

PESTICIDES, FERTILIZERS, AND GMOS IN CONVENTIONAL COTTON FACT SHEET

The below is an abridged version of Pesticide, Fertilizer, and Genetic Modification Use in Conventional Cotton in the U.S. and Globally: The Case for Organic by The Organic Center (2024). All references are in that document.

Where is cotton grown? Cotton is grown in more than 50 countries around the world, with the US being the third largest producer behind India and China in 2024. In 2021, the most recent year for which data is available, more than 11 million acres were planted to cotton in the US, and global cotton production totaled around 82 million acres. Most of this cotton is managed with the extensive use of pesticides, synthetic fertilizers, and genetically modified (GM) seeds.

Are pesticides used on cotton? In the US, some 42 million pounds of pesticides were used on 10.3 million acres in conventional cotton production in 2021, ranking cotton as the most pesticide-intensive crop per acre of the nine field crops surveyed by the US Department of Agriculture (USDA) in 2019-2023, including corn, soybeans, and wheat. Globally, pesticide usage for cotton ranked fifth among the top single global crops (after soybeans, corn, wheat and rice) with an average annual usage of 256 million pounds in the years 2018-2022.

Which are the primary pesticides used on cotton? At least 98 pesticides were applied to conventional cotton in the US in 2021. Just 10 pesticides made up 86% of all pesticides reported used on cotton that year by weight - acephate, acetochlor, dicamba, ethephon, glufosinate-ammonium, glyphosate, paraquat, s-metolachlor, tribufos, and trifluralin - with the herbicide glyphosate alone making up 30% of all pesticides used on US cotton. Unfortunately, global cotton data does not provide the name of pesticides used.

What are the health concerns about pesticide used on cotton? The top 10 pesticides used on US cotton in 2021 pose several health concerns. For example, seven meet the United Nations Highly Hazardous Pesticides criteria; six are considered known, probable, likely, possible, or suggestive carcinogens; four are considered endocrine disruptors; and three are considered level II moderately acutely toxic pesticides.

Globally, analysis of the use of Highly Hazardous Pesticides (HHPs) on cotton versus other single crops over the five-year period of 2018-2022 found that cotton uses a “significant” proportion of HHPs, accounting for 13% of the crop’s total pesticide use, second only to bananas among single crops. Almost all—95%—of HHP’s used on cotton during that period were used in just four countries: China, Brazil, India, and the U.S.

“The widespread use of insecticides, especially the highly hazardous insecticides, raises

concerns about potential adverse effects on non-target organisms, environmental contamination, and the development of insecticide resistance in pest populations.” Similarly, the “use of herbicides raises concerns regarding environmental impact, including soil and water contamination, non-target plant damage, and the development of herbicide-resistant weed populations.” — International Cotton Advisory Committee (ICAC)

Are pesticides containing PFAS or “forever chemicals” used on US cotton? Yes. Ten pesticides containing per- and polyfluoroalkyl substances (PFAS)—known as “forever chemicals”—are among the 98 pesticides used on U.S. cotton in 2021: bifenthrin, fluometuron, fluridone, formesafen, novalunon, pyroxasulfone, saflufenasil, sulfoxaflor, tetraconazole and trifluralin.

Are synthetic fertilizers used on cotton? In the U.S., around 1.3 billion pounds of synthetic fertilizers were used on 10.3 million acres of conventional cotton in 2021, making cotton the third most fertilizer-intensive single crop per acre among nine field crops USDA surveyed 2019-2023, behind only corn and rice. Of that total, nitrogen fertilizer accounted for nearly 54% of all cotton fertilizers used on US cotton or 700 million pounds. Globally, fertilizer usage on cotton amounted to an estimated 16.4 billion pounds in 2020. Nitrogen was also the type of fertilizer most extensively used on cotton globally with approximately 9.4 billion pounds applied that year, representing approximately 58% of total synthetic fertilizer use on the fiber.

What is the concern around synthetic fertilizer use? Not only is the production of synthetic fertilizers energy intensive, but fertilizers can be lost to the environment through volatilization into the air, leaching into ground water, emission from soil to air, and runoff into surface water. Nitrogen fertilizers are a particularly important contributor to climate change by releasing the potent greenhouse gas nitrous oxide.

Is cotton genetically modified (GM)? In the US, 96 percent of the conventional cotton acreage planted was genetically modified in 2024. In addition, 79% of cotton produced globally was genetically modified as of 2019.

What are the concerns around GM use on cotton and other crops? The widespread use of pesticides on GM crops has led to the development of herbicide resistance as well as insecticide resistance. The widespread use of herbicides raises concerns regarding environmental impact, including soil and water contamination, non-target plant damage, and the development of herbicide-resistant weed populations, while the widespread use of insecticides, especially the highly hazardous insecticides, raises concerns about potential adverse effects on non-target organisms, environmental contamination, and the development of insecticide resistance in pest populations.

What about data transparency? Although cotton is a globally grown and used commodity, there is a glaring lack of transparency in the kinds and quantities of chemical pesticides and fertilizers used in the production of this important crop. Despite the widespread use of chemical inputs and their potential risks, detailed industry information about conventional cotton's chemical use largely remains behind prohibitive paywalls and, with the bulk of the reports—provided by the cotton industry with data provided by the chemical manufacturers—omitting the names and quantities of the different pesticides used and providing limited data on fertilizer use.

The US is the only country to publicly report the use of pesticides and fertilizers in cotton production, with USDA conducting semi-regular surveys on cotton production, listing the actual inputs and quantities and providing the information to the public at no cost.

Notes: Here, we refer to active ingredients as “pesticides” unless referring to specific types of pesticides such as herbicides, insecticides, fungicides, defoliants, and the like.

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