

Genetically engineered crops have increased herbicide use

The term “pesticides” includes herbicides, insecticides and fungicides.

The use of genetically engineered (genetically modified or GM) crops has driven up the use of herbicides, especially glyphosate.

All the GM crops grown in Canada are herbicide-tolerant.

All the genetically engineered (genetically modified or GM) crops currently grown in Canada have herbicide-tolerant traits, which means that they are all genetically engineered to withstand spraying by one or more herbicides. Some of these crop plants have other, additional GM traits: insect resistance in the case of GM corn, and low lignin in the case of GM alfalfa.

Five genetically modified crops are grown in Canada: corn, canola, soy, white sugar beet, and a small amount of GM alfalfa. The first GM plant approved in Canada was a glyphosate-tolerant canola, in 1995.

In Canada, 95% of canola, 88% of corn, 81% of soy, and 100% of sugar beet is now GM.¹

In the United States, 93% of corn, 95% of soy, and 97% of cotton acres were planted with GM herbicide-tolerant seeds.²

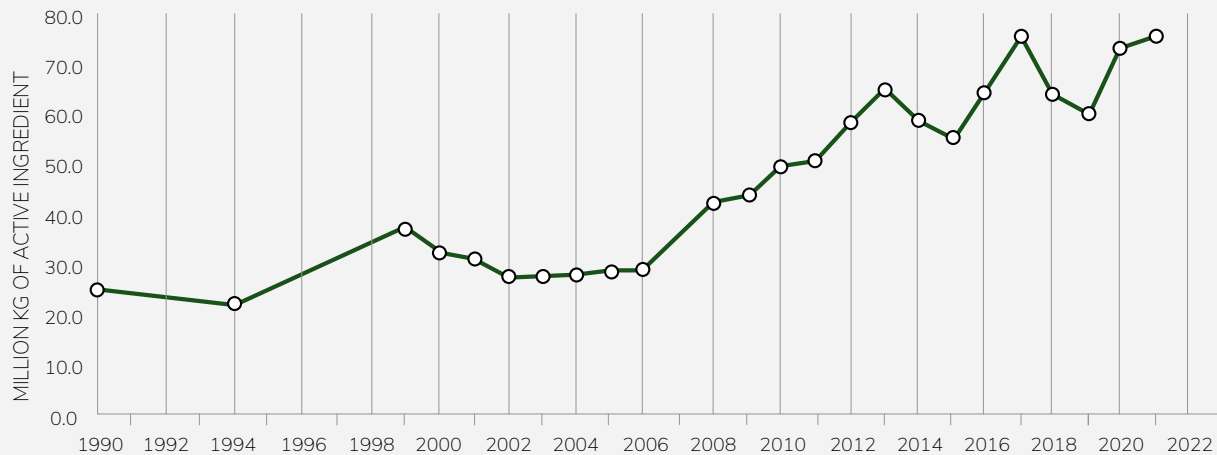
88% of the GM crops grown around the world are herbicide-tolerant.³

Herbicide use has increased with the cultivation of GM crops.

The use of GM herbicide-tolerant crops is clearly associated with increased herbicide use.⁴ Cultivation of genetically modified crops has led to particular herbicides, such as glyphosate, being applied more frequently and at higher rates, and more recently, in new combinations.



Herbicide Sales in Canada 1990-2021



Data from UN FAO and Pest Management Regulatory Agency, Health Canada.

cban.ca/pesticides

In Canada, herbicide sales increased by **244%** between 1994 and 2021.²⁹

Globally, glyphosate use rose almost 15-fold following the adoption of GM crops, from 51 million kg in 1995 to 747 million kg in 2014.⁵

Most GM herbicide-tolerant crops in Canada are tolerant to the herbicide glyphosate; and many are tolerant to the herbicide glufosinate ammonium. The top two agricultural herbicides sold in Canada are glyphosate and glufosinate ammonium.⁶

A 2023 study by US weed scientists found that the spread of glyphosate-resistant weeds has driven up the use of herbicides on GM crops in North America. The scientists found that herbicide application has doubled or tripled, and that the number of different herbicides applied to GM corn fields in North America has risen by more than 50% since the 1990s.⁷

Glyphosate use on GM crops has created “superweeds”.

Intensified use of glyphosate has led to the emergence and spread of many glyphosate-resistant weeds.⁸ These “superweeds” can survive spraying by glyphosate.

In the US, glyphosate-resistant weeds emerged in GM glyphosate-tolerant crops just four years after their introduction (by 2000).^{9,10} Although there were instances of glyphosate resistance in conventional crops, most of the documented cases of glyphosate-resistant weeds in the early 2000s were in fields of GM glyphosate-tolerant crops.¹¹

Since 1996, 59 weed species across the world have developed resistance to glyphosate: 18 of them are found in the US, and eight in Canada.¹² Glyphosate-resistant weeds are now found in five Canadian provinces.

These weeds are further driving up the use of herbicides, creating a “pesticide treadmill” that increases costs for farmers and has serious environmental impacts.

Companies are stacking multiple herbicide-tolerant traits to combat superweeds.

In order to combat glyphosate-resistant weeds, companies are now “stacking” multiple GM herbicide-tolerant traits together in the one seed so that farmers can spray other herbicides on their GM crops.

For example, Canada approved the first GM corn tolerant to **the herbicide 2,4-D** in 2012; the first GM corn tolerant to **dicamba** in 2016; and then, in 2020, a GM corn tolerant to **both 2,4-D and dicamba**. Most of these products are also tolerant to glyphosate.

Approximately 80% of GM corn products on the market in Canada in 2023 were tolerant to more than one herbicide.¹³

The Canadian Food Inspection Agency lists 80 stacked GM products that could be on the market.¹⁴

GM corn cultivation is associated with the increased use of other pesticides.

All of the genetically modified corn grown in Canada is herbicide-tolerant and most is also insect-resistant (Bt), which means that **the GM corn plant itself functions as an insecticide**.

The use of GM Bt corn decreased the use of insecticides, however, the GM plant produces almost as much, or more, insecticide (endotoxin) itself as would have been applied externally.¹⁵ Insecticide use is now rising as insects become resistant to GM Bt toxins.

The total number of pesticides (herbicides, insecticides and fungicides) applied to corn fields in North America increased from approximately 4 per hectare in 1996 when GM crops were introduced, to over 13 in 2023.¹⁶ This includes the widespread use of seed coatings called neonicotinoids.¹⁷

In Canada, the total amount of pesticide sold for agricultural use increased by more than three times from 1991 to 2021. Of this, 78% was herbicide, 13% was fungicide, and 5% was insecticide.¹⁸

Exposure to pesticides is linked to human health risks.

Pesticides are designed to be lethal and many are hazardous to non-target plants, animals and soil organisms. Harmful human exposure to pesticides can occur directly through spray drift (or accidents) when agrochemicals are applied to crops, for example to farmers and farm workers, or by eating food that has pesticide residues or drinking contaminated water.

Research links **the herbicide glyphosate** to health problems including cancer,¹⁹ neurological diseases,²⁰ endocrine disruption and birth defects.²¹ (See the below resource list for recent discussions).²² The International Agency for Cancer Research (IARC) of the World Health Organization classifies glyphosate as a “probable human carcinogen.”²³

Research also shows that **the herbicide 2,4-D** is an endocrine disruptor that is persuasively linked to cancers, neurological impairment and reproductive problems, and may affect the immune system.²⁴ The IARC classifies 2,4-D as a “possible human carcinogen.”

Pesticides harm wildlife.

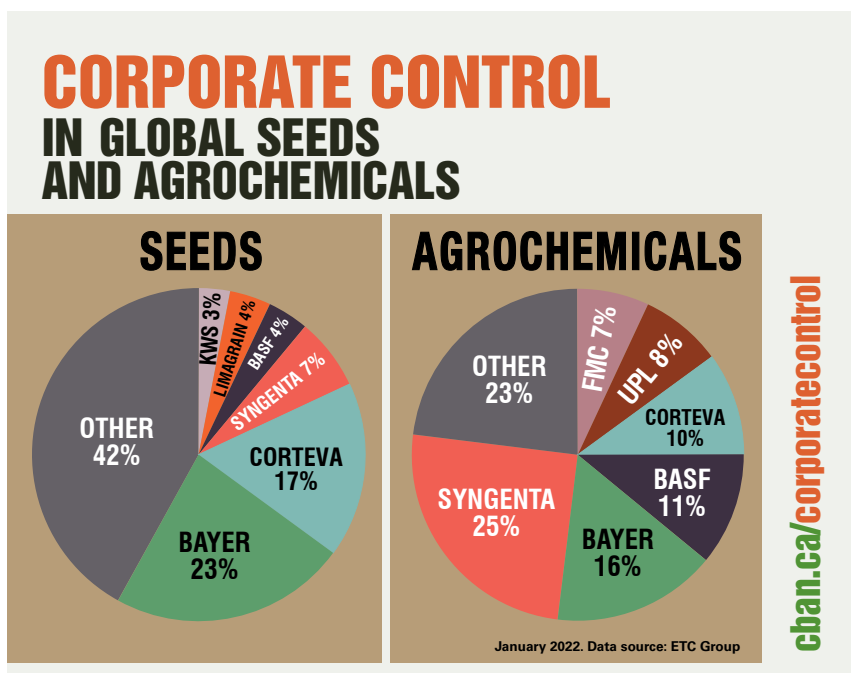
Pesticide use in agriculture reduces wildlife habitat, exposes animals to harmful chemicals, and is decreasing insect biodiversity.²⁵

In December 2023, the Government of Canada classified the Monarch butterfly as an endangered species based on an assessment that concluded that, “Milkweed decline is strongly correlated to with the use of herbicide-resistant crops.”²⁶ The federal government decision states, “The increased use of herbicides and subsequent decline in milkweeds is a significant threat facing Monarchs throughout their North American range. Increased herbicide use may also cause declines in nectar supplies needed by migrating Monarchs and reduce overwinter survival. Neonicotinoid pesticides are an emerging threat, the magnitude of which is poorly understood.”²⁷

Profits from seeds and pesticides are tied together by GM crops.

The markets for genetically modified seeds are controlled by four companies. These companies also sell the pesticides that accompany GM herbicide-tolerant seeds.

Together Bayer, Corteva, Syngenta and BASF control 51% of the global commercial seed market and 62% of the global pesticide (agrochemical) market.²⁸



Organic farmers do not use GMOs or synthetic pesticides.

Organic farmers do not use genetically engineered seeds or other genetically engineered products (genetically modified organisms or GMOs) or synthetic pesticides. The environmental practices of organic farming are set out in the National Canadian Organic Standards that are overseen by the Canadian Food Inspection Agency. Instead of synthetic pesticides, organic farmers use various strategies to control insect pests and weeds, such as planting specific crops near each other to ward away pests, rotating crops, mulching, hand weeding, and using natural predators,²⁹ and can choose from a list permitted substances which are all naturally derived except for a few materials, such as copper sulfate for example.³⁰

Data limitations:

- Canadian regulators list GMOs that are approved but do not track which GMOs are actually on the market (many approved GMOs are not for sale). (Many new gene-edited GMOs will not need to be approved by regulators at all, and will only be listed if companies volunteer this information.)
- While federal regulators do not assess stacked GMO products, the Canadian Food Inspection Agency, following requests from CBAN, asks companies to notify them of stacked products coming to market.
- Statistics Canada tracks the amount of GM soy and corn planted.
- GM Bt corn products and their traits on the market are tracked and listed by the Canadian Corn Pest Coalition, formed to support farmers in delaying pest resistance to Bt traits.
- Health Canada asks companies to report herbicide sales but does not track herbicide use.

Resources

Klein K and Benbrook CM (2024) Comments Submitted to the USMCA Genetically Engineered Corn Dispute Resolution Tribunal, Friends of the Earth US, March 13. <https://foe.org/wp-content/uploads/2024/03/Friends-of-the-Earth-USMCA-Mexico-Corn-comments.pdf>

GeneWatch UK (2022) Time for the end of GM/GE herbicide tolerant crops?

Into the Weeds documentary film (2022) Director: Jennifer Baichwal. gem.cbc.ca/the-passionate-eye

Safe Food Matters safefoodmatters.org

Prevent Cancer Now preventcancernow.ca

Pesticide Action Network North American panna.org

www.cban.ca/pesticides



The Canadian Biotechnology Action Network (CBAN) brings together 16 groups to research, monitor and raise awareness about issues relating to genetic engineering in food and farming. CBAN members include farmer associations, environmental and social justice organizations, and regional coalitions of grassroots groups. CBAN is a project of MakeWay's shared platform.

www.cban.ca/pesticides

Endnotes

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