

Organic Cotton: One of the most important choices you can make for the environment



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People don't always think about organic when it comes to the clothes we wear, the sheets we sleep on, the personal care items we depend on, and the mattresses in our bedrooms. But organic cotton is one of the most important choices people can make for the environment, because it supports a healthy ecosystem and prevents the use of toxic synthetic chemicals.

Cotton is one of the most widely grown crops in the world, and conventional cotton is one of the most chemically intensive crops with serious consequences for the Earth's air, water, soil, and climate – not to mention the health of farm workers and cotton processors. Organic cotton is grown, processed, dyed, and finished with methods that have a focus on building ecosystem health and reducing the use of toxic pesticides, synthetic fertilizers and hazardous processing chemicals.

In this report, we'll cover some of the most recent research on the environmental benefits of organic cotton production, showing the importance of avoiding synthetic chemicals, the role of organic cotton when it comes to climate change mitigation, and the benefits of organic cotton to water and biodiversity. We'll also highlight the latest study to come out showing the multitude of beneficial practices used in organic cotton, from building soil health on the farm to using non-toxic methods of textile processing.



What is organic about cotton?

Organic cotton means that farmers can't use toxic, persistent pesticides, synthetic fertilizer, sewage sludge, or genetically modified organisms (GMOs). Organic farmers also have to use methods that build soil health and support on-farm biodiversity.

But "organic" cotton doesn't stop at the field. [According to the Global Organic Textile Standard \(GOTS\)](#), when organic fiber is processed and certified through GOTS, it has to follow strict regulations protecting the health of the planet and people from the farm all the way to your shopping cart.

Organic clothes, furniture, sheets, towels, tampons, and other textiles cannot be treated with chlorine bleach, formaldehyde, or any other toxic substances, and must be colored with natural and non-toxic dyes that are also free of heavy metals. Organic cotton manufacturers also need to have policies and procedures to monitor and improve the environmental performance of their facilities, and cannot use chlorinated plastics like PVC in their packaging.

The Growing Popularity of Organic Cotton

The organic textile sector has been gaining popularity over the past few years, growing by over 12% annually, and is the largest and fastest-growing sector in organic outside of food with over \$2 billion in sales in 2019. That year, the number of GOTS certified facilities globally grew by 35%, from 5,760 to 7,765 located in 70 countries. With almost 24,000 bales of organic cotton harvested in the U.S. from almost 19,000 acres in 2018, organic cotton is a growing commodity.



The Global Organic Textile Standard

The Global Organic Textile Standard (GOTS) is the world's leading processing standard for organic textiles. GOTS ensures that cotton in a product is grown organically. The certification focuses on what happens after the farm gate, following the cotton through the supply chain to ensure that GOTS certified clothing, sheets, towels, furniture, and other items were all made with environmentally friendly, healthful, and socially responsible inputs and practices.

Here are just a few of the requirements for GOTS certification:

- ✓ Fiber cannot be processed with toxic heavy metals, formaldehyde, or nano particles
- ✓ Chlorinated, brominated and phosphate-based flame retardants are prohibited
- ✓ Textiles cannot be treated with chlorine bleach
- ✓ All dyes must be nontoxic
- ✓ Manufacturers can't use techniques that pose risks to workers
- ✓ Chlorinated plastics like PVC can't be used in packaging





Chemical Use in Conventional Cotton

Conventional cotton is notorious for being one of the world's most chemically intensive crops. In fact, it ranks as the third largest user of pesticides in the United States behind corn and soybeans, using over 68 million pounds of pesticides in 2019. Commonly used insecticides include organophosphates, pyrethroids, and neonicotinoids, which have all been associated with harmful impacts on the environment. Glyphosate—the active ingredient in the popular herbicide “Roundup®,” and categorized as a “probable carcinogen” by the World Health Organization—made up more than 1/3 of all pesticide use on cotton in 2019.

But there is also a growing list of other hazardous herbicides increasing in use in response to the emergence of glyphosate-resistant “super weeds.” For example, the U.S. Environmental Protection Agency (EPA) approved new GMO cotton varieties, Xtend® and Enlist®, which are each resistant to three herbicides: glyphosate, glufosinate and dicamba, and glyphosate, glufosinate and 2,4-D, respectively. These new GMO varieties are expected to replace the traditional

Roundup® ready cotton and are anticipated to increase the amounts of these chemicals used in conventional cotton production. Increased use of dicamba and 2,4-D are of particular concern since they are potentially more toxic than glyphosate and significantly more susceptible to drift, increasing the risk of contamination to nearby crops as well as human exposure. In addition to water contamination and negative impacts on wildlife, studies have linked exposure to 2,4-D with potential human health problems as well.

The onslaught of chemical use continues well past the farm-gate to conventional textiles, as a wide variety of hazardous inputs are used in conventional cotton processing. These include ammonia, azo and heavy metal-based dyes, flame retardants, formaldehyde, petroleum scours, and softeners.

The good news is that all these chemicals are banned from use in the processing of organic cotton if the product is certified to GOTS!



Organic Cotton and Climate Change

Organic cotton outperforms conventional cotton when it comes to climate change mitigation. [A life cycle analysis for organic cotton](#) found that energy demand, calculated on a per yield basis, was 62% lower than that of conventional cotton, and that the total global warming potential of organic cotton was 46% lower than that of conventional cotton. These results are consistent [with other studies](#) that have found that organic production methods [significantly reduce GHG emissions](#) and [use less energy](#).

Organic farming also contributes to climate change mitigation by sequestering carbon in the soil. Studies show that the diverse crop rotation strategies and soil-building practices required by USDA's National Organic Program for all certified organic farmers [increase soil organic carbon](#) leading to [increased long-term carbon storage](#).

Organic Cotton and Water

Organic cotton production has been shown to significantly reduce the amount of water pollution via soil erosion and nutrient leaching compared to conventional cotton production. These benefits have also been documented in other cropping systems where organically managed soils retain water and nutrients more effectively than conventionally-managed soils.

Because of the benefits to soil that organic systems provide, organic soils are also better able to hold water, which can reduce the need for irrigation. In fact, organic cotton production practices can reduce water consumption by as much as 91%. Irrigation water consumption for organic cotton is significantly lower than that of conventional cotton, as organic cotton is mostly rain-fed. The reduction of water use continues throughout the processing of cotton, and water use in GOTS certified cotton is limited to around 50 liters per kg fabric in later stages of the cotton processing.

Organic Cotton and Biodiversity

A large body of literature suggests that organic farming systems can play a role in biodiversity conservation. Common organic farming practices benefit a wide range of organisms. Compared to conventional farms, organic farms generally support a greater diversity of carabid beetles, spiders, earthworms, beneficial parasitoid wasps, vascular plants, birds, bees and other native pollinators, soil microbes and fungi, and small rodents.



Hot New Research on Organic Cotton

While a broad array of research has shown that organic production can provide significant environmental benefits, few studies have actually looked at the specific practices used by organic cotton growers and processors in the United States and documented real-world impacts those practices are having on the environment. A new research project out of Iowa State University fills this gap by surveying organic cotton producers and processors to better understand the specific approaches and methods used in organic cotton production and processing, and the environmental impacts of those techniques.



What They Found

- Conventional cotton relies heavily on GMO herbicide-tolerant and Bt-cotton for managing pests, but because GMO's are banned in organic production, organic farmers rely on a healthy ecosystem to manage pests, and use soil and biodiversity building techniques such as crop rotations, resistant and tolerant varieties, and fostering beneficial insects.
- 40% of surveyed farmers found an increase in beneficial organisms on their farms since adopting organic practices.
- Instead of harmful synthetic pesticides and fertilizers, organic cotton farmers are using cover crops like clover, rye and other crops as rotational crops, to manage soil nutrition, soilborne diseases, and pests.
- Organic soil tends to be healthier – which can lead to climate change mitigation and the ability to adapt to extreme weather events like drought and floods.
- Organic management can reduce water consumption in cotton. Many organic operations practice “dryland production” without irrigation, and of the organic growers surveyed in the study who use irrigation, many use technology to reduce water use, such as drip irrigation.
- Instead of toxic synthetic defoliants (which are used in conventional production), organic producers use natural methods to mature cotton bolls, such as reducing water availability.
- When it comes to cotton processing, organic processors certified to GOTS avoid the environmental footprint of toxic processing aids that are commonly used in conventional processing.
- More research should focus on overcoming the challenges that organic growers and processors face, because organic cotton is an excellent environmental alternative to conventional production.

The Organic Difference: On the Farm

Organic cotton growers in the study cited using practices that are associated with multiple environmental benefits.

Check out the difference between organic and conventional practices:

ORGANIC PRACTICES	ENVIRONMENTAL EFFECTS	CONVENTIONAL PRACTICE	ENVIRONMENTAL EFFECTS
Natural management of soil nutrients with compost and low-toxicity amendments	<ul style="list-style-type: none"> Increased carbon sequestration Climate change mitigation Higher soil health Increased soil biodiversity 	Synthetic nitrogen fertilizer	<ul style="list-style-type: none"> Acidification of soils Harms soil ecosystem
Cover crops	<ul style="list-style-type: none"> Higher soil fertility and health Higher biodiversity 		
Crop rotations	<ul style="list-style-type: none"> Higher soil fertility Fewer diseases and pests Weed management Higher biodiversity 	<ul style="list-style-type: none"> No rotational crops Herbicides and herbicide-tolerant cotton 	<ul style="list-style-type: none"> Monoculture system supporting build-up of insect and disease pests “Super weeds” developed in GM crops
Trap crops	Plants trap insect pests to isolate cotton crop	Synthetic insecticides	Some insecticides harm bees and other pollinators
Entomopathogens	Natural treatments of beneficial microorganisms that can suppress cotton pests	Bt cotton	Harmful to beneficial insects that help keep pest populations in check
Insect and disease-resistant varieties	Support of beneficial organisms without the use of chemicals		“Super bugs” developed in GM crops
Planting later and in warm soils	<ul style="list-style-type: none"> Avoiding soilborne fungal attack of seedlings Supports beneficial organisms 	Synthetic seed treatments	<ul style="list-style-type: none"> Harms beneficial soil biota Systemic treatments can continue to harm beneficial insects throughout the cotton lifecycle



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About The Organic Center

The Organic Center is your trusted source on the science of organic food and farming. We serve up unbiased research so you can make healthier choices based on scientific findings.

Our goal is to empower you to make informed choices in your everyday life. By providing you with the facts on organic, you can make healthy choices for your family and the planet.

The Organic Center is a 501(c)(3) non-profit research and education organization.

We set out to fulfill our mission by:

- Developing partnerships and engagement opportunities with universities, research institutions, federal agencies, organic farmers, and food systems advocates that are working to improve and transform agricultural systems.
- Fostering alliances among funding entities, non-profits, government agencies, and international bodies to advance research on organic systems.
- Investigating and participating in research that will (1) fill knowledge gaps about the health and environmental impacts of organic farming and (2) increase the viability and sustainability of the U.S. agricultural system.
- Empowering consumers to make choices that will improve their health, the health of the environment and the health of their communities through education and outreach.
- Serving as a resource for the public, policymakers, scientists, farmers and industry on the science supporting sustainable organic food and farming.
- Strengthening and expand organic practices and commodities which reduce the use of toxic, synthetic chemicals and have clear benefits to human health and the environment.

Learn more at www.Organic-Center.org

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