Popular Agriculture 2(5) 325-328(September, 2026)
Published at popularagriculture.com

Global E-Magazine
ISSN: 3139-7603

POPULAR ARTICLE

Organic cotton in India: growing green for a sustainable future

K. Nagarajan[1], V. Manivannan[1], A. Sangothari[2], M. Jeeva[3]

1 Agricultural Research Station, Tamil Nadu Agricultural University, Bhavanisagar-638 451, Tamil Nadu, India

2 Department of Agronomy, Tamil Nadu Agricultural University, Coimbatore-641 003, Tamil Nadu, India

3 ICAR- Krishi Vigyan Kendra, Kovilangulam-626 107, Aruppukottai, Virudhunagar, Tamil Nadu, India

Corresponding authors email: nkgj07@gmail.com

Manuscript received: September 26, 2026; Decision on manuscript, September 28, 2026; Manuscript accepted: September 30, 2026

Intricacies of the subject

Cotton is called as "white gold" due to the most important agricultural commodities due to its big role in the textile industry, rural employment, and agricultural income. India is one of the world's largest producers of cotton and has also emerged as the world's leader in the production of organic cotton. As environmental sustainability, soil health and climate change are increasingly becoming issues of concern, organic cotton farming is gaining popularity as a sustainable alternative to conventional cotton farming.

Introduction

Global estimates for the 2020/21 season put organic cotton production at 342,265 tons of fiber worldwide. That's about 1.4 percent of total cotton. India was the top producer. It had around 130,849 tons of certified organic cotton fiber grown on 230,125 hectares of organic farmland. India alone made almost 38 percent of world organic cotton. It also grew 153,004 tons on land that was undergoing conversion to organic farming. That's 86 per cent of the world's cotton in conversion. The major producing states in India are Madhya Pradesh and Odisha, Maharashtra, Gujarat and Rajasthan also important. Farmers grew a range of cotton types, from short-staple up to extra-long-staple varieties (Organic Cotton Market Report, 2022).

Need of organic cotton

Cotton may not be a food crop, but its cultivation has significant environmental implications. Conventional cotton farming often relies heavily on synthetic fertilizers and pesticides, which can degrade soil quality, contaminate water resources, and harm biodiversity. Organic cotton farming takes a different approach. It avoids synthetic chemicals and instead relies on natural manures, biological pest management, and crop rotation practices. These methods help create a healthier and more sustainable agricultural system. The Iran war has disrupted global supplies of inorganic fertilizers by affecting natural gas availability and fertilizer

trade routes, leading to higher prices and reduced accessibility for farmers. This shift toward organic cotton can help reduce dependence on inorganic fertilizer inputs while supporting environmental sustainability and soil health.

Table 1. State-wise production (MT) of organic cotton (2016–21) (Ministry of Textiles, Government of India, 2022)

State	2016–17	2017–18	2018–19	2019–20	2020–21
Madhya Pradesh	74,027.06	82,737.87	91,925.51	84,701.23	383,133.39
Maharashtra	21,455.54	33,447.94	58,423.37	63,720.49	168,009.36
Gujarat	22,364.55	55,858.71	51,020.28	55,898.80	85,782.60
Odisha	23,034.40	58,545.71	74,001.57	103,312.96	106,495.89
Rajasthan	13,625.58	15,412.85	34,033.27	23,211.39	59,173.79
Karnataka	20.08	578.86	363.35	1,152.12	2,998.09
Tamil Nadu	0.00	0.00	1,790.42	2,369.82	3,771.77
Telangana	439.26	856.00	1,316.74	1,343.86	1,561.88
Bihar	0.00	0.00	1.16	1.16	7.47
Total	**154,966**	**247,438**	**312,876**	**335,712**	**810,934**

Reducing environmental impacts through organic cotton farming

A comparative life cycle impact assessment (LCIA) highlights the significant environmental advantages of organic cotton over conventional and Better Cotton Initiative (BCI) cotton. The Better Cotton Initiative is the world's leading sustainability programme for cotton. Per tonne of seed cotton produced, organic cotton recorded the lowest levels of acidification, eutrophication, greenhouse gas emissions, and energy consumption. Its global warming potential was only 295 kg CO_2-equivalent compared to 435 kg for BCI cotton and 731 kg for conventional cotton, demonstrating its contribution to climate change mitigation. Organic cotton also required substantially less primary energy (1,351 MJ) than BCI (2,510 MJ) and conventional cotton (5,375 MJ). Although BCI cotton showed slightly lower blue water consumption, organic cotton still consumed considerably less water than conventional cotton. These findings underline that organic cotton is one of the most environmentally sustainable cotton production systems, offering a cleaner and greener pathway for the textile industry while reducing pressure on natural resources and ecosystems.

Key benefits of organic cotton

Improved soil health: Organic farming practices enhance soil fertility and microbial activity. Crop rotation and organic manures improve soil structure, helping fields remain productive over the long term.

Reduced chemical use: By eliminating synthetic pesticides and fertilizers, organic cotton farming reduces environmental pollution and protects farmers from exposure to harmful chemicals.

Sustainability and ecological balance: Organic cultivation aligns closely with traditional Indian farming principles, emphasizing harmony with nature and conservation of natural resources.

Lower greenhouse gas emissions: Studies suggest that organic cotton production can reduce greenhouse gas emissions by up to 46% compared to conventional farming systems, contributing to climate change mitigation.

Premium market prices: Growing consumer demand for sustainable textiles often enables farmers to receive premium prices for certified organic cotton, improving income opportunities.

Cleaner and safer production: Organic cotton is produced through environmentally friendly methods that minimize contamination of soil, water, and surrounding ecosystems.

Table 2. Comparative Analysis of Life Cycle Impact Assessment (LCIA) for organic cotton, Better Cotton Initiative (BCI) Cotton, and Conventional Cotton Production (per 1 Ton of seed cotton) (Shah *et al.*, 2018)

Impact categories	Organic cotton	Better Cotton Initiative (BCI) cotton	Conventional cotton
Acidification potential [kg SO_2-Equiv.]	3.34	12.14	14.06
Eutrophication potential [kg PO_4-Equiv.]	0.46	2.49	7.07
Global warming potential (GWP 100 Years) [kg CO_2-Equiv.]	295	435	731
Primary energy demand (PED) [MJ]	1351	2510	5375
Blue water consumption (WC) [m^3]	391.80	330.61	541.06

Environmental advantages

Among various textile fibers, organic cotton has demonstrated some of the lowest environmental impacts. The absence of synthetic chemicals and the use of natural soil fertility management practices help reduce ecological damage while promoting biodiversity. The result is a farming system that not only produces cotton but also supports healthier ecosystems and more resilient agricultural landscapes.

Challenges facing organic cotton in India

Despite its advantages, organic cotton farming faces several obstacles that limit its expansion.

High labour costs: Organic farming often requires more manual labour for weed control and pest management, increasing production costs.

Lower yields: Many farmers experience lower yields during the transition from conventional to organic farming, affecting profitability.

Limited domestic market facilities: Although international demand is growing, domestic marketing channels for organic cotton remain underdeveloped.

Seed availability: Access to high-quality organic and non-genetically modified cotton seeds remains a major challenge.

Pink bollworm management: Controlling pests such as pink bollworm without synthetic pesticides
can be difficult and requires integrated management strategies

Competition from conventional and synthetic fibres: Organic cotton competes not only with conventional cotton but also with cheaper synthetic fibres that dominate global textile market. These fibres often offer lower production costs and greater durability,

making it difficult for organic cotton to compete on price despite its environmental benefits.

Limited support during conversion: Farmers transitioning to organic farming often receive insufficient financial and technical support during the conversion period.

Transgenic contamination: The widespread cultivation of genetically modified cotton increases the risk of contamination in organic fields, posing certification challenges.

The way forward

India has established itself as the undisputed global leader in organic cotton production. However, unlocking the full potential of this sector will require stronger policy support, improved seed systems, affordable certification mechanisms, enhanced farmer training, and better market access. As consumers increasingly demand environmentally responsible clothing, organic cotton offers an opportunity to combine economic growth with ecological sustainability. By addressing existing challenges and supporting farmers during the transition process, India can further strengthen its leadership in sustainable cotton production and contribute to a greener and larger textile industry. Organic cotton is more than just a fiber it represents a commitment to healthier soils, cleaner environments, and a more sustainable future for agriculture and fashion alike. Strengthening farmer producer organizations, improving traceability and certification systems, and developing reliable domestic and export markets will further enhance the profitability and long-term sustainability of organic cotton farming in India.

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