



Pesticide Innovation Program Contracts 1995-1996

This document describes the Pest Management Regulatory Agency's Pesticide Innovation Program. Introduced in 1994, this Program contracts with Canadian industry, universities, and government and non-government organizations to pursue the objectives of the Pest Management Regulatory Agency.

A total of 34 contracts were awarded through the six regional offices for the 1995-1996 fiscal year. Details of these projects are outlined in this document.

For more information on Pesticide Innovation Program contracts, please contact the Regional Pesticide Officer in your area (see the Appendix for listings).

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1.0 Background

On April 1, 1995, staff and resources for pest management regulation in Canada were consolidated in the Pest Management Regulatory Agency (PMRA) under the Minister of Health. The mission of the PMRA is:

To protect human health and the environment by minimizing the risks associated with pest control products, while enabling access to pest management tools, namely, these products and sustainable pest management strategies.

The Pesticide Innovation Program (PIP) of the PMRA contracts with Canadian industry, universities, and government and non-government organizations to pursue the objectives of the PMRA.

For more information on the Pesticide Innovation Program, contact the Regional Pesticide Officer in your area (see the Appendix).

2.0 PIP in Progress

2.1 Atlantic Region (includes Nova Scotia, New Brunswick, Prince Edward Island and Newfoundland)

Principal Contact: Neil McTiernan

2.1.1 Reducing Domestic Pesticide Use

Project Name: Reducing Domestic Pesticide Use Fact Sheets

Location: Kentville, Nova Scotia

Objectives:

- 1) To create four new fact sheets to add to the 20 already in existence.
- 2) To place all 24 fact sheets on the Internet.
- 3) To establish a distribution list of domestic pesticide retailers and garden centres in Nova Scotia and mail fact sheets to them.

Contractor: Nova Scotia Department of Agriculture and Marketing - Plant Industry Branch

PMRA Cost: \$7,700

Many Atlantic Canadians are involved in home gardening; lawn, tree, shrub and flower bed maintenance, and vegetable gardening.

Public concern for environmentally sensitive landscaping has inspired the provincial Departments of Agriculture and Environment to provide recommendations for alternatives to pesticide use which will also provide dependable results.

The Pesticide Innovation Program, in the 1994-95 fiscal year, contracted for the development of 20 fact sheets. They were prepared in order to create awareness among home gardeners of an integrated approach to plant maintenance and gardening through the promotion of cultural control, beneficial insects and the safe use of domestic pesticides. This year, four new fact sheets have been developed, which provide information on gardening for butterflies, gardening for hummingbirds, the use of nematodes for pest control, and organic fertilizers for the commercial landscape industry. These fact sheets emphasize cultural controls and reduced pesticide use. The safe use of pesticides is stressed throughout.

The fact sheets are available in all Nova Scotia Department of Agriculture and Marketing offices and on the Internet. They have been promoted at garden club meetings, industry meetings and trade shows.

A report has been completed.

2.1.2 Pesticide Safety and Integrated Pest Management

Project Name: Domestic Pesticide and Integrated Pest Management Awareness Program

Location: St. John's, Newfoundland

Objective: To educate consumers with respect to the safe use of pesticides and to encourage the use of Integrated Pest Management techniques.

Contractor: Department of Environment and Lands - Pesticides Control Section

PMRA Cost: \$8,000

Every year, Atlantic Canadians are poisoned through the use of pesticides. Many of these poisonings could be avoided if users were aware of the risks involved and if they knew the measures to take to prevent accidental exposure to children and bystanders.

In an effort to reduce the number of poisonings related to domestic pesticide use in Atlantic Canada, the Newfoundland Department of the Environment has developed 15 information sheets, with illustrations and aspects of safe and efficient control, for the most common/significant insect or weed problems in Atlantic Canada. Precautions regarding pesticide use are clearly outlined. The information sheets also outline

alternatives for control using techniques other than those involving synthetic chemical use. Proven biological and/or mechanical pest control measures are described, including commonly available household compounds that the homeowner can combine safely to use as an insecticide or herbicide.

A single information sheet has also been produced which describes the federal and provincial regulatory systems. In addition, a domestic pesticide safety brochure was produced which describes basic safety considerations, first aid procedures and other relevant information such as phone numbers for poison control centres and local Environment Departments.

The information sheets and safety brochures are on display in pesticide retail outlets and regional government offices in the four Atlantic provinces.

A report detailing the approach used to develop the information sheets has been completed.

2.1.3 Promotion of Pesticide Safety and Integrated Pest Management

Project Name: Domestic Pesticide and Integrated Pest Management Awareness Program - Reproduction, Promotion and Dissemination

Location: Charlottetown, Prince Edward Island; Fredericton, New Brunswick

Objective: To reproduce, promote and distribute the Integrated Pest Management information sheet booklet and domestic pesticide safety brochure (see section 2.1.2).

Contractor: P.E.I. Department of Environmental Resources Division; P.E.I. Department of Agriculture, Fisheries and Forestry; New Brunswick Department of the Environment - Pesticide Management Unit; New Brunswick Department of Agriculture, Fisheries and Forestry

PMRA Cost: P.E.I.: \$3,500
N.B.: \$3,500

A Domestic Pesticide and Integrated Pest Management Awareness Program has been developed through a cooperative effort involving the four Atlantic provinces, Agriculture and Agri-Food Canada, Health Canada and Environment Canada.

The purpose of the Program is to educate the general public in the safe use of domestic class pesticides.

The Program has two main components. The first involved the development of a

safety brochure for domestic pesticide use (see section 2.1.2). The second component of the Program involved the production of an information sheet booklet on the 15 most common/significant domestic pests in the Atlantic region (see section 2.1.2).

In cooperation with the Newfoundland Department of Environment and Lands, the P.E.I. contractors for this project will print and arrange for the promotion and distribution of 55,000 copies of the safety brochure and 4,000 copies of the fact sheet booklets.

Approximately 40 distribution sites have been identified (government offices and garden centres) as locations where the public can obtain the fact sheet booklets. The safety brochure will be mailed to every home in P.E.I. (48,656 homes).

To strengthen the promotional effort, and to identify locations where the fact sheet booklets and the safety brochures are available, advertisements will be placed in local papers in P.E.I. and other Island publications.

This is the first year of a two-year project in P.E.I. Most of the dissemination of information will take place during the 1996-97 fiscal year through contracts with Canadian industry, universities, government and non-government organizations.

The New Brunswick contractors have printed and translated the fact sheets and brochure. In order to promote the information, advertisements will be placed in local newspapers and other publications. The ads will describe the type of information that is available and direct the public to locations where it is available. A poster advertising the availability of the fact sheets and brochure will be displayed at garden centres in New Brunswick.

2.1.4 Computer-Based Training for Applicators

Project Name: Computer-Based Training Program for Pesticide Applicators in the Atlantic Region

Location: Fredericton, New Brunswick

Objective: To develop a working pilot module to show how computer-based training systems can be utilized to effectively teach sprayer calibration.

Contractor: New Brunswick Department of the Environment - Pesticides Management Unit

PMRA Cost: \$15,000

The provincial governments of New Brunswick and P.E.I. require pesticide applicators to take a certification course if they will be applying commercial or restricted class pesticides. One component of the certification course deals with calibration of spray equipment. Often, growers are not able to grasp the fundamentals of sprayer calibration when explained through conventional teaching methods.

This project involved the compilation of reference material on calibration and the subsequent inputting of information into a pilot computer-based information and training module. This module allows individuals to proceed through the sprayer calibration component of the certification program at their own pace. The module is interactive and is available for refresher training at any time.

A report on the project has been completed.

2.2 Québec Region

Principal Contact: André Caron

2.2.1 Measuring the Impact of Pesticides

Project Name: Development of Indicators for the Measurement of the Impact of Pesticides on the Environment: Available Approaches

Location: Québec City, Québec

Objectives:

- 1) To perform a literature review of the principal methods proposed for the classification of pesticides on the basis of their potential impact on users and on the environment.
- 2) To propose a method of classification of pesticides for Québec.

Contractor: Ministère de l'Agriculture, des Pêcheries et de l'Alimentation du Québec (MAPAQ) - Direction de l'environnement et du développement durable; Richard Poulin, conseiller en environnement.

PMRA Cost: \$7,700

Canada has one of the best pesticide regulatory systems in the world; however, contamination of the environment and adverse effects on human health associated with the use of pesticides still do occur. For these reasons, the MAPAQ set itself objectives to rationalize and reduce the use of pesticides in Québec. However, such a reduction raises a question: could a reduction in the amount of pesticides being used have an impact on the environment or on users? For example, reducing

the amount of pesticides being applied could result in negative consequences if the products subsequently used are more toxic than the previous ones. Having a method to classify pesticides on the basis of their potential impact on the environment and on users would constitute a tool to avoid such a situation.

This project involved a literature review of the principal methods proposed to classify pesticides based on environmental and user impact. This review will permit choice and adaptation of one method for Québec situations. This will give the MAPAQ a tool to better manage programs dealing with reducing the risk associated with the use of pesticides and enable them to promote the use of products with the least impact on the environment and on users.

A report on this project has been completed.

2.2.2 Management Model for Orchards

Project Name: Application of Agro-Environmental Measures to the Management of Orchards Producing Processing Apples

Location: Saint-Nicolas, Québec

Objective: To test a management model for orchards which produce processing apples.

Contractor: Cidrerie & Vergers St-Nicolas

PMRA Cost: \$5,000

This is the second phase of a project that was funded under the Pesticide Innovation Program in the 1994-95 fiscal year. In the first phase, a phytosanitary management model adapted specifically to the production of apples for processing was developed. In this phase of the project, the model was tested.

A report describing the methods and results has been prepared. The results of this study lays out the costs and yields of an orchard management model for orchards producing processing apples. The results have been published in a technical report. This report is available upon request.

2.2.3 Determining Genetic Variability in Frogs

Project Name: Study of Genetic Variability in the Red Corpuscles of Green Frogs Living in Agricultural Environments

Location: Sainte Foy, Québec

Objectives:

- 1) To determine the genetic variability of a frog population and the incidence of malformations within a specific type of environment.
- 2) To determine whether the genetic variability of individual frogs changes over the summer.
- 3) To determine whether triazines, nitrates and nitrites are present in the environments studied.

Contractor: Canadian Wildlife Service

PMRA Cost: \$8,000

Previous research on frog health conducted in 1992 by the Canadian Wildlife Service suggests that pesticides are to blame for malformations, genetic differences and, generally, poorer health between exposed and control population of frogs.

In the first phase of this project, funded under the Pesticide Innovation Program in the 1994-95 fiscal year, researchers determined that frogs inhabiting an environment subject to pesticides do not differ in terms of diversity and incidence of parasites, and damage to DNA observed in frogs inhabiting environments subject to pesticides are not due to the presence of micro-nuclei and mitotic index, but are of another nature.

Amphibians were selected for this study because they are particularly vulnerable to pesticides and because their populations are believed to be declining in Canada. In addition, the characteristics and natural history of amphibian populations mean that they may be exposed to pesticides at various stages of their life cycle (egg, tadpole, adult).

This project involved capturing adult Green Frogs in ponds adjacent to cultivated corn and potato fields. Control sites were also selected. Blood samples from the frogs were taken several times throughout the summer months in order to monitor temporal variations in the DNA content of the red corpuscles. Researchers explored methods of evaluating the DNA content of spermatozoa and spermatic motility in frogs in order to determine whether DNA damage is transmitted to subsequent generations.

A report has been published and may provide the basis for a scientific publication.

2.3 Ontario Region

Principal Contact: Ross Pettigrew

2.3.1 Canadian Phytopathology Society Symposia

Project Name: Canadian Phytopathology Society Symposia on Biological Control Agents and Natural Plant Defences

Location: Toronto, Ontario

Objective: To host two symposia - Potential and Problems of Commercialization of Biological Agents for Soil Borne Diseases and Natural Plant Defence Against Micro-organisms.

Contractor: Canadian Phytopathological Society

PMRA Cost: \$2,500

Participants at the symposium, Potential and Problems of Commercialization of Biological Agents for Soil Borne Diseases, included world renowned specialists in the field of biological control, and representatives from regulatory agencies and private industry involved in commercialization. Ways in which registration and commercialization could be accelerated were discussed. The symposium was presented to a multi-disciplinary audience involved in pest control.

The Natural Plant Defence Against Micro-organisms symposium was likely the first time in Canada where experts on plant resistance mechanisms for four different types of pathogens were brought together in one forum.

Funding from the Pesticide Innovation Program contributed to the cost of travel and living expenses for the speakers at both symposia.

A report was generated from each symposium and the papers from both symposia have been published in the *Canadian Journal of Plant Pathology*.

2.3.2 Promoting Integrated Pest Management

Project Name: Integrated Pest Management Promotion and Public Education Program

Location: Bradford, Ontario

Objective: To provide education and support for traditional muck vegetable and ethnic vegetable growers in York-South Simcoe in the areas of reduced pesticide use, viability of Integrated Pest Management (IPM) and the practical, achievable benefits of intensive IPM through field demonstration.

Contractor: Ontario Ministry of Agriculture Food and Rural Affairs (OMAFRA) - Muck Research Station; Bradford and District Pest Management Board (BDPMB)

PMRA Cost: \$3,500

An IPM program is currently available to vegetable growers in the Bradford area; however, this program is limited to 30% of the cropping area and can deliver only basic scouting services.

The objective of the Integrated Pest Management Promotion and Public Education Program is to expand the IPM program from 30% to approximately 60% in the Bradford area. The premise of the program is that awareness breeds acceptance and technology adoption. As growers become aware of others who have adopted IPM or are participating in IPM research, more growers will be encouraged to adopt this technology and realize its benefits.

Integral to any IPM program is education and the space to develop and expand upon current strategies and explore new areas through research and demonstration. The Integrated Pest Management Promotion and Public Education Program addressed such issues as the reduction of unnecessary pesticide applications, improperly timed or incorrect applications of pesticides, and the promotion of reduced applications through monitoring, education and use of alternative strategies. The solution to these issues is complex and was addressed through a multi-task approach whereby IPM techniques were compared to scheduled pesticide treatments in various demonstration sites.

Funding from the Pesticide Innovation Program was directed towards field labels, research site signs and demonstration site signs.

A report summarizing the short-term impact and benefits of the project has been completed. Technical results and impacts were also distributed through field day reports, demonstration site open houses, the regional Agriphone, IPM annual reports, grower conference presentations, and newspaper and newsletter articles.

2.3.3 Predatory Mites

Project Name: Rearing of Predatory Mites for Thrips Control in Greenhouse Crops and Increasing Expertise in Pesticide Reduction Techniques for Greenhouse Pests

Location: Harrow, Ontario

Objectives: To attend the 47th International Symposium on Crop Protection in Ghent, Belgium and visit the Naaldwijk Research Station in Holland in order to:

- 1) acquire expertise in the rearing of predatory mites for the control of thrips;
- 2) obtain training in the identification of contaminants of mite cultures; and
- 3) learn the strategies that are being developed and which show promise in improving the efficiency of biological control agents in greenhouse crops.

Contractor: Ontario Ministry of Agriculture, Food and Rural Affairs (OMAFRA) - Harrow Research Centre

PMRA Cost: \$1,500

A major pest of greenhouse crops is the western flower thrips. Currently, there are no pesticides registered for this pest on greenhouse vegetables. There are pesticides registered for the control of thrips on greenhouse ornamental crops; however, many growers frequently encounter resistance to pesticides. As a result, several ornamental and vegetable greenhouse growers have attempted to rear the predatory mite, *Amblyseius cucumeris*, a natural enemy of thrips.

Problems in the rearing of this mite and other potential predatory mites have been encountered and expertise in the area is lacking. An entomologist at the Naaldwijk Research Station has successfully developed a system for rearing *Amblyseius cucumeris* and is developing a system for *A. degenerans*, another effective predatory mite for the control of thrips.

A representative from the Harrow Research Centre attended the symposium and met with various experts in the area of rearing of predatory mites.

A report detailing the visits to experts as well as information obtained through the symposium was completed. Two workshops on biological control were presented in Ontario where the information obtained at the symposium was presented. Information was published in trade magazines such as *Greenhouse Canada* and the *Canadian Florist*. A fact sheet on the rearing of predatory mites was also produced.

2.3.4 Beneficial Insects

Project Name: Information Dissemination Regarding Beneficial Insects in Ontario Orchards

Location: Vineland Station, Ontario

Objective: To provide information to growers and Ontario Ministry of Agriculture, Food and Rural Affairs (OMAFRA) extension personnel regarding the identification and use of beneficial insects in Ontario orchards through the publication and distribution of fact sheets.

Contractor: OMAFRA - Vineland Station

PMRA Cost: \$7,000

Beneficial insects can provide significant insect control in orchards. Five fact sheets which aid growers in identifying beneficial insects in orchards were prepared by an expert in the field. The fact sheets will be distributed through OMAFRA extension personnel and given directly to growers. Using the information obtained in the fact sheets, growers may encourage populations of beneficials and therefore reduce chemical pesticide use.

Funding from the Pesticide Innovation Program was directed towards the printing and distribution of the fact sheets.

2.3.5 Integrated Pest Management for Crucifers

Project Name: *Manual of Integrated Pest Management for Crucifers in Ontario*

Location: Simcoe, Ontario

Objective: To prepare and publish a manual for growers, scouts and advisors on the practice of Integrated Pest Management (IPM) for crucifers in Ontario.

Contractor: Ontario Ministry of Agriculture, Food and Rural Affairs (OMAFRA) - Norfolk County Office and Horticulture Research Station

PMRA Cost: \$7,000

Since 1990, a program of IPM on cole crops in Ontario has been in operation. Growers using this program have reduced pesticide use by the following amounts:

- 1) maggot treatment - 32%;
- 2) flea beetles - 100%;
- 3) insecticides - 50%.

With the publication of the *Manual of Integrated Pest Management for Crucifers in Ontario*, virtually all growers in Ontario could participate in this program.

The manual assists growers in understanding, identifying and managing crucifer pests. Emphasis was placed on non-chemical control measures specific to each of the pests and diseases addressed in the manual. Users of the manual should be able to effectively control pests while reducing the amount of pesticides used on these crops. Where the use of pesticides is a necessity, the manual suggests those with the least environmental impact.

The authors expect that over the long term, knowledge obtained through the manual will enable growers of crucifers in Ontario to reduce pesticide use by approximately 50%.

The manual consists of 80 pages of text with approximately 200 colour photographs and is available to Ontario growers free of charge through any OMAFRA office. It was also made available at the Ontario Horticultural Crops Conference in Toronto in February 1996.

2.3.6 Controlling Colorado Potato Beetle

Project Name: Monitoring the Use of Imidacloprid for Control of Colorado Potato Beetle in Southern Ontario

Location: Guelph, Ontario

Objectives:

- 1) To document cultural practices used by Ontario potato growers to control Colorado Potato Beetle.
- 2) To document climatic and soil conditions in fields.
- 3) To measure Imidacloprid residues in soil and water samples taken under field conditions.
- 4) To determine the relationships among climatic conditions, product application methods, soil and water residue levels, and product efficacy.

Contractor: Ontario Ministry of Agriculture, Food and Rural Affairs (OMAFRA) - Resources and Regulations Branch, Guelph, Ontario

PMRA Cost: \$3,000

Colorado Potato Beetle is becoming increasingly resistant to chemical control methods currently available in Ontario. Furthermore, the situation in Ontario is more serious than that found in any other Canadian region.

Imidacloprid is the active ingredient in the product Admire. Imidacloprid was licensed for use on potatoes to control Colorado Potato Beetle in Ontario until September 1, 1995. While initial studies indicate that Imidacloprid is safe and effective, further field sampling is required to verify product efficacy and product persistence in soil and water in order to advise on licensing approvals.

Agronomic and climatic data as well as soil and water samples were gathered from four randomly selected sites in southern Ontario.

A report has been completed and is available from the OMAFRA office.

2.3.7 Integrated Pest Management for Conservatories and Interior Landscapes

Project Name: Integrated Pest Management: A Biorational Approach for Conservatories and Interior Landscapes

Location: Hamilton, Ontario

Objective: To host a symposium on pest management practices in interior landscapes.

Contractor: Royal Botanical Gardens

PMRA Cost: \$3,000

On November 1, 1995, the Royal Botanical Gardens hosted a symposium entitled, Integrated Pest Management: A Biorational Approach for Conservatories and Interior Landscapes. Speakers at the symposium included experts in the areas of Plant Health, Integrated Pest Management and federal and provincial regulations regarding pest management. Representatives from Montreal's Biodome, Nashville's Opryland, Pennsylvania's Longwood Gardens, Ontario's Science Centre, Metro Toronto Zoo and Royal Botanical Gardens addressed issues of pest management in interior landscapes.

The audience included maintenance and management personnel from conservatories, malls and town centres, corporate and public buildings, hotels and restaurants, interior plantscape technicians and contractors, students, pest management professionals, regulatory officials, and commercial suppliers and distributors.

The symposium included a marketplace at which suppliers displayed and provided information on available products.

Transcripts of presentations by speakers at the symposium are now housed in the Royal Botanical Gardens library. Audio and videotapes of the symposium are also available.

Two reports were generated from the symposium. The first gives an overview of the event, including attendance and general comments on the success of the symposium. The second report outlines the method used to disseminate information gathered at the symposium.

2.4 Mid-West Region (includes Manitoba and Saskatchewan)

Principal Contact: Shannon Van Wallegem, P.Ag.*

2.4.1 Product Monographs

Project Name: Product Monographs

Location: Regina, Saskatchewan

Objective: To produce reference material to help the public deal with cases of pesticide drift onto gardens, dugouts and forage crops.

Contractor: Saskatchewan Agriculture and Food - Production Technology Section

PMRA Cost: \$5,250

Each year, Saskatchewan Agriculture receives enquiries regarding the use of garden produce (vegetables and small fruits), forage crops and dugout water following accidental overspray of pesticides or pesticide drift from adjacent areas.

If the pesticides are not registered for use on the crops they come in contact with through overspraying or drift, then it is very difficult for the public to obtain information on pre-harvest intervals, etc. To compound the problem, the public often receives conflicting information from different sources.

This project involved the compilation of label directions, Material Safety Data Sheets and literature on products in order to develop product monographs. Monographs of 17 of the commonly used herbicides, insecticides and fungicides were produced. These are now available through Rural Service Centres in Saskatchewan and the Food Publication Centre of the Saskatchewan Department of Agriculture. They are also available for use by other government agencies.

* In the 1996-97 fiscal year, the Mid-West region will become Manitoba Region and Saskatchewan Region. Shannon Van Wallegghem will be the contact in Manitoba and Bill Maksymetz will be the contact in Saskatchewan. See the Appendix for addresses.

2.4.2 Pesticide Compatibility Tables

Project Name: Pesticide Compatibility Tables

Location: Regina, Saskatchewan

Objective: To develop compatibility tables suitable for prairie growers.

Contractor: Saskatchewan Agriculture and Food - Production Technology Section

PMRA Cost: \$3,000

Growers are concerned with efficiency in crop production and, as a result, are interested in options that will reduce the number of operations they must carry out in producing a crop. For example, a grower might be faced with the question of whether a herbicide and an insecticide which require simultaneous application can be tank-mixed.

At one time, the answer to this question and others could be found in the Pesticide Compatibility Tables; however, the concern over liability from non-label use has led to the disappearance of these Tables. The label is the ultimate authority on tank-mixing; if tank-mixing is not listed on both labels, then it cannot be done.

This project involved the development of a table which includes a list of compatible, registered tank-mixes and a list of those that are not compatible, especially those that pose a threat to human or crop health or the environment. These lists were compiled through label, literature and MSDS (Material Safety Data Sheets) reviews.

They are currently available from Saskatchewan Agriculture and Food -

Production Technology Section.

2.4.3 Economic Thresholds for Insects

Project Name: Economic Thresholds for Insects

Location: Regina, Saskatchewan

Objective: To prepare a fact sheet that summarizes the economic thresholds for the major insect pests of Saskatchewan.

Contractor: Saskatchewan Agriculture and Food - Production Technology Section

PMRA Cost: \$3,000

Insects are abundant in almost every crop grown in Saskatchewan. In order to protect crops from insects, keep production costs as low as possible, and protect the environment from the adverse effects of insecticides, a list of insects and insect population levels that are potentially harmful to crops is essential.

Economic thresholds serve as guidelines when determining if insecticide application is required. When a producer has access to this information, crop losses and costs are kept to a minimum and potential impact on non-target organisms is substantially reduced.

This project involved the development of 7,000 fact sheets dealing with insect identification, cultural methods of insect control, crop monitoring techniques, economic thresholds and selection of appropriate insecticides. The fact sheets were distributed to growers and are available from Saskatchewan Agriculture and Food - Production Technology Section.

2.4.4 Weed Resistance Questionnaire

Project Name: Weed Resistance Questionnaire

Location: Regina, Saskatchewan

Objective: To develop a questionnaire to determine the incidence of multiple weed resistance in Saskatchewan.

Contractor: Saskatchewan Agriculture and Food - Production Technology Section

PMRA Cost: \$1,500

During the late 1980s and early 1990s a number of Group 2 resistant kochia and Group 3 resistant green foxtail sites were confirmed in Saskatchewan. The strategy of using one herbicide group until rendered ineffective is not sustainable and reduces the effective life of herbicides. Until now, no attempt has been made to follow up with growers who are faced with having to change their weed control measures.

For this project, a list of growers who were identified with Group 2 resistant kochia and Group 3 resistant green foxtail was compiled. A weed resistance questionnaire was developed and administered to this group.

Survey participants have been notified of the results and the information gathered will be incorporated in the development of resistant weed management strategies.

2.4.5 Minor Use of Pesticides Program

Project Name: The Minor Use of Pesticides Program

Location: Regina, Saskatchewan

Objective: To promote the Minor Use of Pesticides Program

Contractor: Saskatchewan Agriculture and Food - Production Technology Section

PMRA Cost: \$2,250

Many growers, particularly of specialty crops, are unfamiliar with the existence and means of utilizing the Minor Use of Pesticides Programs: URMULE (User Requested Minor Use Label Expansion) and URMUR (User Requested Minor Use Registration).

A survey of growers and organizations involved in the production of specialty crops was undertaken in order to: 1) determine the major constraints to the further development of specific crops and; 2) to compile a list of products which growers would not support for Minor Use registration and the reasons for this lack of support.

A final summary of the results of the survey will be published and made available.

2.4.6 Protecting Pollinators from Insecticides

Project Name: Bee Safe - Protecting Pollinators from Insecticides

Location: Carman, Manitoba

Objective: To provide producers, pesticide dealers and applicators with information to protect bees from insecticides.

Contractor: Manitoba Agriculture - Soil and Crop Branch

PMRA Cost: \$1,400

There are an estimated 85,000 honey bee colonies operating in Manitoba. Over the last two years, bertha armyworm and diamondback moth outbreaks have resulted in insecticide treatment of close to one million acres of canola in Manitoba per year. This has resulted in a reduction in honey bee population and, in some cases, serious losses to beekeepers. In addition, reduction in honey bee populations results in reduced crop yield from seed pollination.

This project involved the production of a bulletin for producers and pesticide dealers and applicators, stressing the importance of protecting pollinators during insecticide applications.

The bulletin is available from Manitoba Agriculture and copies have been distributed to licensed pesticide dealers and applicators in Manitoba.

2.4.7 Orange Wheat Blossom Midge Conference

Project Name: Orange Wheat Blossom Midge Fact Sheets

Location: Winnipeg, Manitoba

Objective: To increase the knowledge base of the biology of the orange wheat blossom midge and of the registered pesticides in order to increase the efficiency (timing of pesticide application, mode of action, application methods and pesticide safety) of controlling this pest in Western Canada.

Contractor: Agriculture and Agri-Food Canada - Western Committee on Crop Pests; and Manitoba Agriculture - Soils and Crops Branch

PMRA Cost: \$4,300

Each year, the orange wheat blossom midge is a pest in wheat in the Canadian prairies. In Saskatchewan, over 1.1 million acres of wheat were sprayed for wheat midge, and estimated losses in 1995 were \$60 million.

A conference on the control of orange wheat blossom midge was organized and held in Winnipeg in February 1996. Participants included Western Canadian stakeholders involved in research, extension, the pesticide industry, applicators and producers. Topics dealt with at the conference included a summary of current work on wheat midge; a summary of currently registered pesticides used for wheat midge control; a summary of an extension package by Manitoba Agriculture; and the identification of needs by producers and applicators.

A report summarizing the conference has been prepared and distributed to all conference participants. The information has also been summarized into an information fact sheet. 12,000 copies have been produced and are available to growers through Manitoba Agriculture - Soils and Crop Branch.

2.4.8 Herbicide Resistance and Integrated Strategies

Project Name: Provincial Fact Sheets: *Herbicide Resistance in Manitoba and Weedsmart 2000 - Your Integrated Weed Management Strategy*

Location: Carman, Manitoba

Objective: To inform producers of new issues relating to herbicide resistance and to provide the most current information on integrated strategies for resistance management.

Contractor: Manitoba Agriculture - Soils and Crops Branch

PMRA Cost: \$3,500

Approximately 4.5 million acres in Manitoba are considered to be at high risk of developing herbicide resistance. Three million acres may already have some level of resistance. Although awareness of resistance is high, adoption of resistance management strategies still remains relatively low in Manitoba, partially because farmers are unconvinced of the seriousness of the problem.

Integrated strategies for resistance management have been developed and Manitoba Agriculture strives to provide this information to farmers in a timely fashion. This project involved the development of two fact sheets which provide producers with the information they need to effectively manage herbicide resistance so that the spread of resistance is limited to its current acreage and

resistant weeds are managed efficiently on presently infested fields. In addition, integrated strategies for the management of herbicide resistance are outlined and encouraged.

Seven thousand copies of each fact sheet were produced and distributed through regional agricultural staff within Manitoba Agriculture and through the Manitoba Weed Supervisors Association.

2.4.9 Colorado Potato Beetle Conference

Project Name: Colorado Potato Beetle Conference

Location: Winnipeg, Manitoba

Objective: To increase the knowledge base of the biology of the Colorado potato beetle and of integrated pest management strategies to increase the efficiency of controlling this pest in Canada through cultural and biological control options, timing of pesticide applications, mode of action, application methods and pesticide safety.

Contractor: Keystone Vegetable Producers Association Inc.; Manitoba Agriculture - Soils and Crops Branch

PMRA Cost: \$5,800

Each year, Colorado potato beetle is a major pest in potatoes in Canada. In Manitoba, approximately 60,000 acres were seeded to potatoes in 1995. Due to expansion within the potato industry in Manitoba, the number of acres seeded to potatoes is expected to rise to 100,000 acres within two years.

Colorado potato beetle resistance has been detected in many potato growing areas, including Manitoba. Insecticide resistance within a pest population heightens the importance of an integrated pest management strategy.

A conference on the integrated management of the Colorado potato beetle will be held in the summer of 1996. Participants include Canadian stakeholders involved in research, extension, the pesticide industry, and applicators and producers. Topics to be covered at the conference include a summary of current work on the Colorado potato beetle, a summary of currently registered pesticides for its control, the identification of needs by producers and applicators, and the documentation of an integrated management program using cultural, biological and chemical control measures.

A report summarizing the conference will be published and distributed to all conference participants.

2.5 Alberta Region (includes Alberta, Yukon Territory and the Northwest Territories)

Principle Contact: Barry Gordon

2.5.1 Biological Control of Satin Moth

Project Name: Exploring the Basis for Applied Biological Control of Satin Moth in the Edmonton Area

Location: Edmonton, Alberta

Objectives:

- 1) To evaluate the effectiveness of three artificial diets for laboratory rearing of satin moth caterpillars.
- 2) To compare the insect parasitoids reared from satin moth caterpillars in Edmonton and other outbreak areas with those attributed with maintaining the pest at low levels in south coastal areas of British Columbia.
- 3) To determine the extent of any increase over the 1994 distribution and host range of satin moth in the Edmonton area.
- 4) To provide a platform for future inter-agency projects to explore and develop specific applied biological and/or integrated pest management strategies for the satin moth.

Contractor: Edmonton Parks and Recreation - Forestry and Environmental Services

PMRA Cost: \$4,800

In June 1994, a satin moth infestation was discovered in a residential area of North Edmonton. This is the first and only known record of this species in Alberta. Satin moth infestations pose a threat not only to ornamental poplars on which outbreaks often initiate, but are also a potential threat to native poplars and willows.

A relative of the gypsy moth, the satin moth is easily transported in vehicles during certain stages of its life cycle, which explains its arrival in Edmonton. Most individuals in the residential area hit by the satin moth used insecticides or called in professional tree sprayers to destroy the moths.

This project explored the development of a sustainable alternative to the use of insecticides for management of the satin moth. The classical biological control

program envisioned was modelled after the successful USDA (United States Department of Agriculture) satin moth parasitoid program in the Pacific Northwest during the late 1920s and a similar program in the coastal lowlands of British Columbia during the late 1950s.

A report entitled, *Exploring the Basis for Applied Biological Control of the Satin Moth Leucoma salicis (L.) (Lepidoptera: Lymantriidae)* in Edmonton, Alberta, has been completed. An abstract of the report was presented to the Entomological Society of Alberta. An information sheet on the satin moth was also developed for public distribution through Edmonton Parks and Recreation facilities and tree nursery outlets in the Edmonton area.

2.5.2 Pesticide Use in the Northwest Territories

Project Name: Survey to Define Pesticide Use in the Northwest Territories

Location: Yellowknife, Northwest Territories

Objectives:

- 1) To identify the types, amounts and uses of pesticide in the Northwest Territories.
- 2) To identify the retailers of pesticide products in the Northwest Territories.
- 3) To identify the major users of commercial and restricted pesticides in the Northwest Territories.

Contractor: Department of Renewable Resources - Environmental Protection Division

PMRA Cost: \$7,000

The use of pesticides is controlled in the Northwest Territories through administration of the *Pesticide Act* enacted in 1974. The Act states that applicators of commercial or restricted class pesticides and businesses involved in the use or application of a commercial or restricted pesticide must hold a valid permit.

The Pesticide Regulations proclaimed in 1984 describe the information that permit applicants must provide when applying for either a pesticide application permit or business permit.

Currently, the knowledge of pesticide use in the NWT is limited. The Department of Renewable Resources believes that the application of commercial and restricted pesticides is more widespread than the number of permits being issued.

Furthermore, the Department of Renewable Resources has recognized that the Pesticide Regulations require amendments.

A literature review of pesticide management and uses in the NWT was completed. Interviews were conducted with various users of pesticides in the NWT including agricultural, linear development, permit holders, federal and territorial government agencies, crown corporations and retailers.

The information collected has helped increase the knowledge base of pesticide use and will help shape the pesticide program in the NWT including the revision of the Pesticide Regulations.

A report entitled, *Pesticide Use in the Northwest Territories* has been completed and is available to the public.

2.5.3 Impact of Kerb on Soil Fauna

Project Name: Impact of the Herbicide Kerb (propyzamide) on Soil Fauna in Northern Cultivated Soils

Location: Whitehorse, Yukon

Objective: To evaluate Acari and Collembola response following applications of the herbicide, Kerb (propyzamide), in cultivated soils in a semi-arid northern boreal environment.

Contractors: Agriculture and Agri-Food Canada - Yukon Land Resource Unit; Yukon Department of Renewable Resources - Environmental Protection Section

PMRA Cost: \$5,250

The major agricultural field crop grown in the Yukon is grass hay, which is most commonly harvested from perennial stands of brome grass. Weeds, such as foxtail barley, are a problem in some stands. Kerb is the only herbicide recommended for use against foxtail barley in established grass forage stands.

The purpose of this project was to use biological organisms as indicators of soil health and to determine if there exists any degree of negative response from both rate and date of Kerb applications. A report entitled *Reaction to Applications of Kerb (Propyzamide) on Acari and Collembola Populations and Diversity* was prepared and will be presented at the 1996 Agriculture Symposium in the Yukon.

This research will benefit producers in providing information on application rates of

Kerb and will assist pesticide regulators in the Yukon in providing future direction on the use of this herbicide. Longer term benefits will be a greater understanding of the environmental impacts (if any) of using this product. The research will benefit the research community in providing data from the Yukon to compare with similar pesticide-soil fauna studies using other herbicides in southern Canada. This research will also test the concept of using soil fauna as indicators of agri-environmental health.

2.5.4 Multi-Media Modelling of Pesticide Residues

Project Name: Multi-Media Modelling of Pesticide Residues in the Aquatic and Terrestrial Environment

Location: Vegreville, Alberta

Objectives:

- 1) To estimate the concentration and distribution of 32 commonly used agricultural pesticides. The concentrations and distributions will be predicted by adapting a simple Level 1 FUGACITY model (Mackay 1991) and applying it to seven areas of high agricultural input identified on the Soil Landscapes of Canada maps (SLC's) within Alberta.
- 2) To compare predicted water concentrations to available water quality guidelines and LC50s for the 32 pesticides.
- 3) To identify appropriate environmental media for monitoring purposes.
- 4) To identify pesticides which, because of usage patterns and distribution, have potential for direct and indirect impact on aquatic fauna and flora.
- 5) To validate model results with monitoring data currently being collected through the Canada Alberta Environmentally Sustainable Agriculture Initiative projects.

Contractor: Alberta Environmental Centre (AEC) - Plant Sciences Division

PMRA Cost: \$5,500

Pesticides are used extensively in the province of Alberta, with an average of 3,930,314 kg of pesticides sold per year between 1988 and 1993. The end fate of these pesticides is an important issue.

Environmental monitoring for pesticides is becoming increasingly complex and expensive as new formulations and chemistry for products are developed. The new chemistry products are often used at lower rates, have more rapid breakdown or immobilization, and are often used in combination with other active ingredients in a synergistic mode.

The purpose of this project was to address the question of whether surface water is the most appropriate sampling medium for all agricultural pesticides used in Alberta. Currently, water is the only environmental medium for which there is any criteria; therefore, it is usually the sole medium examined for quality and management.

A report entitled *Multi-Media Modelling of Pesticide Residues in the Aquatic and Terrestrial Environment* has been completed. The report concludes that pesticides may be detected more frequently if other compartments are monitored.

2.6 British Columbia Region

Principal Contact: Ilze Rupners

2.6.1 Sprayer Calibration and Pesticide Safety

Project Name: Improving Sprayer Calibration, Sprayer Application Practices and Pesticide Safety in the Fraser Valley of British Columbia

Location: Abbotsford, British Columbia

Objective: To develop an effective procedure for providing help to farmers on equipment calibration, pesticide application practices, technology and safety.

Contractor: British Columbia Ministry of Agriculture, Fisheries and Food (BCMAFF)

PMRA Cost: \$5,000

Agrologists and others have expressed concern regarding the calibration of agricultural pesticide application equipment. During 1995, several pesticide applications resulted in drift which caused crop damage as well as health and environmental concerns in the surrounding areas. Poor pesticide application practices may have contributed to these situations.

Application equipment that is properly maintained, calibrated and operated contributes to the precise deposition of pesticides. While pesticide applicator certification programs include calibration and operation of application equipment, these programs take place in a classroom where practical assistance is not possible.

The sprayer calibration and pesticide safety project involves two phases. The first phase, which took place in the 1995-96 fiscal year, involved the following four activities:

- 1) An on-farm calibration clinic for blueberry growers was conducted by BCMAFF staff and a pesticide educator.
- 2) A workshop for agribusiness, extension workers, pest managers, pesticide educators, commercial applicators and other professionals was conducted by BCMAFF staff to increase participants' awareness and knowledge of sprayer technology, application procedures and calibration.
- 3) A survey was completed in order to obtain information on application equipment, calibration, pesticide safety and application practices used by farmers.
- 4) A procedure for providing on-farm help with calibration, application technology, application practices and safety was developed in conjunction with an intensive training program for four individuals who will work with farmers.

Phase two, which will take place in the 1996-97 fiscal year, will involve on-farm visits by trained teams equipped to help farmers calibrate their sprayers and improve their pesticide application and safety practices.

2.6.2 Persistence and Behaviour of Granular Insecticides

Project Name: Persistence and Behaviour of Granular Insecticides in Agricultural Fields in the Lower Fraser Valley

Location: Delta, British Columbia

Objective: To assess the persistence and behaviour of granular formulations of four registered insecticides (terbufos, fonofos, phorate and carbofuran) in clay loam and organic muck soils typical of the lower Fraser Valley.

Contractor: Canadian Wildlife Service - Pacific Wildlife Research Centre

PMRA Cost: \$10,000

Between 1960 and 1994, there were 25 pesticide-related bird die-offs involving approximately 3,000 birds in agricultural fields in the lower Fraser Valley. Since

1989, the Canadian Wildlife Service has been investigating the incidence of pesticide poisoning in birds of prey in southwestern B.C., particularly in the lower Fraser Valley.

Thirty-seven raptors have been acutely exposed to currently registered carbamate and organophosphate insecticides. Although several of the die-offs have been associated with misuse or improper application of pesticides, at least 19 cases resulted from proper use of registered pesticides. Analysis of crop and stomach contents indicates that the majority of these birds were poisoned as a result of scavenging upon poisoned waterfowl.

Toxicity and environmental fate data required to register a pesticide in Canada are often determined from field trials conducted in neutral or slightly alkaline, dry, well-aerated soil typical of eastern agricultural and western prairie soils. In contrast, agricultural soils in the lower Fraser Valley are acidic and often water-logged in the winter. Granular pesticides that usually degrade quite rapidly to non-toxic compounds under eastern and mid-western conditions are much more persistent in the acidic, flood conditions typical of the Fraser Valley in winter.

In the first year of a two-year project, granular formulations of four insecticides (phorate [Thimet 15G]; terbufos [Counter 15G]; fonofos [Dyfonate 15G]; and carbofuran [Furadan 10G]) were applied as furrow treatment to either potato or turnip crops. One insecticide was applied in each furrow. Mesh bags containing either granular pesticides alone, or granular pesticides plus soil, were laid in the furrow during planting of the crop. These bags were retrieved periodically and concentrations of pesticides in each bag were compared and conditions of the granulars were noted. The study was conducted in both clay loam and organic muck.

In the 1996-97 fiscal year, results will be published in the scientific literature and recommendations will be provided to regulatory authorities. The information generated will also be incorporated into a GIS (Geographic Information System) database which is currently being developed for pesticide management in the lower Fraser Valley. The public will be informed of the results and recommendations through the media and talks given by the Canadian Wildlife Service to interested local groups.

2.6.3 Management Plan for Gypsy Moth

Project Name: A Pest Management Plan for Gypsy Moth in British Columbia

Location: New Westminster, British Columbia

Objective: To create a document which outlines the processes used to identify and eradicate introductions of Gypsy Moth (*Lymantria dispar*), and to evaluate the risk and benefits of the use of the microbial pesticide, *Bacillus thuringiensis* var. *Kurstaki* (Btk).

Contractor: Agriculture and Agri-Food Canada; Frazer Consulting Services

PMRA Cost: \$3,500

Since 1979, Agriculture and Agri-Food Canada has been involved in Gypsy Moth detection and eradication in British Columbia. Carbaryl was the first product used in Vancouver applied by ground spray equipment in a residential neighbourhood. Public concern was expressed over this spraying.

In the 1980s, oil-based formulations of Btk were used, which also caused public concern. In 1991 and 1992, water formulations were used. Public concern has centred on human health issues and the non-disclosure of inerts in the Btk formulation.

The main eradication option currently used by Agriculture and Agri-Food Canada is microbial Btk (Foray 48B). Citizens' groups claim that adverse effects on human health and environmental damage from the use of this microbial pesticide outweigh its benefits.

The purpose of this project was to prepare a public document that identifies the issues involving Gypsy Moth programs in British Columbia. The report represents an attempt to balance the perceived health and non-target effects with the estimated impacts of the moth establishing itself in B.C. The report is available through the B.C. Ministry of Environment, Lands and Parks - Pesticide Branch, and will be used by agencies involved in evaluating treatment sites. The information will also be used by the B.C. Ministry of Environment, Lands and Parks - Environmental Appeal Board hearings to support the need for continued Gypsy Moth eradication projects. The report is also available on the Internet.

2.6.4 Pesticide Applicator Training Manual

Project Name: Enhancements to Pesticide Applicator Training Manual for Agricultural Producers

Location: Victoria, British Columbia

Objective: To produce an improved manual to reduce grower frustration and make the training information on safe and effective pesticide use more practical, relevant and easier to learn.

Contractor: British Columbia Ministry of Environment, Lands and Parks - Pesticide Management Section

PMRA Cost: \$6,000

Pesticide applicator certification is required in B.C. for growers who use very or moderately toxic pesticides. The training manual used in the certification program has been used for four years and requires updating.

This project received Pesticide Innovation Program funding in the 1994-95 fiscal year. In order to continue to upgrade the training manual, further funding was requested.

The manual is now complete and will be sold to growers for the cost of printing. The text is also available to other provinces for their own use.

2.6.5 Pesticide Use on Public Lands

Project Name: Development of a Geographic Information System as a Management Tool for Decision-making for Pesticide Use on Public Lands within the Southern Interior of British Columbia

Location: Penticton, British Columbia

Objective: To develop a Geographic Information System (GIS) which would allow access to the information required to adjudicate a proposed pesticide use on public land, or to allow on-going monitoring of potential pesticide loading impacts.

Contractor: B.C. Ministry of Environment, Lands and Parks - Pesticide Management Program

PMRA Cost: \$10,000

Pesticide Use Permits are required in B.C. for the application of pesticides to public land, bodies of water, and private land used for forestry, transportation or public utility purposes. Applications for Pesticide Use Permits undergo a rigorous technical review in B.C. as part of the adjudication process. Since 1985, the use of pesticides on public land, under permit, has been increasing.

Concern has been expressed regarding the potential build-up of pesticides in certain areas as a result of increasing pesticide use within the southern interior region. Pesticide residues in these areas have been detected through the monitoring of well-water. The potential relationship of detectable residues in well-water to groundwater contamination is currently being investigated.

As a result, future reviews of Pesticide Use Permit applications within the southern interior regions of B.C. must take into account the potential build-up and/or cumulative effects of pesticide usage within particular areas such as domestic water supplies and wells, environmentally sensitive areas, areas of potential groundwater contamination, and aboriginal food gathering areas. This information must be available and current when reviewing proposed pesticide uses.

This project was divided into two phases. Phase One, which began in 1994, involved the compilation and consolidation of pesticide use information. Database design was also initiated during this phase. Phase two involved the completion of the writing of the database program and entering the data onto the GIS.

2.6.6 Integrated Pest Management Information System

Project Name: Integrated Pest Management Information System

Location: Victoria, British Columbia

Objective: To incorporate agricultural pest management information into the Integrated Pest Management (IPM) Information System

Contractor: British Columbia Ministry of Environment, Lands and Parks - Pesticide Management Section

PMRA Cost: \$5,000

The Integrated Pest Management Information System (IPMIS) is an electronic library of information on IPM in agriculture, landscapes, forestry, buildings, gardens, rights-of-way and other locations. Topics include identification of pests (insects, diseases, weeds, etc.), monitoring and prevention of pests, using least-toxic controls, biological controls, pesticide safety, and other pest management related subjects. There is also a products and suppliers database to enable users to find out where to buy various IPM products.

This project was funded by the Pesticide Innovation Program during the 1994-95 fiscal year in which references and resource information was collected. During the 1995-96 fiscal year, IPM manuals and crop guides were downloaded into the existing IPMIS database and images and public domain documents were scanned in. Of these images, there were over 100 out-of-print Agriculture Canada colour fact sheets on pest identification which were scanned into the database.

By making the information readily accessible on the IPMIS, users will be able to find out about, and apply safe and effective means of pest control. The System will also enable suppliers of biological controls, compatible pesticides, monitoring equipment and other IPM products to reach a wider market for their products.

The IPMIS is available to the public on the Internet and through internal computer networks in B.C. Environment and the B.C. Ministry of Agriculture, Fisheries and Food. Information on how to access the IPMIS on the Internet has been disseminated through newsletters, a press release and whenever Pesticide Management Section staff make public presentations. A live demonstration of the System was carried out for the press.

Appendix

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