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May 2008

Agricultural Pesticide Use in U.S. Agriculture
Why USDA-NASS Agricultural Chemical Reporting is Important

For data on increased herbicide use in U.S. agriculture, skip to pp. 3-5

What are chemical pesticides?

Chemical pesticides are synthetic compounds used to kill any pest, such as weeds, insects and plant pathogens (e.g. fungi and nematodes).

Why is it important to track pesticide use?

Various pesticides are known or suspected to have unintended adverse effects on human health and the environment—such as increased risks for cancer, neurological disorders, and endocrine and immune system dysfunction; impaired surface and ground water; and harm to fish and wildlife. In addition, chemical pesticides become less effective as pests develop resistance to them, just as pathogenic bacteria develop resistance to antibiotics. As a result, farmers increase pesticide use and eventually switch to other pesticides that also may become ineffective – a phenomenon dubbed “the pesticide treadmill.” Pesticides also often kill predators that would otherwise help control pests. Accurate data on pesticide use is crucial to making informed decisions on pest management policy – both to minimize harm to human health and the environment, and to slow or prevent development of resistance in pests.

Are there alternatives to chemical pesticides?

Biological (i.e. non-chemical) methods to control pest populations include crop rotation, introduction of pest predators, intercropping, cover crops, disruption of pest mating cycles, use of pest-resistant crop varieties, altering planting dates, and tillage (weeds). Organic production systems do not permit use of synthetic pesticides. Integrated pest management (IPM) prioritizes biological pest control methods and minimizes use of chemical pesticides.

Does the government have policies on pesticide use?

In 1977, the USDA adopted a policy to encourage use of integrated pest management in order to reduce chemical pesticide use and its associated risks. In 1993, USDA and EPA committed to a goal of 75% of U.S. cropland under integrated pest management by the year 2000.¹

What is the state of integrated pest management?

In 2001, the General Accounting Office (GAO) found that USDA and EPA had not made good on their commitments to foster IPM. While USDA estimated that 71% of U.S. cropland was managed using IPM practices in 2000, overall agricultural pesticide use increased by 40 million lbs. from 1992 to 2000, even as total cropland decreased. GAO found that USDA’s overly expansive definition of IPM included

¹ “Agricultural Pesticides: Management Improvements Needed to Further Promote Integrated Pest Management,” Government Accounting Office, GAO-01-815, August 2001. <http://www.gao.gov/new.items/d01815.pdf>.

measures – such as monitoring for pests and cleaning farm equipment – that, while useful, do not by themselves yield meaningful outcomes in terms of reduced pesticide use. For instance, while USDA estimated that 76% of corn was under integrated pest management in 2000, biological pest control was practiced on at most 18% of corn acres.² Accurate pesticide usage information is essential to track progress in meeting the government’s IPM goals.

Uses and types of pesticides

Agriculture accounts for three-quarters of all chemical pesticide usage in the U.S., over five times the amount used by industry and government, and nearly seven times that applied to lawns and gardens (Figure 1). In 2001, the last year for which the Environmental Protection Agency has published data, 675 million lbs. of chemical pesticides were used in U.S. agriculture.

Herbicides used to kill weeds comprise nearly two-thirds of agricultural chemical pesticide use (433 million lbs. in 2001), nearly six-fold more than the insecticides that many associate with the term “pesticide” (Figure 2).

Figure 1: Chemical Pesticide Use in the U.S. by Sector: 2001

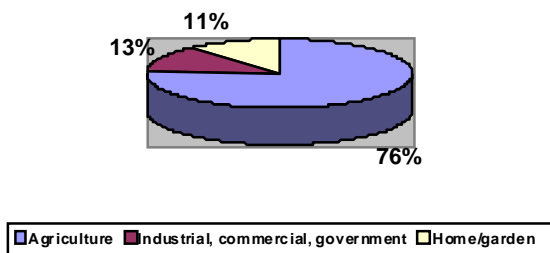
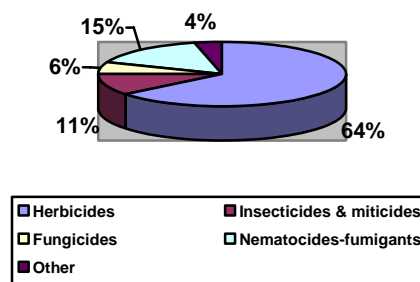


Figure 2: Agricultural Pesticide Use in the U.S. by Type: 2001



Source: “Pesticides Industry Sales and Usage: 2000 and 2001 Market Estimates,” U.S. Environmental Protection Agency, May 2004, Table 3.4. http://www.epa.gov/oppbead1/pestsales/01pestsales/market_estimates2001.pdf.

Are there any trends in pesticide use?

The most significant current trend in pesticide use involves herbicides. After long-term declines, USDA-NASS data show that herbicide use on the major field crops – soybeans, cotton and corn – began to rise in 2002 and 2003 (Figure 3).

Why is herbicide use on the rise?

Widespread introduction of Monsanto’s genetically modified (GM) Roundup Ready soybeans, cotton and corn has been associated with a 15-fold increase in the use of glyphosate weed killer (brand name Roundup) from 1994 to 2005 on these three crops in the U.S. (Table 1). This vastly increased use of glyphosate has spawned an epidemic of weeds resistant to the chemical, most of which have developed since the year 2000. Resistant weeds drive increased rates of glyphosate application and/or rising use of other herbicides in combination with glyphosate.³ As a result, use of atrazine, 2,4-D and other leading weed-killing chemicals has increased since 2002 (Table 2).

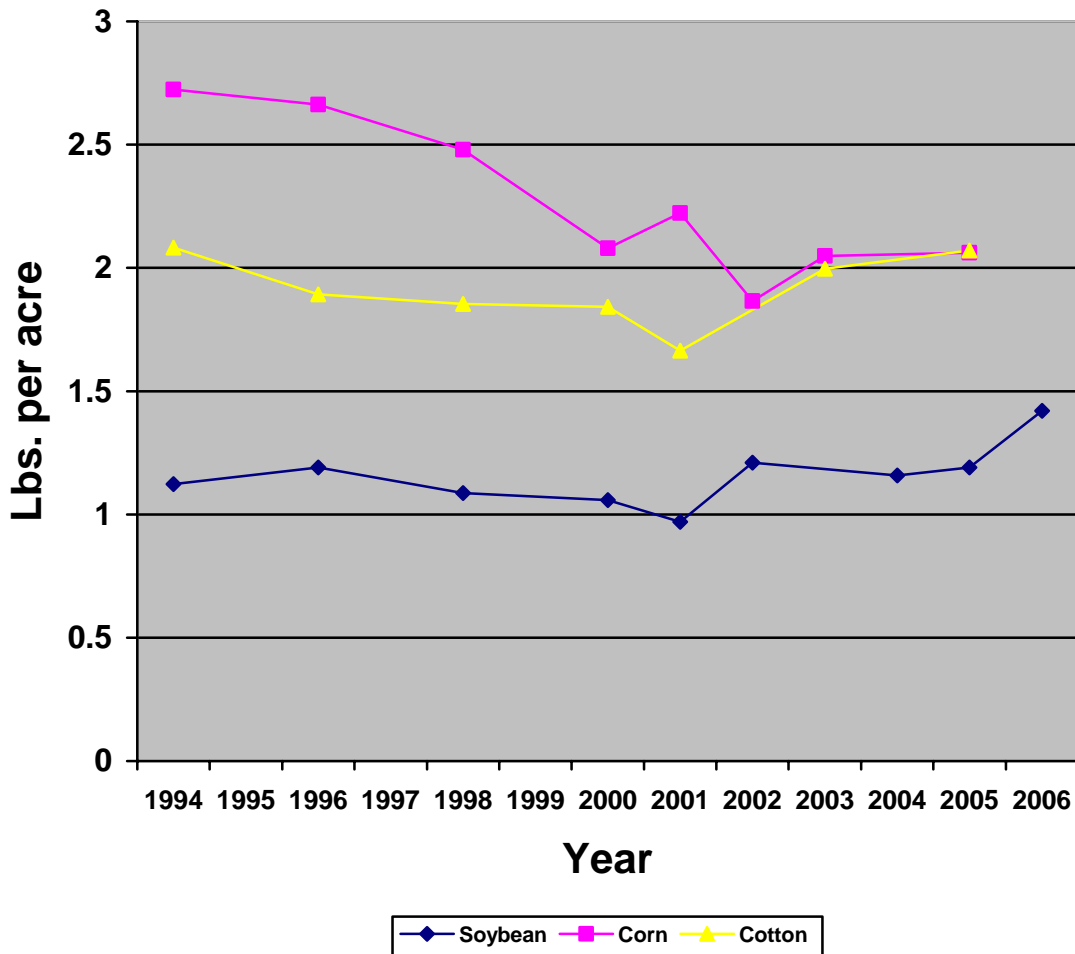
Why are USDA-NASS data important?

USDA-NASS offers the only reliable, publicly-accessible, fine-grained data on agricultural chemical use in American agriculture. Without USDA-NASS data, it will be difficult if not impossible to track important trends in pesticide use such as the increased use of herbicides noted above.

² See GAO report referenced in footnote 1.

³ “Who Benefits from GM Crops? The Rise in Pesticide Use,” Friends of the Earth International & Center for Food Safety, 2008, see especially pp. 8-12. See: http://www.centerforfoodsafety.org/WhoBenefitsPR2_13_08.cfm.

Figure 3: Intensity of Herbicide Use on Major Field Crops in the U.S.: 1994 - 2006



Notes: Intensity of herbicide use began rising in 2002 for soybeans and cotton, and in 2003 for corn, as herbicide-tolerant versions of these crops became prevalent.

Sources: “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 total herbicide use on the respective crop in the “Program States” included in USDA’s survey, divided by the number of acres planted to that crop in the Program States. The Program States surveyed by USDA represent a high percentage of nationwide acreage planted to the crop (usually more than 80%, often more than 90%). The only assumption made here is that the amount of herbicides applied per acre covered by the survey is equal to that applied on acres not included in the survey. This is accepted practice for calculation of pesticide intensity. For instance, see Table 3.3.3 in Section 3.3: “Biotechnology and Agriculture,” in: “Agricultural Resources and Environmental Indicators, 2006 Edition,” USDA Economic Research Service, Economic Information Bulletin 16, July 2006, accessible from: <http://www.ers.usda.gov/Publications/AREI/EIB16/>. In this 2006 report, USDA for some unexplained reason plotted pesticide intensity on major field crops only up through 2001 or 2002, despite the availability of data for later years.

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

Year	Soybeans		Corn		Cotton		Soybeans, corn, cotton Glyphosate applied	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%	n.a.	n.a.	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, which has more reliable statistics on cotton than USDA’s ERS. See: “Cotton Varieties Planted: 2006 Crop,” http://www.ams.usda.gov/cottonrpts/MNXLS/mp_cn833.xls. 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.

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

Crop Active ingredient	Soy	Corn				Notes
	2,4-D ¹ (lbs.)	Atrazine ² (lbs.)	Acetachlor (lbs.)	Metalachlor/ S- metalachlor (lbs.)	Top 4 corn herbicides (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>.