

# Rise of the Superweeds

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## Herbicide's Wide Use Fosters the Spread Of Resistant Pests

DYERSBURG, Tenn. — For 15 years, Eddie Anderson, a farmer, has been a strict adherent of no-till agriculture, an environmentally friendly technique that all but eliminates plowing to curb erosion and the harmful runoff of fertilizers and pesticides.

But not this year.

On a recent afternoon here, Mr. Anderson watched as tractors crisscrossed a rolling field — plowing and mixing herbicides into the soil to kill weeds where soybeans will soon be planted.

Just as the heavy use of antibiotics contributed to the rise of drug-resistant supergerms, American farmers' near-ubiquitous use of the weedkiller Roundup has led to the rapid growth of tenacious new superweeds.

To fight them, Mr. Anderson and farmers throughout the East, Midwest and South are being forced to spray fields with

more toxic herbicides, pull weeds by hand and return to more labor-intensive methods like regular plowing.

"We're back to where we were 20 years ago," said Mr. Anderson, who will plow about one-third of his 3,000 acres of soybean

fields this spring, more than he has in years. "We're trying to find out what works."

Farm experts say that such efforts could lead to higher food prices, lower crop yields, rising farm costs and more pollution of land and water.

"It is the single largest threat to production agriculture that we have ever seen," said Andrew Wargo III, the president of the Arkansas Association of Conservation Districts.

The first resistant species to pose a serious threat to agriculture was spotted in a Delaware soybean field in 2000. Since then, the problem has spread, with 10 resistant species in at

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least 22 states infesting millions of acres, predominantly soybeans, cotton and corn.

The superweeds could temper American agriculture's enthusiasm for some genetically modified crops. Soybeans, corn and cotton that are engineered to survive spraying with Roundup have become standard in American fields. However, if Roundup doesn't kill the weeds, farmers have little incentive to spend the extra money for the special seeds.

Roundup — originally made by Monsanto but now also sold by others under the generic name glyphosate — has been little

short of a miracle chemical for farmers. It kills a broad spectrum of weeds, is easy and safe to work with, and breaks down quickly, reducing its environmental impact.

Sales took off in the late 1990s, after Monsanto created its brand of Roundup Ready crops that were genetically modified to tolerate the chemical, allowing farmers to spray their fields to kill the weeds while leaving the crop unharmed. Today, Roundup Ready crops account for about 90 percent of the soybeans and 70 percent of the corn and cotton grown in the United States.

But farmers sprayed so much Roundup that weeds quickly evolved to survive it. "What we're talking about here is Darwinian evolution in fast-forward," Mike Owen, a weed scientist at Iowa State University, said.

Now, Roundup-resistant weeds like horseweed and giant ragweed are forcing farmers to go back to more expensive techniques that they had long ago abandoned.

Mr. Anderson, the farmer, is wrestling with a particularly tenacious species of glyphosate-resistant pest called Palmer amaranth, or pigweed, whose resistant form began seriously infesting farms in western Tennessee only last year.

Pigweed can grow three inches a day and reach seven feet or more, choking out crops; it is so sturdy that it can damage harvesting equipment. In an attempt to kill the pest before it becomes that big, Mr. Anderson and his neighbors are plowing their fields and mixing herbicides into the soil.

That threatens to reverse one of the agricultural advances bolstered by the Roundup revolution: minimum-till farming. By combining Roundup and Roundup Ready crops, farmers did not have to plow under the weeds to control them. That reduced erosion, the runoff of chemicals into waterways and the use of fuel for tractors.

If frequent plowing becomes necessary again, "that is certainly a major concern for our environment," Ken Smith, a weed scientist at the University of Arkansas, said. In addition, some critics

of genetically engineered crops say that the use of extra herbi-

cides, including some old ones that are less environmentally tolerable than Roundup, belies the claims made by the biotechnology industry that its crops would be better for the environment.

"The biotech industry is taking us into a more pesticide-dependent agriculture when they've always promised, and we need to be going in, the opposite direction," said Bill Freese, a science policy analyst for the Center for Food Safety in Washington.

So far, weed scientists estimate that the total amount of United States farmland afflicted by Roundup-resistant weeds is relatively small — seven million to 10 million acres, according to Ian Heap, director of the International Survey of Herbicide Resistant Weeds, which is financed by the

agricultural chemical industry. There are roughly 170 million acres planted with corn, soybeans and cotton, the crops most affected.

Roundup-resistant weeds are also found in several other countries, including Australia, China and Brazil, according to the survey.

Monsanto, which once argued that resistance would not become a major problem, now cautions against exaggerating its impact. "It's a serious issue, but it's manageable," said Rick Cole, who manages weed resistance issues in the United States for the company.

Of course, Monsanto stands to lose a lot of business if farmers use less Roundup and Roundup Ready seeds.

"You're having to add another product with the Roundup to kill your weeds," said Steve Doster, a corn and soybean farmer in Barnum, Iowa. "So then why are we buying the Roundup Ready product?"

Monsanto argues that Roundup still controls hundreds of weeds. But the company is concerned enough about the problem that it is taking the extraordinary step of subsidizing cotton farmers' purchases of competing herbicides to supplement Roundup.

Monsanto and other agricultural biotech companies are also developing genetically engineered crops resistant to other herbicides.

Bayer is already selling cotton

and soybeans resistant to glufosinate, another weedkiller. Monsanto's newest corn is tolerant of both glyphosate and glufosinate, and the company is developing crops resistant to dicamba, an older pesticide. Syngenta is developing soybeans tolerant of its Callisto product. And Dow Chem-

ical is developing corn and soybeans resistant to 2,4-D, a component of Agent Orange, the defoliant used in the Vietnam War.

Still, scientists and farmers say that glyphosate is a once-in-a-century discovery, and steps need to be taken to preserve its effectiveness.

Glyphosate "is as important for reliable global food production as penicillin is for battling disease," Stephen B. Powles, an Australian weed expert, wrote in a commentary in January in The Proceedings of the National Academy of Sciences.

The National Research Council, which advises the federal government on scientific matters, sounded its own warning last month, saying that the emergence of resistant weeds jeopardized the substantial benefits that genetically engineered crops were providing to farmers and the environment.

Weed scientists are urging farmers to alternate glyphosate with other herbicides. But the price of glyphosate has been falling as competition increases from generic versions, encouraging farmers to keep relying on it.

Something needs to be done, said Louie Perry Jr., a cotton grower whose great-great-grandfather started his farm in Moultrie, Ga., in 1830.

Georgia has been one of the states hit hardest by Roundup-resistant pigweed, and Mr. Perry said the pest could pose as big a threat to cotton farming in the South as the beetle that devastated the industry in the early 20th century.

"If we don't whip this thing, it's going to be like the boll weevil did to cotton," said Mr. Perry, who is also chairman of the Georgia Cotton Commission. "It will take it away."

*William Neuman reported from Dyersburg, Tenn., and Andrew Pollack from Los Angeles.*





PHOTOGRAPHS BY CHRISTOPHER BERKEY FOR THE NEW YORK TIMES

Eddie Anderson, who has about 3,000 acres of soybean fields, is dealing with the pest pigweed.



Jason Hamlin, a certified crop adviser and agronomist, looks for weeds resistant to glyphosate in Dyersburg, Tenn.



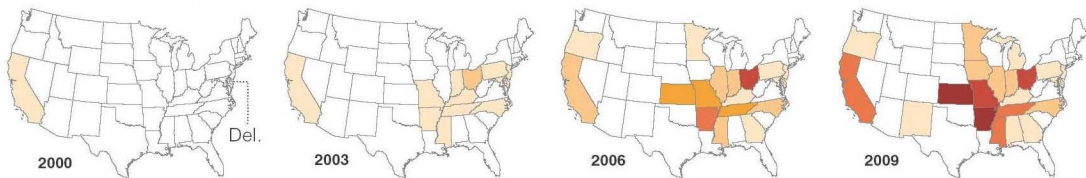


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Supplemental herbicides were applied on Eddie Anderson's land to combat weeds that are resistant to glyphosate.

**Where Weedkiller Won't Work** Farmers' wide use of Roundup, also known as glyphosate, a popular herbicide, has led to the spread of Roundup-resistant weeds across the country. At least 10 species of Roundup-resistant weeds have infested millions of acres in 22 states since 2000.

**GLYPHOSATE RESISTANT WEED SPECIES IN EACH STATE**  
 1 2 3 4 5 6



Source: International Survey of Herbicide Resistant Weeds

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