

ANNUAL REPORT OF THE AGRICULTURAL INNOVATION BOARD

2021 Act No. 49, codified at 6 V.S.A. § 4964(c)(1)

Submitted to the:

General Assembly

By the:

Agricultural Innovation Board and the Vermont Agency of Agriculture, Food &  
Markets

January 15, 2024

6 V.S.A. § 4964(c)(1) Powers and duties of the Board.

“The Agricultural Innovation Board shall:

**(1) issue a report annually to the General Assembly on or before January 15 that recommends policy solutions to assist farmers in:**

**(A) reducing the use of and exposure to pesticides; and**

**(B) the use of innovative or alternative practices[.]”** (Emphasis added.)

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## Introduction

On June 1, 2021, Governor Scott signed Act 49 into law and the Agricultural Innovation Board (the Board or AIB) was created. The Board is tasked with thirteen separate charges (Table 1). The Board has input in five additional areas of potential rulemaking, centered on developing recommendations for regulations establishing best management practices (BMPs) for seeds treated with insecticides used in Vermont agriculture (Table 2). The establishment of the Board and its responsibilities are codified at 6 V.S.A. §§ 1105a and 4964(a)-(d).

Pursuant to the enabling legislation, the Board shall provide an annual report to the General Assembly that recommends policy solutions to help farmers reduce their use of and exposure to pesticides, and to encourage the utilization of innovative or alternative practices. Throughout 2023, the AIB addressed its responsibility to develop a policy recommendation for the Secretary of Agriculture, Food and Markets regarding BMPs for the use of neonicotinoid treated article seeds (6 V.S.A. § 1105a). This document is the Board's annual report, as well as a description of the Board's work, and an outline of the planned work for the coming year.

## Board Meetings

Pursuant to 6 V.S.A. § 4964(b)(4), the Board is required to meet at least four times a year. The Board met monthly in calendar year 2023. Board Meetings were held on January 23, 2023, February 27, 2023, March 27, 2023, April 24, 2023, May 22, 2023, June 26, 2023, July 24, 2023, August 28, 2023, September 25, 2023, October 16, 2023, November 13, 2023, and December 11, 2023. Minutes, recordings and materials presented from these meetings are maintained by the Agency of Agriculture, Food & Markets (the Agency) and are available on the AIB Website under "Meeting Information" at this link:

[Meeting Information | Agency of Agriculture Food and Markets \(vermont.gov\)https://agriculture.vermont.gov/public-health-agricultural-resource-management-division/pesticide-programs/agricultural-innovation](https://agriculture.vermont.gov/public-health-agricultural-resource-management-division/pesticide-programs/agricultural-innovation)

## Work of the Board

In February 2023, the Board provided a report to the House Committee on Agriculture, Food Resiliency, and Forestry and the Senate Committee on Agriculture regarding BMPs for non-neonicotinoid treated article seeds as required by An Act Relating to the Sale, Use, or Application of Neonicotinoid Pesticides of 2022, No. 145 § 5 (2022) (Appendix B). The Board recommended to delay issuance of recommended BMPs for non-neonicotinoid treated article seeds. Since providing this report, the Board has learned that there is limited availability of untreated and non-neonicotinoid corn seed in Vermont, and what is available is limited in regards to maturities and varieties. Untreated soybean seed is slightly more common, with higher sales in Vermont. However, soybean seed is more likely to be treated at a downstream dealer, of which there is one entity in Vermont certified to apply pesticide treatments to seed. Seeds that are treated with fungicide active ingredients only, or with insecticides that are not

classified as neonicotinoids have extremely limited availability to Vermont farmers. Therefore the Board focused their efforts on providing recommendations to the Agency on the required BMPs for the use in the State of neonicotinoid treated article seeds (6 V.S.A § 1105a).

Throughout 2023, the Board continued addressing its responsibility to develop a policy recommendation for the use of neonicotinoid treated seeds by hearing from expert witnesses and obtaining information relevant to the required topics outlined in 6 V.S.A § 1105a. The presentations made to the Board are available on the AIB Website at the link provided above.

The Board met 17 times since February 2022 and members reviewed relevant literature and research on their own between meetings. The Board invited researchers, industry representatives, agricultural service providers, and subject matter experts to present their findings and answer questions from the Board to inform their recommendation for best management practices for the use of neonicotinoid treated seeds in Vermont. Each of the following topics were addressed:

- (A) Establishment of threshold levels of pest pressure required prior to use of neonicotinoid treated article seeds
- (B) Availability of nontreated article seeds that are not neonicotinoid treated article seeds
- (C) Economic impact from crop loss as compared to crop yield when neonicotinoid treated article seeds are used
- (D) Relative toxicities of different neonicotinoid treated article seeds and the effects of neonicotinoid treated article seeds on human health and the environment
- (E) Surveillance and monitoring techniques for in-field pest pressure
- (F) Ways to reduce pest harborage from conservation tillage practices
- (G) Criteria for a system of approval of neonicotinoid treated article seed

#### Key Takeaways by Topic

AIB members worked together after hearing from 14 external subject matter experts and presentations from six Board members and/or Agency staff to summarize what they had learned and if there were any gaps or outlying questions to address. The following points were agreed upon by all members as the summary of what members heard relevant to each required topic included in 6 V.S.A § 1105a. The bold-faced headings align with the statutory charge enumerated in 6 V.S.A. § 1105a(c)(1).

#### **(A) Establishment of threshold levels of pest pressure required prior to use of neonicotinoid treated article seeds**

#### **(E) Surveillance and monitoring techniques for in-field pest pressure**

- Seed purchasing occurs months ahead of the season (September – November prior to April/May planting). Therefore, scouting the field for pests in the current year cannot influence what type of seeds to purchase and plant. Also, the previous year’s pest pressure levels are not a clear indicator of pest levels in the current year.

- Few methods are available for scouting for corn seed maggot and no economic thresholds are established for this pest.
- It is very challenging to monitor soil pests to determine if threshold values are exceeded within the window of time prior to planting in Vermont.
- Monitoring the emergence of corn seed maggot flies using in-field scouting and growing degree day calculators offers growers an option to time planting between emerging fly generations to reduce risk of crop damage.
  - There can be multiple generations of corn seed maggot in VT, but the first generation causes the most significant damage, especially when the corn is slow to germinate.
- Corn seed maggot is unpredictable. It can appear before or after planting. Corn is vulnerable to corn seed maggot damage 7-30 days from planting, and there is no insecticide rescue treatment.
- Wireworm bait traps within the field help scout for the pest and have an established economic threshold of an average of 1 wireworm per bait station for the whole field.
  - Ideally scouting should be done in fall when temperatures are above 45°F.
- The use of genetically engineered (GE) corn seed to reduce corn borer has reduced overall population of corn borer moth, which is well documented in the literature. The use of this technology has benefited farms that do not use GE corn because of overall population reduction.
- Relevant AIB meeting presentations and discussions
  - 3/27/2023  
[Vermont Corn and Soybean Pest Pressures, IPM and Neonicotinoid Treated Seed Research and Availability - Dr. Heather Darby, UVM Extension](#)
  - 6/26/2023  
[Seed Corn Maggot, Stand Losses and the Need for Insecticide Seed Treatments - Elson Shields, Cornell University](#)
  - 7/24/2023  
[Neonicotinoid Treated Seed and IPM in PA - Dr. John Tooker, Professor of Entomology / State IPM Coordinator, Penn State College of Agricultural Sciences](#)
  - 8/28/2023  
Stoner, K. [Best Management Practices for Farmers Using Seeds Treated With Neonicotinoid Insecticides](#), Connecticut Department of Agriculture online publication

**(B) Availability of nontreated article seeds that are not neonicotinoid treated article seeds**

- There is limited availability of untreated corn seed, and they are offered in limited varieties and maturities.
- Untreated seed orders add complexity to seed demand planning for the seed industry and therefore orders for untreated seed must be made early.
  - Untreated seed must be ordered in Sept/Oct for the next planting season. However, the ability to switch maturities, hybrid varieties or from grain

to silage closer to the planting season depending on conditions adds extreme complexity for the seed industry.

- It is relatively common for farmers to need to switch maturities or hybrids depending on growing season conditions.
- That flexibility is not available when a farmer purchases untreated seeds.
- Adding a fungicide-only or non-neonic treated seed option would create exponential complexity within the seed industry since seed production is a multistep and multiyear process.
  - GE technologies require the application of an insecticide to protect industry traits, therefore some trait seeds would not be available in a fungicide-only treatment.
- Limiting seed options for VT farmers would put them at a disadvantage in terms of having options and flexibility in seed performance, seed choices, and would make it more difficult for farmers to adapt to climate change.
- Untreated soybean seed is slightly more common with higher sales in VT.
  - Soybean is more likely to be treated downstream by an in-state seed dealer who is certified to apply a pesticide to the seed.
- Planting a seed without insecticide treatment is considered a liability.
  - Crop insurance premiums could increase because of the increase in perceived risk to the crop.
- Fungicide-only treated seeds are difficult to obtain.
- There are no price savings for untreated seeds.
- Diamide (neonicotinoid alternative) treated seeds are available and commonly/exclusively used in Canada because of regulations.
  - Diamide treated seeds are more expensive than neonicotinoid treated seeds
  - Diamide's relative toxicity to bees is less than neonicotinoids, but toxicity to aquatic invertebrates is similar
  - i.e. Fortenza (cyantraniliprole) registered in 2015
  - i.e. Lumivia (chlorantraniliprole) registered in 2016
- Cimegra is an alternative insecticide (active ingredient broflanilide) that is recently available as in-furrow treatment for soil insects in field crops.
  - 20-26 days after plant protection
  - The majority of planters used do not have the capability to make this type of application since the introduction of treated seed.
  - This insecticide has toxicity to bees similar to the neonicotinoids.
- Relevant AIB meeting presentations and discussions
  - 1/23/2023  
[Seed Sales in VT Update - Vermont Agency of Agriculture, Food and Markets](#)
  - 2/27/2023  
[Update on 2022 Treated and Untreated Seed Reporting - Vermont Agency of Agriculture, Food and Markets](#)

- 3/27/2023  
[Vermont Corn and Soybean Pest Pressures, IPM and Neonicotinoid Treated Seed Research and Availability - Dr. Heather Darby, UVM Extension](#)
- 4/24/2023  
[2022 Seed Report Update - Jill Goss, Vermont Agency of Agriculture, Food and Markets](#)
- 6/26/2023  
Treated Seed Availability and Sales Logistics (Corteva Agriscience) – [meeting minutes](#)
- 6/26/2023  
[Ontario Neonicotinoid Treated Seed Regulations and Related Research - Tracey Baute, Ontario Ministry of Agriculture, Food and Rural Affairs](#)

**(C) Economic impact from crop loss as compared to crop yield when neonicotinoid treated article seeds are used**

- Research comparing fungicide-only treated seed to neonicotinoid and fungicide treated seed shows inconsistent yield differences, if any. No clear trend for increased yield with neonicotinoid treated seeds compared to untreated or fungicide-only treated seed is evident from the sources reviewed.
- Smith, Baute, Schaafsma, 2020 Ontario study found a significant difference in “vigor” with neonicotinoid treated corn seed compared to fungicide only, but did not translate to a significant yield increase.
  - Chance of cost recovery of neonicotinoid treated seed use occurred in < 50% of study sites
  - Early season soil insect pests were not uncommon
  - Poor relationship between insect incidence and yield loss
  - Early season insect pests found in Ontario are generally minor, causing sub-economic injury
- Shields 2022 research at Cornell University showed the assumed cost of yield loss seen in research plots planted with corn seed without insecticide exceeded the cost of the corn seed maggot seed treatment (the yield loss is greater than the cost of the treatment). It is reasonable for farmers to use the seed treatment as an insurance policy because there is no additional cost to the farmer to use.
  - When corn seed maggot is a problem in the field the losses are catastrophic, resulting in having to replant
- There would not be an immediate increase in insurance premiums if growers choose to plant non-neonic treated seeds, however, if there is a change to growers’ choices that leads to consistent increases in losses then there may be increases in premiums in future years with a demonstrated loss.
  - An increase in premiums has a regional effect

- There is opportunity to learn more about the economic impacts of using untreated seed and planting later in the season to avoid peak pest pressures.
  - A shorter maturity (approx. 75-day) silage corn exists, but it may not be what VT farmers need or want for optimal feed production.
- Relevant AIB meeting presentations and discussions
  - 6/26/2023  
[Efficacy and Economic Benefits of Neonicotinoid Seed Treatments - Christine Hazel, Corteva Agriscience](#)
  - 6/26/2023  
[Seed Corn Maggot, Stand Losses and the Need for Insecticide Seed Treatments - Elson Shields, Cornell University](#)
  - 6/26/2023  
[Ontario Neonicotinoid Treated Seed Regulations and Related Research - Tracey Baute, Ontario Ministry of Agriculture, Food and Rural Affairs](#)
  - 8/28/2023  
[Neonicotinoids in NY State: Economic Benefits and Risks to Pollinators - Dr. Scott McArt, Associate Professor of pollinator health, Department of Entomology, Cornell University](#)
  - 9/25/2023  
UVM Neonicotinoid Treated Seed Research Update – Dr. Heather Darby, UVM Extension – [meeting minutes](#)
  - 11/13/2023  
Potential impact of non-neonicotinoid treated seeds to crop insurance discussion – Alexander Sereno, Regional Director USDA Risk Management Agency – [meeting minutes](#)

**(D) Relative toxicities of different neonicotinoid treated article seeds and the effects of neonicotinoid treated article seeds on human health and the environment**

- Review of EPA human health risk assessment for imidacloprid
  - Residue on food crop from neonicotinoid seed treatment use is negligible; therefore, food crops grown from treated seeds are unlikely to present a health risk.
  - Very little risk for exposure to the farmer when seed is purchased already treated
  - Neonicotinoids have favorable human health profile compared to the organophosphate insecticides they replaced.
- Review of EPA ecological risk assessment of neonicotinoid
  - Most likely risk of concern for mammals and birds is from chronic consumption of treated seed



- Imidacloprid, clothianidin and thiamethoxam are classified as highly toxic to honeybees (acute and chronic toxicities)
  - Neonicotinoids can have sublethal impacts on honeybee physiology, reproduction and behavior
- Proposed mitigation measures relevant to treated seed include proposal of additional seed bag label language
  - “Cover or collect treated seeds spilled during loading and planting in areas (such as in row ends).”
  - “Dispose of all excess treated seed by burying seed away from bodies of water.”
  - “Do not contaminate bodies of water when disposing of planting equipment wash water.”
- EPA stated “These risk mitigation measures were considered with the understanding of the high benefits associated with seed treatment uses, which through their use, have the potential to reduce overall neonicotinoid exposure and offer a lower overall ecological risk compared to foliar uses.”
- Neonicotinoids are highly water soluble and persist in the soil.
- Fate and transport of neonicotinoids on the treated seed
  - 2-20% taken up by the target plants (protect from soil pests for up to 3 weeks)
  - 2-3% lost as dust during planting
  - > 90% moves into soil, water, non-target plants
- 1-3% of the acreage treated with a neonicotinoid (clothianidin or thiamethoxam) is treated by foliar or in-furrow treatments, the remainder is through seed treatments.
- The amount of active ingredient per seed is considerably less than in-furrow treatments.
- Seed treatment is considered an Integrated Pest Management (IPM) strategy by the seed industry because of lower usage rates and targeted treatment to the seed.
- Canada’s PMRA investigated honeybee mortalities and found that exposure to neonicotinoids in dust generated during planting of treated corn or soybean seed with vacuum planters contributed to the mortalities observed.
  - Resulting regulation prohibits the use of talc and graphite as seed lubricants in vacuum planters. Recommend using a dust-reducing fluency agent.
  - UVM evaluated seed lubricants available in VT, most growers use talc or graphite, but a dust-reducing fluency agent was available at the local dealer.
- Sources of neonicotinoid exposures to non-target species come from:
  - Exhausted dust from vacuum planters
  - Farmers treating their own seed.
  - Soil dust carried over from previous season moved by any activity in the field and by also contributing to abrasion of seed
  - Surface water after rain event within fields and adjacent to fields from fugitive dust

- Residues blown onto flowering resources including weeds and tree blossoms
- 98% of abrasion comes from soil through the intake of vacuum planters – the solution is to pre-filter followed by post-filter BUT planter modification is not a viable option for VT growers at this time.
- Dust exhausted from vacuum planters that is directed back towards the soil is harmful to ground-dwelling beneficial invertebrates.
  - Dust contains protein and therefore can be attractive to pollinators
- Current UVM studies by Heather Darby are looking at the impact of neonicotinoid treated seeds on plant stands and pest populations. They are monitoring soil and surface water runoff for neonicotinoid levels.
  - Pest levels were low overall across both neonicotinoid treated seed and fungicide only treated seed treatments.
  - Still collecting yield data, but no significant differences across treatments to date and little to no pest incidence data.
  - Only one year of a two-year study has been completed.
- Relevant AIB meeting presentations and discussions
  - 5/23/2022  
[Pollinator Protection Efforts in VT – Dr. Terence Bradshaw, Assistant Professor, Plant & Soil Science, UVM](#)
  - 3/27/2023  
[Environmental Impact of Neonicotinoid Treated Seeds Literature Review - Vermont Agency of Agriculture, Food and Markets](#)
  - 3/27/23  
[Environmental Impact of Neonicotinoid Treated Seed Annotated Bibliography](#)
  - 3/27/2023  
Literature review of risk assessment of neonicotinoid treated seeds on human health – Sarah Owen, Toxicologist, Vermont Department of Health – [meeting minutes](#)
  - 4/24/23  
[Impact of Neonicotinoid Treated Seed on Pollinator Health - Andrew Munkres, Vermont Beekeepers Association](#)
  - 4/24/23  
[Summary EPA Neonicotinoid Ecological Risk Assessment - Morgan Griffith, Vermont Agency of Agriculture, Food and Markets](#)
  - 5/22/23  
[Review of Treated Seed Dust-Off Research - Jill Goss, Vermont Agency of Agriculture, Food and Markets](#)
  - 5/22/23  
[Dr. Schaafsma Planter Modifications Resources and Summary - Jill Goss, Vermont Agency of Agriculture, Food and Markets](#)

- 6/26/2023  
[Natural Resources Defense Council Public Comment and References - Lucas Rhoads, Natural Resources Defense Council](#)
- 7/24/2023  
[Neonicotinoid Treated Seed and IPM in PA - Dr. John Tooker, Professor of Entomology / State IPM Coordinator, Penn State College of Agricultural Sciences](#)
- 8/28/23  
[Neonicotinoids in NY State: Economic Benefits and Risks to Pollinators - Dr. Scott McArt, Associate Professor of pollinator health, Department of Entomology, Cornell University](#)
- 9/25/2023  
UVM Neonicotinoid Treated Seed Research Update – Dr. Heather Darby, UVM Extension – [meeting minutes](#)

**(F) Ways to reduce pest harborage from conservation tillage practices**

- Conservation tillage practices can reduce corn seed maggot populations because plant residues occur mainly on surface of the soil rather than being incorporated into the soil where decomposition occurs.
  - No-till conservation tillage practices are less attractive to corn seed maggot because organic matter isn't exposed
  - Corn seed maggot populations are generally higher after a legume crop is incorporated into the soil than where grass is incorporated
  - Greatest wireworm damage occurs in crops planted in fields following grass sod
- No-till practices provide habitat for beneficial organisms and increased predator populations decreases pest problems (supported by Penn State research and widespread practice amongst PA growers)
- There is a relationship between type of tillage practice and resulting pest pressures.
  - The situation is complex in VT because manure and cover crop incorporation are common and recommended practices.
  - More research is needed on this relationship in Vermont.
- Relevant AIB meeting presentations and discussions
  - 3/27/2023  
Vermont Corn and Soybean Pest Pressures, IPM and Neonicotinoid Treated Seed Research and Availability - Dr. Heather Darby, UVM Extension – [meeting minutes](#)
  - 7/24/2023  
[Neonicotinoid Treated Seed and IPM in PA - Dr. John Tooker, Professor of Entomology / State IPM Coordinator, Penn State College of Agricultural Sciences](#)

**(G) Criteria for a system of approval of neonicotinoid treated article seeds**

- Canada has federal-level prohibition of talc and graphite as seed lubricants to reduce the risk of neonicotinoid seed treatments abrading off of the seeds during planting.
  - Published [Best Management Practices for Protecting Pollinators When Using Treated Seed](#)
  - [Requirement when using Treated Corn/Soybean Seed](#)
- Ontario
  - Provincial regulations require IPM certification (one time, no expiration date) and Pest Assessment Report (formalized scouting report, one time, no expiration) used to gain access to neonicotinoid treated seeds on entire farm property.
  - requirements placed on farmers and technical service providers by provincial regulations were too burdensome to administer the program and therefore were scaled back.
  - transitioned to diamide treated seed
    - Saw 35% reduction in neonic treated corn by 2018, 43% reduction in neonic treated soybean planted in Ontario by 2018 (based on vendor sales reports sent to MECP)
    - Ontario yields for corn and soybean did not see significant changes 2015-2022
    - Neonicotinoid treated seed is still being used on a portion of the planted acreage
- Quebec
  - Requirements placed on farmers to obtain agronomic justification and prescription from certified agronomist following an agronomic assessment.
    - Assess soil type, geographic region, organic matter, tillage practices, crop rotation, pest pressure and assign low, moderate or high risk. Neonicotinoid seed treatments are only justified on farms assessed as high risk.
    - Prescription only valid 1 year
  - Requirements are burdensome have a high impact on resources (growers, government and agronomists) resulting in dramatic reduction of use of neonicotinoid treated seeds.
  - Neonicotinoid treated corn seed use in Quebec has dropped to 0.5% by 2021 (from 100% in 2015)
  - Transitioned to diamide treated seed
- New York passed the Birds and Bees bill in 2023. Prohibits the sale, distribution or purchase of corn, soybean or wheat seeds treated with clothianidin, imidacloprid, thiamethoxam, dinotefuran or acetamiprid starting January 1, 2027, but it appears it will be revised to 2029 following an agreement with the Governor.

- Authorizes the commissioner, after consultation with the commissioner of agriculture and markets, to temporarily suspend the prohibition if there is an insufficient amount of commercially available seed to adequately supply ag market that is not treated with neonics, or if purchase of seed that complies with these requirements would result in undue financial hardship to ag producers.
- By Oct 1 each year the commissioner shall publish written directive as to whether there is a temporary suspension for the forthcoming year.
- Prohibition shall not apply when commissioner determines there is an environmental emergency and no less harmful pesticide would be effective.
- NY Department of Environmental Conservation shall conduct study with NY Department of Agriculture and Markets, New York state's land grant university and State University of New York College of Environmental Science and Forestry, to identify practicable and feasible alternatives to neonics and submit results of study to legislature and governor and post online by Jan 1, 2026.
- Relevant AIB meeting presentations and discussions
  - 5/22/23  
[Review of State Neonicotinoid Use Laws and Regulations - Gene Harrington, Biotechnology Innovation Organization](#)
  - [State Neonic Laws & Regs Summary Table – AIB Sharepoint](#)
  - 6/26/23  
[Ontario Neonicotinoid Treated Seed Regulations and Related Research - Tracey Baute, Ontario Ministry of Agriculture, Food and Rural Affairs](#)
  - 7/24/23  
[A Perspective on Provincial Regulatory Approaches to Neonicotinoid Seed Treatments - Émilie Bergeron, Vice President Chemistry, CropLife Canada](#)
  - 7/24/23  
[Overview of Health Canada's Pest Management Regulatory Agency Neonicotinoid Regulations - Morgan Griffith, Vermont Agency of Agriculture, Food & Markets](#)

## AIB Recommendations

In the current seed market, neonicotinoid treated seeds are an inexpensive form of insurance, and alternative options are very limited for farmers. Because of the unavailability of non-neonicotinoid treated seeds nationally that allow for the necessary flexibility of crop variety choice, and the inability to exchange seeds to adjust for planting conditions closer to planting time, the Board's recommendations focus on research and education. The Board recommends actions to further understand the issues within Vermont, help educate growers about practices to limit pest pressure or reduce non-target exposure, and promote ongoing or planned research. Board members unanimously support efforts to increase pollinator habitat without impacting agricultural production. There is some member support for monetary programs to

mitigate any potential losses from use of non-neonicotinoid treated seeds, although evaluation of total pesticide exposure should be considered in developing monetary programs to support food crop use of non-neonicotinoid treated seed.

These recommendations are based on information gathered and presented to the Board. AIB members understand the toxicity of neonicotinoid insecticides on non-target insects and organisms up the trophic ladder. The Board understands the potential risk for pollinator exposure, and exposure to small mammals, birds, and amphibians, from the use of neonicotinoid treated seeds. In addition, the Board understands that previous research evaluating the impact on corn yield of neonicotinoid treated seeds compared to non-neonicotinoid treated seeds has found inconsistent and/or no significant differences in yield. However, it is unknown how past use of neonicotinoid treated seed has affected the pest populations and pressures throughout agriculture. This halo, or legacy effect, is not well understood and has the potential to influence research studies and therefore should be evaluated.

AIB members reached consensus on the following recommendations:

1. Support additional research:
  - a. Study the impact of halo or legacy effect on pest populations from the almost universal use of neonicotinoid treated seeds since 1990
  - b. Non-target dust movement with new seed treatment technology that reduces abrasion of seed treatment during handling and planting
  - c. Effectiveness, unknown limitations, and market availability of seed lubricant alternatives to talc and graphite
  - d. Impact of managing/mowing buffers at planting time of treated seeds
    - i. Reducing pollinator habitat in areas at risk of exposure from planting treated seeds may conflict with other conservation programs or not be feasible for farms
  - e. Support research and development of neonicotinoid alternatives and sustainable crop protection strategies specifically tailored to Vermont agricultural landscapes
2. Education and training:
  - a. Develop IPM guidance for growers for how to reduce environmental impact of neonicotinoid treated seeds
    - i. Develop information (in collaboration with University of Vermont) on toxicity and potential risk to pollinators decision making, scouting, types of pests, and management practices
    - ii. Develop regional monitoring reports that track the prevalence of pests
  - b. Ensure growers receive updates on relevant research through workshops (developed in collaboration with UVM)
    - i. Seed treatment technology innovations to reduce dust/abrasion

- ii. Seed lubricant alternatives
  - iii. Impact of past use of neonicotinoid treated seeds on present pest populations
  - iv. Local data on feasibility of VT corn crops without neonicotinoid seed treatment (plant stand, yield, economic impact, cultural pest management practices)
- c. Educate growers about seed label language and how to follow the label
- 3. Support and promote efforts to increase pollinator habitat without impacting agricultural production.
- 4. Important to build in a mechanism for review and reevaluation of recommendations, so guidelines can adjust to incorporate knowledge from research.
  - a. Revisit policy recommendations after a defined period of time and evaluate based on measurable metrics

It is important to recognize that the Board evaluated a vast amount of information to fully consider policy recommendations. The Board is proceeding thoughtfully and cautiously to fully understand the effectiveness of any recommendations, to evaluate their potential impacts, and to avoid unintended consequences. Additionally, some important information is still being developed. For example, a demonstration project regarding best management practices developed by Extension Professor, Agronomy Specialist Heather Darby, Ph.D., was awarded a Pesticide Environmental Stewardship Program grant from the U.S. Environmental Protection Agency ([Pesticide Environmental Stewardship Program Grants | US EPA](#)). The outreach and education project focuses on the use of Integrated Pest Management practices to reduce neonicotinoid seed treatments applied to row crops in Vermont. In addition to trainings, crop specific factsheets, technical assistance, and webinars, there will be six partner farms with demonstration plots planted with neonicotinoid treated corn compared to plots planted with fungicide only treated corn (depending on seed availability). The two-year project began in early 2023. There is another study coordinated by the UVM Extension Northwest Crops and Soils Program that is in collaboration with a national network, called the Discovery Farms<sup>®</sup> Program, with the objective of developing on-farm research to determine economic and environmental effects of agricultural practices on a diverse group of farms across the country ([Discovery Acres | Northwest Crops and Soils Program | The University of Vermont \(uvm.edu\)](#)). One goal of this Discovery Acres Vermont project is focused on the relationship between commercial agricultural production and water quality. In 2023, the water samples collected from this project were analyzed for neonicotinoids and common corn herbicides to assess the extent to which chemicals are potentially moving off-target from the neonicotinoid treated seeds or other pesticide applications. Research updates were provided by Dr. Darby to the Board from the first year of the two year project ([Meeting Information | Agency of Agriculture Food and Markets \(vermont.gov\)](#)). A formal report of year 1 findings will be available in early 2024.

## Agricultural Input Survey

6 V.S.A. § 4964(c)(3) states that the AIB shall “survey farmers from every county in the State to help better understand how agricultural inputs, such as pesticides, synthetic fertilizers, and plastics, are currently used as well as current challenges farmers face in reducing these inputs in order to better inform recommendations to be provided in the annual report required under subdivision (1) of this subsection.” AIB members compiled a survey including questions relevant to farmers’ use of treated article seeds, agricultural plastic, fertilizer, pesticides, and IPM practices. The survey was disseminated to a combination of Vermont Agency of Agriculture, Food and Markets (Agency) networks and non-governmental member networks. In January 2023, the survey was sent directly to Agency network lists within the Produce Safety and Water Quality Programs. In addition, contacts from the following agricultural communities were asked to share the survey with their members: Vermont Tree Fruit Growers Association; Vermont Vegetable and Berry Growers Association; Northeast Organic Farmers Association of Vermont; Vermont Sugar Makers Association; Northern Grain Gowers Association; Vermont Horse Council; Vermont Sheep and Goat Association; Young Farmers Coalition of Vermont; Champlain Valley Farmer Coalition; Vermont Farm Agriculture Health and Safety Alliance; Vermont Association of Conservation Districts; New Hampshire-Vermont Christmas Tree Growers Association; and Vermont Grass Farmers Association. The Board received 49 responses, representing 14 counties. A summary of the responses can be found on the AIB website: [Agricultural Inputs Survey Response Summary \(Vermont.gov\)](#).

Due to Board members’ concern that the responses did not provide accurate representation of corn acreage and agriculture in the state, the survey was distributed a second time with a revised plan of dissemination targeting specific segments. The Board received four additional responses, all representing small farm operations, including a maple producer: [Agricultural Inputs Survey Round 2 Response Summary \(Vermont.gov\)](#).

Overall, most respondents operated small farms within the state. There was one large farm operation and five medium farm operations that participated in the survey. Respondents reported as follows: 56% do not use pesticides, 26% use conventional pesticides, and 11% use pesticides suitable for organic production. In response to a question about the type of treated seed used, the 16 non-organic respondents answered that they did not know the type of seed treatment, or that they use treated seed without specifying the type of treatments on the seed planted. Related to fertilizer use, the majority of respondents applied manure produced on, or imported onto, the farm. Respondents reported round bale wrap, netting and twine, and feed and pellet bags as the main sources of agricultural plastic. Over 80% of respondents said they dispose of plastic waste at a landfill, while 17% recycle the plastic waste through local solid waste districts, and 21% sterilize and/or re-use the agricultural plastic on their farm.

## Board Work Plan for CY 2024

The anticipated schedule of issues the Board will consider during the coming year is summarized in Table 2. This list does not include all the Board’s charges. It will not be possible for the Board to develop policy recommendations for all issues within its purview during this next year.



The Board is comprised of many appointed volunteers who generously agreed to serve due to the importance of these topics to Vermont's agriculture and environment, and their dedication to serving the people of Vermont. These members have many other responsibilities, and it is necessary to annually prioritize the issues presented to them for consideration. The members must evaluate a considerable amount of information to enable the Board to develop any sound recommendations.

The menu of issues listed in Table 2 reflects these considerations. The Board will focus on these areas in CY 2024 to make effective progress toward fulfilling its many charges.

Information the Board needs for its discussions is also noted in the table. It should be recognized that some important information may still be in development over the next year and the Board will have to consider these deficits when evaluating policy recommendations and best management practices.

### Public Participation with the Board

Pursuant to 1 V.S.A. §§ 310-314, and in compliance with Vermont's Open Meeting Law, Board Meetings are open to the public and are noticed by posting meeting information on the Agency of Administration's Department of Libraries public meeting calendar for State Agencies, as well as the Agency of Agriculture, Food and Markets' AIB Website, at least two weeks prior to each scheduled meeting. Information pertaining to any special meetings will be publicly posted at least 24 hours in advance of the Board's meeting. Meeting time, location, call-in number, and video meeting link are provided in the notices and agendas are both provided to members and posted publicly to the AIB Website at least 48 hours in advance of regular meetings and 24 hours in advance of special meetings. Time is allotted at each meeting for public comments. Interested persons are invited to attend the meetings as noticed.

Public comments received are included in the meeting minutes and written comments received have been posted on the AIB Website. In 2023, the Board received written public comment from the Natural Resources Defense Council and The Xerces Society.

**Table 1. Agricultural Innovation Board Legislative Charges / Reporting Requirements as established in 6 VSA § 4964 (a) through (d).**

<b>Item</b>	<b>Responsibility/Charge</b>
1	Review historic recommendations for pesticide reduction in the State and coordinate with existing work groups to avoid submitting to the General Assembly conflicting policy recommendations on the regulation of pesticides and farming.
2	Recommend practices that reduce the use of and exposure to pesticides and synthetic fertilizers in order to protect soil biology, human health, and environmental health, including recommended targets to achieve the State goal of an overall reduction in the use of pesticides consistent with sound pest or vegetative management practices.
3	Advise the Executive Branch and the General Assembly with respect to legislation concerning the use of agricultural pest control measures and integrated pest management.
4	Recommend to the Secretary of Agriculture, Food and Markets policies, proposed rules, or legislation for the regulation of the use of treated articles when the Board determines that use of a treated article will have a hazardous or long-term deleterious effect on the environment in Vermont, presents a likely risk to human health, or is dangerous. (Note: amended by Act 145, 2022; see Table 2).
5	Recommend practices to reduce the use and generation of waste associated with plastic in farming.
6	Incentivize farming practices that are looking to reduce the use and dependence on pesticides in their practices.
7	Advise the Agency with regard to the regulation of plant biostimulants.
8	Recommend studies necessary for the performance of its functions as established under this section.
9	Explore methods and standards for transitioning farmers to practices that reduce pesticide usage.
10	Explore methods and standards for farmers to engage in carbon sequestration or mitigation.
11	Review the seed traits of a new genetically engineered seed proposed for sale, distribution, or use in the State.
12	Study and issue recommendations regarding the feasibility of the use of biodegradable plastics in agriculture and the promotion of the use of and production of biodegradable plastics and similar products in Vermont.
13	Seed review. The Agricultural Innovation Board shall advise the Secretary regarding the sale, distribution, or use of genetically engineered seed in the State and may recommend to the Secretary limits or conditions on the sale, distribution, or use of a genetically engineered seed or seeds or recommend a limited period of time for sale of a genetically engineered seed or seeds.
<b>REPORTING</b>	
1	Issue a report annually to the General Assembly on or before January 15 that recommends policy solutions to assist farmers in: (A) reducing the use of and exposure to pesticides; and (B) the use of innovative or alternative practices.
2	Propose an annual budget report that provides ideas for funding sources for any new programs recommended in the annual report.
3	Survey farmers from every county in the State to help better understand how agricultural inputs, such as pesticides, synthetic fertilizers, and plastics, are currently used, as well as current challenges farmers face in reducing these inputs in order to better inform recommendations to be provided in the annual report required under subdivision (1) of this subsection.

Table 2. Agricultural Innovation Board Work Planned Focus Areas for CY 2024 (not necessarily in priority order).

Item	Responsibility/Charge	Informational Needs
1	Review historic recommendations for pesticide reduction in the State and coordinate with existing work groups to avoid submitting to the General Assembly conflicting policy recommendations on the regulation of pesticides and farming.	Recommendations from other extant groups evaluating pesticides and related issues in Vermont.
2	Recommend practices that reduce the use of and exposure to pesticides and synthetic fertilizers in order to protect soil biology, human health, and environmental health, including recommended targets to achieve the State goal of an overall reduction in the use of pesticides consistent with sound pest or vegetative management practices.	Research and demonstration projects involving agricultural impacts and landscape management impacts on areas of AIB concern.
3	Advise the Executive Branch and the General Assembly with respect to legislation concerning the use of agricultural pest control measures and integrated pest management.	Legislation concerning the use of agricultural pest control measures and integrated pest management introduced in the 2023/2024 Legislative Session.
4	Recommend studies necessary for the performance of its functions as established under this section.	Studies needed to provide information not currently available to better understand potential impacts of the use of neonicotinoid treated article seeds.
5	Survey farmers from every county in the State to help better understand how agricultural inputs, such as pesticides, synthetic fertilizers, and plastics, are currently used, as well as current challenges farmers face in reducing these inputs in order to better inform recommendations to be provided in the annual report required under subdivision (1) of this subsection.	Results of the survey of farmers conducted per 6 VSA §4964 (c) 3.
6	Recommend practices to reduce the use and generation of waste associated with plastic in farming.	Information relevant to agricultural plastic use within state, available alternatives, previous research and recommendations.
7	Study and issue recommendations regarding the feasibility of the use of biodegradable plastics in agriculture and the promotion of the use of and production of biodegradable plastics and similar products in Vermont.	Information relevant to biodegradable plastic use in Vermont agriculture, benefits and challenges, and previous research and recommendations.

## Appendix A: Board Members

**Wendy Sue Harper, Ph.D.** - Soil Scientist, Retired Associate Faculty, Prescott College [AIB Role Fulfillment: Soil Biologist]

**Clara Ayer** - Dairy Farmer, Fairmont Farm [AIB Role Fulfillment: an active farmer who is a member of an organization representing the conventional dairy industry in Vermont]  
Appointment concluded April 11, 2023

**Amanda St. Pierre** - Dairy Farmer, Pleasant Valley Farms [AIB Role Fulfillment: an active farmer who is a member of an organization representing the conventional dairy industry in Vermont]  
Appointment commenced April 11, 2023

**Fitzroy Beckford, Ph.D.** - Associate Dean and Director of UVM Extension in the College of Agriculture and Life Sciences [AIB Role Fulfillment: a member from the University of Vermont Center for Sustainable Agriculture]

**Terence Bradshaw, Ph.D.** - Assistant Professor, Department of Plant and Soil Science / Director, Horticultural Research and Education Center, UVM [AIB Role Fulfillment: an active farmer who is a member of an organization representing fruit and vegetable farmers in Vermont]  
Appointment concluded July 1, 2023

**Ann Hazelrigg, Ph.D.** - Extension Associate Professor, Department of Plant and Soil Science / Director, Plant Diagnostic Clinic, UVM [AIB Role Fulfillment: an active farmer who is a member of an organization representing fruit and vegetable farmers in Vermont]  
Appointment commenced July 1, 2023

**Jonathan Chamberlin** - Ag Retail/Crop Consultant, Bourdeau Brothers [AIB Role Fulfillment: a certified crop consultant]

**Clarice Cutler** - Environmental Analyst, Department of Environmental Conservation, Agency of Natural Resources [AIB Role Fulfillment: the Secretary of Natural Resources or designee]  
Appointment concluded October 11, 2023

**Abbi Pajak** - Environmental Analyst, Department of Environmental Conservation, Agency of Natural Resources [AIB Role Fulfillment: the Secretary of Natural Resources or designee]  
Appointment commenced November 6, 2023

**Earl Ransom** - Organic Dairy Farmer, Rockbottom Farm [AIB Role Fulfillment: an active farmer who is a member of an organization representing the organic farming community]

**Ryan Rebozo, Ph.D.** - Director of Conservation Science, Vermont Center for Ecostudies [AIB Role Fulfillment: a member of an environmental organization that advocates for policy regarding the management or reduction of toxic substances in the State]

**Steven Schubart** - Grass-fed beef operation owner, Grass Cattle Company [AIB Role Fulfillment: an active farmer who is a member of an organization representing grass-based, non-dairy livestock farming in Vermont]

**Sarah Owen, Ph.D.** - State Toxicologist, Department of Health, Agency of Human Services [AIB Role Fulfillment: the Commissioner of Health or a designee with expertise in the effects of pesticides on human health]

**Laura DiPietro** - Director, Water Quality Division, Agency of Agriculture, Food & Markets [AIB Role Fulfillment: the Director of the Agency of Agriculture, Food and Markets, Water Quality Program or designee]

**Morgan Griffith** - Agrichemical Program Manager, Public Health and Agricultural Resource Management Division, Agency of Agriculture, Food & Markets [AIB Role Fulfillment: the Director of the Agency of Agriculture, Food and Markets, Agrichemical Program or designee]

**Steven Dwinell** - Director, Public Health and Agricultural Resource Management Division, Agency of Agriculture, Food & Markets [AIB Role Fulfillment: the Secretary of the Agency of Agriculture, Food and Markets or designee]

Appendix B: Report Regarding BMPs For Non-Neonicotinoid Treated  
Article Seeds

REPORT REGARDING BMPs FOR NON-NEONICOTINOID TREATED ARTICLE SEEDS

Act No. 145 of 2022

Submitted to the:

House Committee on Agriculture, Food Resiliency, and Forestry

Senate Committee on Agriculture

By the:

Agricultural Innovation Board and the Vermont Agency of Agriculture, Food &  
Markets

February 15, 2023

Act No. 145 of 2022, Section 5, *Review and Report on BMPs for Treated Article Seeds*:

“On or before February 15, 2023, the Agricultural Innovation Board shall submit to the Senate Committee on Agriculture and the House Committee on Agriculture and Forestry a written report regarding whether best management practices (BMPs) should be adopted for the use of treated article seeds that are not neonicotinoid treated article seeds. The report shall include:

- (1) a summary of the Agricultural Innovation Board’s review of treated article seeds that are not neonicotinoid treated article seeds, including identification of treated article seeds that may have adverse effects on human health or the environment;
- (2) a recommendation of whether BMPs for treated article seeds that are not neonicotinoid treated article seeds should be adopted and whether they should be adopted by rule; and
- (3) proposed BMPs for treated article seeds that are not neonicotinoid treated article seeds. (An Act Relating to the Sale, Use, or Application of Neonicotinoid Pesticides of 2022, No. 145 § 5 (2022))”

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## Agricultural Innovation Board Recommendation

The Agricultural Innovation Board (the Board or AIB) unanimously voted to delay issuance of recommended BMPs for non-neonicotinoid treated article seeds. The Board plans to gather more information about the sale of treated seed in Vermont, including what products and active ingredients are used as treatments and the availability of untreated seeds and treated seed that are not neonicotinoid treated article seed, for example biological seed treatment like rhizobia and fungicide-only treated seeds. The Board will focus their efforts on providing recommendations to the Agency of Agriculture, Food & Markets (Agency) on the required BMPs for the use in the State of neonicotinoid treated article seeds, that may also address other types of pesticide treatments and/or non-seed protection treatments, such as inoculants, by March 1, 2024 (*see* 6 V.S.A. § 1105).

## Review of Non-Neonicotinoid Treated Article Seeds

The Board has discussed treated article seeds at multiple meetings to date. On January 23, 2023, the Board specifically reviewed information from the Agency Feed, Seed and Fertilizer Program about [seed sales data to date](#). Registered distributors of agricultural seed must report to the Agency by February 15 the quantity of untreated and treated agricultural seed sold in Vermont.

“For agricultural seeds sold in Vermont, the manufacturer or processor distributing the seed in Vermont shall report annually on or before February 15 to the Secretary on forms supplied by the Secretary regarding the quantity of treated article seed and the quantity of untreated seed sold in Vermont during the previous calendar year.” (6 V.S.A. § 648 (h)).

The Agency attempted to collect seed sale information ahead of that schedule from distributors that reported tonnage in 2021, including information about treatments applied to seeds. Tonnage reporting is required of those distributors that sold seeds “in containers of more than ten pounds.” There were 48 distributors that fall into this category and as of the January 23<sup>rd</sup> AIB meeting, the Agency had received 13 responses. Within those responses, sales of treated seeds not treated with neonicotinoid insecticides were reported for specialty and turf seeds, but no sales of other types of treated agricultural seed without neonicotinoids were reported to date. Because of the limited responses, the Board did not review literature related to any known or potential impacts of non-neonicotinoid treated seeds to the environment and human health, and felt more time and information was necessary for full understanding of the sales data for agricultural seed in Vermont and literature review of seed treatments relevant to Vermont.

Additionally, the Agency informed the Board on January 23, 2023 that it had not received any public health or environmental concerns, complaints or other incidents regarding non-neonicotinoid treated article seeds to date.

## Existing Requirements for Treated Article Seeds

The Federal Seed Act ([7 CFR § 201.31a](#) and [USDA Labeling Requirements for Chemically Treated Seed](#)) requires that bags containing treated seeds shall be labeled with the following statements:

- This seed has been treated with (insert name of active ingredient of pesticide)
- Do not use for food, feed, or oil purposes

Vermont law also requires labeling to the same effect:

“For all seeds that have been treated, the label shall include a word or statement indicating that the seed has been treated with the commonly accepted chemical or abbreviated chemical name of the applied substance. A caution statement shall be set forth if the substance in the amount present is harmful to human or other vertebrate animals. The caution for toxic substances shall be a poison statement or symbol.” (6 V.S.A. § 644(a)(2))

The corresponding pesticide EPA approved label for the pesticide used as treatment on the treated article seeds is required to have information and instructions concerning first aid, personal protective equipment (PPE), environmental and human/animal health hazards, precautionary statements, directions for use, storage and disposal, and worker protection labeling. The label provides critical information about how to handle and safely use the pesticide product and avoid harm to human health and the environment. Pesticide labels are legally enforceable and are required to have the statement: “It is a violation of Federal Law to use this product in a manner inconsistent with its labeling”.

The product label for the pesticide used in seed treatment contains seed bag label requirements specific to the pesticide and can include statements concerning required PPE, proper disposal, planting instructions and precautionary statements to reduce nontarget environmental and human health exposures such as:

- This seed has been treated with [INSERT PRODUCT NAME(S) (EPA REG. NO(S))] containing [INSERT NAME(S) OF ACTIVE INGREDIENT(S)].
- Store away from food and feedstuffs.
- Wear long-sleeved shirt, long pants and chemical-resistant gloves when handling treated seed.
- Treated seeds exposed on soil surface may be hazardous to wildlife. Cover or collect treated seeds spilled during loading.
- Dispose of all excess treated seed. Leftover treated seed may be buried away from water sources in accordance with local requirements.
- Do not contaminate water bodies when disposing of planting equipment wash waters.
- Do not allow children, pets, or livestock to have access to treated seed.
- Treated seed must be adequately covered with soil at planting.

The Board does not make recommendations above and beyond the current Vermont law, Federal Seed Act or EPA labeling requirements for the pesticides and the treated article seeds at this time for non-neonicotinoid treated article seeds.

## **Review of Voluntary BMPs Available to Growers**

The Board has collected and reviewed resources and BMPs from other states and seed industry associations. These resources are accessible and available to growers in Vermont on the Agency's [Seed Program website](#).

American Seed Trade Association (ASTA) – Crop Life America (CLA) The Guide to Seed Treatment Stewardship. [ASTA SeedGuide Farmers Update2021.pdf \(seed-treatmentguide.com\)](#)

Health Canada, Pollinator Protection and Responsible Use of Insecticide Treated Seed. March 2015. [treated seed-semences traitees-eng.pdf \(canada.ca\)](#)

Honey Bee Health Coalition, Best Management Practices (BMPs) for Pollinator Protection in Field Corn. February 2020. [HBHC Corn 022020.pdf \(honeybeehealthcoalition.org\)](#)

Honey Bee Health Coalition, Best Management Practices (BMPs) to Protect Honey Bees and Other Pollinators in Soybean Fields. February 2020. [HBHC Soybean 022020.pdf \(honeybeehealthcoalition.org\)](#)

Minnesota Department of Agriculture, Stewardship Guidelines and Best Management Practices for Neonicotinoid Insecticide-Treated Seed. May 2019. [Stewardship Guidelines and Best Management Practices for Neonicotinoid Insecticide-Treated Seed \(state.mn.us\)](#)

Minnesota Pollution Control Agency, Disposal of Treated Seeds. April 2022. [Treated Seeds \(state.mn.us\)](#)

Stoner, K. Connecticut Agricultural Experiment Station. Best Management Practices for Farmers Using Seeds Treated with Neonicotinoid Insecticides.

[BMPhandlingNeonicotinoidTreatedSeedspdf.pdf \(ct.gov\)](#)

## **Appendix: Board Members**

**Wendy Sue Harper, Ph.D.**

**Soil Scientist, Associate Faculty, Prescott College**

AIB Role Fulfillment: Soil Biologist

**Clara Ayer**

**Dairy Farmer, Fairmont Farm**

AIB Role Fulfillment: an active farmer who is a member of an organization representing the conventional dairy industry in Vermont

**Fitzroy “Roy” Beckford, Ph.D.**

**Associate Dean and Director of UVM Extension in the College of Agriculture and Life Sciences**

AIB Role Fulfillment: a member from the University of Vermont Center for Sustainable Agriculture

**Terence “Terry” Bradshaw, Ph.D.**

**Assistant Professor, Department of Plant and Soil Science / Director, Horticultural Research and Education Center, University of Vermont**

AIB Role Fulfillment: an active farmer who is a member of an organization representing fruit and vegetable farmers in Vermont

**Jonathan Chamberlin**

**Ag Retail/Crop Consultant, Bourdeau Brothers** AIB Role

Fulfillment: a certified crop consultant

**Clarice Cutler**

**Environmental Analyst, Department of Environmental Conservation, Agency of Natural Resources**

AIB Role Fulfillment: the Secretary of Natural Resources or designee

**Earl Ransom**

**Organic Dairy Farmer, Rockbottom Farm**

AIB Role Fulfillment: an active farmer who is a member of an organization representing the organic farming community

**Ryan Rebozo, Ph.D.**

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**Steven Schubart**

**Grass-fed beef operation owner, Grass Cattle Company**

AIB Role Fulfillment: an active farmer who is a member of an organization representing grassbased, non-dairy livestock farming in Vermont

**Sarah Owen, Ph.D.**

**State Toxicologist, Department of Health, Agency of Human Services**

AIB Role Fulfillment: the Commissioner of Health or a designee with expertise in the effects of pesticides on human health

**Laura DiPietro**

**Director, Water Quality Division, Agency of Agriculture, Food & Markets**

AIB Role Fulfillment: the Director of the Agency of Agriculture, Food and Markets, Water

Quality Program or designee

**Morgan Griffith**

**Agrichemical Program Manager, Public Health and Agricultural Resource Management Division, Agency of Agriculture, Food & Markets**

AIB Role Fulfillment: the Director of the Agency of Agriculture, Food and Markets,

Agrichemical Program or designee

**Steven Dwinell**

**Director, Public Health and Agricultural Resource Management Division, Agency of Agriculture, Food & Markets**

AIB Role Fulfillment: the Secretary of the Agency of Agriculture, Food and Markets or designee

For more information about the AIB please contact

[AGR.AgriculturalInnovationBoard@vermont.gov](mailto:AGR.AgriculturalInnovationBoard@vermont.gov) or visit [Agricultural Innovation Board | Agency of Agriculture Food and Markets \(vermont.gov\)](#)

## Appendix C: Neonicotinoid Use in Vermont

### **Neonicotinoid use in Vermont**

Presented to the Agricultural Innovation Board by the Agency of Agriculture, Food and Markets  
December 1, 2023

#### **Vermont neonicotinoid use over the last five years**

There are a total of 366 products containing neonicotinoid active ingredients registered in Vermont, including agricultural, commercial pest control, and animal health products. In Vermont, all outdoor-use neonicotinoid containing products are classified as restricted use and can only be purchased and used by certified pesticide applicators. Pesticide use is reported annually to the Agency of Agriculture, Food and Markets (the Agency) by certain certified applicators, including commercial, non-commercial, and government certified applicators.

Neonicotinoid usage data reported for the last five years is summarized below (Table 1). Note that these data do not include usage by certified private applicators, who may apply pesticides (including those classified as restricted use) on their own property and are not required to report their individual usage data, or usage from seeds treated with neonicotinoids, which is discussed separately below.

#### **Vermont neonicotinoid use by commercial, non-commercial, and government certified applicators**

Use of neonicotinoids began in Vermont when imidacloprid was first registered in 1994. Neonicotinoid use data presented in this section doesn't reflect homeowner use, seed treatment applications or applications by private applicators. From 2017 to 2021 the most neonicotinoid products are used in the landscaping industry and on golf courses and for structural pest control (Table 1).

Table 1. Total pounds of neonicotinoids reported by commercial applicators, 2017-2021.

<b>Pounds of Neonicotinoids Used Commercially in VT (2017-2021)</b>					
<b>CLOTHIANIDIN</b>					
<b>Treatment Use Type</b>	<b>2017</b>	<b>2018</b>	<b>2019</b>	<b>2020</b>	<b>2021</b>
Lawn Care & Ornamentals	1.4	1.6	1.2	1.2	1.7
Golf Courses	7.1	5.3	20.4	9.7	18.4
General Pest Control	0.3	2.2	3.9	8.5	25.4
Greenhouse / Nursery	NR	NR	NR	NR	NR
Produce Production	NR	NR	NR	NR	NR
Corn, Field & Forage	NR	NR	NR	NR	NR
Highway & Railway	NR	NR	NR	NR	NR
Forestry	NR	NR	NR	NR	NR
<b>THIAMETHOXAM</b>					
<b>Treatment Use Type</b>	<b>2017</b>	<b>2018</b>	<b>2019</b>	<b>2020</b>	<b>2021</b>
Lawn Care & Ornamentals	NR	NR	NR	NR	NR
Golf Courses	4.0	5.6	3.7	7.7	0.7
General Pest Control	3.0	2.5	2.5	0.2	3.7
Greenhouse / Nursery	0.0002	0.0006	NR	0.003	NR
Produce Production	NR	NR	0.2	NR	NR
Corn, Field & Forage	NR	NR	NR	2.1	NR
Highway & Railway	NR	NR	NR	NR	NR
Forestry	NR	NR	NR	NR	NR
<b>IMIDACLOPRID</b>					
<b>Treatment Use Type</b>	<b>2017</b>	<b>2018</b>	<b>2019</b>	<b>2020</b>	<b>2021</b>
Lawn Care & Ornamentals	676.0	646.3	662.0	574.1	646.5
Golf Courses	185.3	152.6	218.7	146.5	168.5
General Pest Control	269.2	183.3	91.1	307.5	96.6
Greenhouse / Nursery	0.06	0.05	0.02	0.03	0.02
Produce Production	NR	0.2	NR	NR	4.0
Corn, Field & Forage	NR	NR	NR	NR	NR
Highway & Railway	NR	NR	0.07	NR	NR
Forestry	NR	0.01	NR	NR	NR
<b>DINOTEFURAN</b>					
<b>Treatment Use Type</b>	<b>2017</b>	<b>2018</b>	<b>2019</b>	<b>2020</b>	<b>2021</b>
Lawn Care & Ornamentals	11.5	10.8	33.7	17.7	14.2
Golf Courses	NR	NR	NR	NR	0.6
General Pest Control	2.0	2.6	2.8	9.4	7.5
Greenhouse / Nursery	24.1	0.05	0.06	0.03	NR
Produce Production	NR	NR	NR	NR	NR
Corn, Field & Forage	NR	NR	NR	NR	NR
Highway & Railway	NR	NR	NR	NR	NR
Forestry	NR	NR	0.08	NR	NR
<b>ACETAMIPRID</b>					
<b>Treatment Use Type</b>	<b>2017</b>	<b>2018</b>	<b>2019</b>	<b>2020</b>	<b>2021</b>
Lawn Care & Ornamentals	NR	0.4	2.0	1.7	1.7
Golf Courses	NR	NR	NR	NR	NR
General Pest Control	6.3	36.6	9.2	26.9	0.9
Greenhouse / Nursery	NR	NR	NR	NR	NR
Produce Production	1.0	7.6	1.7	1.5	4.8
Corn, Field & Forage	NR	NR	NR	NR	NR
Highway & Railway	NR	NR	NR	NR	NR
Forestry	NR	NR	NR	NR	NR

NR = none reported

Although there are products registered in the state containing at least five different neonicotinoid active ingredients, imidacloprid is the most common neonicotinoid applied commercially not including treated seed (Figure 1). Imidacloprid has remained the most common neonicotinoid used by commercial applicators over the past five years. When the commercial use of imidacloprid is classified by treatment type for 2021, use as lawn and ornamental plant treatments account for 71% of imidacloprid use, followed by 18% used on golf courses and 11% in the structural pest control industry (Figure 2).

Figure 1. Total pounds of neonicotinoids reported by commercial applicators, 2021.

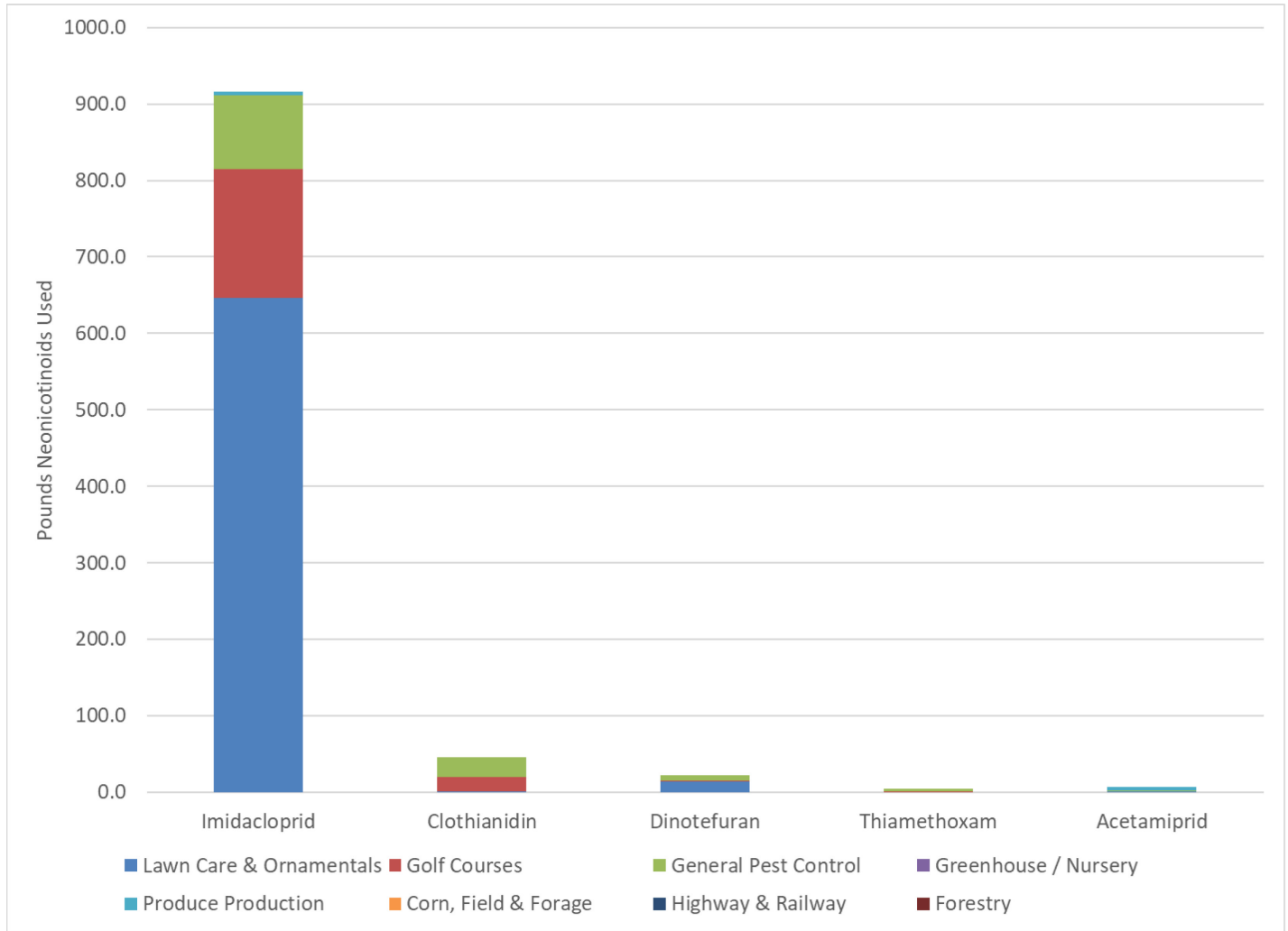
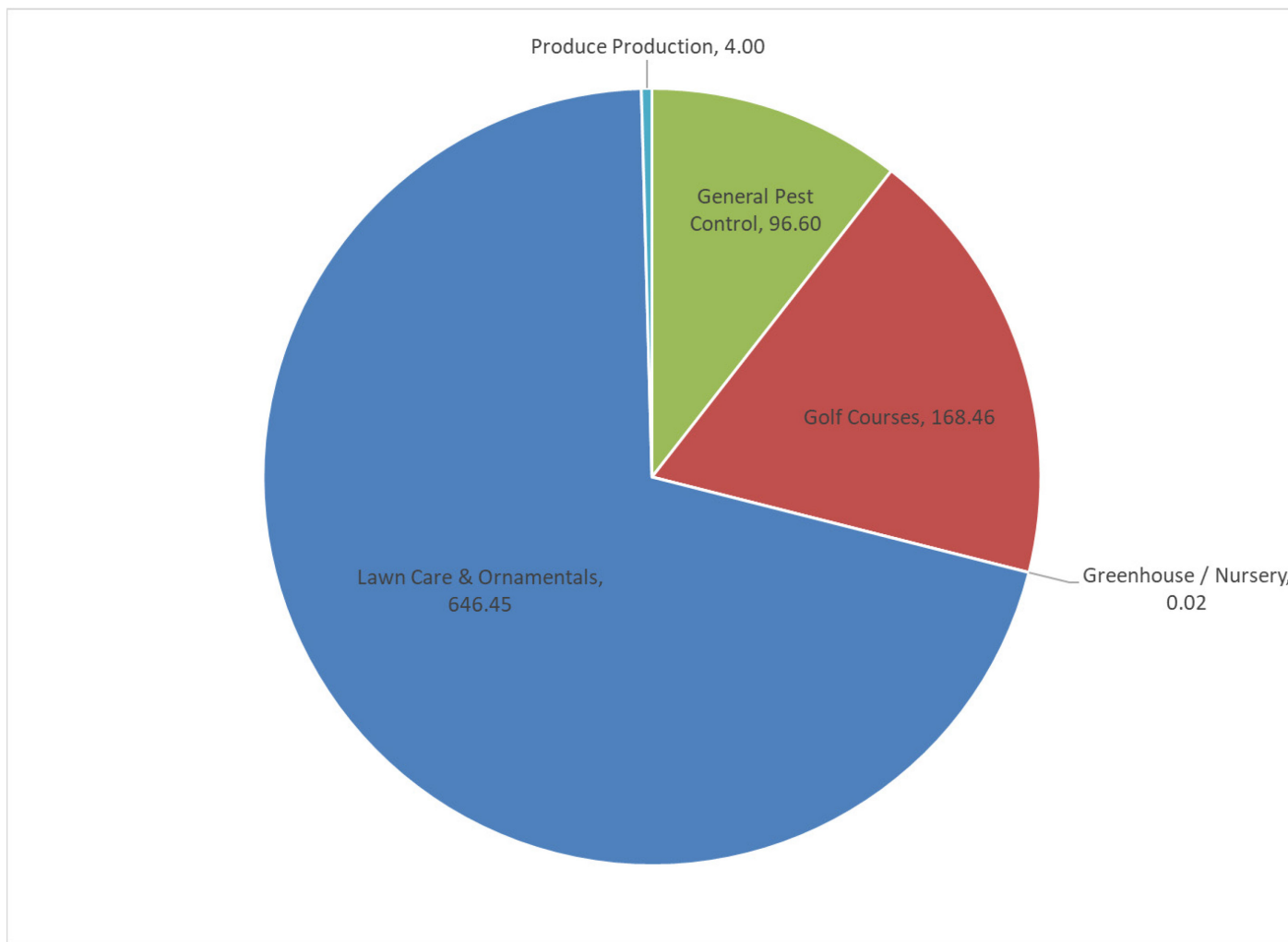




Figure 2. Total pounds imidacloprid commercial use in Vermont by treatment type, 2021.



### Estimated neonicotinoid use on treated seeds

A significant quantity of neonicotinoid insecticide is used in Vermont on treated seed. All field corn is treated out of state by the seed manufacturer with a neonicotinoid and/or a diamide insecticide and a fungicide to protect the seeds and young seedlings from pests. The treated seeds are sold into Vermont either directly to a crop producer or to a Vermont-based registered seed distributor. These treated seeds are considered “treated articles”.

The Agency requires reporting on the quantity of treated article seed and the quantity of untreated seed sold in Vermont. According to seed sales reported to the Agency in 2022, approximately 99.6% of corn planted is treated with neonicotinoids with 87% of the treated corn using clothianidin as an active ingredient. The remaining 13% is treated with thiamethoxam. Based on this information, the reported acreage planted in corn, and average seeding rates, the Agency makes the following estimate of neonicotinoid use attributed to treated seeds: 0.25 - 1.25 mg active ingredient per seed \* 30,000 seeds per acre \* 99.6% of 90,000 acres ≈ 1,482 – 7,410 pounds of neonicotinoid active ingredient per year in Vermont (or 1,289 – 6,447 pounds of clothianidin and 193 – 963 pounds of thiamethoxam per year). This is a result of an application rate of approximately 0.02-0.08 pounds active ingredient per acre over the large number of acres planted in corn. According to soybean seed sales reported to the Agency in 2022, approximately 34% of the soybeans planted are treated with neonicotinoids. Based on the 2022 USDA CroplandCROS estimated acreage of soybeans in Vermont, average seeding rates per acre, and the range of seed treatment application rates, the Agency estimates:

0.075 – 0.23 mg active ingredient per seed \* 160,000 soybean seeds per acre \* 34% of 7,000 acres planted in soybean ≈ 63 – 193 pounds of neonicotinoid active ingredient per year in Vermont.

Including the use of neonicotinoids on treated seed significantly increases the total pounds of neonicotinoids used, with treated seed use contributing more than any other treatment type. However, when evaluating pesticide use, the most useful metric is the rate of application per acre, not the total amount used in a geographic area. Application rates are prescribed by the label, after a review of exposure and environmental fate studies, and set to result in no unreasonable adverse effects at those rates. When comparing the data on a rate per acre basis, the lawn care and ornamental industry apply imidacloprid (the most commonly used neonicotinoid) at a maximum rate of 0.4 lb active ingredient per acre per year and planting of treated seed (as estimated above) applies a maximum rate of 0.08 lb active ingredient per acre per year.