

Controversial pesticide use sees dramatic increase across the Midwest

By Christopher Walljasper and Ramiro Ferrando/Midwest Center for Investigative Reporting | May 26, 2019



Planting near Mansfield, IL on Monday, May 20, 2019. Photo by Darrell Hoemann/The Midwest Center for Investigative Reporting

Farmers have been using the weed killer glyphosate – a key ingredient of the product Roundup – at soaring levels even as glyphosate has become increasingly less effective and as health concerns and lawsuits mount.

Nationwide, the use of glyphosate on crops increased from 13.9 million pounds in 1992 to 287 million pounds in 2016, according to estimates by the U.S. Geological Survey.

A review of the agency's data by the Midwest Center for Investigative

Reporting shows that farmers across the Midwest used an estimated 188.7 million pounds of glyphosate in 2016 – nearly 40 times more than in 1992 when they used a total of 4.6 million pounds. The data for the year 2016 is the latest available.

Farmers in those 12 states – including Illinois, Indiana, Iowa and Nebraska – grow most of the country's soybean and corn crops. Glyphosate is now the primary way farmers manage weeds that would otherwise reduce the amount of grain they can produce. The Midwest accounts for 65 percent of the nation's use of glyphosate for crops, according to the Center's analysis.

The estimates are from data collected through surveys of farms and may be high in some cases. However, the estimates provide an overview over decades on how dramatically glyphosate use has increased.

As a caution, the Midwest Center reviewed data with low estimates of pesticide use on crops and crop fields to avoid overestimation. And not all crops can be sprayed with glyphosate. Therefore, the rate applies only to crops engineered to survive the pesticide.

Pesticide is the broad term for substances that can kill bugs, weeds and other pests. Specifically, herbicides kill weeds and insecticides kill bugs.

Roundup was manufactured by agriculture company Monsanto until it was bought by German pharmaceutical company Bayer in 2018.

Once thought of as a miracle product, overreliance on glyphosate has caused weeds to grow resistant to the chemical and led to diminished research and development for new weed management solutions, according to Bill Curran, president-elect of the Weed Science Society of America and emeritus professor of weed science at Penn State University.

"We're way over-reliant on roundup," Curran said. "Nobody thought we were going to be dealing with the problems we are dealing with today."

Meanwhile, juries have recently awarded at least \$2.2 billion in damages to plaintiffs in three separate cases who claimed that glyphosate caused the cancer, non-Hodgkin lymphoma.

Glyphosate is at the center of thousands of more similar lawsuits against Bayer. As Bayer faces the fourth lawsuit over Roundup [this August in St. Louis County Circuit Court](#), the company is also receiving backlash from investors and the public. The company's [stock price has dropped more than 40 percent](#) since it bought Monsanto.

The EPA, during a [routine review of its glyphosate registration](#), said earlier this year [glyphosate does not cause cancer](#), but the International Agency for Research on Cancer in [2015 classified glyphosate as "probably carcinogenic to humans."](#)

The [U.S. Food and Drug Administration has reported trace amounts](#) of glyphosate in food samples after testing for the first time in 2016, though levels remained below acceptable thresholds. The Centers for Disease Control and Prevention [has called for more research on the chemical's effects on humans.](#)

Click on the map to see glyphosate use in the Midwest (story continues below)

Resistance to glyphosate grows

Despite warning that overuse could lead to weed resistance, manufacturers of glyphosate have continued selling the product to farmers at increasing rates.

James Benham has been farming in Southeast Indiana for nearly 50 years. Benham said, as resistance grew, Roundup went from a cure-all to a crutch.

"Sometimes if you timed it just right, you could get away with just one spraying. Now we're spraying as often as three or four times a year," he said.

Benham said farmers continue to spend more on seed and chemicals but aren't seeing more profit.

"That puts the farmer in that much more of a crisis mode. Can't do without it, can't hardly live with it," he said.

As glyphosate became less effective, farmers also turned to even more pesticides to try and grow successful crops each year.

Glyphosate was first introduced by Monsanto in 1974.

But it wasn't until the 1990s, when the company released genetically modified corn, soybean and cotton seeds that could withstand the weed killer that the use of glyphosate saw a dramatic increase, said Sarah Ward, associate professor of plant genetics at Colorado State University.

"I think it did become too much of a good thing. I think growers locked on to the simplicity, and the effectiveness of using glyphosate as your primary, or in many cases your only means of weed control," Ward said.

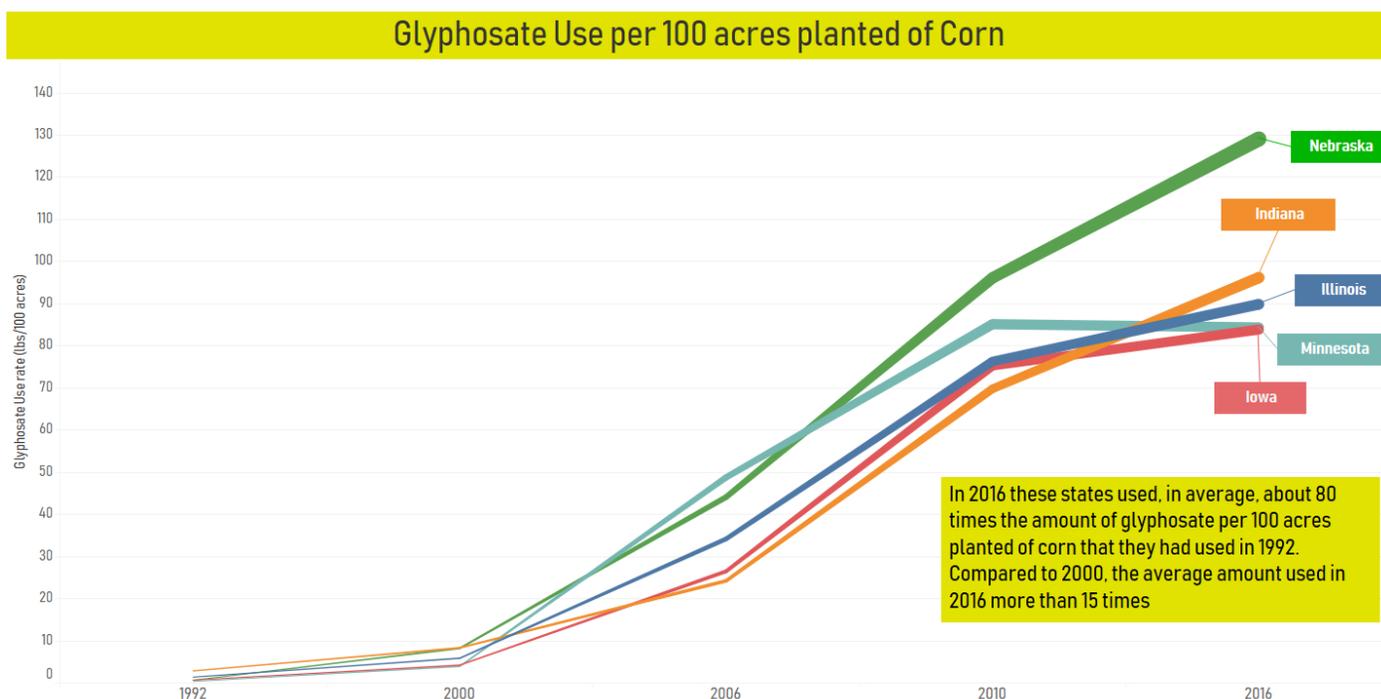
When the patent for glyphosate expired in 2000, it opened the door for generic production, and usage increased even more.

By 2007, the [University of Nebraska's Institute of Agriculture and Natural Resources](#) noted at least 40 generic glyphosate-based herbicides, including offerings by DowDupont (now Corteva Agriscience) and Syngenta.

Charla Lord, spokeswoman for Bayer, said in an email statement that glyphosate is safe and still effective for farm and residential use.

“Glyphosate-based herbicides are supported by one of the most extensive worldwide human health and environmental effects databases ever compiled for a pesticide product. Glyphosate’s ability to effectively control unwanted vegetation provides benefits that extend from individual farms to global trade to national parks to golf courses to local governments to gardeners,” Lord said.

But as glyphosate use shows little sign of slowing, some experts fear what it means for farmers and consumers.



Ramiro Ferrando. Source: U.S. Geological Survey

In 2017, Monsanto reported net sales of \$3.7 billion in its agricultural productivity division, which includes glyphosate, up \$213 million from 2016, according to its annual report.

Market researchers [predict the glyphosate market to grow to \\$8.5 billion to](#)

[\\$10 billion annually](#) by 2021 [up from \\$5 billion now](#).

“The increase in agricultural productivity reflects increased volume of Roundup and other glyphosate-based herbicides globally,” Monsanto said in the report.

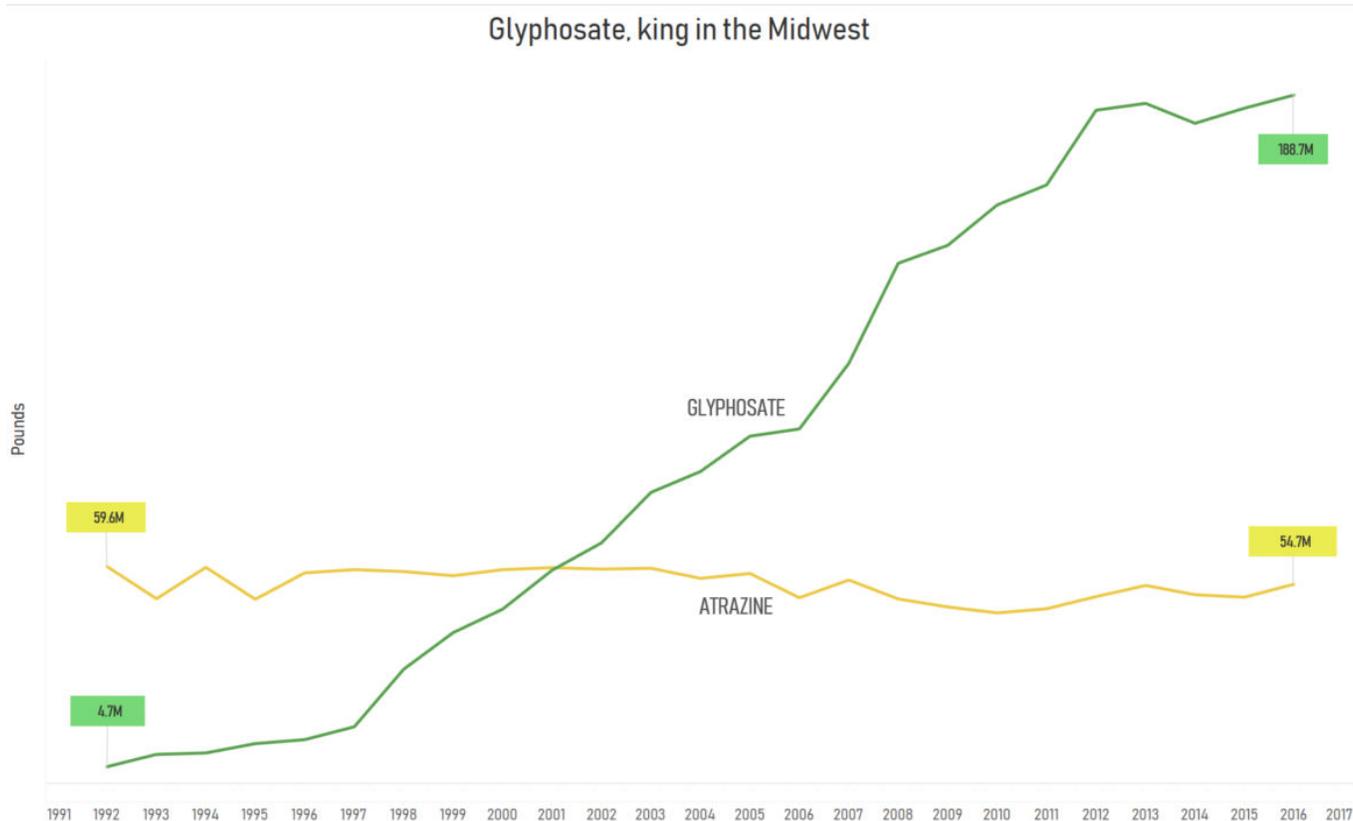
Market researchers predict sales of glyphosate will be between \$8.5 billion [and \\$10 billion by 2021](#).

Game changer

Before glyphosate was available, farmers used a variety of other pesticides to combat specific weeds.

Jack Boyer, a farmer who plants around 800 acres of corn, soybeans and cereal rye in northeast Iowa, said before Roundup, he would apply a mixture of pesticides to the soil before planting, or spray on patches of weeds after the crop emerged from the ground.

“It was quite a labor-intensive process, as well as more chemicals,” Boyer said. “When Roundup, or glyphosate came along, it made things a whole lot simpler and really cleaned up the area, for a long time.”



Ramiro Ferrando. Source: U.S. Geological Survey

Even after applying pesticides, farmers or farm workers would walk the fields, chopping weeds out by hand.

“As a young teenager, I spent a good chunk of my summer with a hoe in hand, chopping those weeds out,” said Mary Boote, chief executive officer of Global Farmers Network, a non-profit group based in Des Moines, Iowa, that advocates for farmers around the world.

In the late 1990s, when glyphosate was combined with genetically modified seeds that could withstand the herbicide, it was a scientific breakthrough in crop biotechnology, according to Boote.

She said glyphosate did more than just help farmers grow better crops.

“The advent of glyphosate was a game-changer. Not only did it effectively kill

the weeds that were threatening and taking away maximum crop production, there was a quality of life issue," Boote said.

The combination of planting glyphosate-resistant seeds, then applying the chemical over the top of the crop allowed farmers to apply a fewer number of chemicals, and led to the rise of no-till farming, which prevented soil erosion.

Alan Kadolph, a farmer in Hardin County, Iowa, said some moved away from other weed management practices, like cultivation or hand-chopping, all together.

"It all went back to cost-effectiveness. Roundup was such a cheap product per acre," Kadolph said.

Victims of success

Dane Bowers, technical product lead for herbicides at Syngenta, said glyphosate worked so well in the late 1990s and early 2000s, people [didn't believe that weeds could develop a resistance to it](#).

"We're kind of a victim of our own success here," Bowers said. "It is such an effective herbicide, it was really difficult to convince people to reduce their reliance on it. It made weed control so simple, effective and affordable."

But with that dramatic shift to glyphosate came a drastic increase in use as well, especially in the Midwest.

Farmers were applying it multiple times a year to keep weeds at bay.

Kadolph said some farmers got used to how versatile glyphosate could be.

"It was so easy. You didn't have to worry about what stage the weeds were (at) out in your field. You just changed your rate of Roundup. 'I'm not going to spray

this week, I'll spray next week," he said.

Aaron Hager, a weed scientist at the University of Illinois, said the overreliance on glyphosate accelerated the growth of weed resistance.

"In any biological system, when you make such a dramatic shift to a very limited number of options to control a pest, that system is very likely going to evolve," Hager said.



Soybeans near Mansfield IL on Monday, September 3, 2018. Photo by Darrell Hoemann/The Midwest Center for Investigative Reporting

Lord said weed resistance is not a new problem for farmers.

"Farmers have been dealing with this issue of herbicide resistant weeds since the 1950s, and it is a reality that growers know how to manage," Lord said in an email.

Ward said this resistance is different because of how widespread glyphosate use has become

"Growers locked on to the simplicity, and the effectiveness of using glyphosate as your primary, or in many cases your only means of weed control," Ward said.

Charles Benbrook, an agricultural economist who has published several studies on glyphosate, and testified as an expert witness on behalf of plaintiffs, said the overuse of glyphosate has presented farmers with real financial challenges.

"The sad reality is that, weed management on conventional, biotech-dependent corn, soybeans and cotton farms is out of control," he said. "It's

created a serious economic problem for farmers, because they're spending far more for seed and weed control."

In 2017, farmers spent \$17.6 billion on chemicals according to the USDA's 2017 Census of Agriculture.

That more than doubled in 20 years. During the same time, farmers spent \$21 billion on seed, up from \$6 billion in 1997, when genetically modified seeds were just hitting the market.

The adoption of genetically modified seeds was rapid. For example, genetically engineered corn made up 17 percent of all corn planted in 2000; by 2016, 92 percent of all corn planted was genetically engineered, [according to USDA data](#).

"It's just a whole different ballgame, because of how powerful, and how successful glyphosate has become," Curran said.