

# What is glyphosate?



Innovation in modern agriculture is helping farmers grow healthy crops using fewer natural resources. We believe that innovation is crucial to addressing the challenges facing the environment and global food system, and we provide farmers with tailored solutions to address these challenges.

When it comes to crop protection, there is no single approach in the fight to protect crops. Farmers today use many tools — from digital technologies like sensors and satellite imagery that provide essential data analytics, to hybrid and genetically modified seeds, to precision equipment and crop protection products like herbicides.

Digital tools and technologies help farmers identify early exactly which plants in the field are being impacted by problematic weeds, insects and disease. This enables them to quickly and precisely take action to protect their harvests. In the face of weeds, this can mean applying herbicides, using just the right amount, in the right place, at the right time.

Glyphosate-based herbicides, as a tool in an Integrated Weed Management system, have provided efficient, safe and cost-effective weed control for more than 40 years. Each of these tools is powerful individually, and by combining them, farmers are incredibly effective at protecting both crops and the environment.

## What is glyphosate and why is it used?

Since the beginning of agriculture, controlling weeds has been one of the biggest challenges faced by farmers. Weeds compete with crops for sunlight, water and nutrients — and, if left uncontrolled, can significantly impact a farmer's harvest.

Early weed control involved practices such as hand weeding, which required a great deal of human labor and difficult working conditions. Farmers also adopted practices like tilling the soil to help eliminate weeds from season to season. While effective, researchers later determined that these practices impacted soil health and released greenhouse gases contributing to climate change.

When the first chemical herbicides were introduced in the 1940s, they gave farmers new tools that helped increase efficiency and more effectively protect crops from damaging weeds.

Introduced as the active ingredient in Roundup® in the 1970s, glyphosate is a non-selective herbicide, which means that it can eliminate almost any type of plant to which it is applied — even desirable plants. It grew in prominence in modern agriculture as an important tool in integrated weed management after the introduction of genetically modified crops, which allowed farmers to use the herbicide in a way that eliminated weeds without harming desirable plants. Today, glyphosate serves as an active ingredient in hundreds of crop protection products currently registered and approved for use in agriculture, vegetation management, lawn care, gardening and more.

The ability to effectively control weeds while preserving the environment is essential to productivity in modern farming.

As global populations continue to grow and the demand for food increases, farmers will continue to rely more and more on effective and innovative solutions that help them ensure productive harvests while also conserving land and resources.

From data gathered from drones, sensors and other digital technologies to trusted herbicides like glyphosate, there are a host of tools in the crop protection toolbox that are essential for farmers to shape a healthy and sustainable future for agriculture.

## Why are glyphosate-based herbicides so important to farming?

There are roughly 30,000 different types of weeds<sup>1</sup> that compete with different crops for space, nutrients, water and light.

When talking about crop protection, it helps to first understand what farmers are up against in their fields. The weeds that farmers deal with can be much larger than your typical garden-variety plants. Weeds like Palmer pigweed, for example, can grow to be 3.05 meters (10 feet) tall at a rate of 7.5 cm (3 inches) a day — that's almost 61 cm (2 feet) per week. Palmer pigweed can grow so rapidly that if farmers aren't monitoring their fields closely, it can quickly take over, stealing essential nutrients from crops. When left unmanaged, Palmer pigweed populations can cripple soybean harvests to just 22 percent their usual size, and it can have devastating effects on farm equipment.

## Glyphosate by the numbers

- // Every year, up to **40 percent** of the world's potential harvests are lost to damaging pests, including weeds.<sup>2</sup>
- // **30,000** different types of weeds<sup>1</sup> compete with crops for space, water and light.
- // Farmers who apply glyphosate have greater success in the fight against invasive weeds, while those who do not use glyphosate can experience harvest losses of up to **22%**.<sup>3</sup>
- // There have been more than **800 scientific studies** and reviews on glyphosate and Bayer's glyphosate-based products submitted to regulators that support that these products can be used safely.
- // Glyphosate-tolerant crops and glyphosate-based herbicides are the biggest enabler of no-till and reduced tillage farming practices. In 2014 alone, no-till and reduced tillage farming practices led to a reduction in carbon emissions equivalent to removing nearly **2 million cars** from the road.<sup>4</sup>

## What is glyphosate?

Over its 40 years of use, glyphosate has become an indispensable tool for farmers looking to improve efficiencies, ensure more productive harvests and preserve the environment. Benefits include:

- // **Ensuring biodiversity and safety for wildlife** Extensive tests have been conducted to examine the potential impacts of glyphosate on wildlife. These studies play an essential role in governmental safety reviews of glyphosate and collectively they demonstrate that glyphosate's approved uses do not pose a threat to the health of animal wildlife.<sup>5,6</sup>
- // **Conserving land** Weeds compete with crops for water, sunlight, nutrients and space. When weeds are eliminated, harvests can be more productive. This means farmers can produce enough on the land they currently have, without using more. Less farmland means more natural habitat and forage preserved for wildlife.
- // **Improving soil health** Glyphosate enables farmers to reduce or eliminate tillage, which helps keep soil undisturbed. This allows organic material, nutrients and beneficial insects to build up in the soil. It also helps reduce erosion and run-off, keeping moisture in the ground and available to crops.
- // **Reducing carbon emissions** Without glyphosate, farmers would need to rely heavily on plowing (or what is known as tillage), a weed control technique that turns over the soil. This process increases fuel consumption and causes soil disruption, releasing greenhouse gases like carbon into the atmosphere.

### How is glyphosate used?

There is no single approach in the fight to protect crops. Farmers today use many tools — from digital technologies like sensors and satellite imagery that provide essential data analytics, to hybrid and genetically modified seeds, to precision equipment and crop protection products like herbicides. Used together, these solutions can be highly effective. When battling weeds, farmers use data gathered from digital tools to precisely apply herbicides where and when they are needed, and in just the right amount.

Many farmers also follow principles of Integrated Weed Management or participate in training and certification programs to help ensure they are up-to-date on best practices for using crop protection products effectively and sustainably.

So how does it work? Products containing glyphosate are typically sprayed over the field, directly on weeds and grasses prior to planting or prior to the emergence of crops, or over

herbicide-tolerant crops. When it comes in contact with a non-tolerant plant, glyphosate moves to the growing points of shoots and roots, where it interferes with the enzymatic production of certain amino acids that are essential for plant growth.

Although the main global market for glyphosate is agriculture, glyphosate is also used to manage weed growth and improve visibility on non-cultivated areas such as industrial complexes and railway tracks.

### When is glyphosate used?

The time, amount and method of application of glyphosate-based herbicides is extremely precise and specific to the crop and target weed species. Farmers often undergo training to use herbicides and they work to adhere to label instructions. They also monitor crops closely and use data analytics to ensure application in the right amount, at the right time, in the right places.

**“We want to explain the benefits that science and innovation can deliver in agriculture while championing what’s important to people: safe, healthy and affordable food that is produced in an environmentally sustainable manner. Improving access to the science behind our products is a key part of our Transparency Initiative.”**

– *Liam Condon, President of the Bayer Crop Science Division*

<sup>1</sup> <https://croplife.org/crop-protection/benefits/> [Retrieved February 12, 2019]

<sup>2</sup> [https://www.oecd-ilibrary.org/agriculture-and-food/oecd-fao-agricultural-outlook-2012\\_agricultural-outlook-2012-en](https://www.oecd-ilibrary.org/agriculture-and-food/oecd-fao-agricultural-outlook-2012_agricultural-outlook-2012-en) [Retrieved February 12, 2019]

<sup>3</sup> [http://www.ecpa.eu/sites/default/files/documents/Glyphosate%20Final%20Report\\_EU%20results\\_20Feb2017.pdf](http://www.ecpa.eu/sites/default/files/documents/Glyphosate%20Final%20Report_EU%20results_20Feb2017.pdf) [Retrieved February 12, 2019]

<sup>4</sup> <http://www.pgeconomics.co.uk/pdf/2016globalimpactstudymay2016.pdf> [Retrieved February 12, 2019]

<sup>5</sup> [https://link.springer.com/chapter/10.1007/978-1-4612-1156-3\\_2](https://link.springer.com/chapter/10.1007/978-1-4612-1156-3_2) [Retrieved February 12, 2019]

<sup>6</sup> [https://www.cropscience-transparency.bayer.com/Safety-results?showTerms=1&srcPage=https://www.cropscience-transparency.bayer.com/-/media/BCS-INTER/WS\\_Prisma/Documents/Summaries/M-641359-01-1.ashx](https://www.cropscience-transparency.bayer.com/Safety-results?showTerms=1&srcPage=https://www.cropscience-transparency.bayer.com/-/media/BCS-INTER/WS_Prisma/Documents/Summaries/M-641359-01-1.ashx)

Learn more at <https://www.bayer.com/en/glyphosate-roundup.aspx>

**“Between 26 and 40 percent of the world’s potential crop production is lost annually because of weeds, pests, and diseases, and these losses could double without the use of crop protection practices,” according to the United Nations Food and Agriculture Organization (FAO).<sup>2</sup>**