



Textile
Exchange

Life Cycle Assessment for Cotton

Frequently asked questions

Contents

What is Textile Exchange’s role and approach to developing Life Cycle Assessment (LCA) studies and using LCA data?.....	3
Goal and scope.....	4
What data sources are used for this LCA?.....	4
Is the method used in this LCA consistent and standardized across other studies?.....	4
What production systems are covered in this study?.....	5
What are the boundaries for the processes included in cotton production?.....	5
Which allocation approach was adopted in this study?.....	5
What is included in the country average production system?.....	5
What is included in the regenerative production system?.....	6
What is included in the organic cotton production system?.....	6
What is included in the recycled cotton production system?.....	6
How were data providers chosen for the study?.....	6
How were geographic regions chosen for the study?.....	7
How was it ensured that the collected data were representative of the assessed cultivation systems?.....	7
Why wasn’t regenerative cotton in the United States included?.....	7
When was the data collected for the study?.....	7
Modeling, impact assessment results, and interpretation.....	8
Why is there a scenario for shipping modes and distances for recycled cotton?.....	8
How is the social impact of cotton production considered in the LCA?.....	8
How will the results from the Textile Exchange Cotton LCA relate to LCA studies that may exist for individual cotton programs?.....	8

Cover photo: Priyadarshini Ravichandran

What is Textile Exchange’s role and approach to developing Life Cycle Assessment (LCA) studies and using LCA data?

There are many impact data gaps and a clear need to strengthen the quality, transparency, and accessibility of LCA data for the fashion, textile, and apparel industry at Tier 4 of the supply chain, where raw materials are produced and initially processed.

Textile Exchange facilitates the development of LCA studies to help fill critical data gaps on impacts related to key fibers and materials, supporting better-informed industry action and impact measurement.

In 2022, we launched a series of seven priority LCA studies covering cotton, polyester, leather (hide production), RWS wool, RMS mohair, nylon, and cashmere. The studies are designed to improve the availability of consistent, high-quality impact data for these materials.

Before exploring the individual LCA reports, we strongly encourage reviewing our position paper, [Ensuring Integrity in the Use of Life Cycle Assessment Data](#), which provides the full foundation and context for this work. The paper explains:

- Why Textile Exchange conducts LCA studies and how this effort supports the industry’s transition to preferred production systems.
- Our role and guiding principles in developing LCA studies, including engagement with producers and expert partners.
- The scope and design of the studies, including cradle-to-gate system boundaries and data sources.
- The measures taken to ensure credibility and transparency, such as third-party critical reviews and multi-stakeholder technical input.
- Why Textile Exchange LCA studies are non-comparative, and how to use the results responsibly.
- The resources and deliverables available for each study and where the resulting datasets will be published.
- Our ongoing work and next steps, including expanding data coverage, incorporating our LCA+ approach, and opportunities for industry collaboration.

Supplementary to this paper, a second paper, [LCA Model Comparison—Case Study: Cotton](#) outlines the variations across LCA methodologies and provides specific examples for why LCA data should not be compared unless specific conditions are met.

To learn more about Textile Exchange’s LCA work, visit [link to LCA page on website] or contact the Impact Data and Measurement team at impactdata@textileexchange.org.

Goal and scope

What data sources are used for this LCA?

Considering that a substantial amount of primary data collection is already ongoing within the cotton sector through sustainability initiatives, certification schemes, and research collaborations, the study aimed to leverage this existing data infrastructure to the fullest extent possible. A systematic evaluation of available data—both published and unpublished—was carried out. In addition, relevant institutions and stakeholders were engaged to obtain access to existing primary datasets or to validate the use of secondary data and related assumptions.

Where primary data was unavailable or incomplete, high-quality secondary data was incorporated as supplementary information. All data sources were assessed using a structured DQR.

NOTE: Further information can be found in [Life Cycle Assessment for Cotton](#), section 4.1 Data collection procedure.

Is the method used in this LCA consistent and standardized across other studies?

This study follows the Cascale Cotton LCA Methodology, a consensus-based framework created by a coalition of cotton programs, LCA experts, and industry stakeholders, which provides industry-aligned guidance on key methodological aspects such as system boundaries, allocation procedures, functional units, and default secondary data values.

It provides a standardized framework for the development of life cycle inventory datasets for cotton cultivation and ginning that can be used within the Higg Product Tools, particularly the MSI, with the objective of enabling consistent, scalable, and transparent cotton fiber datasets. Given the inclusive and collaborative nature of its development, and its intention to serve as a common reference across cotton initiatives, the Cascale Cotton LCA Methodology constitutes an industry-aligned baseline.

By adhering to this framework, the study ensures consistency with widely accepted modeling approaches used for cotton LCA in the fashion, textile, and apparel industry. Where possible, assumptions and data align with those defined by the methodology, helping to improve the credibility of the results.

For recycled cotton, no such industry-aligned framework exists for the quantification of environmental impacts related to the production of recycled spinnable fibers. Methodological choices are transparently documented within the study, follow the methodological framework established in ISO 14040, and fulfill the specific requirements of ISO 14044 across all phases of the assessment.

NOTE: Further information can be found in [Life Cycle Assessment for Cotton](#), sections 2.1 General goals of the study, 2.2 Alignment with industry standards, and 2.5 Compliance with ISO 14044.

What production systems are covered in this study?

The study aims to address critical data gaps and methodological variability found in existing cotton LCA studies, by generating new datasets for country-average¹ (reference system), organic, regenerative, and recycled cotton across key producing countries.

What are the boundaries for the processes included in cotton production?

The study follows a non-comparative, attributional LCA approach and focuses on cradle-to-gin-gate boundaries. The cradle-to-gin-gate system for cotton cultivation covers raw material production from field to ginning. The functional unit is 1 kg of lint cotton at the gin gate. For recycled cotton, the scope includes three types of waste: post-industrial yarn waste, post-industrial fabric waste, and post-consumer waste. System boundaries include waste collection, transport, and mechanical recycling processes. The functional unit is 1 kg of recycled spinnable cotton fiber product for further processing at the factory gate.

Which allocation approach was adopted in this study?

In terms of allocation, for cotton cultivation, this study follows the default allocation approach recommended by the [Cascale Cotton LCA methodology](#), namely, economic allocation based on the five-year average price data. For recycled cotton, which is a multi-output system, economic allocation is used to allocate impacts between the main product and by-products. However, the study takes a conservative assumption, assuming 100% allocation to the main product.

NOTE: Further information can be found in Life Cycle Assessment for Cotton, sections 3.3 System boundary and 3.4: Allocation.

What is included in the country average production system?

The country average product system is intended to represent cotton that is not cultivated under a specific program (for example, Better Cotton Initiative, REEL) nor certified as organic or regenerative. In cases where secondary or national statistical data is used, it is often unavoidable that such data includes contributions from cotton programs. While the goal is to establish these product systems as reference systems and to exclude program data where possible, full separation may not always be feasible. Therefore, the term "country average" was considered the most appropriate to reflect what this production system is intended to represent, rather than "conventional production," which is often how this is typically referenced.

NOTE: Further information can be found in Life Cycle Assessment for Cotton, section 3.1 Product system(s).

¹ This product system is intended to represent cotton that is not cultivated under a specific program (for example, Better Cotton Initiative, REEL) nor certified as organic or regenerative, as defined in the study.

What is included in the regenerative production system?

There is currently no universally agreed-upon definition of regenerative agriculture. For the purposes of this study, commonly referenced practices in regenerative systems were identified based on Textile Exchange's [Regenerative Agriculture Landscape Analysis](#), and used as a reference for a system to qualify as regenerative.

Regenerative systems observed in this study tended to fall into two broad categories:

- Integrated regenerative systems, which may apply synthetic or mineral-based fertilizers and pesticides; and
- Organic-aligned regenerative systems, which avoid synthetic inputs and typically include additional requirements for management practices that go beyond baseline organic certification (for example, regenerative organic).

NOTE: Further information can be found in Life Cycle Assessment for Cotton, section 3.1.1 Cotton cultivation and Annex D.

What is included in the organic cotton production system?

This product system is defined as “certified organic”, meaning it is certified under one of the organic standards in the IFOAM² Family of Standards.

NOTE: Further information can be found in Life Cycle Assessment for Cotton, section 3.1.1 Cotton cultivation.

What is included in the recycled cotton production system?

Recycled cotton fiber is defined as a material that has been reprocessed from reclaimed material by means of a manufacturing process and made into a final product or into a component for incorporation into a product (as per [Textile Exchange Guide to Recycled Inputs](#)). The study considers three types of cotton waste used in the production of recycled cotton, including:

- Post-industrial yarn waste
- Post-industrial fabric waste
- Post-consumer waste

NOTE: Further information can be found in Life Cycle Assessment for Cotton, section 3.1.2 Recycled cotton fibers.

How were data providers chosen for the study?

Potential data providers were identified through the Textile Exchange network, relevant in-country institutions, consultants, and brand sponsorship groups. Potential data providers were contacted, and meetings were set up with those who were interested in taking part. All data providers who were willing and able to be included in the study were included.

² IFOAM refers to Organics International, formerly known as the International Federation of Organic Agriculture Movements.

NOTE: Further information can be found in Life Cycle Assessment for Cotton, section 4.1 Data collection procedure.

How were geographic regions chosen for the study?

Geographic regions were selected based on their relevance to global cotton production and the feasibility of obtaining good-quality primary data. Countries were prioritized using production statistics reported in the 2025 Textile Exchange [Materials Market Report](#), combined with an assessment of where Textile Exchange has established relationships that enable effective data collection. Additional countries are under consideration for inclusion in a subsequent phase to further improve global coverage.

NOTE: Further information can be found in Life Cycle Assessment for Cotton, section 3.1 Product systems.

How was it ensured that the collected data were representative of the assessed cultivation systems?

Ensuring that the sample reflected the characteristics of the assessed cultivation systems was a central objective of the data assessment process. Given constraints in data availability, several approaches were applied to evaluate representativeness. Detailed methods and results are documented in the full LCA report. Geographical representativeness was assessed through the share of production volume covered and the extent to which key production regions were included. This assessment is incorporated into the aggregated Data Quality Rating (DQR), which is reported consistently alongside all results.

NOTE: Further information can be found in Life Cycle Assessment for Cotton, section 4.2.1 Results of primary data collection and assessment of representativeness.

Why wasn't regenerative cotton in the United States included?

Regenerative cotton produced in the United States was not included as we could not find data providers that could support in developing an accurate dataset by providing their data. We may consider including this dataset in a future analysis if there is an opportunity.

NOTE: Further information can be found in Life Cycle Assessment for Cotton, section 3. Scope of the study.

When was the data collected for the study?

Primary data was collected directly from cotton production systems, primarily covering the 2023 season and, where available, previous cultivation years. For secondary data, a strict cut-off was applied to exclude sources older than 10 years. The Data Quality Rating (DQR) of the study considers time representativeness.

NOTE: Further information can be found in Life Cycle Assessment for Cotton, section 4.1 Data collection procedure.

Modeling, impact assessment results, and interpretation

Why is there a scenario for shipping modes and distances for recycled cotton?

As part of the data collection process for all cotton waste types, the truck transportation distance of the cotton waste from the domestic Tier 1 supplier to the recycling facility was collected. For post-consumer waste specifically, no Life Cycle Inventory (LCI) data was provided for international transportation distances. However, considering the potential significant impact of the inbound transportation on the results, a scenario analysis was conducted to assess the environmental impacts of international shipping of post-consumer waste. These results were used to develop an additional baseline scenario for post-consumer waste with international transportation, which was informed by the “average” scenario.

NOTE: Further information can be found in Life Cycle Assessment for Cotton, section 5.2.9 Recycled cotton—international shipping of post-consumer waste.

How is the social impact of cotton production considered in the LCA?

Textile Exchange and our project partners believe it is important to consider the impacts of fiber and material production more holistically. This is linked to Textile Exchange’s “LCA+” approach in which we seek to consider other impact areas not typically covered by LCA, such as biodiversity, soil health, freshwater, animal welfare, and social livelihoods. The social assessment for cotton that is part of the cotton LCA study was developed as part of this LCA+ approach, to capture human rights impact elements related to cotton production. It provides a foundational overview of some of the most common social impacts associated with cotton fiber production and is intended to serve as a general reference, highlighting key themes and offering useful resources for further exploration. It does not represent an in-depth assessment and should not be treated as such.

NOTE: Further information can be found in Life Cycle Assessment for Cotton, section 7. Social assessment.

How will the results from the Textile Exchange Cotton LCA relate to LCA studies that may exist for individual cotton programs?

Textile Exchange’s study is not intended to replace LCA data from a specific cotton program or supply chain. The datasets developed in this study are intended primarily to support environmental impact assessments in cases where more specific data is not available. Users are strongly advised to prioritize the use of supply chain-specific data wherever possible and relevant.

NOTE: Further information can be found in Life Cycle Assessment for Cotton, section 2.3 Intended use and communication of study results.