



Appendix 1: Adoption of Herbicide-Tolerant GM Crops vs. Quantity of Glyphosate Applied in the U.S.

Year	Soybeans		Corn		Cotton		Soybeans, corn, cotton	Notes
	Glyphosate applied ¹	% = HT ²	Glyphosate applied ¹	% = HT ²	Glyphosate applied ¹	% = HT		
1994	4,896,000	0%	2,248,000	0%	789,189	0%	7,933,189	The first HT crop, Roundup Ready soybeans, were introduced in 1995.
2002	67,413,000	75%	5,088,000	11%	n.a.	74% ³	n.a.	
2003	n.a.	81%	13,696,000	15%	14,817,000		n.a.	
2005	75,743,000	87%	26,304,000	26%	17,024,000		119,071,000	More than 15-fold increase in glyphosate use on soybeans, corn and cotton from 1994 to 2005.
2006	96,725,000	89%	n.a.	36%	n.a.	86% ⁴	n.a.	More than 19-fold increase in glyphosate use on soybeans, the most widely planted Roundup Ready crop, from 1994 to 2006.
2007	n.a.	91%	n.a.	52%	18,572,000	92% ⁵	n.a.	

¹ Pounds of active ingredient. Source for all crops: “Agricultural Chemical Usage: Field Crops Summary,” USDA National Agricultural Statistics Service, for the respective years. Accessible from: <http://usda.mannlib.cornell.edu/MannUsda/viewDocumentInfo.do?documentID=1560>. The figures represent sum of all versions of glyphosate, including sulfosate. USDA pesticide usage figures cover only a certain percentage of the nationwide acreage planted to the given crop, a percentage which varies from year to year. In order to obtain the best estimate of nationwide use, we have corrected by dividing total reported glyphosate use by the percentage of the nationwide crop acreage for which pesticide usage data was reported. n.a. = not available, note that USDA does not report pesticide usage for all crops in all years.

² Percentage of overall crop acreage planted to herbicide-tolerant varieties. From USDA’s Economic Research Service (ERS), see: <http://www.ers.usda.gov/Data/BiotechCrops/alltables.xls>. Figures are the sum of percentages listed for “herbicide-tolerant only” and “stacked gene varieties.” As defined by ERS, stacked gene varieties always contain an HT trait. All HT soybeans are Roundup Ready. In 2006, 96% of HT cotton was Roundup Ready, 4% was tolerant to glufosinate (LibertyLink). Most HT corn is Roundup Ready; a small but unknown percentage is tolerant to glufosinate (LibertyLink).

³ May, O.L., F.M. Bourland and R.L. Nichols (2003). “Challenges in Testing Transgenic and Nontransgenic Cotton Cultivars,” *Crop Science* 43: 1594-1601. <http://crop.scijournals.org/cgi/reprint/43/5/1594.pdf>. Figure calculated by adding all HT varieties in Table 1. Based on USDA AMS data, see next footnote.

⁴ From USDA’s Agricultural Marketing Service (AMS), which has more reliable statistics on cotton than USDA’s ERS. See: “Cotton Varieties Planted: 2006 Crop,” USDA AMS. Figure calculated by adding percentages of all HT varieties (those with designations R, RR = Roundup Ready or RF = Roundup Ready Flex and LL for LibertyLink). Note that most HT cotton is Roundup Ready (Flex); LL cotton varieties comprised only 3-4% of US cotton in 2006.

⁵ From “Cotton Varieties Planted: 2007 Crop,” USDA AMS, at: <http://www.ams.usda.gov/mnreports/cnavar.pdf>.



Appendix 2: Usage of Leading Herbicides Other Than Glyphosate on Corn and Soy in the U.S.: 2002 to 2006

Crop	Soy	Corn				Notes
		Atrazine ² (lbs.)	Acetachlor (lbs.)	Metalachlor/ S- metalachlor (lbs.)	Top 4 corn herbicides (lbs.)	
Active ingredient	2,4-D ¹ (lbs.)					
2002	1,389,000	55,018,000	34,702,000	25,875,000	115,595,000	
2003	n.a.	60,480,000	39,203,000	27,535,000	127,218,000	
2005	1,729,000	61,710,000	32,045,000	27,511,000	121,266,000	From 2002 to 2005, atrazine use on corn increased by 12%. Use of the top four corn herbicides increased 4.9%. The 5-fold increase in glyphosate use on corn over the same time span (see Table 1) has clearly not displaced any of the leading corn herbicides.
2006	3,673,000	n.a.	n.a.	n.a.	n.a.	Use of 2,4-D on soy rose by more than 2.6-fold from 2002 to 2006. Over the same period, glyphosate use on soy rose 43% (see Table 1). Glyphosate is clearly not displacing use of 2,4-D.

Figures = pounds of active ingredient. Source: "Agricultural Chemical Usage: Field Crops Summary," USDA National Agricultural Statistics Service for the respective years. Accessible from: <http://usda.mannlib.cornell.edu/MannUsda/viewDocumentInfo.do?documentID=1560>. USDA pesticide usage figures cover only a certain percentage of the nationwide acreage planted to the given crop, a percentage which varies from year to year. In order to obtain the best estimate of nationwide use, we have corrected by dividing total reported use of the respective herbicide by the percentage of the nationwide crop acreage for which pesticide usage data was reported. n.a. = not available, note that USDA does not report pesticide usage for all crops in all years.

¹ 2,4-D, the second-most heavily used herbicide on soybeans (after glyphosate), is a phenoxy herbicide that formed part of the Vietnam War defoliant Agent Orange. 2,4-D has been associated with a number of adverse health impacts on agricultural workers who apply it: increased risk of cancer, particularly non-Hodgkin's lymphoma, and increased rate of birth defects in children of men who apply the herbicide. 2,4-D is also a suspected endocrine disruptor. For more, see <http://www.beyondpesticides.org/pesticides/factsheets/2,4-D.pdf>. For restrictions on residential use of 2,4-D in various countries, see: <http://en.wikipedia.org/wiki/2,4-D>. Figures cited are the sum of all forms of 2,4-D.

² Atrazine, the most heavily used herbicide on corn, has been linked to endocrine disruption, neuropathy and cancer (particularly breast and prostate cancer). Atrazine is regularly detected in drinking water supplies in the Midwest, and has been associated with low sperm counts in men. Exposure to extremely low levels of atrazine can cause sex change and/or deformities in frogs, fish and other organisms. Based on this evidence, and the widespread presence of atrazine in drinking water supplies, the European Union announced a ban on atrazine in 2006. The U.S. EPA re-registered atrazine in 2003 despite objections from scientists and environmental groups. See <http://www.beyondpesticides.org/pesticides/factsheets/Atrazine.pdf> and <http://www.loe.org/shows/segments.htm?programID=06-P13-00016&segmentID=1>.

- When biotechnology companies are forced to admit that GM crops do in fact increase rather than decrease overall pesticide use, they often fall back on a second claim – that increased use of glyphosate is good, because it displaces more toxic herbicides. However, recent trends show that this is decidedly not the case for several widely used and toxic herbicides. Use of both atrazine on corn and 2,4-D on soybeans has increased substantially since 2002.
- Increasing use of 2,4-D on soy (and perhaps atrazine on corn) is largely attributable to the need to control glyphosate-resistant weeds.