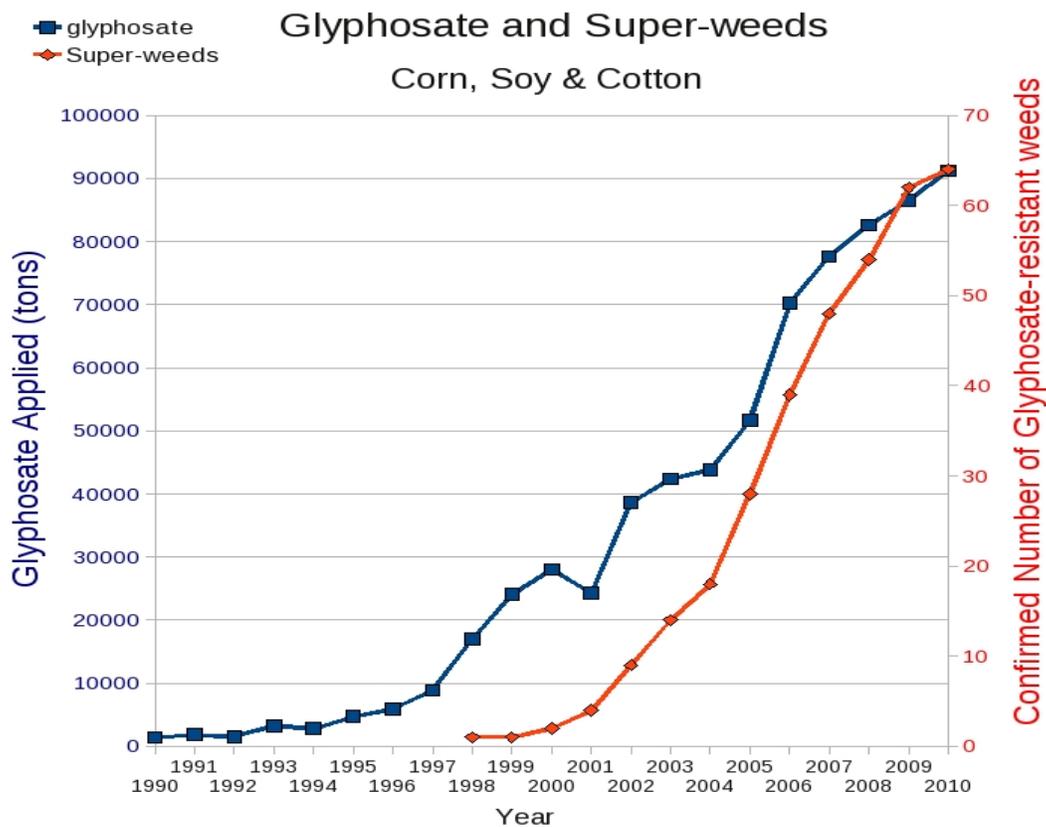


GMO crops increase pesticide use

Dr. Nancy Swanson

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Contrary to claims made by the chemical industries, glyphosate use increased 6,504% from 1991 to 2010 according to [data from the USDA](#): National Agricultural Statistics Service (NASS). States participating in the USDA surveys reported applying a whopping 91,200 tons (1 rail car holds approximately 100 tons) of glyphosate on corn, cotton and soy crops alone in 2010 (see graph). Glyphosate is the active ingredient in Roundup™, the herbicide used on Roundup Ready™ crops genetically engineered (GE) to withstand glyphosate. Glyphosate [residues of up to 4.4 mg/kg have been detected](#) in stems, leaves and beans of glyphosate-resistant soy, indicating metabolism of the herbicide. This means that the Roundup Ready™ plants are absorbing the herbicide and you cannot simply wash it off.



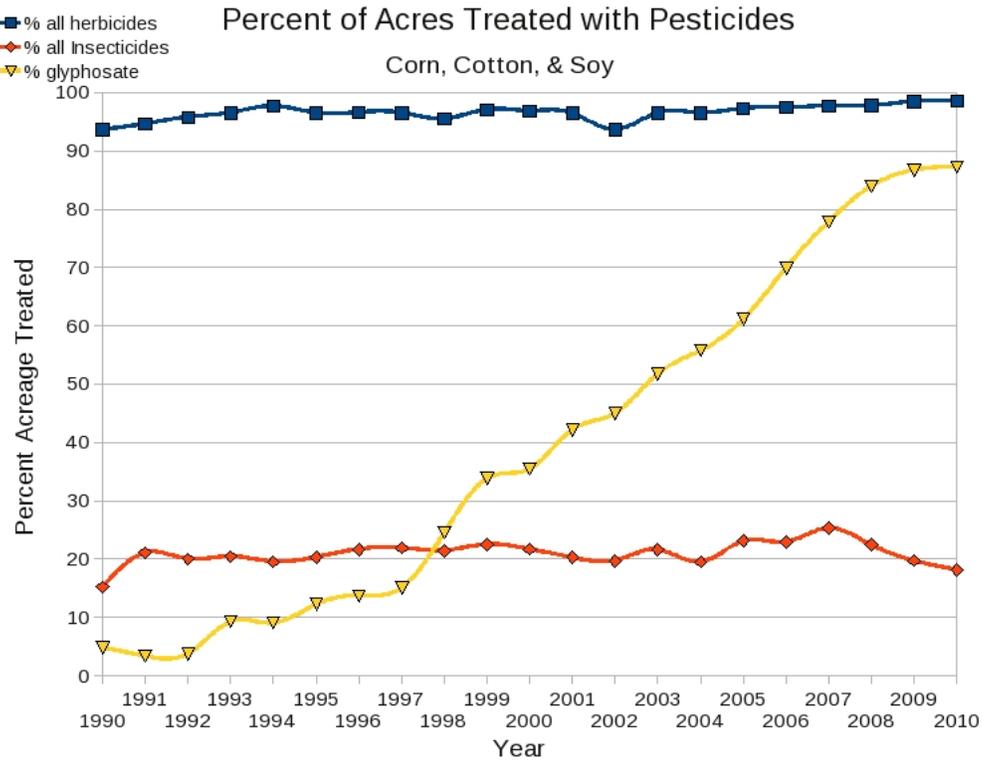
Glyphosate is showing up everywhere

In a 2011 study by the [U.S. Geological Survey](#), glyphosate was frequently detected in water, rain and air in the Mississippi River basin. Also in 2011, [Chang et al.](#) reported concentrations of glyphosate in air and rain as high as 2.5 µg/L in agricultural areas in Mississippi and Iowa. The presence of two insecticides and 27 herbicides were detected in reservoir water in the Northern Great Plains in 2007, according to [Donald et al.](#) The total concentration of herbicides in drinking water was 2.4 µg/L. Because glyphosate is in our air, water and food, we are likely accumulating low doses over time.

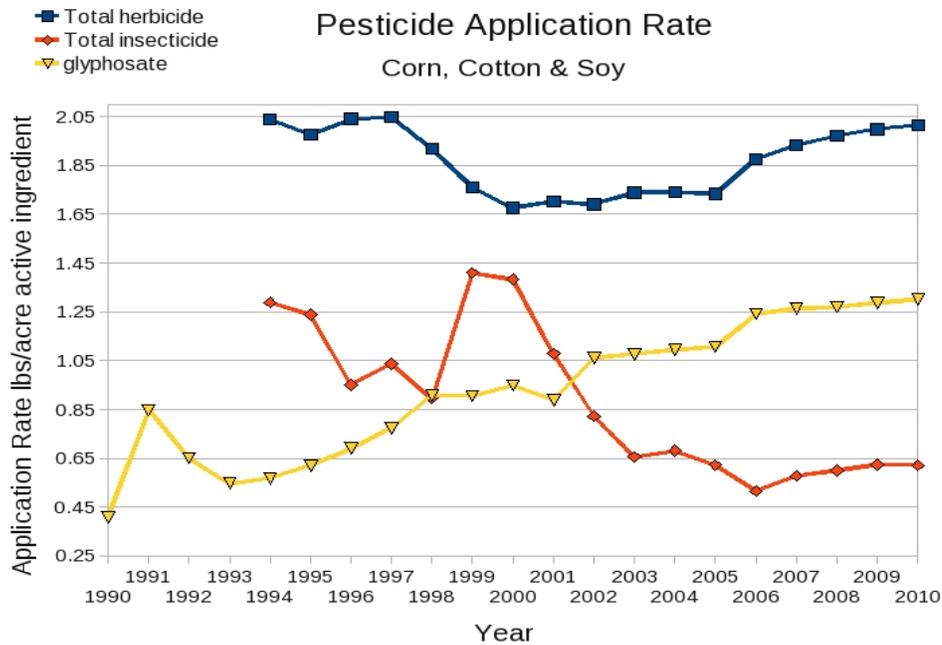
Overall pesticide use on GMO crops is increasing

“Pesticide” is a broad term encompassing both herbicides and insecticides. The graph showing the percentage of the combined total acreage of corn, cotton and soy treated with herbicides shows an overall increase of 6% from 1990 to 2010. There was also a 1,722% increase in the percentage of acres

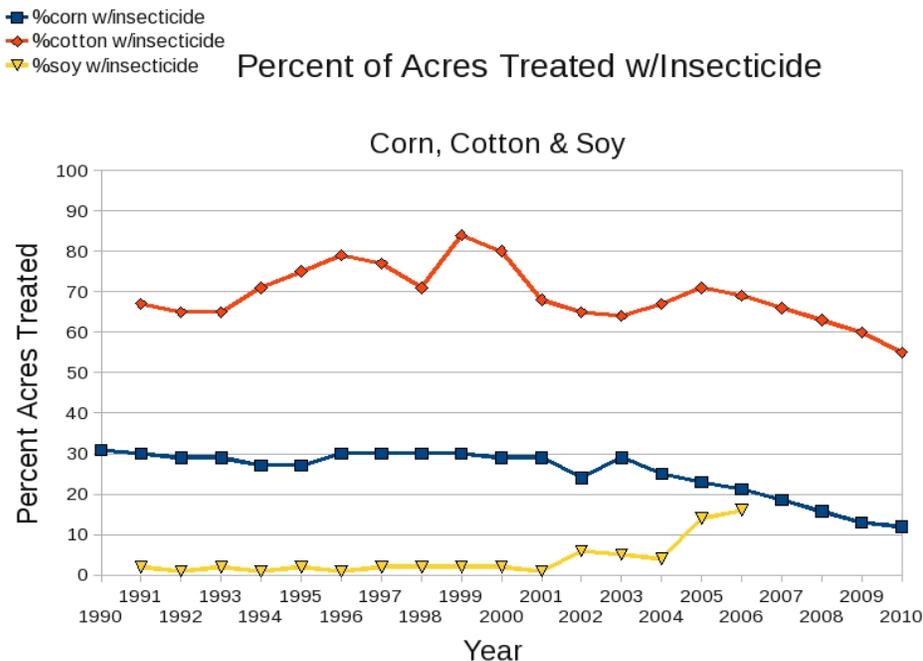
treated with glyphosate, primarily used to treat GE glyphosate-resistant crops. This leads to the conclusion that the overall increase in herbicide use is due to the increase in glyphosates. The percentage of acreage treated with insecticides oscillates a bit but remains steady.



While the percentage of crops treated with herbicides is increasing, the application rate in lbs/acre of active ingredient has also increased for glyphosate, meaning that more of the product has been applied more often over time. This is probably due to the [increase in glyphosate-resistant weeds](#), or “super-weeds,” shown in the first graph. The chemical industry’s solution is to engineer varieties resistant to stronger herbicides, 2,4-D and dicamba. Indeed, the [FDA has already approved three](#) two for soy and one for corn. The total herbicide application rate did decline from 1997-2000, but then rose steadily until it again reached pre-GMO crop rates.



The insecticide application rates have oscillated but have shown a steady decline. As [previously reported](#), GE corn was slower to be integrated and the insecticide rates for corn (not shown) show a steady decrease. But the insecticide rates for soy and cotton oscillate. The percentage of acres treated for insecticides is shown in the final graph. There was a sharp rise in the application rate of insecticide applied to cotton around 2000, corresponding to the peak in the percentage of acres treated for cotton. There are [increasing reports](#) of bollworm resistance to the Bt toxin in GE cotton. The industry solution? Genetically engineer cotton with two or more stacked Bt traits. Why there are increasing insecticide applications to soybeans is a mystery.



One of the main selling points for GE crops was that they would decrease pesticide use. This has not

been realized.

Note: Data for all three crops, corn, cotton and soy, were not available for every year from 1990-2010. Data for some of these years for some crops were interpolated before being combined.

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Data sources:

Glyphosate: [USDA:NASS](#) National Agricultural Statistics Service (NASS)

GE crop data:

1996-1999 data: [USDA Agricultural Economic Report No. \(AER-810\) 67 pp, May 2002](#)

2000-2012 data: [USDA:NASS National Agricultural Statistics Service](#)