.

Another attempt to obtain core funding for this project will be made in 2003. The project may be broadened out to include a review of industrial filters, their advantages and disadvantages for filtering sap and syrup. This requires further discussion between OMAF and OMSPA's Research and Technology Transfer Committee.

Recommendation 6(b):

That the source and nature of odours in metal containers used for packing maple syrup be investigated.

There has been no action taken on this recommendation.

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Recommendation 6(c):

That maple producers be provided with ready access to technical information on the use of high pressure steam in maple production

Considerable progress has been made towards follow-up on this recommendation.

A series of four seminars on the use of high pressure steam for maple production were held across the commercial range of the maple industry in Ontario in 2002. About 100 maple producers, industrial representatives and others attended these very informative sessions. It is believed that this is the first time that such comprehensive seminars on this subject have been held in Ontario or elsewhere.

A Factsheet on the use of pressure steam has been developed to draft stage and will be published by OMAF in 2003.

The above referenced work is being supported by OMAF, OMSPA and the Agricultural Adaptation Council.

Recommendation 6(d):

That the economics of high pressure steam compared to alternative production systems be investigated.

A preliminary investigation of the economic of using high pressure steam in maple production is underway at the time of writing of this report. A resulting technical report focusing initially on the preliminary economics of using high pressure steam in maple production will be available in the first quarter of 2003.

The above referenced work is being supported by OMAF, OMSPA and the Agricultural Adaptation Council.

Issue #7: Determining the Nutrient Status of Pure Maple Syrup**Recommendation(s):**

To obtain the information necessary to provide nutritional labelling for maple syrup produced in Ontario.

OMAF has begun the task of assembling background information pertinent to nutritional labelling. This work will continue and receive more emphasis in 2003.

Issue #8: Summary of Research Findings: Sugar Bush Management**Recommendation(s):**

That a literature search and synthesis of research information pertinent to sugar bush management be carried out.

A comprehensive listing of research papers completed by December 31, 2001. A copy of many of the titles is available from OMAF in Kemptville.

The synthesis aspect of this project has not yet been initiated.

Issue # 9: Ice Storm Recovery Research in Ontario**Recommendation(s):**

The assessment of ice storm induced crown damage and its effects on root starch levels, sap production, sugar content and wound closure in sugar bushes be extended with re-measurement in 2003 and 2005.

That the assessment of the effects of ice storm damage on the nutritional status of maple trees is extended with re-measurement in 2003 and 2005.

That the value of fertilization as a remedial treatment for ice-damaged sugar bushes be determined.

That the incidence of damaging agents in ice-damaged sugar bushes-sugar maple borer, branch and stem decays be monitored

That the impact of selected damaging agents on the health of ice-damaged sugar bushes be monitored.

That the effects of ice -storm induced crown damage on the microclimate of sugar bushes be determined.

A pre-proposal for funding of recommendation (a), (b) and (c) have been prepared by the Ontario Forest Research Institute (OFRI). In December 2002, OFRI scientists were given the green light to proceed with a full proposal. There has been no word on the status of this submission as of the writing of this report. Both OMPSA and the North American Maple Syrup Council will be contacted to confirm their support for this work.

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PRIORITY GROUPING "B"

Issue #1: Vegetative Propagation of Maple Sweet Trees

Recommendation(s):

To continue vegetative propagation work in Ontario using scions collected from sweeter than average maple trees.

No action has been taken on this recommendation.

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Issue #2: Investigation of A Vapour Compression System for Maple Syrup Production

Recommendation(s):

That the advantages and potential of a Vapor Compression System suitable to a 1000-3000 maple operation be investigated.

An industrial consortium in eastern Ontario has developed a proposal to design, fabricate and evaluate a Vapor Compression System which would be suitable to a 1000-3000 tap operation.

Seed funding for the project has been obtained from the North American Maple Syrup Council and the remainder of funding is expected to come from the industrial consortium.

It is anticipated that this will be a three-year project with the design stage being completed in 2003.

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Issue #3: Intercropping Focus

Recommendation(s):

That agroforestry researchers consider placing more emphasis on enhancing field crop production, pasture management, rural road, odour and livestock issues, and riparian situations.

Research initiatives already underway or planned at the University of Guelph should help meet this objective over the next few years.

[| Top of Page |](#)**Issue #4: Need for Improved Understanding of the Relationship between Trees and Farm Drainage****Recommendation(s):**

That research be encouraged which improves the understanding of the relationship between tree roots and tile drainage systems.

It has been decided that this research activity is not warranted. Information from relevant research completed to date should be packaged and transferred to farmers in a reader-friendly format.

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Part 2. Service Needs

Issue #1: Support Facilitating Agroforestry Research Projects, and transferring the results of research and extension activities to farmers**Recommendation(s):**

That support for agroforestry extension in Ontario be continued.

OMAF and Ontario's conservation authorities continue to provide critical support for agroforestry extension.

There is a need for OMAF's Agroforestry Specialists to strengthen their linkage with the field extension personnel of the conservation authorities.

[| Top of Page |](#)**Issue #2: Need to Ensure an Adequate Supply of Genetically appropriate trees and shrubs for afforestation on farms and in other rural areas****Recommendation(s):**

The relevance of this recommendation is probably stronger than it was one year ago before the Climate Change and Green Cover initiatives were announced.

In the fall of 2002, OMAF and OMNR agreed to form an Interministerial Technical Working Group to coordinate program efforts and to better flesh out opportunities for afforestation on farm and non-farm rural lands. It expected that representatives from the Ministry of the Environment (MOE) and the Ministry of Municipal Affairs and Housing (MMAH) would also be joining this group.

[| Top of Page |](#)**Issue #3: Need to Harmonize Grade Names and Standards for Maple Syrup**

Recommendation(s):

That the grade names and standards used for maple syrup internationally be reviewed with a view towards standardization.

This study has now been initiated under the auspices of the International Maple Syrup Institute (IMSI). A working group has been struck to review the grade names and descriptors used for maple syrup across the commercial range of the maple industry. An Interim report was prepared for IMSI and tabled at the Annual IMSI meeting held in North Conway, New Hampshire in 2002.

A final report will be submitted to IMSI in the 2003 calendar year.

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Issue #4: Need to Develop a Comprehensive Policy to Support and Guide the Planting of Trees and shrubs in rural Ontario.

Recommendation(s):

That a comprehensive policy for tree planting be developed to support tree planting needs and guide tree planting activities over the next decade or more.

OMNR has made good progress towards the development of a comprehensive policy for tree planting in rural Ontario. Other Ministries including OMAF, MOE and MMAH need an opportunity to participate in the development of this policy.

A recently struck inter-ministerial technical working group focusing in afforestation issues will include representatives from OMNR, OMAF, MOE and possibly MMAH. This group should have a substantial role in developing and finalizing a tree planting policy for Ontario.

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Agroforestry Research and Service Needs

Part 1. Research Needs

PRIORITY GROUPING "A"

Issue #1: Importance of Agroforestry Research at the University of Guelph in Helping Meet Environmental Management Objectives.

Description

In the last several decades there has been a plethora of unequivocal evidence indicating that the global climate is changing. As a counter measure, climate change mitigation and adaptation processes are being examined globally. In Canada, both federal and provincial governments are working towards meeting Kyoto standards by the year 2012. In this context, agroforestry based land-use systems are being considered as having significant potential to augment carbon (C) sequestration and to reduce greenhouse gas (GHG) emissions in agroecosystems. However, there is no research to date in Canada in general, and in Ontario in particular that will contribute to the above knowledge. Therefore, all agroforestry based land-use systems in Ontario need documenting with respect to their current and future contribution towards climate change mitigation processes in particular and to the environment (emphasis on nutrient management and water quality) in general. The possible expansion of these land-use practices on marginal and degraded land needs to be evaluated and the overall impact on meeting Kyoto standards by 2012 needs to be quantified and verified. The information derived from this research will also be helpful in formulating appropriate policy to facilitate large-scale adoption in the province. The proposed research will also identify methodologies that could be used to calculate C credits and trading in the future, an area that is being widely discussed and scrutinized by many industries and sectors around the world. Agroforestry-based land use systems have large potential in this regard and, therefore, results from this strategic approach will be useful in the design and development of such systems for many areas of Canada on a national level.

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Background

Recommended land-use changes in agriculture, such as zero tillage and minimum tillage, believed to sequester more C in soil, have proven otherwise (Angers et al., 1995; Voroney and Angers, 1995). Furthermore, in the forest sector, an increase in the occurrence of forest fires since 1979, possibly linked to climate change, makes it difficult to determine if Canada's forests will remain a sink for C or become a long-term source. The above factors in conjunction with the burning of fossil fuel and intensive agriculture have contributed to a 10% increase in Canadian CO₂ emissions, from 454,226 Gg in 1991 to 499,526 Gg in 1995. Therefore, alternative land management strategies and farming system technologies that may increase the ability of agricultural lands to trap atmospheric C need to be developed in Canada, in order to meet the terms of reference of the Kyoto Protocol. This will also aid in understanding the extent to which these alternative land-use practices may contribute to the provision of a global buffer to increased atmospheric CO₂.

Agroforestry is a collective term used to describe land-use practices that incorporate trees into farming systems. Agroforestry has its roots in the developing world, where lack of land resources in the presence of high population growth necessitated the development of novel and simultaneous wood and food production systems by indigenous peoples. In North America, many different types of agroforestry have been employed historically (Gordon et al., 1997), but the vast potential economic and environmental benefits attributed to agroforestry have yet to be realized on a large scale.

In the recent past, many studies have identified tree-based land-use practices (agroforestry) as a significant global opportunity to reduce the accumulation of CO₂ in the atmosphere (Schroeder, 1993; Unruh et al., 1993; Nair, 1993; Dixon, 1995; Young, 1997). The United Nations has also estimated that agroforestry based land-use practices on marginal or degraded lands could sequester 0.82-2.2 Pg C per year, globally, over a 50-year time frame (Dixon et al., 1994). Agroforestry land-use practices are less adopted in Canada even though there is a great potential for their adoption. Estimates of marginal or degraded land technically suitable for establishment of agroforestry systems in North America are between 90 - 140 x 10⁶ ha, and in Canada, 57 x 10⁶ ha (agricultural land classes 3 through 6).

The main types of agroforestry systems currently being researched in many areas of North America and applicable to portions of the Canadian landscape would include windbreaks and shelterbelt systems (e.g. Loeffler et al., 1992), silvipastoral systems [animals / pasture and trees] (Bezkorowajnyj et al., 1993), integrated riparian forest systems (O'Neill and Gordon, 1994; Oelbermann and Gordon, 1999), forest farming

systems (Williams et al., 1997) and intercropping systems [crops are grown between widely spaced tree rows] (Gordon and Williams, 1991; Williams and Gordon, 1992, 1994, 1995; Ntayombya and Gordon, 1995; Thevathasan and Gordon, 1995, 1997; Thevathasan et al., 1999). Carbon sequestration potential and GHG emissions reduction potential of these systems needs to be quantified and verified in a planned strategic manner.

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Recommendation(s):

Immediate research is needed to quantify C sequestration and to model C dynamics in province-wide agroforestry-related land-use practices (e.g. tree-cereal intercropping, orchard tree-based intercropping, windbreaks, riparian buffer strips, silvopasture, forest farming etc.). This information will be of paramount importance during the Kyoto reporting period given the federal government's commitment to ratify GHG emissions by 2012.

Agroforestry-related land-use practices also have the potential to reduce nutrient loading to adjacent waterways through the development of efficient nutrient cycling systems. The above mechanism could significantly reduce nitrous oxide emissions through efficient cycling of nitrogen, especially in tree-cereal intercropping systems and in riparian buffer systems. Preliminary modeled data suggests that in a tree-cereal intercropping system, nitrate leaching could be reduced to 50% compared to a conventional agricultural field. More research is needed to validate this hypothesis in tree-cereal intercropping systems and in riparian buffer systems. Research results may contribute significantly towards N₂O emission reduction efforts in agroecosystems. Therefore, in the above context, this is an immediate research priority.

The efficient filtering mechanism of tree roots could also potentially filter harmful organisms such as coliform bacteria, including E.coli, especially from manure runoffs and soil leachates. There is no research to-date that has investigated this low-cost but potentially efficient mechanism for enhancing water quality. Immediate research is needed in this area.

Remote sensing technology could be used in agroforestry-related land-use practices to study the long-term impacts of C sequestration both in trees and in soils under efficient nitrogen fertilizer management regimes. The University of Guelph Agroforestry Research Site (Victoria Road) has been selected as a 'test site' by the Centre for Research in Earth and

Space Technology (CRESTech) to conduct remote sensing research applications using both airborne (Compact Airborne Spectrographic Image (CASI)) and spaceborne images (IKONOS satellite). At Present, the feasibility of using hyperspectral imagery to develop a model for carbon sequestration in tree-crop ecosystems is underway. This involves correlation of spectral "red edge" parameters with ground-measured quantities, such as tree carbon data. CASI data will be used to generate chlorophyll pigment concentration maps; these will then be compared to C sequestration, ground-truthed. Further, Nitrogen (N) transfer from trees to associated crops will be determined by comparing CASI measurements of test plots of fixed N application to CASI measurements of the tree-crop plots. In this manner, N calibration of the hyperspectral data can be developed allowing better N fertilizer management in agroecosystems. This will also lead to quantification of the potential reduction in N₂O emissions from agroecosystems, a major source of greenhouse gas emissions. Quantification of carbon sequestration and reduction of N₂O emissions is the first step to demonstration of Canada's commitment to the Kyoto protocols.

A GPS / GIS database should be developed for all current agroforestry based land-use activities in Ontario. In addition to the above, potentially available land area that could be brought under some form of temperate agroforestry systems in the future also should be documented. Development of such a database will facilitate

accurate quantification of C sequestration through agroforestry based land-use systems and contribute to climate change mitigation impact assessment studies in the future.

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Target Agency(ies)

It is obvious that our main target agency will be the O.M.A.F to facilitate follow-ups on the agroforestry research recommendations and objectives. We will be working closely with the agroforestry extension personnel working for the OMAF to achieve the above research goals and objectives. In addition, we will also target a few federal initiatives (e.g. BIOCAP) and a few private industries. Among the private sectors, Centre for Research in Earth and Space Technology (CRESTech) will be our prime target. The latter funding agency has an expressed interest in supporting research on remote sensing applications for agroforestry research and development. We will also be exploring possibilities of deriving funds from power generation institutes, manufacturing industries and from transportation industries to support research that positively contributes towards climate change mitigation processes. We will also follow-up with a variety of provincial and federal livestock associations (e.g. Ontario Cattlemen Association, Dairy Farmers of Canada, Canadian Pork Council, Canadian Sheep Federation etc.)

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Issue #2: Lead Contamination in Maple Syrup

Background

In 2001 and 2002, OMAF has stepped up the number of samples of maple syrup taken from maple operations, compared to previous years. In 2002, a number of maple producers had syrup seized by the Canadian Food Inspection Agency since the level of lead contamination exceeded 1 ppm. This is the level of contamination which currently triggers a detention of the product.

In Canada, blending of contaminated and non-contaminated syrup is not permitted. There is a need to investigate the potential for filtering lead out of contaminated syrup with commonly used syrup filters in the maple industry. It is acknowledged that the solution to the problem in the longer term is to take steps so that lead contamination is minimized and/or eliminated in the production process through targeted equipment replacement and /or best management practices.

Recommendation(s):

That several filters be evaluated to determine their potential for reducing lead contamination in maple syrup.

Target Agency(ies)

OMAF and OMSPA

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Issue #3: The process for handling minor use registrations is currently being revised. It is extremely important that the new arrangement be finalized as soon as possible.

Background

The process for handling Minor Use registrations is being reorganized and coordinated by Agriculture and Agri-food Canada. It is expected that once the new process has been put in place, it should be easier to apply for, conduct minor use field trials, and speed minor use registrations to control important pests in agriculture.

Recommendation(s):

That the new process for dealing with minor use registrations be finalized as soon as possible.

Agency(ies):

Agriculture and Agrifood Canada, OMAF

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Issue #4: The Emerald Ash Borer, an exotic wood boring insect, has been found in the Windsor area of Ontario.

Background

In 2002, the Emerald Ash Borer, and exotic wood boring insect was found in the Windsor, Ontario area. This insect has potential to cause very serious damage to Ontario's Ash resource.

Recommendation(s):

That efforts to raise the awareness of the public and landowners regarding the Emerald Ash Borer be encouraged and supported and that quarantine measures of the Canadian Food Inspection Agency for this pest be fully supported.

Agency(ies)

Forestry Canada, Ontario Ministry of Natural Resources, Canadian Food Inspection Agency.

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Issue #5: Several native and exotic wood boring insects have potential to cause serious damage to Ontario's forests.

Background

Wood boring insects, both native and exotic, have tremendous potential to cause serious damage to the forest resource with attendant negative economic impacts. Examples of this type of insect include the Asian Long-horned Beetle, the Emerald Ash Borer and the Carpenter Worm.

Recommendation(s):

That private and public sector researchers be encouraged to develop practical control monitoring and control

measures for these insect pests.

Agency(ies)

MNR Provincial Forest Health, Natural Resources Canada.

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Issue #6: Registration of Insecticides for Tree Nut Orchards

Background

The Tree Nut Industry has considerable potential for growth, especially in southwestern Ontario. In order to ensure that the industry realizes its growth potential and is sustainable, research and support will be crucial over the next few years.

The Society of Ontario Nutgrowers (SONG) is the primary voice for the organized tree nut industry in Ontario. OMAF has been working closely with SONG in order to help ensure that research needs are identified and met.

In Ontario, tree nut growers need improved access to pest and weed control products.

Recommendation(s):

That URMULE registrations of pest and weed control products identified in Appendix 2 of this report be pursued.

That any identified nutrient management issues in tree nut orchards be identified and addressed.

Target Agency(ies)

OMAF, Agriculture and Agri-Food Canada

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Issue #7: Registration of Herbicides for the Christmas Tree Industry

Background

In Ontario, Christmas tree growers have very limited access to herbicides for use in their operations. Often weeds are present which cannot be effectively controlled by herbicides which are currently registered for use in Christmas tree plantations.

Problems with resident weed populations or weed shifts after initial treatment can significantly reduce the survival of planted seedlings. Growth performance of the outplantings as well as the quality of the trees can also be adversely affected.

Ontario's growers are at a competitive disadvantage with neighboring jurisdictions where growers have access to a broader selection of approved herbicides for use in their plantations.

Recommendation(s):

That the URMULE registration of several herbicides identified in Appendix 2 of this report for Ontario's Christmas tree industry be actively pursued.

Target Agency(ies)

OMAF, Agriculture and Agri-Food Canada.

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Issue #8: Approved and Safe Use of Chemicals in the Production of Maple Syrup

Description

Many maple producers use defoaming agents to affect the boiling process when making maple syrup. There is a need to review the use of defoaming agents in the industry in order to ensure that their use is approved, safe and does not in any way contaminate the maple syrup.

In recent years, many maple producers in Ontario have moved to permanently installed tubing systems in their sugar bush. Research designed to evaluate alternatives to sanitize and clean maple tubing at the University of Guelph-Alfred Campus has been carried out since 1998 and a technical report summarizing the results is available. There is a need to further investigate

treatment alternatives for sanitation and cleaning since some of the results from the initial study were not conclusive and also in the light of new information.

Recommendation(s):

Investigate alternative defoaming agents for the maple syrup industry

Investigate alternatives to sanitize and clean maple tubing for permanent tubing installations.

Target Agency(ies)

University of Guelph-Alfred Campus; OMAF

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Issue #9: Development and Use of the Health Spout in Ontario's Sugar Bushes

Background

Over the past several years, research into a new smaller diameter "health spout" for the maple industry has been carried out in Vermont (Proctor Research Centre), New York (Uihlein Maple Research Station) and Quebec (Centre Acer). This

spout is 5/16 inches in diameter while the traditional spout is 7/16 inches in diameter. Preliminary research has shown that use of the health spout permits tapholes to heal over more quickly while maintaining about the same sap production levels as the conventional spout. However, there is a need to more fully assess and

document staining of the sapwood associated with the health spout so that it can be compared with the conventional spout. Consequently, many maple producers are adopting the health spout.

Maple producers place high priority on maintaining ongoing research into the health spout. There is also a need to develop a health spout for bucket operations since the existing health spout is suitable only for tubing installations.

It is important that maple producers be kept abreast of research into the health spout.

Recommendation(s):

To encourage ongoing research into the health spout and to transfer the results of this work to maple producers.

Target Agency(ies)

Cornell University; University of Vermont; Centre Acer; OMAF

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Issue #10: Producing High Quality Maple Syrup and Maintaining it in Storage.

Background

It is recognized within the maple industry that filtering up maple sap can potentially upgrade the quality of the sap as well as the syrup produced from it. There are a number of sap filters available to the maple industry designed for small and large operations.

There is a need to consolidate technical and economic information on sap filters and investigate the pros and cons of the different filter types. Proper methods for cleaning and storing the filters should also be reviewed. This work should raise producer awareness regarding the benefits of filtering sap. It should also help them select appropriate filters for their operation and provide them with information regarding proper maintenance and storage of the filter units.

There is a belief in the maple industry that manufacturing odors are present in most metal containers. There is a need to investigate the source of these odours as well as proper sterilization procedures.

The use of high pressure steam in the production of maple products has been an area of research focus in Ontario for several years. This technology has some advantages over more conventional processing technologies and is highly versatile. It may be possible to produce more of the higher grades of syrup with a steam installation and economies of production may be improved in some cases. Also, high pressure steam can be used to sterilize equipment such as sap collection tanks, syrup drums and buckets. There is a need to provide maple producers with access to technical information and sources of equipment and expertise. Also, the economics of using high pressure steam compared to conventional syrup production systems should be explored.

Recommendation(s):

That a comprehensive review of sap filters appropriate for use in the maple industry be undertaken

That the source and nature of odours in metal containers used for packing maple syrup be investigated.

That maple producers be provided with ready access to technical information on the use of high pressure steam in maple production.

That the economics of high pressure steam compared to alternative syrup production systems be investigated.

Target Agency(ies)

OMAF; University of Guelph; North American Maple Syrup Council.

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Issue #11: Determining the Nutrient Status of Maple Pure Maple Syrup

Background

In order to support the growing demands of consumers, the Canadian government is considering the advisability of adding nutritional labelling information to containers of maple syrup produced in Ontario. Nutritional information for maple syrup produced in Ontario which could be used for this purpose is unavailable.

It will be necessary to collect information on the nutritional status of maple syrup which is sufficient to satisfy labelling requirements so that it is available if the requirement for including this information on the label becomes mandatory. This may include collecting information from other jurisdictions for comparative purposes.

Many maple producers view nutritional labelling as a positive thing and see that including this information on the product label may have marketing advantages.

Recommendation(s):

To obtain the information necessary to provide nutritional labelling for maple syrup produced in Ontario.

Target Agency(ies)

OMAF; Agriculture and Agri-Food Canada

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Issue #12: Summary of Research Findings: Sugar Bush Management

Background

It is 25 years since a comprehensive consolidation and review of research findings pertinent to sugar bush management has taken place. There is a need to pull together the results of research which has accumulated since 1975 and make

the results of this work available to maple producers.

The Ontario Maple Syrup Producers Association has expressed special interest in any information related to the thinning of mature maple stands.

Recommendation(s):

That a review of research information pertinent to sugar bush management be carried out and that a Best Management Practices Manual be prepared which incorporates the applicable results of research.

Target Agency(ies)

OMAF

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Issue #13: Need to Continue Aspects of Ice Storm Recovery Research in Ontario

Background

Following the ice storm of 1998 which affected eastern Ontario, the Ontario and Canadian governments received a Brief from the Ontario Maple Syrup Producers Association (OMSPA) requesting, among other things, assistance to research the affects of the Ice storm on sugar bushes. Subsequently, a comprehensive program was approved by the two levels of government and implemented commencing in 1999. This program included an evaluation of the effects of the

ice storm on the productivity of sugar bushes, an evaluation of the nutritional status of sugar bushes and remedial treatments and other projects. This program which was supported using Disaster Relief Funding will be completed effective December 31, 2001.

In the OMSPA Brief, a commitment to research designed to monitor the effects of the Ice Storm on sugar bushes was requested for a minimum of five years. The Disaster Relief Programs did not allow for this length of program effort.

Recommendation(s):

The assessment of ice storm induced crown damage and its effects on root starch levels, sap production, sugar content and wound closure in sugar bushes be extended with re-measurement in 2003 and 2005.

That the assessment of the effects of ice storm damage on the nutritional status of maple trees are extended with re-measurement in 2003 and 2005.

That the value of fertilization as a remedial treatment for ice-damaged sugar bushes be determined.

That the incidence of damaging agents in ice-damaged sugar bushes - sugar maple borer, branch and stem decays be monitored.

That the impact of selected damaging agents on the health of ice-damaged sugar bushes be monitored.

That the effects of ice-storm induced crown damage on the microclimate of sugar bushes be determined.

Target Agency(ies)

Ontario Forest Resources Institute-OFRI; Ministry of Agriculture and Food; Natural Resources Canada and Agri-Food Canada

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PRIORITY GROUPING "B"

Issue #1: Vegetative Propagation of Maple Sweet Trees

Background

Techniques to vegetatively propagate sugar maple have been successfully developed at Cornell University-Uilein Maple Research Station over many years. In 1998, a three-year study was initiated at the University of Guelph-Guelph and Kemptville locations to adapt the vegetative propagation technology to Ontario. The study showed that rooting of the vegetative material was highly dependent on the physiological condition of the scions when collected and the greenhouse misting regimen. Rooting success varied from poor to very good depending on the season.

Overwintering of the rooted plants proved to be the biggest challenge due to the fragility of the rooted material. The results of this study are summarized in a report entitled "Vegetative Propagation of Sugar Maple and Black Maple in Ontario".

The Ontario Maple Syrup Producers Association- Maple Orchard Committee is interested in continuing efforts to vegetatively propagate maple using scion selections from sweeter than average trees.

Recommendation(s):

To continue vegetative propagation work in Ontario using scions collected from sweeter than average maple trees.

Target Agency(ies)

OMAF; University of Guelph; Private Nurseries

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Issue #2: Investigation of a Vapour Compression System for syrup Production

Background

A prototype vapor compression unit was tested at the Uilein Maple Research Station in Lake Placid, New York a number of years ago. The unit was expensive and applicable to large operations. Consequently, the technology never really took hold in the industry.

In 2001, a consortium of individuals with appropriate skill sets for evaluating the potential of Vapor Compression has come together. The intent is to develop and test a vapor compression system which would be appropriate to smaller operations and thus being more affordable. The Director of Maple Research at Cornell University is interested in collaborating on the project.

Recommendation(s):

That the advantages and potential of a Vapor Compression System suitable to a 1000-3000 tap maple operation be investigated.

Target Agency(ies)

OMAF; North American Maple Syrup Council

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Issue # 3: Intercropping Focus

Background

It should be recognized by agroforestry researchers that "multi-purpose food bearing trees", as defined by agroforestry researchers are referred to as "orchards" by agricultural industries and horticultural institutions. Intercropping has been and remains a traditional and applied practice in nut and fruit orchards during the establishment period. Agroforestry researchers should consider refocusing their attention away from managed orchards to instead enhancing field crop production, pasture management, rural road, odor and livestock issues, and riparian situations.

Recommendation(s):

That agroforestry researchers consider placing more emphasis on enhancing field crop production, pasture management, rural road, odour and livestock issues, and riparian situations.

Target Agency(ies)

Agriculture and Agri-Food Canada; University of Guelph.

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Part 2. Service Needs

Issue #1: Support Facilitating Agroforestry Research Projects, and Transferring the Results of Research and Extension Activity to Farmers

Background

Agroforestry Extension Specialists fill a critical role in helping ensure that the findings of ongoing research in Ontario and elsewhere are transferred into practice. Also, their support is needed to help identify research needs, facilitate the

funding of research and provide technical guidance to farmers and researchers.

The role of Agroforestry Extension Specialists is also critical in the packaging and transfer of technical information to farmers.

Recommendation(s):

That the support provided for Agroforestry Extension in Ontario be continued.

Target Agency(ies)

OMAF; Conservation Ontario

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Issue #2: Given that Conservation Authorities have 64 staff delivering in-field extension, an opportunity exists for the OMAF agroforestry team to strengthen their linkage with this force.

Background

Conservation Authorities have up to 64 professionals and technicians delivering in-field extension (all or part of the year). The recent Environics poll of Ontario farmers indicated that this extension force is their most trusted source of (tree-related) resource management information. As elaborated elsewhere, the Part Two Report of the Walkerton Commission of Inquiry recommends that Conservation Authorities develop source water protection plans for each watershed, which will identify, among other things, many opportunities for application of agroforestry practices that protect water quality. These circumstances suggest that the Conservation Authority in-field extension forces are a key element of the Province of Ontario's commitment to implementing all the recommendations of the Walkerton Inquiry. This offers a tremendous "multiplying" potential for the OMAF agroforestry team.

Recommendation(s):

That the agroforestry team at OMAF leverage the Conservation Authorities' capacity in this area by forging an even stronger link with this group of in-field extension staff

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Issue #3: Need to Develop a Comprehensive Policy to Support and Guide the Planting of Trees and Shrubs in Rural Ontario

Background

The Ontario government has a long history of supporting the planting of trees on agricultural and other lands in rural Ontario in order to meet a variety of objectives. As early as 1880, the provincial legislature developed mechanisms to promote tree planting along roadways. The evidence of this very early effort still marks the rural landscape of southern and eastern Ontario.

Throughout the 1900's over one billion tree seedlings were produced for private land plantings through the provincial

nursery system. In conjunction with the Agreement Forest Program and the Woodlands Improvement Act Program as well as in partnership with conservation authorities and the agricultural community, over 500,000 hectares of plantations were created.

Due to changing government priorities and fiscal constraints in recent years, most provincial level tree planting programs and supporting initiatives were curtailed in the 1990's. As a result, tree planting in rural Ontario has declined dramatically.

Recently awareness regarding the critical role trees can play in addressing environmental management issues such as global warming, water supply and quality as well as nutrient management concerns has increased. This has lead to a renewed interest in developing a comprehensive tree planting program for Ontario. The need for a comprehensive policy as well as the specific issues needing attention are outlined in two recent reports prepared by the Ontario Ministry of Natural Resources:

A Review of Current and Potential Seedling Production in Ontario.

Critical Review of Historical and Current Tree Planting Programs on Private Lands in Ontario.

The recommendations contained in these reports should be addressed through the development of a comprehensive tree planting policy for Ontario which addresses the needs of rural Ontario.

Recommendation(s):

That a comprehensive policy for tree planting be developed to support tree planting needs and guide tree planting activities over the next decade or more.

This policy should address the following specific items:

Need to outline the many benefits of tree planting in rural Ontario.

Need to address seed and nursery stock questions including appropriate seed sources for Ontario's climatic zones, best types of nursery stock, capacity of the private sector and administrative support needed.

Need for a reliable supply of source identified seed from native tree and shrub species adequate to supply the current and projected demands of rural Ontario.

Need to better identify lands available and suitable for tree planting in rural Ontario.

Need to better identify suitable species and calculate projected demand for nursery stock.

Need to determine appropriate pricing formula for nursery stock.

Need to consider the role and importance of natural successions of vegetation as an alternative to tree planting in same areas.

Target Agency(ies)

Ministry of Natural Resources, OMAF, MOE, MMAH

Issue #4: Need to Ensure an Adequate Supply of Genetically Appropriate Trees and Shrubs for Afforestation on farms and in other Rural Areas.

Background

One problem that has been mentioned in previous reports as a constraint is the availability of biologically appropriate (and "source-identified") nursery stock. The Forest Gene Conservation Association continues to progress in implementing a certification process for seed, seed collectors, and nursery stock. This important work will allow consumers to make an informed decision when trying to make an appropriate match between seed source and planting location, an important genetic consideration in agroforestry.

However, this certification system will not ensure availability of appropriate stock; it will only ensure that some stock on the market is source-identified. Appropriate nursery stock availability

for large scale planting programs continues to loom on the horizon as a major constraint to any nascent large-scale planting program, and a minor constraint to existing programs. This will be the case until demand for nursery stock is predictable several years into the future. Much demand is driven by incentive programs, such as the Rural Water Quality Program, and therefore availability of appropriate stock is tightly linked with predictability of long-term funding for tree planting programs. Long-term funding for tree planting incentive programs, therefore, needs to be known and trusted by growers before this problem will be solved.

Recommendation(s):

That steps to be taken to ensure an appropriate and sustainable supply of source identified native trees and shrubs is available to meet anticipated future demand in rural Ontario.

Target Agency(ies)

Ministry of Natural Resources; Ministry of Agriculture and Food; Conservation Authorities; Forest Gene Conservation Association

Issue #5: Need to Harmonize Grade Names and Standards for Pure Maple Syrup

Background

The production and marketing of maple syrup is often viewed in an international context. An increasing number of Ontario's maple syrup producers are becoming involved in the exporting of the product.

At the present time, the grade names and standards applied for packing maple syrup can vary by jurisdiction. The extent of the problem is not fully known. The Ontario Maple Syrup Producers Association (OMSPA) has requested that the grade names and standards be reviewed with the view towards harmonization. OMSPA has made this recommendation to the International Maple Syrup Institute (IMSI) and IMSI struck a committee in the fall of 2001 to study the matter and bring recommendations to the IMSI Board of Directors.

Recommendation(s):

That the grade names and standards utilized for maple syrup internationally be reviewed with the view towards harmonization.

Target Agency(ies)

OMAF, IMSI

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Issue #6: Maintenance of OMAF Website for Agroforestry

Background

OMAF is in the process of re-organizing and updating the information for Crop Technology on their website. This includes the Agroforestry Information component of the site.

Recommendation(s):

That both extension and research information be posted on the website.

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Issue #7: Packaging and Transferring Information Related to Agroforestry

Background

Over the past few years, OMAF has placed considerable emphasis on packaging and transferring agroforestry information to landowners/producers using a number of vehicles (e.g. Website, Manuals Info CD's, Fact Sheets, Information Notes, etc.)

There has been a request from industry that additional emphasis be placed on some of the shorter length materials in a variety of delivery venues. It is recognized that this needs to be balanced with other media (e.g. manuals, CD's etc.)

Recommendation(s):

That OMAF place some additional emphasis on short technical articles (e.g. Fact Sheets, Information Notes, and Page Summaries) and transfer the information through a variety of venues.

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Emerging Issues

Projected Increase in Demand for Source-Identified Nursery Stock for Tree Planting Programs

Over the past several years, public policy officials have developed an increased awareness regarding the value of trees in meeting environmental management objectives. In particular, there is growing interest in tree planting initiatives which would be specifically tailored to address societal and on-farm issues. These issues include global warming, nutrient management, maintaining water quality and quality, retirement of fragile lands and others.

However, it is evident that Ontario lacks the infrastructure to deliver large quantities of good quality, source-identified seed. There is an immediate need to develop a comprehensive provincial policy designed to guide tree planting programs in the future (Refer to Research and Service Recommendations).

Possible Adverse Effects of Global Warming on the Maple Industry

A recent study in New England, indicated that temperatures during the sugaring season have warmed by about 3.0 degrees F° or more in Rhode Island, Vermont and New Hampshire in the past 100 years. According to a Maple Case Study, maple syrup production in New England declined significantly in the past 100 years. Approximately 33% of this reduction was attributed to climate change.

Because the maple season is confined to a few weeks in the spring, it is potentially quite vulnerable to the potential affects of global warming including extreme fluctuations in temperature. In fact, long-term monitoring of maple production at the regional level could provide an excellent barometer of the effects of climate change.

Discussions should begin to evaluate the need for long-term monitoring of weather patterns and their impact on the health and productivity of sugar bushes.

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Sweet Chestnuts for Forests and Managed Orchards

Dr. Adam Dale of H.E.S. Simcoe, University of Guelph has identified a plant breeding opportunity to incorporate genetic resistance to chestnut blight disease into native Canadian sweet chestnuts. The project would require a long-term commitment of 20 years to develop the first resistant progeny. The project would initially focus on forest sweet chestnuts, which could also be adapted for use in managed orchards. The Trillium Foundation has provided some initial funding for the project in 2001. The Canadian Food Inspection Agency and MNR have been made aware of the project. Although some mild tolerance to blight infection may be present, there are currently no known sources of resistant sweet chestnuts in North America.

Grafted Black Walnut Cultivars

A project has been discussed and submitted independent of SONG (southwest) to establish a managed orchard on private land to evaluate several selected old cultivars of native black walnuts. The named or numbered walnut cultivars are maintained at an orchard museum at the University of Lincoln, Nebraska called the "Dr. Cyril Bish Nut Orchard Museum". Budwood of these selections can be ordered for grafting purposes. One nursery in Niagara offers several of these cultivars for sale as grafted true-to-name trees. This project would be considered additional to the cultivator study already in progress at HES Simcoe involving sweet chestnuts and Japanese heartnuts. The project may also be in line for funding after the Sweet Chestnut breeding project as described above which has also been initiated during 2001.

There are a number of private growers already testing native walnut cultivars on their own land. Native black walnuts have not been identified by SONG (south west) as having market potential but they have been discussed by the Northern Nut Growers Association as having potential value. Any new walnut industry will be competing with established commercial walnut industries of Washington, California and Oregon.

Walkerton Commission of Inquiry - Source Water Protection Plans

The Part Two Report of the Walkerton Commission of Inquiry recommends that all watersheds should have "source [water] protection" plans developed by the appropriate Conservation Authority. It further recommends that all-large or intensive farms, and all farms in "high risk" circumstances should be required to develop an individual source protection plan consistent with the watershed source protection plan. Riparian buffers, fragile land retirement to afforestation, and groundwater protection plantings are some of the agroforestry practices that would be prominent in source protection plans.

The Province of Ontario has committed to implementing all recommendations of the Walkerton Commission of Inquiry. When these two recommendations are implemented, therefore, it will cause the identification of thousands of locations where agroforestry practices are a priority as part of an overall source water protection strategy, and presumably, incentives will be put in place (or continued) to encourage their adoption.

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Proposed Agroforestry Research at the University of Guelph (2003-2008)

5. Results-Based Logical Framework Analysis (Agroforestry Research and Development, University of Guelph).

Overall Project Goal

To identify agroforestry research and service needs that will address societal concerns related, but not limited to, climate change mitigation processes, nutrient management and water quality through agroforestry-based land-use practices in Ontario.

Expected Results - Impact

Augmentation of C sequestration and reduction of GHG emissions in Ontario agroecosystems through agroforestry-based land-use systems.

Positive contributions to water quality and nutrient management through agroforestry-based land-use systems
Quantification of C sequestration rates in current agroforestry land-use systems in Ontario.

Performance Measurements - Performance Indicators

Quantification of potential C sequestration in marginal and degraded lands in Ontario through the adoption of temperate agroforestry systems.

Quantification of GHG emissions reduction (nitrous oxide) and GHG emission offsets (methane) in Ontario.

Improvement in water quality indices.

Quantification of efficient management of N fertilizers.

Assumptions/Risk Indicators - Assumptions

Environmental factors and Ontario climate remain the same with least climate extreme frequencies.

Sufficient research funding becomes available to execute individual project objectives.

More interaction / awareness among partners such as federal and provincial governments, private sectors, farmers, relevant industries, environmental and non governmental groups etc. is possible.

Policy issues relevant to agroforestry land-use are promoted (provincial or national)

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Specific Project Objectives

1. To develop a GPS / GIS database for all agroforestry systems in Ontario

Outcomes

Availability of reliable and accurate provincial agroforestry related research, social, environmental and statistical data.

Performance indicators

Development of GPS coordinates and mapping of all agroforestry related land-use systems in Ontario. Development of various GIS information/data layers for provincial agroforestry systems (e.g. C sequestration numbers, GHG emission reduction numbers, site specific growth indices for tree species in agroforestry systems)

Assumptions

Same as above

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Specific Project Objectives

2. To quantify C sequestration and to model C dynamics in province-wide agroforestry-related land-use practices (e.g. tree-cereal intercropping, orchard tree-based intercropping, windbreaks, riparian buffer strips, silvopasture, forest farming etc.)

Outcomes

Provincial C sequestration values for various temperate agroforestry systems will become available. This information will be of value to climate change mitigation processes, policy development etc.

Performance indicators

C sequestration 'numbers' for tree-cereal intercropping, orchard tree-based intercropping, windbreaks, riparian buffer strips, silvopasture, forest farming systems in Ontario

Assumptions

Same as above

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Specific Project Objectives

3.1 To quantitatively measure nitrate-nitrogen losses from an intercropped system and from an adjacent monocropped system.

Outcomes

Efficient utilization of N fertilizers and less detrimental impacts on the environment through tree-based intercropping systems

Performance indicators

Quantitative measurements of nitrate-nitrogen losses from an intercropped system and from an adjacent monocropped system.

Assumptions

Same as above

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Specific Project Objectives

3.2 To quantitatively assess the nitrate-nitrogen capturing ability of fast growing and slow growing tree species in an intercropped situation.

Outcomes

Documentation of nutrient cycling ability of fast-growing and slow-growing tree species in agroforestry systems.

Performance indicators

Quantification of nutrient cycling by trees in agroforestry systems

Assumptions

Same as above

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Specific Project Objectives

3.3 In conjunction with 3.1 and 3.2 to validate the existing hypothetical model of N-cycling in intercropped and monocropped situations.

Outcomes

Creation of N cycling model for tree-based intercropping systems and for conventional agricultural systems in Ontario

Performance indicators

N cycling models for tree-based intercropping systems and conventional agricultural systems.

Assumptions

Same as above

Specific Project Objectives

3.4 To quantify N₂O reduction potentials in tree-based intercropping systems.

Outcomes

GHG emissions reduction potentials in tree-based intercropping systems

Performance indicators

Quantification of N₂O emission reductions.

Assumptions

Same as above

Specific Project Objectives

4. Improving rural water quality through tree-based agroforestry systems

Specific Project Objectives

To quantify potential bacterial pollution from agricultural practices using *E. coli* NAR as a biotracer.

Outcomes

Documentation of bacterial pollution from agricultural practices and proving the usefulness and efficiency of using *E. coli* NAR as a biotracer.

Performance Indicators

Bacterial contamination and runoff data from agricultural fields

Assumptions

Same as above

Specific Project Objectives

To determine the extent of bacterial movement from manured tree-based intercropping fields and from manured conventional agricultural fields through tile drains to surface water under normal agricultural practices.

Outcomes

Potential reduction of bacterial contamination through tree-based intercropping systems.

Performance Indicators

Quantification of water quality indices for both systems

Assumptions

Same as above

Specific Project Objectives

From objective 4.2, to quantify the bacterial filtering ability of tree roots in tree-based intercropping systems.

Outcomes

Identification and documentation of low-cost but potentially efficient tree-based filtering mechanism

Performance Indicators

Quantification of the filtering capacity of fast-growing tress species in a tree-based intercropping systems

Assumptions

Same as above

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Specific Project Objectives

5. Remote sensing applications in agroforestry systems

Specific Project Objectives

5.1 Acquisition, processing and calibration of Compact Airborne Spectrographic Images (CASI) to generate CASI-hyperspectral reflectance data for the agroforestry test site, University of Guelph.

Outcomes

Development of a new methodology to derive information from CASI- hyperspectral reflectance data and compare that with ancillary ground data sets so that CASI images could be used to measure agroforestry related parameters.

Performance Indicators

Acquired, processed and calibrated CASI data for the agroforestry test site, University of Guelph.

Assumptions

Same as above

Specific Project Objectives

5.2 To quantify and model C sequestration rates in tree-crop ecosystems (introducing trees into agroecosystems to augment C sequestration in agroecosystems) and to explore relationships to CASI reflectance imagery.

Outcomes

Development of C sequestration model based on CSAI reflectance imagery.

Performance Indicators

Quantified C sequestration values for tree-based intercropping systems using CASI data.

Assumptions

Same as above

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Specific Project Objectives

5.3 To quantify N transfer from tress to associated crops using CASI- hyperspectral data - for better N management in agroecosystems and to quantify the potential reduction in N2O emissions from agroecosystems.

Outcomes

Development of a methodology with the use of CASI- hyperspectral data to monitor and enhance N use efficiency. This information will be valuable for precision farming and for the use of Variable Rate Technology (VRT).

Performance Indicators

Nitrogen (N) transfer from trees to associated crops will be determined by comparing CASI measurements of test plots of fixed N application to CASI measurements of the tree-crop plots. In this manner N calibration of the hyperspectral data will be developed allowing better N fertilizer management in agroecosystems. This will also lead to quantification of the potential reduction in N₂O emissions from agroecosystems, a major source of greenhouse gas emissions.

Assumptions

Same as above

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Ontario Apiculture and Pollination Research and Services Subcommittee

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**Ontario Apiculture and
Pollination Research and Services
Subcommittee**

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Apiculture and Pollination Chair Report

This year's meeting was different from anyone that I had previously attended. The uncertainties within the Department of Environmental Biology at the University of Guelph around the apiculture program appeared to affect the spirit of the day's discussions. Also several OBA members were unable to attend due to illness and unexpected delays. The attendance was far smaller than usual. Hopefully these matters will be sorted out by next year and vibrancy will return to the discussions.

On a lighter note, the committee applauded Doug McRory's performance as Provincial Apiarist. Last June his Program was reviewed, the first time since the early '90s, and only minor changes were deemed necessary. Basically a clear track record, and the beekeeping industry is happy with the support OMAF is providing and program personal.

In the "Resource Package for OHCRSC Subcommittee Chairs" there is a section on "Gathering input between meetings", including sample questionnaires. As a committee member I drafted and presented a "Research Project Assessment Form" to use as a template to encourage input from committee members between meetings, for use by the research community. As Dr. Scott-Dupris pointed out in the discussions, just having such a document can help researchers focus their thoughts when deciding on research projects. The committee members will have a year to think about this concept and can decide at next years meeting about adopting it.

I look forward to serving for another year as chair of this sub-committee.

Yours in beekeeping,
David Vander Dussen

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Apiculture and Pollination State of the Industry

Current State of the Beekeeping Industry - 2002 (D. McRory)

This has been an exceptional production season for most beekeepers in Ontario. The average production that was reported at the August commercial meeting was 120 pounds per hive. There was an excellent honey flow into early September as well. The price for bulk honey has been unexpectedly high at \$2.00-2.25 per pound. These high prices may have a detrimental effect on those beekeepers that had built up their markets beyond their own production capacity. Many of them are not able to meet the higher prices as the retail market is lagging behind with increases. Many will not have the volume of honey to supply their normal markets and may loose their market share with the present high prices.

Varroa mites are now throughout Ontario except in the Thunder Bay area. Resistance to Apistan has occurred in the eastern area of Ontario. It has now been confirmed in Niagara and Haldimand-Norfolk regions. An Emergency Use Permit is in place for Check-Mite Strips for the counties east of Frontenac until December 31, 2002. It is expected that this Emergency Use permit will be renewed for 2003 and the area expanded to include Niagara and Haldimand-Norfolk.

All other border areas were tested with negative results. It will be important for all beekeepers across the province to report any incidences of high Varroa populations to the bee inspectors so that follow up testing can be done. The Niagara and Haldimand-Norfolk finds of resistance do not relate to movement across the border. We are reaching the limit of the life of Apistan without an alternative to alternate with to extend the life of both chemicals. The spring of 2002 was particularly cool and the present application methods of Formic did not give the level of control as would be desired. Therefore Varroa populations were very high going into fall. The late fall honey flow did not contribute to getting Varroa treatments on in a timely manner. There was Varroa damage to colonies in the fall of 2002 and undoubtedly will show up with higher winter loss. NOD industries has worked with the OBA Tech-Transfer Program to develop a better application method which they hope to have in place for the spring of 2003 to off set the kind of problems that occurred in the spring of 2002. The hygienic testing and now the Harbo tests are continuing with the bee breeders to develop bees that are resistant to Varroa. The Russian stock, which is showing good resistance to Varroa, was brought in for the third season. It will be necessary to keep bringing stock as long as the USDA keeps releasing stock. Francois Petit will be established as the "Breeder" for the Russian stock and will have queens available for beekeepers in the Apistan resistant areas next spring as he is in the area in Eastern Ontario. Two other Ontario beekeepers have the Russian stock and may have queens available for those outside the area.

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Honey Bee Tracheal Mites (HBTM) continue to spread slowly. About 45 % of the colonies have both mites. Again, Thunder Bay has neither mite. Even with the cool conditions, HBTM was well controlled with the spring treatment of Formic Acid. The HBTM breeding work with the "Quick Test" continues with the Bee Breeders.

Resistance to Oxy-tetracycline has not occurred in Ontario to date. Samples of American Foulbrood (AFB) have been sent to the Beltsville Lab of USDA for conformation. Beaverlodge Research Station is taking the lead on getting two alternate products registered. As Provincial Apiarist I have been assisting in any way possible, as the companies are located here in Ontario.

The sweet corn spray problems were moderate this past season. It would be expected that they would have been higher considering the drought conditions this summer. There was a change made to the "Protocol" whereby the beekeepers were to send their current locations with bees to the sweet corn processing companies. There will be a meeting this winter of all involved groups to review the process and recommend changes to the present process. Canadian Honey Council has approached PMRA to establish a pesticide compensation fund for such losses.

Small Hive Beetles (SHB) have not been found in Ontario but were found at MacGregor, Manitoba. Apparently they were brought in on a shipment of beeswax cappings being rendered at MacGregor Wax Works. A beetle was found in a pollen trap about one mile from the plant. The federal government did not take any action, as SHB is not named Federally. The province is monitoring the situation. The Wax plant did a major clean up to prevent further problems.

A review of the OMAF Apiculture Program was held this past season. No major changes resulted from the review.

Bears have been more of a nuisance to beekeepers this past season. The incidence of bear problems has increased and the locations of damage have spread over a larger area into southern Ontario.

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Apiculture and Pollination Activities in the Last Year

The committee met on November 5, 2002 at the OMAF building in Guelph.

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Apiculture and Pollination Accomplishments

Relative impact on foraging honey bees of integrated strategies for control of European corn borer, *Ostrinia nubilalis*, attacking sweet corn.

Janisse Bailey and Dr. Scott Dupree

Draft Recommendation for OAPR&S Sub-Committee

Peter Hallett

Report to Apiculture and Pollination Sub-Committee of Ontario Horticultural Crops Research and Services Committee - Pollination and Related Activities

Peter G. Kevan

Influence of protein surplus and deficit on worker bees and their colonies

Heather Mattila (PhD Student, Environmental Biology) and Gard Otis

Effects of drone size on fitness: effects on sperm

Gwynne McAneney (MSc Student, Environmental Biology) and Gard Otis

Storage proteins in wintering honey bees

Gard Otis, Diana Wheeler, Norm Buck, and Heather Mattila

(Environmental Biology, University of Guelph, and Entomology, University of Arizona)

2002 Report by The Ontario Beekeepers' Association Tech-Transfer Program

Alison Skinner, Janet Tam and Shannon Melin

Varroa Infestation Levels of Honey Bee Colonies During The Fifth Year of A Breeding Program: Report For 2001

Tibor I. Szabo and Daniel C. Szabo

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Apiculture and Pollination Emerging Issues

Resistance Varroa mites in Cornwall, Niagara and Haldimand-Norfolk areas are the greatest biological problem facing beekeeping in Ontario in 2003.

Possible Solutions

Register Choumpos.

Register or obtain similar exemption for Oxalic Acid as Formic Acid.

Through extension, have beekeepers adopt screened bottom boards to give about 40% control of Varroa.

Through extension, have beekeepers adopt putting two shallow frames in each brood chamber and cut off the drone comb that the bees build to give about 40% control of Varroa.

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Resistance of American Foulbrood (AFB) to the only registered chemical - Oxytetracycline.

Possible Solutions

Register both Tylosin and Lincomycin in Canada.

Continue to monitor the susceptibility to Oxytetracycline of colonies that breakdown with AFB and destroy them by fire or irradiate them.

Through the Tech-Transfer Program, continue to develop hygienic stocks of bees with the Ontario Bee Breeders.

Through the Tech-Transfer Program, continue to develop the Harbo suppression of mite reproduction trait in the Ontario Bee Breeder's stock.

Through extension, have beekeepers adopt changing their stock over to the HBTM resistant, hygienic and suppression of mite reproduction stocks that are available from the Ontario Bee Breeders.

Small Hive Beetles.

Possible Solutions

Register Check-Mite ®

Do surveys near high risk areas.

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Apiculture and Pollination Research Priorities

Research Priority 1: Development of Varroa Mite-Resistant Bee Stocks Using Different Selection Approaches and Integrating Resistance into Ontario Tracheal Mite-Resistant Existing Bee Stocks.

Varroa mites continue to be a major concern. These mites can annually kill 50-70% of bee colonies if infested colonies are not treated. Breeding bees resistant to varroa is the long-term solution to this problem. Research has shown that hygienic behaviour, grooming behaviour, and low mite reproduction is important natural traits possessed by honey bees for varroa control. We need to continue the selection program for breeding these traits into the Ontario tracheal mite-resistant bees to reduce the effect of Varroa in Ontario. The continued import of the "Russian" stock from the United States is a priority to widen the genetic base of this Varroa resistant bee. Thus, Ontario bee stocks will be resistant to both mites, and beekeepers will gain the benefits of using these bees in the IPM program.

Research Inventory:

These four items have been part of the OBA Tech-Transfer Program and need to remain as priority items. The importation of the Russian Bee Stock needs to continue as long as the U.S. project keeps releasing new genetic lines of this stock.

Gap/Barriers/Opportunities:

The development of resistant stocks to mites is a tedious and expensive process. It requires a long period of time for selection, development and implementation. We have personnel who are trained in the use of instrumental insemination techniques for breeding. This allows the transfer of genetic materials (eggs and semen) without bringing any other possible pests and diseases. This research is well under way but continuing resources are needed to complete this project. The Tech-Transfer Program should carry on another importation in 2003.

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Research Priority 2: Further Development of an Effective Integrated Pest Management (IPM) Program for Controlling Parasitic Mites, Small Hive Beetles and Infectious Diseases of Honey Bees.

Apistan® is currently effective on varroa mites in most of Ontario. Resistance has been shown in Cornwall, Niagara and Haldimand-Norfolk areas. The continuous use of Apistan® on varroa is leading to the development of resistance across the province. Development of new miticides to be alternated with Apistan® will help to reduce the emergence of resistance to Apistan®. We have developed an effective single application method for Formic Acid to be used in rotation with Apistan®. However, Apistan® is nearing the end of its life expectancy. Therefore, we need to find a replacement strategy for Apistan®. If possible it would be good to develop other "softer" chemical controls that work in Ontario i.e. oxalic acid or non-chemical methods like screened bottom boards and drone brood removal.

Terramycin resistant strains of American Foulbrood have been found in parts of Canada on a large scale. It has not been found yet in Ontario. There is a need to develop an IPM strategy to deal with AFB.

Research Inventory:

The IPM program for Varroa and Tracheal mites has been part of the OBA Tech-Transfer Program. The development of the IPM component for AFB is new addition to this program. Therefore, the IPM program remains as an important priority issue.

Gap/Barriers/Opportunities:

Recent research by the OBA Tech-Transfer program has shown that Oxalic acid is a promising chemical to be used for varroa control. More research is needed to study the side effects on bees and to try to register this product to use in honey bee colonies. Formic Acid needs to be fully registered and more work needs to continue on application methods. Other tools can also be evaluated against mites.

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Research Priority 3: Concern over how Imidocloprid affects honey bees.

The beekeeping industry is still concerned about the sub-lethal effects being reported out of France. The debate as to whether it is a problem to honey bees has not been resolved.

Research Inventory:

There has been some research conducted in this area but more is needed to resolve the question. Sub-lethal effects of all new pesticides need to be investigated before they are registered.

Gap/Barriers/Opportunities:

The Canadian Beekeeping Industry would like to see research projects conducted by researchers independent of the registering company, to answer the question of sub-lethal affects of all new crop protection products, and how honey bees are affected. This should be a requirement of the registration process and should be financed by some agency other than the registering companies to give complete impartiality.

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B. Pollination Issues

Research Priority 1: Management Strategy for Machine Harvested Cucumbers.

Cucumber is a crop grown in south - western Ontario. Large acreage has been grown every year. The pollination requirements are not well defined. To ensure a high quality crop, pollination is needed. Studying factors affecting pollination efficacy and requirements is needed to serve both cucumber growers and beekeepers.

Research Inventory:

The University of Guelph, Pollination laboratory has the trained expertise in the field of pollination ecology and biodiversity. So far, in order to solve this issue, the cucumber growers and the beekeepers have sponsored research.

Gap/Barriers/Opportunities:

More research funds need to be allocated to conduct the necessary research. The OMAF research program at the University of Guelph can focus on providing some resources to study this problem. Any increase in cucumber pollination will help increase the cash return to beekeepers and growers.

Research Priority 2: Pollination Requirements of New Varieties of Apples.

Mites have exterminated feral honey bees. This part of the pollinator force available for crops has disappeared. Wild bee populations have also been extensively reduced. High-density apple orchards are annually increasing. Therefore, the apple pollination requirements should be reevaluated. Examination of the genotypes of apple seeds in ripe fruit is needed to map and quantify the extent of gene and pollen movement in orchards.

Research Inventory:

The University of Guelph, Pollination laboratory has been working on this issue.

Gap/Barriers/Opportunities:

Financial support from the industry and the OMAF program at the University of Guelph are needed. The OMAF research program at the University of Guelph stopped their support in 1999-2000.

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Research Priority 3: The importance of actively encouraging education and research on alternative pollinators.

Research Inventory:

Dr. Peter Hallett continues to work on designing nesting materials to utilize native pollinators in a managed environment, in order to provide pollination services.

Gap/Barriers/Opportunities:

Dr. Hallett is encouraged by this committee to continue this work.

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Apiculture and Pollination Service Priorities

Service Priority 1: Maintenance and Enhancement of the Apicultural Laboratory Services through the Bee Inspection Program.

Service Inventory:

Brenda Perrin and Jim Anderson provide Lab services to the beekeeping industry of Ontario. The new microscopes that were added during the past two seasons added greatly to this program ability to function efficiently.

Gap/Barriers/Opportunities:

With the mites and now the resistant mites, this is a critical service and needs to be maintained and enhanced.

Service Priority 2: Continued support for the ban on the importation of honey bees to Canada from mainland United States. Ontario beekeepers feel that there are too many problems with American bees to consider opening the border to them.

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Service Priority 3: Registration of CheckMite™ (Coumaphos). This pesticide is the only registered product for controlling the small hive beetle in the world. It is also effective against Varroa. As Ontario has Apistan® resistance and Check-Mite® was given an Emergency Use Permit the committee supports full registration of CheckMite™.

Service Inventory:

Beekeepers have some concerns about this product but this is the only product registered in the world to control the Small Hive Beetle and Varroa mites that are resistant to Apistan®. We encourage finding a safer, friendlier product to be used.

Gap/Barriers/Opportunities:

Dr. Don Wilson of Bayer has worked on registration of CheckMite™ (Coumaphos). If full registration can not be achieved for this product the committee supports a renewal of the Emergency Use of CheckMite® through Health Canada - Pest Management Regulatory Agency (PMRA).

Service Priority 4: Federal Registration of Formic Acid Mite-Away. This product can be used under the current exemption of formic acid as allowed by the PMRA. A full registration is required to maintain the use of this product. The committee supports the full registration of Mite-Away through PMRA.

Service Inventory:

The OBA Tech-Transfer specialist and NOD Industries have developed the Formic Acid Mite-Away pad.

Gap/Barriers/Opportunities:

Beekeepers have been using Mite-Away for tracheal and Varroa mite control. The use of the pads is covered under the PMRA memorandum for use of Formic Acid in bee colonies in Canada. NOD Apiary products is pursuing the full registration of this product. The committee supports the full registration of this product to be added to the approved tools for the IPM program.

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Apicultural Tech-Transfer Priorities

Tech-Transfer Priority 1: Maintenance of the Apicultural Regulatory and Extension Programs in Ontario.

The Apicultural Regulatory and Extension Programs have played an important role in the beekeeping industry in Ontario. New problems such as resistance of Varroa to Apistan®, SHB and the possibility of resistant AFB are important issues that could seriously affect the beekeeping industry. Inspection and monitoring of diseases and pests have become very important in implementing the IPM program in areas where it is needed. Educating beekeepers about new techniques for management of bee diseases and pests remains critical across the province.

Tech-Transfer Inventory:

OMAF has a Provincial Apiarist and 22 part time bee inspectors. These personnel are deployed across the province to inspect, monitor and educate beekeepers.

Gap/Barriers/Opportunities:

With the finding of new pests and diseases just across the US border, the Apiculture Regulatory and Extension Program has become very important to the beekeeping industry. This team has tremendous experience in sampling and monitoring pests and diseases. Any additional hours available in this program area would help to maintain the industry ahead of the potential problems.

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Tech-Transfer Priority 2: Maintenance of the OBA Tech-Transfer Program

The OBA Tech-Transfer Program has played a crucial role in developing the current Integrated Pest Management Program for Honey Bees in Ontario. Breeding of bees resistant to Honey Bee Tracheal Mites, hygienic behaviour, non mite reproduction and introduction of Russian stock are all examples of Tech-Transfer items that have been developed through this program in the last nine years that have contributed to the health of the beekeeping industry in Ontario.

Tech-Transfer Inventory:

The OBA has run a very successful Tech-Transfer Program where they have been able to have a full time researcher work with student assistants to carry out projects that are high priority for the industry. This has been a very efficient use of the resources and the industry is very proud of the Bee Breeding and IPM Programs that have been developed and delivered in close co-operation with the OMAF Apiculture Program.

Gap/Barriers/Opportunities:

The committee supports continued financial support by OMAF to the OBA to maintain this critical program.

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Tech-Transfer Priority 3: Monitoring for Varroa Resistance to Apistan® and Check-Mite ®.

The development of resistance to Apistan® by Varroa mites is expected. It has now been confirmed in Cornwall, Niagara and Haldimand-Norfolk regions. Resistance to Check-Mite ® has not been shown in Canada to date but is wide spread in the US. Ontario could either develop Check-Mite ® resistance from within or it could spread across the border to Ontario. Continuous monitoring of the efficacy of Apistan® and Check-Mite ® and resistance by mites is a very important issue. Beekeepers would not like to be surprised by the fact that Varroa has survived the treatment and killed their colonies.

Tech-Transfer Inventory:

The bee inspectors of Ontario are involved in the monitoring process. The OBA Tech-Transfer Program has been following up the monitoring for resistance across Ontario with follow-up conformation testing.

Gap/Barriers/Opportunities:

Testing of monitoring methods needs to be ongoing. Resources dedicated to this critical area.

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Tech-Transfer Priority 4: Registration of Tylosin and Lincomycin

The development of resistance to Oxy-tetracycline in Canada is a real concern.

Research Inventory:

Research has been done in the United States to show that these two products are safe and efficacious for controlling r-AFB and residues are not a problem. Beaverlodge Research Station in Alberta is taking the lead on this project in Canada.

Gap/Barriers/Opportunities:

The Provincial Apiarist is working with Beaverlodge Research Station, CHC, Elanco and Pharmacea-Upjohn to bring about the registration of these products. These products, once registered, will be recommended to Ontario beekeepers in an IPM Program to rotate all three so we do not develop resistance to any particular one of them. The committee supports the registration of these antibiotics for use in honey bees through Health Canada - Veterinary Drugs Directorate.

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Tech-Transfer Priority 5: Quality of Hive Products to Meet Consumers Expectations.

The continuous use of miticides and antibiotics in bee colonies increases the risk of contaminating the hive products

(honey, wax and propolis) with residues. If the residues exceed the allowed limits, the products cannot be marketed. Monitoring residues in hive products needs to continue to ensure high quality and no contaminants as expected by the consumers.

Tech-Transfer Inventory:

As each new product or method of application is developed for a specific problem, the residue work must be done. Once the product is on the market follow up surveys are necessary to see if over time accumulation of the product is occurring.

Gap/Barriers/Opportunities:

The cost of sample analysis is very high although this issue is an important issue for food safety and quality. More resources need to be allocated for monitoring the program to ensure food quality. Finding any residues will affect marketing of hive products. It also can be a concern for consumers.

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Apiculture and Pollination Recommendations

Recommendation 1: Registration of CheckMite™ (Coumaphos)

The committee supports Bayer's application for full registration of CheckMite ® through PMRA. If full registration can be achieved for this product the committee supports a renewal of the Emergency Use of CheckMite ® through PMRA

Recommendation 2: Federal Registration of Formic Acid Mite-Away

The committee supports NOD Industries application for the full registration of Mite-Away Formic Acid Pads through PMRA.

Recommendation 3: Registration of Tylosin and Lincomycin

The committee supports the registration of Tylosin ® by Elanco and Lincomycin ® by Pharmacea-Upjohn for use in honey bees through Health Canada Bureau of Veterinary Drugs.

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Apple Research and Services Subcommittee

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Apple Research and Services Subcommittee

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State of the Industry

2001 Crop

The industry went into the marketing of the 2001 crop one year ago on an optimistic note. It was a medium sized crop and the crop on the West Coast was not overly large. Without advertising and promotional activities or any way to gather and disseminate market intelligence, Ontario marketers still considered the local crop manageable. Prices were firm at good levels. This was the case throughout the marketing season and most varieties yielded fair returns. McIntosh was the exception. It became evident by early 2002 that this variety was not holding up in storage. Fruit pressure levels dropped and this caused a great deal of pressure bruising. Gradeouts were as high as 50%. Although sales volume for this variety remained good, the poor packouts yielded disappointing returns for producers.

2002 Crop

The 2002 growing season presented growers with many difficulties. Unseasonably warm temperatures in early April advanced tree maturity significantly. An early bloom was then hit with frosts of varying intensity. Across the province crops ranged from very good to very poor, from full crops down to 10% crops.

2002 was a very dry summer and fruit size was affected where crops were present. The result at harvest was variable crop size, variable fruit size and variable fruit quality. This in turn raised harvest costs dramatically.

Overall, the provincial crop is down 26% from last year and 38 % from the 5-year average. Fresh apples are down 35% from last year and 42% below the 5-year average. With this small volume prices for fresh and processing apples are very firm. But storage operators are struggling to keep overhead costs down and marketers are losing shelf space to western competitors. It will have to be bought back in coming years.

Many areas of the province were disturbed by a significant increase in Codling Moth numbers. Oriental Fruit Moth infestations increased dramatically from Niagara to Norfolk to Essex. It was found in Georgian Bay. There is fear of export quarantines being placed on our fruit due to either of these pests. Eastern Ontario reported scale on the increase and problems with white apple leafhopper. Georgian reported some problems with scab and severe cases of powdery mildew.

There is still no grower organization in place to give a united voice to the industry or collect funds for research purposes. There continues to be a need for input and comment on legislation. Without an organization and accountability framework it is difficult to do these things. The Apple Steering Committee is a volunteer group of apple producers from across the province charged with trying to reorganize the industry. They operate out of an office at the OTFPMB with producer donated funds. This summer they circulated petitions to request a producer vote by OFPMB. There was good support from producers, packers and processors alike to move forward with the formation of a new organization. It is hoped that Farm Products will conduct a vote in the spring of 2003 and perhaps a new organization will be in place by the end of that year. The industry has dire need for leadership for the future.

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Service Issues Identified

Qualified Labour

OMAF's payscale for summer experience students is at minimum wage. This is inadequate compensation for students who are given responsible scouting and data collecting duties in IPM and research activities. As a result the best of these students look elsewhere and not to OMAF for meaningful summer experiences. IPM and research are left with less than

qualified and conscientious summer help. Negative impact has already been experienced.

With sectors like the nursery business it is getting tougher to find good qualified people for work in skilled horticulture positions and most of the work is being taught to offshore labour crews.

Lack of Independent Extension Workers

More and more knowledge is being transferred by chemical company representatives whose marketing priorities are sometimes in conflict with those of good IPM practice. This will eventually erode the IPM system, as we know it. IPM is seen by the Agricultural Community as being largely done for "Public Good" and as such the Government has a role to play. The model that is being used in OMAF is better suited to the agronomic crops like corn, beans and wheat rather than horticulture crops which require more frequent attention during the growing season.

IPM Support Models

The discussion reflected on the need for support of IPM groups. By comparison, the ones currently in operation in the Province of Quebec receive support from Government if certain criteria are met.

The point was made that more support should accrue to growers or grower groups for adoption of IPM protocols. The problem is that there is no continuum of expertise in the field. People in the field are suffering from lack of expertise.

For a more complete listing of Research and Specialist Activities, refer to the January 2002 Report.

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Apple Research Issues Ranked by Priority

Sustainable IPM Systems

- Internal Lepidoptera (OFM, CM)
- Fireblight Strategies with impending loss of Streptomycin
- Emerging Pests (Dogwood Borer, Sawfly)
- Alternatives to Organophosphate and Carbamate Insecticides
- Resistance Management of Insect pests
- Disease Management Strategies

Post Harvest Strategies for Quality and Safety Assurance

1-MCP, Storage Technology
Disease Control, Fungicide Resistance
Antioxidants and Bioflavanoids

Production Management

Cultivars Specific Recommendations
Thinning and Growth regulators

Accomplishments

OMAF Service Accomplishments and Some Highlights From 2002

Publication 360

Volume of information increased by 70 pages. Publication is now 295 pages in length. Includes several updates for example ... thinning recommendations now include specific information on how to deal with adverse weather, frost and set variability as a component of crop load management strategies.

ONNL

The Orchard network newsletter published 62 pages of original information during 2002. We now have sponsorship to help with the cost of distribution. Mailings are handled by Kelly Blyth in the Apple Growers Steering Committee offices in St. Catharines. Writing and printing costs are handled by OMAF. Editor: John Gardner, Assoc. Editor Dr. Jennifer De Ell

Consultant Training

A training session for consultants and scouts was held in March of 2002 organized by Kathryn Carter. Several Crop Tech Staff helped to make the session meaningful and thorough.

Weekly IPM Conference Calls

Funded and supported by OMAF and Chaired by Kathryn Carter. This venue included an hour-long discussion with consultants and field advisors. These briefing sessions were held on Friday throughout the growing season. Attendance was consistent on a weekly basis with representatives calling in from all apple-growing districts.

IPM Conference

Held in March of 2002 in Toronto. Included several international speakers and provided a forum for exchange of information on IPM for the Ontario Horticulture Industry. Organized by Margaret Appleby.

Apple Program OHCC

A very successful program was held in February at the Hamilton Convention Center.

Average attendance per session approached 100 individual growers. Consultant attendance was also very good with credits being offered for certification.

IHC

An international group of scientists, consultants and researchers were toured within Ontario on August 17th of 2002. This was part of the International Hort Congress Proceedings. John

Gardner and Dr. John Cline organized the tour. Some good international contacts were made as a result of this activity.

Food Safety Practices...Unpastuerized Apple Cider

In the Production and Distribution of unpastuerized Apple Cider ... a manual produced by OMAF describing risk, tools, resources and practical instructions regarding safe production practices. Reference: John Henderson

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Recommendations

Recommendation # 1

Issue

The postharvest facilities at Vineland have been closed, current facilities at Simcoe are outdated and not very extensive, and facilities at Guelph are over 40 years old and in poor shape. To ensure the long-term viability of this important research and teaching area new, state-of-the-art postharvest research and educational facilities need to be constructed at the University of Guelph (Guelph and Simcoe campuses). These would house current and future faculty (including a possible Canada Research Chair in Postharvest Physiology), technical staff, graduate students, postdoctoral researchers and visiting scientists.

Background

The fresh tree fruit sector has indicated the need for construction of proper and more modern postharvest research space in Ontario.

Spending on agri-food research, and postharvest research specifically, is limited even though the industries involved with fresh fruits, vegetables and ornamentals, and related food products (e.g., value-added, fresh-cut, minimally processed, etc.) contribute significantly to the economy. Canada imports fresh commodities and food products worth over \$ 3 billion to meet market demand. Ontario contributes greater than 50% of the national economy related to fruit, vegetable and ornamental crops, and thus has a vested interest and tremendous need to enhance the amount of strategic research performed in the postharvest sector. Ontario has export markets that could be enhanced by postharvest technologies that improve quality, shelf life, etc. Also, there is considerable public interest in the role of fruits, vegetables and plant products in disease prevention and health restoration, as consumption of fresh products containing functional food ingredients is on the rise.

A thorough understanding of the physiological factors and biochemical changes affecting problems with postharvest storage, handling and quality of horticultural commodities are areas that need extensive investigation both at a fundamental and applied level. A facility dedicated to advanced research and education in postharvest biology and

technology will bring together Ontario researchers in this field and should promote local, regional, national and international interaction and collaboration.

Recommendation

That the University of Guelph build and equip new, state-of-the-art Postharvest Research and Educational facilities with the support of fruit, vegetable, and ornamental sectors of the Ontario horticulture industry.

Target Agencies

Dr. Alan Wildeman, Vice-President (Research), University of Guelph
President, OF&VGA
Chair, Apple Growers' Steering Committee
Executive Director, Flowers Canada
President, CHC
Director, Crop Technology Branch, OMAF

OASCC Linkages

Ontario Horticultural Crops Research and Services Committee

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Recommendation #2

Gaps in Delivery of IPM to Ontario Apple Growers

Issue

The continuum of excellence in IPM for Ontario apple growers is in jeopardy of failing. Both the service and developmental components of IPM need to be maintained and strengthened. There appears to be a loss in usage of IPM programs by some segments of the industry. With these losses, any gains in practicing environmental sustainability could also be threatened.

Background

The Ontario apple industry has long been regarded as a leader in IPM acceptance and adoption in North America. Apple growers are well versed in IPM due to their commitment to attending workshops, schools, demonstration projects, Environmental Farm Plan workshops.

In 2000, the service and delivery component of the apple IPM program was passed over to independent consultants as result of the OMAF realignment. OMAF retained a role in continued development of IPM and support for field advisors. In many areas, these programs are well run. However, there are a few regions in Ontario where the program is weak or non-existent due to a lack of affordable or easily accessible and unbiased expertise.

In the last three years, Ontario apple growers have continued to have access, through funding from the provincial government, to an agriphone service that provides updates on pest population abundance and some basic elements of IPM strategies. With the end of this funding, the growers will now carry the cost of this service. This is an expense that

many growers may not be able to afford due to difficult financial times.

IPM is a constantly changing and dynamic program. Growers and consultants need to be up-dated constantly. Growers need to be well versed in new techniques to manage resistance and require the confidence to adopt strategies on chemistries and techniques that are both beneficial to the environment and the economic health of the industry.

Ontario apple growers now carry the full cost of implementing of IPM on their farms. This cost will increase as growers continue to move towards using IPM friendly products, which are often more expensive than pesticide intensive programs. These newer strategies can require a more finely tuned usage recommendation. The benefits of IPM include a reduced environmental impact. This benefits all Ontarians as a public good. As a result, growers should not have to be responsible for the full cost of IPM programs. Included in the "public good" domain are the following:

- Cleaner air, water and soil
- Enhanced biodiversity within the orchard ecosystem
- Reduced risk disease, insect, and weed management programs.

Recommendation

Innovative mechanisms need to be developed to maintain and increase the adoption of IPM by growers. IPM expertise in the field should be maintained and strengthened by providing training and mentorship opportunities for consultants.

Ontario government continue to provide hands-on expertise for growers through demonstration trials

OMAF be committed to the testing of newer non-pesticide technologies.

The Ontario government must support the adoption of IPM through financial incentives to growers adopting IPM on their farms.

Target Organizations

OMAF

OASCC Linkage

OHCRSC

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Recommendation #3:

Issue

Currently there is a misalignment of funding resources and research mandates with industry priorities.

Background

OASCC committees spend a significant amount of time and energy determining which research priorities best address the needs of the industry, and research projects undertaken by OMAF, AAFC, and U of G should address these priorities.

OASCC recognizes the continued support of several key researchers in addressing industry priorities. However the committee feels that there are several important issues for the apple industry that have been identified in previous reports, and have not been adequately addressed by researchers (oriental fruit moth and codling moth). Research on these economically significant pests is critical to ensuring a viable pome fruit industry in Ontario.

The pest management complex in apple orchards is both complex and dynamic. New and emerging pest issues may require a shift in the direction or primary focus of research

activities. To develop sustainable IPM programs, research must address the pest complex (e.g. internal lepidoptera) rather than individual pests within the system.

Recommendation

Research undertaken by OMAF, AAFC, U of G and other institutions should receive industry support and address the priorities identified by the OASCC committees. Research projects that do not address the OASCC priorities should not receive continued funding from public sources, until these issues are resolved.

The Apple Research and Services Subcommittee strongly encourages researchers to attend and participate in the annual meeting and other meetings with stakeholders, and to provide ongoing updates on the status of their programs. Committee members have noted a trend of inadequate research representation at these events, and poor communication regarding existing research projects.

Research mandates and funding resources should be flexible enough to allow researchers to address new pest management issues in a more timely manner, as the disruption caused by a new pests can undermine the success and sustainability of existing IPM programs.

Target Agency

Agriculture and Agri-food Canada, Attention Dr. Gary Whitfield

OASCC Linkages

Ontario Pest Management Research and Services Committee

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Recommendation #4:

Issue

Lack of industry organization to represent growers

Background

Since the demise of the Ontario Apple Marketing Commission on October 23, 2001, the industry lacks the ability to analyze issues, formulate policy positions and inform and lobby various levels of government, institutions and other sections of the marketing chain. Growers are not able to

access the funds and programs through matching funding to do the research required for several major production and storage issues. In addition, apples are not represented in discussions on safety net programs.

Objective

The Apple Growers Steering Committee has consulted growers through several province wide series of meetings and have developed a list of major priorities of growers. Support for an organization has been established through a petition and deposit of \$200.00 each by over 200 growers. The Steering Committee has placed its proposal before the Farm Products Marketing Commission. Establishment of a new organization is necessary before the 2003 season for the industry to move forward.

Recommendation

It is recommended that Ontario Ministry of Agriculture and Food officials (OFPMC) proceed immediately to carry out the processes required for growers to indicate their support for a new organization. Further to this action, if grower support is indicated, that the Minister approve the formation of a new organization.

Target Agency

Ontario Ministry of Agriculture and Food

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Berry Research and Services Committee

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Ontario Horticultural Crops Research and Services Committee

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Executive Summary

The Ontario berry crops industry remains stable. There is a modest increase in acreage of fall- and summer-bearing raspberry. Day-neutral production of strawberry is increasing at a slow pace as growers adapt this new technology to northern latitudes.

The Ontario Plant Propagation program will be moved to New Liskeard where there are plans to build a nuclear stock facility. Individual propagators and OBGA will assume more responsibility for the program which has been successful in the past.

Research and service priorities remain unchanged. There were several emerging issues that impact on the horticultural industry in general and berry crops in particular.

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State of the Industry and Emerging Issues

The Ontario berry industry remains stable. There was a very small increase in strawberry acreage and raspberry acreage continues to expand. A very modest acreage of fall-bearing raspberries are grown under high tunnels for extension of the season. Insect pests can be a problem in these protected culture situations.

Low temperatures in late May, created frost conditions that damaged some of the early flowers in the strawberry crop. Although yield potential was lowered many growers reported better than anticipated yields. Many growers have invested in overhead irrigation for frost protection. The number of day neutral strawberries growing on plasticulture is increasing. Market potential remains strong for the crop outside of the normal June-bearing season. However, pest management issues remain problematic due to the continuous production cycle. Sudden Oak Disease has been found on plants from California and could restrict plants entering Canada and restrict exports to the US.

The raspberry crop was good this year with some minor pest issues observed. Some growers are opting to reduce acreage while intensifying management practices resulting in improved quality and yield per hectare.

The blueberry crop in Ontario is very small but continues to expand at a modest rate. Many new blueberry plantings are placed on marginal land with high pH which creates vigour problems.

The plant propagation scheme is being renewed with new screenhouses on grower farms and funding for a nuclear stock facility at New Liskeard.

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Emerging Issues (Detailed)

Integrated Pest Management for Raspberry

Raspberries have a relatively poor set of control tools. No scouting procedures have been established and thresholds are not available to guide effective use of control measures.

Tarnish plant bug, mites and fertility requirements for day-neutral strawberries

The use of day-neutral varieties to produce strawberries over the entire season is the most rapidly expanding sector of the industry. This season long growing system also presents new management challenges for producers. There are no nutrient (especially nitrogen) management recommendations for day-neutral production at northern latitudes. The suite of

chemicals for insect control in June-bearing strawberry is not available due to continuous cropping. Thresholds for pesticide application would be particularly useful to growers.

Fertigation and trickle irrigation guidelines

More growers are using trickle irrigation to conserve water and decrease risk of water-borne contaminants on fruit. Guidelines are required for fertility and to document differences between individual varieties. The growers noted that leaf analysis testing has been very helpful in fertility management.

Water Quality Guidelines

Are the current guidelines (dated 1972) still relevant? There appears to be no information available on the cost effective treatment of large volumes of contaminated water (eg. irrigation ponds).

Quality Inspectors

Many large retail outlets and processors are demanding HACCP-like reports before accepting produce from growers. Currently, there is a shortage of qualified personnel to do the inspections and issue the appropriate reports. There is a question of who will train these inspectors and who will pay the cost of the inspection. This is an industry wide problem that has recently emerged.

Qualified Extension Personnel and Consultants

Growers report there is a shortage of qualified personnel to provide timely production recommendations during the growing season. There is a shortage of fee for service consultants to assist growers.

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List of Research and Service Projects

AAFC - Harrow

Canadian Clonal Genebank - Margie Luffman

University of Guelph

Department of Plant Agriculture - Simcoe

Development of cultivars with high fruit quality and environmentally sustainable management systems in berry crops - A. Dale

Department of Plant Agriculture - Guelph

Raspberry Breeding - A. Sullivan

Strawberry Biotechnology and Germplasm Development - A. Sullivan & R. Harbut

Strawberry Flower Initiation/Row Cover Trial - A. Sullivan

Department of Plant Agriculture - Vineland

Alternative methods to fumigation for sustainable strawberry production - Maria Derkacz
Nutrient Management for Improved Strawberry Production - Maria Derkacz

Kemptville College

Strawberry Variety Trials - John Madill
Strawberry Breeding Nursery - John Madill

New Liskeard Agricultural Research Station (NLARS)

Strawberry Micropropagation - B. Hughes and W. Cook
In Vitro selection of anthracnose resistant strawberry clones - B. Hughes
Breeding and selection of winterhardy strawberry cultivars with improved quality and yield - B. Hughes and A. Dale
Stock plant propagation and virus-testing for the Ontario Plant Propagation Programs - B. Hughes

Ridgetown College

Weed Control in Strawberry - F. Tardif and J. Zandstra
Strawberry Variety Trials - J. Zandstra
Raspberry Variety Trials - J. Zandstra and A. Sullivan
Evaluation of Cover Crops and Reduced Tillage Systems for Weed Suppression in Strawberry - J. Zandstra, F. Tardif, J. O'Sullivan, L. Huffman, P. Fisher and A. Verhallen

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Research and Services Accomplishments

Strawberry Breeding

A. Dale and B. Hughes

Sapphire was released to growers this spring and Serenity will be available in spring 2003. Another 25 selections are in various stages of micro-propagation, virus-testing, and propagation for trials from 2003 onwards. Cultivar trials from five Univ. of Guelph sites in 2001 were compared. Mesabi had the highest yields and Yamaska was the latest. Genotype x environment interactions were noted as follows: for days to 25% harvest, the coefficient of variation was negatively correlated with the cultivar mean; for yield, cultivars could be sorted into groups if their within-site standard deviations were regressed against the site means or latitude.

Anti-oxidants in strawberry fruits - R. Tsao, R. Yang, E. Sockovie, T. Zhoud and A. Dale

We have examined 26 cultivated and 26 Canadian wild strawberry varieties for their total phenolic contents and antioxidant activities. We found that the total phenolic content varied markedly among both cultivated and wild varieties. We concluded that in cultivated varieties, anthocyanins may be a major contributor to the total phenolic content. However in wild strawberries, phenolic compounds other than anthocyanins have more affect on the total phenolic content. Black

Sturgeon River 24 had extremely high anti-oxidant activity (FRAP) (5-6 x cultivated strawberry).

Production of raspberries out-of season in greenhouses - A. Dale, T. Blom, E. Kent, A. Sample.

From a series of experiments several issues around growing red raspberries in greenhouse have been solved. Information has been produced on breaking dormancy and chilling requirements, production patterns and cultivar interaction has been obtained. This will lead to management recommendations for commercial use.

Raspberry Breeding

A. Sullivan

A new raspberry selection 86-117d was identified for release and naming. The selection has high yields of large fruit. It has shown excellent levels of winterhardiness at several locations.

Strawberry Germplasm Development

A. Sullivan and R. Harbut

Hybrids of wild strawberry species, called synthetic octoploids, have been crossed to Ontario-adapted varieties. These hybrids have shown very high levels of vigour and produced very large

fruit in the early generations. This unique material holds great promise for improving the cultivated strawberry.

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Major Publications

OMAF Publications #360, Fruit Production Recommendations
2002-2003 edition published May 2002. New content includes:

Food Safety Chapter

Information on Cover Crops

Line drawings of berry pests

Tables of pesticides by family/resistance management info.

OMAF Publication #75, Guide to Weed Control

The 2003 edition was published in January. Leslie Huffman is editor. Berry content reviewed and updated. New info on integrated weed management included.

Newsletters

Ontario Berry Grower

Produced monthly, in the GROWER, edited and compiled by Pam Fisher and Margaret Appleby. Also distributed to 398 on-line subscribers.

Internet

Responsible for maintenance and content on berry page at <http://www.gov.on.ca/OMAF/english/crops/hort/berry.html>

Presentations

12 conference and workshop presentations

Meetings, Workshops Organized

Several events were organized in 2002 including presentations at Ont. Hort Crops Conference, IPM Workshop for Crop Scouts, IHC-2002 Berry Tour, OBGA workshop

Demonstrations and field projects

Numerous projects are underway including disease control measures, on-farm yield trials, weed control, IPM monitoring and fertigation.

Site-specific Intensive Sampling Project: Heather Griffiths, IPM Modeling Specialist and OMAF

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Berry Team

To demonstrate use of information using GPS sampling techniques, and to study the relationship between soil characteristics, nutrient uptake and pest populations in strawberries, peppers and tomatoes.

A 10-acre block of Annapolis was chosen for this project. In the planting year, 40 sites were flagged and GPS'd. Samples were taken at all 40 locations and distribution of the following components was mapped: Verticillium, nematodes, soil nutrients, soil moisture (weekly), leaf nutrient levels, weed distribution, PLH populations, early runner production, expression of verticillium in plants.

Data on yield, berry size and postharvest quality was collected in 2002. This information has been compiled and is waiting analysis.

A poster on year 1 of this project was prepared and presented at the Ontario Horticultural Crops Conference 2001.

Minor Use Registration

Jim Chaput is the coordinator of the minor use program. There were several accomplishments benefitting berry growers including new registration and stronger national linkages and PMRA.

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Report on Action Taken on 2002 Recommendation

Recommendation

It is recommended OMAF and the University of Guelph maintain the infrastructure at the SPUD Unit in New Liskeard and the Department of Plant Agriculture in Vineland and that the support of a virologist be made available to the plant propagation program by AAFC.

Target Agencies

Deb Stark, Assistant Deputy Minister, Research and Corporate Services Division, OMAF
Alan Wildeman, Vice President Research, University of Guelph
Gordon D. Dorrell, Assistant Deputy Minister, Agriculture and Agri-Food Canada

Response

Funding and commitments from OMAF and University of Guelph have been obtained for the berry crops propagation program at New Liskeard. However, no response has been received from Dr. Gary Whitfield, AAFC concerning the need for support of a virologist for the program.

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Recommendation

It is recommended that AAFC fill the nematologist research position at the Vineland facility of the Southern Crop Protection and Food Research Centre.

Target Agency

Gilles Saindon, Director, Southern Crop Protection and Food Research Centre (SCPFRC), Agriculture and Agri-Food Canada (AAFC)

Response

This recommendation will be forwarded for comment to Dr. Gary Whitfield, National Science Director for Theme 160 - IPM & Plant Protection for his consideration for staffing. No response was received from Dr. Whitfield.

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Recommendation

It is recommended that any fertility recommendations for crops in the guidelines and regulations of the proposed Nutrient Management Act be based on valid research applicable to Ontario.

Target Agency

Jim Wheeler, Assistant Deputy Minister, Agriculture and Rural Division, OMAF

Response

A detailed response was received and it appears nutrient management is being addressed on several fronts by various

agencies and funding programs.

Action

The need for a high level of matching funding from external sources in the New Directives Program was difficult for the berry crops industry to achieve. Researchers would not be able to receive sufficient funding for the necessary research into nutrient management.

Research Priorities

No changes for 2002. See 2001 document.

Service Priorities

No changes for 2002. See 2001 document.

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New Recommendations

Recommendation # 1:

Issue:

Virology support for the Ontario Berry Crop Plant Propagation Program

Background:

The support of a virologist is integral to the success of this program. Such a person could also develop research projects that would be of interest to the national berry crops industry.

Details:

The issue can be resolved by AAFC making a virologist available to the Ontario Plant Propagation Program and Eastern Canadian virus problems in berry crops.

Recommendation:

It is recommended that AAFC provide the support of a virologist to the plant propagation program

Target Agency:

Dr. Wade Johnston, Director, AFHRC, AAFC

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Recommendation # 2:

Issue:

Continuity of Nematology Research

Recommendation:

It is recommended that AAFC fill the nematologist research position at the Vineland facility of the Southern Crop Protection and Food Research Centre.

Target Agency:

National Program Leader, AAFC. Mr. Jim Bouman, AAFC, London, please forward to appropriate person.

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Recommendation # 3

Issue:

Nutrient Management

The cost sharing formula for funding for research has made it difficult for the smaller commodities to participate in New Directions program.

Recommendation:

It is recommended that any fertility recommendations for crops in the guidelines and regulations of the proposed Nutrient Management Act be based on valid research applicable to Ontario. The funding formula be amended to reflect a lower contribution from grower associations.

Target Agency:

Jim Wheeler, Assistant Deputy Minister, Agriculture and Rural Division, OMAF.

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Recommendation # 4

Issue:

IPM for Raspberry

Background:

The current information for scouting and diagnosis of raspberry diseases is lacking. The limited number of pesticides available for controlling insects and diseases is also limiting. Raspberry is an excellent candidate for integrated pest management. The deficiencies in scouting procedures and threshold values are barriers to implementing IPM.

Recommendation:

The OMAF Berry Crop Specialist develop a "scouting guide: that outlines procedures that would enable growers and consultants to develop and exploit IPM for raspberry."

Target Agency:

Bill Ingratta; Mike Celetti, Pam Fisher, OMAF.

OASCC Linkages:

Ontario Pest Management Research and Services Sub-committee

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Ontario Crucifer Crops Research and Services Subcommittee

Author:

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Ontario Crucifer Crops Research and Services Subcommittee

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01 January 2003

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17 September 2003



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Mandate

The Ontario Crucifer Crops Research and Services Sub-committee met on November 26, 2002 at the OMAF office in Guelph, Ontario. The meeting was chaired by Kristen Callow. 12 members and 21 guests attended. 11 growers and 7 industry representatives were present.

The Ontario Crucifer Crops Research and Services Sub-committee meets annually to review issues of concern, research projects and set priorities for the following crops: Cabbage, Cauliflower, Broccoli, Brussels sprouts, Radish, Rutabaga and Specialty Crucifers.

The committee is comprised of representative growers, provincial specialists, service providers, seed companies and researchers. This sub-committee reports annually to the Ontario Horticultural Research and Services Committee (OHRSC) and the Ontario Pest Management Research and Services Committee (OPMRSC).

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Industry/Sector Scan

Acreage Trends

In general the acreage of broccoli, cabbage and rutabaga is expected to remain stable. The acreage of fresh-market cauliflower is expected to decline because of the requirement for cello wrapping; whereas, the acreage of processing cauliflower may increase. The acreage of fresh-bunched radishes is expected to decline. These changes reflect changing consumer trends and fewer growers staying in the business.

Production Trends

In general insect pests and weather related problems continue to be the most limiting production issues. Lack of access to new reduced risk crop protection materials is cited as a major production issue.

Pest Management Programs

Many growers of cole crops monitor their own fields or have a consultant checking the crop regularly. AIMS and Cargill Ltd. provided scouting services in 2002 for approximately 15 cole crop sites. The costs of delivery and the fractured nature of the crucifer crops industry are major limiting factors to further IPM adoption. IPM programs for rutabagas are no longer delivered by any agency or persons.

Marketplace Trends

In general the marketplace was quite a bit better than last year particularly for broccoli and cauliflower.

Generally, growers are feeling more optimistic than last year. There is a renewed optimism. However, if new systemic, target specific pest control products are not registered for new and emerging pests, such as: the Swede midge and Pea leafminer growers will not be able to survive on the decreased quality and yields that their current spray program provides.

Production Statistics

The estimated acreage of crucifer vegetables is shown in Table 1.

Table 1. 2001 Production of Crucifer Vegetables in Ontario (OMAF)

	Acreage	Farm Value (\$'000)
Broccoli	2,100	5,675
Brussels sprouts	200	720
Cabbage, Asian	450	750
Cabbage, Other	3,150	8,875
Cauliflower	2,725	11,000
Radish	675	2,300
Rutabagas	1,750	5,020
Other Asian-type crucifers	3,000	N/A
TOTAL	12,300	approx. 34,340

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Responses to 2002 Recommendations

Both AAFC, London and the University of Guelph, Ridgetown acknowledged the need for research for cabbage maggot on rutabagas, however very few resources are available to initiate such work and no work was completed in 2002.

AAFC, Policy Branch responded to the minor use recommendations by stating that AAFC is currently organizing a Pesticide Minor Use Centre in concert with the Provincial minor use coordinators; the centre will operate out of Ottawa, using regional field facilities. The Centre is expected to be operational by April 1, 2003.

OMAF responded to the issue of consistent funding similar to the FS2002 by stating that the OMAF New Directions in Agri-Food and Rural Research Program will fund research of a similar nature in the Pest Management Section. Also, the new 2002-2006 Plant Program under the OMAF-University of Guelph Agreement includes Pest Management as one of four program objectives.

Both AAFC and OMAF responded to the need for dedicated funding for research in the area of 'Nutrient Management Planning' specific to Ontario's horticultural crops. Within the New National Science Programs of AAFC, there is a Research Theme 150, "Nutrient Cycling and Organic Residues", which focuses on many aspects of nutrient management including manure management. Research activities will complement provincial activities related to nutrient management planning. OMAF stated that funding through the New Directions 2003 program in the "Healthy Environment" component will address some of these concerns. OMAF also stated that the Resources Management and Environment Program under the OMAF-University of Guelph Agreement will be under review in 2003. New proposals will be accepted for the program and it is expected that projects in the nutrient management area will continue to be a significant part of this program.

AAFC responded to the recommendation that the University of Guelph, Ridgetown and AAFC Canada (Delhi, Vineland

and St. Jean sur Richelieu) move to certify personnel and field station sites as GLP compliant by stating that there are 7 AAFC hubs across Canada, including Harrow, Delhi, Vineland and St. Jean-sur Richelieu that are expected to be GLP compliant by the 2003 growing season as part of the Pesticide Minor Use Initiative.

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Minor Use Priorities for Crucifer Crops

Brassica and Leafy Vegetables

Entomology:

1. **Swede Midge** - acetamiprid - Assail (Bayer), spinosad - Success (Dow Agro), novaluron - Rimon (Makhteshim)
2. **Cabbage Maggot** - fipronil - Regent/Canon (Bayer), novaluron - Rimon (Makhteshim)
3. **Leafminer** - acetamiprid - Assail (Bayer), cyromazine - Citation (Engage Agro), novaluron - Rimon (Makhteshim)
4. **Lepidoptera** - indoxacarb - Avant (Dupont), methoxyfenozide - Intrepid (Dow Agro), acetamiprid - Assail (Bayer), novaluron - Rimon (Makhteshim)
5. **Aphids** - pymetrozine - Fulfill (Syngenta), flonicamid - IKI 200 (ISK)
6. **Thrips** - acetamiprid - Assail (Bayer)

Plant Pathology:

1. **Bacterial Diseases** - acibenzola - Actigard (Syngenta)
2. **Downey Mildew** - BAS 516-N/A (BASF), zoxamide - Gavel (Dow Agro), fenamidone - Reason (Bayer)
3. **Clubroot** - N/A
4. **Alternaria** - fenamidone - Reason (Bayer), BAS 516-N/A (BASF)
5. **Powdery Mildew** - myclobutanil - Nova (Dow Agro)

Weed Management:

1. **Weeds** - sulfentrazone - Authority (FMC), clomazone - Command (FMC/UAP), s-metolachlor - Dual II Magnum (Syngenta), ethametsulfuron-methyl - Muster (Dupont)

Rutabagas

Entomology:

1. **Cabbage Maggot** - fipronil - Regent (Bayer), novaluron - Rimon (Makhteshim)
2. **Swede Midge** - acetamiprid - Assail (Bayer), spinosad - Success (Dow Agro), novaluron - Rimon (Makhteshim)

Plant Pathology:

1. **Powdery Mildew** - myclobutanil - Nova (Dow Agro)

2. **General Diseases** - Bas 516 - N/A (BASF)

Radish

Entomology:

1. **Cabbage Maggot** - fipronil - Regent (Bayer), novaluron - Rimon (Makhteshim)
2. **Swede Midge** - acetamiprid - Assail (Bayer), spinosad - Success (Dow Agro), novaluron - Rimon (Makhteshim)
3. **Aphids** - flonicamid - IKI 200 (ISK), pymetrozine - Fulfill (Syngenta), acetamiprid - Assail (Bayer)

Plant Pathology:

1. **Rhizoctonia** - azoxystrobin - Quadris (Syngenta), thiophanate-methyl -Senator (Engage Agro)
2. **Downey Mildew** - zoxamide - Gavel (Dow Agro), dimethomorph - Acrobat (BASF), Bas 516 - N/A (BASF)
3. **General Diseases** - trifloxystrobin - Flint (Bayer)

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Crucifer Crops Research Issues (Prioritized)

Development of Pest Control Strategies

There is a need to investigate, develop and transfer practical pest control methods for crucifer crops. Both established pests and new pests continue to plague crucifer crop growers everywhere. Access to effective IPM tools and strategies remains a barrier to competitive production in Ontario.

Current Activities

There is some research activity underway by University of Guelph and Agriculture and Agri-Food Canada personnel on some of the established pests such as cabbage maggot, Lepidoptera, thrips, weeds, clubroot and soft rot as well as the pests: Swede midge and pea leafminer.

Gaps/Barriers/Deficiencies

There is a major effort needed in the area of developing IPM strategies for cabbage maggot on rutabagas. In addition there is a need for continued research into alternative management options for cabbage maggot on the entire crop group. The evaluation of plant species as trap crops for flea beetles, thrips, caterpillars and other insects, evaluation of varieties with resistance to pests, evaluation of biological and cultural control methods for the entire pest complex affecting crucifer crops is needed. The major diseases of current focus include black rot, clubroot, *Alternaria*, downy mildew and powdery mildew.

The two new pests affecting crucifers in Ontario that will require a long-term research commitment are swede midge and pea leafminer. Swede midge research work is of the most immediate concern due to the quarantine of host species movement from eight counties in Ontario. All growers in these counties will need to participate in the CFIA certification program before shipment of Swede midge host species into non quarantined zones within Ontario, Canada and the

United States will be allowed.

Nutrient Management

Because of concerns about current recommendations and impending legislation regarding nutrient management, the crucifer crops sector wishes to take a proactive approach to develop an integrated fertility program.

Current Activities

Limited work has been undertaken in the past few years to investigate the nutrient response of the major crucifer vegetables and to relate this to nutrition's role in pest management programs. Most of this research is either completed or poorly funded.

Gaps/Barriers/Deficiencies

A far more comprehensive and integrated fertility management program needs to be developed for crucifer crops which takes into account the complete soil nutrition regime and nutrient management planning. Studies on crop uptake, crop removal, growth stage models, the effects of irrigation and a review of current recommendations are needed.

Because soil-borne diseases (clubroot, *Rhizoctonia*, *Fusarium*) and some insect pests may be greatly affected by fertility practices, evaluation of disease and insect management strategies should be an integral part of any fertility research.

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Minor Use Registrations

There exists a serious need for minor use pest control product registrations for improved control of insects, diseases and weeds of crucifer crops, especially specialty crucifers. In light of the effects of the US FQPA and continuing lack of a 'level playing field' for Ontario growers, the registration of new, 'reduced risk' and 'biopesticide' active ingredients as well as new seed treatments is also urgently needed. Increased cooperation with the US IR-4 program is strongly encouraged.

Current Activities

In May, 2002; AAFC and Health Canada announced \$ 7.3 million for 'reduced risk initiative'. \$3.3 million for AAFC to develop crop profiles and IPM strategies, \$4.0 million to PMRA to increase review staff for minor uses and establish position of minor use advisor

In June, 2002; AAFC announced a 6 year, \$54.5 million commitment to improve access to pest control products with the focus on reduced risk products.

- AAFC to establish an "IR-4-like" structure to prioritize minor use needs nationally, make minor use submissions, manage submissions, generate necessary field data and laboratory data
- Establishment of at least 6 GLP compliant research facilities in BC, Prairies, Ontario, Quebec and Maritimes to cover all zones
- Proposed establishment of headquarters in Ottawa with executive director, IR-4 liaison, study directors and administrative assistants
- Establishment of a national minor use website, improved liaison with PMRA and IR-4 and coordination of an annual national priority setting meeting

Gaps/Barriers/Deficiencies

AAFC will be establishing at least 6 GLP compliant research facilities in BC, Prairies, Ontario, Quebec and the Maritimes to cover all zones. However, there is concern from the University of Guelph's Ridgetown, Kettleby and Simcoe Research Stations whom have obtained GLP certification. Ridgetown, Kettleby and Simcoe need a commitment from AAFC that they will still receive funding for URMULE GLP research trials. If these stations do not receive GLP work to complete, they will not maintain their GLP certification.

Until the new system is fully functional, AAFC should continue to provide minor use research funding to other institutions which have research underway on URMULE projects.

Specialty Crucifer Crops

The crucifer crops sector remains concerned that the continued introduction of new crucifer species from Asia could introduce new and devastating pests and diseases to Canada, threatening our traditional crucifer crops. There remains a need to continue to survey and detect these problems before they become epidemic.

Current Activities

Other than limited and informal OMAF field activities, no research is currently being conducted in this area.

Gaps/Barriers/Deficiencies

Because no research is being conducted the industry remains at risk from unknown introductions of diseases and pests as well as from a lack of management strategies for such new pests. The primary concern presently involves the introduction and spread of crucifer viral diseases.

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Variety evaluation

There remains a need for the evaluation of crucifer crop varieties suited to Ontario growing conditions, storage conditions, market demands, pest complex and fertility requirements.

Current Activities

Other than some work by University of Guelph researchers in Kettleby and Simcoe, no major variety evaluations independent of seed companies is underway.

Gaps/Barriers/Deficiencies

Because little or no work is planned for variety evaluations by public institutions, growers in Ontario and Canada generally will have less reliable information about suitable varieties to grow for various Ontario conditions. A more integrated approach to variety evaluations is also needed which takes into account differences in pest resistance and fertility requirements.

Post Harvest Handling

There remains a need for the evaluation of crucifer crop post harvest handling practices to increase the shelf life and storability of crucifer crops to increase the competitiveness of the industry.

Current Activities

No work is underway and no work is planned.

Gaps/Barriers/Deficiencies

Because no work is planned for post harvest handling evaluations, growers in Ontario and Canada generally will have less reliable information about suitable storage conditions.

Value Added Products

There remains a need for the evaluation of value added products to maintain the competitiveness of the crucifer crop industry.

Current Activities

No work is underway and no work is planned.

Gaps/Barriers/Deficiencies

Because no work is planned for value added products, growers in Ontario and Canada will continually lack any competitive advantage over the United States.

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Crucifer Crops Service Issues (Prioritized)

Certification of Greenhouse Growers

Certification of greenhouse growers is a top service priority due to CFIA quarantine of Swede midge host species and equipment movement from eight counties. All greenhouse crucifer growers (including ornamentals) will be encouraged to participate in the certification program. OMAF and consultants will need to help relay the certification program to all growers and the CFIA will be required to audit and certify.

Current Activities

OMAF and U of G are currently working with the CFIA to establish a certification protocol for all growers of Swede midge host species by January 15th, 2003.

CFIA is scheduled to speak about the certification program at the Swede Midge Workshop held at the Ontario Fruit and

Vegetable Convention on February 18, 2003.

Gaps/Barriers/Deficiencies

Numbers of personnel able to help transfer certification protocol requirements to growers in the field is extremely limited. There is only a small window of time In February and March where growers in quarantined areas will need to be certified.

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Swede Midge Identification

Identification of Swede midge is required so growers can take timely action to manage this quarantine pest. Growers and crop consultants will need a system in place to send samples and traps for immediate identification and confirmation of the presence / absence of Swede midge. This is imperative if we are going to be successful in confining the spread of this extremely destructive insect.

Current Activities

There will be a Swede Midge Workshop held at the Ontario Fruit and Vegetable Convention on February 18, 2003. All growers, inspectors, consultants and scouts have been strongly encouraged to attend.

OMAF conducts in class IPM / ICM training for crucifer crops.

OMAF provides in-field training for inspectors, consultants and scouts throughout the season.

Gaps/Barriers/Deficiencies

Numbers of personnel able to positively identify this pest are extremely limited. Also, the personnel able to identify this pest have many other responsibilities, therefore, turn around time can not be guaranteed

Degree day emergence model for the Swede midge

A degree day emergence model for Swede midge needs to be verified in Ontario conditions. Until this research is complete, consultants and OMAF should set up a network of soil temperature probes in order to help identify time of emergence of the first generation of the Swede midge (based on the European model) in all known infested counties across Ontario. This information will help growers predict emergence times across the province. This will help growers better time there spray applications and control population increases in areas where known populations exist.

Current Activities

U of G will continue to work on the verification of the European model in York county.

Gaps/Barriers/Deficiencies

The temperature probes will need to be placed in the field by mid-April. At this time summer assistants and scouts have not completed school, so it will be very difficult to get daily readings.

Consistency of Scouts

Consistency of scouts from year to year will help to increase grower confidence in IPM / ICM programs. Stable expertise is needed to have good IPM / ICM programs. Increased training of personnel is required.

Current Activities

Depending on the company, wage increases and scholarships may be provided.

Gaps/Barriers/Deficiencies

Limited number of Agriculture students available and all companies are competing for the best students. Increased wages and benefits will encourage students to stay for more than one year and will attract more students to Agriculture.

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Quick Turn Around Time and Accuracy of Diagnostic Testing

Growers require quick turn around time and accuracy of diagnostic testing. Quick field tests and bioassays would help to identify pests and determine management strategies quickly.

Current Activities

OMAF and U of G have met with GAP Environmental Services and there is potential for this service.

Gaps/Barriers/Deficiencies

Unless a guaranteed number of samples can be given to the lab and coordinated through Provincial specialists, consultants, scouts and industry the budgetary constraints will be too high.

Quick Access to OWN

Growers across the province would like quick access to weather information, relevant to their area in order to monitor degree days to help predict emergence of insects and utilize disease forecasting systems.

Current Activities

OWN is a 12 month service that growers can pay for.

Gaps/Barriers/Deficiencies

It would be beneficial to have soil temperature and soil moisture information, so growers could calculate degree days for certain insect pests. Establishing a joint project with OWN on crucifer crops would be very beneficial to the industry.

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Recommendations to OHCRSC and OPMRSC

Recommendation 1

Issue:

Resources to implement effective and leading-edge nutrient management programs are not available to minor crop producers such as crucifer crops. Without a financial commitment from the agencies developing this legislation, vegetable crop producers will not be able to effectively implement adequate nutrient management plans.

Background:

The Ontario Crucifer Crops Research and Services Committee recognizes the need for the development of detailed nutrient management profiles for all vegetable crops including 'crucifer' crops. To utilize crop nutrition inputs effectively and still maintain crop yields and quality an integrated crop fertility program must be developed which takes into account crop removal data, crop uptake data and growth stage models. New recommendations may be necessary which reflect the results of new research. By implementing such research now, a proactive, detailed and responsible nutrient management plan can be developed.

Recommendation:

The Ontario Crucifer Crops Research & Services Committee requests that OMAF and Agriculture & Agri-Food Canada establish dedicated funding for research in the area of 'Nutrient Management Planning' specific to Ontario's horticultural crops including 'crucifer' crops.

Target Agencies:

OMAF
Agriculture & Agri-Food Canada
University of Guelph

OASCC Linkages:

Ontario Horticultural Crops Research and Services Committee

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Recommendation 2:

Issue:

The rutabaga industry faces the prospect of major crop losses from cabbage maggot due to loss of currently registered pest control products, reliance upon only one control option and few if any available alternatives.

Background:

Rutabaga growers in Canada have lost access to cabbage maggot control options in the past several years leading to reliance upon only one insecticide, Lorsban in the organophosphate group. Organophosphate insecticides are under review by the Pest Management Regulatory Agency and may be lost or restricted for this use. In addition, the use of one group of organophosphates repeatedly will lead to insecticide resistance and loss of control.

The OCCRSC wishes to emphasize the urgency of the situation to PMRA of Health Canada, AAFC Research Branch and the University of Guelph's Ridgetown College which conducts rutabaga research at the Huron station. Until suitable alternatives can be developed and registered in Canada, it is vital that the PMRA maintain registration of currently labeled pest control options which are presently the minimum required.

A comprehensive research program which identifies and evaluates effective alternatives to currently labeled insecticides and breeding resistance is urgently needed.

Recommendation:

In light of the urgent need for the rutabaga industry to address an increasing problem with cabbage maggot control options, the OCCRSC recommends to Agriculture and Agri-Food Canada Research Branch, London and to University of Guelph's Ridgetown College and Plant Agriculture Department, Guelph that a comprehensive research program be implemented for cabbage maggot management and resistance breeding on rutabagas. Recognizing the response received to this recommendation in 2002, the OCCRSC wishes to see a clear and concise research plan put into place in 2003.

In addition the OCCRSC wishes to strongly remind the Pest Management Regulatory Agency of Health Canada that they must consider carefully any reviews of pest control products for rutabagas as there are presently no alternatives to currently labeled materials.

Target Agencies:

G. Whitfield, National Science Director for Theme 160 - IPM & Plant Protection, AAFC
G. Ablett, University of Guelph, Ridgetown
L. Kott, University of Guelph, Guelph
I. Gerke, Health Canada, Pest Management Regulatory Agency

OASCC Linkages:

Ontario Pest Management Research and Services Committee

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Recommendation 3

Issue:

The crucifer crop industry faces severe losses from a newly identified pest called the Swede midge. Currently, the CFIA has quarantined the movement of Swede midge host species material, soil associated with host species and equipment from: Simcoe, York, Toronto, Halton, Brant, Wellington, Dufferin and Niagara counties. Growers in non-quarantined

zones need quick methods to identify this pest to reduce spread of this insect.

Background:

The CFIA will be quarantining the movement of crucifer crop transplants and related Swede midge host species, including ornamentals as well as the movement of soil alone or in association with plants and used farm machinery and equipment used in the cultivation or management of crucifer crop fields, including: tractors, harvesters, blowers, rakes, sprayers and cultivators from eight counties: Simcoe, York, Toronto, Halton, Brant, Wellington, Dufferin and Niagara.

Growers of crucifer crop transplants, or other Swede midge host species in the quarantined counties will not be allowed to move plants or equipment to non quarantined counties in Ontario, the rest of Canada or the United States.

The CFIA is currently working on a certification protocol for greenhouse growers. The CFIA are anticipating completion of this protocol by January 15th, 2003. Growers that comply and meet all protocol requirements in the quarantined counties will be allowed to move plants to non-quarantined zones in Ontario, Canada and the United States.

Currently, there are no phytosanitary requirements on the export of produce. However, the U.S. has not made this a formal declaration.

Recommendation:

The Ontario Crucifer Crops Research & Services Committee requests that OMAF and the University of Guelph provide growers, consultants, the CFIA and other industry personnel with training and diagnostics to identify this pest. University of Guelph, Laboratory Services as well as other diagnostic labs in the Province should provide an identification service for growers, consultants and other industry personnel.

Target Agencies:

OMAF
University of Guelph

OASCC Linkages:

Ontario Pest Management Research & Services Committee

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Recommendation 4

Issue:

With the new minor use initiative announced by AAFC in June, 2002, current University of Guelph GLP facilities (Ridgetown, Kettleby and Simcoe) are wondering if they will need to maintain their GLP status.

Background:

In June, 2002; AAFC announced a 6 year, \$54.5 million commitment to improve access to pest control products with the

focus on reduced risk products.

- AAFC will establish an "IR-4-like" structure to prioritize minor use needs nationally, make minor use submissions, manage submissions, generate necessary field data and laboratory data
- Establishment of at least 6 GLP compliant research facilities in BC, Prairies, Ontario, Quebec and Maritimes to cover all zones
- Establishment of headquarters in Ottawa with executive director, IR-4 liaison, study directors and administrative assistants
- Establishment of a national minor use website, improved liaison with PMRA and IR-4 and coordination of an annual national priority setting meeting

Recommendation:

The Ontario Crucifer Crops Research and Services Committee (OCCRSC) requests that AAFC inform University of Guelph's, Kettleby and Simcoe Research stations if they need to maintain their GLP certification and inform them what types of projects they will be asked to complete if they maintain certification (ie. National priorities A, B, or C).

Target Agencies:

Agriculture & Agri-Food Canada
Health Canada, Pest Management Regulatory Agency

OASCC Linkages:

Ontario Pest Management Research & Services Committee

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Recommendation 5

Issue:

Funding for research which sustains a viable and healthy food supply has dwindled in recent years. Long term, stable and adequate funding is required so researchers can adequately address issues and develop improved integrated crop management programs for growers.

Background:

During the course of the Food Systems 2002 program, many successful and economically sustainable research and development projects have led to significant improvements to IPM programs and pesticide reduction. According to recent figures, there has been a 40% reduction in the amount of pesticide used in Ontario and a concurrent 40% reduction in the risk associated with their use. It was also identified that further public resources be targeted to fruit and vegetable crops.

The development of IPM and more recently ICM (Integrated Crop Management) programs requires a stable and dedicated source of funding to ensure that new problems and serious on-going problems are addressed. In light of the general 'public good' that such programs have achieved to date, it is recommended that they be fully supported in the future.

Currently, researchers can apply to the New Directions in Agri-Food & Rural Research Program for funding.

Recommendation:

The goal of improved integrated vegetable crop management strategies leading to high quality food supplies requires a long-term and dedicated commitment. Therefore, the OCCRSC wishes to request that annual funding be provided to ensure the success and competitiveness of the Crucifer crop industry is maintained.

Target Agencies:

University of Guelph
OMAF, IRMB

OASCC Linkages:

Ontario Pest Management Research and Services Committee

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Ontario Ginseng Research and Services Subcommittee

Author:

Jan Schooley - Chair

Ontario Ginseng Research and Services Subcommittee

Creation Date:

01 January 2003

Last Reviewed:

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Executive Summary

The ginseng industry has faced a series of challenges in 2002 related to weather and pest management. A series of freezing temperatures in late May left many ginseng gardens with damage. Damage ranged from recoverable plant damage to loss of entire gardens. Following the freezing temperatures the weather turned hot and humid and gardens damaged by frost were infected with *Botrytis* that threatened to decay entire plant canopies and move into the roots. Other gardens were infected with *Alternaria* and losses were rapid and severe with affected gardens losing 50% or more of standing foliage. During the summer extreme heat, coupled with the use of low cloth shade structures, resulted in the loss of over 60% of the standing seed crop. Late summer heavy rains washed out some gardens and where rain was abundant, *Phytophthora* spread uncontrollably.

The impact of this series of events will be long lasting. Because Ginseng is a perennial crop, losses due to frost will impact yield until 2005. An accurate estimate of loss will not be possible until that time. This year's harvest was about 30% less than expected. Because ginseng seed requires a 1 year stratification, losses from this year's seed crop abortion will impact the industry in 2003. The seed-to-harvest cycle for this crop, which is usually carefully managed, has been interrupted for at least the next 4 years.

Root prices are higher this year than in previous years but the crop size is down about 30% in Ontario and has declined in B.C. and Wisconsin. Weight loss on drying was higher than expected.

There are several issues emerging in this industry but the one that will have the most economic impact is the production of *Panax quinquefolius* in China.

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State of the Industry

Crop Size

Ontario: 2.8-2.9 million lbs., down 1 million lbs. from 2001

Wisconsin: 500,000 lbs., down from 2001, projected down further in 2003

B.C. 1.5 million lbs., down due to rust, movement of land base to Ontario

China: unknown and increasing (estimated between 1 and 2 million lbs.)

Crop Prices

\$20 - \$30/lb depending on the style of the root, Avg., \$22.50

Crop Quality

Adverse weather has resulted in a higher than average number of cull roots. The % dry-down in kilns is higher than normal and the weight:volume ratio of harvested roots has decreased.

The two diseases that remain of concern to the industry and that limit yield and quality are *Cylindrocarpon* and Rusty Root.

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Emerging Issues

1. The increasing use of low cloth shade has resulted in seed abortion due to increased temperatures and humidity and may be a factor in seedling death due to heat stress and early dying of gardens.
2. The left over 'hardware' from ginseng shade structures is posing a problem to following crops. "S" hooks that are 2-5 cm in size become mixed into the soil and root crops such as carrots can be adversely affected. This has resulted in a reluctance of landowners to rent to ginseng growers.
3. The increased production of *Panax quinquefolius* in China will have a major impact on trade in the future. Two factors are involved here: direct market competition; and using China as a source of seed when the North American seed crop does not meet demands.
4. The Nutrient Management Act will have direct impact on ginseng producers as receivers of manure. Growers are concerned about possible limitations on their use of this product to build up soil organic matter. They are also concerned that nitrogen uptake and loss data will not reflect the needs for maximum root size and quality.
5. An increasing number of gardens are dying back early in the season. Early dieback results in less root growth and lower profits. It is suspected that this problem is nutritional in nature and may be influenced by the garden environment.
6. Site selection is emerging as a leading cause of poor yields and quality. Until good control of *Cylindrocarpon* is obtained, growers continue to rent land that is marginal for ginseng production. There is a current trend to use fertilizer to "fix" poor land.
7. Crop insurance has no baseline reference for short term perennials such as ginseng. It has been difficult for growers to work through this with Agricorp.
8. Irrigation is used increasingly for ginseng production. There is little comparative data to understand which type is best for this crop. There is a need for an information 'bank' that includes the use of irrigation for evaporative cooling of low cloth gardens, the effect of irrigation on the incidence and control of *Phytophthora* and the impact of irrigation on nutrient availability.
9. Soil compaction remains an issue in this crop. Preplant tillage practices need to be addressed.
10. There are concerns about the impact on markets from increased acreage if tobacco growers switch to ginseng in a recent downsizing of the tobacco industry.

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Industry Needs

1. There is an increasing need to relieve the environmental stresses placed on ginseng under low cloth shade structures.
2. There is an increasing need to address the impact of irrigation on ginseng and determine all aspects of its use for this crop.
3. There is an emerging need to learn how to 'clean up' leftover hardware after ginseng has been removed from a field.

New Priorities

1. To evaluate the use of irrigation and its impact on nutrient uptake and cooling.
2. To determine how to relieve environmental stresses associated with ginseng production under low cloth shade.
3. To identify a means of removing "S" hooks from fields after ginseng production.

Ongoing Priorities

1. To determine the crop removal numbers for N and P in Ontario ginseng.
2. To determine the effectiveness of manure application to ginseng in the preplant year. Past evidence has indicated that manure is applied excessively in terms of nutrients to ginseng. It's affect on root shape, however, has not been explored and should be. There is some evidence that excess manure is associated with symptoms of Rusty Root.

Recommendations

There are no recommendations for 2002.

Service Needs

1. To develop an adequate crop insurance program for Ontario ginseng
2. To determine appropriate N and P levels for ginseng production
3. To learn how to identify high risk fields that may contain populations of *Cylindrocarpon* or high levels of unacceptable residues
4. To establish safety nets that better address the needs of perennial crops
5. To have crop scouting more widely available (AIMS provides field scouting)
To maintain OMAF support through the specialist position in Simcoe.

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Research and Service Accomplishments for 2002: University of Guelph

John T.A. Proctor and Dean Louttit
Dept. of Plant Agriculture, University of Guelph

Proctor, J.T.A. and W.G. Bailey. 2002. The globalization of ginseng. On-site program, XXVI International Horticultural Congress and Exhibition, August 11 - 17, p. 314 (Abstract - see below). To be published in Acta Horticulturae.

Abstract

Ginseng is the world's most widely used medicinal plant. The ginseng family, *Araliaceae* (Order, *Umbelliferales*) includes the genus *Panax*, which consists of 11 recognized species, 9 of which are from Asia and 2 from eastern North America. Members of this genus have been used in the traditional medical practices

of many cultures in Asia since the beginning of recorded history. Ginseng usage in western cultures is relatively recent and can be traced to native Indians in eastern North America. As the world more seriously embraces phytomedicines, ginseng will continue to play a significant role although numerous challenges exist. The taxonomy, nomenclature, genetics and biochemistry of the species needs international standardization. For instance, global standards for chemical constituents of the ginseng plant must be created and integrated into the technologies and methodologies used in clinical trials.

Expansion of global ginseng production in the last 20 years has changed its image from an obscure medicinal plant with substantial financial returns, to one with reduced returns to producers. To meet this challenge, enhancement of production efficiency is necessary. Substantive issues are: resolving the replant problem, and permitting the successful re- use of ginseng production land; improving knowledge of seed physiology and management, refining the seed stratification process, and increasing germination efficiencies: decreasing the use of pesticides through the development of comprehensive integrated pest management programs; increasing the quality of the natural forest and artificial growing environments for successful plant production; enhancing harvesting, storage, drying and processing technology for ginseng and ginseng products; and adapting, developing and refining mechanization for all phases of the ginseng production system. These many issues cannot be accomplished without research expertise, concerted and ongoing research funding support, and strong agribusiness leadership.

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Rolston L.J., J.T.A. Proctor, R.A. Fletcher and D.P. Murr. 2002. Gibberellin effects on inflorescence development, bud dormancy and root development in North American ginseng. J. of Ginseng Res. 2b: 17-23.

Abstract

The objective of this study was to determine the effect of foliar applications of gibberellin on inflorescence and root development in North American ginseng. Foliar sprays of GA increased seed head height and diameter, maximum pedicel length, and seedless green berry number. Although GA3 and GA4+7 showed similar promoting effects on seed head expansion and parthenocarpic green berry development, GA4+7 also demonstrated increased root fresh weight, and a 50% lower incidence of perennating buds breaking dormancy. Previous studies have suggested that GA4 may have additional and potentially greater biological effects (Swain and Olszewski, 1996), than most of the approximately 100 identified plant and fungi-based gibberellins (Sponsel, 1995). Inclusion of GA4,7 to these field experiments confirms this. When applied as a spray, GA4+7 sprays appear to have greater application in ginseng production compared to GA3. Further evaluation of the effects of GA4+7 in combination with Ethrel may allow growers to improve spray coverage of the inflorescences for disease control and for better abscission response, and promote root development while minimizing the senescence effects of the Ethrel treatments.

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Campeau, C., John T.A. Proctor, Chung-Ja C. Jackson and H.P. Vasantha Rupasinghe. 2002. Rust-spotted North American ginseng roots: phenolic, antioxidant, ginsenoside and mineral nutrient content. HortScience 37: xx-yy (in press).

Abstract

Rusty root is a major problem in ginseng production worldwide as it reduces root quality. Full characterization of rusty root is unavailable, and necessary for development of effective control measures. A comparison of phenolics, antioxidants, ginsenosides and mineral nutrient content of rusted and non-rusted tissue from disease free roots is reported. Periderm and adjacent tissues of four-year-old North American ginseng roots (*Panax quinquefolius* L.) had a total phenolic content of 3.05 mg.g⁻¹ dry wt (as gallic acid equivalents) which was increased 53% by rust-spotting.

Antioxidant activity increased with phenolic content and was 33% higher (3.6 vs 2.7 mg.g-1 dry wt as ascorbic acid equivalents) in rust-spotted tissue. Total ginsenoside content was higher (139.1 vs 119.4 mg.g-1) in healthy than in rust-spotted tissue, the latter reflecting a significant decrease in four of the major ginsenosides (Rb2, Re, Rd and Re). The Rg group was higher (38.0 vs 29.9 mg.g-1) in healthy than in rust-spotted tissue. The mineral elements N, P, Ca, Mg, Zn, Mn and Fe were higher, and K lower (21 %) in rust-spotted tissue than in healthy tissue.

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Papers submitted for publication

Bailey, W.G., and J.T.A. Proctor (2002). The globalization of ginseng. Submitted to Acta Horticulturae.

Proctor, J.T.A. (2002). Production practices for North American ginseng: challenges and opportunities. An invited review submitted to the J. Ginseng Res.

Jackson, Chung-Ja C., J.P. Dini, C. Lavandier, H. Faulkner, H.P.V. Rupasinghe and

J.T.A. Proctor (2002). Accumulation of ginsenosides in *Panax quinquefolius* L. in relation to plant development and growing conditions. Submitted to Planta Medica.

Fournier, A.R., J.T.A. Proctor, L. Gauthier, A. Gosselin, S. Khanizadeh, A. Bo1anger and M. Dorais (2002). Relationship between understory light and root ginsenoside concentration in American ginseng (*Panax quinquefolius* L.) cultivated in a broadleaf forest. Submitted to Phytochemistry.

Fournier, A.R., J.T.A. Proctor, L. Gauthier, A. Gosselin, S. Khanizadeh and M. Dorais (2002). Relationship between understory light and the growth and morphology of American ginseng (*Panax quinquefolius* L.) cultivated in a broadleaf forest. Submitted to J. Amer. Soc. Hort. Sci.

Fournier, A.R., J.T.A. Proctor, L. Gauthier, A. Gosselin, S. Khanizadeh and M. Dorais (2002). Physiological acclimation of American ginseng (*Panax quinquefolius* L.) to understory light when cultivated in a North American broadleaf forest. Submitted to Physiol. Plantarum.

Papers read at conferences (indicate invited presentations)

Proctor, J.T.A. 2002. Production practices for North American ginseng: challenges and opportunities, p. 212-226 In: Advances in ginseng research 2002: Proc. of the 8th International Symposium on Ginseng. Nam-In Baek (ed.). The Korean Society of Ginseng, Seoul, Korea., Invited Plenary Lecturer.

Schooley, J., and J.T.A. Proctor. 2002. Frost damage to North American ginseng, p. 590. In: Advances in ginseng research 2002: Proc. of the 8th International Symposium on Ginseng. Nam-In Baek (ed.). The Korean Society of Ginseng, Seoul, Korea. (Poster Abstract).

Campeau, C., J.T.A. Proctor, D. Murr, J. Schooley and O. Louttit. 2002. North American ginseng rust-spot, p. 591. In: Advances in ginseng research 2002: Proc. of the 8th International Symposium on Ginseng. Nam-In Baek (ed.). The Korean Society of Ginseng, Seoul, Korea. (Poster Abstract).

Campeau, C., J.T.A. Proctor, Chung-Ja C. Jackson, and H.P. Vasantha Rupasinghe. 2002. Rust-spotted North American ginseng roots: chemical constituents and mineral nutrients, p. 592. In: Advances in ginseng research 2002: Proc. of the 8th International Symposium on Ginseng. Nam-In Baek (ed.). The Korean Society of Ginseng, Seoul, Korea. (Poster Abstract).

Proctor, J.T.A. and W.G. Bailey. (2002). The globalization of ginseng. On-site program, XXVIth International Horticultural Congress and Exhibition, August 11 - 17, p. 314, (Abstract). Invited.

Fournier, A.R., J.T.A. Proctor, L. Gauthier, A. Gosselin, S. Khanizadeh, A. Bo1anger and M. Dorais (2002). Relationship between understory light and root ginsenoside concentration in American ginseng (*Panax quinquefolius* L.) cultivated in a broadleaf forest.

Proctor, J.T.A. (2002). Production research for the Canadian ginseng industry. An invited talk to 200 ginseng growers at the Annual General Meeting of the Associated Ginseng Growers of British Columbia, Armstrong, B.C., February 23. Invited.

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AAFC Report to the Ginseng Subcommittee of OHCRSC

Southern Crop Protection and Food Research Centre AAFC

Ginseng research projects

[Reeleder, RD; Ball-Coelho, B; Brown, D.; Roy, R.]

FTES: 2002

Protection: Prof- 0.3 Tech: 0.3

Production: Prof-. 0.2 Tech: 0.2

On-going projects

1. 1 Fungicide evaluations:

1.1.1 Quadris / *R. solani* - new trials established in 2001 and 2002.

1.1.2 BASF 500 / *R. solani* - new trials established in 2001 and 2002.

1.1.3 Topas / Cylindrocarpon - no apparent efficacy

1.1.4 Cylindrocarpon - new fungicide chemistries: in vitro evaluations underway.

1.1.5 Seed treatment trials initiated (Senator, Maxim XL, Dividend XL) in 2002.

1.1.6 Planning for 2003 Cylindrocarpon fungicide trial underway (Senator, BASF 500).

1.2 Pythium fungicide tolerance to metalaxyl: field survey underway

1.3 Cylindrocarpon / rusty root evaluations underway

1.4 Cylindrocarpon DNA soil extraction method development underway.

1.5 Soil compaction / root shape trials completed.

1.6 Ginseng irrigation trials completed.

1.7 Ginseng germplasm/ micropropagation project

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Fungicide Trial Reports 2002

Efficacy of Propiconazole for Management of Rhizoctonia Damping-Off in Ginseng, 1997-2001

Conclusions

Disease in all plots spread in a roughly circular pattern from the site of inoculum addition. In the seedling year, disease development in control plots was adequate in fall-infested subplots; the mean radius of area of damped-off plants in control plots was 26 cm compared to 11 cm in spring-infested control subplots. In fall-infested subplots, application with the high rate of TOPAS tended to increase stand and decrease disease radius when compared to the control. However, differences were significant for stand only in the third year (2000) and for disease radius only in the fourth year (2001). The high rate of TOPAS was not significantly different from NUTRI-Q with respect to stand or disease radius. Disease development in spring- infested subplots was erratic but overall trends in treatment effects were similar (data not shown). Delayed emergence resulted in higher stand counts in 1999 than in 1998. The high rate of TOPAS used here may provide some suppression of damping-off caused by *R.solani*.

- Application of treatment was made 23 Oct 97. No applications were made during 1999-2001.
- Application of treatment was made 12 May 98. No applications were made during 1999-2001.
- Application of treatment was made 26 May 98. No applications were made during 1999-2001.
- Nutri-Q 0-0-5 was applied 23 Oct 97 only.
- PI: Mean number of plants per square metre. Rad: radius of damped-off area in cm.

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Efficacy of Propiconazole for Control of *Cylindrocarpon* Root Rot in Ginseng, 1997-2001

Conclusions

Delayed emergence resulted in higher stand counts in 1999 and 2000 than in 1998. There was no response to increasing rate of TOPAS for stand or disease severity. It was concluded that the incidence of disappearing root rot (leading to stand decline) was low and not affected by treatment. Rusty root, however, was common and was moderate to severe in most plots. The trial did not provide evidence that TOPAS, at the rates and application frequency used here, will be useful for control of diseases caused by *C. destructans*.

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Research Abstracts

Quayyum, H.M., Gijzen, M., and Traquair, J.A. 2002. Purification of a necrosis-inducing, host-specific protein from spore germination fluid of *Alternaria panax*. *Phytopathology* (in press).

"Spore germination fluid of *Alternaria panax*, the causal agent of Alternaria blight of American ginseng (*Panax quinquefolius*), collected from water droplets or aqueous ginseng leaf extracts produced visible water-soaked lesions on wounded, detached leaflets after incubation for 48 hours. Maximum development of brown, necrotic spots occurred four to five days after inoculation on attached and detached ginseng leaflets. Of 15 plant species tested, only American ginseng was susceptible to applications of spore inoculum or spore germination fluid. The phytotoxic activity of the spore germination fluid was destroyed by heat and treatment with proteinase A. The phytotoxic factor was retained by an ultrafiltration membrane with 30 kDa molecular mass cut-off. Purification of the phytotoxic protein, named AP-toxin, was performed by anion exchange and gel filtration chromatography. Bioactive fractions eluted as single peak. By comparison with protein standards, a molecular mass of 35 kDa was estimated for the native protein. The denatured protein toxin also had a mass of 35 kDa as determined by SDS-PAGE analysis. Production of the protein toxin was induced on American ginseng leaflets and water extracts of ginseng leaves but not on leaves of other non-host plants and their water extracts. The results show that *A. panax* produces a host-specific, proteinaceous toxin during colonization and pathogenesis of ginseng leaves".

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Nicol, R.W., Traquair, J.A., and Bernards, M.A. 2002. Ginsenosides as host resistance factors in American ginseng (*Panax quinquefolius*). *Can. J. Bot.* 80: 557-562.

"American ginseng (*Panax quinquefolius* L.) produces a number of saponins (ginsenosides). The ability of saponins from

cultivated American ginseng to inhibit fungal growth in vitro was evaluated. Fungi exhibited a range of sensitivity to ginsenosides extracted from roots collected in two growing seasons. Important root pathogens (*Cylindrocarpon destructans*, *Fusarium solani*, and *Fusarium oxysporum*) were unaffected by these phytochemicals at a concentration of 1 mg/ml, whereas the growth of *Alternaria panax* and nonpathogenic *Trichoderma* spp. was inhibited. The same trend emerged when a range of ginsenoside concentrations was used on a subset of fungi. Hyphal growth of *C. destructans* was unaffected up to a level of ginsenosides approaching that found in roots (i.e., about 3 % dry weight). The growth of *F. solani* was significantly less than that of the control at saponin concentrations of 0.01 to 3.0 % (w/v), but was relatively unaffected in comparison to growth of *Trichoderma hamatum* and *A. panax*.

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Reeleder, R.D. (1), B. Capell (1), L. Tomlinson (1), J. Miller (1), and W. Hickey (2). Use of a commercial paint shaker to extract fungal DNA from soil (1) Agriculture and Agri-Food Canada, London, ON N5V 4T3; (2) Dept. Soil Science, University of Wisconsin, Madison WI 53706. Annual Meeting of the American Phytopathological Society, Milwaukee WI, 27-31 July 2002.

A bead homogenization procedure was used in conjunction with a commercial paint shaker to extract DNA from multiple large soil samples. Platforms designed to accommodate eight 50-ml Oakridge tubes were constructed and fitted to the shaker clamps. Soil samples (5-10 g) infested with chlamydospores of the fungus *Cylindrocarpon destructans* were used to evaluate efficiency in fracture of spores and release of DNA. Glass and zirconium oxide beads of various diameters were compared for DNA yield and reduction of colony-forming-units (CFU) on agar media after shaking treatments. Shaking for 20 min with 1 -mm diam zirconium oxide beads yielded the largest amount of DNA and provided fungal CFU reductions of 98 percent. Effects of various DNA extraction solution components (calcium chloride, proteinase K, sodium dodecyl sulfate) were evaluated for their effects on DNA yield and on amplification with the polymerase chain reaction (PCR). Generally, minimum concentrations of the components maximized yield. Their impacts on PCR amplification were in some cases concentration dependent.

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Reeteder, R.D. 2002. Diseases of shade-grown medicinal herbs., Agriculture and Agri-Food Canada, London, ON N5V 4T3. Annual Meeting of the American Phytopathological Society, Milwaukee WI, 27-31 July 2002.

Goldenseal (*Hydrastis canadensis*) and black cohosh (*Cimicifuga racemosa*) are medicinal herbs that are indigenous to North America. Both are potential companion or rotation crops in shade-cultivated ginseng (*Panax quinquefolius*) production systems. The susceptibility of *H. canadensis* and *C. racemosa* to two serious root diseases of *P. quinquefolius* was determined. Plants of the three species were grown in a shaded greenhouse and inoculated with isolates of *Phytophthora cactorum* or *Cylindrocarpon destructans* known to be virulent to ginseng. *P. quinquefolius* plants were severely diseased or killed by both pathogens. However, neither fungus was pathogenic on *H. canadensis* or *C. racemosa*. In related work, local goldenseal crops were observed to be severely affected by root disease. *Cylindrocladium colhounii* was isolated from diseased roots and shown to be pathogenic on *H. canadensis* plants. The fungus was not, however, pathogenic on *P. quinquefolius*. As both *H. canadensis* and *C. racemosa* are unaffected by two widespread root diseases of ginseng, further studies on their potential cultivation with ginseng is merited.

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Reeleder, R.D. and B. Capell. 2002. Impacts of different pentachloronitrobenzene (quintozene) use patterns on severity of damping - off of ginseng (*Panax quinquefolius*) caused by *Rhizoctonia solani*, Journal of Ginseng Research (in press).

In replicated field trials, the efficacy of pentachloronitrobenzene (PCNB; quintozene) for control of damping-off of ginseng seedlings was found to be affected by timing of application and formulation. Application at the time of seeding and prior to placement of straw mulch was found to provide the most consistent level of disease control. However, decline in plant

stand during the four-year production cycle resulted in most treatments providing similar levels of plant populations at harvest. Soil residues of pentachloronitrobenzene were generally highest (1 ug PCNB/g soil) in those treatments that exhibited the highest levels of disease control in the seedling year. Straw contained high levels of quintozone after application. Beet seed assays with artificially-infested soils indicated that current use rates provide an amount of product suitable for high levels of disease control.

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Reeleder, R.D., Roy, R., and Capell, B. 2002. Seed and root rots of ginseng (*Panax quinquefolius* L) caused by *Cylindrocarpon destructans* and *Fusarium* spp.. Journal of Ginseng Research (in press).

Ginseng (*Panax quinquefolius* L.) has become one of the most valuable herb crops grown in North America. However, traditional cropping practices are favourable to disease and significant losses due to root disease are common, despite frequent use of fungicides. Seedlots are often contaminated with pathogens, however, little is known about the causes of seed decay and the role of seed pathogens as incitants of root rots. It was shown that both *Fusarium* spp. and *Cylindrocarpon destructans* were able to rot seeds and that *C. destructans* was more virulent than *Fusarium* spp. on seedling roots. A modified rose bengal agar (MRBA) medium (1 g KH₂PO₄; 0-5 9 MgSO₄-7H₂O; 50 mg rose bengal; 10 g dextrose; 5 g Bacto peptone; 15 g Bacto agar; 3.0 mg streptomycin sulfate; 250 mg ampicillin; 10 mg rifampicin; 500 mg pentachloronitrobenzene; 500 mg dicloran; and 1 L distilled water) was superior to potato dextrose agar in detecting *C. destructans* in diseased roots. Isolation of *C. destructans* from diseased seedlings arising from seeds sown in replant soil supported the hypothesis that this pathogen is a cause of ginseng replant failure in North America.

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Ontario Grape and Wine Research and Services Subcommittee

Author:

Neil Carter - Chair

Ontario Grape and Wine Research and Services Subcommittee

Creation Date:

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17 September 2003



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State of the Industry Reports

Submitted by Bill George Jr.

The winter of 2001 and 2002 was one of the warmest on record. The result was a very delayed ice wine harvest. The last of the ice wine grapes were picked on March 5, 2002. While all of the grapes left for ice wine were picked, much of it went as late harvest and the brix level of the juice pressed was lower than usual because of the warmer temperatures. The brix level of the juice is determined by temperature of the frozen grape when it is pressed, not by the brix level of the grapes when it is in an unfrozen state.

Unfortunately, the spring was not as gentle. We experienced five nights of severe frost in April and May, after many of the buds had started to break. The Queenston-St. David's area was among the hardest hit. This area is the earliest in the Peninsula and those varieties that were well advanced suffered a lot of damage, Chardonnay being the hardest hit. By the middle of harvest it appeared that the crop would be down 10-12% from expectations. It was believed that the later half of the wine grape crop would be heavier, and it was. At time of printing, actual crop size was not known.

Concord and Niagara, away from the Lake, especially south of St. Catharines, sustained severe losses, approximately 50-60% in some cases. As a result, the Concord/Niagara crop was the smallest on record, at around 7,500 tonnes (10,000 tonnes in 2001).

In addition to the spring damage, the crop was further reduced by the drought conditions of the summer months. Apart from the Concord/Niagara for juice, the industry could not handle any more grapes. As of October 31, there were 543 tonnes of wine grapes surplus to winery needs. Of these grapes, 459 tonnes were Red Vinifera, i.e. Cab Franc and Cab Sauvignon.

Elvira growers received a shock when Canandaigua Wines informed them in the summer that they were not intending to purchase Elviras from Ontario. In the end, however, they purchased about 60% of the crop, leaving 245 tonnes not harvested. This will be the last year of production for most of the Elviras in Ontario.

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It is interesting to note that with the vines currently in the ground, production of Red Vinifera will nearly double to 19,000 tonnes by 2004. This is only 2 years away. Handling the next few crops will be the biggest challenge facing the industry since the FTA.

On a better note, the dry weather of 2002 meant that there were fewer pesticide problems, good news to the grower as it reduced his dependency on pesticides and reduced his input costs.

The big story of 2001 was the Asian Lady Beetle, which followed the Soya Bean Aphid into Ontario from the southern United States. 2001 was the first time we had suffered an outburst of this insect. The Lady Beetle secretes a pyrazene

compound when it is startled or killed. This product then gets in the juice leaving an off taste when the produce is turned into wine. Estimates of as much as 1 million litres of wine were affected in 2001, much of this may have to be dumped.

Fortunately, there was no reoccurrence of the problem in 2002, in fact population numbers were said to be below normal.

Once again we enjoyed an extended warm fall which resulted in good sugars in the grapes, with the first frost not occurring until late October. The regular harvest did not finish until the first week of November. The following chart shows the changes in production by type, with projections to 2004.

Production by Category 1996-2004

(**Shows potential crop size based on vine count - actual crop size will vary)

	1996	1997	1998	1999	2000	2001	2002**	2003**	2004**
Juice Concord/ Niagara	13450	10434	10084	14116	10674	10108	10094	10094	10094
Red Hybrids	2866	3245	3300	4941	4071	4775	5137	5938	6011
White Hybrids	15667	16464	16035	19964	14761	14699	15069	15250	15300
White Vinifera	5726	7248	9227	11350	11583	12602	14190	15153	16112
Red Vinifera	2796	3649	4881	6925	8867	9867	13227	15377	17983

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Ontario Fresh Grape Growers' Marketing Board 2002 Crop and Market Summary

Submitted by Adrian Huisman, Secretary - OFGGMB, November 15, 2002

The 2002 season for the most part was uneventful. The crop, which was originally estimated to be about the same or somewhat larger than 2001 actually came at 12% less. This makes the 2002 fresh grape crop one of the smallest crops on record.

The Board, in cooperation with Dr. Jennifer DeEll and Ken Slingerland, has completed the second of a two year study on the quality of Sovereign Coronation grapes. The goal is to establish sugar and/or sugar acid standard for mature grapes, and to develop a model for determining maturity dates for use in market planning.

Average Returns Through Ontario Dealer-Shippers 1998 - 2002 (\$'S PER TON)

* Returns are net of all service charges, commission and container costs.

	1998	1999	2000	2001	Prelim 2002
Sovereign Coronation	1630	1617	1595	1500	1612
Other Blue Grapes	1069	985	900	952	1077
Combined	1076	1060	1070	1208	1310

Fresh Fruit Sales Through Ontario Dealer-Shippers 1998 - 2002 (Tons)

	1998	1999	2000	2001	Prelim. 2002	5 Year Average	% Change '02 vs '01
Sovereign Coronation	132	333	486	732	637	464	-13
Other Blue Grapes	1628	1617	1425	932	825	1285	-11
Combined	1760	1950	1911	1664	1462	1749	-12

Oct. 31/02

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National Grape Cooperative Association - 2002 Report to the Ontario Grape and Wine Research and Services Subcommittee

**Jay Hardenburg, Senior Viticulture Specialist, National Grape Cooperative Association
2 South Portage St., Westfield, N.Y. 14787**

The National Grape Co-operative Association/Welch's received 1,901.7 tons of Concord grapes and 1,526.1 tons of Niagara grapes from its Ontario grower-members during the 2002 harvest season. This was despite the significant spring frost damage that affected many of our members' vineyards in April, 2002, and despite the drought conditions that prevailed throughout much of the Niagara Peninsula during much of the 2002 growing season. The high bud fruitfulness resulting from the early 2001 growing season, early vine development in 2002, high growing degree day accumulations, and timely pre-harvest rainfall this fall all contributed to making this year's crop larger than originally anticipated after the initial spring frost damage assessments.

For the second consecutive year, most of the Concord and Niagara crop from National Grape's Ontario members was received at the Cadbury/Mott's plant in St. Catharines. Niagara harvest started on Thursday, September 12th and continued for 5 days through September 16th, with National's Ontario members delivering 1,172 tons. Average yield per acre was 3.1 tons/acre and the average Brix level of 14.18 % was within Welch's target range for Niagaras. Two harvester operators delivered an additional 354 tons of Ontario-grown Niagaras to Welch's processing plant in Lawton, MI. to fill part of the shortfall at that plant resulting from spring frost losses in Michigan.

Concord harvest commenced at the St. Catharines plant on Monday, September 30th and continued for the next 9 days until completion on October 8th. National's Ontario members delivered 1,572 tons of quality Concords at an average Brix level of 17.7 %, well above National's Eastern Pool average of 17.1 %. Yield per acre averaged 2.4 tons/acre, very close

to our Ontario members' 7-year average.

Although Ontario Concord and Niagara vineyards yielded better in 2002 than expected, Ontario growers' yield averages still fell significantly below the averages of National's other Eastern production areas. Our Ontario members' average Niagara yield of 3.1 tons/acre compared to the Lake Erie/Lake Ontario belts average of 5.35 tons/acre and even fell below the Michigan average of 3.68 tons/acre. The Ontario Concord average of 2.4 tons/acre also fell below the Lake Erie/Lake Ontario belts average of 4.67 tons/acre and the Michigan average of 2.76 tons/acre. While some Ontario juice grape growers are achieving yields competitive with other Eastern Concord and Niagara growers, the challenge remains for all Ontario juice growers to find ways to increase yields more rapidly than competing regions in order to stay in business.

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Along with the crop reductions resulting from spring frost damage, the drought conditions that persisted through most of the 2002 growing season over most of the Niagara Peninsula probably had the greatest depressing effect on this year's crop yields. Given the frequency of warm, dry growing seasons in recent years, the National Grape field staff believes that additional research on vine/soil water relations in Concords and Niagaras is of increasing importance.

One issue of continuing concern to all Eastern grape growers during 2002 was the U.S. Environmental Protection Agency's registration reviews of existing grape pesticides under the Food Quality Protection Act (FQPA) legislation. This resulted in the cancellation by the EPA of all registered use on grapes for azinphos-methyl (APM/Guthion) and benomyl (Benlate). Hopefully, the maintenance of U.S. import tolerances for these chemicals will allow their continued use on grapes in Ontario for some period of time before the PMRA cancels their registered use on grapes in Canada as well.

The EPA will continue to review the registered uses for existing grape pesticides at an increasing pace over the next few years and additional restrictions or cancellations of current materials are expected. This continuous loss of existing pesticide products means that the grape/wine/juice industries will need to increase their investments in both research and administrative efforts directed toward additional registrations of new pesticides for use in grape growing.

One positive note for Ontario grape growers over the past couple of years has been the full registration by the PMRA of several new pesticides for use in grape vineyards. These include the new strobilurin fungicide kresoxim-methyl (Sovran), the neonicotinoid insecticide acetamiprid (Assail), the miticide pyridaben (Pyramite), the fungicide zoxamide/mancozeb (Gavel) and the molluscicide metaldehyde (Deadline M-Ps).

However, there are many pesticides which are currently registered or close to registration for use on juice grapes in the U.S., but not in Canada, that would be very valuable to Ontario growers if they were to be registered for use on grapes here. These include the sterol inhibitor fungicides Elite (Bayer), Procure (Uniroyal), Rubigan (Dow), and Bayleton (Bayer); a leafhopper-specific insecticide Provado (Bayer); herbicides Solicam (Novartis), Surflan (Dow), and Chateau (Dow?); and miticide Vendex (Griffin). National Grape Co-operative will be glad to offer any assistance that we can in support of pursuing registrations of some or all of these materials in Ontario.

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Fortunately, two pests that had surfaced as significant problems in the industry in recent years were not a problem for National's Ontario members during the 2002 harvest season. Both the European land snail (*Cepaea nemoralis* L.) and the Asian Lady Beetle (*Harmonia axyridis* Pallas) were present only in greatly reduced numbers this year. Even though all of the ecological reasons for the population declines of these pests are not clear, National Grape believes that additional study is still warranted.

The National Grape field staff believes that based upon the earlier than normal vine development during the 2002

growing season, near-record growing degree-day accumulations, and favorable weather conditions during the flower cluster initiation period, the potential exists for an above average crop of Concords and Niagaras in the year 2003. This would be a very desirable scenario for our Ontario growers given the continuing strong demand for both Concord and Niagara grape juice, which is being driven in large part by the favorable news concerning the positive health benefits of grape juice.

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Ontario Ministry of Agriculture and Food - 2002 Grape Overview

Submitted by Ken Slingerland, Tender Fruit and Grape Specialist, OMAF, Oct. 28, 2002

Weather

The Niagara Peninsula, which is home to over 95% of the grapes in Ontario, experienced another hot, dry growing season in 2002. The area experienced another mild winter with -8.3° C being the coldest recorded temperature in January. Spring weather continued to be mild as the temperatures recorded during April 15th to 19th were all above 23.3° C and grape development was pushed ahead of normal. Temperatures then fell between 2.3° C and -1.6° C during the 21st to the 29th of April causing concern for the season's grape crops. Grape growers reported many blocks of Chardonnay being injured as many primary buds were killed at this time.

Without the above normal rainfall in April (114.0 mm), we most likely would have struggled with tonnage and berry size for all grapes. Timely rains during June were critical for the early season crops, but irrigation was necessary during the dryer months of July and August. Some areas west of St. Catharines and along the Niagara Escarpment were not fortunate enough to experience some of the heavier thunderstorms that dumped 25 to 50 mm of rain in a very short period closer to the lake.

Table 1. Precipitation in mm - Vineland Station

	Jan.	Feb.	March	April	May	June	July	Aug.	Total
2002	61.6	30.5	77.9	114.0	25.5	58.0	48.3	21.5	437.3
85 norm.	61.8	57.6	64.8	70.3	70.6	75.7	67.4	71.6	565.8

Summary

Most of the grapes came through the season with fair yields and outstanding quality in the Niagara Peninsula below the escarpment. However, yields varied from field to field and from cultivar to cultivar. Many of the grape cultivars without irrigation tended to be under crop predictions.

The success of the Niagara-on-the-Lake Irrigation System and the close proximity to water for other growers was a key factor in the quality and quantity of grapes. There is some concern for the overall health of vines for the second year in a row, especially young vines and those plants that were not irrigated. October/November rains have replenished the soils and hopefully most plants are in good shape to get through another winter.

The year 2002 can be summed up as a spring frost year. Most growers had only partial to moderate crops due to the cold spring temperatures and spring bud injury. The value of land could easily be assessed this year as sites closest to the lakes and along the bench with good air-flow, generally came through with much greater crops than those sites further inland. Spring frosts are generally a rare occurrence below the escarpment and many growers know how close they came to losing their crops in 2002.

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Summary of Research Priorities 2002

1. Development of nutrient management guidelines through research of Ontario grape and wine production systems.
2. Development of advanced integrated pest management tools.
3. Vineyard management to minimize vine stress and maximize productivity, quality and environmental sustainability.
4. Fruit quality and factors affecting wine quality and acceptance.
5. Variety, clone and rootstock evaluation.

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2002 Research Priorities

Development of nutrient management guidelines through research of Ontario grape and wine production systems.

- Determine nutrient requirements and nutrient budgeting for grapes (including juice, table and wine grapes) recognizing the particular characteristics of our climate and the wide range of soil types on which grapes are grown in Ontario.
- Determine availability, losses and tracking of nutrients in Ontario grape and wine production systems.
- Develop soil testing standards and nutrient recommendation standards.
- Evaluate soil amendments and crop nutrition.

Development of advanced integrated pest management tools.

- Evaluate alternative pest control products (including conventional, biopesticides, biologicals and pheromones) to replace organophosphate and carbamate insecticides, as well as fungicides that will be lost as a result of FQPA and re-evaluation of pesticides.
- Conduct Good Laboratory Practices (GLP) residue trials to support minor use registration applications for pesticides including herbicides.
- Develop and validate predictive and management models for pests of grapes including but not limited to grape berry moth and various diseases of grapes.
- Develop efficient, rapid monitoring methods and economic action thresholds for insects, mites, weeds and grape diseases.
- Develop appropriate, systems-based resistance management strategies especially for pests with the potential for

rapid development of resistance including but not limited to botrytis, powdery mildew, and mites.

- Evaluate area-wide mating disruption for control of grape berry moth in different areas of Ontario.
- Efficacy testing of growth regulators for table grapes.
- Evaluate appropriate product use to minimize pesticide residues on fresh market grapes.
- Evaluation of bird control techniques.
- Development of integrated pest management strategies for pests including, but not limited to mites, leafhoppers, crown gall, Asian ladybird beetle etc.

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Vineyard management to minimize vine stress and maximize productivity, quality, and environmental sustainability.

- Training and other cultural practices to regulate vigour while maximizing productivity, ensuring good fruit composition and high wine quality.
- Determine parameters and need for irrigation while ensuring food quality; e.g. *E. coli* contamination in water.
- Develop accurate systems for measurement of soil water and water relations in wine, juice and table grapes.
- Develop accurate scheduling for irrigation and fertigation of grapes.
- Develop and encourage the adoption of systems of efficient water use.
- Application of precision agriculture; e.g. GPS and GIS to support various disciplines and help growers make better decisions.
- Mechanization of vineyard operations and reduce labour costs.

Fruit quality and factors affecting wine quality and acceptance.

- Marketing and consumer preferences.
- Aroma and flavour profiles as influenced by terroir, fermentation etc.
- Improved vintner methods for ice wine product.
- Yeast and bacterial metabolism in the fermentation and wine making process.
- Colour stability.

Variety, clone and rootstock evaluation.

- Evaluations of varieties, clones and rootstocks for wine, juice and fresh market grapes throughout the province.

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Top Five Pests Lists (as identified by the OGGMB Research Committee)

Top 5 Insect and Mite Pests for Grapes - 2002 (in order of priority)

- Grape Berry Moth
- Leafhopper species complex
- (including potato leafhopper, grape leafhoppers, 3-banded leafhopper)
- Grape phylloxera
- European red mite

- Erineum mite

Top 5 Diseases for Grape - 2002 (in order of priority)

- Powdery mildew
- Botrytis bunch rot
- Downy mildew
- Phomopsis
- Black rot

Other Pests Attacking Grape - 2002

- Birds

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Responses in 2002 to Recommendations from 2001

Issue # 1 (2001)

Inadequate crop protection research capacity to address important insect, mite and disease problems in grapes.

Recommendation #1 (2001)

It is recommended that SCPFRC London and the National Program Leader of AAFC Research Branch move forward quickly to address the research gaps in ecology, monitoring methods, predictive models and control of grape insect and mite pests, as well as the epidemiology and control of grape fungal diseases such as powdery mildew, botrytis bunch rot, downy mildew, black rot and phomopsis.

Target agencies

Dr. Gilles Saindon, Director of AAFC - SCPFRC, London
Dr. Gary Whitfield, Director of AAFC - GPCRC, Harrow
Also Forward to National Program Leader, Research Branch, AAFC.

Response

(From SCPFRC, London) This recommendation will be forwarded for comment to Dr. Gary Whitfield, National Science Director for Theme 160 - IPM & Plant Protection

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Issue #2 (2001)

Loss of conventional organophosphate and carbamate insecticides with a lack of registered replacement products for control of grape pests.

Recommendation #2 (2001)

That both AAFC and PMRA increase resources to provide insect control product alternatives to the grape industry. The above mentioned government agencies to work closely with other stakeholders such as OGGMB, OMAFRA, National Grape Co-op (New York) and Canadian registrants to facilitate solutions.

Target agencies

Wendy Sexsmith, Pest Management Regulatory Agency
Dr. Gilles Saindon, Director of AAFC - SCPFRC, London
Dr. Gary Whitfield, Director of AAFC - GPCRC, Harrow

Also forward to National Program Leader, Research Branch, AAFC

Response

(From SCPFRC, London) The Pesticide Minor Use Program will include this recommendation.

Message will be forwarded to Mr. Bill Boddie, Policy Branch, AAFC, Ottawa.

The OGGMB should ensure that its interests for crop protection materials are placed on the national priority list through the offices of the regional pesticide minor use co-ordinator by March 15 of each year.

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Issue #3 (2001)

Inadequate resources to conduct good laboratory practices (GLP) residue trials to support minor use registration programs.

Recommendation #3 (2001)

AAFC research branch allocate budget resources and staff to facilitate Vineland and Harrow site certification and to support GLP residue trials for grape and tree fruit minor use registration applications and projects.

Target agencies

Dr. Gilles Saindon, Director of AAFC - SCPFRC, London
Dr. Gary Whitfield, Director of AAFC - GPCRC, Harrow
Also Forward to National Program Director, Research Branch, AAFC

Response

(From SCPFRC, London) There are 7 AAFC hubs across Canada, including Delhi, Vineland, St. Jean and Harrow, that are expected to be GLP compliant by the 2003 growing season as part of the Pesticide Minor Use Program. Harrow and Agassiz, BC are already GLP compliant.

Issue #4 (2001)

Lack of harmonization of pest control products to support an expanding grape and wine industry. This could result in reduced global competitiveness and loss of both domestic and export market sales.

Recommendation #4 (2001)

PMRA improve the registration process for all crop protection materials including biologicals and biorationals. AAFC research and policy branch allocate budget resources and staff to facilitate data collection and compilation of minor use application packages.

Target agencies

Wendy Sexsmith, Pest Management Regulatory Agency
 Dr. Gilles Saindon, Director of AAFC - SCPFRC, London.
 Dr. Gary Whitfield, Director of AAFC - GPCRC, Harrow
 Also forward to National Program Leader, Research Branch, AAFC

Response

(From SCPFRC, London) There are 7 AAFC hubs across Canada, including Delhi, Vineland, St. Jean and Harrow, that are expected to be GLP compliant by the 2003 growing season as part of the Pesticide Minor Use Program, and will be conducting trials by the next growing season.

AAFC is currently organising a Pesticide Minor Use Centre, which will operate out of Ottawa, using regional field facilities. The Centre is expected to be operational by April 1, 2003, and will be responsible for compilation and submission of the data packages to the PMRA.

For more information contact Mr. Bill Boddie, Policy Branch, AAFC, Ottawa.

Summary of Issues with Recommendations

1. The nutrient management act will require growers to develop nutrient management plans but there is currently not enough information or standards to allow them to do so.
2. The grape and wine industry requires timely harmonization for evaluation and registration for pest control products used in Canada and the United States to ensure all producers have access to effective materials for the development of sustainable resistance management programs that are viable and maintain competitive balance with international trading partners.
3. Water management is becoming an extremely important issue for grape growers but there is currently not enough information specific to Ontario's grape growing conditions to guide their management decisions
4. There is a continuing need for enhancement of crop protection research capacity to address important insect, mite, nematode, weed and disease problems in grapes.
5. Slowness of establishment of Good Laboratory Practices (GLP) compliant facilities to perform residue trials and other requirements for User Requested Minor Use Label Expansion (URMULE)

submissions.

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Recommendation #1

Issue

The nutrient management act will require growers to develop nutrient management plans but there is currently not enough information or standards to allow them to do so.

Background

- Nitrogen recommendations for juice and wine grapes differ both in timing and rate. Non-traditional organic matter sources (paper mill fibre residue, winery pomace, composted winery pomace and/or poultry manure combined) are being used in vineyards. Their impact on the seasonal nutrient cycle is not documented well enough to be used for good nutrient management planning budgets.
- Organic matter sources for vineyards include non-traditional materials such as papermill biosolids, winery pomace and various composted mixtures often including poultry manure. Their impact on the nitrogen cycle in a vineyard is not fully understood. Organic matter breakdown over winter is difficult to predict, and combined with the slow activity of vines and cover crops over winter, the early season nitrogen budget is difficult to calculate for the beginning of the season. This puts the subsequent nutrient plan calculations in doubt.
- Detailed seasonal budgeting of nitrogen use in grapes is not well developed for cool climates, such as Ontario, where cold soils will impact organic matter breakdown and root activity. Data already generated in the field of grapevine nutrient uptake and utilization is concentrated in warm winter areas, under irrigation and on coarse soils (California, Australia and South Africa). This data is therefore not readily translatable to Ontario with cold winters, natural but intermittent rainfall and heavy clay soils, where nutrient balance/imbalance can seriously affect fruit quality and over wintering capability.
- The use of fertigation is just now being investigated and the timing/rate of application needs to be documented for good nutrient planning.
- Growers are concerned about the time and money that will be needed to develop nutrient management plans and the applicability of these plans in light of the paucity of information (see above) relevant to Ontario grape and wine production systems.
- The Ontario Grape Growers Marketing Board Research Committee provides the following comment:
"The industry has identified this area as the number one area of concern for we understand the importance of this area in our immediate future. It is a regional, provincial and national concern. The industry needs to be an active participant in the on-going consultative process, the development and the implementation of nutrient management. We solicit government/research support in determining the impact of potential legislation on the grape industry."

Gaps/Barriers/Deficiencies

1. There is insufficient Ontario data to create accurate profiles of nutrient use and sequestering in grapes
2. There is insufficient Ontario data on the use of alternative organic matter sources and their fit in the nutrient cycle of a producing vineyard.
3. There is insufficient data from fertigation trials to document uptake and/or loss patterns of nitrogen as influenced by irrigation.
4. Specific needs requiring research identified by the OGGMB Research Committee:
 - a. Soil testing standards for perennial crops, particularly vineyards (Timing, position, depth, common analytical procedure for use in base calculations for nutrient planning)

- b. Specific nutrient requirements for horticultural crops
- c. Nutrient availability, losses and tracking for nutrient management plans
- d. The need for data re: "equal in and equal out" related to soil types pertinent to viticultural areas.

Details

- Research programs need to be encouraged to address the concerns of nutrient management act implementation.
- Nitrogen and manure management are strong programs with the UG Department of Land Resource Science but the crop focus is annual cash crops and implementation focus is on high risk land prone to surface erosion and overuse of fresh manures. Use of spring soil samples, manure analyses and legume crop credits along with predictable crop utilization/removal equations have been used to develop good nutrient management guidelines for these crops.
- Developing nutrient budgets for perennial crops is complicated by residual nutrients in the perennial structures, the use of slow release organic matter amendments not included in the conventional studies, permanent sods and intermittent cultivation strategies and the addition of irrigation/fertigation practices.
- The fruit crop nutrition program has been dropped from the UG Department of Plant Agriculture list of horticultural research programs and the research scientist in that program has been declared redundant.
- Mature plantings of grapes in vineyards under the control of the UG Department of Plant Agriculture and/or research grants held by faculty members of UG/Plant Agriculture and UG/Land Resource Science and CCOVI/Brock University are available for nutrition studies with appropriate additional funding.
- Soil and water research programs at other universities may be other useful avenues.

Recommendation

Resources and manpower need to be assigned to develop standards for creation and implementation of nutrient management plans in the Ontario grape and wine industry, from production through processing.

Target agencies

- University of Guelph
- Ontario Ministry of Agriculture and Food
- Brock University
- University of Waterloo

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Recommendation #2

Issue

The grape and wine industry requires timely harmonization for evaluation and registration for pest control products used in Canada and the United States to ensure all producers have access to effective materials for the development of sustainable resistance management programs that are viable and maintain competitive balance with international trading partners.

Background

- The enactment of the Food Quality Protection Act (USA) has resulted in the re-evaluation and removal of many

pesticides in the US market. The US industry has undertaken the registration of new replacement products to offset product loss. To meet US standards many Canadian producers are losing current conventional products without adequate alternative replacements putting them at an economic and production disadvantage.

- Despite actions by regulatory agencies to "harmonize" the registration of new pesticides, there still exists a time lag between adoption and availability of new materials between Canada and the United States.
- In many cases US adoption and use of new effective reduced risk materials is far in advance of those adopted for use in Canada. In some instances new product registration is not pursued at all within Canada.
- Regulatory directive 2002-02 (31 May 2002), Section 1.0 states that the PMRA " recognized the need to encourage registration of new reduced risk pesticides and acted upon a government commitment to pursue harmonization as one of the key means of achieving efficiencies and facilitating access to new lower risk technology. It also understood the need for Canadian growers to have access to new technologies at the same time as their US counterparts." Several programs have been introduced as well as a process for joint review of minor use pesticides. However, the same time adoption has not occurred with Canadian registration of new reduced risk pesticides occurring significantly later and sometimes not at all.
- Registrants have indicated that the process used in Canada is too time consuming and excessively expensive to pursue bringing products to the Canadian market.

Gaps/Barriers/Deficiencies

The response time for product review and acceptance by Health Canada - PMRA has been too long for many firms to consider product registration that respects patent length on proprietary materials and potential to recoup investment in the Canadian marketplace.

- Volume of registration requests cannot be reviewed and acted upon by existing staff at regulatory agencies within an acceptable time frame to ensure Canadian competitiveness with trade partners.
- There exists a need to streamline the regulatory process so that US and Canadian agencies can review similar information packages at the same time to ensure equal timing of adoption/availability to producers.
- AAFC Vineland does not have any personnel working on fungicides, nematocides or herbicides for the grape industry and limited resources for insecticide evaluation

Details

- Increase AAFC resources and personnel to perform the evaluations listed above for both efficacy and GLP residue trials (see Recommendation # 5)
- PMRA to improve harmonization process so that true harmonization of product availability can be achieved. PMRA should quickly identify and remove barriers to true joint reviews.
- PMRA to streamline registration process especially for reduced risk products.
- PMRA to increase staffing to deal with existing backlog of registration applications.

Recommendation

That PMRA, AAFC, and OMAF allocate additional personnel and resources to ensure that product registration for reduced risk pesticides be achieved at the same time as their US counterparts to maintain competitive balance and ensure sustainability of economically viable and environmentally responsible grape production.

Target Agencies

- Wendy Sexsmith, PMRA
- Dr. Gilles Saindon, Director of AAFC-SCPFRC, London
- Dr. Gary Whitfield, National Science Director for Theme 160 - IPM & Plant Protection
AAFC-GPCRC, Harrow

- Ontario Ministry of Agriculture and Food

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Recommendation #3

Issue

Water management is becoming an extremely important issue for grape growers but there is currently not enough information specific to Ontario's grape growing conditions to guide their irrigation and soil water management decisions.

Background

- In recent years, and especially the last two very dry summers, grape growers in Ontario have had to increasingly rely on irrigation to maintain the health of their vineyards.
- Wasteful, overhead systems are currently the common practice, but more efficient strategies such as trickle or subsurface irrigation will be necessary in the future to make the best use of available water.
- There is irrigation/fertigation information available from British Columbia, California, South Africa and Australia but it does not necessarily apply in Ontario because of their more arid, predictable climates, coarser soils and generally mild winters.
- Evapotranspiration calculations based on models developed in very arid regions do not take into account intermittent but profound droughts under high humidity conditions. Irrigation schedules in arid regions maintain vines at a relatively constant, benign deficit and the vines remain in a good physiological state, whereas vines in Ontario cycle at intermittent, unpredictable intervals from drought to ample to excess during rains, followed by ample to drought in its absence.
- Currently, there are no good physiological markers to use as drought indicators for vineyards, to be incorporated into pre-emptive irrigation timing schedules. Other than using individual rain gauges and noting absence of rain, early stages of drought stress are not readily measured in a vineyard and application of water is therefore haphazard.
- Soil moisture monitoring is difficult in heavy clay soils where drought can be aggravated by the soil physical condition of being difficult to re-wet and the small root volume developed in these restrictive soils. Currently, there are no good, economical soil moisture monitoring devices that can accurately measure soil moisture in a manner applicable to that particular vineyard.
- There are some winemakers who hold the view that ANY irrigation reduces fruit quality. Growers are concerned that, although this view is fundamentally untrue, excess irrigation could compromise fruit quality and vine hardiness but withholding water altogether will seriously impact both fruit and vine health.

Gaps/Barriers/Deficiencies

- No irrigation schedules have yet been developed for vineyards in Ontario and models developed in other parts of the world may not be applicable because of our humid climate.
- No irrigation studies have been completed with complete fruit flavour and wine flavour profiles to prove the effectiveness of appropriate irrigation in vineyard management.
- No irrigation studies have been completed to determine best management practices for different soil types in Ontario since grapes in Ontario are grown on a wide variety of soil types - many on the heavier clays - and many different soil/cover crop management systems are applied.
- Current overhead irrigation practices can have a negative impact on IPM systems management. Overhead irrigation can contribute to disease pressures (e.g. powdery mildew) and have an impact on timing of insecticide applications. More efficient trickle and subsurface irrigation systems need to be researched to give growers options for better water delivery systems that will not negatively impact their pest management systems.

Details

- Currently, two studies are underway in the Niagara Region, but extensive research trials need to be established in grape growing areas where soil type and climatic parameters may be different.
- Good, practical, economical soil monitoring systems need to be developed for heavy dense lacustrine clays as well as clay based glacial tills and deep alluvial sands, all three present in the Niagara Region and elsewhere in the grape growing districts of the province. Information is needed to develop best management practices and water application rates tied to soil percolation, infiltration and absorption rates, to prevent runoff and/or leaching of nutrients.
- A good reliable set of calculations needs to be developed using the soil type, the present soil water conditions, the vine phenology and health, and an estimate of vine water demand. These need to be readily calculated at specific physiological stages in the vine's annual growth cycle so that stress is avoided at these key times (flowering, fruit set, veraison)
- The effects of appropriate irrigation on fruit and wine quality need to be well defined to allay the fears of some winemakers that irrigation will detract from wine quality.

Recommendations

Resources and personnel should be assigned to develop standards, protocols and schedules for irrigation management for specific soil types in the grape growing areas of Ontario.

Target Agencies

- University of Guelph (Plant Agriculture and Land Resource Sciences)
- Brock University (CCOVI)
- OMAF
- AAFC-GPCRC, Harrow
- AAFC-SCPFRC, Vineland

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Recommendation #4

Issue

There is a continuing need for enhancement of crop protection research capacity to address important insect, mite, nematode, weed and disease problems in grapes.

Background

- Recommendations on this issue have been made repeatedly by the Ontario Grape and Wine Research and Services Sub-Committee. The response from AAFC- SCPFRC to last year's recommendation was not seen by the committee as helpful or satisfactory.
- Several key research positions have been unfilled at AAFC-SCPFRC, Vineland for a considerable time and others will be vacant soon (see 'Gaps/barriers/deficiencies' below).
- The Ontario Grape Growers' Marketing Board challenges the research and extension services that the "critical mass" required to service the industry is shrinking and critical services are not being addressed.

Gaps/Barriers/Deficiencies

- AAFC-SCPFRC, Vineland. The entomology position (population ecologist) has been vacant since 1998. The initial request to fill this position was presented in 1998 and after two rounds of searches and interviews, the position remains unfilled. With continuing changes in the pest complex and in pest control options, the vacant ecology position leaves a critical gap in the entomology program at AAFC Vineland. With new technologies now available such as disruptive pheromone products, a reduction in available chemical control options and shifts in population dynamics, modifications of the grape IPM program are needed. There are currently no new field investigation projects or senior research scientists at AAFC Vineland addressing the mite and insect problems in grapes.
- AAFC-SCPFRC, Vineland. The nematologist position at Vineland (formerly Dr. John Potter - retired) remains unfilled.
- AAFC-SCPFRC, Vineland. The plant pathology position at Vineland (formerly Dr. John Northover - retired) was identified as a priority in the Plant Pathology Review of the Vineland Fruit Program in January 2000. Although there are plant pathologists/virologists employed at Vineland, their efforts are currently directed at non-grape issues, e.g. plum pox virus, fire blight.
- AAFC - SCPFRC, Vineland. The recent retirement of virologist Dr. Wayne Allen leaves another gap in the research capacity at Vineland.
- OMAF - Simcoe. The sprayer application specialist position (formerly at Simcoe) has been vacant for well over a year. This position is very important in providing education and training packages pertaining to sprayer application technologies. It is also important in prevention of pesticide residues on grapes.
- University of Guelph - Vineland. Work in grape integrated pest management ceased in 1999 at U of G, Vineland. There is significant work needed in this field on an ongoing basis.
- Brock University: NSERC, OGGMB, and WCO funding for the NSERC industrial Research Chair in Viticulture ceased in 2002. The Cool Climate Oenology & Viticulture Institute and the Dept. of Biology have the infrastructural capability to carry out pest management research, but ongoing funds and more staff are needed to completely fulfil their research mandate. More staff would also allow CCOVI to develop a cooperative extension program to fill the void left by the departure of staff from University of Guelph, OMAF, and Agriculture Canada.

Details

- Positions at facilities listed above need to be filled promptly so that important grape and wine research and services can be conducted and delivered in a timely fashion.

Recommendations

- AAFC-SCPFRC and Dr. Gary Whitfield, National Science Director for Theme 160 - IPM & Plant Protection, should work quickly to address the gaps in crop protection research at AAFC-Vineland by filling the existing vacancies. In addition, these parties should clarify the roles and responsibilities for grape disease research at the Vineland research facility.
- OMAF - Agriculture and Rural Division should work quickly to fill the vacant sprayer application technology specialist position which is seen as an important gap in services by the OGGMB.

Target Agencies

- AAFC- SCPFRC and Dr. Gary Whitfield, National Science Director for Theme 160 - IPM & Plant Protection
- OMAF - Crop Technology Branch
- University of Guelph
- Brock University: Prof. Ian Brindle, Dean, Mathematics and Science, and Dr. David Atkinson, President, Brock University.

Recommendation #5

Issue

Slowness of establishment of Good Laboratory Practices (GLP) compliant facilities to perform residue trials and other requirements for User Requested Minor Use Label Expansion (URMULE) submissions.

Background

- As of 2001, all new crop residue studies conducted in the field and laboratory must be conducted under GLP protocols.
- There are only 3 private companies in Ontario that have qualified staff and certification to conduct these trials.
- The implementation of the new GLP guidelines means more research funding will be required to conduct these labour intensive trials as a result of the increased documentation and data requirements and the need for separate residue and efficacy studies.

Gaps/Barriers/Deficiencies

- The committee appreciates the response of AAFC in a similar recommendation in 2001. However, as of late 2002, only Agassiz and Harrow are GLP compliant while Vineland is not. Therefore, to date there are still no facilities with GLP certification able to conduct GLP residue trials on grapes in the primary grape growing area of Ontario .

Details

- Vineland is to be one of the AAFC GLP "hubs", therefore, increased effort is needed to get the GLP program organized and in place for the 2003 season.

Recommendation

AAFC prioritize the GLP certification process at Vineland and swiftly allocate additional budget and staff to have Vineland GLP compliant and ready to begin the work needed to support URMULE submissions.

Target Agency

- Dr. Gilles Saindon, Director of AAFC-SCPFRC, London
- Dr. Gary Whitfield, National Science Director for Theme 160 - IPM & Plant Protection, AAFC - GPCRC, Harrow.

Issues and Notes from 2002 Services Discussion

The reports in the following section cannot easily be separated between the categories of 'research' and 'services'. Many of the personnel involved in grape and wine work provide both research and services to the industry.

Service providers who had not normally been involved in, or even aware of this committee were encouraged this year to provide reports of their service activities to give a better picture of the extent of service activity in the province.

The 2002 meeting also included some discussion of the issues surrounding services and brief notes on the issues identified are below. These issues are not listed in order of importance.

Issue: Information transmission to growers.

Notes: There is concern about the delivery of information to growers especially in regards to interpreting research results and making them accessible to growers. There is also a need for growers to know what topics of research are being pursued. An effort to provide complete information on this topic will be through the delivery of copies of this years' OGWRSSC report to the OGGMB Research Committee for sharing with interested growers. The OGGMB now have a website that will also contribute to this effort. The Tender Fruit Grapevine and Hort Matters newsletters continue to be routes for OMAF and others to deliver information to growers; discussions with growers may help determine future information needs for the newsletters. The Lake Erie regional grape program provides email updates to growers (1-3/week) but is a large investment in time for the New York extension personnel.

Issue: Funding of phone service for the regional agriphone messages.

Notes: OMAF has supported the regional agriphone through the University of Guelph, Vineland campus. With the changes to the structure of the Vineland campus, these phone lines will be lost. This is an extremely important tool for growers in Ontario and efforts should be made to prevent any interruption of this service. The OGGMB funds KCMS to provide the messages but may not be willing or able to pay for the phone lines. Some infrastructure is required for the agriphone to handle multiple calls simultaneously. That infrastructure may already be locally available through private companies.

Issue: Service and information availability for eastern Ontario grape growers.

Notes: The Prince Edward County Winegrowers' Association (PECWA) feel they are still not well recognized and seem to spend an inordinate amount of time trying to find the information their grower members need. The changes in OMAF extension efforts in eastern Ontario were identified as one reason for this knowledge gap but the fact that many growers in that region are relatively new to the industry was also identified as a reason for lack of contacts with information and service providers. The OGGMB has a 'starter kit' available for new growers and will provide them to any new growers as soon as they know of their existence. Growers need to contact the marketing board though, as the board may not know of the growers until their third or fourth year of operation.

Issue: Niagara Agricultural Weather Network (NAWN) funding expired.

Notes: NAWN is an area wide weather service providing information from 13 locations in the Niagara region. The information generated by NAWN was extremely useful to industry, research, extension and consulting personnel to help interpret weather differences and their effects on pest activity, crop phenology etc. across the region. This information was also useful when testing and using models to predict disease activity.

NAWN was funded by a consortium of groups including Grape and Tender Fruit Ontario Limited, AAFC, OMAF, the University of Guelph and Brock University. Additional funding for the last three years through Healthy Futures paid for a Systems Supervisor but as of September 1, 2002, that funding ceased. This situation now leaves the original consortium

members with the decision of whether to continue funding of the network but presently, it does not appear that any one of the members is taking the initiative to fund the network. Data is still being collected but there is no maintenance, supervision or quality control of the information recorded.

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Research and Services Reports

Ker Crop Management Systems

Submitted by Kevin Ker, KCMS November 2002©

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Summary of Services and Research Projects - 2002

KCMS is an independent private entity that provides unbiased professional advisory services and research. KCMS does not receive any commission sales or fees as part of its advisory services/research role.

KCMS operates year round conducting research, delivering services and professional development (since establishment) and has no direct affiliation as an agent/employee for any laboratory, supplier, buyer or manufacturer involved with the grape and wine industry. KCMS does collaborate with government and other agencies, research facilities (local and international) and others for the development and delivery of information for the benefit of the entire industry.

KCMS provides comprehensive horticultural advisory services (all facets of crop production and protection) across Ontario in Niagara, Eastern and Southwestern Ontario. These services involve development of crop nutrition plans, site development, land use planning, economic reviews (costs of production, costs of establishment, production projections, insurance and legal proceedings, etc) and pest management advice and other services for growers and businesses involved with the all aspects of the grape and wine industry.

Monitoring Activities 2002

Approximately 4,000 acres monitored once each week. Comprised of 375 blocks at over 115 farm locations covering entire Niagara peninsula. Labrusca cultivars (juice and fresh market) along with hybrids and vinifera cultivars (for wine) were monitored for pest activity, crop phenology, crop load estimations and plant health issues on weekly basis from 27 April to 30 August for routine evaluations. Fruit sampling for harvest indexes and pest activity continued through to harvest at approximately 550 acres each week.

A comprehensive crop report (including information covering all aspects of grapevine production and pest information) was developed and recorded each week based on the data from the monitored sites. Messages were available to all

grape growers via local or toll free telephone access. The Grape Crop Report messages were updated each week. These messages were developed including consultation and information from local government agencies, research and extension and research colleagues from nearby US facilities and Dr. Wendy McFadden Smith (Grape Pathologist).

For the 2002 growing season the Niagara crop report had 3,533 calls (almost 10% more than in 2001) and Southwestern Ontario grape crop report 205 calls.

Service Activities

- Presentation: An Overview of the Ontario Grape and Wine Industry and Managing High Vigour Issue in Vineyards. Long Island Agricultural Forum, Long Island NY January 2002. Cornell Cooperative Extension
- Development and delivery of region wide Grape Crop and Pest report for Niagara and Southwestern Ontario available to all growers and funded by Ontario Growers Marketing Board (prepared in conjunction with Dr. Wendy McFadden-Smith)
- Monthly contribution to PECWA newsletter 2000 - 2002
- KCMS annual update of vineyard establishment and operating costs for use by lending agencies and industry.
- KCMS is involved with Ontario Municipal Board hearings regarding vineyard site suitability and land use planning issues in Ontario.

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Research 2002

2002 Topic areas have included:

- Using digital ortho imagery and software to assess IPM and crop efficiencies for vineyards
- Evaluation of gypsum block technology for assessing vineyard water requirements and irrigation timing
- Update costs of establishment of vinifera and labrusca Grapes (data from more than 50 commercial vineyard operations)
- Assessment of Surround™ for potential use for control of leafhoppers in commercial vineyards in Ontario
- Predicting crop loads in commercial vineyards
- Establishing optimum crop loads at specific sites for specific cultivars
- Implementing alternative control strategies for grape berry moth
- Measuring effectiveness of crop nutrient programs in commercial vineyards (ongoing)
- Development of region identification within Niagara Peninsula using grapevine phenology and climatic data
- Assessing secondary pest activity and injury in commercial vineyards

McSmith Agricultural Research Services

Submitted by Wendy McFadden-Smith, McSmith Agricultural Research Services

Summary of Research Projects

Evaluation of computer models for predicting grapevine diseases

Use of Silicon-based products as an alternative to synthetic fungicides for control of grapevine powdery mildew

Efficacy of different treatments for control of grapevine diseases

Summary of Service Activities

- Collaborated with KCMS for development and delivery of region wide Grape Crop and Pest report for Niagara and Southwestern Ontario available to all growers and funded by Ontario Growers Marketing Board
- Instructor in Brock University, Cool Climate Oenology and Viticulture Institute and Niagara College Oenology and Viticulture Technical programs
- Participated in Fruit Technical Working group to make recommendations re pesticides to be included in OMAF Publication 360 Supplement 2003
- CCOVI workshop Optimizing Sprayer Performance - April 2002 (with K. Ker)
- Organized Grape field tour and presented pathology research trials, August 2002

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Agricultural Integrated Management Services Intensive Crop Monitoring Program

Submitted by: Monalisa Elshayeb, IPM Co-ordinator 519-780-0456 ext. 324

355 Elmira Road North, Unit 103, Guelph, Ontario, N1K 1S5AIMS (Agricultural Integrated Management Services) is offering an Intensive Crop Monitoring Program to protect crops from significant damage with minimum use of pesticides. The AIMS monitoring program will be set up using two scenarios. Both scenarios will involve accurate and intensive scouting, however where an established OMAF Integrated Pest Management Program is in place, AIMS will provide members with those specific thresholds and procedures. Any commodity that does not have an established OMAF Integrated Pest Management Program, AIMS will provide the most appropriate and up-to-date guidelines and procedures to a grower, based on comprehensive research.

AIMS qualified scouts will monitor a wide variety of crops observing insects, diseases (fungal, bacterial and viral), weeds, physiological disorders (nutrient problems and/or environmental influences) and any other pest problems. On average, crop monitoring will take approximately 30-40 minutes for every 10 acres of scouting, however certain commodity groups will require additional time. Scouts will use a number of monitoring techniques including, field walks, trap counts, microscope counts, sweep net counts, tapping tray counts, and weather monitoring. After a scout is done monitoring a growers field they will leave a scout report, which will let growers know exactly what is occurring in their fields. Scouts may also use a visual aid such as a chart or communicate with a grower directly. Scouts will not give any chemical recommendations, however AIMS will provide qualified industry experts to deal with those issues.

To aid AIMS members one step further, area agri-reports will be available twice weekly. These agri-reports will allow growers to gain knowledge into the pest pressures in their area and give growers a heads-up on any potential problems so that better management decisions can be made. Agri-reports may also include recommendations (from Publication 363 or 360) so that pesticide treatments can be incorporated with cultural, mechanical and biological control methods. To accommodate all situations the agri-report will be available through phone, fax and email.

Grapes Crop Monitoring

Vineyards will be monitored twice weekly for a period of approximately 20 weeks during the growing season. Currently AIMS offers an intensive-monitoring program for this commodity. Pheromone traps for grape berry moth will be placed and monitored in each vineyard. Along with trap monitoring, scouts will examine 50-100 plants for any additional insects,

disease and physiological disorders. Traps counts along with beneficial insect counts will be recorded for the grower after each visit. Major pest complexes that will be monitored include: grape berry moths, leafhoppers, phylloxera, phomopsis cane and leaf spot, downy and powdery mildew, black rot, botrytis bunch rot.

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Niagara Pest Monitoring Club

Submitted by: Arnie Lepp, Niagara Grape and Tender Fruit Distributors Ltd.

N.P.M.C. is a non-profit, open organization of commercial growers currently operating over 4,000 acres of vineyards and orchards within the Niagara Peninsula from Grimsby to Queenston.

Experienced horticulturalists share pragmatic solutions and incorporate expertise from various research consultants involved in crop protection services and plant nutrition.

Five seasonally employed scouts, statisticians, two volunteers and independent laboratories develop integrated pest management advice and crop nutrition data for club participants and specific research projects.

Monitoring Activities

May to September monitoring.

- Over 2000 acres scouted a minimum of once a week
- 75 different farm locations
- labrusca, hybrid and vinifera cultivars checked for pest activity and plant nutrition indicators
- crop report based on data from monitored sites was developed each week and distributed to all members and other organizations and agricultural supply businesses.

*Accurate mapping of orchards and vineyards for complete site integrity.

*On-farm information and documentation binders supplied and updated weekly.

*Integrated Pest Management by intensive monitoring with experienced field scouts.

*On site laboratory in Niagara-on-the Lake, for insect and disease identification, ph water testing.

*Leaf and soil sampling provided as part of the monitoring program to promote healthier, disease resistant plants. Samples are delivered to A&L Laboratories for professional analysis at a group rate and eventual data sharing.

*Weekly group meetings between growers, scouts, nutrition and pesticide consultants.

*vineyard pests monitored for included: Leafhoppers, Mites, Grape Berry Moth, Phylloxera, Phomopsis, Black Rot, Botrytis Bunch Rot, Powdery and Downy Mildew

Research 1993-2002

Effects of phosphorus levels in plant tissue on the frequency and population levels of Grape Berry Moth.

Magnesium and Potassium levels in plant tissue relative to mildew resistance.

Grape Powdery and Downy Mildews as affected by calcium levels in plant tissue.

Developing a statistical mathematical model for macro and micronutrient concentrations relative to grape downy and powdery mildews.

The effects of cultural vs. environmental factors on Grape Mildews, Botrytis and Berry Moth Levels.

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Report of the Grape Industry of Southwestern Ontario, "Canada's South Coast"

Submitted by Hans Peter Pfeifer, ontariograpes.com

Local organizations

Growers in southwestern Ontario formed a study group, called "The Viticultural Roundtable of SW Ontario", which has been very active since 1994 (www.ontariograpes.com). Recently, they have joined with "SWOVA" (Southwestern Ontario Vintners' Association), bringing the grape growers and the wineries into one organization. Projects of the Roundtable include:

1. Educational Meetings: The annual meeting schedule has evolved with topics that focus on "Quality enhancing production methods" (the mission statement for the Roundtable)

2. Sustainable Grape Production: For the last 4 years, the group has been working on the development of a sustainable production protocol with the focus on more conscientious use of pesticides.

3. Scouting & Disease Model Evaluation

4. Local Weather Network

5. ontariograpes.com

Services provided by ontariograpes.com include:

- Site and soil suitability
- Variety and rootstock evaluation
- Full line on-site viticultural consulting with hands-on training
- Research on established and new varieties
- Development of sustainable grape production systems
- Organization of scouting services, and advice on pest management
- Development and assessment of nutrition management

In cooperation with Euro Nursery and Vineyard, numerous projects have been established on their farm in Harrow:

- Adaptation trial to evaluate differences in rootstock performance
- Evaluation of new cultivars from Switzerland , as part of a trial in Switzerland & New Zealand
- Variety evaluations with vines from France (Viognier, Syrah, and clones of Sauvignon Blanc, Merlot, Cabernet Franc, Cabernet Sauvignon)
- Variety evaluations in cooperation with SWOVA to find new cultivars worth growing, i.e. Pinotage, Barbera, Petite

Verdot, Dolcetto, Refosco , Tempranillo , Aleatico etc

6. Residual Herbicide Evaluations

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Ontario Ministry of Agriculture and Food, Vineland

Submitted by Mr. Kenneth C. Slingerland, Tender Fruit and Grape Specialist

Projects with Growers, Marketing Boards, U. of Guelph, AAFC, etc.

- CanAdapt Sovereign Coronation Maturity Project
Lead: Jennifer DeEll; Collaborator: Ken Slingerland

Presentations 2002

June - State of Industry - Agricultural Research Institute of Ontario - 25 directors
February - Grape Growing in Ontario, Minnesota Grape Growers Association - 200 growers
February - Economics of Grape Growing, Minnesota Grape Growers Assoc. - 200 growers
February - 3 lectures to Niagara Parks School of Horticulture students

Publications, Factsheets, Infosheets

- Slingerland, K. C., Molenhuis, J. Establishment and Production Costs for Grapes in Ontario, 2001 Grape Economic Report, OMAF. 34 pg.
- Slingerland, K. C. 1996 -2002. Editor and contributor, OMAF Tender Fruit Grape Vine, 6 issues per years, Mailing 1400. 20 pg.
- Slingerland, K. C. Vineyard Site Selection, OMAF website, info-sheet 8 pg.
- Slingerland, K. C. Fisher K. H. Wine Grape Production Outside Traditional Areas in Ontario, OMAF website, 13 pg.
- Gardener J., Slingerland, K. C. , Carter N., What you should know about fruit production in Ontario - in progress
- Slingerland, K. C. Grapes and Tender Fruit Section In: Fruit Production Recommendations 2002-2003, Publication 360, OMAFRA. 36 pg.

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Ontario Ministry of Agriculture and Food - Summary of Key Activities in 2002 and Emerging Issues Affecting the Industry

Submitted by Hugh W. Fraser, P.Eng., MSc., OMAF, Vineland: 20 November 2002

- Although my Provincial Specialty deals with post-harvest handling of horticultural crops (cooling, storage, packaging, etc.), I spend an increasing amount of time with environmental issues of all kinds. This is mainly in

the livestock and poultry sectors, since my area includes: Niagara Region, Haldimand County, and the rural area of what is now known as the City of Hamilton. However, in the grape & wine industry, I do get involved with complaints about: noise from cannons used in vineyards to scare birds; odours from manure or paper mill wastes both stored temporarily and spread as organic and nutrient sources, and from improper handling of grape pumice; and overspray issues.

- Assisting in putting together the *Nutrient Management Act* regulations and protocols. This has taken much of my time in the past 6 months. Under the Act, all prescribed materials that are land-applied will eventually have to be applied according to a Nutrient Management Plan that outlines how and where these materials will be applied and at what rates to protect water quality. Although the Act mainly deals with the field application and storage of manure, it will affect the grape and wine industry over time. This will include manure with bedding, papermill wastes, composts, or other materials used as organic matter sources, and temporarily stored in fields before application; grape pumice from wineries; washwaters that need to be disposed of; and commercial fertilizers. Over time, I expect to see more livestock farmers composting manure, and there may be an opportunity for grape growers to receive more of this material.
- Review of Nutrient Management Plans for livestock and poultry farms. In the past few months, I have reviewed several Nutrient Management Plans for dairy, swine and poultry operations. I expect that I will be involved in the review of plans and strategies that the grape and wine industry will be required to submit over the next few years.
- Investigating the application of vertical-flow, wetland biofilters for treating liquid manure and other liquid wastes. This is a designed sub-surface system in which nutrient rich wastewaters flow vertically through beds of gravel and sand medium, planted with cattails, reducing BOD, suspended solids, phosphorus, ammonia, *E.Coli*, and odours. It could have application in the grape and wine industry for treating wastewaters from wineries.
- I continue to field complaints from neighbours about propane-fired, bird-scaring cannons, and have deflected many complaints from growers by educating their neighbours on the need for this equipment. This year there have thankfully been less complaints than in the past. I think that the factsheets, articles, presentations, and field work I've been involved in recent years on this issue has created more awareness by growers that neighbouring complaints will not go away without some effort. I have found most growers to be cooperative in being sensitive to their neighbours. I am using new guidelines on separation distances and time of use based on the sound level measurement study I conducted in 2001 and on similar work in British Columbia. This will become the basis for what is considered normal farm practice in future. I will be putting an article together this winter for growers to explain this.
- Steering Committee for an on-farm applied research project, funded through *Healthy Futures*, investigating runoff from dry-bedded, poultry manure. This 2-year project is now complete, and the results will help form the basis for temporary storage recommendations for similar materials in fields before application. For the grape and wine industry, this could include solid manures, paper mill wastes, composts, or other materials.
- I continue to field calls on tile drainage of grapes, and finding old drainage plans in our office from as far back as 75 years. There are too many vineyards without good plans of where the tiles are. I estimate there to be as many as 5000 miles of tile drains in Ontario vineyards.

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Viticultural Work at the University of Guelph, Department of Plant Agriculture Vineland

Submitted by K.H. Fisher, Associate Professor, B Piott, Research Technician

Project 21460: Vineyard management for vinifera cultivars in Ontario

Objective 1: To evaluate new vinifera varieties and clones for suitability to the Ontario climate and to the Ontario wine market

Objective 2: To develop training, trellising, pruning level and spacing recommendations for vinifera cultivars to enhance their wine quality and their overall winter hardiness.

Objective 3: To investigate various canopy management systems and their influence on disease development and disease control methods.

Objective 4: To assess the effects of rootstock on soil suitability, establishment rate, longevity, winter hardiness and wine quality of various vinifera varieties and clones.

Objective 5: To develop soil management and fertility programmes to enhance productivity, winter hardiness and fruit quality of various vinifera clones/varieties.

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Project 21470: Variety development and production management for efficiency and profitability in juice, wine and table grapes in Ontario

Objective 1: To develop crisp-fleshed, seedless, winter hardy, disease resistant table grape varieties using conventional breeding techniques

Objective 2,3: To develop non-labrusca flavoured red and white wine grape varieties that are winter hardy to -30°C and disease tolerant using conventional breeding techniques: To evaluate new varieties for suitability to the Ontario climate.

Objective 4: To develop a management protocol for Sovereign Coronation in order to improve bunch conformation and seedlessness, using rootstocks, girdling and vigour management.

Objective 5: To develop a soil management programme using tillage, fertility, soil amendments, cover crops and drainage to invigorate existing vineyards and improve yields, and to rehabilitate land for vineyard planting.

- Soil/irrigation management
- Soil amendment (with P. Voroney (LRS/UG))
- Soil rehabilitation (with K. Bellamy of KLB & Assoc. deceased)

Objective 6: To develop trellising/pruning systems that will encourage mechanization and reduce hand labour while enhancing yields in labrusca and hybrid vineyards.

Objective 7: To investigate the use of rootstocks to invigorate and/or stabilize various varieties.

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What's Happening at CCOVI 2002

Submitted by A.G. Reynolds, Viticulture Chair

Projects Administered by A.G. Reynolds

Contact: Dr. Andrew G. Reynolds
Professor of Viticulture, Cool Climate Oenology & Viticulture Institute
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500 Glenridge Ave., St. Catharines, Ont. L2S 3A1
phone:905-688-5550 ext. 3131; fax:905-688-3104
e-mail:areynold@brocku.ca

1. Terroir project. Industrial partners: Chateau des Charmes, Lambert Farms, Falk Family Farms, Glenlake Orchards & Vineyards, and Wismer Vineyards.

2. Water relations and irrigation

2a. Irrigation/ fertigation. Industrial partner: Earthway Farms and Irrigation.

2b. Irrigation deficit timing for wine grapes. Industrial partner and funding source: Lambert Farms; NRC-IRAP.

4. Shoot thinning. Industrial partner: East Dell Estate Winery; Novello Vineyards.

5. Establishment of Sub-Appellations by sensory and chemical characterization of Niagara wines.

5a. Sensory & chemical analysis of Niagara "red Bordeaux". Industrial partner & funding: VQA Ontario; MMO.

6. Spatial relationships of Riesling flavor potential. Industrial partner: Vineland Estates Winery.

7. Impact of viticultural and enological practices on grape and wine flavor. Industrial partners & funding sources: Cave Spring Cellars & Lakeview Cellars; MMO; NRC-IRAP.

7a. Impact of viticultural and enological practices on flavor of Chardonnay musqué.

7b. Development and application of a spectrophotometric assay for measuring β -glucosidase activity in fermentations.

8. Chemical diagnostic tests for validation of authenticity of icewines.

Research team: A.G. Reynolds, D. Inglis, G. Pickering, Ian Brindle, and Janet Nurgel

8a. Identification of chemical & sensory markers unique to Canadian icewine: Harvest date (faux icewine) trial.

8b. Validation of diagnostic tests: impact of yeast strain on chemical markers

8c. Impact of crop level

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Projects Administered by Debra Inglis

Research Summary: Responding to direct concerns from the industry, Dr. Debra Inglis has initiated a research program to study volatile acidity (VA) production during icewine fermentation. The higher VA levels in icewine are related to the higher sugar concentrations in the starting juice, but the metabolic basis for wine yeast production of high VA is not known.

Dr. Inglis Research Team Projects

1. The timing of di-ammonium phosphate addition to fermenting Chardonnay must: Effect on nitrogen utilization, ethyl-carbamate formation and CAR1 expression by yeast. (Monique Albert, M.Sc., 1999-2001).
2. Correlation of *Saccharomyces cerevisiae* aldehyde dehydrogenase (ALD3) gene expression to acetic acid production during icewine fermentation (Gary Pigeau; MSc 2000-2002).
3. Stephanie Martin, MSc student in Biotechnology, Brock University. The hyper osmotic stress response of wine yeast induced by fermentable sugars during icewine fermentation and its relation to metabolites specific to this wine. (2001-2003).

Recent and current Undergraduate 4th year Thesis Projects

Colin Pitkin. Measurements of acetic acid and glycerol production internally within the yeast and externally in the wine during fermentation of icewine juice at 40 Brix and juice diluted to 35, 30 25 and 20 Brix. (September 2001-April 2002).

Tom Green, OEVI major, Brock University. The effect of ammonia and glutamate addition to icewine juice on glycerol, succinic acid and acetic acid production by *Saccharomyces cerevisiae* V1116 during icewine fermentation. (January-August 2001).

Natalie Hein, OEVI major, Brock University. The effect of varying total SO₂ concentration in icewine juice on acetic acid production by *Saccharomyces cerevisiae* V1116 during icewine fermentation. (January-August, 2001).

Projects Administered by Gary Pickering

1. Elucidation of the contribution of selected compounds in Canadian ice wines to wine flavor and quality
2. The influence of powdery mildew on final wine quality
3. Astringency in Canadian red wine: The influence of fruit ripeness on quality
4. Astringent sub-qualities elicited by red wine: the role of ethanol and pH
5. Does individual sensitivity to 6-n-propylthiouracil predict the perception of bitterness and astringency intensity elicited by red wine?
6. Determining the effect on quality of wines vinified in the presence of *Harmonia axyridis*
7. The use of enzyme technology to minimize sulphur dioxide use in wine production

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Appendix: Acronyms used in this report

AAFC: Agriculture and Agri-Food Canada
AIMS: Agricultural Integrated Management Services
CCOVI: Cool Climate Oenology and Viticulture Institute
EPA: Environmental Protection Agency
FQPA: Food Quality Protection Act
GIS: Geographical Information Systems
GLP: Good Laboratory Practices
GPCRC: Greenhouse and Processing Crops Research Centre (AAFC)
GPS: Global Positioning System
IPM: Integrated Pest Management
KCMS: Ker Crop Management Systems
MARS: McSmith Agricultural Research Services
NAWN: Niagara Agricultural Weather Network
NMA: Nutrient Management Act
NPMC: Niagara Pest Monitoring Club
NSERC: National Science and Engineering Research Council
OFGGMB: Ontario Fresh Grape Growers' Marketing Board
OGGMB: Ontario Grape Growers' Marketing Board
OGWRSSC: Ontario Grape & Wine Research and Services Sub-Committee
OMAF: Ontario Ministry of Agriculture and Food
OMAFRA: Ontario Ministry of Agriculture, Food and Rural Affairs (now OMAF)
PECWA: Prince Edward County Winegrowers' Association
PMRA: Pest Management Regulatory Agency
SCPFRC: Southern Crop Protection and Food Research Centre (AAFC)
UG or U of G: University of Guelph
URMULE: User Requested Minor Use Label Expansion
URMUR: User Requested Minor Use Registration
WCO: Wine Council of Ontario

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Ontario Greenhouse Floriculture Research and Services Subcommittee

Author:

Graeme Murphy - Chair/
**Ontario Greenhouse
Floriculture Research and Services
Subcommittee**

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Executive Summary

The committee meeting was attended by 22 people, of whom 14 were industry representatives, including 8 growers. The industry growth has flattened out in 1991, and the general impression was that the trend would continue in 2002, with a difficult spring for many growers. New greenhouse construction is down compared to previous years. Energy prices continue to cause some nervousness among growers; for the last 2 years it has been gas prices, this year electricity costs. There was considerable concern from growers about the influence of the mass markets on crop production. In particular, growers are now being requested to care for the plants in the retail section of large chain stores.

Emerging issues identified by the committee included:

- The impact on the industry of Nutrient Management Legislation
- The increasing incidence of quarantinable pest and disease problems; two that have emerged this year are the swede midge and the pea leafminer
- The potential impact of an OECD proposal to implement a registration program for biological control agents based on the pesticide model
- The move of the U. of Guelph floriculture research program from Vineland to Guelph
- Land use policies in Niagara that may limit expansion in the greenhouse industry below the Niagara escarpment.

Services were a major focus of the committee this year, and although the list does not claim to be comprehensive, the following were identified as important:

- Energy audits
- Pest/disease diagnosis
- Nutrient analysis
- Ethylene testing
- Pesticide certification
- Boiler certification
- Education
- Consultants

Six recommendations emerged from the meeting, several of which dealt directly with the above issues. Issues on which Recommendations were made included:

- Ethylene testing service provided by the University of Guelph
- Rapid insect/disease diagnosis at US/Canada border crossings
- Land use issues in Niagara
- Registration of new pesticides for the greenhouse industry
- Need for educational programs at universities and colleges, targeted at producing graduates with the skills required for a career in the greenhouse industry
- The OECD proposal for a registration program for biological control agents

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State of the Industry

General

The Ontario floriculture farm gate sales for 2001 were \$662 million (Statistics Canada) an increase of 4% from 2000. This is considerably less than the increases of around 10% per year that the industry has come to expect over the last 10-15 years. 2002 can expect to see a further levelling out of industry growth. Although there has been mixed reaction from individual growers, many (especially those relying on bedding plant sales) were affected by cold wet spring weather that delayed the onset of the traditional gardening period in southern Ontario.

Energy continues to be a concern to growers, only this year it is based on electricity costs (for the past 2 years, gas prices have been the major concern). Electricity costs vary considerably among growers, but average about 10% of the total energy bill. For growers with supplemental lighting, the costs are greater, up to about \$1/ft²/year.

Border issues are still causing problems. These issues range from threats of quarantinable pests and diseases, to border delays for export shipments, to US perceptions of subsidies and the effect of Canadian product moving into US markets (see Emerging Issues).

Greenhouse Construction, industry expansion

New greenhouse construction was limited in the past year compared to previous years. Of greater concern is the number of greenhouse operations currently for sale, with one grower estimating that there were currently between 40-50 in the Niagara area alone. In Leamington as well, there have been bankruptcies and selling of businesses, although one operation in that area is expanding to pick up some of the resultant shortfall.

Markets

Cut flowers

Individual grower responses to the strength of the market varied, probably depending on the crops being grown. For some the market was relatively strong throughout the year. In other crops there was a feeling that the local market was fairly soft, but there was increasing interest being shown in export, especially for niche crops and those that don't ship well from more distant markets (e.g. snapdragons, gerbera). There is continued local expansion in the production of these two crops.

Potted flowering plants

Marketing is a major concern to the industry with increasing pressure being placed on growers by mass marketers. Decisions made by large chain store buyers, make it difficult for growers in weekly production to react, and long-term planning is not possible. The consolidation of the mass market leaves growers with fewer options, and there is concern that they are dictating terms to the industry without really knowing what they are doing. The lack of expertise and facilities in large chain stores to care for plant material is now being put back onto the growers who are being asked to manage retail space. One suggestion for addressing this issue was through the consolidation of the production industry perhaps through grower cooperatives, although there was considerable scepticism over whether this would be possible given the individuality and entrepreneurial nature of many growers.

Spring crops

The spring plant and bedding plant market are the driving force for the whole industry, and success is built around what happens in May and June. This year, the cool, wet weather lasted until the last week of May, delaying for many growers

the intensive spring activity, which most growers schedule for the middle of May. Building a whole industry around a 2 week shipping window always has the potential to result in problems. For wholesale growers servicing the mass markets, it was particularly difficult as they were forced to sit on product and try to maintain its quality for 2-3 weeks after it was ready for shipping. For retail garden centres, the overall season was a good one. It started late, but continued with heavy consumer demand until at least the end of June. There is a levelling off of the market for bedding plant flats, and increased demand for larger sized annuals, hanging baskets and container plantings. There is a higher end market of consumers willing to pay for larger plant material and instant colour.

Pests/Diseases

With regard to the usual pests and diseases with which the industry has to deal, there was several of concern this year. Powdery mildew on gerbera was a serious problem for a number of growers in the late summer and fall period. There are few registered products and an increasing incidence of resistance to those that are registered. Of further concern is that there are few potential products with new chemistries that are likely to be registered in the near future. Fusarium in cyclamen is a common problem, one that can result in significant crop losses. 2002 was a difficult year for cyclamen growers because of the hot, dry summer which added considerably to the stress on the crop and a greater than normal level of disease.

For insect pests, issues were based on control problems of some regular pest species, and on the damage caused by secondary pests. Aphids resulted in a greater than usual number of problems this year, primarily with green peach aphid not being as well controlled by pirimicarb as growers have come to expect. Similar observations were noted in Quebec. Silverleaf whitefly on poinsettia has been increasingly difficult to control over the last 3 years. The trend continued this year although in general the industry is more aware of the need for early monitoring and control, and the dangers of over-reliance on one pesticide. The situation was exacerbated by the whitefly problems experienced by a major propagator in central America. Many cuttings came into Canada with a well-established whitefly population. Secondary pests such as *Lygus* bug and leafhoppers resulted in heavy damage to some crops where biological control was being used. Leafhopper damage to roses was especially severe.

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Emerging Issues

Nutrient Management Legislation

The Nutrient Management Act was passed into law in June 2002. Phase 1 of the regulations pertaining to this Act was placed on the Environmental Bill of Rights for public comment in August, and the time period for response has now passed. Phase 2 of the regulations is expected to be posted in early December with a 60 day period for public review and comment.

This legislation and the regulations will have a dramatic impact on the greenhouse industry and there should be a coordinated review and response.

Quarantinable Pests and Diseases

Quarantine issues identified in last year's report (e.g. Sudden Oak Death, Chrysanthemum White Rust) continue to hang over the industry, however there are additional problems that have emerged this year. There have been a considerable number of individual quarantine pest problems and it was suggested that the real issue is the lack of a coordinated North American approach to dealing with these incursions.

- Swede midge is a pest that lays its eggs into the growing point of brassica crops. The midge larva causes considerable damage to the plant making it unmarketable. The insect was first identified in Ontario in 1991 and CFIA surveys have found it in 9 counties. Movement of host plants out of these counties is currently restricted. The US is in the process of conducting surveys in New York and Michigan. The field vegetable industry is especially at risk, however there is a number of greenhouse grown ornamental plants in this family, as well as bedding plant seedlings that may be exported to the US. Some growers had product turned back at the border in the spring for this reason.
- Pea leaf miner (*Liriomyza huidobrensis*) is very closely related to the insect that caused so much damage to the chrysanthemum industry in the 1980's. However, this species has a wider host range. It was first found in Ontario in 1997 and has been believed to be present in the USA (especially California) for many years. Recent work however, has shown that there are two almost identical species that can only be distinguished by molecular means. Surveys have shown that the species in the US previously thought to be *L. huidobrensis* is in fact *L. langei* and that *L. huidobrensis* does not occur in the USA. Although there have been no confirmed intentions by the US to regulate movement of host plants of this pest, the potential for such action exists.

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OECD Registration of Biological Control Agents

A draft document has been developed by OECD countries to guide the process of registration of biological control agents. The registration as outlined in the draft, is based on the pesticide model and asks for unrealistic data requirements that would likely eliminate ongoing research and development by the biological control industry. With so much of the greenhouse vegetable industry dependent on biocontrol and an increasing number of flower growers using it as a primary pest management strategy, the impact on the industry could be devastating. (See Recommendation 6).

Move of University of Guelph Research Programs

The decision by the University of Guelph to move its floriculture research program from Vineland to Guelph will have a negative impact on the cooperative research projects between the University of Guelph, Agriculture and Agri-Food Canada and OMAF and thus on benefits to the industry. The University is also proposing to go to a "full-cost" recovery system from researchers for the use of greenhouse space, with a proposed charge mentioned of \$300/m² of bench space/year. Such a cost would severely curtail the research program, and in the opinion of the committee negates any reasons for the move.

Land Use Policies

There is increasing political pressure in the Niagara region to restrict the building of new greenhouses below the escarpment. This is of particular concern to existing businesses, given that the vast majority of new greenhouse building is associated with the expansion of current operations. Much of the pressure on the industry seems to be coming from the Wine Council, despite the fact that the greenhouse industry in Niagara accounts for less than 150 Ha (2001 Agricultural Census). (See Recommendation 3).

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Research/Tech Transfer Reports Activities and Major

Accomplishments

Research

AAFC, Vineland

Researcher: Javier Gracia-Garza

Project Title

Management of soilborne plant pathogens of ornamental crops under recirculating fertiliser solutions.

Major Accomplishments

1. Request to PMRA for label expansion of Mycostop to include use against *Pythium*. Original application rejected but new data submitted and PMRA asked to reconsider the decision.
2. Two articles to appear in the issues of December 2002 and January 2003 in Greenhouse Canada:
 - *Spreading of soilborne pathogens in closed irrigation systems*: Survey of commercial greenhouses in the Niagara Region.
 - *Do soilborne pathogens move from infected pots into the irrigation water in closed irrigation systems?*: Controlled experiments conducted in research greenhouses at AAFC and Univ of Guelph (Vineland Campus).
3. Scientific journal publications:
 - *Pre- and post-plant applications of copper-based compounds to control Erwinia soft rot of calla lilies*. 2002. Canadian Journal of Plant Pathology. 24: 274-280.
 - *Efficacy of various biological control agents and biorationals against Pythium root rot in poinsettia*. 2003. HortTechnology. 13: 1-5.

AAFC, Harrow

Researcher: Les Shipp

Project Title

Development of an integrated pest management program for thrips on greenhouse ornamentals

Major Accomplishments

1. Determined that approximately 50% of the WFT pupate on the plant. This information suggests that control strategies need to be developed for the pupal stage on the plant.
2. Correlated adult WFT population densities with premature flower senescence of daisy chrysanthemums (cv. Eureka).
3. Determined that flower senescence stimulates dispersal of adult WFT to migrate to healthy flowers.

University of Guelph

Researcher: Theo Blom

Project Title

Height control and Growth of Easter Lilies;
 Effect of Water Temperature on Different Plant Species
 Post-Harvest Quality (with Lisa Skog and Wayne Brown)
 Cultivar Trials (with Wayne Brown)
 Pathology Projects (with Javier Gracia-Garza and Wayne Brown)

Major Accomplishments

- Cold water applied overhead is an excellent tool for height control of Easter lilies. The response is linear with water temperature (1.75 cm / C) in the range of 2-15o C. The effect of cold water is reversible (8-10 days). Some bedding plants are also responsive to this treatment.
- Certain hydrating solutions protect cut flowers (lilies, alstroes, freesias and snapdragons) from the effects of ethylene exposure in the chain.
- Coco coir extracts are not necessarily beneficial as an amendment to the fertilizer solution.
- Gerbera cultivars have shown different susceptibility to *Phytophthora cryptogea*. The application of 2000 zoospores of *P. cryptogea* per pot caused plant death of cv. "Kinsey" while 200,000 zoospores of *P. cryptogea* did not kill cv. "Martine".

Researcher: Michael Dixon

Project Title

Management and Measurement Techniques for Greenhouse Nutrient Recycling in Floriculture

Major Accomplishments

- Grown *Alstroemeria* and *Gerbera* under long term nutrient recycling without any negative effects on crop production or quality.
- Examined the effects of ethephon on Geranium water and nutrient uptake.
- Shown that ozonation has no negative impacts on plant productivity under the conditions examined.
- Developed models that predict plant nutrient uptake in relation to net carbon exchange rate and environmental variables such as light intensity, humidity, temperature and CO2 concentration.
- Developed a calibration and sampling protocol for ISFET sensors and developed algorithms required for individual ion control of an automatic fertigation system based on ISFETs and/or future sensor technologies
- Conducted a survey on the current statues of nutrient recirculation in Ontario's greenhouse industry.
- Shown that copper can be used to control green algae and reduce the incidence of pythium in greenhouse crops and also determined the tolerance levels of copper for several floral crops.

Researcher: John Sutton**Project Title**

Management of Micro-organisms and Allelochemicals in Nutrient Recycling Systems

Major Accomplishments

- Several microbial agents (potentially commercial) have been tested in hydroponic chrysanthemums against *Pythium*, *Phytophthora* and *Fusarium*.
- Quantitative data in relation to inactivation of pathogen spores were published, helping to develop optimized UV dosages in hydroponic recirculating systems for testing here.
- Early detection of pathogenicity of root diseases such as *Pythium* (prior to visible symptoms) is being studied in several snapdragon and chrysanthemum cultivars.
- Integration of early detection protocols and both biocontrol and physical/chemical remediation control continue to be tested.
- We are testing several healthy and infected greenhouse crops for the production of chemicals with allelochemical traits.
- Chrysanthemums growing in recirculating hydroponic solution produce extracts that have allelochemical (toxic) properties on subsequent plant growth. We have isolated and purified suspect compounds using HPLC and GC/MS.
- Specific compounds have recently been tested for their allelochemical properties using to different plant bioassay systems that were developed here. A third, more sensitive bioassay for toxic compounds based on fluorescence traits of *Lemna* was developed. A paper outlining this new protocol is being prepared for publication currently .
- Aggressiveness of *Pythium* root rot of both snapdragons and chrysanthemums grown in various soil-less mixes and rooting matrices is being determined.
- Antibiosis of 15 microbial agents against *Pythium* was evaluated in vitro.
- Associations of selected microbial agents with root systems of snapdragon and chrysanthemums were determined.
- A series of temperature studies to determine the effect of root temperature are in progress.

Researcher: Bernie Grodzinski**Project Title**

Selection of Low light Tolerant Cultivars for Full year Production of Ornamental Crops

Major Accomplishments

- We have screened over 120 *Arabidopsis* ecotypes from international seed banks to select for specific genes which confer high productivity under low light.
- We have identified three productive natural lines
- Crosses and back crosses of these line have produced several NEW F1 and F2 lines with improved low light tolerance
- Patterns of gene expression (DNA and RNA contents) are currently being investigated at Guelph and the Salk

Institute in California (ie D Wolyn is on sabbatical leave there).

- Currently four commercial snapdragon lines have been identified with low light tolerant traits in either the main stem or axillary leaves.
- Photosynthesis and export response curves for these lines are being determined, and the bases of productivity under low light are being studied.
- A new fixed stage microscope and microinjector system for the analysis of pH and ion concentrations in the apoplastic fluids of intact plants has been developed and we are continuing to refine our protocols for determining sugar concentrations in symplastic and apoplastic fluids separated from leaves.
- A patent search is currently underway for a new microinjector system developed in our laboratory.

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Technology Transfer - Wayne Brown and Graeme Murphy (OMAF)

Issues Management

1. *Chrysanthemum White Rust* - worked with CFIA, OMAF, and BCMAFF colleagues with the development of appropriate eradication strategies.
2. *Sudden Oak Death* - Participated in monthly conference calls with CFIA worked with the industry on impact statements and with CFIA to get measures in place to allow movement of Oregon produced azaleas and Easter lily bulbs into Ontario.
3. *Pea leafminer* - Discussions with OMAF and University staff on the potential restrictions on movement of this pest.
4. *Swede midge* - Participated in conference calls to discuss this pest and provide input into the impact it may have on the greenhouse floriculture industry.

Technology Transfer

1. *IPM Workshops* - Prepared and presented 2 1-day workshops for growers on integrated pest management, reviewing basic biology and management strategies for insects and diseases. 50 participants (GM, WB)
2. *Floriculture Crop Nutrition* - in cooperation with Theo Blom, presented a 10-week (1 night per week) course (Jan-Mar) covering the chemical and practical basis of fertilization and plant growth. 30 participants (WB)
3. *Flowering potted crops* - in cooperation with Theo Blom and Albert Grimm (Jeffery's Greenhouses) coordinated a 10 week (1 night per week) course (Sep-Nov), discussing one major crop per evening. 27 participants (WB)
4. *Biological Control Study Groups* - Discussion meetings/workshops with growers using biocontrol. Meetings held every 6-8 weeks and including growers, consultants, and biocontrol producers. Approx 30-40 participants. (GM)
5. *Conferences*
 - *Canadian Greenhouse Conference* - worked with the speaker program to develop a meaningful 2-day speaker program for the various industry sectors. Speaker sessions were very well attended. Organised the pre-conference bus tour which continues to be very popular especially for small retail growers. (GM, WB)
 - *International IPM Conference* - Helped organise the conference which was held in March in Toronto. 38 invited speakers from around the world presented information on strategies and leading edge developments in IPM. Approx. 250 participants. (GM)
 - *ISHS Conference* - Organised the post-conference floriculture (The Elegant Science) tour as well as assisting in the organisation of the mid-week tour and arranging for flowers. (WB)
6. *Nutrient Management Act 2002* - Worked with several working groups involved with establishing standards and protocols. (WB)

7. *URMULE submissions for greenhouse floriculture* - Continuing to work with PMRA, industry and new Flowers Canada technician Tom Thiessen to register new products for the industry through the minor use program (GM, WB)

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Applied Research

1. Cooperative Disease Management Projects (Javier Gracia-Garza, Theo Blom, Wayne Brown)

- Pythium in recirculating nutrient systems; Phytophthora in cut gerbera grown in a recirculating irrigation system; *Erwinia* soft rot of greenhouse floriculture crops

2. Cooperative production/crop management studies (Theo Blom and Wayne Brown)

- Effect of water temperature on stem elongation; Influence of interrupted cooling and case cooling on bulb size

3. Cultivar trials (Wayne Brown and Theo Blom)

- Poinsettia - Evaluation of more than 100 cultivars from 5 breeders. Approx. 30 cultivars that have not been part of previous trials. Last year approx. 85 people attended Open House. Impact can be considerable with one breeder overwhelmed by Ontario orders for a cultivar that was viewed for the first time at last year's Open House.
- Cut red roses - Primary focus is production and quality, but secondary observations are also important. Strong differences in susceptibility to mildew, thrips and whitefly.

4. Post-harvest studies (Lisa Skog, Theo Blom and Wayne Brown)

- Ozone and its potential to control ethylene damage and Botrytis; Effectiveness of different hydrating solutions on cut flowers with and without exposure to ethylene.

5. The use of Biological Control in Canadian Greenhouses (Graeme Murphy, Gillian Ferguson, plus colleagues in NB, Quebec, Alberta and BC)

- The survey was completed in January 2002 and the results communicated through the IOBC.

6. Development of an integrated pest management program for thrips on greenhouse ornamentals (Les Shipp, Bruce Broadbent, Marc Rhainds, Graeme Murphy)

- Develop integrated pest management strategies for thrips in floriculture

7. Field Investigations into the Rove Beetle (*Atheta coriaria*) in Commercial Greenhouses (Graeme Murphy)

- Monitor a naturally occurring population of the above beetle to determine if it can be manipulated to improve control of fungus gnat populations

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Research and Services Issues/Priorities

Research

Issues identified in last year's report continue to reflect the industry's research needs. The priorities have been listed below in abridged form from last year. (Refer to 2001 Report for details on the priorities listed below). The only change that the committee felt that needed to be added was in the issue of pest management, where the need for rapid disease diagnosis, particularly in irrigation water in recirculating systems, was identified as a priority.

List of Issues

1. Integration of Nutrient, Water and Disease Management Strategies from an Environmental Perspective
2. Border Issues
3. Development of Improved Floricultural Crops and Production Techniques
4. Post Harvest Handling and Shelf-Life Issues with Potted and Cut Flower Crops
5. Development and Implementation of IPM programmes in Floriculture
6. Optimisation of the Greenhouse Environment
7. Communication

Services

The focus for this year's meeting was on services used by the industry, and identifying gaps and needs. The issue resulted in some excellent discussion and extensive industry contributions. The committee felt that services could be divided into those that are voluntary (and usually of primary benefit to the individual grower, e.g. soil and nutrient analysis, disease diagnosis) and those that were mandatory or legislated (e.g. Pesticide certification courses, boiler certification, future requirements around nutrient management). There was also discussion around educational services, in particular to service an urgent need for skilled labour, but also for courses to allow existing industry personnel to upgrade their own skills. The following list of services identified by the committee is presented in no particular order of importance or priority.

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Energy Audits - Energy audits provide an assessment of the energy use and efficiency of individual greenhouse operations.

Current Activities

As a result of the rapid inflation of energy prices in the last 2-3 years, a number of workshops on energy management was held across the province. As a follow-up to this initiative, energy audits were carried out as part of a cost-sharing partnership between IRAP (Industrial Research Assistance Program), utility companies and individual growers, to help growers identify areas where energy efficiencies could be gained. Approximately 20 growers requested that they be included in the audit program, and of those, about half have been included in two rounds of audits, one in Leamington and one in Niagara.

Gaps/Barriers/Deficiencies

There is a need for improved efficiency of electricity usage. However, grower concerns about energy efficiency are directly related to its cost. Two years ago, natural gas was the primary concern, this year it was electricity until recently when the price was capped. Grower demand for this type of auditing service will likely fluctuate depending on the overall availability and price of energy.

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Pest and Disease Diagnosis - Provides a service to growers for identification of pest and disease organisms which is essential for choosing appropriate control strategies. There are gaps however, in the extent of these services.

Current Activities

Disease and pest diagnosis through the University of Guelph is currently servicing the individual grower needs of the industry adequately in most cases. There are also diagnostic labs in the USA and Europe that are occasionally used by some Ontario growers. Diagnostic kits for diagnosis of some diseases are available through Agdia Labs in the US, and some growers make extensive use of these.

Gaps/Barriers/Deficiencies

With the advances in irrigation technology over the last 10 years, and with increasing concerns over nutrient management, a significant percentage of the industry is now using recirculating irrigation systems. As a result however, this has led to problems of disease management in these closed loop systems. Growers need a rapid diagnostic service that would allow them to identify disease pathogens in recirculating systems. Ideally growers would like a 'litmus paper' type test kit to provide rapid on the spot identification.

Apart from the needs of individual growers, the industry also has a need for insect and disease diagnostic expertise at US border crossings to confirm or refute US concerns about exported floriculture product. A number of growers have experienced delays and product loss at the US border when insects or diseases found in shipments have had to be sent to labs in other cities for identification (a process that can take a number of days). The industry is currently in no position to counter (at short notice) US concerns that the insects may pose a risk. (See Recommendation 2)

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Nutrient analysis - regular analysis of soil and nutrient solutions is a tool that supports the crop production programs of many flower growers. Nutrient analysis of plant tissue is less commonly used but has an important function in resolving nutritional problems.

Current Activities

Many Ontario growers currently send samples for nutrient analysis to OMAF certified labs in Ontario. A significant percentage however (estimated at 30-50%) send samples to Europe for the same analysis.

Gaps/Barriers/Deficiencies

One of the reasons given for the use of European labs, despite the fact that the service is more expensive, was their provision of recommendations to support the analytical data. In this respect, they are going a step further than the Ontario

labs which simply provide the numerical information. This is a service that used to be provided by OMAF crop specialists, but with changing extension responsibilities over recent years is not routinely done.

The growers on the committee did not necessarily feel that there was a cause for concern over the use of European laboratories, although a service offering recommendations to support local labs would obviously be appreciated. Most growers felt that the market should be left to sort itself out.

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Ethylene testing - the impact of ethylene on flower quality is probably the most important post harvest issue facing growers. However, it can also be a problem in production, particularly during winter months.

Current Activities

The Horticultural Products Lab at the University of Guelph in Vineland currently runs an ethylene testing service for growers.

Gaps/Barriers/Deficiencies

There are concerns over what the move of the post harvest research program from Vineland to Guelph may mean for the future of ethylene testing. Will the service still be offered? Will it be as user friendly as it currently is? It fulfils an important need for the industry and one that should be retained if possible. (See Recommendation 1)

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Pesticide Certification Courses - mandatory requirement for growers to renew their pesticide safety certification every 5 years.

Current Activities

Certification courses are run out of Ridgetown College and growers must renew if they are to retain their certification that allows them to buy pesticides.

Gaps/Barriers/Deficiencies

The general opinion was that these are excellent courses that provide growers with a valuable review of the safe and effective use of pesticides.

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Boiler Certification Courses - mandatory requirement TSSA - Technical Standards and Safety Authority. These courses were put in place as a service to the greenhouse industry. Without certification greenhouse operations would be required to employ Stationary Engineers to operate and maintain their boilers.

Current Activities

The TSSA is currently in the process of running boiler certification courses in Vineland and Leamington.

Gaps/Barriers/Deficiencies

The opinion of growers who have taken the course is that it is aimed at a very basic level, with emphasis on boiler maintenance and care. For growers, the boiler is their single most important piece of equipment, especially during the winter months and proper maintenance is critical. Grower comments suggest that the instructors were surprised at the level of sophisticated safety equipment, backups and alarms in use on greenhouse boilers. However, the certification course is an excellent option to the alternative of employing engineers to be on-site 24 hours a day.

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Education - Educational programs in greenhouse production are important for the continued growth and strength of the industry.

Current Activities

Courses at Niagara College and the University of Guelph offer students training in horticulture, but for many growers the training was not aimed specifically enough at greenhouse production. Flowers Canada (Ontario) has recently formed an Education Committee to address some of these concerns, to determine what educational programs are available, what the needs of the industry are, and the skill sets they are looking for. The committee hopes to work with universities and colleges to develop appropriate programs.

Gaps/Barriers/Deficiencies

The industry has a shortage of skilled labour to meet its expanding needs. It is not uncommon to find growers being hired from Europe to meet the needs of greenhouse operations in Ontario. Educational programs designed for greenhouse production are needed to provide new graduates with the necessary skills for a career in greenhouse floriculture. Additionally, a promotional campaign aimed at schools to increase awareness of the industry, is needed in order inform more young people of the opportunities that exist in the industry and to foster their interest (See Recommendation 5).

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Consultants - Private consultants provide an important service, with many growers making use of them for advice and recommendations on production and pest management issues.

Current Activities

There are only a few Ontario based consultants, and by their own admission, have heavy workloads and the potential for more clients than they can handle. Also, there are many growers who use European consultants, often on a quarterly basis.

Gaps/Barriers/Deficiencies

One of the concerns over the use of European consultants is their lack of knowledge of Ontario production, and factors affecting it. These can be quite different from the European situation. It was suggested that educational needs of the industry described above could have additional carryover benefits in consulting services.

Detailed Recommendations

Recommendation #1

Issue

Ethylene testing service for the greenhouse industry is a valuable service currently being provided by the Horticultural Products Lab at the University of Guelph, Vineland.

Background

Ethylene contamination (due to incomplete combustion of fossil fuels, faulty equipment or gas leaks) of greenhouses can cause significant losses in post-harvest storage and transportation, and in greenhouse production, particularly during winter months when greenhouses are not being vented. Detection of ethylene concentrations is essential for identifying the problem and determining corrective measures.

Details

With the move of research programs from Vineland to the main campus in Guelph, there is concern that the ethylene testing service will be discontinued or not as accessible to growers.

Recommendation

It is recommended that the University of Guelph continue to offer an ethylene testing service to greenhouse flower growers in Ontario.

Target Agency

- University of Guelph

Recommendation #2

Issue

There is a need for rapid identification of insects and diseases at US border crossings.

Background

The success of the Ontario floriculture industry depends on its ability to compete globally and the strength of its export market. Most of the industry's production is currently exported and it has a positive trade balance with the US. With a perishable commodity such as flowers it is essential that border crossings are free of delays. Even a one day delay can compromise the

quality of the product. There has been a number of instances in the last couple of years of product (especially cut flowers) being delayed at the US border because of the presence of insect or disease pests. USDA border officials, without the necessary expertise to differentiate between species, send samples to experts for identification, a process that can take several days.

Details

For the export market, there is a need for expertise (and/or equipment) at major US border crossings, allowing rapid identification of insects and disease pathogens in a timely fashion.

Recommendation

It is recommended that:

- The Canadian Food Inspection Agency work with the USDA to investigate opportunities for then use of rapid diagnosis technologies for the identification of insects and diseases in major ports between the USA and Canada.

Target Agencies

- CFIA

OASCC Linkages

- Ontario Pest Management Research and Services Committee

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Recommendation #3

Issue

Constraints are being proposed on further development of the greenhouse industry in the Niagara region below the Niagara Escarpment.

Background

The focus of the greenhouse industry in Niagara has traditionally been located below the Niagara escarpment, to take advantage of factors such as:

- Access to transportation
- More moderate temperatures
- Infrastructure concentration

However, the soil below the escarpment is ideally suited for the production of tender fruit and grapes, leading to a number of recent conflicts on the best uses for this unique agricultural land.

Details

There is increasing pressure on the industry to locate new greenhouse construction above the escarpment, supposedly to reduce the pressure on agricultural land. Much of the push for this appears to be coming from the Wine Council. Committee concerns over these policies are twofold. Firstly, the committee felt that land use concerns directed against the greenhouse industry could not be substantiated. The 2001 Agricultural Census reported a total of 142 Ha of greenhouse flower production in the Niagara region, an insignificant area when compared with other agricultural production, or with urban development. Secondly, most new greenhouse construction in the industry comes from the expansion of existing operations. Policies that would expect this type of expansion to occur away from the central location of a business, would unfairly disadvantage individual growers.

Recommendation

It is recommended that Flowers Canada (Ontario) lobby local and regional governments to address misconceptions surrounding greenhouse use of agricultural land.

Agencies

- Flowers Canada (Ontario)

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Recommendation #4

Issue

Registration of new pesticides for the industry through the minor use registration program

Background

The floriculture industry is at a disadvantage compared to its global competitors. There is a need for new pesticides that allow growers to manage pests using similar products to those available in the USA and Europe. Of primary importance are those products that have been classified as reduced risk in the US, or which have an IPM fit. The floriculture industry has been very successful and efficient in recent years in registering new products through the Minor use program, primarily through an industry-funded position focusing on new registrations. However, there are still many products that are needed to further enhance growers' pest management programs.

The lack of new pest control products also gives rise to concern about the potential for off-label use of pesticides. There is concern for two main reasons:

1. The shortage of new pest control products, can make pest management programs very frustrating, with growers using ineffective products or trying to maintain a pesticide rotation (for resistance management purposes) with only 1-2 products that are effective.

2. The price differential between products (with the same active ingredient) labelled for field use and those labelled for greenhouse use can be wide. The use of cheaper (field use) products with the same active ingredient as the greenhouse labelled product, may offer short-term monetary benefits for growers. However, it ignores the developmental costs required for registration, the liability issues around high value intensive horticulture, and the goodwill of chemical companies in committing time and resources to the registration process. The industry has developed good relationships with chemical companies over the last few years, with its commitment to the Minor Use Program and the registration of a significant number of new products during that period. If the industry is to continue to receive the cooperation of chemical companies in helping it meet its pest management needs, it must address this issue proactively to ensure all growers are fully aware of their responsibilities. The industry needs to address this issue if they are to get the co-operation of pesticide companies in pursuing registration of new products.

Details

Announcements in 2002 by AAFC and Health Canada of increased investment into the Minor Use Registration Program, were welcomed by the committee. The Minor use program has long been a subject of Recommendations from this committee and it is pleasing to see evidence of an increasing commitment to the program. The committee was concerned that any new funding for minor use initiatives be shared equitably between all agricultural sectors.

With regard to potential off-label pesticide use, Flowers Canada has put in place an information campaign to educate growers about the use of registered pest control products. This will involve a series of articles in the industry newsletter, and talking about the issue at grower meetings.

Recommendation

It is recommended that PMRA and AAFC ensure that the needs of all agricultural sectors are considered in determining how to move forward with plans to improve the Minor Use program. The committee also fully supports the action taken by Flowers Canada to address the issue of off-label use of pesticides.

Target Agency

- Pest Management Regulatory Agency
- AAFC
- Flowers Canada

OASCC Linkages

- Ontario Pest Management Research and Services Committee

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Recommendation #5

Issue

The need for educational programs aimed at providing graduates with the necessary skill set for a career in the

greenhouse industry.

Background

The greenhouse floriculture industry has been expanding through the 1990's at a rate averaging about 10% per year. This level of expansion provides excellent career opportunities people with a range of skills, but there is a particular need for employees with horticultural training, specifically in greenhouse crop production.

Details

The industry has a shortage of skilled labour to meet its expanding needs. It is not uncommon to find growers being hired from Europe to meet the needs of greenhouse operations in Ontario. Educational programs designed for greenhouse production are needed to provide new graduates with the necessary skills for a career in greenhouse floriculture. Additionally, a promotional campaign aimed at schools to increase awareness of the industry, is needed in order inform more young people of the opportunities that exist in the industry and to foster their interest. Flowers Canada (Ontario) has recently formed an educational committee with the goal of reviewing the educational and training needs of the industry, in terms of new employees. This committee proposes to work with colleges and universities to develop programs that provide graduates with the skill sets needed in the floriculture industry.

Recommendation

The committee supports the initiative of Flowers Canada (Ontario) in establishing its education program and recommends it continue to work with educational institutions in achieving its objectives.

Target Agencies

- Flowers Canada (Ontario)

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Recommendation #6

Issue

Proposal for registration of biological control agents by the OECD

Background

Biological control is a well-established component of pest management in greenhouse floriculture with 10-20% of the total production area in Canada, currently using biological control. The adoption of the strategy has played a major role in reductions in pesticide use in greenhouse floriculture in the last 15 years. In many cases, growers using biocontrol are using 80-90% fewer pesticides. Biocontrol agents coming into Canada currently need a permit from CFIA, which is granted after a pest risk assessment is carried out.

Details

A January 2002 proposal by an OECD Working Group (of which Canada is a member), recommends a registration system for biocontrol agents that is based on the pesticide model of registration. The data requirements as proposed are

unrealistic and would almost certainly result in reduced research and development of new natural enemies by commercial biocontrol producers. If the full data package were produced, the cost of development would have to be passed onto growers, reducing their use, and resulting in an increase in pesticide use. The implications for the industry could be disastrous, setting back all the progress that has been made in biological control in the past 10-15 years. For greenhouse vegetables, the consequences would be even worse, with biocontrol currently being used in 80-90% of greenhouse in Canada.

Recommendation

It is recommended that PMRA work within the OECD working group to ensure that any regulation of biological control agents does not adversely impact the greenhouse industry in Canada. It is understood and appreciated that some regulation is required, but the pesticide model of registration is not appropriate.

Target Agency

- PMRA

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Executive Summary

The value of Ontario Greenhouse and Protected Crops in 2002 was over \$0.55B. These crops comprise greenhouse vegetables and mushrooms. A large portion of these crops (70% in the case of greenhouse tomatoes) was exported.

The greenhouse vegetable industry continued to grow for an 8th year; 24 hectares (60 acres) were added in 2002, mostly in the Leamington area. The total area is now estimated at 480 ha (1200 acres) for Ontario (1000 acres in Leamington). In comparison, the entire US greenhouse vegetable industry is estimated at around 850 acres. The 2002 value of all Ontario greenhouse vegetables is estimated at around \$412 M.

The most critical problems faced by the industry in 2002 were: Adverse weather conditions causing fruit quality deterioration and a number of other issues relating to marketing and its administration.

Industry needs for new technology and expert advice were met effectively by a strong research and extension team ; consequently, no recommendations have been put forward by this OHCRSC Sub-Committee for additional resources; the recommendations put forward by our group address different concerns. The research and services priorities identified will be addressed by the present staff.

The mushroom working group is divided into two sections: 1) commercial button mushrooms and 2) specialty mushrooms, so as to better hear the needs of each sector of mushroom cultivation. The commercial button mushroom market remains strong with growers anticipating slight increases in production and prices. The portabella and crimini mushrooms occupy about 10% of the market share. The industry is expanding in the quantity of substrate that will become available to Ontario growers. Dry bubble disease and flies have increased this year. While other diseases are present, they remain at a manageable background level. Environmental and nutrient management issues are major concerns. Research issues principally focus on environment, control of pests and mushroom quality.

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Introduction

This is the Annual Report of the Greenhouse and Protected Crops Sub-Committee within the Ontario Horticultural Crops Research and Services Committee.

Following the restructuring of the OASCC committees in 1999, the present report, in addition to the usual crop production aspects, addresses pest management issues and priorities. The membership of the (Greenhouse and Protected Crops) Sub-Committee was modified in 1999 to include some key members of the discontinued Protected Crops Sub-Committee of the OCPC.

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State of the Industry

GREENHOUSE VEGETABLES (S. Khosla and G. Ferguson)

Crop Conditions

General Comments

The 2002 growing season started off with a mild sunny Jan and Feb followed by a prolonged period of below average light levels. This resulted in well-established plants with a good fruit load that resulted in delayed plant development and fruit harvest when light levels were lower in Mar and Apr. Light levels improved in late May/early June and remained at or slightly higher than the average. This was followed by average to below average light levels in the fall further inducing fruit quality and production problems.

The maximum and minimum temperature recorded during the 2002 season were in general higher than the average, coupled with long periods without rainfall, caused fruit quality problems such as blossom end rot and sunscald to prevail. There has been an increase in the number of growers installing raised trough systems (retrofit in old greenhouses as well new installation in new construction). Several growers have begun to recycle their nutrient solution using heat pasteurization, UV or ozonation.

Production

Tomato

Tomato crops planted in early Dec set fruit easily but harvest was delayed due to the low light levels with the heavy early fruit load. This also affected fruit set on trusses 4, 5 and 6. Later plantings (late Dec/early Jan) experienced better light levels resulting in improved fruit quality. Overall production was at or slightly better than average. In the heat of the summer some growers had severe blossom end rot, fruit cracking problems as well as decreased shelf life.

The most commonly grown beefsteak cultivar was Rhapsody with several growers who planted Quest as an alternative. In the numerous cultivar trials conducted this past year a new beefsteak cultivar was not identified that would suite the Ontario growing conditions or the market. However, the cultivar Dundee has shown well as a short season beefsteak cultivar and was tried more extensively in the fall with good success. There will be further trials conducted in 2003. Clarence was the most popular cluster tomato grown in Ontario. Several new lines were tried but their fruit size was found to be inadequate.

There is an increased interest in grafting tomatoes on rootstock to improve plant vigor. Several growers reported good results in their 2002 trials.

Cucumber

Three plantings per year has become more popular as growers are striving to supply a high quality product to the marketplace.

The early-planted crops were able to establish well, resulting in excellent production when the prices were extremely high in Jan and Feb. Subsequent plantings were slow to establish and had a longer period before harvest. The later plantings (Aug) established well despite the heat. In general the production has increased slightly. Bodega, Mystica, Aviance, Logica, Dominica and Pyralis are the most common cultivars grown in the first two crops. Gardon, virus resistance cultivar, is used in the fall crop. Several new lines will be released in 2003 that will fit the Ontario requirements.

Pepper

Triple 4 was the main red coloured cultivar grown in Ontario. The better light conditions at the early stages of planting allowed plants to set a heavy fruit load which resulted in poorly balanced plants when the extended low light period prevailed delaying harvest and decreasing fruit setting on the second flush. Subsequent growing conditions allowed production to increase with average to above average final production reported. Bossanova (yellow coloured) and Sympathie (orange coloured) were the other cultivars grown in Ontario. As a result of grower trials conducted in 2002 the red cultivar 4-ever, and new yellow cultivar, will be planted in 2003 on a larger scale.

Pest Management

Tomatoes

Significant pest problems included the following:

1. PepMV - This disease carried over into 2002 and at least 20 operations were affected. Likely more than this number of operations was infected with the virus with perhaps 50% or more of the acreage being affected. As in 2001, reported losses varied from 0-20%. Symptoms were again associated with stress conditions including uneven light conditions within an operation, poor vigour in association with fluctuating light conditions, stressed roots due to poor irrigation or irrigation failure, and fungicide applications.
2. Cabbage loopers were prevalent during summer and control with Dipel has been variable.
3. Russet mites were also prevalent during summer and caused significant damage in a few operations.
4. Tomato bug or *Engytatus modestus* - This pest was reported in about 5 operations. Warm conditions last winter together with early crops are some of the reasons that might have caused the incidence of this bug this year.
5. There were several incidences (at least 1 dozen) of bacterial canker. It is likely that a severe windstorm several weeks earlier may have contributed to the high incidence of this disease.

Cucumbers

Major problems for this crop were as follows:

1. Powdery mildew is still a challenge for many growers who are always looking for alternative products.
2. There were at least 4 incidence of Fusarium root and crown rot this year. It is possible that this disease may have occurred in other operations but was unrecognized because symptoms of this disease may be confused with those of gummy stem blight or Pythium root rot. This disease caused about 20% plant loss in at least 2 operations. Once this disease occurs in an operation, it appears to be difficult to eradicate and becomes a chronic problem.
3. Spider mites and cabbage loopers were the major insect problems.

There is growing interest among cucumber growers in use of biological control. The acreage is now about 30% and there is indication that this acreage will continue. Some of the reasons for this trend include increasing adoption of biological control by some large operations, resistance to pesticides, concern about food quality, and monitoring activities by PMRA.

Peppers

Major problems for pepper crops were as follows:

1. There were several incidences of Fusarium earlier in the year but losses were not as dramatic as in previous years
2. There was an incidence of INSV this year because of infected thrips early in the year.
3. Mildew was a problem in a couple of operations.
4. Cabbage loopers were prevalent during the summer.
5. European corn borer - losses were generally low possibly due to lower population levels, and aggressive use of biological controls including Trichogramma species and Orius.
6. Lygus bug - damage due to this pest was lower this year possibly due to increased use of Orius.

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Major IPM Activities

- Dicyphus trial - Worked with MGS and Biobest in carrying out a trial using mullein (*Verbascum thapsis*) plants for the establishment of Dicyphus in 2 tomato operations.
- Arranged for meeting between Dutch pepino researcher and Canadian researchers to establish contact among them and to facilitate collaboration of research.
- Obtained a research permit for Stylet Oil in peppers for control of mildew. Carried out observations on mildew infection following application of several rates of Stylet Oil.
- Worked with Geoff to do a lab trial for Stylet Oil against spider mites.
- Worked with Les and Geoff Riddle on GLP residue trial for Pirimor on tomatoes.
- Obtained an extension of the emergency registration for Ridomil on cucumber.
- Generally working with Geoff, Les, and Ray at Harrow, and with BC, Quebec, & Alberta on minor use registrations.
- Working on factsheets for whiteflies and thrips with Graeme and Les.

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MUSHROOMS

Mushrooms

Ontario continues to lead the nation in mushroom production with 49.7% of the total production. According to the preliminary report by Statistics Canada, 94.5 million pounds were sold in 2001, a decrease of 1.4 million pounds from 2000. Farm gate value was \$143 million, an increase of \$2.2 million. Fresh market price was \$1.66/lb., an increase of 8 cents. Processing grade mushroom prices decrease by 5 cents to \$0.76/lb.

The industry is expanding through the construction and expansion of composting operations. These operations will

produce compost fully spawn-run and resultingly annual production will increase.

Mushroom sales to the USA could be as much as 20%.

Browns (portabella and crimini) production and market continues to grow, occupying at least 10% of the market share. This market is not being affected by the season as it was anticipated.

Total labor cost was 60 cents per pound of mushroom harvested, up by 6 cents from that reported last year. Owners returned to the Ontario economy \$56.78 million in salaries and wages, employing 2368 full and part-time employees.

Growers see a stable to modest increase in the industry for 2002 with slightly higher fresh and processing prices.

Trichoderma harzianum, biotype Th4, (green mould disease) persists at a background level with occasionally outbreaks, some with significant economic impact. Despite its presence, mushroom farmers consider that their disease management practices will reduce or at least maintain the devastating effects of this disease.

The incidence and severity of dry bubble disease (*Verticillium fungicola*) has increased during 2002.

Problems with a number of other diseases and mites, wet bubble (*Mycogone perniciosa*), viruses, Cobweb (*Dactylium dendroides*), bacterial Blotch and mites are considered well managed with no anticipated outbreaks for the coming year.

Mushroom flies (*Lycoriella mali*) were more serious this year than in past years.

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Specialty mushrooms

The specialty mushroom industry is comprised of generally small growers, producing oyster and shiitake mushrooms. No formal production statistics are published in Canada. An educated guess would place the combined annual production of oyster and shiitake mushrooms in Ontario between 1 and 2 million pounds at a sales value of between \$4 and 8 million. Farmgate price has remained stable for several years. From the chairman's perspective, the specialty industry has overall remained rather stable for the past several years.

There is an anticipated increase in shiitake and oyster mushroom production.

Competitor moulds (e.g. green moulds, bacterial blotch, *Penicillium* sp.) continue to be problematic in both oyster and shiitake operations. Flies don't appear to be problematic.

Greenhouse Vegetable and Protected Crop value (Millions of \$), and production volume (Millions of Kg, or dozen), since 1990

	1990	1991	1992	1993	1994	1995	1996	1997	1998	1999	2000	2001
Tomatoes (\$ M)	25	32	24	33	39	42	55	79	126	145	177	217
Tomatoes kg (000,000)				18	23	31	38	49	80	106	131	153
Cucumbers (\$ M)	19	25	23	32	34	41	46	62	77.8	91.9	97.5	113
Cucumbers doz. (000,000)				4.4	4.7	5.3	6	8.3	9.8	11.9	12.8	14.4

Lettuce (\$ M)	1	1	1	1	1	1	1	1	1	1	1	1
Sweet Peppers (\$ M)	3	4	4	4	4	5	11	12	27	27.6	32.7	80.5
Sweet Peppers kg (000,000)				1.5	1.3	1.4	3	4.4	6.7	7.4	9.7	21.6
SUB-TOTAL (\$ M) [Greenhouse Vegetables]	48	62	52	70	78	89	113	154	154	266	308	411.5
Mushrooms (\$ M)	76	74	77	85	90	105	102	111	112	117	120	143
Mushrooms kg (000,000)				32	34	40	36.5	36.4	37	37.7	36.2	42.9
TOTAL (\$ M)	124	136	129	155	168	194	215	260	344	383	428	554.5

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Committee Activities

The Greenhouse and Protected Crops Sub-Committee of the OHCRSC (without the Working Group on Mushrooms) met on October 21, 2002, (10:30 am - 3:30 pm) at the Ontario Government Information Center, London, Ontario, for their Annual Meeting.

Present:

A. P. Papadopoulos (Chairperson)

G. Ferguson (Vice-Chairperson, and acting Secretary)

S. Khosla, K. Devaere, D. Hoffman, R. Cerkaskas, J. Vanderhout, R. Vorberg, B. Micallef, J. L. Shipp, Carl Mastronardi (for Gerry Mastronardi), Dominic Mastronardi, M. Celletti, D. Oroz, Tom Magri, Dean Tiessen, and Jenny Hale.

This year the combined commercial and specialty working groups met on November 5, 2002 in the board room of Money's Mushrooms, Campbellville, ON. In most years the working groups do not meet formally and then questionnaire responses are used to establish criteria for the report.

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Significant Research/Service Accomplishments

GREENHOUSE VEGETABLES

1. Increased use of the raised trough system for production and labour efficiency.
2. Increase in the number of acres with intercropping to minimize down time between crops.
3. Down time between crops minimized by the use of machinery to efficiently remove crop residue from greenhouses (20 acres cleared in 2 days)

4. Increased use of summer CO₂ to improve fruit quality and production. The use of flue gas CO₂ with hot water tanks has increased.
5. Development of a biological and cultural control strategy for control of western flower thrips on tomatoes using the predatory bug, *Dicyphus hesperus*, and predatory mite, *Amblyseius cucumeris*. Previously, there was no biological control program for thrips on tomatoes and growers had to use chemicals that would interfere with biological control programs for other pests.

MUSHROOMS

A project to evaluate the emissions from mushroom compost produced on an aerated floor compared to a traditional rick completed its field work. Summarization of the research is in progress.

Citation 75WP was submitted for label expansion for application to casing and PMRA required GLP residue and decline study. This report was submitted in June, 2002. A decision by PMRA is anticipated in early 2003.

A field efficacy trial for antipated registration of Gnatrol DG (*Bacillus thuringiensis israelensis*) against sciarid flies was initiated in late November.

A graduate student working on the effectiveness of ozone to enhance post-harvest mushroom quality has finished the trials but has terminated his studies before completing his thesis. This work is being written up by a second party.

A graduate nears completion in the investigation of the fate of pesticides in recycled water used for mushroom compost preparation.

A graduate student is nearing completion in the investigation of the possible role of ammonia suppressants on commercial mushroom production.

The identification of disease samples continues to provide a significant asset to the industry as they battle the background levels of diseases, especially *Trichoderma* spp.

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Report of Actions Taken on Previous Years Recommendations

Issue: Support for minor use

Increased funding and other support be provided for minor use registration of new products.

Response discussed at OHCRSC

Pest management recommendations have been forwarded to OPMRSC.

Issue: Incentives for environmentally sustainable systems

Provide incentives to the Ontario greenhouse vegetable industry to implement environmentally sustainable production systems.

Response discussed at OHCRSC

It would be advantageous for the greenhouse vegetable industry to pursue environmentally sustainable systems regardless of the availability of incentives.

Issue: Labour Shortages

A split system (6 moths + 6 months) be implemented in the access and management of offshore labour.

Response discussed at OHCRSC

The subcommittee should contact the agencies involved in administering the program to discuss this need.

Issue: Pest Diagnostic Lab

Increased support be provided to the Pest Diagnostics Laboratoty in Guelph.

Response discussed at OHCRSC

Pest management recommendations have been forwarded to OPMRSC. The committee should contact the clinic directly to discuss the specific diagnostic needs that were identified by your subcommittee.

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Emerging Issues

GREENHOUSE VEGETABLES

New US Act and Regulations will result in more stringent phytosanitary certification requirements for Canada, grower shippers and packers will need to keep detailed records resulting in higher costs. The FTA (re; bioterorism) will also require people and shipments to be registered in advance

- Water management issue is gaining strength. The situation is worsening with the recycling of plastic and rockwool. Waste companies have refused to accept material if not pre-processed.
- There is a potential for imposing registration requirements for biological controls in the same fashion as for chemicals.
- Efforts to manage nutrients are continuing and the Provincial Nutrient Management Act is about to be enacted.

- Ongoing concern about pests and pathogens been introduced into Canada on imported produce; there is a need for more careful handling of imports (e.g. more effort to isolate imports from local produce at packing houses and marketing channels).

MUSHROOMS

Commercial mushrooms

Some major concerns from previous years continue to hold attention. Mushroom growers are currently focused on 1) environmental issues which include odors generated from the composting process, waste water and its impact off-site, 2) nutrient management, especially the time line for compliance and specific regulations imposed, and 3) replacement for Benlate for control for green mould disease.

Emerging issues are impacts of farm workers to organize and perhaps a worker shortage.

Specialty Mushrooms

The major concerns are 1) lack of quality at the retail level and 2) and the imported Chinese shiitake with its unpleasant smell and possible use of formalin as a preservation chemical.

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Priorities of Subcommittees

GREENHOUSE VEGETABLES

Research Priorities

1. Evaluate new and old pest (thrips, whiteflies, lygus bugs, tomato bug), disease (powdery mildew, pythium, bacterial canker, Fusarium stem&root rot of cucumber), and virus (Pepino mosaic virus) control measures (including application methods) and implement IPM strategies for control of powdery mildew in cucumbers, tomatoes and peppers, Pythium root rot and Penicillium in cucumbers, and, Botrytis in all vegetables.
2. Develop and evaluate energy use and environmental strategies that optimize plant growth, productivity, and fruit quality, as well as integrated pest management techniques in greenhouse vegetables. Specifically, evaluate the production of greenhouse vegetables on raised gutters, with or without artificial lighting.
3. Development of strategies such as trap crops, insect exclusion via screening of vents, and new biological control agents, for improving control of new and old pests that disrupt IPM programs, such as thrips, lygus bugs, cucumber beetles, and whiteflies.
4. Maintain research on soilless culture with emphasis on recycling nutrient solutions and disease management to improve profitability and sustainability. Also, develop strategies to manage greenhouse waste (growing media, plant material, nutrient solution, plastic etc.) and to ensure the sustainability of the greenhouse industry. Explore opportunities for the biological production of greenhouse vegetables.
5. Investigate the potential for the use of disinfectants such as chlorine bleach, Virkon, Physam 20, and the fungicide Phyton 27, as protectants against diseases, particularly bacterial and fungal diseases. Also, Identify sites and form of dormant stages of bacterial and fungal pathogens in order to effect rational control between

crops with disinfectants and modification of cultural practices.

6. Evaluate new types of crops, cultivars, and post-harvest technology procedures (including packaging and labelling) to optimize yield and fruit quality. Explore the potential for the biological production of greenhouse vegetables and investigate the benefits of grafting.
7. Investigate strategies to reduce efficiency of insects as vectors of plant diseases such as CMV by aphids, Beet Pseudo Yellows Virus by whiteflies etc.

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MUSHROOMS

The working groups elected NOT to rank them. They defer to the research committee of the CMGA to decide the important priorities at the time research funds become available.

Commercial mushrooms - Long term priorities (2 to 4 years duration)

The working group established the following as long term priorities.

- Compost odour management, especially treatment techniques
- Improvement of mushroom quality, especially sliced mushrooms
- Influence of mushroom farming practices on surface and underground water
- Control products for management of Green mold and Verticillium diseases
- Enhancement of value to mushrooms
- Food safety issues

Specialty mushrooms- Long term priorities (2 to 4 years duration)

- Develop "best practices" procedures for packaging and storage of specialty mushrooms to improve the shelf life and quality at the retail store level.

Commercial mushrooms - Short term priorities (within two years)

Insect and Disease

- Determine the effectiveness of fungicides, fungi static materials and barrier techniques to manage Trichoderma green mould and dry bubble
- Provide the necessary information required by AAFC for registration of products already registered in the USA and Europe
- Determine relationship between virus (La France and patch disease) and browns (portabella and crimini)

Production

- Determine the effect of water quality on mushrooms
- Develop criteria for the "best" casing soil, e.g. black peat, sugarbeet lime, flour lime
- Determine influence of straw cultivars, poultry litter bedding, feed additives, ammonia suppressants and pesticide residues on composting, mushroom production and human health
- Prepare a literature review of the nutritional benefit of mushrooms
- Enhance mushroom quality through minimal treatment at the farm level

Specialty mushrooms - Short term priorities (within two years)

Insects and diseases

- Develop controls for blotch and trichoderma diseases

Production

- Optimize environmental management techniques to maximize production and quality
- Evaluation strains to optimize mushroom production and quality
- Develop marketing strategies and retail presentations to improve profitability to mushroom growers

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Service Priorities

The working groups discussed the issues surrounding 'service' to the mushroom industry. Their primary concern is the availability for virus testing and compost analysis in Canada. Compost analysis is a routine practice for most farms. Samples are analyzed on-site, within Canada and in the USA. There is no single lab to which the growers send samples. There are no labs in Canada that do virus testing for mushrooms. (They have been done infrequently by AAFC in Vineland.) Samples are sent to spawn suppliers or to The Pennsylvania State University. Virus is currently not a serious problem on mushroom farms in Canada; however, there are significant virus or virus-like problems in UK. Thus, the growers are concerned with the absence of domestic labs should a problem occur here. At the same time, they realize that a market is necessary for any lab to develop the skill sets for the testing.

Commercial mushrooms

- Identification of insects, diseases and weed moulds
- The use of internet as means for providing technology transfer from own research and published work of others
- Workshops

Specialty mushrooms

- Identification of insects, diseases and weed moulds
- Telephone consultations
- Be an information centre on advances in specialty mushroom production
- Deliver Trichoderma control information on Shiitake mushrooms
- The use of internet as means for providing technology transfer from own research and published work of others
- Internet training courses
- Workshops

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Priorities for Minor Use Registrations

Table 1. Overall Crop Pest Rating - Greenhouse Vegetables (Listed in order of priority)

* These pests are particularly important because of the disruption they cause in biological control programs.

Pest	Crop	Reasons
Powdery Mildew	Cucumber Pepper	Resistance appears to have developed New disease in pepper, only 1 product registered
Botrytis	a) Tomato b) Cucumber	a) Cucumber Resistance appears to have developed to current product, can cause significant losses (13% yield loss reported in 2000 in one crop. b) Resistance appears to have developed to current product
Root diseases	a) Cucumber b) Tomato & Pepper	a) Significant losses can occur Only 1 product registered for Pythium b) No products registered
Thrips	Cucumber, Tomato, Pepper	No products registered, Lannate for Cukes not on current label New thrips problem - Echinothrips - threatens cukes & pepper
Whitefly	a) Tomato b) Cucumber	a) IPM-compatible products needed, none currently registered for use during crop b) Vector Beet Pseudo Yellows in cukes Resistance exist to current products IPM-compatible products needed, none currently registered for use during crop
*Lygus bugs	a) Cucumber b) Pepper	a) No products currently registered for its control IPM-compatible products needed b) IPM-compatible products needed
*Cucumber beetles	Cucumber	No products currently registered for its control IPM-compatible products needed
<i>Fusarium solani</i>	Cucumber	New disease No products currently registered for its control
Two-spotted spider mite	Cucumber, Tomato, Pepper	Resistance appears to have developed to current products IPM-compatible products needed
Aphids	Cucumber, Tomato, Pepper	IPM-compatible products needed Vector viruses in all crops

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Table 1a. Overall Crop Pest Rating - Mushrooms (Listed in Order of Priority)

Pest	Crop	Reasons

Green mould disease - <i>Trichoderma harzianum</i> (biotype Th4)	Commercial mushrooms	75% of Ontario's farms with infection histories. Significant losses occur. Accumulative dollar losses in millions. Controlled principally by sanitation and hygiene. Easily vectored by humans and insects. Coating of spawn grain with benomyl helps; resistance developing in USA. No fungicide effective once infection starts.
Dry bubble disease (<i>Verticillium fungicola</i>)	Commercial mushrooms	All Ontario farms with infection histories. Easily vectored by humans and insects. Resistance to benomyl. Products with zineb not exportable to USA. Chlorothalonil, marginal control, phytotoxic to mushroom mycelia.
Trichoderma spp.	a)Commercial Mushrooms b)Specialty Mushrooms	a)Spotting of mushroom caps, reducing quality. No fungicide registered during production. b)A common contaminant of oyster and shiitake substrate. No fungicide permitted. Losses frequently high.
Bacterial blotch	Commercial and Specialty Mushrooms	Spots and decay of tissue. Controlled principally by environmental management. Chlorine lowers population density.
Sciarid fly: (<i>Lycoriella mali</i>)	Commercial and specialty mushrooms	Direct damage by larvae; adults as significant vector for diseases.
Cobweb disease (<i>Cladobotrium dendroides</i>)	Commercial mushrooms	Infrequent occurrence in Canada. Highly resistant strain in Europe.

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Detailed Recommendations

Recommendation #1

Whereas,

Biological control has been in use in greenhouse vegetables for the past two to three decades, and currently forms the mainstay of pest management programs for arthropod pests in the majority of greenhouse vegetable operations in Ontario. Growers choose biological control as their major strategy over chemical control for several reasons including improved efficacy because of development of resistance to pesticides, use of bumble bees, improved plant vigour and fruit quality, less concern about pre-harvest intervals, a more pleasant working environment, etc.

Despite the current regulation in place that is administered by the Canadian Food Inspection Agency, there is a move towards developing further requirements by OECD countries. In this regard, attention was recently drawn to a draft document dated January 9, 2002, entitled "Guidance for Registration Requirements for Invertebrates as Biological Control Agents." Some of the proposed data requirements prior to registration of a BCA in this document include information for assessing the following:

- Human health and safety
- Environmental risks

- Efficacy

Regulations that are currently in place for new BCAs have worked well to date and there have been no known adverse consequences as a result of release of any exotic BCA in Canada. There have, however, been incidences of alien and invasive arthropod pest species in greenhouse crops. Such species have disrupted biological control programs. With the global market place that exists, it is expected that more new invasive species will occur, and will have to be addressed. In addition to reasons cited previously, this is another reason for desiring the continued survival of biological control companies and the continuing development of new BCAs.

Most biological control companies are small and marginally profitable as evidenced by bankruptcies, change in ownerships, etc. If the proposed document for registration of BCAs is adopted by OECD countries, it is believed that the cost associated with fulfilling data requirements for registration would force some companies out of business. At the very least, the increased cost would severely restrict research and development of new BCAs needed to improve current control programs, or to address new problems. Another possible consequence of such increased costs is a switch in growers' current strategy of high reliance on BCAs towards increased reliance on pesticides in order to maintain economic viability.

It is Recommended that:

It is recommended that the status quo for regulation of new biological control agents be minimally changed, if at all. Any changes considered necessary by the Pest Management Regulatory Agency should not impose undue financial burden on biological control companies such that production and use of biological control agents become uneconomical.

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Recommendation #2

Whereas,

Announcements for increased funding by the federal government for an improved structure for the minor use registration process is much appreciated by the industry. However, our industry lags far behind the greenhouse vegetable industry in some jurisdictions in having access to products, particularly those that are considered as reduced risk and that are compatible with use of natural enemies. Although harmonization of registration is supposed to be in place, differences in the registration process in the different jurisdictions, particularly between EPA and PMRA have delayed registration in Canada. Furthermore, such differences have served as a deterrent to joint registrations of new products by some chemical companies for fear of delayed registration and loss of market share.

It is Recommended that:

It is recommended that the Pest Management Regulatory Agency continue to strive to expedite and truly harmonize the minor use registration process, particularly that for reduced risk products.

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Appendix: Terms of Reference

To prepare research and service summaries and to recommend research and service priorities in Ontario for greenhouse and protected crops.

To disclose problems that face greenhouse and protected crops which require investigation.

To co-ordinate research and services planning and cooperation.

To assess and suggest priorities for new programs and recommend which programs presently underway should be expanded or terminated.

To estimate, where possible, costs involved in the contact of new research and services programs and to supply cost-benefit information.

To suggest, where possible, how funds might be obtained or freed to conduct new research and development.

To present written reports and recommendations to the Horticultural Crops Research and Services Committee.

To invite additional research and development personnel to information meetings where progress within crops can be presented.

To assist in the preparation of recommendations for grower use.

To contact federal, provincial, university, and industry managers for representatives to serve on the committee.

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Ontario Low Acreage and Special Crops Research and Services Subcommittee

Author:

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Ontario Low Acreage and Special Crops Research and Services Subcommittee

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Introduction

The Low Acreage and Special Crops Research and Services Sub-Committee held a meeting on November 21, 2002 at Simcoe, OMAF Resource Centre. Meeting chairperson was Denise Beaton. Fourteen sub-committee members and 4 sub-committee substitute or guests participated. Sector representatives included 5 growers, 1 industry, 3 from University of Guelph and 9 from OMAF.

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State of the Industry

Summary

Marketing limitations and challenges, limited pesticide registrations and weather conditions impacted Low Acreage and Special Crops in the year 2002. The cold weather in May affected the yield or timing of maturity of some crops. Most crops grew very well in the hot, dry weather but the shortage of water was an issue with some crops. On average, disease and insect pressures were at below-normal or normal incidence level.

Those associated with the production and processing of low acreage and special crops (niche crops) will continue their requests for increased agronomic research, technology transfer, pest control and management despite the fact that crop insurance is unavailable to many of these crops and markets remain competitive.

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2002 Crop Updates and Research and Service Accomplishments

Sweet Potatoes

The sweet potato crop performed very well with the warm, dry weather experienced in the 2002-growing season. Growers were pleased with the yield, skins and quality of the crop. Prices dropped initially at harvest, but leveled off later on. Armyworms were a new pest problem for this crop. There is some concern with this pest. Some other diseases and insects that caused minimal damage to this crop were *Fusarium*, potato weevil, loopers, wireworms and black cutworms. When reviewing minor use needs for sweet potatoes, white grubs were identified as the number one target pest. Mike Columbus, OMAF, reported that acreage has increased to 250 acres. There is some work being done to provide a crop insurance program for the sweet potato growers. University of Guelph has one year remaining for the sweet potato variety trial research project.

Belgian Endive

In 2002, some problems were experienced in early spring with seeds blowing out of the soil. Also, this crop requires good moisture levels. Smaller root development was observed and believed to be due to the shortage of water. Overall, yield was good. Marketing and diseases were not a problem for Belgian endive in 2002. Some manganese, magnesium, calcium and boron deficiencies were observed this year, likely due to severe dry weather conditions.

Tarnished plant bug was observed in a few cases. There are a limited amount of pesticides that are registered for this crop. Treflan is registered in the U.S., but not in Canada. The focus of minor uses is moving from individual crops to crop groups. Some discussion took place regarding Belgian endive being included in the same crop group as chicory. Perhaps this crop should be moved to the Root Crops and Leafy Vegetable Research and Services Sub-Committee.

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Culinary Herbs

Herbs grew very well in the hot weather this year. The harvest season started late due to the cold, wet weather in May. Market held a steady price. Disease and insect pressures were fairly low. Some damage from soil-borne root diseases, bacterial disease, tarnished plant bug, aster leafhoppers and aphids were noted. There is a concern that there will not be a market to support more growth in Ontario herb production. Organic herb growing seems to be where the demand is for herbs. Imports into Canada are mostly non-organic products. For non-organic herbs, there is inadequate/lack of registered herbicides available. Although seed supplied by companies is registered certified, a great deal of physiological difference is noted. There was some discussion about herb growers needing brokers in the near future. This would help out with bioterrorism issues at the border. The brokers are pre-approved, so the grower wouldn't have to be. The Marketing session of the Ontario Fruit and Vegetable Convention on Feb. 19, 2003 at Brock University will be covering topics such as exporting and labeling.

OMAF (Jan Schooley) sits on a National Coalition to address on-farm food safety, Good Manufacturing Practices, Good Agricultural Practices. The lead organization is the Saskatchewan Herb and Spice Association. This coalition also acts as liaison with the Natural Health Products Directorate. Ginseng & Medicinal Herb Specialist, Jan Schooley, OMAF co-authored a revised factsheet "Growing Culinary Herbs in Ontario" and provides information on herbs on the OMAF web site. Michael Celetti reported a root rot problem with baby dill and cilantro. Pest Diagnostics lab is still not able to identify the cause of the root rot. Al McKeown conducted chive variety trials.

Pumpkins

2002 was a good growing year for pumpkins. The time of planting and rainfall were important factors in crop yield. Some leaf analysis was conducted and nutrient deficiencies were found. It is thought that this could be due to the hot weather. There was not a lot of insect pressure. Powdery mildew was experienced again this year. This disease seems to come in every year when the pumpkins are in full foliage, following a heavy dew. Jim Chaput mentioned that the province is trying for a seed treatment. Some growers select their own seed, so the seed treatment may not help these growers. John O'Sullivan and Rob Grohs (University of Guelph) evaluated various herbicides for pumpkins. There were problems with many weeds, mainly pigweed, in these trials.

Squash

Squash grew very well in 2002. Some powdery mildew and sunscald was observed. John O'Sullivan and Rob Grohs (University of Guelph) conducted herbicide evaluation trials on squash.

Asparagus

Frost was a major problem for asparagus growers this year. Most cuts were made in June with minimal cuts in May. Yields were below average. Cucumber beetles and asparagus beetles were observed in some asparagus crops. Rust is still the main disease challenge for asparagus, especially with some of the more susceptible varieties (Centennial and Viking). Biotechnology may be one way to address rust and asparagus beetle problems.

The breeding program is no longer available at the Cambridge Research Station due to its closing. The breeding program will be moved to Simcoe, University of Guelph. Three hundred crowns must be moved to Simcoe before freeze up. Issues that will affect asparagus research on the Simcoe station this coming season are: (1) limited available acreage; (2) limited operating and labour budgets; (3) limited cooler storage; (4) greenhouse space and field operations expenses; (5) moving costs; and (6) setback of the asparagus research program due to the move.

There is a need for new pesticide registrations. New registrations should focus on pesticides with new modes of action and pesticides that are currently registered in the US. If a pesticide is not registered in the U.S., the U.S. automatically give a tolerance of zero for any residues that may be found. Elaine Roddy, OMAF Vegetable Specialist, has assisted with storage trials, which involved using different types of boxes to decrease weight loss.

(see Asparagus Research and Services Sub-committee meeting minutes - attached).

Melons

This year produced a bumper crop of melons. The early plantings were delayed or froze off. Prices were lower this year due to the ample availability of product. The biggest challenge this year was marketing caused by melons maturing at once due to the excessive heat. Sunscald also impacted quality. Disease and insect pressures were fairly low. Research trials were conducted in Delhi to test levels of nitrates in nitrogen fertigated melons.

Pickling Cucumbers

Yield and quality were fairly good. There was a higher incidence of fruit rot in pickling cucumbers than what is normally observed. This is unusual for a dry season. Also, some problems with boron levels were seen when levels were below 0.8 ppm in the soil. John O'Sullivan and Rob Grohs (University of Guelph) conducted various trials for cucumbers: (1) advanced multipick; (2) main multipick; (3) simulated once-over machine harvest; (4) once-over late harvest; (5) small cucumber and (6) herbicide evaluation.

Organic Crops

In 2002 an Organic Research Advisory Committee (ORAC) was formed. The membership represents a cross section of producers, processors, wholesalers, certifiers, researchers and OMAF. ORAC forwarded its 2002 report to the Low Acreage & Special Crops Sub-Committee.

The ORAC report is provided with this report for consideration by OASCC. Organic production covers a wide range of crops. There are not a lot of statistics yet on the percentage of organic farming. The lack of rain experienced in 2002 was the main problem for organic crops, since most commodities are not irrigated. There is a significant amount of organic

produce being imported by California.

(see Report of the Organic Research Advisory Committee - attached).

Sugar Beets

Janice LeBoeuf, OMAF Vegetable Specialist, reported a good 2002 sugar beet crop in terms of yield, sugar and harvesting (early harvest and not a lot of mud). Janice assisted with different variety trials, sugar beet spacing trial, field piling trial (first trial for field piling in North America to assess weight and sugar losses during field piling), minor use application (Quadris - still in progress), nitrogen verification project, updating the vegetable web pages and reviewing registered pesticides. Ridgetown College staff, University of Guelph, conducted weed control research for sugarbeets.

Beets

John O'Sullivan and Rob Grohs (University of Guelph) conducted beet (processing) cultivar observation trials (early and late).

Root Chicory

There was only small acreage of chicory planted this year as the developer of this crop went into receivership. Darren Robinson, Ridgetown College, reported that Upbeet did not show phytotoxicity on chicory. There is a problem with how to control established chicory.

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Peppers

Disease pressure was low for peppers in 2002. Some sunscald, disease rot and cucumber mosaic virus (Delhi, Port Rowan area) were observed. The cucumber mosaic virus is proving to be extremely crop limiting in the Delhi and Port Rowan area. Some investigation into the possible causes for this virus being worse in these areas would be warranted (i.e. possible vectors). Some aphid problems were observed, but only in a few fields. Extension personnel are currently updating the OMAF vegetable web site and reviewing registered pesticides. Darren Robinson (Ridgetown College) reported research results for determining the tolerance of peppers to various pre-emergence and post-emergence herbicides. John Warner (AAFC) and John Zandstra (Ridgetown College) worked on the evaluation of biodegradable and solar mulch films in pepper production. Also, John Warner and Bill Balkwill (AAFC) conducted bell pepper variety trials. John O'Sullivan and Rob Grohs (University of Guelph) evaluated hot banana pepper and sweet banana pepper variety trials and conducted herbicide evaluations in peppers.

Leeks

2002 was a good year for leeks. Market went down this year. This is an allium crop and should be considered by the Root Bulb and Leafy Vegetable Research and Services Sub-Committee.

Okra

Okra on plastic mulch produced a very good crop this year. There was some insect pressure from tarnished plant bug.

Globe Artichokes

The evaluation of globe artichoke production on muck soil was done in 2002 by Mary Ruth McDonald, K. Vander Kooi (University of Guelph) and Mike Columbus (OMAF). Covering globe artichokes with straw proved to be unsuccessful, due to the intrusion of mice! Next year, sawdust may be substituted for straw to evaluate the potential for this covering. Globe artichokes did not grow well in the intense heat. Also, there was a fungus problem observed in one trial. This crop is fairly susceptible to late frost. Winterkill would be an issue for globe artichokes if grown as a perennial crop in Ontario.

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Emerging Issues

Nutrient Management

There exists a need to address information gaps on actual crop uptake and removal rate of nutrients, and the environmental effect of such nutrients, i.e. phosphorus and nitrogen. In order to form the basis of nutrient management guidelines, nutrient uptake curves and the validity of current recommended rates must be addressed. This issue is being addressed with certain crops (i.e. melons, cucumbers); however, there is no data for other low acreage crops, such as sweet potatoes and herbs. It is difficult to obtain research funding for these low acreage crops.

Food Safety

The increasing consumer concern with respect to the environment and food safety is making growers question their public liability within the production/distribution chain (on-farm accountability). Also, there is concern that grocers may want growers to provide HACCP plans in the near future. We need to make sure our production systems can meet requirements set by CFIA and processors. The quality of water for irrigation and the washing of produce on the farm were raised. Can the on-farm water supply used for irrigation and the washing of produce be a threat to food safety and the farmstead operation!

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Export Marketing Restrictions

There are barriers to exporting low acreage and special crops, which include zero tolerance pesticide residues, quarantiable pests and bioterrorism issues.

Water Management

Dry growing conditions were experienced in the last two years. More awareness is being drawn to using water efficiently as possible. There is concern that watering restrictions could become enforced if dry conditions persist. Water management issues are currently being addressed in some areas: (i) hiring of Rebecca Shortt, OMAF's Irrigation Specialist, (ii) grants provided for trickle irrigation (tomatoes) and (iii) Water Stewardship Enhancement Program. Some gaps still remain for identifying critical irrigation times for crops. It is important that research continues for trickle irrigation, its scheduling and fertigation practices.

Energy Costs

There is great concern with increasing energy costs for natural gas, diesel and electricity. Field operations, irrigation and fertilizer input costs would increase. Producers need more assistance on how to decrease energy costs.

Genetically Modified Organisms

There exists a need to establish preliminary research with respect to G.M.O. products. If the United States accepts this practice and Ontario fails to do so our growers may be unable to compete effectively in the market place thus loss of a market and economic development opportunity (e.g. "Round up ready" and "Liberty link" sugar beets and chicory.) The major gap with G.M.O. products is consumer acceptance.

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Subcommittee Activity in the Last Year (2001 Recommendations)

Recommendation #1

The Low Acreage and Special Crops Sub-Committee requests that OMAF and AAFC establish dedicated funding for research in the area of Nutrient Management specific to horticultural crops including those considered "Low Acreage and Special".

AAFC Response, sent by Bruce Bowman, London AAFC

Within the New National Science Programs of AAFC, there is a Research Theme 150, "Nutrient Cycling and Organic Residues", which focuses on many aspects of nutrient management, including manure management issues. Research activities will complement provincial activities related to nutrient management planning.

The National Theme Director is Dr. John Richards - richardsj@agr.gc.ca

OMAF Response

Several subcommittees forwarded recommendations concerning research needs for nutrient management in horticultural crops. These issues focused on three areas:

1. current and new fertilizer recommendations (Berry, Ginseng, and Nursery/Landscape and Turf subcommittees)
2. funding for research related to nutrient management (Sweet Corn; Root, Bulb & Leafy Vegetables; and Crucifer subcommittees)
3. industry participation in developing regulations and protocols (Greenhouse Floriculture subcommittee)
4. Resources to implement effective and leading-edge nutrient management programs (Low Acreage Crops)

Current and new fertilizer recommendations

Current and new fertilizer recommendations will continue to be approved by the appropriate subcommittees and the Ontario Soil Management Research and Services Committee (OSMRSC). As well, any other crop related values such as "nitrogen removal in harvested product" and yield, which are a significant part of the NMAN program and N-Index will be approved by the appropriate subcommittees and the OSMRSC. While research data to change fertilizer recommendations and supporting values in NMAN from Ontario are encouraged, documentation from other jurisdictions, reflecting similar soils, growing conditions and sound replicated trials may be considered.

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Funding for research related to nutrient management

Funding to address the current research needs related to nutrient management are available through the OMAF 2003 *New Directions in Agri-Food and Rural Research Program*. The objective of this program is to stimulate the sustainable growth and competitiveness of Ontario's agri-food and rural sectors. The "Healthy Environment" component of this program can address some of the funding concerns.

The Resource Management and Environment Program under the OMAF-University of Guelph Agreement will be under review in 2003. New proposals will be accepted for the program and it is expected that projects in the nutrient management area will continue to be a significant part of this Program.

Copies of projects funded under the Plants Program under the OMAF-University of Guelph Agreement have been distributed to all OHCRSC subcommittee chairs for distribution to their committee members.

Industry participation in developing regulations and protocols

All horticultural commodity sectors are encouraged to review and comment on the proposed Nutrient Management Act regulations and protocols as they become available, either on the OMAF website (<http://www.gov.on.ca/OMAFRA/english/agops/index.html>) or the Ontario Environmental Bill of Rights website (<http://204.40.253.254/envregistry/018748er.htm>). Commodity groups are encouraged to cooperate with their OMAF commodity specialists to understand the effects of the proposed regulations and protocols on their sector.

Recommendation #2

In light of increased consumer concern about food safety, the Low Acreage and Special Crops Committee supports increased financial support towards research, technology transfer and integrated crop management strategies which will assure a high quality food supply. In order to offset increased cost of production as a result of mandatory safety requirements, financial assistance should be made available to the producer.

Response from Innovation and Risk Management Branch, OMAF

Food safety research funding is available through several Ministry programs including the OMAF-University of Guelph Agreement, the Food Safety Research Program, and the Healthy Futures for Ontario Agriculture Program. Details of 60 current research projects under these programs have been compiled in the recently released Compendium of OMAF Funded Food Safety Research. Copies of this document can be obtained by contacting Leah Jones, Innovation and Risk Management Branch, OMAF.

Under the OMAF - University of Guelph Agreement, food safety work is ongoing in the Food Program, the Animal Program and the Plant Program. A special call for proposals has been issued by the Plant Program Director this fall asking specifically for research projects that address food safety concerns,

especially on-farm food safety concerns. This includes research that addresses food safety concerns with irrigation water, wash water and water used for on-farm food processing.

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Recommendation #3

It is recommended that the University of Guelph, Laboratory Service and Agriculture and Agri-Food Canada move immediately to certify personnel and additional field station sites as GLP compliant.

AAFC Response, sent by Bruce Bowman, London AAFC

GLP- certification will be happening over the winter of 2002-2003 at 6 Centres across Canada, including AAFC-Vineland, Delhi and Harrow.

Recommendation #4

A proactive system be established immediately ("an office of Canadian minor use") that could streamline, coordinate and facilitate the requirements for Low Acreage and Special Crops. Such a system would work with the PMRA to accept crop group labels and harmonize crop mapping with the USA.

AAFC Response, sent by Bruce Bowman, London AAFC

A new Pesticide Minor Use Initiative is being introduced across Canada and is expected to be harmonized with the US IR-4 Program.

Recommendation #5

The variety trials for Low Acreage and Special Crops be continued and enhanced. This work is vital for Ontario producers to be competitive in the marketplace and for continued economic viability of the agri-business community.

No response received, however there are cultivar evaluations outlined in the OMAF - University of Guelph Plant Program 2002-2006.

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Recommendation #6

That peas and beans be included as part of the Sweet Corn Research and Services Sub-Committee commencing year 2002.

University of Guelph Response

John Zandstra, University of Guelph and chair of the Sweet Corn Research and Services Sub-Committee, confirmed that pea and bean crops would become a part of the Sweet Corn Research and Services Sub-Committee for 2002. Sweet corn, Bean and Pea Research and Services Sub-Committee met on Nov. 7, 2002.

Minor Use Priorities

Minor use priorities were identified for a number of the low acreage and special crops including cucurbits, peppers, asparagus, sweet potato, herbs, eggplant, sugarbeets, beets, root chicory and Belgian endive. Jim Chaput, OMAF's minor use coordinator would like to hear from the majority of growers from each commodity and take these minor use priorities to the national level. Minor use work remains a high priority for the agricultural industry. In order to keep pace with products, available to U.S. counterparts work needs to be initiated and minor use completed if Ontario producers are to compete in an ever-competitive global market place.

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Research Priorities

Nutrient Management Information Gaps and Plan Implementation Costs

The Issue

Nutrient management legislation is in the process of moving forward. Growers and industry personnel associated with production and processing of Low Acreage and Special Crops indicate a shortage of reliable and current information available on which to base fertility recommendations. Furthermore the agri-business community has expressed concern over the shortage of human resources dedicated to implementation of nutrient management planning for Low Acreage and Special Crops. The dollar cost to the grower and industry associated with implementation of nutrient management planning is a concern. Can the industry remain competitive with imports from countries that grow similar produce without regard for nutrient management? Will the Ontario grower be able to compete in future market without financial assistance?

Current Research/Extension Activities

Some research is being conducted in Ontario with respect to nutrient management recommendations for Low Acreage and Special Crops (i.e. nitrogen trials in melon, cucumbers (Beyaert, AAFC)). However there are many Low Acreage and Special Crops with no research being done with respect to nutrient management recommendations (i.e. sweet potatoes, herbs). Technology transfer specialists (extension) within Crop Technology, OMAF have commenced an evaluation of recommended fertility rates and nutrient crop removal rate for certain Low Acreage and Special crops.

Gaps/Barriers

Agronomic research with respect to all aspects of nutrient management planning criteria for all Low Acreage and Special Crops requires completion. The criteria for soil nutrient deficiencies, pH, different soils, nutrient removal rates, nutrient values for waste, cull piles and wash water, for respective yields of those crops considered Low Acreage and Special must be developed as soon as possible at a reasonable cost to the agri-business community.

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Food Safety

The Issue

Food safety is not just a post-harvest issue. The market is expressing concern over the exceeding of chemical residues, wash water quality, irrigation water quality and worker hygiene. Grocery chain store retailers and agriculture industry processors indicate need for HACCP certification or equivalent from grower to consumer. If a food safety certification program were in place, would it be a "whole" farm approach or "commodity" approach? Growers of Low Acreage and Special Crops have expressed concern over the added cost of record keeping, grower liability insurance and the ability to compete in the market place with imported produce from countries that they do not enforce post harvest quality food safety standards. Also, growers are concerned with the lack of information available from the marketplace and government on food safety.

Current Research/Extension Activities

Both federal and provincial governments continue to address the food safety issue. Federally such a mandate is addressed through the CFIA, PMRA, Health Canada and Agriculture and Agri-Food Canada. Provincially a fresh market quality Program Lead Position within Crop Technology, OMAF has been set in place. In addition, all crop technology specialists working in the area of Low Acreage and Special Crops extension do appreciate the need for improved post harvest strategies to ensure food safety and quality.

Gaps/Barriers

The Low Acreage and Special Crops fresh market and processing sectors could benefit from increased human resources and financial assistance towards implementation of food safety programs. Although some industry players have taken a pro-active approach to the implementation of HACCP, others have not.

Export Marketing Restrictions

The Issue

There are barriers to exporting Low Acreage and Special Crops, which include zero tolerance pesticide residues, quarantiable pests and bioterrorism issues.

Current Research/Extension Activities

Jim Chaput, OMAF's Minor Use Coordinator is aware of the zero tolerance pesticide residue issue. When setting minor use priorities for Ontario, current pesticide registrations and submissions from other countries are taken into account. Joint submissions with the U.S. are encouraged. Herbicide trials are being conducted on some of the low acreage and special crops (i.e. sugarbeets, peppers).

Gaps/Barriers

With the limited research conducted in some low acreage and special crops, it is difficult to register new products that already have residue limits set in other countries. Sometimes Ontario growers are forced to use products that are registered in Ontario, but not registered in the country they are exporting to, due to lack of options for registered pesticides.

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Water Management

The Issue

Dry growing conditions were experienced in the last two years. More awareness is being drawn to using water efficiently as possible. There is concern that watering restrictions could become enforced if dry conditions persist.

Current Research/Extension Activities

Water management issues are currently being addressed in some areas: (i) hiring of Rebecca Shortt, OMAF's Irrigation Specialist, (ii) grants provided for trickle irrigation (tomatoes) and (iii) Water Stewardship Enhancement Program.

Gaps/Barriers

Some gaps still remain for identifying critical irrigation times for crops. It is important that research continues for trickle irrigation, its scheduling and fertigation practices.

High Energy Costs

The Issue

There is great concern with increasing energy costs for natural gas, diesel and electricity. All production practices, such as field operations, irrigation, fertilizer input costs and post-harvest conditioning (heating and/or cooling of agricultural produce and its products) will be affected and costs will increase.

Producers need more assistance on how to decrease energy costs.

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Acceptance of Genetically Modified Organisms (GMO)

The Issue

A select but limited number of Low Acreage and Special Crops (e.g. Sugar beets, asparagus, cucurbits) could potentially benefit from continued research and acceptance of GMO varieties. This is important to the grower/processor to ensure yield and quality and to remain competitive and in the market place with their USA counterparts.

Current Research/Extension Activities

Very little if any research is taking place with respect to GMO development of Low Acreage and Special Crops in Ontario. Information with respect to GMO variety development is left to private research seed companies primarily located in the USA. Extension activities in this area too are rather limited however supported in principle by OMAF Crop Technology specialists providing the market exists for GMO products.

Gaps/Barriers

Consumer demand for GMO products in some countries has diminished. Market opportunity has been lost. For Ontario

producers to remain competitive with USA counter parts, it is important to recognize the advantages of GMO varieties.

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Service Priorities

Scouting Services

The Issue

More growers are expressing a need for well-qualified pest scouting services at an affordable cost.

Current Service Activities

A.I.M.S. and some private consultants provide pest-scouting services to growers.

Gaps/Barriers

A.I.M.S. reported that there are new summer students each year that require training. There are not too many students that return the next summer due to the low wages that are offered. Also, the cost for pest-scouting services can be expensive.

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Recommendations to OHCRSC and OPMRSC

Recommendation 1

The Low Acreage and Special Crops Sub-Committee requests that OMAF and AAFC establish dedicated funding for research in the area of Nutrient Management specific to horticultural crops including those considered "Low Acreage and Special".

Directed to Agriculture and Agri-Food Canada and Ontario Ministry of Agriculture and Food.

Recommendation 2

The Low Acreage and Special Crops Sub-Committee recognizes that both federal and provincial governments provide financial and technical support to growers in the area of food safety. However, this sub-committee continues to express concerns with limited financial support available to the Low Acreage and Special Crops. More support is needed in the areas of research, technology transfer and integrated crop management strategies to ensure that our Ontario growers can remain competitive and provide high quality food produce/products. In order to offset increased cost of production as

a result of mandatory safety requirements, financial assistance should be made available to the producer.

Directed to Ontario Ministry of Agriculture and Food (Innovation and Risk Management Branch), Ontario Ministry of Agriculture and Food (Food Inspection Branch) and University of Guelph.

Recommendation 3

The Low Acreage and Special Crops Sub-Committee recommends that OMAF, AAFC and University of Guelph provide assistance (financial support and resources) to producers on how to decrease energy costs. All production practices, such as field operations, irrigation, fertilizer input costs and post-harvest conditioning (heating and/or cooling of agricultural produce and its products) will be affected and costs will increase.

Directed to Ontario Ministry of Agriculture and Food, Agriculture and Agri-Food Canada and University of Guelph.

Recommendation 4

That variety and demonstration trials for Low Acreage and Special Crops be continued and enhanced. This work is vital for Ontario producers to be competitive in the marketplace and for continued economic viability of the agri-business community.

Directed to Agriculture and Agri-Food Canada and University of Guelph.

Recommendation 5

That research trials for Low Acreage and Special Crops be conducted to identify critical irrigation times. It is important that research continues for trickle irrigation, its scheduling and fertigation practices.

Directed to Agriculture and Agri-Food Canada and University of Guelph.

Recommendation 6

That leeks, Belgian endive and chives be included as part of the Root Crops and Leafy Vegetable Research and Services Sub-Committee commencing year 2003.

Directed to Ontario Ministry of Agriculture and Food, University of Guelph (Department of Plant Agriculture) and OASCC.

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Asparagus Research and Services Subcommittee Meeting Minutes

D. Wolyn convened the meeting at 10:00 a.m. in room 1118 of the Bovey building at the University of Guelph.

Present: P. Banks, E. DeHooghe, A. McKeown, E. Roddy, J. Wilson, D. Wolyn

Minutes of the previous meeting

The minutes of the previous meeting were approved with no changes.

Business arising/correspondence

There was no correspondence or business arising from the minutes.

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Research Reports

P. Banks, D. Wolyn - University of Guelph

Closing of the Cambridge Research Station

The Cambridge research station will be closed by the end of the fiscal year, and 300 crowns must be moved to Simcoe before freeze up. Half of the crowns will be females, the remaining half will be supermales, putative supermales and males. Priority will be given to plants currently used as parents of hybrids in the trial A02 that was planted at Simcoe this spring. New supermales identified from testcrosses at Simcoe are also high priority.

Crowns will be dug with a manure fork on the front-end loader of a tractor, tied with lock ties and stored temporarily in apple bins. Most of the crowns will be planted whole into the nursery at Simcoe within a week of digging. If the plants are high priority, the crown will be split and only half of the crown planted. The remaining half will be stored over the winter and planted in the field in the spring if needed. A. McKeown suggested that the crown could be planted in pots in the greenhouse and the shoots used for tissue culture over the winter.

There are more than 8 acres of asparagus at the Cambridge research station. A. McKeown pointed out that there is already 1.5 acres of asparagus planted at Simcoe, and an expansion of plantings will impinge on fields needed by other programs. In addition, operating and labour budgets at the Simcoe research station have been cut. This will affect all work on the station this coming cropping season. Higher charges may be expected for greenhouse space and for field operations.

Cooler storage at Simcoe is limited, and asparagus crowns should not be stored near apples or other ethylene producers. A. McKeown suggested that crowns could be stored temporarily in the driving sheds in apple bins covered with tarpaulins. Long-term storage would be best arranged with local cabbage growers who do not store ethylene-producing crops.

We have applied for transition funding to pay the cost of the move from Cambridge to Simcoe. J. Wilson suggested that we also apply for funds to pay for 6 months of monitoring at the new site. Moving to Simcoe should set the breeding program back at least 3 years.

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The Breeding Program

The male hybrid Guelph Millennium has good yield, spear quality and winter hardiness, but is too susceptible to rust. It is

the supermale parent G305 that is susceptible to rust, not the female G024. Just as G305 was grown from a berry on a Lucullus plant, we now have about 70 second-generation supermales derived from crosses of G305 and other females. Some of these supermales have better vigour and rust resistance than G305. Hybrids produced using the new supermales will be compared to Guelph Millennium. A new hybrid will need to be significantly better than Millennium because seed production with a new supermale will require a new cage.

Some of the new supermales derived from Guelph Tiessen set more berries than most females. This past summer, these highly andromonoecious supermales were crossed to other supermales and to vigorous, rust-resistant males. There will be a higher proportion of supermales among the progeny from these crosses than occurs when chance berries are collected from hybrids.

P18 and P19 the Preliminary Yield Trials

The first full harvest of the P18 trial at Simcoe and Cambridge was shorter than usual because of the cool, late spring. The results reported from the two sites were very different. A. McKeown suggested that the high gradeouts at Simcoe were due to the frequent frosts in early May after spears had emerged. Cooler temperatures at Cambridge kept the spears in the ground. Consequently, no spears were graded out of the harvest at Guelph because of frost. Two hybrids, G242xG751 and G158xG305, were thought to be worthy of testing on a wider scale.

J. Wilson wondered what testing at two sites would mean for other growers. P. Banks pointed out that the purpose of these trials was to eliminate hybrids with little potential. Wider testing in replicated trials was impossible because funding was not available. The breeding program intended to produce 4-5 lb of a few hybrids that would be planted as half-acre strip plots in growers' fields. E. Roddy thought that driving tours would be a good way to acquaint growers with new hybrids.

Giant has been used as a check in trials because of its rust resistance. E. Roddy suggested that it be replaced with Knight, the variety growers were most impressed with.

E. Roddy - OMAF

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Post-Harvest Studies

Post-harvest trials in conjunction with J. DeEll have shown that Alameda water boxes, a new type of packing tray developed in California, will prolong the storage life of asparagus by almost 10% when compared to the standard box used in Ontario. The moisture pad used in Ontario boxes improves the condition of the butt end of the spear for at least 3 days, but not for as long as a week.

Two trials conducted this year have not been analyzed. One was to determine how quickly spears attained their full height and weight when stored in Alameda boxes. The second study investigated the effect on quality of delaying cooling. Spears were left in the field for different periods of time before being moved into the packing shed. Spears were then left in the shade for different lengths of time before cooling.

Wind Abatement

Rye is grown as a fall cover crop to provide a layer of organic matter on the ground in the spring. This mat reduces but does not eliminate sand blasting. Purple spot may develop in storage on spears that have been sand blasted but did not

show disease symptoms when chilled. Studies are planned to determine if other cover crops would be more effective at reducing sandblasting. J. Wilson wondered if cover cropping could be related to growing asparagus organically.

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Nutrient Management

Asparagus packing lines discharge wash water which is considered a nutrient source under the new nutrient management legislation. Growers who pack are required to have a strategy for dealing with nutrients, not just a plan which is all that is required of nutrient users. Split nitrogen applications of 50 and 75 lb/ac, rates that are commonly used by growers, are not likely to cause concern even on sandy soils. However, J. Wilson added that there are other issues that affect nutrient management: phosphorus use, nitrogen formulation and nitrogen timing. Some growers prefer single applications of nitrogen early in the season. E. Roddy said that there will be special considerations for growers of perennial crops where nitrogen rates may be higher in the first few years of crop establishment than in the later production years.

E. DeHooghe - Ontario Asparagus Growers' Marketing Board

Millennium performed well in Ontario this cold, wet spring. The limited plantings in Michigan also impressed growers who have shown interest in purchasing seed. The seed distributor has had growers putting in orders for 20-30 lb. Guelph Millennium is cheaper than the Jersey varieties--C\$400/lb compared to US\$450/lb. Germination rates of over 90% make Millennium a good buy for Michigan growers. Seed samples from storage have gone to a seed-testing lab, but the results of the germination tests are not yet available. The Board is projecting sales of 400 lb, and intends to produce seed in 2003. J. Wilson asked if the Board had discussed discounting seed to reflect germination. E. DeHooghe replied that they would have to consider a price adjustment if the germination of the seed in storage had fallen off dramatically.

Miscellaneous

The asparagus growers have decided to pool resources with the ginseng growers and hire a manager who will be responsible for both crops. The position has been advertised, but not yet filled. The Board's annual meeting will be held at the Elmhurst Inn on 23 November 2002.

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Research and Service Priorities

Minor-use Registrations

J. Chaput has distributed templates for minor-use requests, and has asked that submissions be forwarded to him by 1 December 2002. He also stated that PMRA will not consider any further registrations for EBDC fungicides, carbamates OP insecticides or chlorothalonil. J. Wilson thought that we should

continue to list chlorothalonil (Bravo) as one of the priorities for asparagus because spraying frond is a non-food use of the fungicide. Chlorothalonil has been registered for use on asparagus in the United States. With free trade, it would make sense to harmonize pest regulations with our largest trading partner.

E. DeHooghe asked if it would be possible to change the pre-harvest interval (phi) for Sevin from 2 days to 1 day. E. Roddy did not think that this would be feasible. J. Wilson wondered if rimsulfuron (Prism) could be included for post-emergent weed control in asparagus. E. Roddy thought that we were more likely to see results with halosulfuron (Sanda) because Gowan was interested in pursuing registration for cucurbits.

Biotechnology

J. Wilson thought that Monsanto was now much more willing to consider licencing key biotechnology for use with minor crops. D. Wolyn commented that this approach would be more difficult for a hybrid crop when the parents could not be easily inbred. Significant time would also be needed to perfect techniques for transforming asparagus. J. Wilson thought that this should still be considered. Weed control with Roundup at \$7/ac was very attractive to growers.

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Asparagus Research and Services Sub-Committee Priorities

Research Priorities

1A. Long-Term: Breeding high yielding, good quality cultivars suitable for the Ontario asparagus industry should continue. Cultivar evaluation should emphasize salable product, and of that # 1 should be 'weighted' heavily.

Asparagus is a perennial crop where an established field is expected to produce economically for a decade or more. Weak cultivars decline in vigour over time such that a plantation may become non-viable and prematurely ploughed-out. High, sustained yields are necessary for a profitable Ontario industry, however, asparagus requires several years of establishment before revenue is generated. The breeding program established at the University of Guelph has recently release a new cultivar with improved yields. Continued research is necessary, however, to further improve yield and disease tolerance. Improved disease tolerance can reduce inputs, fungicide sprays, and impact the long-term viability of a plantation.

1B. Short-Term: Minor-use registration should be pursued for pesticides.

Insecticide Priorities: 1. spinosad (Success) 2. pymetrozine (Fulfill)

spinosad: Spinosad is an insecticide derived from natural fermentation. In addition to low mammalian toxicity and a 1 day pre-harvest interval, spinosad is recommended for use in integrated pest management programs because it has little impact on beneficial predacious insects. Currently registered insecticides like malathion and methoxychlor are much more toxic and non-selective. Trials should be started to determine if spinosad could be registered to control asparagus beetles and cutworms during the harvest season.

pymetrozine: Pymetrozine is an insecticide developed to control sucking insects: aphids or tarnish plant bugs. It does not kill the insects but stops feeding so that they eventually die. This product would replace pirimicarb (Pirimor), a translaminar carbamate insecticide.

Fungicide Priorities: 1. chlorothalonil (Bravo) 2. tebuconazole (Folicur) 3. trifloxystrobin (Flint) 4. pyraclostrobin (Headline)

chlorothalonil: Chlorothalonil is a cheap and effective protectant fungicide that is registered in the United States for the control of rust on asparagus. It provides an alternative to the EBDC fungicides currently registered, zineb and metiram (Polyram).

tebuconazole: Tebuconazole is currently being evaluated by IR4 because trials in Michigan have shown it to be the best product available for the control of rust, more effective than propiconazole (Tilt) or myclobutanil (Nova).

trifloxystrobin and pyraclostrobin: Both of these strobilurin fungicides are considered to be low risk pesticides. Studies in Michigan have shown these products to be more effective at controlling rust than azoxystrobin (Quadris) but less effective than tebuconazole. Fungicides with a different mode of action should be available to rotate with tebuconazole to minimize the risk of fungicide resistance.

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Herbicide Priorities: 1. linuron (Lorox) 2. halosulfuron (Sandea) 3. flumioxazin (Valor) 4. sulfentrazone (Authority) 5. pyridate (Tough)

linuron: At present, growers may only use 2,4-D to control emerging weeds during the 4-6 week harvest period. This synthetic auxin herbicide is very volatile, and twisted spears have to be discarded from the harvests after use. Linuron, a substituted-urea herbicide, has foliar activity, but not the volatility of 2,4-D. This herbicide is registered for use in Michigan, Washington and California, as long as it is not applied within one day of harvest. Trials should be started to determine if this herbicide could be registered for use on asparagus during the harvest season

halosulfuron/pyridate: For the past two years, weed infestations have been high at the end of the season. The only herbicides currently registered for use after harvest are for the control of grasses. Sulfonyl-urea herbicides (group 2) like halosulfuron (Sandea) would control flushes of pigweed and other broadleaf weeds late in the season. Pyridate is registered in Canada as Lentagran, but this formulation is being discontinued. It has been replaced in the United States by Tough, a postemergent herbicide for the control of annuals in peanuts and corn.

flumioxazin/sulfentrazone: Residual herbicides like metribuzin and linuron are applied to control weeds before the crop emerges, but there have been reports from Michigan of resistance to these group 5 and 7 herbicides. Flumioxazin and sulfentrazone are group 14 herbicides which could be used to control weeds resistant to other herbicides.

1. Biotechnology, in addition to traditional methods, should be investigated to provide control of perennial weeds, asparagus beetles, rust and Fusarium.

The perennial nature of asparagus presents many challenges for breeding. Combining several favorable characteristics in female and supermale hybrid parents requires many years, more than that when working with annuals. Genetic engineering can provide new sources of genes that could be efficiently incorporated into asparagus germplasm and improve the efficiency of cultivar development.

2. Research in soil management of asparagus plantations should be conducted, especially considering micronutrients and pH.

Commercial asparagus plantations are usually planted in sandy soils of low buffering capacity. These soils are prone to micronutrient deficiencies and low pH which can reach levels that reduce yield. Soil amendments can not be

incorporated once the crop is planted. Research is necessary to determine how to minimize micronutrient deficiency and reduction in soil pH.

The meeting adjourned at 12:05 p.m.

Secretary: P. Banks

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Report of the Organic Research Advisory Committee

Prepared by: Hugh Martin, OMAF - Organic Crop Production Program Lead

This is the first time for the Organic Research Advisory Committee met to discuss issues relevant to research and the organic sector of Ontario Agriculture. We respectfully submit this report for your consideration. The committee plans to meet again in the Winter of 2003 and welcomes your comments.

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State of the Industry - Ontario Organic Sector

The Organic sector in Ontario has been growing steadily for over 25 years. In recent years organic grown products have entered mainstream markets and gained in profile in the marketplace.

There is a general lack of Ontario based statistics to quantify the size of the industry. It was identified that there needs to be more surveys to improve the statistical knowledge of the Ontario organic sector. Following are some generally accepted statistics:

2001 Census (Number of farms)*

* Note: Due to both undercoverage and response errors, the total number of farms producing certified organic products for sale is under-reported.

	Canada	Ontario
Total	2230	405
Fruit or veg farms	614	120
Field crop	1442	308
Livestock	381	120
Other (Maple, nuts)	340	38

Source: Statistics Canada 2001 Census of Agriculture
(<http://www.statcan.ca/english/freepub/95F0301XIE/tables/pdf/table12Can.pdf>)

2000 Canadian Organic Growers (A. Macey)

	Canada	Ontario
Total # of producers in 2000	3108	578
% increase since '99	34%	17%
# in transition	312	19
Total # of processors/handlers	323	94
Acres (estimate)	839,250	55,000

Macey also estimates 8,000 acres of soybeans, 11,000 acres of cereals and 20 organic dairy farms. (In 2002, there are 30-35 certified organic dairy farms in Ontario)

Source: Eco-Farm and Garden Magazine, Winter 2002, Canadian Organic Growers

Can also be found in Directory of Organics in Canada at <http://cog.ca/2002orgdirectory.pdf>.

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2000 Statistics Canada (B. Parsons)

	Canada	Ontario
# of organic farms with fruit	365	85
# organic farms with vegetables	415	140
Acres of organic fruit	4,300	995
Acres of organic vegetables	4,200	2,025

Source: Vista on the Agri-Food Industry and the Farm Community, September 2000, Statistics Canada
(<http://www.statcan.ca/english/freepub/21-004-XIE/vis0900.pdf>)

A study of fruit and vegetable production published in Vista (Sept 2002) looked at a number of different crops and concluded that "about half of the organically grown crops generate a gross return per acre greater than conventional methods". (<http://www.statcan.ca/english/freepub/21-004-XIE/21-004-XIE02009.pdf>)

A survey of 256 organic farms by Hall and Moggyrody of U of Windsor in 2000 found that 151 of these farms grew fruits or vegetables but the average acreage of these crops was generally low with a mean of 8 acres. They found that the average organic farm in Ontario had 153 acres of crop production (all crops).

The Organic Trade Association has kept statistics on retail sales within the industry for many years. In October of 2001 they reported that in North America the organic sector has average growth of 22.7% per year when averaged over the last 10 years. They estimated 2001 retail sales at \$9.3B and there are projections of \$20B by 2005.

The following three tables are sourced from a recent USDA report Recent Growth Patterns in the U.S. Organic Foods Market (<http://www.ers.usda.gov/publications/aib777/>). They show the status and growth of the US market which has many similarities and is inter-twined with our markets for trade. Note that all sales are in U.S. dollars)

In 2001 Agriculture and Agri-Food Canada estimated that the value of the retail organic food sector was \$1B and about \$500M value to the farmgate. By the year 2005 this has been estimated to reach \$1.9B retail of certified organic foods. It has been estimated that 80% of the Canadian organic sales is from imported products. Similarly many of our organic products are exported to USA, Europe and Asia.

In Ontario, there is currently no regulatory requirement for organic farms to be certified but due to market requirements most commercial scale farms that sell organic product are certified organic by one of several certification bodies. The standards for each of these agencies while not identical are largely similar and conform to both the Canadian Standards for Organic Agriculture (CAN/CGSB-32.310-99) and the USDA National Organic Program.

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Mandate of the Organic Research Advisory Committee

The Organic Research Advisory Committee met for the first time on July 10, 2002. The membership represented a cross section of producers, processors, wholesalers, certifiers, researchers and OMAF. See Appendix.

The purpose of the Organic Research Advisory Committee (ORAC) is to review and consider issues that may affect the organic sector within Ontario. The committee then formulates recommendations to address deficiencies and needs within the sector. The committee also provides a forum to enhance networking between organizations within this broad sector.

ORAC will forward it's report to relevant committees of the Ontario Agricultural Services Co-ordinating Committee (OASCC) for consideration. This will increase the awareness of the organic sector's research needs among representatives of academia, government and the conventional agri-food sector.

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Concerns and Emerging Issues

The organic sector is currently growing rapidly at both the grower and the retail levels. There are estimates that approximately 80% of the organic products sold in the province are imported. The Ontario organic sector would like to build the producer capacity to be responsive to this growth and to reduce some of these imports to permit more Ontario consumers, retailers and processors to be able to buy Ontario grown organic product.

There was concern on the committee that private partner sponsorship is more difficult to obtain for organic projects. Organic systems are less dependent on proprietary inputs and the kind of research needed is fundamentally nonproprietary. Most organic agriculture associations are also small without adequate funds to support research.

There were infrastructure concerns that we need for more

- researchers working with organic systems
- organic research lands
- extension of research information
- public government support

There has been some relevant research done in other jurisdictions (Europe, USA) which is appropriate to Ontario. The challenge is to be able to identify this work and to not duplicate. This work needs to be evaluated and brought to Ontario.

The committee has identified a need for greater dissemination of organic information to communicate solutions. This would include improved communication of research findings. Organic production also lends itself well to participatory research, perhaps using farmer cells or local groups empowered to do on-farm research with links to researchers and resources for communications of the results.

Organic farmers are increasingly being given opportunities to buy products and technologies that have not been independently evaluated. There needs to be some evaluation of many of these products for their effectiveness and appropriateness on Ontario organic farms.

Current Organic Research Activity

There are a limited number of ongoing research activities that the committee is aware of in Ontario.

- Guelph Organic Test Site, located at The Ignatius Jesuit Centre. A partnership with U of Guelph Plant Agr. (Ann Clark, Duane Falk and others), The Ignatius Jesuit Centre, and OntarBio Organic Farmers Cooperative. A five-acre demonstration site.
- A 7-year crop rotation, distributed on a five-acre demonstration site. With 4 years of grain and 3 years of forage (Clark, Falk).
- In 2002, oat, barley, and spelt variety comparisons used selected varieties to compare relative ranking to a conventional site. (Falk)
- Organic weed control (Clark)
- On-farm crop production field evaluations in support of organic agriculture course (Clark)
- Organic Agriculture Centre of Canada studies on nutrient cycling and management (A. Clark, P. Voroney, R. Martin)

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Research Issues

Note: The following research issues are not listed in order of priority for 2002 due to a lack of time during the meeting since this was an inaugural meeting.

Whole Farm Planning Systems

a) **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 either 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.

b) **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 no opportunity for the 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.

- c) **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.
- d) **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.

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Soil Management Systems

- a) **Soil fertility** - Most soil fertility research has traditionally been focussed on the use of fertilizer products that are not permitted in organic production. There is a need for more research and information on managing fertility on organic farms. Livestock manures are used on many organic farms but about 50% of Ontario's organic farms do not have livestock operations on the farm. Organic standards also require most livestock manure to be composted. There are numerous topics to be looked at:
- Best management practices for making good compost on the farm (reducing nutrient and greenhouse gas losses, controlling pathogens, maximizing crop benefits, manure quality factors). How to make and use compost teas. Using composts and compost teas for crop/pest management.
 - Fertility recommendations and nutrient availability on organic farms considering the sources of nutrients and economics appropriate to organic farms.
 - How cover crops influence the use of nutrients on the farm.
 - Fertility challenges with perennial crops (example: fruit trees)
 - Evaluation of non-traditional sources of nutrients such as fish solutions, kelp, rock phosphate, etc. Substantiation of claims of other benefits for these products (for example frost protection using fish solution)
 - How does fertility influence nutrition and fresh food quality and processing qualities?
- b) **Soil biological systems** - More information is needed on soil biological systems to measure and understanding soil organisms. The benefits and interactions of various bacteria, fungi, other soil organisms need to be documented as well as how to manage beneficial organisms in the soil through various soil management practices. This is especially critical during the transition period when farms are converting to organic farming practices and there are significant changes to the populations of these organisms.
- c) **Crop Rotation** - Research is needed to identify suitable rotation to maintain soil quality. Organic farmers rely on crop rotations to manage various pests including weeds, insects, and diseases. Crop rotation also includes appropriate cover crops to match the needs of the next crop and the longer term cropping system. For example what is the effect of various allelochemicals from straw and other residues on the following crops and on the pest complex. There is a need for information and to quantify the effects on how various main crops and cover crops contribute to a successful organic cropping system and how best to sequence and integrate them. There is a need to work with new/non-traditional species such as spelt, flax, amaranth, etc to identify and develop new products and markets.
- d) **Mulches** - Mulches are used in organic systems both as living and as dead mulches. Moisture retention, nutrient cycling, and pest control (weeds) are all advantages. Systems to optimize row configurations, equipment and appropriate crops are needed as well as evaluations of various mulching materials available for commercial use. Evaluations of the use of forages as living mulches in a variety of main crops to provide additional nutrients (mainly nitrogen) in organic systems.

Pest Management

Organic farmers frequently see pests as indicators of problems in the cropping system rather than as problems in themselves. They feel that by correcting these cropping systems (tillage, rotations, fertility, etc) they can avoid many of their pest problems.

- a) **Weeds**- In many crops weeds are one of the most limiting factors to yield on organic farms. 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 control to complement other weed management approaches. How to reduce trips over the fields with mechanical tools.
- b) **Beneficial organisms** - There needs to be more information on various beneficial insects, fungi, bacteria, etc to assist in the control of various insects. What farming practices (including field border effects) can enhance beneficials? This would also include the use of homeopathic methods of weed/pest control.
- c) **Bio pesticides and new products** - Research 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.

Plant Breeding/Genetics

- a) **Adaptiveness to organic** - There is a need for research to identify how desired traits in varieties adapted to organic farms may be different from conventional. Is the relative performance of some conventional varieties different in the absence of higher fertility or plant protection materials common in conventional variety evaluation methodology? Can these be characterized by particular plant traits such as height, plant type, root characteristics, pubescence, leaf parameters, etc. For example, is there a difference in the tolerance of varieties to weeds?
- b) **Breeding for resistance** - Organic farmers have a continued need for new cultivars that are resistant to pests and have good agronomic traits and market oriented qualities that are appropriate on organic farms. There is also a concern that there needs to be a diversity of genotypes available for growers.
- c) **Seed blends** - Organic land can be more variable than conventional without the use of conventional inputs that tend to homogenize many of the limiting soil factors. There has been reports that using blends of varieties and or species can be beneficial in organic production.
- d) **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.

Livestock Management

- a) **Organic breeds** - There is a need to identify the needs on organic farms and how these needs in organic production

may be different from conventional practices. What are the desired traits or breeds that are most adapted to organic?

b) **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.

c) **Pest management** - Internal parasites and various external insects and diseases can be problems on organic farms needing new approaches that are compatible with organic practices and standards.

d) **Nutrition** - Balancing feeds on organic farms can be challenging since some ingredients have unique supplement needs and the availability of feed supplements is sometimes limited either by the organic standards or by availability of supply. Non-traditional ingredients can sometimes be used to replace supplements.

e) **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.

f) **Heritage breeds** - What is the role of heritage breeds or species in organic production? Are there opportunities to develop new markets with these products.

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Markets and Farm Economic Issues

a) **Market Research** - There is a need for more consumer research to look at who is buying organic products and why. This will assist the industry with marketing strategies for organic products. What is the benefit and effect of private labels in the market place.

b) **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. At the farm level there is a need to develop enterprise budgeting tools example crop budgets) that take into account whole farm systems that are appropriate for use on organic farms.

c) **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.

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Nursery, Landscape and Turfgrass Subcommittee

Author:

Jennifer Llewellyn - Chair/

Nursery, Landscape and Turfgrass Subcommittee

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Subcommittee Executive Summary

The 2002 season was characterized by lower than average precipitation, including snow cover and rain. The spring was wetter and colder than average, resulting in an extended leaf emergence period and delayed insect development. Turf

was also slow to resume shoot growth in the spring but the cool, wet weather stimulated good root growth. This was followed by one of the driest and hottest summers on record. In autumn, the temperature dropped rapidly and remained lower than average. Precipitation was frequent in the autumn, but without significant accumulation.

Industry statistics point to strong growth in the nursery, landscape and turf sectors. The strength of the US dollar relative to the Canadian dollar was reflected in a strong export market for ornamental nursery stock. Although the land use for nursery stock decreased in the year 2001, the farm gate value was static between 2000 and 2001. This may reflect a trend toward container production, which uses a smaller area for production space. The cool, wet spring weather resulted in depressed sales of ornamental nursery stock. The late frost, which took place around Victoria Day weekend, resulted in mortality in some recently uncovered container crops and liners (e.g. *Euonymus*, *Weigela* and *Prunus*). The hot, dry summer created problems with water quality and quantity available for irrigation. Many growers had to rely on poor sources of irrigation water and a few growers had to truck in supplemental water. The cool, wet weather interfered with timely pesticide application for the landscape service providers. The demand for sod was average in 2002. Demand during the summer was down due to municipal water bans. The water bans also affected lawn care service providers. Many homeowners gave up on looking after their lawns. Golf course construction continued at a steady pace during 2002. Golf rounds were down in the spring of 2002 because of the cool, wet weather.

Many nursery growers are looking toward mechanization as a solution to the skilled labour shortage in nurseries. There is also room for improvement on irrigation delivery systems for container crops (e.g. ebb and flow systems that are applicable for outdoor production). Growers are concerned about the implications of nutrient management legislation on competitiveness. They are worried about plant production practices being dictated to them from government. This is also true for sod growers. The industry has been proactive in finding long term solutions to the shortage of skilled labour. Landscape Ontario has been sending recruiters to schools and malls to attract young people into the field or ornamental horticulture.

Pesticide use on turf in private and public property continues to be an issue. The industry has responded by implementing volunteer IPM accreditation in lawn care, golf and parks. Insect pests were a big problem this season due to the hot, dry weather. European crane flies, which are a relatively new turf pest, keep spreading. There continues to be a need to educate the turf industry about this new pest. Borers and scale insects present some of the greatest challenges to pest management in the landscape. White grubs continue to cause economic losses in field grown nursery stock, especially on sandy soils. Leafhoppers and mites continue to plague both field and container production.

Research continues on fungicide efficacy for turf and daylilies. Efficacy trials for new products in turfgrass management, annual bluegrass resistance to disease and insect pests, fertigation, recycling systems, flood irrigation and utilization of waste products for propagation media and useful statistics for the horticultural industry continue to be developed. The nursery industry has been proactive in securing funding for a national IPM research position for nursery crops. A more long term funding strategy is also being developed to meet the needs for future research in the ornamental industry.

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Emerging Issues

Nutrient Management Act and Regulations

OMAF has come up with draft regulations and protocols that deal with the use of all types of applied nutrients. These are posted on the OMAF website for industry feedback. Consultation meetings will be taking place in Dec., 2002 and Jan. 2003. The committee members were concerned about the information gaps for nursery and sod production and how they are going to be filled. There is concern about who will conduct the research and how it will be funded. One example of

this is the limited research data available on crop uptake values for nursery stock in all stages of production and sod production. There is ample data on seedling production for woody ornamentals and forestry crops but very little on other stages (e.g. whips, caliper trees and shrubs). This is very applied research that may not be competitive enough for acceptance in peer reviewed journals. Another concern is who is going to write the nutrient management plans for the industry and who is going to train them.

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Pesticide Issues

Pesticide Bans

Nursery growers are concerned over the possible ramifications of municipal pesticide bans, that they will have an affect of use of pesticides in nursery production. The Cobalt pesticide by-law in Ontario includes restriction of pesticide use in agriculture in that municipality. The by-law states that farmers have to document all the pesticides that they intend to use for each upcoming growing season.

The turf industry's response to the possibility of pesticide bans has been to become politically active. The IPM council has put together a program of voluntary turf IPM accreditation to demonstrate a willingness to reduce pesticide use in lawn care, parks and on golf courses. To date, other than the Cobalt by-law, there have been no new pesticide bans in Ontario municipalities.

Loss of Old Formulation Pesticides

Many of the older formulation pesticides are the backbone of chemical pest management for nursery producers. PMRA's re-evaluation and voluntary manufacturers de-registrations are leaving the industry with gaps in pest management (e.g. there are no products currently registered for Japanese beetle larvae and pine shoot beetle). The industry needs a dedicated technician for pesticide registrations (e.g. minor use).

Integrated Pest Management

With the industry focusing on IPM as the solution to pesticide bans, it is becoming apparent that there are information gaps on pest biology, monitoring and detection techniques and thresholds. The registration of low risk, IPM friendly pesticides is also crucial to the adoption of IPM in maintenance and plant production.

Water Use and Management

With continued long, hot, dry summers concerns of chronically low water supplies and the use and conservation of this water persists as a problem in the green industry. There is an increasing need for technology transfer to improve choice, proper use and scheduling of irrigation delivery systems. High salt levels in irrigation water are becoming more of a problem in Ontario nursery production. The industry needs research on mechanisms which reduce the salt content (e.g. Na, Cl, SO₄) of high salinity water.

Quarantinable Pests

The incidence of new pest introductions into Canada is rising. The agencies devoted to the management of quarantinable pests do not currently have adequate resources to deal with the high volume of issues. In addition, there are research gaps regarding the pest biology in its new environment (e.g. emerald ash borer), mechanisms for dispersal,

host range and management strategies. The ornamentals industry should have an industry representative to deal with regulatory agencies regarding pest issues, especially quarantinable pests.

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Responses and Action Taken To The Previous Years' Subcommittee's Recommendations

The Nursery, Landscape and Turf subcommittee acknowledges the support of the OHCRSC parent committee with respect to last year's recommendations.

Research programs continued to address industry needs as evidenced by the continuation of projects and the initiation of new research efforts designed to meet stated concerns. The support of service personnel in extension and lab areas is also appreciated and continues to meet industry expectations.

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Recommendations Arising From Gaps/Barriers/Deficiencies

Title: Development of Nutrient Management

Research/Service Strategy and Plan

Recommendation

The subcommittee of Nursery, Landscape and Turf recommends a concerted effort to develop a Nutrient Management Strategy for container and greenhouse plant production as well as Nutrient Management Plans for nursery and sod production.

Details

OMAF is developing a Nutrient Management Strategy for producers of prescribed nutrients (e.g. container nurseries and greenhouses). The aim is to improve the ability of the nursery and turf industries to minimize the affects of fertilizer use on ground water and surface water. Research is needed to address quantification of nutrient uptake of crop groupings (e.g. field conifers), because of the diversity of plant material in ornamental nursery production.

Background

Research data regarding N and P uptake by ornamental nursery crops and sod is lacking. Data exists on various species of tree seedlings but not on other stages of plant production (e.g. whips, calipers, and shrubs). This type of data cannot be substituted when it comes to inputting N and P uptake values in the NMAN program for field production. The Nutrient Management Strategy needs to be practical to be useful for growers.

Title: Registration of Reduced Risk Pesticides and IPM

Research/Service

Recommendation

The subcommittee of Nursery, Landscape and Turf recommends continued support for research on integrated pest management and registration of new, lower risk pesticides for the turf and nursery production and landscape.

Details

The aim of this recommendation is to improve the ability to manage insect, disease and other pests in the in the face of reduced availability of registered pesticides and increasing concern about their affect on the environment. Current initiatives by the nursery industry include a funding strategy to hire an IPM technician who will also deal with minor use coordination. The committee is looking for increased collaboration with government and universities to fill research gaps and product registration gaps.

Background

Despite the loss of older formulation pesticides (e.g. organophosphates) and possibility of municipal pesticide bans, landscape/turf maintenance and nursery growers are still expected to produce high quality plants with reduced pest management tools. Research should address improvements in integrating pesticides into IPM programs, as well as the development and adoption of low risk alternatives to current practices.

Title: Management of Water Quality and Quantity

Research/Service

Recommendation

The subcommittee on Nursery, Landscape and Turf recommends continued research into irrigation water quality, delivery systems and water conservation in turf, landscape and nursery production. Also needed is the transfer of new technology to the industry.

Details

The objective of this recommendation is to identify water quality and water management as a high priority for research and service. Research and services should address mechanisms to reduce salinity in irrigation water, increased efficiency in irrigation delivery systems and overall water conservation practices.

Background

Water quality and quantity have been identified as limiting factors in the production of nursery crops (especially

containers) in Ontario. Unless this issue is address, there will be increased crop losses and reduced quality and limitation on the expansion of this industry. The long-term changes in climate and weather (e.g. hot, dry growing seasons over the last five years) have resulted in low water availability, which is limiting production and harvest and sales of turf. Areas which could be addressed include irrigation delivery systems (e.g. fertigation and recycling), irrigation scheduling, use of gray water and the development of low water use systems.

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Title: Biology and Management of New and Emerging Pests

Research

Recommendation

The subcommittee on Nursery, Landscape and Turf recommends support of research efforts into the biology and control of emerging pests which have the potential to become economically damaging. Pests are of concern include sudden oak death, emerald ash borer, white grubs (in field nursery production), daylily rust, plum pox virus and anthracnose basal rot.

Details

Many of the emerging pests are new to Ontario and their biology and management are not well understood in our region. To insure the economic sustainability of the industry, these pests need to be managed. The industry needs access to more university level research into pest management solutions for these high priority pests.

Background

New and emerging pests are responsible for significant crop losses each year. Quarantinable pests have greater ramification on access to markets (e.g. moratorium on shipping). Registered pesticides are not available for two of the most significant quarantined nursery pests: pine shoot beetle and Japanese beetle. The economic future of this industry is at risk unless more rapid pest management solutions to these new and emerging pests are found.

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Title: Acquisition of Current Industry Economic Data

Recommendation

The subcommittee on Nursery, Landscape and Turf recommends that current economic industry data specific to nursery production and the overall value of the turf industry be acquired.

Details

There is a need for specific data regarding the land base dedicated to production of various crop groupings (e.g. number of acres in Ontario used for production of field grown conifer trees). Similarly, the total value of the turf industry in Ontario is not known. Quantification of the sizes of these two industries could justify more resources being diverted to deal with research and service needs.

Background

The nursery and turf industries in Ontario are large and are increasing in value every year. Turf industry statistics would help to designate the position relative to other commodities and its applicability for research funding. Statistics for individual nursery crop groups are required in data submission packages for minor use registrations. This type of data is often difficult to procure and often must be estimated.

Title: Educating the Regulators

Service

Recommendation

The Nursery, Landscape and Turf subcommittee would like to host a tour of PMRA regulators to visit nursery operations and sod farms and golf courses to educate them about pesticide use in these settings.

Details and Background

PMRA staff are toxicologists by training and often have little knowledge of turf and nursery production systems. The subcommittee will make this suggestion directly to Jim Chaput (OMAF Minor Use Coordinator) for the 2004 growing season. Various committee members have volunteered to host the PMRA staff at their farms and places of business.

Title: Increase Resources for Pest Diagnostic Clinic

Service

Recommendation

The Nursery, Landscape and Turf subcommittee would like to see increased resources available for the Pest Diagnostic Clinic.

Details and Background

Turn around time continues to be an issue for samples sent to the Pest Diagnostic Clinic.

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2002 Research and Service Priorities for OHCRSC Subcommittees

1. Development of Nutrient Management Strategy and Plan
2. Registration of Reduced Risk Pesticides and IPM
3. Management of Water Quality and Quantity
4. Biology and Management of New and Emerging Pests
5. Acquisition of Current Industry Economic Data

6. Educating the Regulators

Increase Resources for Pest Diagnostic Clinic

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Ontario Potato Research and Services Subcommittee

Author:

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Ontario Potato Research and Services Subcommittee

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Executive Summary

The Ontario Potato Research and Services Sub-Committee is composed of industry, government and university representatives. The industry is represented on this committee by the Ontario Potato Board, the Ontario Seed Potato Growers Association (OSPGA) and individual producers.

The potato industry in Ontario remains stable. Weather conditions in 2002 resulted in low yields in some areas, however quality was excellent and prices remain buoyant. Emerging issues with the potential to affect the industry in Ontario include: Ontario's Nutrient Management Act, potato mop-top virus reported in the U.S., the discovery of the potential carcinogen in starch-based foods that have been cooked at high temperatures, and the re-organization of the Research Branch of Agriculture and Agri-Food Canada (AAFC) under the Agricultural Policy Framework.

Significant research efforts are being expended in four of this committee's research priorities: soil and seed-borne diseases, new varieties for the Ontario market, post-harvest quality, integrated pest management and insecticide resistance monitoring, and greenhouse seed potato production by researchers from AAFC, the University of Guelph, the Ontario Ministry of Agriculture and Food (OMAF) and the industry. The Ontario Potato Board financially supports many of these research projects, while the OSPGA contributes to seed potato research.

Members of this committee were instrumental in successfully hosting the 2002 annual meeting of the PAA as part of the XXVIth International Horticultural Congress held August 11-17 in Toronto. The 2002 potato field day was held August 17th to coincide with the PAA meeting.

Service priorities for this committee and the industry are: maintenance of potato extension services in Ontario, registration of new pesticides for potatoes, and maintenance of Nuclear seed potato production in Ontario.

This committee has one recommendation in 2002 concerning the re-location of the potato research program from the University of Guelph's Cambridge Research Station to the Elora Research Station and the lack of appropriate potato storage and handling facilities at the Elora Station.

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Introduction

The Ontario Potato Research and Services Sub-Committee is composed of industry, government and university representatives (see Appendix). The industry is represented on this committee by the Ontario Potato Board, the Ontario Seed Potato Growers Association (OSPGA) and individual producers. The committee meet November 12, 2002 to formulate this report which is an update on the 4-year strategic report prepared in 2001.

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State of the Industry

The potato industry in Ontario remains stable. There are approximately 275 commercial growers in Ontario growing over 43,000 acres of potatoes. About 55% of the acreage is for the fresh or tablestock market. The remaining 45% is for the processing market, mainly for potato chips. There are approximately 1,000 acres of certified seed potatoes grown in Ontario.

The main potato-production areas in the province are Alliston, Shelburne, Leamington, Ancaster, Simcoe-Scotland-Burford, Grand Bend and Mount Albert. Potato production is also located around population centers in the north, such as Thunder Bay and Sudbury.

The main varieties grown for the fresh or tablestock market are Superior, Yukon Gold, Cherokee, Kennebec, Norland, Chieftain and Goldrush. Shepody, Snowden and the Frito-Lay varieties are the main processing varieties in Ontario.

In 2002, a slow spring and wet June was followed by a hot dry summer and good harvest weather resulted in low yields in some areas but excellent quality. Prices remain buoyant especially for fresh market potatoes.

Pest management scouting reported an increase in cutworm damage on tubers from mid-season hatches of cutworm larvae especially in southwestern Ontario. Colorado potato beetles continue to show no field resistance to Admire, however lab tests show that some populations are becoming harder to exterminate.

There was not a lot of late blight pressure in 2002, however brown spot (*Alternaria alternata*) and black dot (*Colletotrichum coccodes*) were common due to heat stress during the growing season. Fusarium infection of tubers in the field was found for the first time in 2002.

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The Ontario Potato Board continues to play a critical role in addressing marketing issues and determining research priorities for the Ontario industry. The Board funded the following projects in 2002:

- Field Guide to Insects, Diseases and Defects of Potatoes in Ontario (E. Banks, OMAF)
- Development of a Food Safety Handbook for Handling and Packing Vegetables - project in conjunction with the Ontario Fruit and Vegetables Growers Association and AIMS (D. Powell, University of Guelph)
- Ontario Cooperative Potato Variety Trials (S. Squire)
- Video of the 2002 Potato Variety Trials (S. Squire and V. Currie, University of Guelph)
- Development of Genetic Tools for Ecological Studies in Soil of the Potato Scab Pathogen (G. Lazarovits, AAFC)
- Late Blight Control (E. Banks, OMAF and H. Platt, AAFC, PEI)
- Wireworm Control (J. Tolman, AAFC)
- Tuber Calcium Survey of Commercial Fields in Ontario (E. Banks, OMAF)
- Chip Quality and Genetic Markers (R. Yada, University of Guelph)

The OSPGA continues to fund research in minituber production techniques (B. Hughes, University of Guelph). The Industrial Tuber project using crops to produce beneficial antibodies ceased in 2002 when one of the project partners, MPB Cologne, lost their financial backing.

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Emerging Issues

Nutrient Management

Ontario's Nutrient Management Act is a new law with a complex set of regulations and protocols which will be implemented over a five-year period. It is designed to set clear, consistent standards for nutrient management on farms and protect the environment. The Ontario Ministry of Agriculture and Food (OMAF) and the Ministry of the Environment are working together to develop and implement an overall strategy on the application of nutrient rich materials to land. Stages 1 and 2 of the draft regulations are now posted on the OMAF website at www.gov.on.ca/OMAFRA/english/agops/index.html. Individuals and organizations are invited to submit comments on the proposed regulations and protocols as they become available.

Potato producers in Ontario are concerned that the base levels being discussed for potatoes in Ontario are founded on research conducted many years ago on older potato varieties. OMAF should consult with the Ontario Potato Board and the processors in Ontario before establishing the base levels for nitrogen and phosphorous fertilization of potatoes in Ontario.

Mop-top Virus

The potato mop-top virus (PMTV) is a quarantinable potato disease which survives in the soil within dormant resting spores of its fungal vector, powdery scab (*Spongospora subterranea*). Infected resting spores can persist for up to 18 years in the soil.

Serious yield and quality reductions can occur in some potato cultivars. Symptoms of PMTV may not be present in infected plants and tubers, and visual inspection may be inconclusive as the symptoms are similar to those caused by other viruses and physiological conditions. Lab analyses carried out by the Canadian Food Inspection Agency (CFIA) confirmed the presence of PMTV in samples imported from 8 US states. As much of the seed for chip varieties in Ontario is imported, this situation may cause a serious gap in chipstock for chip processors in Ontario.

Recently CFIA surveyed all Elite II and lower seed classes in Canada for PMTV. US seed states are also surveying their seed lots for PMTV. CFIA and their US counterpart, APHIS, are meeting December 17th, 2002 to review the survey results.

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Acrylamide

In April 2002, Swedish researchers reported the discovery of the potential carcinogen, acrylamide, in starch-based foods that have been cooked at high temperatures. The list of foods included potato chips, french fries, processed cereals and bread. Since then, similar findings have been reported in other countries. When asparagine, a prominent amino acid found in potatoes, is heated above 120 OC with glucose, a reducing sugar also present in potato, acrylamide is formed. Research into acrylamide formation has been initiated in Canada. Initial testing in the US has shown great variation in acrylamide levels between samples from the same brand. Why the variation and what levels constitute a potential health hazard is being researched.

APF and Re-Organization of AAFC Research Branch

Under the Agricultural Policy Framework (APF) the Research Branch of Agriculture and Agri-Food Canada (AAFC) has been re-organized into 4 National Programs (Environment, Sustainable Production, Innovation and Renewal, and Food

Safety). Each Program encompasses a number of cross-Canada teams. Under Environment there is Water, Air, Soil, Biodiversity, Nutrient Cycling and Integrated Pest Management. AAFC researchers have been asked to submit new research proposals by April 1, 2003 in the priority areas of the APF under these headings.

The Ontario Potato Research and Services Committee is concerned that the current AAFC potato research programs in pest management and breeding be identified as areas of work that need to be continued by AAFC researchers. Given that all programs will be aimed at National Issues, provincial associations and research committees may have to liaise more closely with national associations to ensure that the issues of interest are addressed.

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Research Accomplishments in 2002

Potato Productivity: Nutrient Management, Soil Improvement and Irrigation

Nitrogen Requirements of New Yellow Flesh Varieties (E. Banks, OMAF)

The new varieties, Fabula, Caesar and Morning Gold, performed very well at low and medium nitrogen rates.

Fall Application of Gypsum to Reduce Sodium Injury to Potato Roots (E. Banks, OMAF)

Fall applications of gypsum reduced the sodium damage caused to potato roots. Profitable yields were obtained from areas of fields that in the past had sodium problems.

Skin Color Enhancement (E. Banks, OMAF)

One application of a plant growth regulator enhanced the red color of the red skinned variety, Chieftain.

Tuber Calcium Levels (S. Squire)

Three replicated trials to increase calcium levels in potato tubers were completed in 2002.

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Control of Soil and Seed-Borne Diseases

Management of Potato Soil-born Pathogens Using Organic Amendments (G. Lazarovits, Southern Crop Protection and Food Research Centre, AAFC)

The Lazarovits laboratory is examining of the use of organic amendments (liquid swine manure, fish emulsion, neem cake, meat and bone meal, etc.) for reducing populations of soil-borne plant pathogens, specifically the fungus causing early dying, *Verticillium dahliae*, and the bacterium causing potato scab, *Streptomyces scabies*. Work is aimed at identifying what factors in the amendments and in soil regulate the efficacy of these products for controlling soil-borne diseases. Genetic probes are being developed to follow the populations of the pathogens in soil so that one can rapidly determine what materials are most effective in eliminating these pathogens. Such methodologies are essential if we are to increase the pace of development of disease control methodologies.

Evaluation of the New Seed Treatment "FLUTOLANIL" to control Rhizoctonia (E. Banks, OMAF)

Flutolanil provided excellent control of Rhizoctonia sprout and stolon canker.

Identification of a Fusarium Strain that Attacks Potato Tubers in the Field (E. Banks, OMAF)

Identification of *Alternaria alternata* as a New Important Disease attacking Potatoes in Ontario (E. Banks, OMAF)

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Evaluation of New Varieties for the Ontario Market

Evaluation of Potato Varieties and Breeding Selections in Ontario (V. Currie and A. Sullivan, University of Guelph and R. Tarn, AAFC, N.B.)

Replicated potato variety trials were conducted at the Cambridge Research Station in 2002. Ninety elite breeding selections and new varieties were evaluated against standards for agronomic performance and end use quality. Results are used by the industry to determine suitability of new cultivars for commercial production in Ontario.

Ontario Cooperative Potato Variety Trials (S. Squire)

175 new cultivars have been evaluated over the four years of the Ontario Cooperative On-Farm Potato Variety Trials. Of these, Cal White, Goldrush, Envol, Reba, Roselys, Norvalley, Fabula, Eva, and Adora are now grown in significant or niche commercial acreage in Ontario.

Five candidate chip varieties were compared to Snowden in On-Farm trials at two sites for the Canadian Snack Food Association (S. Squire).

Strip Trials of New Varieties in Commercial Fields in Grand Bend, Alliston and Delhi

(E. Banks, OMAF)

Fabula, Cesar and Vivaldi performed very well at these locations

Evaluation of Gourmet Varieties for the Ontario Market (E. Banks, OMAF)

All Red, a red skin variety with pink flesh produced an outstanding yield of long tubers with smooth skin.

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Post-Harvest Physiology

Regulation of Low Temperature Sweetening (L.J. Copp, G.J. Vallee, C. Lopez-Amaya, A.G. Marangoni and R.Y.

Yada, University of Guelph)

The objective of this research is to isolate and characterize the enzymes of the anaerobic respiration pathway in cold-sensitive and cold-tolerant tubers, to identify possible targets for molecular modification. Two enzymes have been extracted from commercially purchased tubers. Enzyme purification methods were developed and identification methods are being developed.

Determination of Cellular and Starch Characteristics Affecting Specific Gravity (L.J. Copp, G.J. Vallee, C. Lopez-Amaya, A.G. Marangoni and R.Y. Yada, University of Guelph)

The objective of this research is to confirm the relationship of size of starch granules and tuber specific gravity previously observed following the 2000 growing season.

This year, a total of 18 different tuber samples of five cultivars were collected from different growing regions of Ontario. Tubers were sampled at four different times throughout the storage season. Specific gravity, chip colour, starch granule size distribution and relative starch crystallinity were determined for all samples.

Integrated Pest Management and Insecticide Resistance

Microplot Evaluation of Insecticides for Colorado Potato Beetle (CPB) Control (Jeff Tolman, Southern Crop Protection and Food Research Centre, AAFC)

1. Evaluation of ADMIRE, TI-435 and CALYPSO as Planting Treatments for Control of CPB. Under the conditions of this trial sufficient systemic residues of all planting treatments remained in potato foliage to significantly reduce feeding by both adult and larval CPB several weeks beyond the period that those residues caused significant mortality of introduced insects.

2. Relative Persistence of Neonicotinoid Insecticides Applied to Potato Foliage for CPB Control

Overall results of this experiment, foliar residues of the tested rates of ADMIRE, TI-435 and CALYPSO remained acutely toxic for only 1 day after treatment. However, feeding by both adult and first instar larval CPB was significantly reduced for at least 21 days.

Survey of Susceptibility of Colorado Potato Beetle (CPB) to imidacloprid (ADMIRE), lambda-cyhalothrin (MATADOR) and spinosad (SUCCESS) (Jeff Tolman, Southern Crop Protection and Food Research Centre, AAFC)

A total of 35 populations of CPB were received at London. For 2nd instar larvae, less than 50% mortality was observed at the diagnostic dose (LC98 for a susceptible strain) for 2 of 35 populations for ADMIRE, 28/35 populations for MATADOR and 13/35 populations for TRACER. For adult CPB less than 50% mortality was observed at the diagnostic dose (LC98 for a susceptible strain) for 0 of 31 populations for ADMIRE, 29/31 populations for MATADOR and 10/29 populations for SUCCESS. Results suggest that:

- a) we may be seeing the first indication of development of detectable tolerance to ADMIRE in a couple of populations
- b) there has been very little reversion of previously developed tolerance to MATADOR
- c) the laboratory population of CPB is more susceptible to SUCCESS than many of the field populations tested.

Pheromone-trap Monitoring of Populations of Adult Wireworms (Jeff Tolman, Southern Crop Protection and Food Research Centre, AAFC)

Specimens were collected in 4 locations (Kent, Elgin, Lambton and Dufferin counties). All collected specimens have not yet been identified.

Evaluation of the Insecticide ASSAIL to Control the Colorado Potato Beetle (E. Banks, OMAF)

In research trials, Assail provided excellent control of Colorado potato beetles and leafhoppers.

Evaluation of Admire used as a seed treatment to control Colorado Potato Beetle (E. Banks, OMAF)

Admire applied as a liquid seed treatment or as a dust seed treatment provided excellent control of Colorado potato beetle in two field trials. The systemic activity of Admire in the field lasted for about 60 days after the treatment.

Use of CALYPSO for the Control of Potato Insects (R. Pitblado, Ridgetown College, University of Guelph)

CALYPSO provided excellent control of both the larval and adult stages of Colorado potato beetles. Leafhoppers were control using the high rate of CALYPSO. Populations of flea beetles were significantly controlled with both ADMIRE and CALYPSO. All rates of CALYPSO 480SC controlled insects to a level that showed significant increase in potato yields.

Greenhouse Minituber Production for Seed Potatoes

Nuclear Minituber Production Systems (B. Hughes, New Liskeard Agricultural Research Station, University of Guelph)

A survey by the Ontario Seed Potato Growers Association has shown that as minituber size increases from 5 g/tuber to 28 g/tuber the ratio of weight planted to weight harvested is reduced from 81 to 1 to as low as 36 to 1. Research is

required to maximize tuber number while maintaining or improving the total weight produced. Several controlled release fertilizers were compared for their effects on greenhouse minituber yields and size distribution on crops established from in vitro and in vivo cuttings. The results depend on the cultivar and type of crop. One treatment appears to increase both the tuber numbers and total weight produced for 3 cultivars. To date, no effective growth regulators have been identified that increase tuber numbers.

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Service Accomplishments in 2002

Potato Association of America (PAA) Annual Meeting

Ontario successfully hosted the 2002 annual meeting of the PAA as part of the XXVIth International Horticultural Congress held August 11-17 in Toronto. Leslie Copp, University of Guelph did an excellent job as chair of the local accommodations committee. A total of 160 PAA delegates from 22 states, 9 provinces and 9 other countries attended the meeting. The 4 day Potato Symposium, sponsored by the PAA, consisted of 33 oral and 76 poster presentations. These papers will be published in an upcoming volume of Acta Horticulturae.

Many of the PAA delegates participated in the post-conference Potato Industry Tour lead by Eugenia Banks. This tour garnered the highest attendance of all the post-conference tours. Participants visited a packing plant, potato storages, Dr. Peter VanderZaag's breeding program and trials, and participated in the 2002 Potato Field Day outlined below.

Potato Field Day

The potato field day was held August 17th to coincide with the PAA meeting in Toronto. This highly successful field day featured minituber production at the SPUD Unit and the research trials located at Wayne Dorsey's farm in Alliston including the HZPC Americas Low Nitrogen Trial, New Seed Treatments and the Variety Trials. The day ended with a BBQ sponsored by Syngenta.

Horticultural Crops Conference

The Potato Session of the Horticultural Crops Conference was well attended by growers.

Agriphone

The Potato Agriphone was available to the industry throughout the growing season. Messages were recorded each Monday morning from June until the end of August by the OMAF potato specialist, Eugenia Banks.

Newsletter

The Ontario Potato Board Newsletter was available to producers either by email, fax or mail.

Emergency Registration

The Potato Board and OMAF were successful in obtaining emergency registration of Quadris for the second year.

Integrated Pest Management Program

Thirty five students attended the training sessions lead by Eugenia Banks for potato scouts. This included scouts for AIMS and those paid by the growers via the grower's associations in Simcoe and Dufferin counties. Over 13,000 acres of potatoes were monitored.

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Potato Field Guide

The Field Guide to Insects, Diseases and Defects of Potatoes in Ontario authored by Eugenia Banks will be available by March, 2003. This guide features high-quality photographs of potato pests and problems in Ontario.

Seed Potato Upgrading and Distribution (SPUD) Unit

The SPUD Unit at the New Liskeard Agricultural Research Station continues to produce Nuclear seed potatoes for the Ontario seed potato industry. The SPUD Lab maintains 26 named potato cultivars as well as 7 selections from Dr. VanderZaag's breeding program in tissue culture. Demand for Nuclear minitubers continues to grow. Over 2000 lb of minitubers were produced in 2002 by the SPUD Unit and its 2 contract greenhouse producers in the north.

The SPUD Unit is also diversifying as it will become the centre of expertise for Nuclear stock plant maintenance and propagation for the Ontario berry crop propagation program. The centre will ensure that virus-tested stock plants are available for the berry industry in Ontario. This program complements the Unit's work in seed potato production.

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Research Priorities

These priorities are the same as those determined in 2001 as part of a four-year strategic plan.

Potato Productivity: Nutrient Management, Soil Improvement and Irrigation

Growers must consider many factors to produce a high quality potato crop. Fertility, soil tilth and water availability are the most important factors that influence crop productivity. Ontario potato growers must achieve high yields of high quality tubers to remain competitive. Proposed legislation on nutrient management and the reduced availability of water for irrigation are issues that need to be addressed.

Growers need to know the optimal fertility levels for new varieties entering the marketplace. Growers also require long-term trials to determine the effect of crop rotation, drainage and cultivation on soil tilth and potato production. Research on irrigation such as drip irrigation and irrigation scheduling would help conserve water.

For the past 10 years, no potato research addressing nutrient management, soil improvement or irrigation has been

conducted in Ontario either by the University of Guelph or by AAFC.

Control of Soil and Seed-Borne Diseases

Every year, potatoes are affected by soil and seed-borne diseases that reduce yields or make the crop unmarketable. Fusarium, Rhizoctonia, scab, early dying (Verticillium wilt and nematodes), late blight, early blight, pink rot, leak and soft rot are among the most important diseases attacking the potato crop in Ontario.

There is only one plant pathologist in Ontario conducting research on the control of soil-borne diseases, Dr G. Lazarovits at AAFC, London. Dr. Lazarovits is evaluating the use of organic amendments to reduce scab. His lab has also developed a laboratory method to predict the level of scab infestation in fields from soil samples.

The Potato Board has supported surveys conducted by Dr H. Platt from AAFC in Charlottetown to identify the late blight strains that have been found in Ontario. Such studies provide an early warning of changes in races which may affect control methods.

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Evaluation of New Varieties for the Ontario Market

To remain competitive, potato growers must grow varieties that meet consumers' demands. Testing under Ontario conditions is crucial for the selection of new varieties that the provincial market requires. It is important that AAFC continue to make selections for the Ontario market and evaluate them under Ontario conditions.

New varieties need to be evaluated for their tolerance to disease and physiological disorders, their dry-matter content, yield and performance under adverse growing conditions. Variety testing is being conducted by the Potato Board Cooperative Variety Trials, the University of Guelph and OMAF. New varieties evaluated in these trials have been adopted and are being grown successfully by Ontario growers.

This type of research is invaluable for potato growers and should continue as new varieties with improved traits would allow them to expand markets and reduce inputs of pesticides and fertilizers. Replacements are required for a number of the main varieties currently grown in Ontario. For instance, Superior, the most common early variety, does not perform well under dry conditions requiring weekly irrigation. It is also very susceptible to nematodes and Verticillium wilt. In the Shelburne area, a replacement is required for Shepody the main processing variety used for soups, stews and pre-peel sales. Chieftain, the main red-skinned variety grown in the province, is susceptible to heat necrosis and its red skin color fades in storage turning brownish.

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Post-Harvest Physiology

The potato-chip market is very competitive, and processors require high-quality potatoes to satisfy consumers' demands. One of the main problems growers and processors face is the formation of reducing sugars in tubers induced by low temperature storage. Reducing sugars cause the darkening of potato chips when fried. Specific gravity or dry matter content is also an important factor in process quality.

The University of Guelph has conducted research to identify factors regulating process quality in potatoes, to elucidate the mechanism of low temperature sweetening in potatoes and to develop models for prediction of end-product color

from harvested and stored potatoes.

Further research is needed to allow growers to better manage the crop in storage and to suppress the formation of reducing sugars in tubers which lead to dark chip colour.

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Integrated Pest Management and Insecticide Resistance

Potato insects and diseases are a constant threat to the potato crop. The management of potato insects and insecticide resistance monitoring are ongoing issues. Alternative methods of pest control needs to be researched.

The Colorado potato beetle (CPB) is one of the most serious pests in the province. If left uncontrolled and weather conditions are favorable, beetles can devastate a field in a few weeks. Colorado potato beetle populations have developed resistance to most of the insecticides used for their control. Admire is the only insecticide currently registered in Ontario that is effective against all CPB stages.

Monitoring for the development of resistance to Admire is extremely important. The testing and registration of new insecticides with different modes of action would reduce the likelihood of resistance developing.

Aphids can cause serious economic losses if present in fields. They also vector virus diseases. Aphids have developed resistance to insecticides in other potato production areas. Monitoring aphid insecticide resistance in Ontario is important before problems develop.

Wireworms are a problem in potato fields rotated with hay, a desirable practice because rotation reduces soil-borne diseases and improves yield. There are, however, no reliable procedures to determine the extent of wireworm infestations nor are there effective products for wireworm control.

Cutworms are becoming a problem with the changing climate in Ontario.

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Greenhouse Minituber Production for Seed Potatoes

The Ontario seed potato industry is based on Nuclear minitubers produced by the Seed Potato Upgrading and Distribution (SPUD) Unit and the contract greenhouses in northern Ontario. Research to improve greenhouse yields and minituber size, and to minimize the risks associated with Nuclear seed production, benefits seed potato producers by reducing the cost and increasing returns in the field while maintaining the highest quality possible.

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Service Priorities

Extension Services

The industry in Ontario feels that the services of the Ontario potato specialist are essential to their industry. This includes educating producers on new and existing potato pests and current potato issues, the Potato Agriphone, training potato field scouts, conducting technology transfer trials and organizing field days.

Registration of Pesticides for Potato Pest

Pesticide registration is an issue for Canadian potato producers. Producers in other countries, namely the US, have access to pesticides not currently registered for potatoes in Canada. New pesticides often pose a reduced risk or are effective resistance management tools. Many times the pesticide company will make a submission for registration of one of these pesticides in Canada. However if they don't, IR-4 data is usually not available as potatoes are not a minor crop in the US. It is very costly to obtain the data required for residue levels, occupational exposure, crop tolerance, efficacy, etc to support registration.

In 2002, this committee requested the registration of 5 insecticides, 4 fungicides and 1 herbicide on behalf of the industry. These products replace old technology, reduce risk and provide tools for IPM, reduced pesticide use and to manage resistance.

Nuclear Seed Potato Production

The Seed Potato Upgrading and Distribution (SPUD) Unit is the foundation of the Ontario seed potato program supplying producers with high quality Nuclear minitubers. This service is essential to the industry in Ontario.

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Recommendations

Recommendation # 1

Issue

Relocation of the Cambridge potato research program to the Elora Research Station

Background

As part of recent cost savings announced by the University of Guelph, the Cambridge Research Station will be closed effective March 31, 2003. Consequently, the potato research program conducted at this station over the last 50 years will be relocated to the Elora Research Station.

The evaluation of new potato varieties in Ontario is a high priority for the industry in Ontario and this research committee. New varieties with improved traits would allow the Ontario industry to expand markets and reduce inputs of pesticides and fertilizers. Replacements are required for a number of the main varieties currently grown in Ontario.

Details

This research program produces approximately 20 tons of potatoes which must be stored immediately after harvest under specific temperature and humidity conditions until they can be sorted, graded and evaluated. Following this sub-samples are removed and the remainder is discarded. The Cambridge Research Station was equipped with a potato storage with a capacity of 25 tons and a field lab to accomplish these tasks. As the Elora Research Station does not have similar facilities, a temperature-controlled potato storage with enough capacity for at least 20 tons and a forklift-accessible preparation area are required.

Recommendation

It is recommended that the University of Guelph provide the necessary facilities for the potato research program at the Elora Research Station.

Target Agency

Dave Hume, Associate Vice-President, Research, University of Guelph

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Ontario Root, Bulb and Leafy Vegetable Research and Services Subcommittee

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Ontario Root, Bulb and Leafy Vegetable Research and Services Subcommittee

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Industry/Sector Scan

Mandate

The Ontario Root Bulb & Leafy Vegetable Research and Services Sub-committee meets annually to review issues of concern, research projects and set priorities for the following crops: carrots, Alliums, lettuce, celery and other leafy vegetables.

The annual meeting of this committee, chaired by Dr. Rebecca H. Hallett was held on November 25, 2002 at OMAF, 1 Stone Rd W., Guelph, Ontario. 14 members and 12 guests, including 4 grower and 7 industry representatives, attended.

The committee is comprised of representative growers, provincial specialists, service providers, seed companies and researchers. This sub-committee reports annually to the Ontario Horticultural Research and Services Committee (OHRSC) and the Ontario Pest Management Research and Services Committee (OPMRSC).

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State of the Industry

The 2002 season began with cold and wet conditions, followed by heat and drought for the remainder of the season. This led to generally decreased disease issues, but to increased need for irrigation and some concerns about crop size. Pea leafminer is the top issue for celery and other leafy vegetables. There are concerns about increasing seedcorn maggot problems in onion and with potential for establishment of onion maggot in new regions.

Onions

Cold, wet weather early in season led to slow germination and emergence and problems with the seedcorn maggot, particularly where culls were left in field after 2001 harvest. Weed problems are increasing, particularly with chickweed and nutsedge. Bacterial disease (e.g. early Botrytis) occurrence was up due to high humidity. Onion thrips were hard to control in certain areas (Dover/Chatham), but population increases were late this year, so they did not cause much damage. Some problems seen with root knot nematode in fields that had carrots in 2001. Onions fell early and thus were of relatively small size; heat and irrigation may have been contributing factors. Access to irrigation is becoming essential for onion production. White rot was not a problem due to drought conditions after beginning of season. However, pink root was a serious problem in some areas, regardless of variety grown. Phytotoxic effects were observed when Prowl was applied in frost conditions.

There has been a small acreage increase of 20-30 acres near Vienna.

Carrots

It was a good year for carrots. Aster leaf hoppers carrot weevils and carrot rust fly did not cause concern this year. Carrot size was small in some areas, but of good quality and excellent yield, except for baby carrots which had high proportion of forking in some areas (Keswick). Problem weeds included three-seeded mercury, spotted spurge and leafbane. Violet root rot was found for the first time in Ontario in Kent. This disease is on CFIA's unwanted to list, which may lead to future concerns. In some fields, geese were found to be a problem in addition to usual damage by deer. Nematodes are a problem in some new fields in Bradford.

There has been a relatively large increase in acreage in Elgin, Kent and Norfolk.

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Lettuces

Severe lettuce drop due to Sclerotinia in some regions (e.g. about 70% field lost in Bradford if not treated with Ridomil), especially where there is limited rotation practiced. Deer were a problem, especially in romaine, which may appear fine externally, but the heart has been consumed. Since the pea leafminer species present in Ontario is not yet established in the USA, this may become a quarantine issue. Problems with Phytophthora bottom rot are leading some growers to consider giving up lettuce production. Tarnished plant bug can be a problem on endive as it stings veins and allows entry of bacterial pathogens.

Celery

Pea leafminer remains a serious problem in celery in Bradford, especially in September when populations and damage are high. Some Bradford growers have given up celery production as a result. In Thedford-Grand Bend, some celery left standing in fields as contracts were filled. Some tarnished plant bug damage was observed. Bacterial diseases were relatively low this year.

Spinach

Pea leafminer is the main pest of concern. Stippling damage is mostly seen which makes leaves unmarketable. Little mining damage is observed. Tarnished plant bug and aphids are a problem on spinach, Asian leafy vegetables and dandelion.

Garlic

It was a good year for growing garlic, which is planted in the fall and harvested between July and August. The 2002 crop was of good quality and good bulb size. Fall planting is complete for the 2003 crop and is reported to have rooted well. Major issue is the lack of herbicides registered for this crop. Garlic growers' association has been battling the dumping of garlic from China in North America.

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Shallots

In 2002, shallots were planted early but harvest was later than normal. Extreme summer heat led to poor size. Nutsedge is the main weed problem.

Leek

Without irrigation, leeks attained small size in 2002. Market prices fell so some fields were left unharvested. There were some minor thrips problems and in Bradford pea leafminer stippling damage was seen.

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Research Reports

The following research reports were submitted. Copies of reports may be obtained directly from the authors, or from the Chairperson.

- a. Doran, J., MR McDonald and B Grodzinski. Pungency profiles of leek leaves.
- b. MacIntyre-Allen JK, JH Tolman, RR Dries and RJ Muth. Evaluation of tray-drench treatments for control of onion thrips attacking Spanish onions, 2002.
- c. MacIntyre-Allen JK, JH Tolman and RR Dries. Evaluation of Gaucho 480F as a seed treatment for control of onion thrips attacking dry yellow seed cooking onion on organic soil, 2002.
- d. MacIntyre-Allen JK, JH Tolman, RR Dries and RJ Muth. Evaluation of environmentally friendly, low impact foliar treatments for control of onion thrips attacking dry yellow seed cooking onion on organic soil, 2002.
- e. MacIntyre-Allen JK, JH Tolman and RR Dries. Evaluation of foliar insecticides for control of onion thrips attacking dry yellow seed cooking onion on organic soil, 2002.
- f. MacIntyre-Allen JK, JH Tolman and RR Dries. Evaluation of insecticide-surfactant combinations for foliar control of onion thrips attacking dry yellow seed cooking onion on organic soil, 2002.
- g. Martin, AD, and RH Hallett. Pea Leafminer Update - 2002.
- h. McDonald MR and K Vander Kooi. Evaluation of seed treatment and furrow fungicide treatments for control of onion smut, 2002.
- i. McDonald MR and K Vander Kooi. Efficacy of new chemistry fungicides for the control of Botrytis leaf blight, 2002.
- j. McDonald MR and K Vander Kooi. Field evaluation of seeded commercial yellow cooking onion cultivars and breeding lines for resistance to the onion maggot, *Delia antiqua* Meigen, 2002.
- k. McDonald MR and K Vander Kooi. Field evaluation of transplanted commercial yellow cooking onion cultivars and breeding lines for resistance to the onion maggot, *Delia antiqua* Meigen, 2002.
- l. McDonald MR and K Vander Kooi. Evaluation of copper ionized water for the control of Septoria late blight on celery, 2002.
- m. McDonald MR and K Vander Kooi. Evaluation of Assail for control of aphids in lettuce, 2002.
- n. McDonald MR and K Vander Kooi. Evaluation of foliar clipping treatments in combination with commercial fungicides for cultural control of Sclerotinia rot of carrot, 2002.
- o. McDonald MR and K Vander Kooi. Efficacy of new chemistry fungicides for the control of carrot leaf blight, 2002.
- p. McKeown, A and CJ Bakker. Yield of chive cultivars: Simcoe 2002.
- q. Swanton, CJ, and K Chandler. Research summary: Weed control in vegetable crops, 2002.
- r. Westerveld, S, A McKeown and MR McDonald. Effect of nitrogen application rate on yield and leaf blight severity in carrots grown on muck and mineral soil.

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Changes to Emerging Issues

The following issue is an addition to those reported in the 2001 Strategic Report from this committee:

1. There is a growing and serious need for effective treatments to replace soil insecticides. A number of soil insects (including wireworms in carrots and onions, and cutworms in all crops) are becoming more damaging and/or more difficult to control due to a lack of soil treatments.

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Report of Action Taken Since Last Annual Report

Responses were received from OMAF and AAFC to the following recommendations presented in the 2001 Strategic Report of this committee:

Loss of Nematode Research Capabilities in Ontario

Recommendation

The Ontario Root, Bulb & Leafy Vegetable Research & Services Committee recommends that action be taken to ensure that the ability to conduct nematode research of relevance to vegetable growers is maintained after the retirement of Dr. John Potter.

Target Agency

- G. Saindon, AAFC, Research Branch, SCPFRC, London

Response received from AAFC

This recommendation will be forwarded for comment to Dr. Gary Whitfield, National Science Director for Theme 160 - IPM & Plant Protection, who is the responsible manager for plant protection scientists for Canada.

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Dedicated Funding for Nutrient Management Research

Recommendation

The Ontario Root, Bulb & Leafy Vegetable Research & Services Committee requests that OMAF and Agriculture & Agri-Food Canada establish dedicated funding for research in the area of 'Nutrient Management Planning' specific to Ontario's horticultural crops including 'root, bulb and leafy vegetable' crops. (AAFC; OMAF, Research, Education, Laboratories and Risk Management Branch).

OMAF - University of Guelph programs are asked to give higher priority to NMP research issues in future programs (OMAF-University of Guelph).

In addition, the Ontario Root, Bulb & Leafy Vegetable Research & Services Committee requests that the provincial Minister of Agriculture, Food and Rural Affairs work to ensure that costs of implementing NMP legislation are not downloaded to Ontario growers, including those of root, bulb and leafy vegetable crops (Minister, OMAF).

Target Agencies

- OMAF (Research, Education, Laboratories and Risk Management Branch)
- Brian Coburn, Minister, OMAFRA
- Agriculture & Agri-Food Canada
- OMAF - University of Guelph Research Program

Response received from OMAF

Funding to address the current research needs related to nutrient management are available through the OMAF 2003 New Directions in Agri-Food and Rural Research Program. The objective of this program is to stimulate the sustainable growth and competitiveness of Ontario's agri-food and rural sectors. The "Healthy Environment" component of this program can address some of the funding concerns.

The Resource Management and Environment Program under the OMAF-University of Guelph Agreement will be under review in 2003. New proposals will be accepted for the program and it is expected that projects in the nutrient management area will continue to be a significant part of this Program.

Copies of projects funded under the Plants Program under the OMAF-University of Guelph Agreement have been distributed to all OHCRSC subcommittee chairs for distribution to their committee members.

Response received from AAFC

Within the New National Science Programs of AAFC, there is a Research Theme 150, "Nutrient Cycling and Organic Residues", which focusses on many aspects of nutrient management, including manure management issues. Research activities will complement provincial activities related to nutrient management planning.

The National Theme Director is Dr. John Richards - richardsj@agr.gc.ca

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Modification of the Minor Use Regulatory Process

Recommendation

The removal of the crop residue subzones 5B, 7A, and 1A must occur if progress towards minor use is to be achieved. (PMRA)

The application of crop group labels for registration of safe and effective crop protection materials is necessary (PMRA)

True harmonization of data requirements for seed treatment registrations is necessary so that minor crop growers have access to this excellent risk reduction strategy. (PMRA)

The use of the US 'reduced risk' classification on minor use submissions for products that are classified as such in the USA is necessary. (PMRA)

The use of a more inclusive 'biopesticides' category in Canada is also necessary so that growers have equal access to these risk reduction tools. (PMRA)

A more responsive and cost-effective URMUR program is needed to secure access to many products currently only available to US producers. Registrants, sponsors and PMRA need to work closely together on each URMUR submission. (PMRA and CropLife Canada)

When funding is approved for URMULE projects, researchers should be able to request an advance on the approved funds so that research can be initiated in a more cost-effective manner (AAFC)

AAFC should set aside funding to establish an "office of Canadian minor use" that could coordinate and facilitate the needs of all minor crops commodities in Canada. The concept of an "IR-4 North" coordinating office which can provide study directorship to minor use projects is recommended. (AAFC, Policy Branch)

Target Agencies

- PMRA, Health Canada- D. Chaput, Health Canada, Pest Management Regulatory Agency
- V. Sorenson, Crop Life Canada
- B. Boddis, AAFC, Policy Branch
- J. O'Sullivan, OMAFRA-University of Guelph, Plants Program
- G. Saindon, AAFC, Research Branch, SCPFRC, London
- G. Dorrel, ADM, AAFC, Research Branch, Ottawa

Response received from AAFC

There are 7 AAFC hubs across Canada, including Delhi, Vineland, St. Jean and Harrow, that are expected to be GLP compliant by the 2003 growing season as part of the Pesticide Minor Use Program. They will be responsible for conducting residue trials and some efficacy and plant tolerance trials. However, grower groups that need a particular registration should approach their regional pesticide minor use coordinator to assure that their interest makes it onto the national priority list by about March 15 of each year.

AAFC is currently organizing a Pesticide Minor Use Centre, which will operate out of Ottawa, using regional field facilities. The Centre is expected to be operational by April 1, 2003.

For more information contact: Mr. Bill Boddis, Policy Branch, AAFC, Ottawa

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Certification and Maintenance of GLP-compliant facilities

Recommendation

It is strongly recommended that both the University of Guelph (Ridgetown) and Agriculture & Agri-Food Canada (Delhi & Vineland) act promptly to certify personnel, field station sites and

laboratory facilities as GLP compliant. (U of G; OMAF-U of G; AAFC-SCPFRC) Stable funding is needed from the University of Guelph and AAFC to provide base support to research facilities who have invested in GLP compliance in order that GLP-certifications are maintained (U of G; OMAF-U of G; AAFC - Research Branch)

Target Agencies

- G. Saindon, Director, AAFC, Research Branch, SCPFRC, London
- C. Swanton, Chair, Department of Plant Agriculture, University of Guelph
- M. Sears, Chair, Department of Environmental Biology, University of Guelph
- OMAF-University of Guelph Research Program

Response received from AAFC

There are 7 AAFC hubs across Canada, including Delhi, Vineland, St. Jean and Harrow, that are expected to be GLP compliant by the 2003 growing season as part of the Pesticide Minor Use Program.

AAFC is currently organizing a Pesticide Minor Use Centre, which will operate out of Ottawa, using regional field facilities. The Centre is expected to be operational by April 1, 2003.

For more information contact: Mr. Bill Boddie, Policy Branch, AAFC, Ottawa

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Issues

Minor Use Priorities

Jim Chaput summarized changes to the Minor Use program, including the federal governments new initiative to establish an AAFC Pesticide Minor Use Centre and Program. In addition, summaries were given of new registrations achieved, active URMULE projects and current priorities for Ontario for onions (dry bulb and green), lettuce, carrots, celery, spinach, garlic and parsley. The committee reviewed new minor use needs and ranked them for each commodity, as shown below:

Celery

- Insect
 1. Leafminer: (Crop Group Application to be submitted)
 - Acetamiprid (Assail)
 - Novaluron (Rimon)
 - Pyriproxifen (Knack)
 2. Tarnished plant bug
 - OP replacement
 3. Leafhoppers
 - Acetamiprid (Assail)
- Disease

1. Leaf blights
 - BAS516
 - Fluazinam (Allegro)
 - Azoxystrobin (Quadris)

Lettuce/Spinach

- Insect
 1. Leafminers
 - Included in Crop Group
 2. Aphids
 - Pymetrozine (Fulfill)
 3. Leafhoppers
 - Acetamiprid (Assail)
 4. TPB
 - OP Alternative
- Disease
 1. Sclerotinia
 - BAS510 (Endure)
 - Fluazinam (Alegro)
 2. Pythium
 - Fenamodone ?
 3. Downy Mildew
 - Zoxamide (Gavel)
 - Famoxadone + cymoxanil (Tanos)
 4. Bacterial Leaf Spot
 - Famoxadone + cymoxanil (Tanos)
 - Acibenzolar (Actigard)

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Carrot

- Insect
 1. Carrot Rust fly
 - Thiomethoxam, (Platinum)
 2. Weevil
 - Same as Carrot rust fly
 3. Leaf Hoppers
 - Acetamiprid (Assail)
 - Disease
 1. Pythium
 - Cyazofamid (Ranman)
 - Fenamidone (Reason)
 2. Sclerotinia
 - Fluzinam (Allegro)
- Thiophenate

3. Leaf Blights

- BAS 516
- Tebuconazole (Folicur)
- Weeds

1. Broadleaf

- Metribuzin (Sencor)
- Flufenacet + metribuzin (Axiom)

2. Group 7 resistant pigweed

- Investigate options

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Dry Bulb Onions

- Insect

1. Onion Maggot

- Fipronil (Regent)
- Clothianodin

2. Thrips

- Spinosad (Success)
- Pyriproxifen (Knack)
- Novaluron (Rimon)
- Flonicamid (IKI200)

- Diseases

1. White Rot

- BAS 510

2. Botrytis neck rot

- Fenhexamid (Elevate)

3. Downy Mildew

- Zoxamide (Gavel)
- Famoxadone + cymoxanil (Tanos)

- Weeds

1. Weeds, including Nutsedge

- Flumioxazin
- Ethofumesate (Nortron)
- Bromoxynil (Pardner)
- Butafenacil (Rebin)

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Green Onion, Leeks, Shallots, Chives

- Insects

1. Onion maggot

- Fipronil (Regent)
- Clothianidin

2. Thrips

- Same as Onions (Bulb vegetable group)

3. Leek Moth

- Bt, Dipel 2XDF

- Disease
 1. Same as Group
- Weeds
 1. Same as Group

Garlic

- Weeds
 - Oxyflurofen (Goal)
 - Flumioxazin (Valor)
- Diseases
 1. Fusarium
 - Folicur
 - Fludioxnil (Scholar)
 - Maxim

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Red Garden Beets

- Insects
 1. Leafminers (Serpentine)
 - § Assail
- Disease
 1. Cercospora
- Weeds
 - Upbeet
 - Dual Magnum
 - § Frontier
 - § Nortron

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Research Priorities

Seven research issues were identified and prioritized in the following order:

1. Crop Fertility Issues.
2. Disease Management
3. Integrated Insect and Nematode Management.
4. Development of Integrated Weed Management Programs.
5. Minor Use Pesticide Registrations
6. Value-added Product Development.
7. Cultivar Evaluations.

Details of each Research Issue are given below.

Research Issue # 1: Crop Fertility Issues

Issue

A. Fertility Recommendations. In light of developing provincial nutrient management legislation, research is required to review and revise current information and provincial recommendations for root, bulb & leafy vegetable crops. Only limited research specific to root, bulb & leafy vegetables has been undertaken, so the accuracy and suitability of current recommendations to these crops is unknown.

B. Micronutrient and Tissue Analysis Recommendations. Increasing attention is being placed on the use of micronutrients in crop production. However, for many of the micronutrients in question, there is a lack of sufficient research to either support or counter their use. The feasibility and accuracy of the use of tissue analyses in making micronutrient recommendations must be evaluated.

Current Research/Extension Activities

- Research on nitrogen management of carrots, onion and cabbage has been undertaken by Drs. M.R. McDonald, A. McKeown and C. Scott-Dupree (Departments of Plant Agriculture and Environmental Biology, University of Guelph) over the last 3 years. This research has largely focused on application rates and timing and the effects of nitrogen on insects and diseases.
- Kessel and K. Callow began micronutrient studies on cole crops and Asian crucifers in 2001; however there is no plan to extend these trials to root, bulb & leaf vegetable crops.

Gaps/Barriers/Deficiencies

A) Fertility Recommendations. Special emphasis should be placed on an integrated fertility program which takes into account the complete soil nutrition regime and nutrient management planning; validation of crop uptake, crop removal, and growth stage models specific to root, bulb & leafy vegetable crops are required as well as a revision of current Provincial recommendations.

Of particular concern is the applicability and accuracy of current nutrient parameters in assessing nutrient input/output of vegetable production practices on muck soils.

B) Micronutrient and Tissue Analysis Recommendations. Improvements in fertilizer recommendations for root, bulb and leafy vegetable crops with particular emphasis on in-field evaluation of new micronutrient formulations and the use of tissue analysis. The evaluation of commercially available micronutrient formulations for solubility and availability of micronutrients to plants is needed in order to permit accurate recommendations to be made to growers.

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Research Issue # 2: Disease Management

Issue

The presence of diseases in field and in storage greatly impacts the quality of vegetable produce, and causes serious post-harvest losses of stored produce. Certain diseases such as *Sclerotinia* and *Sclerotium* are no longer adequately prevented by existing fungicides and the incidence of some diseases such as downy mildew on onions has been increasing in recent years.

Current Research/Extension Activities

- Research on *Sclerotinia* of carrots has been undertaken by Drs. G. Boland and M.R. McDonald over the last 4 years. This research has largely focussed on the biology and epidemiology of *Sclerotinia sclerotiorum*, but includes a component on cultural control practices.
- Research on the control of disease in storage is also being addressed. This research is largely focussed on determining if the wooden boxes are an infection source for stored carrots.
- Research on *Sclerotium* of onions has been undertaken by Drs. T. Hsiang and M.R. McDonald over the last 3 years. This research has focused on the use of Vesicular Arbuscular Mycorrhizae (VAM) as a biological control of *Sclerotium cepivorum*
- There is some research on biological controls for *Sclerotinia* on lettuce being initiated at MCRS.

Gaps/Barriers/Deficiencies

Effective management practices are needed for foliar and soil-borne diseases of all root, bulb and leafy vegetable crops, with particular emphasis on *Sclerotinia*, *Pythium*, *Sclerotium*, *Fusarium*, and *Rhizoctonia* spp.: leaf blight, early and late blight, corky root rot, bacterial leaf spot, downy mildew, white rot, violet root rot, crown rot and crater rot. Approaches may include cultivar resistance, fungicides, biological controls, and soil amendments, among others. Information on the biology and epidemiology of these diseases is also needed.

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Research Issue # 3: Integrated Insect and Nematode Management.

Issue

Effective management of insect pests is complicated by the anticipated loss of older pesticides, by reduced efficacy of existing pesticides, by lack of access to new pesticides, and by the presence of several new insect pests in Ontario vegetable crops. In addition, effective management practices for nematode pests of vegetable crops have not been defined.

Current Research/Extension Activities

- Pea leafminer research was begun by Dr. R.H. Hallett, University of Guelph, in 2000. This research is focussing on: whether pea leafminer can overwinter in Ontario field conditions; the host range of the Bradford pea leafminer population; protocols to improve sticky trap monitoring of populations; and insecticide evaluations. A factsheet for growers on leafminers of vegetable crops was prepared by Jim Chaput in 2000.
- Dr. M.R. McDonald conducted insecticide efficacy trials for aphids in 2002.
- There are no active research projects on tarnished plant bug or cutworms.
- Drs C. Scott-Dupree and M.R. McDonald have completed a project on the interactions between onion maggots and onion smut, including implications for control recommendations.
- Drs. C. Scott-Dupree and J. Tolman are currently investigating the presence of insecticide resistant onion thrips populations in the Thedford-Grand Bend region.
- Nematode research being conducted in Ontario, does not focus on crops of concern to this committee. With the retirement of Dr. J. Potter in 2002, the future of nematode research capabilities in Ontario is in jeopardy.

Gaps/Barriers/Deficiencies

An integrated crop management or systems approach is needed to ensure the successful implementations and adoption of new management practices developed for both insect and nematode pests of root, bulb & leafy vegetable crops. IPM is a systems approach; control of one pest element can influence the balance of others within the system. Therefore, the development and evaluation of sustainable IPM programs to address the dynamic arthropod pest complexes (insects, mites) of vegetable crops is required.

Insect Pests

Development of appropriate management practices including, but not limited to, cultivar resistance and alternatives to pesticides, must be developed for control of insect pests.

Group 1 (Established pests) including tarnished plant bug, aphids, cutworms, onion maggot, carrot rust fly and onion thrips.

Group 2 (New and emerging pests) including pea leafminer, leek moth, and carrot weevil. Provincial surveys of pea leafminer in multiple crops and of leek moth in onions and garlic are also needed.

Existing research programs must be expanded and supported over the long-term in order to permit the development of effective management programs and specific control recommendations for these insect pests. Special consideration should be given to:

1. control and population dynamics of major pests (including, but not limited to, onion maggot, onion thrips, carrot rust fly, pea leafminer);
2. secondary pest resurgence and control (including, but not limited to, carrot weevil, tarnished plant bug, aphids, cutworms);
3. new pest introductions and/or developments (including, but not limited to, pea leafminer, leek moth; and Provincial surveys for new pests, including pea leafminer in multiple crops and leek moth in onions and garlic);
4. evaluation of new pest control products;
5. biological control agents and cultural techniques;
6. economics of program implementation.

Nematode Pests

Integrated nematode management systems are required for carrots and other root, bulb & leafy vegetable crops, including methods such as crop rotations, soil amendments, band fumigation and late fall plowing. Damage thresholds and symptom expressions for species such as lesion and pin nematodes should also be considered.

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Research Issue # 4: Development of Integrated Weed Management Programs.

Issue

The control of weeds, and the increase in resistant weed populations, is an ongoing challenge for growers of root, bulb & leafy vegetable crops. Weeds of particular concern to this group are yellow nutsedge, common groundsel and grasses. In recent years an increase in resistant weeds (e.g. pigweed) has been observed.

Current Research/Extension Activities

- A number of weed-related research projects have been undertaken at the University of Guelph (Yellow nutsedge - Dr. Francois Tardif; weeds in no-till carrots and onion - Dr. Clarence Swanton), but these have received little or no funding and their future is uncertain.
- Dr. F. Tardif has been investigating examples of weed resistance on an unfunded basis, but the root, bulb & leafy vegetable sector cannot rely on the long-term continuation of this service.
- Dr. Diane Benoit (AAFC, HRDC- St Jean-sur-Richelieu) has collaborated on yellow nutsedge research with Dr. F. Tardif, but the current status of her research program is unknown.

Gaps/Barriers/Deficiencies

Research is needed to investigate: cultural practices, new pre- and post-emergence herbicides, herbicide banding, new weed introductions and changes in the weed complex. The weeds of special concern are yellow nutsedge, common groundsel and grasses. Practical short and long term solutions must be identified.

New product registrations for management of herbicide-resistant weed populations must be sought.

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Research Issue # 5: Minor Use Pesticide Registrations

Issue

The impacts of FQPA (USA) and re-evaluation (Canada) decisions are very great for Canadian growers because of a lack of access to alternative replacement products. The registration of new, 'reduced risk' active ingredients is urgently needed.

Due to the loss, or anticipated loss, of current pesticide products, there is a need for minor use pesticide registrations for improved control of insects, diseases and weeds. Increased demands from PMRA for multiple location efficacy and residue trials have greatly reduced the feasibility of obtaining many minor use registrations.

Current Research/Extension Activities

- Research towards the registration of minor use pesticides has been an ongoing concern of many researchers involved in this committee for many years.

Gaps/Barriers/Deficiencies

- Seek minor use pesticide registrations for improved control of insects, diseases and weeds of muck crops.
- Emphasis should continue to be placed on reduced risk active ingredients and replacements for organophosphates.
- There is a particular need for minor use research on herbicides for garlic and for new products to control herbicide-resistant weeds.
- Minor use research should continue over the next few years until AAFC completes establishment of the new Pesticide Minor Use Centre and Program.

Research Issue # 6: Value-added Product Development

Issue

Growers in the root, bulb & leafy vegetable sector would like to take advantage of the growing market-demand for value-added vegetable products. While the technologies for some of these products are well-established, the development of value-added products using fresh onions (e.g. sliced, diced, pureed) is currently restricted by shelf-life limitations.

Current Research/Extension Activities

- There are no current research activities in this area.
- Jennifer DeEll, Vineland, OMAF, has some experience with post-harvest handling of crops and may be able to help coordinate, or advise on the establishment of appropriate research program.
- Kristen Callow, OMAF, will be attending a conference on new agricultural products and will be able to share relevant information on new products with growers and potential researchers.

Gaps/Barriers/Deficiencies

Research is required to develop appropriate handling, packaging and processing practices for value-added fresh vegetable products in order to improve product quality. Research is specifically needed on methods to enhance the shelf-life of value-added onion products.

Research Issue # 7: Cultivar Evaluations

Issue

As most new vegetable varieties are developed in other regions of North America and in Europe there is a continuing need for the evaluation of varieties for suitability to Ontario growing conditions. The reduced number of registered pesticide products makes the evaluation of varieties for pest and disease resistance and for competitive ability against weeds particularly important over the next five years.

Current Research/Extension Activities

- Shawn Janse and Drs. M.R. McDonald and A. McKeown (University of Guelph, Department of Plant Agriculture) have undertaken the evaluation of root, bulb & leafy vegetable crop varieties at Bradford and Simcoe for many years.

Gaps/Barriers/Deficiencies

There is an expressed need within the grower community for continued evaluations of root, bulb and leafy vegetable crop varieties for suitability to Ontario growing conditions, storage conditions, market demand, and pest/disease resistance, with emphasis on, but not limited to, carrots and onions.

Service Priorities

Emphasis was given to Service Issues at the 2002 meeting of this committee. Four service priorities were identified and ranked in order of importance, as follows:

1. Access to weather data and degree day information
2. PCR Diagnostics
3. Timely and accurate plant diagnostic testing
4. Continuity and consistency of crop scout expertise.

Details of each Service Issue are provided below.

Service Issue #1: Access to weather data and degree day information

Issue

Timely and economical access to weather data and degree day information is of increasing importance to growers and crop consultants. This information is needed to effectively time pest monitoring efforts and pest and crop management practices. Weather data that is relevant to all regions in which horticultural crops are grown are required. Expansion of and increased access to the Ontario Weather Network (OWN) is needed, with reduced subscription rates offered to growers.

Current Activities

- OWN provides weekly air temperature and precipitation data to OMAF staff who distribute the information to consultants, scouts and other industry personnel.
- OWN monitoring begins May 1 each year.

Gaps/Barriers/Deficiencies

- For many over-wintering insect and disease pests, weather monitoring needs to begin by April 1, for accurate calculations of degree days and other predictions of developmental parameters. In addition, air temperature alone is not always sufficient for prediction of the development and emergence of soil dwelling pests. In these cases, soil temperature and soil moisture data may also be required.
- In Quebec, vegetable growers pay a flat \$50 fee for access to similar information. Subscription rates for growers in Quebec are subsidized by their provincial government.

Service Issue #2: PCR Diagnostics

Issue

The availability of PCR Diagnostics, particularly for diagnosis of aster yellows in leafhoppers, has been an ongoing service issue for this sector for a number of years.

The methodology for detecting the aster yellows phytoplasma in leafhoppers has been available for a number of years. This research was conducted at the University of Guelph and was partially funded by OMAFRA through Food Systems 2002. This technology is essential to help growers make optimal management decisions on a timely basis.

Current Activities

- OMAF representatives discussed the provision of this service with the Uof G Pest Diagnostic Clinic in spring 2001. At that time the clinic was unwilling to add this technology to their diagnostic services.
- OMAF representatives met with GAP Environmental Services, London, ON, to discuss the possibility of aster yellows diagnoses being provided at their lab. The company is open to this possibility and in 2003 will operate a pilot project to determine aster leafhopper infectivity ratings across Ontario. OMAF personnel will help to coordinate the collection of standardized bulk samples from regions across Ontario for use in this project.

Gaps/Barriers/Deficiencies

- Growers have expressed willingness to pay for this service, but it is not offered through the Uof G Pest Diagnostic Clinic.
- Unless a sufficient number of samples are submitted to the lab for diagnostic testing, the budgetary constraints will be too high.
- In other jurisdictions, this technique has been made available to growers free-of-charge.

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Service Issue #3: Timely and accurate plant diagnostic testing

Issue

Improved quality of plant diagnostic facilities available, particularly with respect to sample turn-around time and ability to provide accurate pest and disease diagnoses. Rapid and accurate communication of results is important to the selection and implementation of pest and crop management strategies. A comparative evaluation of these qualities and service charges levied by the labs available to growers (e.g. UofG Pest Diagnostics Clinic, Agdias, etc) is needed.

Current Activities

- OMAF and U of G have met with GAP Environmental Services and there is potential for this service to be offered by GAP in addition to the other available labs.

Gaps/Barriers/Deficiencies

- Unless a guaranteed number of samples can be given to the lab and coordinated through Provincial specialists,

consultants, scouts and industry the budgetary constraints will be too high.

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Service Issue #4: Continuity and consistency of crop scout expertise.

Issue

This sector suffers from high turnover in crop scouts which leads to lack of continuity and concerns about reliability of advice offered to growers. Improved training programs are needed to provide new scouts with comprehensive information on pest, disease and other plant symptoms prior to the occurrence of these conditions in the field. Efforts, possibly including incentives, should be made in the industry to retain crop scouts for multiple years. Consistency of scouts from year to year will help to increase grower confidence in IPM and ICM programs.

Current Activities

- Depending on the company, wage increases and scholarships may be provided.
- OMAF provides scout training workshops for a number of horticultural crops.

Gaps/Barriers/Deficiencies

- A limited number of agriculture students are available each year to hire and all companies are competing for the best students. Increased wages and benefits would help to encourage students to stay for more than one year and attract more students to agricultural studies and careers.
- The need to provide training to scouts early in the season means that they are often not able to see actual pest and disease damage symptoms in the field during training. Brief follow-up training sessions during the season and/or the provision of high quality graphic images and diagnostic keys could help to improve the ability of scouts to recognize and accurately diagnose pest and crop conditions in the field.

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Emerging Issues

Concern was expressed about the following new and emerging issues:

1. Growers are concerned about the impact of nutrient management plans and legislation on production of root, bulb & leafy vegetable crops. Of particular concern is the applicability and accuracy of current nutrient parameters in assessing nutrient input/output of root, bulb & leafy vegetable production practices.
2. Leek moth on onions and garlic.
3. Increasing problems with carrot rust fly late in the season and probable occurrence of a second generation of carrot weevil in Ontario.
4. The presence of new races of downy mildew on spinach, which current spinach varieties are not resistant to.
5. Increasing occurrences of herbicide-resistant weeds.
6. There is a growing and serious need for effective treatments to replace soil insecticides. A number of soil insects (including wireworms in carrots and onions, and cutworms in all crops) are becoming more damaging and/or

more difficult to control due to a lack of soil treatments.

Recommendations Arising From Identified Issues

There are four recommendations made by the Ontario Root, Bulb & Leafy Vegetable Research & Service Committee in 2002. They are ranked in decreasing priority as follows:

1. Requirements for Nutrient Management Strategies and Plans
2. Modification of the Minor Use Regulatory Process
3. Support for GLP-compliant Facilities
4. Loss of Nematode Research Capabilities in Ontario.

Details of each recommendation are provided below.

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Recommendation # 1

Issue

Requirements for Nutrient Management Strategies and Plans

Background

Nutrient Management legislation is being phased-in in Ontario beginning in 2003. Horticultural operations, including those for root, bulb and leafy vegetable production, will become subject to this legislation within the next few years. Currently data generated in Ontario is required for the establishment of crop profiles and integrated crop fertility programs.

Details

The Ontario Root, Bulb & Leafy Vegetable Research and Services Committee recognizes the need for the development of detailed nutrient management profiles for all vegetable crops including those covered under its mandate. To utilize crop nutrition inputs effectively while still maintaining crop yields and quality an integrated crop fertility program must be developed which takes into account crop removal data, crop uptake data and growth stage models. This will require considerable resources and research activity, assuming all data must be generated in Ontario and all nutrients are governed by this legislation.

The capacity to conduct the required research for this sector does not currently exist in Ontario. In some cases, reliable and appropriate data is available from other regions, and may be applicable to Ontario growing conditions.

Recommendation

The Ontario Root, Bulb & Leafy Vegetable Research & Services Committee requests that OMAF direct Nutrient Management legislation pertaining to horticultural crops towards a few key nutrients (e.g. nitrogen and phosphorus), as opposed to the complete range of nutrients that may be found in this sector. In addition, this committee requests that OMAF accept the use of non-Ontario data, where appropriate and reliable data is available.

Target Agency

- Helen Johns, Minister, OMAF
- Derek Nelson, Minister's Office, OMAF
- Chris Stockwell, Minister, Ontario Ministry of the Environment
- Heather Capanelli, Minister's Office, Ontario Ministry of the Environment
- John Steele, Ontario Ministry of the Environment

OASCC Linkages

- OHCRSC

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Recommendation #2

Issue

Modification of the Minor Use Regulatory Process

Background

In 2002, the federal government announced a new initiative under the auspices of AAFC to establish a Pesticide Minor Use Centre and Program, similar to the USA IR-4 program. Ontario is a major participant in the Minor Use process, and is responsible for approximately 40% of the total Canadian URMULE submissions annually.

Seven GLP-compliant facilities are to be established by AAFC for pesticide residue research, reportedly in time for the 2003 growing season. As of December 2002, several key positions have yet to be filled at both PMRA and AAFC, with the exception of the Minor Use Advisor.

Details

The Ontario Root, Bulb & Leafy Vegetable Research & Services Committee is pleased to see this initiative taken and hopes that this will resolve current difficulties including excessive residue trial requirements in both Ontario and Quebec, lack of use of crop groupings, poor interest by registrants in the URMUR program and lack of access to reduced risk, biopesticide and seed treatment pest control options. The removal of the crop residue subzones 5B, 7A, and 1A must occur if progress towards minor use is to be achieved.

The process to become GLP-compliant generally requires over a year, so it seems unlikely that AAFC facilities will achieve this status in time for research to be conducted in the 2003 growing season.

Researchers, extension personnel, industry and grower cooperators require adequate, consistent and stable funding to ensure completion of requirements under the minor use system. More flexibility with regard to funding minor use projects is required and more communication with the sponsors of minor use projects is needed.

Recommendation

The Ontario Root, Bulb & Leafy Vegetable Research & Services Committee recommends that AAFC make all

reasonable efforts to 1. ensure that the new Pesticide Minor Use Program meets the needs of the horticultural sector in Ontario and, 2. ensure open communication between AAFC, the provincial minor use coordinator and other representatives of the horticultural sector in Ontario, in order to ensure that reasonable and effective policies and requirements are established for submissions to the new Minor Use program.

In addition, the Ontario Root, Bulb & Leafy Vegetable Research & Services Committee recommends that AAFC & PMRA act to ensure the rapid establishment of the Pesticide Minor Use Program, including completion of all necessary hirings in the first quarter of 2003.

Target Agencies

- Mary Comerenski, Bill Boddys, AAFC, Farm Financial Programs Branch
- Al Tomlin, AAFC, London Research Station
- Imme Gerke, Wendy Sexsmith, PMRA, Health Canada
- Jim Chaput, Bill Ingratta, OMAF

OASCC Linkages

- OPMRSC

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Recommendation #3

Issue

Support for GLP-compliant facilities

Background

In 2002, the federal government announced a new initiative under the auspices of AAFC to establish a Pesticide Minor Use Centre and Program, similar to the USA IR-4 program.

Seven GLP-compliant facilities (including Delhi, Vineland, St. Jean and Harrow) are to be established by AAFC for pesticide residue research, reportedly in time for the 2003 growing season. Under the Pesticide Minor Use Program residue trials, as well as some insecticide efficacy and plant tolerance trials, will be the responsibility of these facilities.

There are currently several non-AAFC GLP-compliant facilities in Ontario (Uof G Kettleby, Ridgetown and Simcoe Research Stations).

Ontario is a major participant in the Minor Use process, and is responsible for approximately 40% of the total Canadian URMULE submissions annually.

Details

AAFC has made a 6-year commitment to the Pesticide Minor Use Program. At this early juncture, its existence beyond the initial 6-year period cannot be considered a certainty.

The process to become GLP-compliant generally requires over a year, so it seems unlikely that AAFC facilities will

achieve this status in time for research to be conducted in the 2003 growing season.

Many of Ontario's Minor Use submissions require pesticide residue trials that must be conducted at GLP-certified field sites in Zone 5 and by GLP-certified personnel. AAFC's horticultural research programs have traditionally been based at St. Jean-sur-Richelieu, Quebec. This site is in Zone 5b, and as a result, results from residue trials conducted at this location are not considered acceptable for Ontario conditions by PMRA. The AAFC facilities in Ontario targeted for GLP-certification are not suitable for the production of all root, bulb & leafy vegetable crops, particularly those grown on muck soils. If residue trials can only be conducted at AAFC stations under the Pesticide Minor Use Program, then some commodities under the mandate of this committee will be unable to obtain minor use product registrations.

Considerable effort and funds have been invested in obtaining GLP-certification of facilities and associated personnel at the University of Guelph. The cost of initial GLP-certification is approx. \$25,000, while the cost of maintaining GLP-certification is \$2,500 per year. If GLP-certification of facilities and personnel are allowed to lapse, then considerable investment may be required in the future if these facilities need to be re-certified.

Recommendation

The Ontario Root, Bulb & Leafy Vegetable Research & Services Committee asks that AAFC clarify how the minor use needs of horticultural crops grown on muck soils in Ontario will be addressed under the new Pesticide Minor Use Program. It is strongly recommended that AAFC consider designating GLP-compliant facilities at UofG as satellite field stations for conducting the residue trials needed for minor use submissions of those crops that cannot be grown at AAFC Ontario research facilities.

It is strongly recommended that the OMAF-University of Guelph Plants Program and AAFC commit to maintaining GLP-certification of MCRS and Simcoe research stations for at least 2-3 years until AAFC's Pesticide Minor Use Program is established and its success can be evaluated. Stable funding is needed from the University of Guelph and AAFC to provide base support to research facilities that have invested in GLP compliance in order that GLP-certifications are maintained.

It is recommended that AAFC act to obtain GLP-certification of its Ontario facilities as quickly as possible.

Target Agency

- Mary Comerenski, Bill Boddis, AAFC, Farm Financial Programs Branch
- Al Tomlin, AAFC, London Research Station
- Imme Gerke, Wendy Sexsmith, PMRA, Health Canada
- Jim Chaput, Bill Ingratta, OMAF
- C. Swanton, Chair, Department of Plant Agriculture, University of Guelph
- M. Dixon, Chair, Department of Environmental Biology, University of Guelph
- David Hume, OMAF-University of Guelph Plants Program

OASCC Linkages

- OHCRSC and OPMRSC

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Recommendation # 4

Issue

Loss of Nematode Research Capabilities in Ontario

Background

Previously, at AAFC- Vineland there were 4 nematologists active in research. In 2002, the last nematologist in Ontario retired. In the past, this committee was given assurances by previous directors of AAFC Southern Crop and Food Protection Research Centre that the capacity for conducting nematode research and addressing nematode concerns in this province would be maintained. The presence, introduction, and outbreaks of nematodes in Ontario vegetable crops have the potential to result in serious quarantine and trade issues, and as such it is essential that a significant nematode research program is available to support the Ontario root, bulb and leafy vegetable sector.

There are currently nine nematodes regulated by the CFIA that have the potential to become established and threaten the production of horticultural crops in Ontario, including:

- *Ditylenchus destructor* Thorne - potato rot nematode
- *Ditylenchus dipsaci* (Kühn) Filipjev - stem and bulb nematode
- *Globodera pallida* (Stone) Behrens - pale cyst nematode
- *Globodera rostochiensis* (Wollenweber) Behrens - golden nematode
- *Heterodera glycines* Ichinohe - soybean cyst nematode
- *Longidorus* spp. Micoletzky - needle nematodes
- *Meloidogyne chitwoodi* Golden, O'Bannon, Santo & Finley - Columbia root-knot nematode
- *Trichodorus* spp. Cobb - stubby root nematodes
- *Xiphinema* spp. Cobb - dagger nematodes

On several occasions in the past correct identification of nematode species was crucial to the root, bulb and leafy vegetable sector. The lack of an 'in house' nematode taxonomist at AAFC will force Ontario producers to use US resources for identification which may lead to quarantine and trade issues on exported crops.

Although there is one nematologist at AAFC - Horticulture Crops Research & Development Centre (St-Jean-sur-Richelieu), that research program focuses on nematodes of potato, corn and turf and does not address vegetable crops.

Details

Very few nematologists are left at any AAFC locations throughout the country. Correct identification of all taxa of crop pest pests and the maintenance of a research effort is crucial for the adequate protection of root, bulb and leafy vegetables and the stability and competitiveness of the industry.

Recommendation

The Ontario Root, Bulb & Leafy Vegetable Research & Services Committee recommends that action be taken to ensure that the ability to conduct nematode research of relevance to vegetable growers is maintained after the retirement of Dr. John Potter.

Target Agency

- Gary Whitfield, Science Director, Theme 160 - IPM & Plant Protection, AAFC, Research Branch
- Carberry, Executive Director, Plant Products Directorate, CFIA

OASCC Linkages

- OHCRSC
- OPMRSC

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Summary of Distribution of Recommendations

Recommendation	AAFC	ARIO	CC	CARC	OMAF	Other
1. Nutrient Management					X	Ontario Min. of Environment
2. Minor Use Regulatory Process	X				X	PMRA
3. GLP Facilities	X				X	PMRA, Univ of Guelph
4. Nematode Research	X					CFIA

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Ontario Sweet Corn Research and Services Subcommittee

Author:

John Zandstra - Chair

Ontario Sweet Corn Research and Services Subcommittee

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Industry/Sector Scan

State of the Industry

Seasonal Summary

Peas

Cold wet conditions in April and May made for scattered planting dates and an overall increase in seedling damping-off. The losses did not relate back to one pathogen in particular, suggesting that the increased incidence was a largely a result of adverse weather conditions and not a specific breakdown of the seed treatment. A rapid switch from cool, wet conditions to hot dry weather set a rapid pace for much of the harvest, with larger than average by-pass acreage and lower than average yields.

Beans

Early-planted fields also suffered increased amounts of seedling die-back and root maggot damage. Wet conditions triggered problems with herbicide injury. Leafhoppers were extremely high in many areas and pressure lasted well into the season. Hot conditions during July and August set yields back, although we probably came out ahead of 2001 (this year we did not have the virus pressure on top of the heat stress.)

Sweet Corn

There was a very slow start to the year due to long planting delays; overall, the crop was planted LATE! The long warm end to summer saved the late-planted crop. High flea beetle pressure was noted in several defined locations early in the season, with populations rebounding again in late August. Moderate levels of Stewart's wilt was evident in later plantings. Populations going into winter were high. The Gaucho registration for sweet corn is now permanent.

On the whole, processing yields were below average; however, there were some respectable numbers coming off fields in mid-to-late Sept. It was a year when you could identify out the good soil types (and a little luck with a timely rain didn't hurt either.) Elgin and parts of Essex/Kent were the worst affected by the dry weather.

On the fresh market side, the spring weather conditions set the early crop back by 3-4 weeks. There was no real quantity of fresh market sweet corn on the market until late July, and prices remained strong until the August long weekend. Late season yields improved especially where a timely rain came through in early August. European Corn Borer and Corn Earworm numbers were unbelievable! Earworm migrated in early July, catching many growers off guard.

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Research and Extension Accomplishments

Weed Management

Herbicide research continues at Ridgetown College (peas, beans, and sweet corn) and University of Guelph, Simcoe (sweet corn). Weed management projects in peas include collecting data to reduce the pre-harvest interval for Pursuit, trials to evaluate Dual + Pursuit, Meridian Plus, First Rate and Flumioxazin tolerance in peas. Recropping studies are also being done with the herbicides Classic and Converge.

Weed management trials on lima beans presently involve working towards a registration for Pursuit. Herbicides which are being screened for tolerance in both snap and lima beans include Viper, Basagran + Reflex, Basagran + Excel Super, Dual + Pursuit, Meridian, and Flumioxazin. Tolerance to First Rate and Halosulfuron-methyl are being studied in lima beans. Recropping studies with Converge are being conducted on several bean types (cranberry, black, kidney, white); lima beans and snap beans will be evaluated in 2003. Mesotrione recropping studies are also being conducted.

Variety screening for tolerance to Accent (fresh and processing varieties) and Accent + Pardner tank mixes (fresh market varieties) are ongoing at Ridgetown and Simcoe. Studies on Lontrel tolerance are completed, and studies on Mesotrione tank mixes continue at Ridgetown. Classic recropping studies at Ridgetown indicate some varietal sensitivity.

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Insect and Disease Management

Alternate methods of managing European Corn Borer are being conducted in the Department of Environmental, University of Guelph in the context of their impact on honey bees. Furadan, Matador and Spinosad, as well as Attribute sweet corn varieties are being evaluated. Direct contact and residual contact bioassays for Matador and Spinosad indicate that both show low toxicity to honey bees.

A number of insect and disease management trials continue at Ridgetown College, which include seed treatment and granular applications for wire worm and seed corn maggot in snap beans and sweet corn, aerial vs. ground applications of Warrior and Matador for managing pests in sweet corn, evaluating seed treatments for managing Stewart's Wilt, and studies using Headline to control sweet corn foliar diseases.

Studies on Angular Leaf Spot of beans were conducted in the Department of Environmental Biology, University of Guelph in cooperation with OMAF extension personnel. Trials evaluated pathogen survival under Ontario conditions, varietal response to the disease, as well fungicide efficacy in controlling the disease.

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Management Studies

Nitrogen management studies on sweet corn were conducted at Agriculture and Agri-Food Canada, Harrow (fresh market and processing), Ridgetown College (processing), and University of Guelph, Simcoe (fresh market). The objectives of these collaborative studies are to identify the fate of nitrogen in a sweet corn production system, determine the response of sweet corn to soil nitrogen, identify optimum nitrogen fertilizer rates which maximize yield sweet corn and minimize nitrogen leaching, and develop a pre-side dress nitrogen technique for sweet corn.

The use of biodegradable mulches in sweet corn production was evaluated again in 2002 at Harrow and Ridgetown with good results. Trials at Harrow also included weed management studies using biodegradable mulches. Other management trials at Ridgetown included intensive management of sweet corn (irrigation and high populations), and studies to evaluate the impact of in- row spacing variability and delayed emergence on the performance of sweet corn.

Cultivar Trials

Fresh market and processing sweet corn and snap bean variety trials were conducted at Harrow. Processing sweet corn and pea variety trials were established at Ridgetown.

Other Research/Extension

- Nitrogen Verification Project: a large scale project to look at nitrogen use and losses over the course of the season was initiated in 2002. This project, which is managed by OMAF extension specialists included 15 bean, pea and sweet corn sites
- Pea Contaminant Survey: pea crops were surveyed to determine the amount of contamination due to ground beetles
- Processing Crop Update: a weekly newsletter was prepared by OMAF crop specialists summarizing the status of processing crops in Ontario, which included peas, beans, and sweet corn.
- On-farm Evaluation of PSNT: on farm trials were conducted on processing sweet corn fields to determine the effectiveness of a pre-side dress soil nitrogen test.
- Modeling: Models to predict the numbers of Corn Flea Beetles and potential incidence of Stewart's Wilt were evaluated.

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Service Activities

Insect and Disease Scouting (IPM)

The services provided by AIMS (Agricultural Integrated Management Services) was outlined. They provide scouting services and recommendations for control of insect, disease and weed problems in most horticultural crops, and will provide their services across the entire province, provided a core of interested growers is available in a specific location. A number of processors run their own IPM programs, and there are a number of private consultants who provide IPM services to mainly the sweet corn industry. Overall it was felt that the IPM service provided by AIMS and other private consultants was adequate

Nutrient Management Plans

AIMS is able to provide assistance to producers in developing nutrient management plans. A number of private consultants are also particularly active in providing nutrient management consulting services. This issue was felt to be adequately covered by the services provided by these groups

Food Safety

As more people tend to cook sweet corn with the husk, there are questions about the potential of increased pesticide residues and microbes on the product. Overall, growers question if current standards for crop handling (eg: chlorination of cooling water) are sufficient? In respect to the processing industry, all processors are HACCP certified, and grower compliance is mandatory. This will result in increased record keeping by growers in the future. Overall, more information or consultation on issues of food safety are required.

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Emerging Issues

Many issues discussed in the strategic report (2001) are still current, and are listed below. New emerging issues are included as items 7-12.

Acceptance of Transgenic Technology

While this issue is not "emerging", it continues to be an issue for the sweet corn industry. Transgenic sweet corn could have a major impact on the sweet corn industry. Transgenic cultivars are a positive tool for growers, in terms of better insect control, area-wide suppression of corn borers, and more effective weed control. Processors no longer grow any Bt corn for fear of jeopardizing export markets. Bt sweet corn continues to be grown by fresh market growers and sold without problems.

Disposal of Plastic Mulches

While it presently is not a problem, there is concern that in the future landfills may refuse to accept agricultural plastic waste. Recycling of this type of material is difficult because of it is often dirty.

Food Safety

With increased emphasis on food safety in the marketplace, some concerns are being raised about food safety in the sweet corn industry. In particular, are questions about chlorine levels in wash water, proper disposal of chlorinated water, and proper management of water used for hydro cooling. While growers try to maintain sanitary conditions when handling their produce, concern was raised about sanitation in some of the distribution centers (eg: Ontario Food Terminal).

Declining Research Funds and Personnel

Research funds are becoming harder to find, especially for commodity groups with no grower organization. Research and extension personnel are also in decline, which is a concern.

Handling of Sweet Corn at the Retail Level

Concern was expressed about the way Ontario sweet corn was handled at the retail level. It was felt that retailers need to be educated on how to handle sweet corn in order to maintain quality. Poor quality produce at the retail level reflects poorly on the entire industry. Often product is stored at the warehouse for unacceptable time periods without proper cooling (especially a problem with early season Se varieties.)

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Coordination Between Bee and Sweet Corn Industries

Progress has been made in identifying bee hives near sweet corn fields; however some beekeepers do not identify hive locations clearly enough, or the list of local beekeepers is outdated. Negative publicity about bee kills are an ongoing concern and frustration for sweet corn growers.

Nutrient Management Legislation

Uncertainty about the new Nutrient Management Legislation and what it entails, as well as the potential cost of implementation is an issue of concern

New Pests

Several new pests have been identified in recent years, which have the potential to have significant impacts on the industry (Angular Leafspot in beans, Common Mosaic Virus in beans)

Loss of Pest Control Products

Several pest control products are no longer available to the industry, and there are no suitable replacements for them. (For example, Lorsban as a seed treatment in beans)

Climate Change

Increased frequency of hot, dry growing seasons are negatively impacting crop yields.

Resistance to Pesticides

There is evidence that Group 2 herbicide resistance is present in eastern black nightshade, which will affect its control in peas.

Quality Assurance within the Plastic Mulch Industry.

Presently there is no quality assurance standard in the plastic mulch industry. New products become available with no guarantee of how they perform under our growing conditions.

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Report of Actions Taken on Previous Recommendations

Recommendation 1 from 2001

"increase funding to support nutrient research in order to meet the requirements of the nutrient management planning legislation"

Response (AAFC)

Within the New National Science Programs of AAFC, there is a Research Theme 150, "Nutrient Cycling and Organic Residues", which focuses on many aspects of nutrient management, including manure management issues. Research activities will complement provincial activities related to nutrient management planning.

The National Theme Director is Dr. John Richards - richardsj@agr.gc.ca

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Recommendation 2 from 2001

"encourages the PMRA and OMAFRA to continue to work with the EPA and IR4 in order to reduce inconsistencies in availability of pesticides between Ontario and US producers, and recommends that funding available to the minor use registration process be increased to allow more products to move through the system"

Response (AAFC)

A new Pesticide Minor Use Initiative is being introduced across Canada and is expected to be harmonized with the US IR-4 Program.

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Recommendation 3 from 2001

"encourage the Ontario Apiculture and Pollination Research and Services Sub-committee to include research on bee kills in relation to the sweet corn industry as a research issue".

Response (Ontario Beekeepers Association)

The following resolution on this issue was passed unanimously at the December 2001 Annual OBA meeting:

Resolution #6:

Whereas beekeepers have no source of compensation for hives lost due to pesticide spraying, and Whereas determining blame in such cases have proven difficult, and Whereas the Pest Management Regulatory Agency collects and holds back 3% of the gross sales as a registration fee pesticide companies pay to have their products registered, Therefore be it resolved that the OBA work with Canadian Honey Council to lobby the Pest Management Regulatory Agency to establish a compensation fund for beekeepers with hive losses due to pesticides.

Obviously, pesticide use/misuse on sweet corn continues to be a concern for the beekeeping industry. The sight and stench of a beeyard hit by pesticides is revolting, very difficult to clean up, and a major financial hit. It is also a concern to cucumber growers who rent bees to pollinate their crop at the time when pesticides may be applied, affecting their production.

The attitude towards insecticides of the ON Apiculture and Pollination sub-Committee can be seen in Issue #4: concern over how Imidocloprid affects honey bees. It is on page 42 of our report. We can tell the regulatory agencies when there is a problem, and it is for them to deal with it.

I can see in your sweet corn report under #2 on page 4 a graduate project is mentioned. This is good, as long as it is independent and in depth enough to give accurate findings.

There seems to be frustration towards the beekeepers by the sweet corn growers about the registration

of Gaucho, page 6 of your report. The need to insure the safety of products within the larger environment has been one of the painful lessons hopefully learned in the last century. Frustration towards the beekeepers is a case of a "shoot the messenger" attitude towards a situation that will be resolved one way or the other as facts become clear.

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Issues

Pest Management

Issue

Maintaining a good inventory of pest control products is essential for the success of the sweet corn, pea and bean industry. As products are deregulated, work needs to continue to fill the gaps created by these losses, as well as provide new products for new pest problems (rust, flea beetle, aphids, angular leaf spot, common mosaic virus). Sustainable approaches to pest management, and products with reduced environmental impact need to be developed and evaluated in order to reduce the impact on beneficial insects.

Research inventory/current activities

Weed management research is conducted at the University of Guelph facilities at Ridgetown and Simcoe. Insect and disease management research is also conducted at Ridgetown College. Extension services for the sweet corn, pea, and bean industries are offered from the OMAF office in Ridgetown. Several projects at the main campus of the University of Guelph benefit the sweet corn and bean industries: one to evaluate the impact of Bt corn and new sweet corn insect management products on bee colonies, and the other which is investigating the incidence, tolerance and control methods of angular leaf spot in snap beans.

Gaps/barriers/deficiencies/opportunities

Present efforts in the area of pest management for sweet corn, peas, and beans are meeting the needs of the industry to the extent that they can, but it is essential that they continue. Deregulation of pesticides by the PMRA, before new replacements are in place continues to be a concern for Ontario sweet corn, pea and bean growers and processors. Often the holdup for new product registrations is not the efficacy and crop tolerance research, but the speed at which PMRA processes requests. This came to light recently when Lorsban was removed as an insecticide for seed treatment on beans; no replacement product is available.

Research is required in the area of contaminants in pea fields (slugs, snails) and methods need to be developed to minimize the impact of these pests.

A survey of the incidence of angular leaf spot in beans is needed in order to assess how widespread this pest is in Ontario.

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Nutrient Management

Issue

Current data which documents the utilization of nitrogen and phosphorous by a sweet corn, pea and bean crop over the range of environmental and soil conditions experienced in Ontario is lacking. Present nitrogen recommendations for sweet corn, as outlined in OMAFRA Publication 363, are felt inadequate to grow a profitable crop, and considerably lower than that recommended in other sweet corn producing regions (for example, neighboring U.S. states). Research which evaluates nutrient application timing and the environmental fate of essential crop nutrients is also lacking for sweet corn, peas and beans.

Research inventory/current activities

Research on the uptake and utilization of nitrogen on sweet corn grown on plastic mulch vs bare soil is being completed at Ag-Canada, Harrow. A project evaluating the yield response of sweet corn to nitrogen rates on several soil types, and the environmental fate of soil N is ongoing at Agriculture and Agri-Food Canada, Harrow. This study will also assist in developing a pre-side dress soil nitrogen test for sweet corn.

Gaps/Barriers/Deficiencies

Given the pending nutrient management legislation, effort needs to be directed towards providing research data to document nutrient utilization by sweet corn, peas and beans. Information on the loss of nitrogen through leaching and other means during crop development and after the crop is off, and the use of cover crops to trap nitrogen is required, as well as the impact of manures and soil amendments on nutrient planning. It needs to be recognized that the horticulture industry in general does not have the data available documenting crop nutrient uptake and utilization, to the extent that the field crop industry does, and needs time and funds to compile this information. Any new information dealing with nutrient management on these crops needs to be incorporated into new recommendations.

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Crop Culture**Issue**

In order to remain competitive, continued research is required on crop management to allow Ontario sweet corn, pea, and bean growers to provide a quality product in an efficient and economical manner.

Research inventory/current activities

Sweet corn management trials are presently being conducted at Ag-Canada, Harrow, and Ridgetown College. Variety trials are being conducted at Agriculture and Agri-Food Canada,

Harrow (fresh and processing sweet corn, beans), and Ridgetown College (processing sweet corn, peas).

Gaps/barriers/deficiencies/opportunities

Research needs to continue in the following areas:

1. Evaluation of plant populations, in row spacings, row spacings and their impact of yield and quality in sweet corn.

Specific production systems can be developed for certain varieties. This could include fertility programs as well.

2. Use of plastic mulches for advancing maturity; use of biodegradable mulches to offset environmental impact of conventional plastics
3. Identifying factors which contribute to stress and reduced productivity in sweet corn, peas and beans and identify varieties with tolerance to stressful growing conditions (moisture, air and soil temperature, soil characteristics, plant population). It is felt that certain varieties perform better under stressful growing conditions; these characteristics need to be identified and exploited.
4. Developing management systems for sweet corn, peas and beans with an emphasis on crop quality. Often earliness and yield are emphasized, at the expense of quality. Poor quality product on the market reflects poorly on the entire industry.
5. Soil management studies are required to maintain crop productivity. Studies on topics such as crop rotations, fertility, and the use of cover crops are needed
6. Variety evaluations need to continue in order to provide unbiased information to Ontario producers.

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Recommendations

Ontario Sweet Corn, Pea and Bean Research and Services Subcommittee

Recommendation #1

Issue

Lack of harmonization of pesticides between Canada and the U.S.

OASCC Linkage

OPMRSC

Target Agency

PMRA, AAFC, OMAF

Title

Minor use funding and coordination.

Details

The Sweet Corn, Pea and Bean Research and Services Sub-committee encourages the PMRA and OMAF to continue to work with the EPA and IR4 in order to reduce inconsistencies in availability of pesticides between Ontario and US producers

Background

Ontario growers continue to feel that they are at a disadvantage in terms of the availability of pesticides compared to U.S. producers. While there are still inequities, improvements are being made in coordinating the efforts of the PMRA and IR4. While this effort is recognized, there is a lot of work which needs to be done.

Overall, a system needs to be in place which will allow rapid evaluation and registration of new pesticide products. This is especially important when pesticides are deregulated, and new pest problems emerge.

Recommendation #2

Issue

The Sweet Corn, Pea and Bean Research and Services Sub-committee recommends that more funding be made available for research and on-farm implementation of nutrient management legislation.

OASCC Linkage

OSMRSC

Target Agency

OMAF, MOE, AAFC,

Title

Increase funding to support nutrient research and on-farm implementation in order to meet the requirements of the nutrient management planning legislation.

Details

Due to the all encompassing nature of the new Nutrient Management Legislation and its large potential impacts on many vegetable producers, and due to the significant requirements of new research information, Nutrient Management funding is required at two levels:

- a) to fund research programs necessary to fill gaps in the current agronomic knowledge base regarding nutrient sources, crop requirements, application timing and waste product utilization.
- b) to help defray the costs of nutrient management compliance to agricultural producers.

Background

Nutrient management planning requires information on crop nutrient response rates, crop uptake and utilization rates, and the fate of excess nutrients in the soil, to name a few. Coupled with the data required on a range of soil types and environmental conditions over several years, and the impact of manures, organic soil amendments, fertigation, and split applications on nutrient fate, a considerable amount of information needs to be collected.

Recommendation #3

Issue

The Sweet Corn, Pea and Bean Research and Services Sub-committee recommends that OMAF encourage its staff specialists to improve communications with private service providers (IPM, nutrient management), and establish a more formal approach to training activities

OASCC Linkage

OPMRSC

Target Agency

OMAF

Title

Increase communication and training by OMAF staff specialists to private service providers.

Details

Presently, OMAF staff specialists do not provide individual on-farm services, such as IPM services, nutrient management consultation, or general agronomy advise. They are however, involved in training activities with service providers such as initial IPM training for AIMS scouts. It is felt that their expertise should be utilized more by providing in-field follow up to initial IPM training activities, which would be to the benefit of the entire industry.

Background

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Recommendation #4

Issue

The Sweet Corn, Pea and Bean Research and Services Sub-committee recommends that on farm inspections for food safety and residue testing be coordinated.

OASCC Linkage

Target Agency

OMAF, CFIA

Title

Coordination of on-farm inspections

Details

There is grower concern over the number of different inspectors (at all levels of government) covering farm operations, particularly food safety and residue testing. There is a desire to see co-ordination in inspection activities and better information access for growers at the time of and following inspection activities. Inspectors need to better identify themselves and their purpose to growers

Background

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Ontario Tender Fruit Research and Services Subcommittee

Author:

John Cline - Chair

Ontario Tender Fruit Research and Services Subcommittee

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Executive Summary

The past year was a challenging season for the Tender Fruit industry. An early spring frost and extended summer drought lead to problems with adequate fruit volumes and marketable fruit size at maturity.

Surveys for plum pox virus identified additional infected trees, primarily in orchards and areas where the disease had been identified in the 2001 survey. Industry efforts to identify sources of PPV-free budwood outside of the quarantine zone have enabled propagation of trees for future replacements and new plantings. The demand for processing peaches is very high, and the processor is proceeding with plans for new plantings to meet this demand.

Important service milestones included the publication of six issues of the *Tender Fruit Grape Vine* newsletter; the Niagara Peninsula Fruit and Vegetable Growers' Association annual convention and trade show at Brock University in Feb., 2002; the distribution of trees of new selections by the Ontario Fruit Testing Association; an international workshop on plum pox virus in the spring of 2002 with attendees from Canada, the USA, Europe and the Australia, several new OMAF factsheets on Apricot, Peach, Nectarine, Cherry, Plum, and Pear cultivars.

Research highlights include continuing the breeding and evaluation of rootstock and variety/selections presently located at Vineland and Cedar Springs. Vineland researchers continue to participate in orchard management experiments and several grower/industry/research funded projects (ie CanAdapt) were continued.

The most important issues brought to the attention of the committee included:

- the detection and eradication of trees infected with plum pox virus
- the continued need for increased supplies of peaches and pears for processors, through expansion of the land base for production outside of traditional areas
- the need for fire blight control strategies in light of the future loss of streptomycin
- continued research support for the tender fruit industry through staffing the crop protection research positions at Agriculture and Agri-Food Canada, Vineland Station
- establishing and dealing with nutrient management concerns

The committee included pest management discussions and priorities. Most pest management research and extension staff attended the meeting and submitted reports to the committee.

The executive of the committee includes John Cline, Chair and Wayne Roberts, Vice-Chair and Secretary.

Introduction

This report was prepared by the "Tender Fruit Research and Services Sub-Committee of the Ontario Horticultural Crops Research and Services Committee". It summarizes the work of the subcommittee over the past year, especially the discussions at their November 4, 2002 meeting. Contained in this report is a summary of the accomplishments of the tender fruit industry, issues, research and service priorities and recommendations affecting the industry.

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Committee Activities

The Tender Fruit Research and Services Sub-Committee (TFRSSC) met on November 4, 2002, at OMAF-Vineland, under the Terms of Reference for the Committee to distribute reports of industry, research and extension activities. The reports summarized research and service activities including accomplishments. Research and service activities were reviewed and prioritized by the sub-committee. Research priorities submitted to the Committee by the Tender Fruit Section of the Ontario Pest Management Research and Services Committee were discussed and ranked by TFRSSC (Appendix). Pest management research and extension staff presented reports on pesticide updates and issues (see Appendix). A list of emerging and ongoing issues was reviewed and new items were added and discussed. After discussing the issues, recommendations were developed in the report for the parent committee. An updated membership list was accepted (Appendix). Dr. John A. Cline, University of Guelph, Department of Plant Agriculture, Simcoe, will serve as Chair, and Wayne Roberts from the Marketing Board will serve as Vice-Chair for 2002-2003.

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Industry Scan

2002 Growing conditions

After a mild winter in 2001/2002, the tender fruit industry was faced with a widespread frost on the Victoria Day weekend. This primarily affected cherry, plum, and pear production, as these crops were in bloom at the time of the frost. Peaches and apricots, were affected to a lesser but still significant extent. Production was affected by the killing of flower ovules as well as extremely poor pollination because of an extended period of inclement weather.

An extended period of hot dry weather which is not typical for the tender fruit areas of Ontario, persisted from June to September. Accessibility to water was a key factor in quality and quantity of production. Without irrigation, many tender fruit crops had difficulty reaching acceptable marketable fruit size, and there is some concern for the overall health of trees which were not irrigated. Despite the drought and spring frost, most major fruit crops came through with outstanding quality and good yields.

Market

Fresh peach volumes were down slightly by 3% over 2001, with an average price around \$992/ton. With the exception of Anjou, movement of most pear cultivars was down by 10 to 17% over 2001, with prices around \$904-945/ton. Movement of Japanese plum was down significantly, with stable prices around 1613-1690/ton. Sales of European plums were down by 8% over 2001, however prices increased to approximately \$1378/ton. Sales of sweet cherries was down 35%, nectarines -2%, processing peaches -16%, processing pears -17% over 2001.

Although clingstone peach tonnage processed again surpassed previous records, the Ontario crop was down slightly due to smaller fruit size resulting from drought conditions. Good weather enabled growers to delay harvest until the fruit was more ripe than usual and so obtain larger fruit size. The processing shortfall was made up with increased imports, and 2001 was the second year that imports exceeded domestic production. Demand is strong, with strong product sales. Kraft has embarked on an aggressive planting program to ensure long-term supply of processing clingstone peaches from Ontario growers.

The processing pear crop was down due to lighter fruit set and smaller fruit size, with fewer pear orchards having access to irrigation. Domestic production supplied only ~30% of processing requirements.

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Nabisco/Kraft Raw Product Summary

	Tons Processed in 1998	Tons Processed in 1999	Tons Processed in 2000	Tons Processed in 2001	Tons Processed in 2002
Cling Peaches - Domestic	6223	6985	7405	7087	6291
Cling Peaches - Imports	3241	5393	5697	7369	8401
Cling Peaches - Total	9464	12377	13012	14456	14392
Processing Pears - Domestic	3066	3728	5,178	3021	2740
Processing Pears - Imports	6,366	9,277	6,666	7746	8268
Processing Pears - Total	9,432	13,005	11,844	10857	11008
Domestic Total	9289	10,713	12,583	10028	9031
Imports Total	9,607	14,670	12,363	15261	16669
Total	18896	25382	24946	25312	25700

Nursery

The availability of trees for planting outside the PPV quarantine zone is the most challenging issue facing the nursery industry, especially sourcing budwood outside the quarantine zone. For fresh market cultivars, source trees have been identified and tested by CFIA, but the biggest gap is for processing clings for south-western Ontario. A Prunus certification program has been initiated (see TFRSSC recommendation 2000-7) that will address the short-term and long-term needs relative to adequate supplies of virus-tested nursery stock. Importation of trees from the US are a concern .

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Report of Action Taken on Previous Year's Recommendations

TFRSSC 2001-1

The TFRSSC recommends that, as part of a coordinated effort to eradicate plum pox virus in stone fruits in Ontario, research initiatives emphasizing the horticultural aspects of the disease are needed.

Response

No response to recommendation provided. It is recognized that AAFC has provided the UoG with \$300 K funding to address horticultural research on PPV including breeding and host susceptibility studies.

TFRSSC 2001-2

The TFRSSC recommends that the University of Guelph, Department of Plant Agriculture, complete the staffing of the stone fruit breeding position at Vineland Station

Response

Dr. Jay Subramanian began his tenure in Vineland as of August, 2002 replacing Dr. Neil Miles

TFRSSC 2001-3

The TFRSSC recommends that the PMRA improve the registration process for crop protection materials including biologicals and biorationals.

Response

No response provided

TFRSSC 2001-4

The TFRSSC recommends that AAFC-Vineland continue to provide crop protection research and support to the tender fruit industry by the timely staffing of positions in entomology, pathology and nematology.

Response

No response provided

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Emerging Issues

Loss of streptomycin for fire blight control

- Streptomycin is the only material registered for control of fire blight in producing orchards. Registration has been on an annual basis for years because of the issue concerning its use in plant agriculture resulting in antibiotic resistance in human pathogens. PMRA has requested a data package with studies and questions that amounts

to the equivalent of a complete submission package. The Canadian distributor (United Agri-Products) has requested this information from the US manufacturer/originator, but they do not have the required studies completed, and the Canadian market is too small to warrant the generation of the data for PMRA. The current review is likely to result in loss of registration by the end of 2003, putting an additional constraint on pear growers. Currently, the fire blight susceptible pear cultivars Bartlett, Bosc, Anjou, Flemish Beauty and Clapp's Favorite, account for almost all commercial pear production in Ontario. Fire blight tolerant or resistant cultivars are being recommended only for trial plantings.

- Non-antibiotic control measures are required. Development of resistant germplasm is the long-term approach to fire blight control, but cultivars currently in production are susceptible. Research is on-going in breeding for fire blight resistance using traditional breeding techniques, and in developing alternate control measures through a stimulation of plant defence mechanisms known as systemic acquired resistance (SAR).
- Impact of the loss of fire blight control include: reduction in pear production, and removal of pear orchards; reduction in raw product available for processing at a time that the processing industry has increased needs; interdependence of peach and pear processing to maintain economic viability of processing plant.

Black Knott of Plums

- It is generally agreed that the greatest impediment to the expansion of the Ontario European and Japanese plum industry is the wide prevalence of black knott. New research on chemical and management control methods are required. The University of Guelph, Vineland has several very promising selection with a range in ripening dates. Methods of controlling blackknott would hasten the uptake and viability of the plum industry.

High Density Peach, Nectarine and Plum Orchard Technology

- Greater efficiencies in productivity and harvesting, and improved fruit quality are gained through the use of higher-density, size-controlling orchards. Research on such technologies are becoming available with new germplasm (ie, dwarfing cherry rootstocks, peach trees with columnar growth habits, more dwarfing pear and plum rootstocks).

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Research Priorities (Similar to those reported in 2001)

It is recognized by TFRSSC that there are inter-relationships between these priorities and integrated approaches will provide the best opportunities for progress. With the expansion of the peach industry into new areas, winter hardiness will be a consideration in breeding, orchard management and plant nutrition research objectives.

Breeding and germplasm improvement for resistance to pests, diseases and abiotic stresses

- an integrated approach to breeding and germplasm improvement will help sustain the tender fruit industry and maintain its prominent place in Ontario.
- Specific breeding objectives will include:
 - assess germplasm for PPV resistance and screen new potential imports
 - maintain input especially cling stone breeding program
 - fire blight resistance important for pear breeding
 - continuing need for suitable late season processing peach and pear cultivars

- winter hardy processing peach cultivars for new plantings in the Lake Erie North Shore area

IPM for pests and diseases - include FQPA considerations

- maintain research on mating disruption trials for control of OFM and other pests

Orchard Physiology and Management

- An integrated approach to conducting orchard physiology and management research will help sustain the tender fruit industry and maintain its prominent place in Ontario.
- To meet the demand for processing peaches, it is anticipated that new orchards will be planted outside the traditional production areas, such as in the most favoured climates north of Lake Erie. Evaluation of productivity, adaptability, and longevity of processing cultivars outside the traditional growing regions of the Niagara Peninsula and South-Western Ontario is required
- Additional research objectives include:
 - orchard training systems for higher density, improved fruit quality, production and harvest efficiency.
 - irrigation systems including trickle and sub-surface drip irrigation for water conservation and prevention of pesticide contamination into the groundwater.
 - scion-rootstock interactions in cherry, plum, peach and pear, for tree size control (dwarfing for high density orchards), disease resistance, improved tree habit, hardiness, and production efficiency
 - plant bio-substances
 - gibberellins to regulate flowering and fruiting in order to minimize hand thinning and optimize fruit size
 - ethephon and soybean oil to delay bloom and to construct models to estimate the reduction in risk of crop damage due to spring frosts.

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Plant nutrition and nutrient management

- need to review OMAF nutrient recommendations for orchards
- uptake and removal of nitrogen in a perennial crop (tree) system - impact on timing of fertilizer applications
- review nitrogen and nitrogen:potassium balance
- look into environmental and water quality issues
- interactions: effects of plant nutrition on winter hardiness, fruit quality, storage, etc

Post-harvest and fruit quality

- control of brown rot and other postharvest pathogens of all tender fruit
- regulation of fruit ripening for improved quality at harvest and extended storage and shelf life
- prevention of mealliness or chilling injury of peaches and nectarines
- modified atmosphere packaging
- value added products

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Service Priorities (not ranked)

1. The provision of economic information for tender fruit crops

2. Training of IPM personnel

- pest and disease monitoring with consultants, no longer with OMAF
- need to ensure scouting personnel are trained sufficiently
- Assist in commercial implementation of mating disruption techniques for control of oriental fruit moth

3. PPV education

- Tender Fruit Marketing Board lead on prunus certification program

4. Servicing of Tender Fruit Growers Outside of Niagara

- Some growers from outside the Niagara region are concerned about the availability of adequate OMAF and/or private industry support to help service their tender fruit crop needs.
- It was the opinion of some that "AIMS" was not adequately meeting their needs
- One example given was that growers need to be adequately educated with regard to new disruptive pheromone technology available for OFM and other pests. The availability of consultants and/or OMAF extension personnel is not meeting grower expectations.

5. Safe and Healthy Food

- Food quality certification programs are becoming increasingly important in establishing a clear link between point of origin and the consumer. Continuation and expansion of food quality assurance programs will ensure that the tender fruit industry is able to address the high priority it places in this service.
- improved information on the value added nutritional and nutraceutical components of tender fruit crops is warranted

6. Water Quality/irrigation

- Provision of services to ensure efficient use of water, methods of reducing environmental impact from irrigation practices, and strategies to ensure a reliable and high-quality water source is available to the horticulture industry are paramount to the tender fruit industry.

7. Nutrient Management Plans and the Nutrient Management Act

- Provision of services to ensure adequate grower education of Act
- Grower participation in planning process
- Desire government research and support in determining the impact of forthcoming legislation on the tender fruit industry

8. Sound, Objective Financial Information for Growers

- many growers are not aware of and how to apply for government-funded programs
- improved and/or expanded financial services to help educate grower of, for instance, NISA, SDRM, and tax incentive programs are requested

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Research and Development Recommendation 1

To: OMAF, U of G, AAFC

TFRSSC 2002-1 Critical Mass Staffing of Tender Fruit Personnel

Background

The OTFPMP challenges the research and extension services that the critical mass required to service the industry is shrinking and critical services are not being addressed.

Details

The TFRSSC is concerned about the erosion of research and service support in various aspects of tender fruit production. These concerns relate to:

1. The OMAF sprayer application specialist position (formerly in Simcoe) is vacant. This position is very important in providing education and training pertinent to sprayer application technologies to prevention pesticide contamination and minimize pesticide residues (OMAF)
2. Growers rely on research and recommendations for control of pests, diseases and nematodes in order to maintain a high level of fruit production. Several pests and diseases have been identified by TFRSSC, and IPM of pests and diseases is included in the research priorities of this committee. Alternative control measures are required as the industry faces review of currently registered materials. The vacancies at AAFC, Vineland to provide nematogology, entomology and pathology research are an outstanding concern to the TFRSSC. The Nematology position became open when Dr. J. Potter retired in early 2002. TFRSSC recommends that staffing action be initiated and completed so that vacant positions in entomology and pathology are filled prior to the 2003 growing season. This is a revision and re-submission of TFRSSC Recommendation 2000-8 (OHCRSC 68) and TFRSSC Recommendation 2001-4
3. With the recent loss of the plant nutrition program (Derkacz) at the University of Guelph, Vineland Campus, the TFRSSC reflected it grave concern for lack of research and support in plant nutrition in tree fruit and activities surrounding NMP for perennial horticulture crops. At a time when increased research inputs into nutrient management are needed, the University/OMAF have eliminated research in this area on tender fruit.

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Research and Development Recommendation 2

To: OMAF

TFRSSC 2002-2 Complete Tender Fruit Cost of Production Publication

The TFRSSC recognizes the importance of current economic information pertaining to the cost of production of tender fruit crops. Currently, some of this information is out of date and/or only available electronically. The committee requests that OMAF make available printed information on the current economics (cost of production, etc) of the tender fruit industry

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Appendix 1: Terms of Reference of Committee

The Tender Fruit Research and Services Sub-Committee is a subsidiary of the Horticultural Crops Research and Services Committee.

Membership is made up of representatives of the industry, including growers, organizations and companies; government agencies providing services and scientists; and affiliated industries such as processors and dealer-shippers.

The Sub-Committee meets on an annual basis to receive reports, review research and service activities, evaluate the state of the industry and make recommendations to the parent committee on matters of research, services and concerns of the industry.

Officers are elected for a period of two years and they are Chair and Vice-Chair (who also serves as recording secretary).

Officers for 2000-2001: Chair Dr. David Hunter (AAFC); Vice-Chair Mr. Wayne Roberts (OTFPMB)

Officers for 2002-2003: Chair: Dr. John Cline, (U. of Guelph); Vice Chair: Mr. Wayne Roberts, (OTFPMB)

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Ontario Tomato Research and Services Subcommittee

Author:

John Warner - Chair

Ontario Tomato Research and Services Subcommittee

Creation Date:

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Last Reviewed:

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Ontario Horticultural Crops Research and Services Committee

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State of the Industry

The 2002 crop year began with cool, wet conditions and with wide spread frost over the Victoria day long weekend in May, considerable plant loss and replanting was required. Growing conditions were generally dry during the main part of the growing season. However, many areas received rains at critical times, and with the assistance of irrigation and the drought tolerant tomato plant, the crop came through very well.

Processing tomato production is expected to increase in the future due to anticipated expansions in processing capacity. Processing yields are also expected to increase, partly due to an increase in the use of irrigation. Irrigation, especially on the lighter soils is increasing, and this trend is expected to continue in the future with the addition of more drip irrigation systems. Availability of water and water quality will become more of an issue. Although diseases were not a serious problem in most fields in 2002 because of dry conditions, control of bacterial diseases remains a high priority for both processing and fresh market growers.

The combined farm value for both processing and fresh market tomatoes in Ontario for 2001 was \$63,466,000. This represents an increase of approximately 11.6% from the 2000 value of \$56,078,000. Although figures are not available for 2002, the combined farm value should increase due to higher processing yields and an increase in the processed tonnage in 2002 compared to 2001.

a) Processing Tomatoes

Table 1. Recent trends in the Processing tomato industry in Ontario (Sorted by Year): (Sources: OPVG, OMAF Publication 20 and OMAF website)

* includes fresh market acreage.

	Contracts	Measured Acres	Processed Tonnage*	Avg. Yield (tons/ac)	Gross Farm Value
1993	275	19,206	510,000	26.5	\$53,040,000
1994	237	19,834	575,000	28.9	\$59,336,000
1995	228	18,578	578,000	31.0	\$60,619,000
1996	222	15,940	502,000	31.2	\$52,475,000
1997	192	14,800	497,000	33.3	\$50,310,000
1998	183	15,060	562,000	37.0	\$52,475,000
1999	187	16,680	545,000	32.0	\$57,291,000
2000	173	15,810	450,000	28.4	\$44,238,000
2001	173	16,822	533,625	31.6	\$50,866,000
2002	176	17,088	619,350	36.2	N/A

Processing harvest began about 7 to 10 days later than normal, however, good harvesting conditions in the fall allowed all the major processors to reach or exceed their expected pack. Processing yields were reported at 36.2 tons per acre in 2002 which was near the record yield of 37 tons/ac in 1998. Fruit quality was generally good with no major insect or disease problems encountered in 2002. Bacterial diseases were a concern in a few fields. Lower than normal soluble solids was a concern in some irrigated fields. Because of the research and infrastructure in place (breeding, transplant production system, irrigation, production and harvesting practices, processing capabilities) and a little help from mother nature (frost free fall harvest period), a near disaster in 2002 was turned around into a near record crop.

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b) Fresh Market Tomatoes

As with the processing crop, cold weather and frost delayed planting and slowed early growth of plants. In spite of dry weather during much of the growing season, yields were near normal.

Table 2. Recent trends in the Fresh Market tomato industry in Ontario (Sorted by Year): (Source: OMAF Publication 20 and OMAF website)

	Harvested Acres	Farm Value
1992	7,500	\$32,055,000
1993	5,910	\$43,633,000
1994	6,308	\$36,705,000
1995	5,217	\$26,454,000
1996	5,714	\$22,603,000
1997	5,500	\$19,800,000
1998	2,325	\$10,866,000
1999	2,200	\$11,400,000
2000	2,115	\$11,840,000
2001	2,200	\$12,600,000
2002	N/A	N/A

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Emerging Issues and Concerns

Fresh market and greenhouse tomato marketing

One of the major chain stores in Ontario is marketing greenhouse tomatoes during the field tomato season in 3 litre baskets, giving the impression that they are field tomatoes. There is concern that this could seriously damage the field tomato market, particularly if other chain stores refuse to buy field tomatoes. The fresh market growers need input on varieties or production methods that will allow them to produce the tomato that the consumer wants and that will compete effectively with greenhouse tomatoes. Cultivar evaluation to improve shelf life, firmness and eye appeal, and investigating staked tomato production systems to improve tomato quality was suggested as possible solutions.

Herbicide residues

In some cases, herbicide residues are thought to be interfering with tomato production. There is a need to carry out plant back studies to determine the carry over effects of herbicides to subsequent crops. This research is presently being carried out at AAFC, Harrow and U. of G., Ridgeway.

Roundup drift

The incidence of roundup drift from other crops and field borders hurting tomato is a concern. Although ongoing, education is still required to alert growers of this problem and to suggest solutions.

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Research and Services Accomplishments and Subcommittee Activities

Subcommittee Activities

The Ontario Tomato Research and Services SubCommittee met on Nov. 14, 2002 to discuss state of the industry, research and service activities, research and service issues/priorities, to prepare recommendations to the OHCRSC and the OPMRSC, to prepare a list of minor use priorities, and to review the subcommittee membership list. A special recognition was provided for long time subcommittee members, Vaino Poysa, AAFC, Harrow and Dale Smith, H.J. Heinz, Leamington as these individuals will be moving to other areas of work.

Breeding and Cultivar Development

The tomato breeding program at AAFC, Harrow has been discontinued and breeding lines were transferred to U. of G., Ridgetown College and to private sector tomato breeders in Canada. The Ridgetown breeding program is shifting goals toward providing a continued source of enhanced germplasm for OTRI member breeders who breed new cultivars specifically for Ontario conditions.

At AAFC, Harrow, in 2002, tomato lines were evaluated for agronomic characteristics and resistance to diseases. Interspecific breeding material from wild sources were evaluated and 446 plants were selected for further evaluations. Crosses were made to transfer a range of traits to broaden the genetic base of adapted tomato. Simple sequence repeat genetic markers were used to identify genes for resistance to diseases (powdery mildew) which will assist in the selection of traits of interest in breeding programs.

At U. of G., Ridgetown, breeding to exploit sources of vertical resistance to diseases (controlled by single genes) was continued. In addition, work will expand to select for horizontal resistance (multi-gene resistance). One synthetic population has been created for development of anthracnose resistance. Thirty five entries in the processing tomato yield trial were evaluated at 3 locations in Essex and Kent counties. Data on yield, quality, canning recovery and processing quality were obtained.

Evaluation of 8 fresh market tomato lines from private breeding programs was carried out at AAFC, Harrow. SVR 0334 and SVR 0336 (Seminis Seeds) continue to show promise as early maturing cultivars and one of these is expected to be named and introduced.

Trickle Irrigation

The OPVG sponsored a Drip Irrigation Tour in the Leamington area on June 20, 2002. This was very well attended and gave growers a chance to see drip irrigation setups in several grower fields as well as hear about irrigation research projects. A farm scale study was initiated to determine the effects of surface and subsurface drip irrigation and fertigation on tomato yield and quality, and on water and nutrient use efficiency of processing tomato. Another study was initiated to

determine the optimum rate of nitrogen and phosphorus for yield and quality of processing tomato under trickle irrigation.

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Nitrogen Fertilization Management

A 4 year study to determine nitrogen fertilizer requirements on a sandy loam soil for processing tomato cultivars was completed. Although total and marketable yield were influenced by N rate, quality parameters such as fruit colour, size, firmness and soluble solids were generally not affected by N rate.

Row Spacing Management

A study was initiated to determine the optimum row spacing for 2, high vigour, late maturing processing tomato cultivars.

Crop Protection

Work is continuing to develop PCR-based assays to detect bacterial diseases. It is essential that we have rapid, efficient and reliable methods to quantify bacterial populations on tomato seeds and symptomless plug transplants so that an adequate assessment of the disease threat presented by these inoculum sources can be determined. A project was initiated to develop a method for quantifying bacterial pathogens on greenhouse tomato plug transplants. Sampling the bacterial spot pathogen in Ontario fields has determined that the race complex is changing. *Xanthomonas gardneri* (a highly virulent type) and race 3 of *X. campestris* pv. *vesicatoria*, which were considered rare in Ontario are becoming more prevalent.

Pinnacle received minor use registration for weed control in tomatoes and Prism received a label expansion to include fresh market tomatoes in 2002. Studies were continued to evaluate new products and herbicide combinations for control of problem weeds and to assess crop tolerance to various herbicides. Trials to assess tank mixing herbicides and fungicides were also carried out.

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Extension Activities

A nitrogen verification project to gather data on nitrogen use throughout the season was initiated. Vegetable content on the OMAF web site is being reviewed and updated. A record of temperatures and photographic record of frost damage in several processing tomato fields in the spring of 2002 was carried out. Environmental impact quotients were calculated for common tomato pesticides and pest management programs for processing tomato. Numerous meetings were planned and held as well as ongoing consultations with grower groups, consultants and industry representatives, and numerous printed articles (newsletters and other articles) and radio reports were prepared and disseminated.

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Responses to 2001 Recommendation

Recommendation 1: Access to Crop Protection Materials/Minor Use Registrations

Improved access to newer, safer, more environmentally friendly and biocontrol materials through the URMULE and URMUR programs is required.

It is recommended that:

- Equal access to new pest control products available in the US be provided to Canadian growers and this can be accomplished with shared registration and residue levels set at the same time and at the same levels as the US. Canada still has a number of registration requirements unique to Canada which increases the cost of Canadian registrations, slows the process and often results in denial of access to products in Canada (Health Canada, PMRA).
- The registration process be speeded up so that Canadian farmers have access to the newer products at the same time as their US counterparts (Health Canada, PMRA).
- An office for minor use be established in Canada to expedite minor use registrations in Canada (AAFC and Health Canada).
- Adequate funding for the URMULE and URMUR programs be provided. AAFC should continue to fund projects at the 75% level. It is also suggested that OMAFRA split the remaining cost with grower commodity groups (AAFC, Policy Branch and OMAF).
- AAFC and the University of Guelph provide GLP compliant facilities to ensure that residue and other data development work required to support the minor use program may be carried out (AAFC Research Facilities in Ontario and University of Guelph).

Responses

The recommendation was forwarded to the Ontario Pest Management Research and Services Committee

From Jim Chaput, OMAF, Minor Use Coordinator for Ontario

Agriculture and Agri-Food Canada (AAFC) has made a significant monetary commitment to minor use and will be establishing an "IR-4-like" structure in Canada over the next year. Six federal research stations have been identified to become GLP minor use centers where field efficacy, crop tolerance and residue trials will be done for nationally prioritized projects. The Pest Management Regulatory Agency (PMRA) has also committed to putting in place more personnel to deal with minor use projects. A new minor use advisor (Ms. Imme Gerke) has already been appointed. Additionally the PMRA has published a directive supporting the submission of EPA reduced risk products and biopesticides. Jim Chaput provided additional comments on the minor use program and minor use activities at the subcommittee meeting held on Nov. 14, 2002.

From Bruce Bowman, AAFC

The Pesticide Minor Use Initiative is happening across Canada. It will be critical that growers and grower groups work with the provincial minor use coordinators to ensure that their plant protection requirements are brought forward to them by March or each year for consideration in the national priority list.

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(The following comments pertains to portions of the Recommendation).

AAFC is currently organizing a Pesticide Minor Use Centre in concert with the provincial minor use coordinators; the Centre will operate out of Ottawa, using regional field facilities. The Centre is expected to be operational by April 1, 2003. Grower Groups that have need of pesticide registrations are encouraged to contact their regional Pesticide Minor Use Coordinator (Mr. Jim Chaput for Ontario) to get the compound on the national priority list by March 15 of each year, so that it may receive due consideration.

There are 7 AAFC hubs across Canada, including Harrow, Delhi, Vineland and St-Jean-sur-Richelieu that are expected to be GLP compliant by the 2003 growing season as part of the Pesticide Minor Use Initiative. Harrow and Agassiz, BC are already GLP compliant.

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Research and Service Issues/Priorities

There is a need for ongoing research funding to support the tomato industry and technology transfer is also very important. The research and service issues/priorities have not changed and can be seen in full detail in the 2001 report on the OMAF web site. The following highlights the research and service issues.

Breeding and Cultivar Development

The availability of suitable cultivars is essential for the tomato industry to continue in Ontario. The Ontario breeding program has been a key factor in maintaining the competitiveness of the processing industry and has played a major role in yield and quality advances made over the last 15 years. Current research efforts are addressing the opportunities that will continue to provide a basis for sustained development of the Ontario processing tomato industry. Emphasis should be placed on earliness, disease and pest resistance, reduction in mould counts, fruit firmness, peeled colour, field storage capability and field and factory yield. Bacterial diseases have been a persistent industry problem and breeding to select for field resistance (horizontal resistance) should be emphasized. A change has occurred in that the tomato breeding program at Harrow was discontinued and the breeding objectives at Ridgely have changed somewhat.

Cultivar evaluation for fresh market tomatoes should also continue.

Access to Crop Protection Materials/Minor Use Registrations

Improved access to newer, safer, more environmentally friendly and biocontrol materials through the URMULE and URMUR programs is required. The following concerns need to be addressed:

1. Canadian growers require equal access to new pest control products available in the US and this can be accomplished with shared registration and residue levels set at the same time and at the same levels as the US. Canada still has a number of registration requirements unique to Canada which increases the cost of Canadian registrations, slows the process and often results in denial of access to products in Canada.
2. The registration process needs to be speeded up so that Canadian farmers have access to the newer products at the same time as their US counterparts.
3. An office for minor use should be established in Canada to expedite minor use registrations in Canada.
4. Adequate funding for the URMULE and URMUR programs is required. AAFC should continue to fund projects at the 75% level. It is also suggested that OMAFRA split the remaining cost with grower commodity groups.
5. AAFC and the University of Guelph need to provide GLP compliant facilities to ensure that residue and other

data development work required to support the minor use program may be carried out.

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Pest Management in Fresh and Processing Tomatoes

The sustainability of the tomato industry depends on safe, blemish free produce. Continued research efforts are needed to address the current and new insects, diseases and weeds that compete with the production of tomatoes. The focus should be to identify safe and effective pest control materials such as herbicides, fungicides and insecticides, their proper rates, timing and application. Delivery mechanisms for the implementation of IPM programs in Ontario are required.

The following are the issues that need to be addressed:

1. Bacterial diseases are persistent problems for both processing and fresh market growers. The development of diagnostic tools and management/control strategies, including biological control, disease screening of seed and improved methods for detection of bacterial diseases in seed and transplants is a high priority.
2. New pest (insect, disease, weed) control product development should remain a focus for tomato research in Ontario.
3. Adequate diagnostic services for the identification of insects, diseases and weeds. An improved diagnostic service for bacterial diseases is required (PCR based).
4. Erosion of IPM support by the public sector.
5. Improved use of the Ontario Weather Network for delivery of pest modelled information, IPM programs, irrigation scheduling.
6. Pesticide registrations for the greenhouse tomato seedling industry.
7. The organic market for both fresh and processing tomatoes is generating interest. There is essentially no research to assist any of these growers to adopt this technology.
8. Food safety.
9. Effect of new cultural practices on pest management.
10. Effect of production practices on productivity of soils.

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Crop Water Management Through Irrigation and Fertigation

Research in the area of crop water management through efficient and environmentally benign irrigation and fertigation techniques is required.

The following areas require more research:

1. Efficient use of irrigation water to maximize yield and quality. More research is needed on scheduling of drip irrigation for tomatoes on a variety of soil types. What is the effect on tomato fruit quality such as soluble solids? What is the cost effectiveness of fertigation?
2. Water use restriction. Under drought conditions, water use restrictions are likely. More research is required to determine the critical stages for irrigation and to determine the impact on yield, quality and crop returns with restrictions on water use at various times.
3. Water quality. More research is required in the area of impact of irrigation water quality on yield and crop quality and food safety concerns.
4. Irrigation use expansion - availability of water sources.

Nutrient Management

Nutrient management research including evaluating current recommendations through crop response research (crop uptake/removal of nutrients and effects on nutritional aspects of tomato), assessments of nutrient application technology, best management practices, nutrient application timing and the environmental fate of essential crop nutrients, with particular attention to nitrogen and phosphorous, is required.

The following areas require more research:

1. Basis for the phosphorous recommendations. The nitrogen and potassium recommendations have had some work in the past 10 years, but few if any people appear to know the basis for the phosphorous recommendation. The phosphorous recommendation needs to be updated.
2. Losses/leaching. Information on the loss of nitrogen through leaching and other means during and after the crop and the use of cover crops to trap nitrogen is required.
3. Split application. Information on the efficient use of fertilizer and how to use split applications of fertilizer to best advantage with the least impact on the environment is required. The question of fertigation with many scheduled feedings is part of this.
4. Reduced tillage. The impact of reduced tillage on nutrient management is required.
5. Cover crops. Information on the uptake and predicting the release of nutrients is required.
6. Manure use and organic amendments. How does this impact on nutrient planning?

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Availability of Suitable Land and Land Selection

Some of the yield enhancement that has occurred in the last several years has resulted from growers renting or purchasing land that has never been used for tomato production. This land produces heavy crops of tomatoes for the first few times it is used, but production seems to decline rapidly after the 2nd or 3rd crops. Cost effective methods to combat the 'replant syndrome' should be investigated, including proper field selection, tillage systems, irrigation and fertility practices, the use of soil amendments including cover crops, fumigation, different crop rotations and choice of herbicides.

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Service Issues/Priorities

Diagnostic services

Diagnostic services for the identification of insects, diseases and weeds are presently provided by the Pest Diagnostic Clinic, University of Guelph as well as by OMAF personnel and private industry consultants. Diagnostic services for bacterial diseases using PCR technology is presently lacking. Bacterial disease control in tomatoes is based on using 'clean' seed and growing plug transplant in a 'clean' environment. Detection of small numbers of bacterial cells on or in seed and on greenhouse plug transplants is important to determine the need for seed treatment and to identify the risk of bacterial contamination in the crop from plug transplants. PCR techniques for bacterial disease identification have been developed by AAFC, London but no PCR based diagnostic services are presently available to the tomato industry. Private laboratories that could offer PCR based diagnostic services are being investigated.

Pest monitoring/scouting

Pest control programs in tomato are based on insect, disease and weed monitoring to determine the need for and timing of pesticide applications. Pest monitoring services are presently offered by private consultants hired by growers or industry consultants. OMAF offers training for IPM scouts. The following deficiencies were identified:

- a. A degree day model for variegated cutworm is required.
- b. Updated disease and pest monitoring information is required (OMAF).
- c. There is a need to pool information collected by OMAF, industry and private scouts and agreement was reached to do this.
- d. Good diagnostic services are required (see above).

Ontario Weather Network (OWN)

The OWN presently collects and provides important weather information for IPM and TomCast (tomato disease warning model) and should be continued. Weather data could be available and used for other purposes such as irrigation scheduling.

Soil testing

Existing services offered by private laboratories are considered adequate.

Nutrient Management Planning

Legislation passed in 2002 will require that all growers eventually have a nutrient management plan (NMP) for their farm. Regulations pursuant to the legislation are being developed. Publicity is required to ensure that all grower are aware of the act and regulations, as well as the time frame for implementation depending on their type of farming operation. Grower support and resources will be required for farmers to prepare the required NMP. Several private groups have indicated that they will be providing services or kits for the preparation of NMP.

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