



Genetically Modified Crops and Herbicides

The use of genetically modified (GM, also called genetically engineered) crops has been tied to the use of pesticides for over twenty years.

With widespread adoption of GM crops, herbicide use has increased dramatically.

Almost 100% of the GM crops grown in Canada are genetically modified to be herbicide-tolerant.

Five GM crops are grown in Canada: corn, canola, soy, white sugar beet, and a small amount of GM alfalfa. All are herbicide-tolerant except for a few GM sweet corn varieties that are only insect-resistant.

88% of the world's GM crops are herbicide-tolerant. GM herbicide-tolerant crops are grown on 409.7 million acres around the world.

Most, but not all, herbicide-tolerant crops are genetically engineered to withstand applications of glyphosate-based herbicides. About 56% of the global use of glyphosate-based herbicides is on GM crops.

While glyphosate-tolerant crops dominate the market, how much area is planted in Canada is unknown. Many GM corn varieties, and roughly half of all canola varieties, are tolerant to the herbicide glufosinate. Recently, the Canadian government approved corn and soy genetically engineered to tolerate the older herbicides 2,4-D and dicamba. **Many or most genetically modified crops are now tolerant to more than one herbicide.**

INCREASED USE OF HERBICIDES

Herbicide-tolerant crops were introduced in Canada in 1995 with the promise of creating a more efficient system for herbicide application, reducing total herbicide use. This was true for many farmers in the first few years of growing

GM crops, but this trend quickly reversed and we now see a steady increase in herbicide use.

Sales of agricultural herbicides in Canada increased by 199% from 1994-2016, to 654 million kilograms. That is an almost 3-fold increase.

While total herbicide sales increased in Canada, there was also a shift towards glyphosate and away from some other herbicides used in corn, canola, and soy.

Glyphosate is the top herbicide ingredient sold in Canada, followed by glufosinate-ammonium and 2,4-D. Glyphosate use tripled in Canada between 2005 and 2011.

SPREAD OF HERBICIDE RESISTANT WEEDS

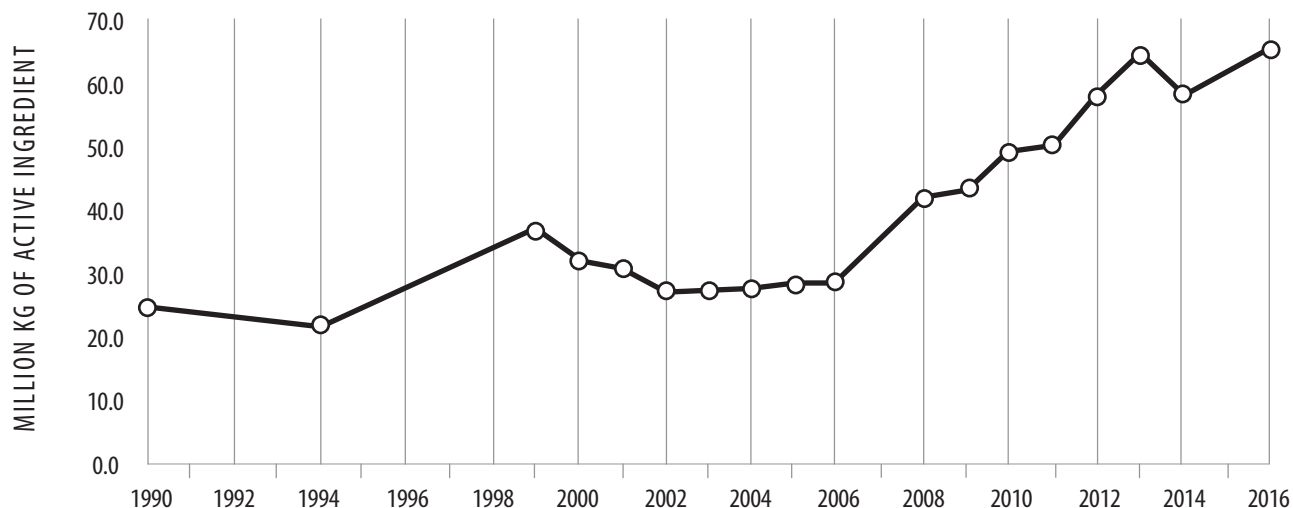
As a result of evolutionary pressure from widespread and frequent use of certain herbicides, some weeds have developed herbicide resistance. Higher doses and additional kinds of herbicides are being used to control the spread of these herbicide-resistant weeds.

42 weed species across the world have developed resistance to glyphosate (all since 1996): 17 of them are found in the US, and six in Canada. Glyphosate resistant weeds are now found in five Canadian provinces. Four are in Ontario (Common ragweed, Common waterhemp, Giant ragweed, and Horseweed); glyphosate resistant kochia is spreading across Manitoba, Saskatchewan and Alberta; and the first glyphosate resistant weed (Birdsrape Mustard) was found in Quebec in 2017.

In 2010, Monsanto began offering rebates to farmers when its herbicide product failed to kill all their weeds. Now DowDupont is warning that weeds with resistance to multiple herbicides may prevent some farmers from growing certain crops altogether.

The emergence of herbicide resistant weeds displays the failure of the herbicide-tolerant cropping system introduced twenty years ago by Monsanto, Bayer and other companies.

Herbicide Sales in Canada 1990-2016*



DICAMBA- AND 2,4-D-TOLERANT CROPS

There are no new herbicide products (with different modes of action) coming to market to help control glyphosate resistant weeds, so companies have genetically modified crops to tolerate the older herbicides 2,4-D and dicamba.

- Monsanto launched (2017) a GM corn that is tolerant to dicamba plus glyphosate (Roundup Ready™ Xtend™).
- DowDupont (Corteva) is selling GM corn (2017) and soybeans (2018) tolerant to 2,4-D plus glyphosate (Enlist™).
- Monsanto has requested approval to market a GM corn tolerant to both dicamba and 2,4-D / quinclorac as well as glufosinate.

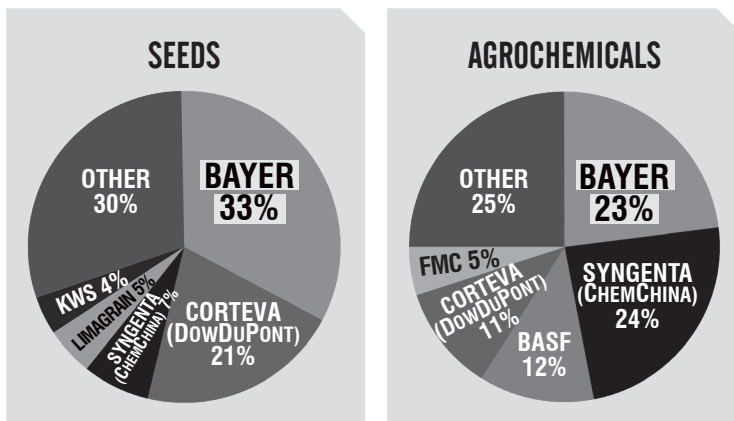
The introduction of these new GM herbicide-tolerant crops will repeat and deepen the cycle of rising herbicide use and the evolution of resistant weeds in a “pesticide treadmill”.

CORPORATE CONTROL

Until 2016, the global market for GM crops was dominated by six companies - Monsanto, Dupont, Syngenta, Dow, Bayer and BASF. After a wave of mergers, these markets

are now controlled by just four companies: Bayer bought Monsanto, Dow and Dupont merged and rebranded as Corteva, ChemChina bought Syngenta, and some of Bayer’s and Monsanto’s business was sold to BASF. Sales of pesticides and GM seeds are closely tied together for these companies. **Four companies now control 67% of the global seed market and 70% of the global pesticide market.**

Corporate control in global seeds and agrochemicals post-mergers



* Data for 1990-2006 is from the UN Food and Agriculture Organization and data from 2008-2016 is from Health Canada

The Canadian government does not track which GM crops are grown, where or how much, however the Canadian Biotechnology Action Network maintains an updated list of GM foods on the market at www.cban.ca/gmfoods For information on CBAN's tracking of GM crops please see our report "Where in the World Are GM Crops and Foods?" www.gmoenquiry.ca/where The federal government reports on herbicide sales but does not track herbicide use in Canada.