





Reduction of neonics: The Québec experience

Louis Robert, agronome, M.Sc.



Neonics — The New DDT Conference
CT Coalition for Pesticide Reform
Trinity College
Hartford CT

March 11, 2024



*« Good science starts with good **problem definition**, and good problem definition usually starts with accurate **observations on the system in question** »*

Lowenberg-DeBoer, James, et Erickson, Bruce. 2019. Setting the record straight on precision agriculture adoption. *Agron. J.* 111: 1552-1569.

*« It is **difficult** to get a man to understand something when his salary depends upon his **not understanding it** »*

Upton Sinclair (1878-1968)



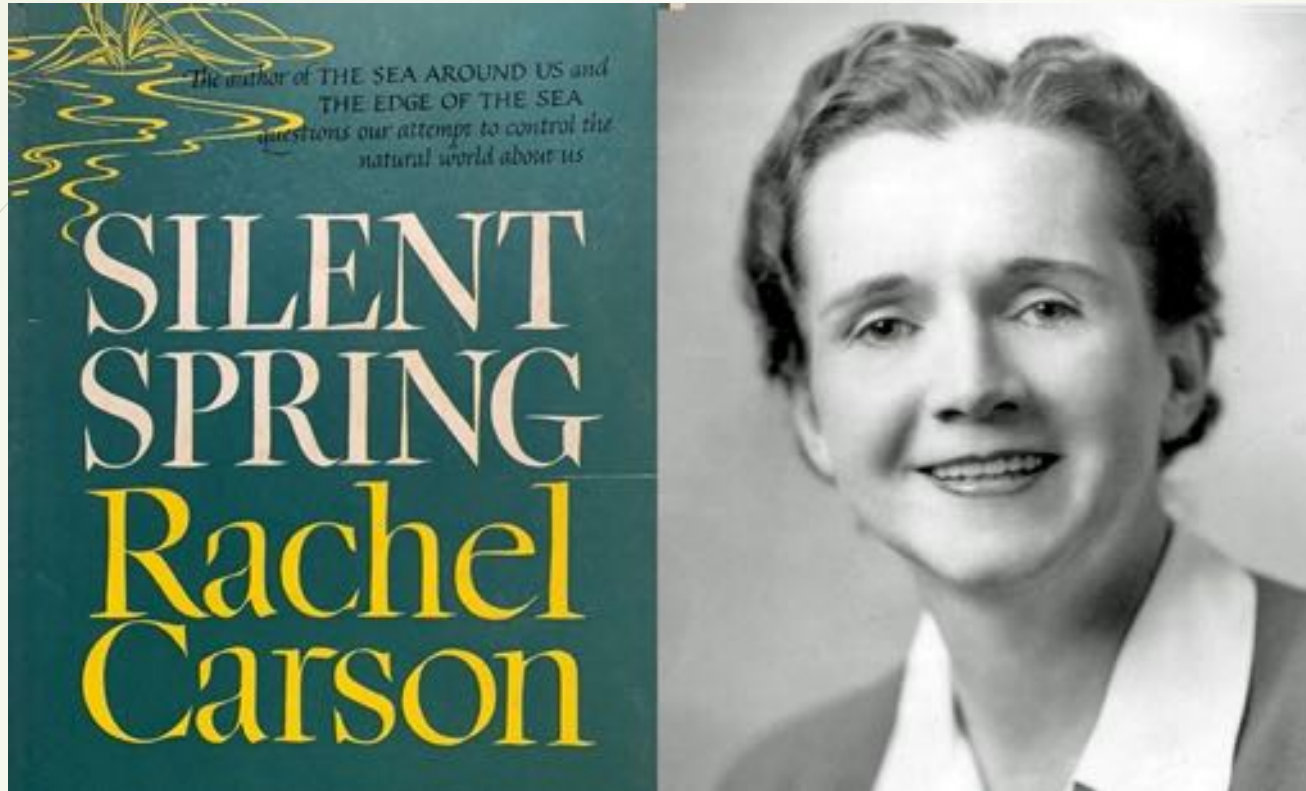
Vidéo « DDT so safe you
can eat it, 1947

<https://www.youtube.com/watch?v=gtcXXbuR244>



March 2015, TF1 (french television)

<https://www.youtube.com/watch?v=7jWyrbPOTJQ>



- In 1962: Abundant scientific evidence of global disaster already brought about by first uses of pesticides
- 1962-2024: any progress ?



The backdrop

- ▶ Québec: around 1 M acres each of corn, soybeans; 600 000 acres in small grains; 100 000 acres in vegetables;
- ▶ Total pesticides used: over 5 000 tons of active ingredients, 74 % in the ag sector;
- ▶ In 1992, the Ministry of Agriculture, **together with the Ministry of Environment and the farmers union** agreed upon a plan aiming at a reduction of 50 % of the amount of pesticides used by 2000: no effect;
- ▶ The plan (voluntary) was resurrected, with lesser, more humble objectives, in 2011 and again in 2020: no effect;
- ▶ Conclusion: incentives and extension don't work (but no one ever wondered why).

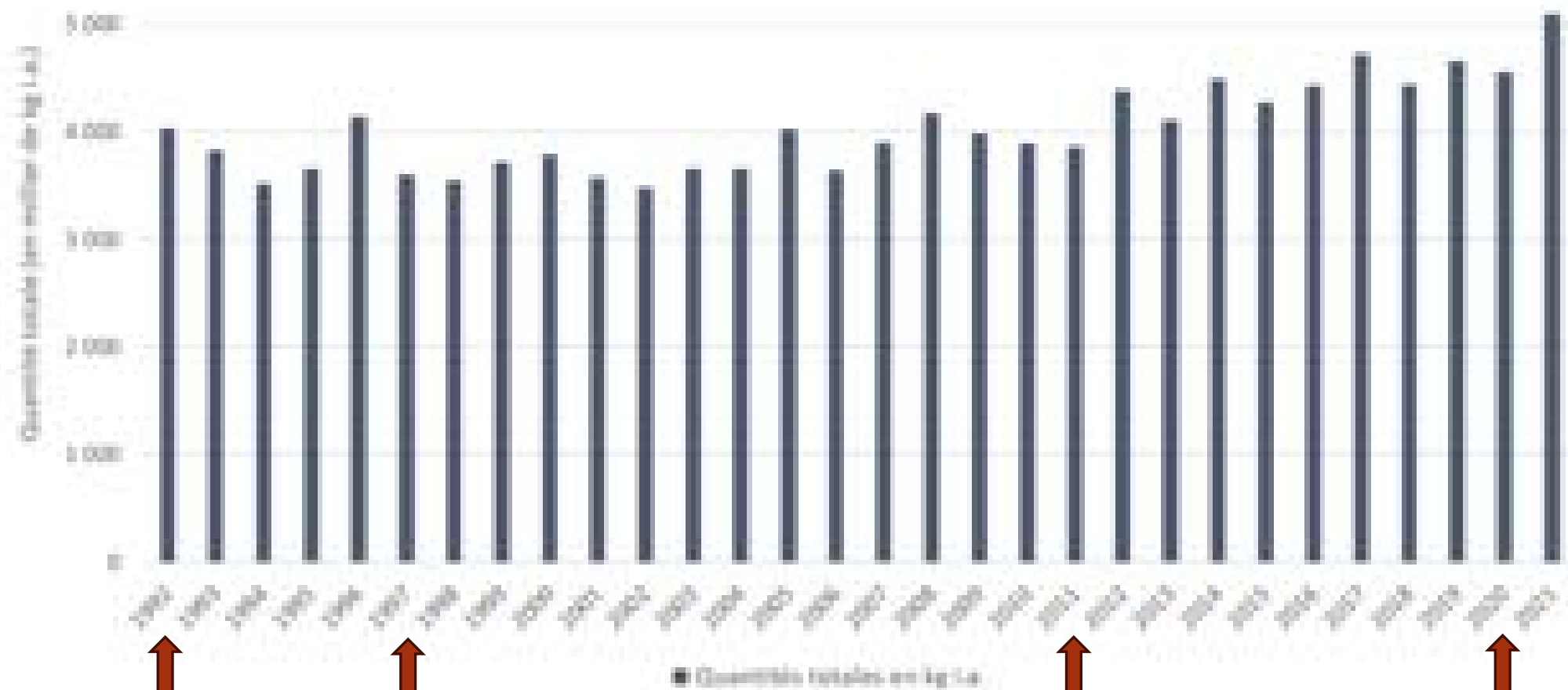


Figure 1. Évolution des ventes totales depuis 1992

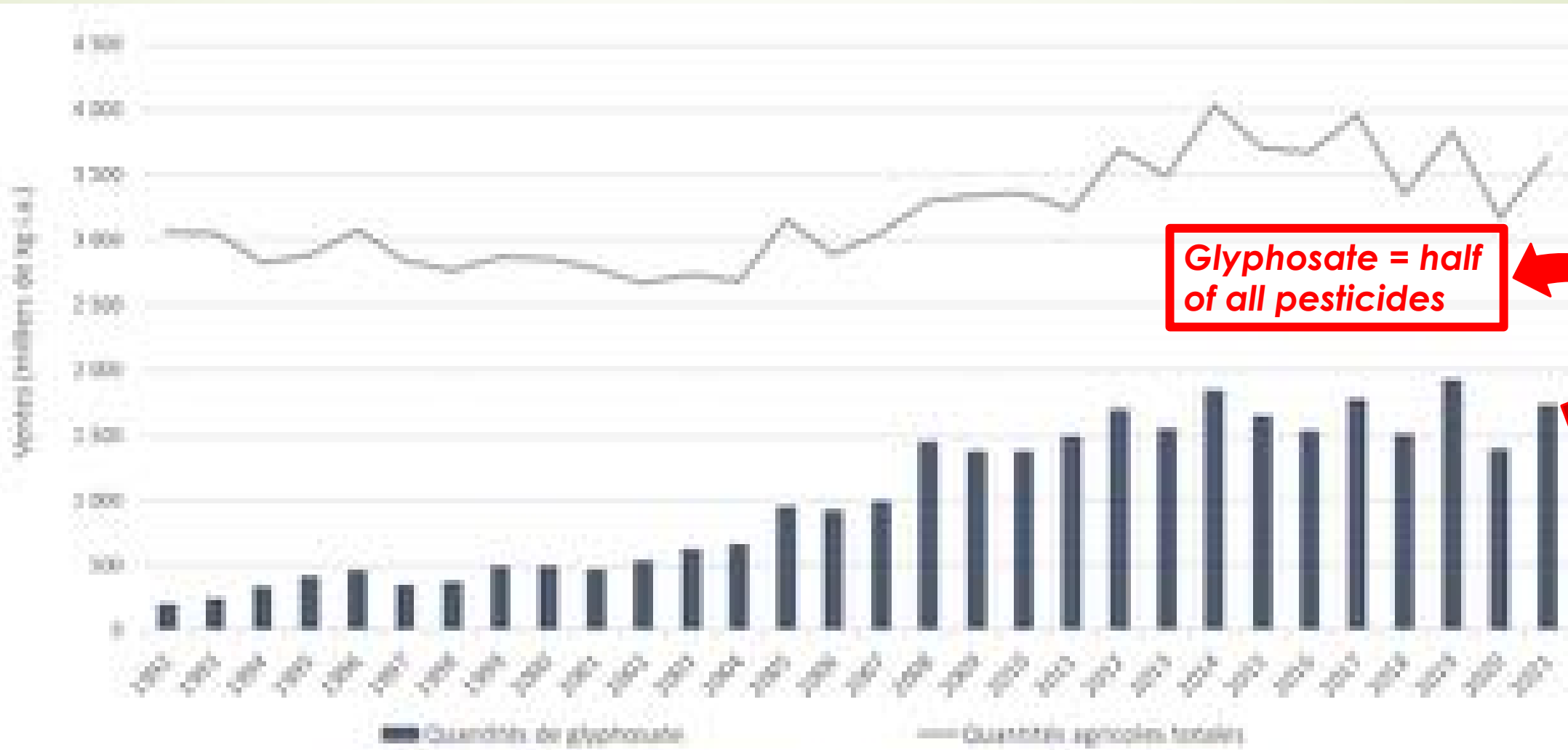


Figure 3. Variation annuelle des ventes de glyphosate du secteur de la production végétale depuis 1992



In the meantime...

- Monitoring by the Ministry of Environment reported that pesticides were detected in most if not all streams, and in increasing concentrations, especially neonics;
- Scientific evidence of their toxicity built stronger. For ex., Bonmatin (2010): toxicity of neonics for honeybee = 5400 à 7297 X that of DDT;
- 1,5 % of « PONCHO » reach target (Alford, A., Krupke, C.H. 2017. PLoS One 12 :e0173836)
- Neonics suspected to be a major cause of colony collapse disorder (CCD) and pollinators decline;
- Public concern grew stronger: environment, public health, etc.
- Public-funded research showed no benefit to farmers from the use of insecticide-coated seed in 84 field crops trials (Labrie et al., 2020)

RESEARCH ARTICLE

Impacts of neonicotinoid seed treatments on soil-dwelling pest populations and agronomic parameters in corn and soybean in Quebec (Canada)

Geneviève Labrie^{1,2*}, Annie-Ève Gagnon^{1,2b}, Anne Vanasse², Alexis Latraverse¹, Gilles Tremblay^{1,2c}

1 Centre de recherche sur les grains Inc. (CÉROM), St-Mathieu-de-Beloeil, Québec, Canada, **2** Département de phytiologie, Université Laval, Québec, Québec, Canada

† **†** Current address: Centre de recherche agroalimentaire de Mirabel (CRAM), Mirabel, Québec, Canada
†b Current address: Agriculture and Agri-Food Canada, Saint-Jean-sur-Richelieu, Research and Development Centre, Saint-Jean-sur-Richelieu, Québec, Canada
†c Current address: Ministère de l'Agriculture, des Pêcheries et de l'Alimentation du Québec, Saint-Hyacinthe, Québec, Canada
 * glabrie@cram-mirabel.com



OPEN ACCESS

Citation: Labrie G, Gagnon A-e, Vanasse A, Latraverse A, Tremblay G (2020) Impacts of neonicotinoid seed treatments on soil-dwelling pest populations and agronomic parameters in corn and soybean in Quebec (Canada). PLOS ONE 15(2): e0229136. <https://doi.org/10.1371/journal.pone.0229136>

Editor: Nicolas Desneux, Institut Sophia Agrobiotech, FRANCE

Received: August 12, 2019

Accepted: January 30, 2020

Published: February 26, 2020

Copyright: © 2020 Labrie et al. This is an open access article distributed under the terms of the [Creative Commons Attribution License](https://creativecommons.org/licenses/by/4.0/), which permits unrestricted use, distribution, and reproduction in any medium, provided the original author and source are credited.

Data Availability Statement: All relevant data are within the paper and its Supporting Information files.

Funding: Labrie, G. The 5 years studies in corn and soybean have been possible by funding from the program Prime-Vent Volet 11.1 and Volet 3.2 of the Ministère de l'Agriculture, des Pêcheries et de l'Alimentation du Québec project number PV 3.2-2014-003, PV3.2-2014-020, CERO-1-LUT-11-1582. The funders did not play any role in the study

Abstract

Agricultural soil pests, including wireworms (Coleoptera: Elateridae), are managed primarily with pesticides applied directly to seeds before sowing. Seeds coated with neonicotinoids have been used widely in Quebec (Canada) for several years. To assess the agronomic and economic value of neonicotinoid seed treatments in soybeans and corn in Quebec, trials were conducted from 2012 to 2016 in 84 fields across seven regions in Quebec. We evaluated the effect of neonicotinoid seed treatments on soil pest densities, crop damage and yield. The results showed that 92.6% of corn fields and 69.0% of soybean fields had less than 1 wireworm per bait trap. However, no significant differences in plant stand or yield were observed between treated and untreated corn or soybeans during the study. This study shows that neonicotinoid seed treatments in field crops in Quebec are useful in less than 5% of cases, given the very low level of pest-associated pressure and damage, and that they should not be used prophylactically. Integrated pest management (IPM) strategies need to be developed for soil insect pests to offer effective alternative solutions to producers.

Introduction

Since the middle of the 1990s, neonicotinoids (i.e. imidacloprid, clothianidin and thiamethoxam) have become the main class of insecticides routinely used to protect seeds and seedlings against injuries caused by soil insects [1, 2, 3]. Corn, canola, soybeans, wheat and cotton are the principal crops grown worldwide for which seed treatments are used on a large scale, with a rapid increase in the acreages treated [1, 4]. A vast body of scientific literature has demonstrated that the scale of use of those insecticides has resulted in widespread contamination of agricultural soils, freshwater resources, wetlands, and non-target vegetation, along with

Materials and methods

- 5 years, 7 regions, 84 site-years
- Sites prone to damages were picked 1/3
- Each site treated as an independant trial
- The sole factor: wi/wo NST, 3 reps

Results

- Wireworms and seed corn maggots were present in all fields, sometimes in large numbers
- No effect of NST on insect no.
- Sometimes NST reduced no. of damaged seedlings
- No effect on plant stands nor yields (0/84)
- Conclusion holds true for all seed insecticides

Industry/UPA interference

- Hindered the publication of results
- Had me fired from the Dept of Ag
- Fabricated a 5 % risk



- Main culprit: chairman of the board of directors of the public-funded research = also a director of the Farmers Union and registered lobbyist for the pesticide industry
- Mislead the farming community with respect to the effectiveness of neonics
- Ended up building mistrust towards public research and researchers
- The negligence and misconduct of the Dept of Agriculture (MAPAQ) made it an accomplice

Excerpts from the final report of the 2019-2023 official inquiry made public September 23rd, 2023

Ministry of Environment 2019: 5 « High-risk pesticides »

Require recommendation by a registered agronomist

Active ingredient	Type	Crops	% Reduction since 2015	Remarks
Atrazine	Herbicide	Field crops	90	Persistent in the environment
Chlorpyrifos	Insecticide	Vegetables	99	Unlawful in Canada by the end of 2023
Clothianidin	Neonicotinoids (Insecticides)	All	99	As of 2015, 100 % of the corn planted, 50 % of the soybeans were treated with NST; in 2021, 0,5 %.
Imidacloprid				
Thiamethoxam				

Pesticides commonly used on Québec farms

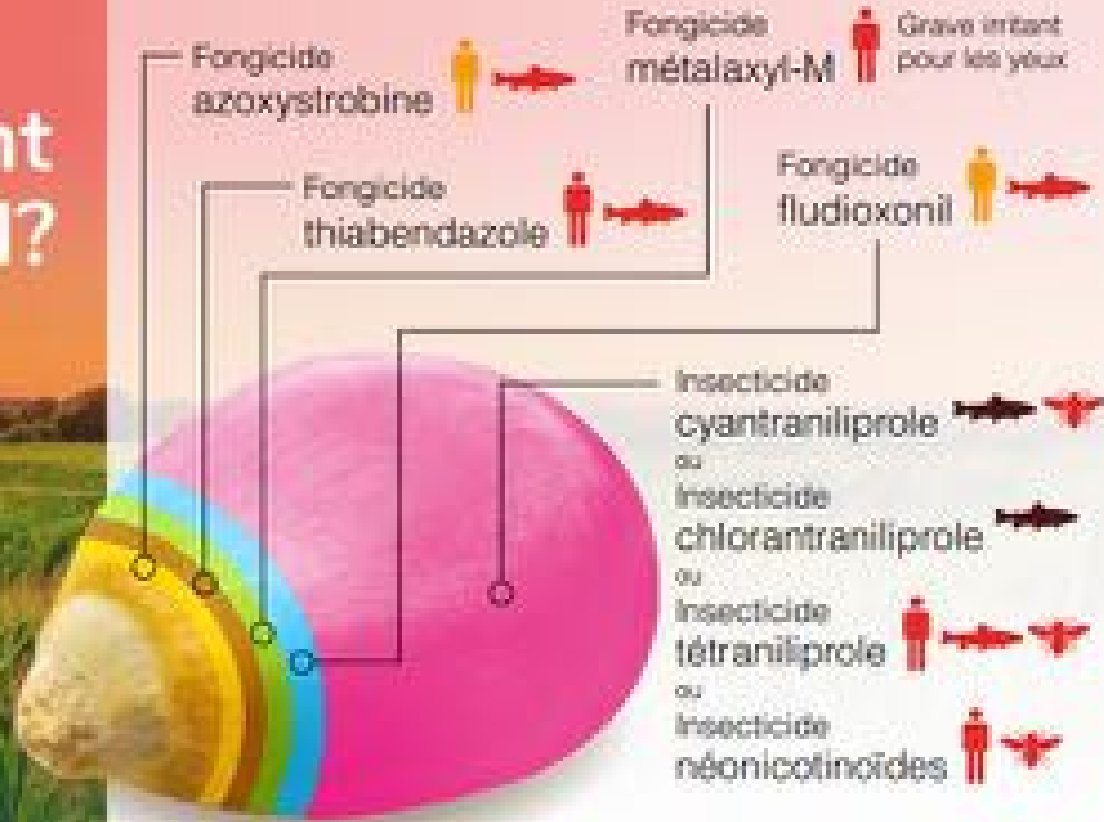
Targeted pests	Pesticides	Toxicity	Tons of active ingredient	Examples
Insects	Insecticides	+++	+	'Cruiser' as corn seed treatment for the control of wireworms and seed corn maggots
Diseases	Fungicides	++	++	'Prosaro' sprayed on wheat spikes against fusarium head blight
Weeds	Herbicides	+	+++	'Roundup' on soybeans

Toxicity + quantity = overall risk on health and environnement

Semences enrobées : Avez-vous réellement besoin de ce cocktail?

Lorsque leur usage est
absolument nécessaire ou
justifié par un agronome, prenez
les moyens pour protéger votre
santé, celle de votre famille et
celle de votre entourage.

Consultez SagePesticides.qc.ca
pour en savoir plus.



* D'autres ingrédients actifs peuvent enrober les semences.

Toxicité : ● Extrêmement élevée ● Élevée ● Modérée

Risques pour : Humain Les organismes aquatiques Les abeilles

Getting rid of pesticides: On-farm strategy

Type of treatment	Examples	Time horizon (yr)	Solution
Useless	Seed insecticides	1	Use of untreated seed
Preventive	Seed and foliar fungicides	5	Risk assessment
« Essentials »	Broad spectrum herbicides	10	Integrated Pest Management (IPM)

Getting rid of pesticides: the regulatory approach

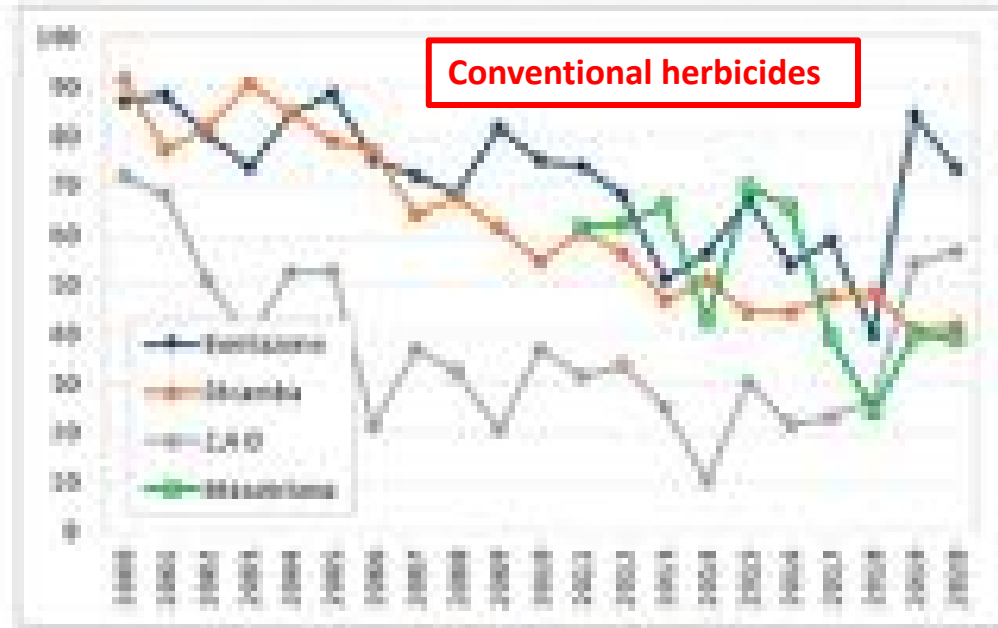
Type of seed treatment	Estimated 2024 corn area (acres)	Trend	Restriction on use
Fungicide & neonic	5 000	---	2019
Fungicide & diamide	500 000	↓	2025
Fungicide	400 000	↑	2027 ?
None	45 000	↑	N/A

The Crop Insurance Agency reports no crop failure/yield reduction due to lack of seed treatment

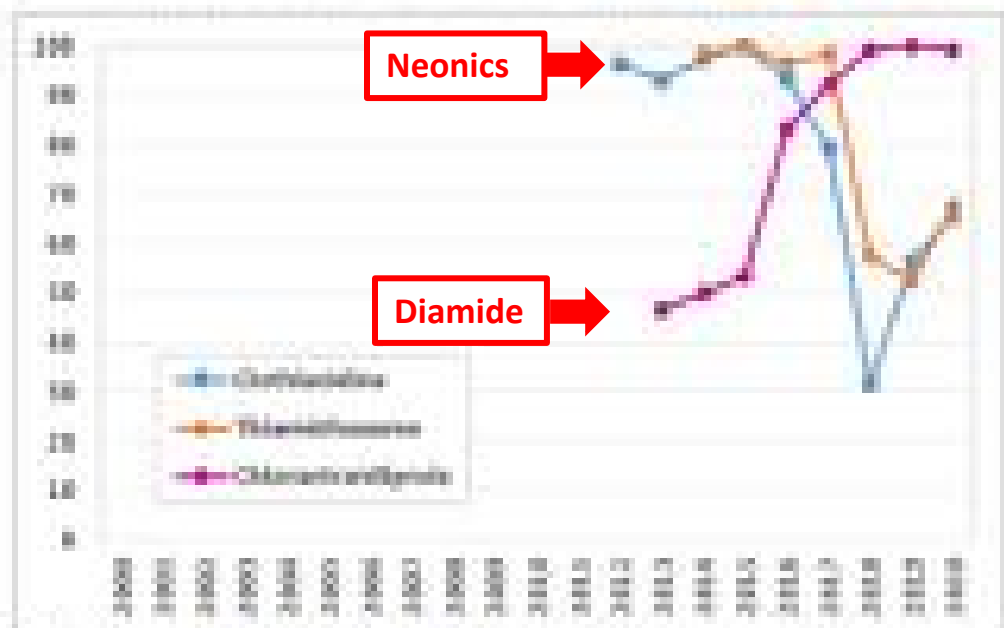


The shortcomings

- Instant switch to other insecticides, i.e. diamides, despite evidence of their acute toxicity to aquatic life (safer on honeybees) and uselessness;
- Comparing results from the 2015-2017 and the 2018-2020 water sampling campaigns of watersheds: decreases (20-40 %) in the concentrations, frequencies of detection and threshold overruns of neonics; increases in those of diamides; chlorantraniliprol ('LUMIVIA') now detected in 99,5 % of samples
- Sales of pesticides keep up, loss of trust, public outcry;
- Research and alternative methods, i.e. Integrated pest management (IPM: scouting, crop rotation, cover cropping, etc.), are overlooked;
- How come we must turn to legislation even when such **toxic** compounds show **no benefit** to farmers ? Industry and Farmers organization interference, too few extension agronomists.



Conventional herbicides



Neonics

Diamide

Figure 5. Tendances des fréquences (%) de détection pour quelques pesticides

Neonics

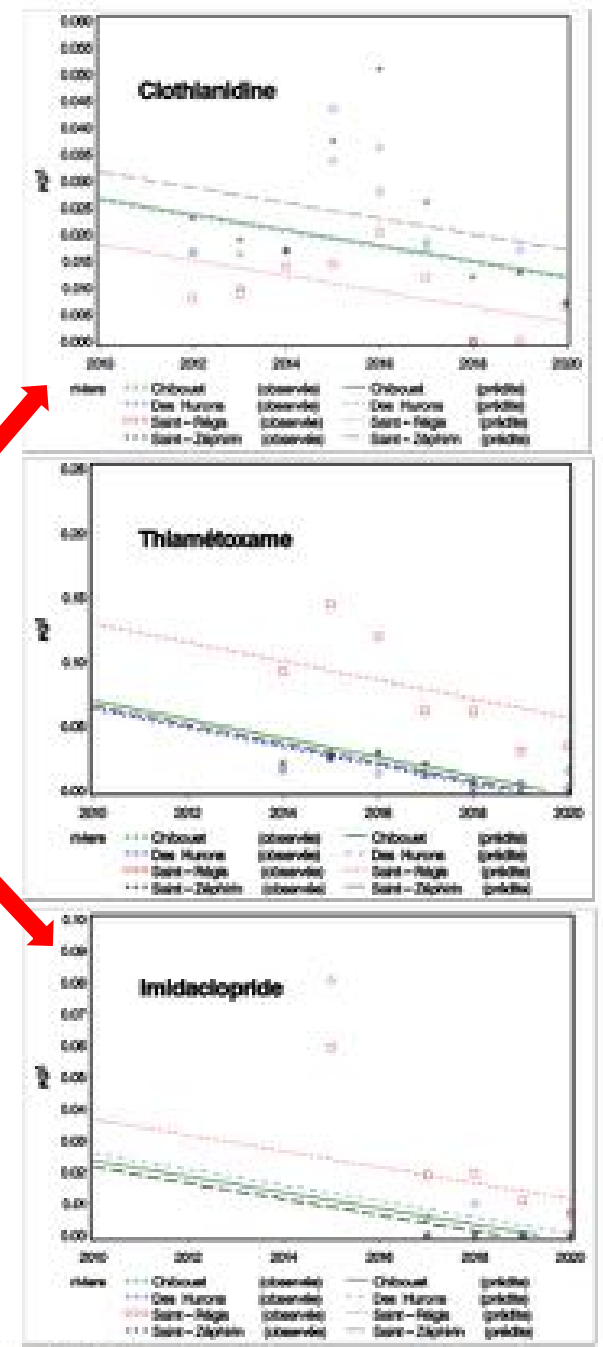


Figure 7. Régression linéaire des concentrations médianes de clothianidine, de thiaméthoxame et d'imidaclopride

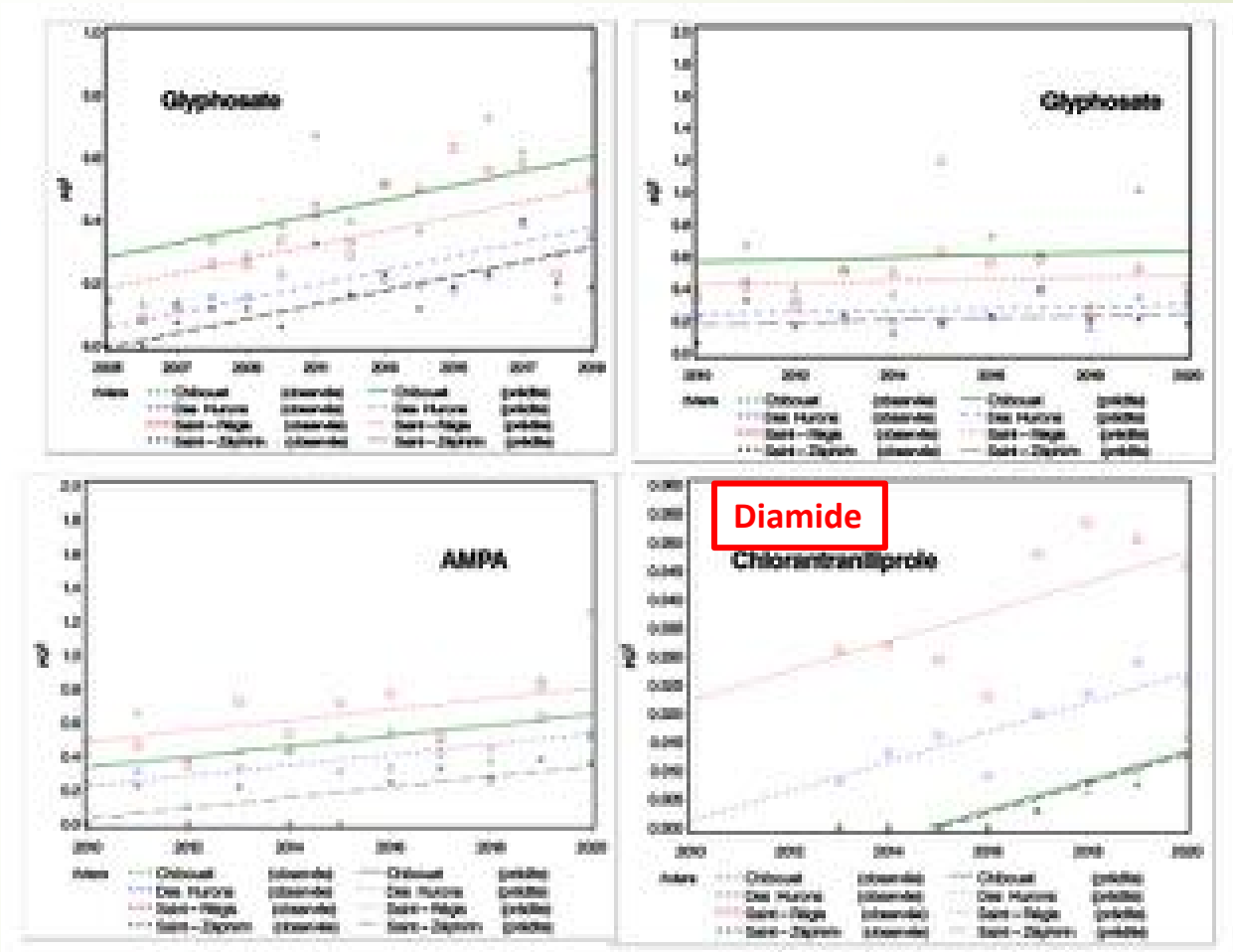


Figure 9. Régression linéaire des concentrations médianes de glyphosate (sur 15 ans et sur 10 ans), d'AMPA et de chlorantranilprole



IPM: Band spraying and mechanical weeding, Christian Brault, Saint-Louis-de-Gonzague, été 2023

**IPM: intercrops
and cover crops**





Planting soybeans into standing winter rye
(Photos: Mélanie Brouillard)



IPM: Scouting and agronomic services







Conclusion

- Legislation has limitations;
- Should not pinpoint neonics
- All pesticides are toxic, and we can farm without any
- Agronomic objectives are always in line with farm economics and environmental well-being, including health issues
- Agronomic standpoint alone: phasing out of pesticides makes sense
- The adoption of basic agronomic research results – IPM - could bring about a short term reduction of more than 50 % in the use of pesticides;
- But unless the QC extension system undergoes major adjustments, we will keep relying on legislation;
- ***Questions ?***