Pest Management Regulatory Agency (PMRA)
Health Canada
2720 Riverside Drive
Ottawa, Ontario K1A 0K9

December 11, 2013

RE: NOI2013-01 Action to Protect Bees from Exposure to Neonicotinoid Pesticides

On behalf of Canada's plant science industry, CropLife Canada appreciates the opportunity to provide comments on the proposed measures outlined in NOI2013-01, Action to Protect Bees from Exposure to Neonicotinoid Pesticides. We would also like to provide you with an update on our recent activities and developments in the area of neonicotinoid seed treatments and environmental health.

CropLife Canada is the trade association representing the manufacturers, developers and distributors of plant science innovations — pest control products and plant biotechnology — for use in agriculture, urban and public health settings.

In principal, CropLife Canada supports the measures outlined in the Notice of Intent as a means to address potential unintended exposure of bees to neonicotinoid insecticides during the planting of treated corn or soybean seed. As outlined in this document, CropLife Canada believes that the labeled uses of neonicotinoids as seed treatments on corn and soybean are sustainable as per the historical safe use and the proven overall benefit to agriculture production of these products.

Introduction

Pollinators and pest control products are complementary components of a sustainable agricultural production system. Pest control products are tools that enable us to realize greater yields from the same area with fewer inputs; without these products, we would lose a significant percentage of our crops to pests and diseases [1-3]. Globally, losses due to pests in eight major crops (wheat, corn, rice, barley, soybean, cotton, potatoes and coffee) were estimated at $90.8 billion in 1998 [reviewed in 1, 2, 4].

The agriculture and agri-food system in Canada encompasses several sectors, including the farm input and service supplier industries, primary agriculture, food and beverage processing, food distribution, retail, wholesale and foodservice industries [5]. Loss of key crops therefore affects more than just the rural economy. It has a knock-on effect across the entire agri-food sector. Of note, it also affects the availability of key forage for bees. [1]

[1]For example, canola is a major forage crop for Canadian bees [6]. Loss of crops to insects has a huge effect on the beekeeping industry.

Insect pollinators are responsible for the reproduction of 70% of the main food and fibre crops and approximately 90% of wild plants [reviewed in 7, 8]. More than half the bee colonies in Canada (~300,000 colonies) contribute annually to the pollination of canola [6]. Another 80,000 colonies provide pollination services to the Canadian hybrid seed canola industry, which depends on honey bees for the precise pollen transfer of specific genetic lines [6]. A further 35,000, and 15,000 colonies are used to pollinate blueberries and apples, respectively [reviewed in 9, 10]. Without the essential pollination services provided by bees, our industry, would have no crops to protect; therefore it is no exaggeration to emphasize that the success of the global agri-food sector is dependent on bees.

We appreciate that the issue of pollinators and neonicotinoid insecticides is a complex and sensitive topic. We are, however, concerned that in the rush to find answers, neonicotinoids are being singled out when in fact there are many other factors to be considered. CropLife Canada would like to underscore the importance of ensuring that dialogue around this issue be founded on factual information so that meaningful solutions can be found.

Bee health in Canada

There is an important difference between population declines and colony losses. The former speaks to long-term changes in managed honey bee numbers while the latter refers to an acute phenomenon realized over short time periods. While the significance of both should not be downplayed, it is critical that the distinction between the two be understood and carefully considered.

Beekeepers in Canada are reporting challenges in honey bee winter survival, with average overwintering losses fluctuating between 12 and 40% in recent years [for example, see recent reports in 11, 12-14] resulting in short-term colony losses.[2] Anecdotal reports suggest that the average overwintering mortality in Canada has historically been around 15%; however, the Canadian Association of Professional Apiarists (CAPA) have only recorded that value once since they began surveying in 2007.[3]

Despite these short-term losses, honey bee populations in Canada have increased steadily in recent years resulting in a significant increase in population numbers. Indeed, the most recent data from Statistics Canada shows that managed honey bee colony numbers across Canada are now at record highs (see Figure 1) [27, 28].

[2] There is no single identified cause of heightened overwintering losses, although recent scientific research has turned increasingly towards a combination of parasitic mites and honey bee pathogens [for example, see reviews in 12, 15-26].
[3] CropLife is not aware of any public data that document historic overwintering numbers across Canada.

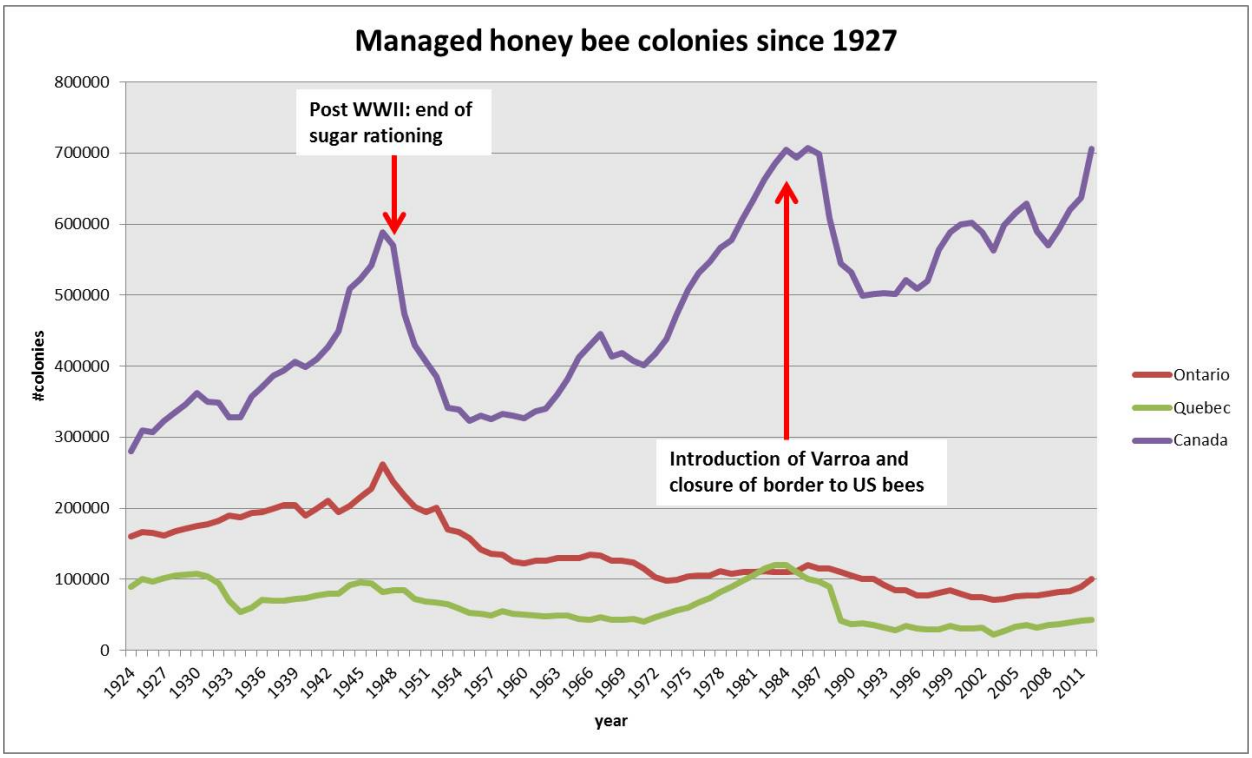

Figure 1. Statistics Canada data tracking managed honey bee populations in Canada since 1924 indicate that colony numbers are now at the highest levels ever seen [source of data 27].

As shown in Figure 1, there are two main peaks in the Canadian numbers. The first of these corresponds to the Second World War, when sugar rationing was in effect and demand for non-sugar sweeteners was high. The second occurred in the mid-1980's and was followed by a significant drop due to the closure of the border to US bees and the introduction of the Varroa mite in to Canada [9]. It is worth noting that, following decades of declining populations in both Ontario and Quebec, colony numbers in these two provinces have been increasing since the early 2000s coinciding with the introduction of neonicotinoid seed treatments into Canadian agriculture (see Figure 2 and Figure 3).

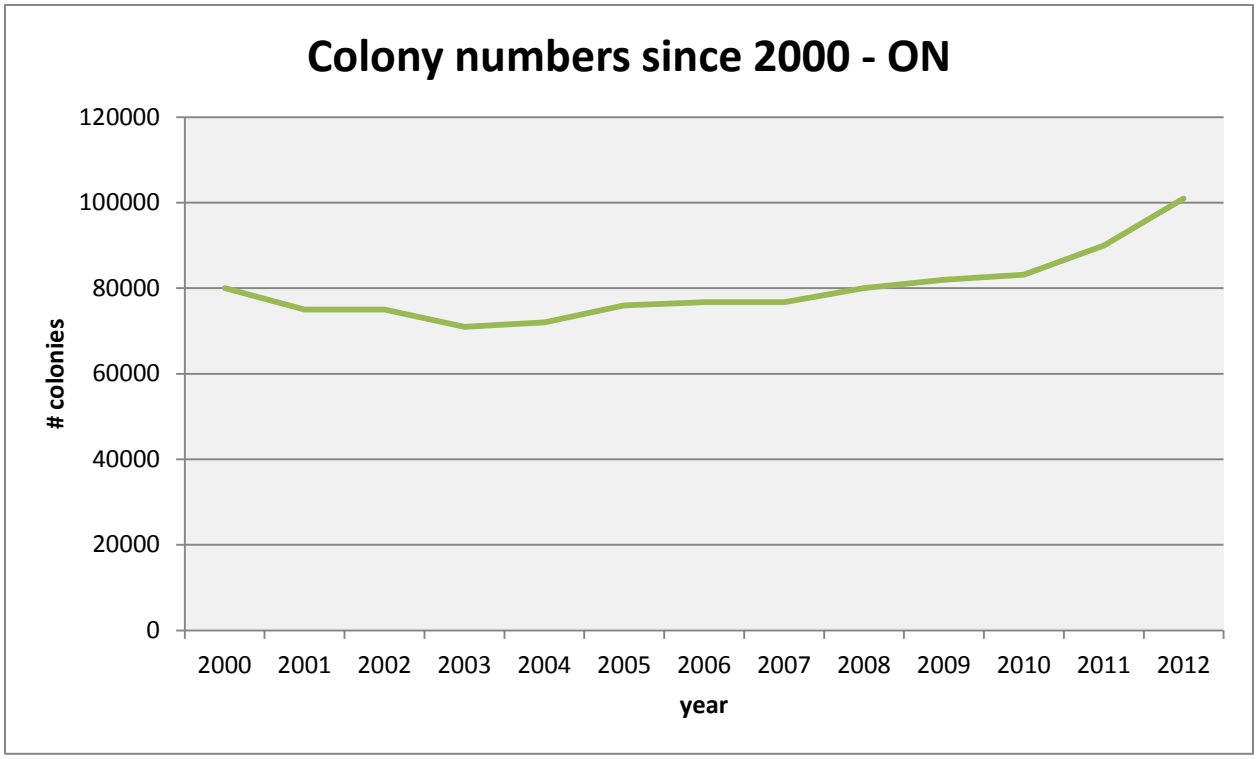

Figure 2. Managed colony numbers for Ontario have been trending upwards since 2000 (which captures the period during which neonicotinoid seed treatments have been used) [27]. Of note, Ontario colony numbers have increased by more than 25% during this period.

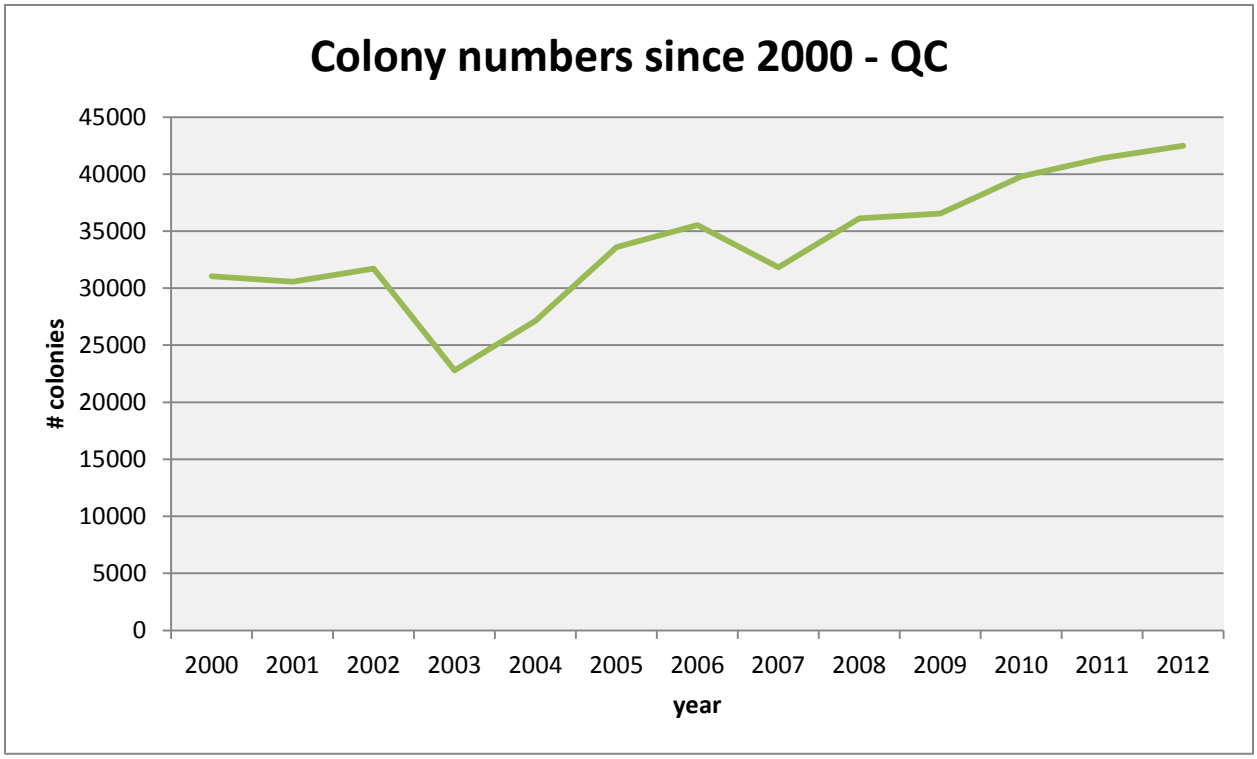

Figure 3. Managed colony numbers for Quebec have been trending upwards since 2000 (which captures the period during which neonicotinoid seed treatments have been used) [27]. Of note, Quebec colony numbers have increased by more than 36% during this period.

Pollinator health is a very complex subject with numerous confounding factors that preclude the identification of any one factor as the single cause of short- and long-term bee health issues. Indeed, current research on bee health indicates that honey bees are affected by stresses from multiple sources [for example, see review in 29]. Some of the factors under investigation by bee researchers include:

- Parasites (in particular the Varroa mite, which has developed resistance to many treatments) [17, 19, 30-34]
- Diseases (primarily inadequate Nosema detection and control) [33-36]
- A lack of genetic diversity within bee stocks [37-39]
- Climate change and associated changes in habitat and forage [21, 40]
- Pesticides and interactions with modern agriculture [41, 42]
- Other stress-inducing problems such as colony transport, lack of appropriate food at appropriate times, weather, etc. [32, 43-45]
- Queen quality [37, 38, 46]

While all of these factors likely impact bee health to differing degrees under different circumstances, world-leading researchers all agree that the major challenge to bee health globally is the Varroa mite [for example, see 19, 31, 47, 48]. This is further corroborated by the experience of Australia, which remains Varroa-free and boasts a healthy honey bee population

despite widespread neonicotinoid use for over a decade [23].[4] Indeed, Australian beekeepers are a key supplier of queen bees and packaged bees to beekeepers in Canada every spring [28, 49]. Furthermore, it is also worth noting that in western Canada, colony populations have increased in parallel with increasing canola acreage (Figure 5) and seed treatment insecticides are used on approximately 100% of the over 20 million acres of canola in western Canada [50, 51].[5]

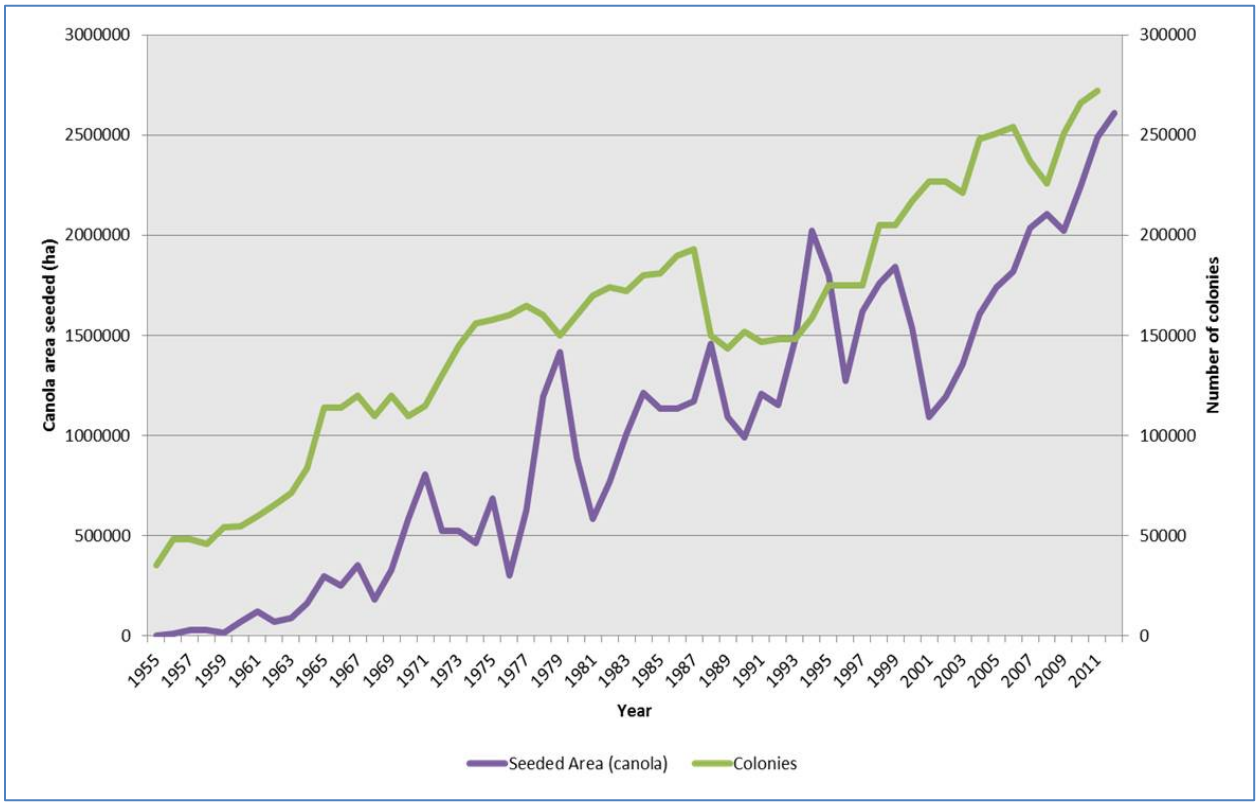

Figure 4. In AB, which boasts the largest population of managed honey bees in Canada, honey bee colony numbers have been increasing in parallel with seeded canola area for several decades [27, 51, 52].

The complexity of this subject warrants a comprehensive, objective, and multi-factorial approach in order to fully understand the relative contributions of any one aspect. Exposure to environmental chemicals is but one piece of this intricate puzzle; failure to adequately address the other factors will result in an unsatisfactory outcome whose impacts will be felt across our entire agri-food system.

Benefits of seed treatments

CropLife Canada agrees that insecticides, including those used for seed treatments, should not come into contact with bees and other non-target species. One of the important benefits of

[4] See FAOSTAT for records of Australian bee hive numbers: http://faostat3.fao.org/faostat-gateway/go/to/download/Q/QA/E
[5] Canola, unlike corn, is a crop that bees forage heavily on.

insecticide-treated seeds is that they reduce the likelihood that bees and other non-target organisms are exposed to the insecticide.

Systemic seed treatments move from the treated seed into the young growing roots and leaves of the seedling and confer protection for approximately 40 days post-emergence [for example, see data in 53]. This effectively exposes only insects that are feeding on the seed, the roots, or the foliage; any beneficial insect that is not feeding on the crop plant is essentially not exposed. Systemic insecticides enter the xylem and move quickly into the leaves to provide protection against insect damage. Transport back to other parts of the plant, including flowers, only occurs via the phloem and studies have shown that very little is transported this way [54, 55]. As a result, residue levels in nectar and pollen are expected to be low. This is corroborated by existing data that confirm exposure via pollen and nectar of treated crops is negligible [56-61].

Modern seed treatments have replaced/prevented the need for early season applications of broad spectrum post-emergence insecticides to control insects such as armyworms and cutworms. Depending upon the crop and pest spectrum, 2, 3 or even 4 broadcast applications can be replaced. Environmental and human safety is increased since there is less drift, less run-off to surface waters, reduced worker (and non-target) exposure, and reduced food/feed residues.

Product Stewardship and Bee Health

CropLife Canada and our members are profoundly committed to the responsible and ethical management of crop protection products throughout their entire life cycles. This is a commitment that starts from the very early stages of research and development and extends to container management and disposal of obsolete product. Our industry is committed to maximizing the benefits and minimizing the risks of our products.

Acute incidences, such as those reported recently around the planting of treated seed, should not happen and we have taken additional steps to protect bees from unintended exposures to pesticides from treated seeds. These measures are summarized in the following paragraphs.

Best Management Practices

CropLife Canada established a Pollinator Working Group in 2011 to assemble the technical expertise from within our member companies to help us reach out to beekeepers to better understand some of the challenges they face. One of the first projects this group sought to undertake was the development of best management practices (BMPs) for growers. In spring 2012, the working group made the decision to re-focus this project to specifically address best management practices for growers planting treated corn seed. This project resulted in the development of an extensive repository of fully referenced BMP information. These BMPs have been used extensively by CropLife Canada and our members to reach out and educate growers

in various fora over the past year. They also formed the basis for the BMPs published by other key groups including the PMRA and OMAF.[6]

CropLife Canada views these BMPs as a living document and is committed to their continued revision based on lessons learned. We are gratified that PMRA and other stakeholders have indicated a similar commitment and look forward to working with all stakeholders to ensure that the BMPs truly reflect the best practices available to growers.

Seed Bag Stewardship

CropLife Canada has been working with our sister organization, CleanFARMS Inc. in Ontario and AgriRécup in Quebec, to establish pilot programs for the collection and disposal of treated seed bags in 2013. We have also made progress towards an industry-led set of auditable standards for commercial seed treatment facilities that are anticipated to be in place by 2015.

New Seed Bag Labels

CropLife Canada has collaborated with the PMRA to develop label language that will be printed on corn seed bag tags by 2014 to specifically alert growers to the presence of an insecticide on the corn seed and direct them to the BMPs developed by CropLife Canada for additional information [62]. Our industry has also agreed to adopt the European Union dust-off standards, and committed to regular face-to-face meetings with the regulator to report back on dust-off levels and R&D progress.

Engagement with the Canadian Honey Council

One of our most important developments is our partnership with the Canadian Honey Council (CHC). In October 2012, our two organizations co-hosted a multi-stakeholder roundtable meeting to bring together stakeholders from across agriculture. The goal was to identify areas in which we can work together to establish an ongoing dialogue that will help ensure the sustainability of beekeeping and agriculture for the future. Stakeholders included CropLife Canada, the Canadian Honey Council, the Canadian Association of Professional Apiculturists (CAPA), the Ontario Beekeepers Association, Grain Farmers of Ontario, the Canola Council of Canada, the Canadian Horticultural Council, and the Canadian Federation of Agriculture (CFA).

We co-hosted a follow-up meeting in March 2013 that was attended by an expanded list of stakeholders, including representatives of the crop protection industry, the CHC, the Canadian Association of Professional Apiculturists (CAPA), PMRA, key grower groups, and the equipment manufacturers. There was overwhelming support among all participants to continue the forum; we are currently exploring options to formalize the roundtable and have approached Agriculture and Agri-food Canada to establish a Value Chain Roundtable on bee health.

[6] Summary versions of CropLife Canada's BMPs may be found here: http://www.croplife.ca/issues/pollinators

Following the bee mortality incidents in Ontario and Quebec in 2012, the CHC formed a committee to look at a number of aspects around pesticide-related incidents from a Canada-wide perspective. At the request of the CHC, CropLife Canada had a representative on the Committee and we made our internal resources available to the group. The first set of recommendations from this committee was released in spring 2013.

Support for Research Initiatives

CropLife Canada and our member companies are proud advocates for new research in agriculture. To this end, we have offered our support to several bee-related research initiatives.

For example, we recently supported an application from the Alberta Beekeepers' Commission (ABC) and the Manitoba Beekeepers Association (MBA) for funding from Growing Forward II to pursue a five-year national bee disease study. Should this application be successful, CropLife Canada has committed to providing $27,000 per year in financial support for five years to help secure a total of one million dollars for this important study.

We have also provided letters of support for funding applications. For example, we supported the Grain Farmers of Ontario application to the Canadian Agricultural Adaptation Program for funding to support the project titled "*Mitigating the Risk of Exposure of Pollinators to Insecticide Contaminated Dust during Corn Planting*".

Participation in National and International Bee Health Meetings and Workgroups

CropLife Canada has participated in a number of key national and international pollinator meetings, including the U.S. Department of Agriculture Honey Bee Health Workshop, the North American Pollinator Protection Campaign Annual Meeting, Apimondia (International Federation of Beekeepers' Associations), the American Honey Producers' Association Annual Meeting, the Ontario Beekeepers' Association annual meeting, and the EPA Pollinator Health Summit. We presented at the International Pollinator Health Conference at the University of Pennsylvania and are committed to an ongoing engagement in the international pollinator health community.

The crop protection industry invests heavily in research and development (R&D) and is deeply committed to the stewardship of our products throughout their entire lifecycle. On March 5, 2013 the US Environmental Protection Agency (EPA) hosted a Pollinator Health Summit with stakeholders engaged in activities to reduce the potential acute exposures of pollinators to pesticides.[7] The research efforts discussed at this meeting were broadly categorized into three main areas:

- Reducing planting dust
- Improving seed treatment formulations
- Developing best management practices and improving communications

[7] Background information on the EPA Pollinator Summit, as well as copies of all presentations, can be found online here: http://www.epa.gov/oppfead1/cb/csb_page/updates/2013/pollin-summit.html

Several CropLife member companies presented overviews of their activities at this meeting and all of their presentations may be viewed online.[8] Of note, the consensus of the key stakeholders at that meeting — including senior researchers from the United States Department of Agriculture (USDA) — is that any risk to bees from exposure to dust from treated seed during planting would be mitigated by the efforts currently underway.

CropLife Canada is a member of both the Ontario Bee Health Working Group and the comité pollinisateurs SPQA in Quebec and have been active participants since their inception in 2013 and 2011 respectively.

Talc Replacement Products

During corn planting, a lubricant is typically added to the seedbox to reduce seed-to-seed friction and improve uniformity of planting. The type of lubricant used may vary by manufacturer but the most commonly used products today are talc and graphite, which are added to the planter by the grower. The potential effect of these products on the generation of planter exhaust dust has been raised as a possible contributor in the exposure of bees to insecticide from treated seed. As a result, companies have been exploring possible alternatives to talc and graphite to reduce the dust emitted during planting.

One possible replacement underwent large-scale field trials across the US and Canada during 2013. These field trials indicated that the alternative fluency powder significantly reduced dust relative to talc or graphite without negatively impacting planter performance.

Corn Dust Research Consortium

The crop protection industry is an active and integral part of the recently formed Corn Dust Research Consortium (CDRC) — a multi-stakeholder initiative that is committed to reducing honey bee exposure to dust emitted during planting of treated corn seeds.[9] The CDRC brings together stakeholders from a broad spectrum of areas — including crop protection, seed production, farm equipment, corn growing, beekeeping, academic, governmental, and conservation organizations — to fund and oversee two proposed research projects designed to better understand how to mitigate potential risk to honey bees from exposure to planter-emitted dust during corn planting.

In order to identify measures that could be implemented in time for the 2014 growing season, the CDRC is focussing its efforts on two key research studies:

- Identification of flowering cover crops and weeds in and around cornfields during spring planting season in order to develop recommendations for best management practices that growers can follow in order to minimize exposure of forager honey bees to seed dust while maintaining as much forage for honey bees as possible.

[8] http://www.epa.gov/oppfead1/cb/csb_page/updates/2013/pollin-summit.html
[9] For more information on the CDRC, see: http://pollinator.org/CDRC.htm

- To evaluate the effectiveness of a new seed lubricant product that has been developed by Bayer CropScience (see above for more details).

Reports from both projects are expected by the end of November 2013 and will be incorporated into recommendations that will be communicated to beekeepers and corn growers ahead of the 2014 planting season. Ultimately, the results of the studies will be published in the peer-reviewed literature to advance the understanding of the issue in a broad and transparent manner.[10]

Investment in New Hive Health Products

While the factors that impact bee health are complex and multifaceted, researchers agree that the single biggest threat to honey bees globally is *Varroa destructor*, commonly known as the Varroa mite [for example, see 19, 31, 47, 48]. In recent decades, the Varroa mite has had a major impact on the health of bees around the world. Varroa mites feed on the hemolymph of bees, causing direct damage to the bee and inflicting wounds that may become contaminated with bacteria or fungi. In addition, they act as a vector for a range of viral diseases including Deformed Wing Virus (DWV), Acute Paralysis Virus (APV) and Chronic Paralysis Virus (CPV). Of particular note, recent work has shown that even when Varroa populations are managed within a colony, the impact of the viruses that they transmit, in particular DWV, may still be significant since they remain at high levels and may be transmitted vertically via queens and drones [63].

There are only a few treatments available to control Varroa, which is notorious for rapidly developing resistance to control products and this is an area of critical concern to CropLife member companies and beekeepers alike. The challenge inherent in developing an insecticide that is effective against the pest (i.e., the Varroa mite) but not the host (i.e., the honey bee) cannot be understated. Several CropLife member companies have registrations for hive health products (which are themselves pesticides) and continue to invest in research to develop new products to protect bees from these devastating hive pests. CropLife Canada and our member companies are eager to work with researchers and beekeepers to develop new tools in this space.

Mitigation measures outlined in NOI

CropLife Canada and our member companies are strongly supportive of the measures outlined in the Notice of Intent. As indicated above, we have already taken significant steps to address many of the requirements.

Requiring the use of safer dust-reducing seed flow lubricants

CropLife Canada and our members are strongly supportive of the adoption of the Alternative Fluency Powder as a replacement for talc or graphite in 2014. The Canadian crop protection

[10] More information about the research may be found in the CDRC Request for Proposals: http://pollinator.org/PDFs/RequestforProposalsFINAL021213.pdf

industry has committed to ensuring that growers who use a seedbox lubricant for the planting of corn or soybean seed will use the alternative fluency powder in 2014.

CropLife supports PMRA's goal of rapidly implementing dust-mitigation measures and is committed to working with our members and value chain partners to ensure awareness and compliance.

Requiring adherence to safer seed planting practices

As described in the preceding section, CropLife Canada led the development of a comprehensive set of best management practices for growers of treated corn seed during 2012. These BMPs were reviewed by a number of stakeholders — including the Grain Farmers of Ontario (GFO), PMRA, OMAF (formerly OMAFRA), the Canadian Honey Council, the Ontario Beekeepers Association, and the Alberta Beekeepers' Commission — before being finalized.

The final document includes over 100 separate literature citations and has formed the basis for similar BMP initiatives by a number of stakeholder groups including the PMRA, OMAF, GFO, and the Canadian Seed Trade Association (CSTA).

As discussed above, CropLife Canada views these BMPs as a living document and is committed to working with the PMRA and other stakeholders to ensure that they integrate lessons learned and offer tangible, practical advice for growers.

CropLife and our member companies engaged in an education and outreach program during the winter of 2012/13 to ensure that the BMPs reached as wide an audience as possible (for example, see summary list of CropLIfe Canada outreach activities in Appendix A). We remain committed to ongoing outreach and dissemination ahead of growing season 2014.

Requiring new pesticide and seed package labels with enhanced warnings

CropLife Canada and our members proposed revised seed tag language changes in 2012 in order to raise grower awareness of the importance of following best management practices in order to mitigate any potential risk to pollinators [as outlined in 62] and our seed bag tags will reflect those changes in 2014.

CropLife Canada and our members are also supportive of the further language changes for corn and soybean seeds as outlined in the Notice of Intent [64]. We have agreed to implement these changes to the pesticide label for seed treatment uses ahead of the 2014 growing season and will work with PMRA to ensure that the label changes are made expeditiously. We have committed to working with all stakeholders to develop an outreach and dissemination plan to ensure that all growers are aware of the updated label language and understand the importance of taking steps to mitigate potential risk to pollinators while planting treated seeds.

CropLife Canada members agree that the changes to the pesticide label for treated seed will be reflected on the seed bag tags in time for the 2015 growing season.

Requiring updated value information be provided to support the continued need for neonicotinoid treatment on up to 100% of the corn seed and 50% of the soybean seed

CropLife Canada and our member companies are supportive of PMRA's decision to evaluate the value of neonicotinoid seed treatments. Although the data supporting the yield benefits of seed treatments to corn and soybean are extensive [for example, see 65, 66-92], CropLife Canada feels it is important to consider other beneficial aspects of seed treatment neonicotinoids when reviewing the value of these products. Consistent with the new approach to value that is outlined in PMRA DIR2013-03, the value of seed treatments to Canadian growers and our environment is much broader than a simple impact on yield [93]. As such, it is important to consider the multitude of positive environmental (and human exposure) benefits that seed treatments offer relative to alternative methods of application and pest control. To ensure a more fulsome discussion on the topic, CropLife Canada would be willing to host a workshop to bring together growers, scientists, and regulators to explore the subject and address any uncertainties.

Corn producers have traditionally relied upon some form of insecticide to control soil-dwelling insect pests. Insecticide seed treatments in particular have proven to be the most effective and least environmentally intrusive way to control target insect pests. Insecticide seed treatments protect seeds and emerging plants from insect damage during the critical first weeks of development and before pests can cause significant losses in the form of reduced plant populations and/or damage to growing plants. This protection helps growers to maximize both the yield and quality potential of their crop.

As mentioned earlier, the adoption of seed treatment insecticides has replaced/prevented the need for early season applications of broad spectrum post-emergence insecticides to control insects such as armyworms and cutworms. Depending on the crop and pest spectrum, 2, 3 or even 4 broadcast applications can be replaced. Without these technologies, growers would need to revert back to using in-furrow and broadcast spray applications, significantly increasing the overall amount of active ingredient used per unit area as more product is required to ensure proper placement near the seed in the furrow. This, in turn, would increase the likelihood of exposure of non-target organisms; increase the carbon footprint associated with producing a crop due to significant increases in diesel use; and increase the likelihood of resistance developing.[11] In addition, a reversion back to dry insecticide systems would require the vacuuming of boxes to remove left-over insecticide before transport. This would significantly increase operator exposure to older, more toxic active ingredients.

Soil-applied insecticides for some insects are less effective than seed treatments as they only protect a zone around the seed. As roots grow outside of this zone, the plant is susceptible to

[11] It is also worth noting that, since the introduction of insecticide-treated seed, fewer growers have opted to purchase dry and/or liquid insecticide application systems. As such, much of the existing equipment stock is not equipped for pesticide application. Furthermore, it is unlikely that all models in the existing Ontario inventory could be retrofitted with dry insecticide systems (due to complications arising from central fill systems, row unit drive, spacing, etc.).

insect damage with the resultant yield loss. In sharp contrast, modern seed treatments are applied, by the seed company or other accredited facility, using precision approaches that ensure complete seed coverage. In addition to being more effective, far less active ingredient is used and there is a lower risk of environmental exposure.

Furthermore, the neonicotinoid insecticides, by virtue of their low mammalian toxicity and systemic properties, replaced the use of more toxic chemistries. As a result, they are the only effective product against certain pests since alternative chemistries are no longer registered.

Field trials have consistently shown that early planting increases yield potential [94-100] and neonicotinoid seed treatments play a significant role in facilitating this earlier planting. For example, seed corn maggot is an important driver pest on corn as it thrives in these earlier planting conditions; seed treatment protection is particularly important in this instance where there is no curative (i.e. rescue treatment) option for maintaining an economically relevant plant stand [101]. Without neonicotinoid seed treatments, growers would likely need to delay planting to avoid insect-related issues.

Seed treatments allow growers to adopt conservation tillage practices while still protecting their crops. Indeed, the area of land subject to conventional tillage in Canada has decreased significantly in recent years, from 40.5% in 2001 to 19% in 2011 [102]. Conservation tillage offers a range of environmental benefits including reduced erosion, increased carbon dioxide sequestration, increased organic content, and reduced fossil fuel consumption [for example, see 102, 103-106]. Removal of seed treatments would mean growers returning to traditional tillage practices. This, in turn, would increase the carbon footprint associated with planting activities by necessitating a significant increase in diesel fuel consumption.

Seed applied insecticides offer growers a targeted, environmentally sustainable means of pest management and, as such, play an important role in Integrated Pest Management (IPM). IPM is the careful consideration of all available pest control techniques and subsequent integration of appropriate measures that discourage the development of pest populations and keep pesticides and other interventions to levels that are economically justified and reduce or minimize risks to human health and the environment. A central tenet of integrated pest management (IPM) is the establishment of action thresholds to determine when a pest population warrants control; these thresholds do not exist for many of the pests that are controlled by seed treatments and even when they do, the availability of grower-viable testing for underground pests is extremely challenging. The impact threshold for wireworm is 1 wireworm per problem area; for white grubs and seed corn maggot, insects that can cause significant damage to plant stands, action thresholds have not been established. Seed treatments have been used for decades because of the high incidence of these insects in most conditions.

In addition to the primary benefits discussed above, seed treatment neonicotinoids also provide important secondary benefits to the crops that they protect. For example, neonicotinoids are also used to control plant virus vectors [107], helping to suppress the secondary spread of viruses, such as Stewart's Wilt, in crops [reviewed in 108, 109-112]. They have also been reported to enhance plant vigour and stress tolerance (both biotic and abiotic), independent of

their insecticidal role, [113-115] through induction of salicylate-associated plant defence responses [116].

Summary

CropLife Canada and our members are strong advocates for science-based decision-making and are supportive of the Pest Management Regulatory Agency's (PMRA) work to ensure that sound science form the basis for regulatory decisions. We support the goal of PMRA, the US EPA, and California DPR in developing a revised pollinator risk assessment framework to thoroughly assess any potential risks of pesticides to honeybees and to better understand the impact of pesticides — along with nutritional, environmental, and genetic factors — on all pollinators [117].

Pollinators and pesticides are complementary and integral components of a sustainable agricultural system. As an industry we are highly dependent on a healthy and robust pollinator population and have a vested interest in protecting and promoting honey bee health. We understand that bee health is a complex and multifactorial issue that cannot be addressed by focussing on a single causative factor. As such, we would like to underscore the importance of adopting an holistic approach, enlisting professional diagnostic support (e.g., through the National Bee Diagnostic Centre) to assess the impact of know contributors to health (e.g. parasites, bacteria, viruses, environmental factors, pesticides and other toxins) in order to fully understand what the relative contributions of these various factors are.

In closing, on behalf of the Canadian plant sciences industry, CropLife Canada appreciates the opportunity to provide input on this important consultation.

Sincerely,

Maria Trainer, Ph.D.
Managing Director, Regulatory Affairs

Pierre Petelle
Vice President, Chemistry

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Appendix A: Outreach Completed by CropLife Canada

The following is a list of outreach events that CropLife Canada participated and groups to whom CropLife Canada has made presentations on the subject of bee health:

- St Hyacinth Farm Show
- Canadian Honey Council-CropLife Canada multi-stakeholder roundtable meetings
- Ontario Beekeepers' Association AGM
- USDA Honeybee research conference
- North America Pollinator Protection Campaign (NAPPC) Meeting
- Alberta Beekeepers' Commission AGM
- Manitoba Beekeepers' Association Board Meeting
- Saskatchewan Beekeepers' Association AGM
- Society of Toxicology webinar series
- Grain Farmers of Ontario AGM
- Apimondia
- GrowCanada
- MAPAQ Roundtable
- OMAF Bee Health Working Group
- Southwest Ag Conference
- Farm Tech
- American Honey Producers' Association (AHPA) Meeting
- Canadian Horticulture Council Crop Protection Committee
- PMRA FPT Education Committee
- EPA-PMRA Pollinator Summit
- Canadian Seed Trade Association
- CanPolin Roundtable
- Canadian Federation of Agriculture
- Ontario Federation of Agriculture Board Meeting
- MB Corn Growers' Association
- Western Pest Management Forum
- Manitoba Agronomists' Convention
- Ontario Agri Business Association
- American Chemistry Society AGM
- Society of Environmental Toxicology and Chemistry AGM
- International Conference on Pollinator Biology