From Data to Impact

How to Get Cotton LCAs Right

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Commissioners:

Better Cotton Initiative

Cotton Australia

Cotton Incorporated

U.S. Cotton Trust Protocol

Contributors:

Cascale

Cotton Research and Development Corporation

Textile Exchange

Prepared By:

EarthShift Global, LLC

Amos Ncube, Ph.D.

Mariana Ortega Ramirez

Nathan Ayer, Ph.D.

Thomas Etheridge, Ph.D.

Tess Konnovitch

Lise Laurin

Introduction

Introduction

In the cotton apparel sector, sustainability claims are increasingly being scrutinized for scientific credibility, transparency, and relevance. Life Cycle Assessment (LCA), though a widely accepted and important tool for quantifying environmental impacts, is often misapplied or over-relied upon in ways that ignore its limitations and distort decision-making.

As this position paper argues, LCAs are best applied as part of a broader, multi-dimensional sustainability assessment approach. The effective scrutiny and accountability of the cotton sector require linking LCA outputs to farm-level indicators of natural, social and economic capital and data collection protocols, shared impact categories, and integrated reporting systems that reflect the full scope of impacts of cotton systems.

The common, current use of LCAs can result in misguided sustainability strategies, misallocated resources, and erosion of trust among stakeholders. There is an urgent need to reassess how LCAs are used and communicated within the sector to support more credible, context-aware sustainability outcomes. While the responsible use of LCAs is a must, the right quantification of environmental impact demands that we all go further, avoiding LCAs in isolation at all costs, placing them within a multilayered system in which different actions and practices are not only measured, but connected and combined.

There is an urgent need to reassess how LCA is used and communicated within the sector to support more credible, context-aware sustainability outcomes.

The primary audience for this position paper is technical experts within textile brands and retailers, such as ESG reporting managers, carbon/sustainability teams and consultants, who are responsible for Scope 3 emissions reporting and data-driven sustainability planning. Nonetheless, its implications are highly relevant for policy makers, industry alliances, and sustainability program developers working to shape credible, science-based approaches to environmental measurement and claims.

Not a comprehensive method

This position paper underscores that LCAs, while a critical analytical method for quantifying environmental impacts such as greenhouse gas emissions, water use, and energy consumption, are not a comprehensive method capable of capturing the full complexity of sustainability in agricultural systems. LCAs were originally developed for controlled industrial systems, manufacturing plants, power generation and transportation fuels where inputs and outputs can be clearly defined.

When applied to less controlled, variable systems like agriculture or apparel supply chains, this structural mismatch creates inherent limitations and uncertainties. In the apparel sector, for example, these challenges often lead to misuse of LCAs, which in turn can lead to unintended consequences. The utility of LCAs in the cotton sector hinges on how rigorously they are applied, how robustly and transparently data is collected, how clearly limitations are communicated, how consistent data inputs are across different tools or cotton programs, and how constructively results are used in decision-making.

Misapplication, whether through inappropriate comparisons, limited context, or disregard for methodological boundaries or simply a lack of understanding, risks not only undermining stakeholder trust in corporate environmental claims and data integrity, but also misdirecting sustainability investments and interventions.

A key ask is that brands use LCA metrics that are informed by regional and farm context and commit to a long-term engagement approach with their cotton suppliers. By developing a baseline assessment of current practices, identifying areas for improvement, and investing in capacity-building at the farm level, brands can achieve measurable environmental and social outcomes. This approach would align with principles of additionality, where impact is generated through targeted interventions that would not otherwise occur.

Moving forward, the apparel sector could adopt a more technically grounded and context-aware approach to LCAs. Attributional LCAs (which assess the environmental impacts of a product or system as it currently exists) remains important for baseline assessments and hotspot identification, but consequential LCAs (which evaluate the broader environmental consequences of changes in a system, such as sourcing shifts or policy interventions) may be more appropriate in evaluating systemic impacts, especially where market signals or land use changes are involved.

However, while consequential LCAs may be the right tool for informing sourcing strategies, they are also more complicated and sometimes more uncertain than attributional LCAs. This increased technicality may be even more challenging for the apparel supply chain to understand and use correctly. Methodological alignment across programs such as Better Cotton Initiative, *my*BMP (Best Management Practices, Australia) and the U.S. Cotton Trust Protocol together with consistent data collection and modeling protocols, and improved communication will be essential to ensure data quality and comparability. However, for LCAs to be truly comparable and not just methodologically aligned, they must be explicitly designed with comparison in mind, apply context-specific data, and be subjected to independent critical review. This paper advocates for advancing beyond current baselines by embedding greater scientific rigor, transparency, and real-world relevance into how LCA data is interpreted, and used. Only then can apparel brands integrate the data appropriately, fairly and with improved outcomes.

The path forward demands coordinated action from brands, cotton programs, and policymakers grounded in scientific integrity, acknowledgement of limitations, and real-world applicability.

A Call to Action

With stronger methodological discipline, clearer communication, and equitable stakeholder engagement, the cotton sector can shift from fragmented, sometimes contradictory claims toward responsible, science-based, and farmer-informed use of LCAs. When integrated into a broader sustainability toolkit, LCAs can then support the identification and prioritization of environmental interventions that drive systemic sustainability outcomes.

Furthermore, to strengthen sustainability outcomes in the cotton sector, **the most critical recommendation is to fund primary data collection, farm-level capacity building, and innovation,** sharing the risk of sustainable practice adoption.

Problem, Position, & Approach

Our Position

This position paper is primarily directed at sustainability and ESG professionals within textile brands and retailers and those responsible for interpreting and applying LCA data in strategy, claims, and Scope 3 emissions reporting. However, the insights and recommendations are also relevant for policymakers shaping reporting frameworks, and program developers working to align data systems and measurement protocols across the supply chain. LCAs are useful for identifying where environmental interventions may be most impactful within cotton production systems. They help illuminate environmental hotspots and support reporting obligations. However, LCAs cannot account for social, economic, and many ecological factors and should not be used for direct comparative claims among cotton types, programs, or regions, or even other fibers unless the studies are methodologically aligned using consistent system boundaries, functional units, impact categories, and data sources. In practice, such alignment is difficult to achieve. For example, comparing LCA data from Better Cotton Initiative in India in 2025 and 2028 might be one of the few valid comparisons, assuming all methodological parameters are held constant. Comparisons across different countries, cotton programs or standards are rarely reliable and risk misrepresenting performance. The apparel/textile sector should support a shift from these fragmented, sometimes contradictory comparative and marketing claims toward responsible, science-based, and farmer-informed use of LCAs integrated into a broader sustainability toolkit.

The Problem: Misuse and Misinterpretation of LCAs

To ensure that this position paper reflects a balanced and informed perspective, we engaged in a stakeholder consultation process. This included one-on-one interviews with representatives from leading cotton programs and voluntary standard owners. The consultation informed this collective position paper on the role, use, and risks of using LCA data in the cotton sector. Participants included technical experts and representatives from Australia, North America, and Europe, such as the Cotton Research and Development Corporation, Better Cotton Initiative, Textile Exchange, Cotton Incorporated, and the U.S. Cotton Trust Protocol. Their input highlighted key challenges and risks, summarized below.

Challenges Identified

- Some LCA practitioners/consultants, industry organizations, and apparel brands have sometimes incorrectly used LCA results to inappropriately support marketing narratives and claims. This is a challenge because such misuse undermines the credibility of LCAs as a scientific tool, erodes stakeholder trust, and risks directing sustainability investments toward less effective or even counterproductive interventions.
- Comparative claims across geographies or cotton types often misuse standalone LCAs that were not designed for comparison, leading to misleading conclusions.
- LCAs are misused as a prescriptive environmental criterion for making sourcing decisions, disregarding socio-economic and biodiversity dimensions not measured by LCAs.
- Farmers are expected to freely and transparently provide input data but rarely see corresponding value, benefits or external investment in farm-level improvements.
- The data collection burden, including time, technical capacity, and opportunity cost, is disproportionately high for smallholder farmers, who often lack the digital tools or incentives to participate in LCA-aligned reporting systems. This exacerbates power imbalances in sustainability data flows and risks excluding the majority of global cotton producers.

"LCAs are like looking through a keyhole, you certainly see something, but it is never the full picture."

Jesse Daystar — Cotton Incorporated

Risks

- Misleading claims that damage credibility (Transformers Foundation, 2021).
- Poor sourcing decisions that overlook/disregard key social or environmental realities and local context, and in doing so can exacerbate negative environmental, social, or economic impacts.
- Undermining consumer trust and penalizing transparency (Bates & Baumann, 2022).
- Blurring priority hotspots, which risks misdirecting investments away from farmers and the most impactful sustainability interventions, undermining the primary purpose of LCAs.

Hypothetical Case Example

Impacts of Misapplied LCA in Cotton Sourcing

To further illustrate the potential consequences of misinterpreting or selectively applying LCA data, the following case example presents a hypothetical yet plausible scenario. It demonstrates how even well-intentioned decisions when based on incomplete or misaligned LCA interpretations can result in unintended outcomes for brands, producers, and the broader cotton sector. In this scenario, a global apparel brand is under internal and external pressure to demonstrate progress toward its climate commitments, including voluntary reporting under the Science Based Targets initiative (SBTi). Cotton is a significant input for the company, and much of its current sourcing comes from non-certified suppliers in Region B. Recently, the brand's sustainability team reviews climate impact data from widely used LCA database and identifies a lower carbon footprint for cotton produced in Region A as shown in the following Table 1.

Table 1: Comparative LCA Data from Commercial Database

Dataset	Geography	Temporality	IPCC 100y
Cotton lint {Region A}| lint production | Cut-off, U	A	2023	5 kg CO_2e/ kg lint
Cotton lint {Region B}| lint production | Cut-off, U	B	2023	10 kg CO_2e/ kg lint

The team sees this as a clear opportunity to reduce Scope 3 emissions through a sourcing shift to Region A. Though marginally more expensive, Region A's cotton meets quality specifications and is represented in the same LCA database, lending the appearance of methodological consistency. Internal stakeholders interpret the carbon reduction as meaningful, and the marketing department prepares to communicate this anticipated improvement in environmental performance.

However, while the datasets appear comparable on the surface, the analysis fails to account for the limitations inherent in attributional LCAs. The carbon figures represent average or region-specific environmental burdens at a fixed point in time. They do not reflect the longer-term carbon data, the consequences of changing sourcing practices, disruption to supplier networks, nor do they include potential ripple effects on land use, farmer livelihoods, or displaced coproduct systems such as cottonseed oil markets.

"Comparing LCA studies is like comparing apples to oranges"

Klara Shepherd — Better Cotton Initiative

Initially, the brand sees a favorable reduction in reported emissions. But under regulatory or stakeholder scrutiny, any claims derived from this comparison would face significant challenges. As highlighted in similar cases (e.g., Norwegian Consumer Authority, 2022), such claims could be deemed misleading or unsubstantiated due to a lack of methodological equivalence. In this instance, the brand refrains from making public comparative claims (greenhushing), using the LCA data internally for reporting and strategy purposes. Still, the decision to shift sourcing based solely on attributional LCA data introduces longer-term risks – environmental, added cost, and reputational.

The brand's decision to shift suppliers even if driven by internal targets and good intentions could result in a range of unintended consequences. These could potentially include increased water stress in Region A due to expanded cotton cultivation, economic disruption in Region B, and minimal net climate and overall environmental benefit once system-wide effects are considered. Regarding water stress, for example, water utilization in region B may not change (or may even go up) as farmers are still likely to use whatever water is allocated to them. Moreover, the initial emission savings reported through attributional LCA may not hold up under closer scrutiny, especially if comparative claims are made publicly without robust methodological support. In addition, even when LCAs are an excellent tool to identify trade-offs between environmental impact categories, they are still limited and cannot cover all aspects that are material to the apparel sector. Neither attributional nor consequential LCAs can account for social impacts such as job losses in existing supply chains and reputational harm when the full impacts emerge.

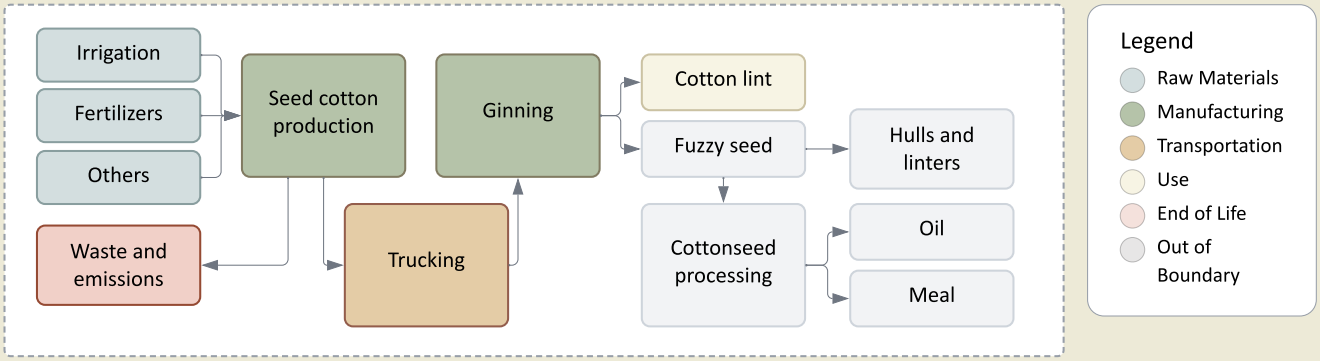
Attributional vs. Consequential LCAs

To more fully assess the implications of shifting suppliers based on LCA data, it is essential to understand the distinction between Attributional Life Cycle Assessments (ALCA) and Consequential Life Cycle Assessments (CLCA), two approaches that serve different analytical purposes. Attributional LCAs (ALCA) provide a snapshot of the environmental burdens associated with a specific product or process at a defined point in time, using average or observed data. When doing attributional LCAs, the purpose is to trace a specific aspect of the product back to its contributing unit processes using data on specific or market average suppliers and partitioning the system impacts according to specific allocation choices. In the context of cotton, an attributional LCA would include greenhouse gas emissions and other impacts associated with the cultivation and processing of cotton lint. However, because cotton production also generates co-products such as cottonseed (used for oil, meal, or feed), the attributional LCA must allocate shared impacts across these outputs. Different allocation rules based on mass, economic value, or energy content can significantly alter results. Most LCAs done for cotton lint report only the portion allocated to lint, excluding the environmental burdens attributed to cottonseed and its derived products. This highlights an important limitation: attributional results reflect accounting choices, not the broader system consequences. This approach is widely used for environmental footprinting and sustainability reporting.

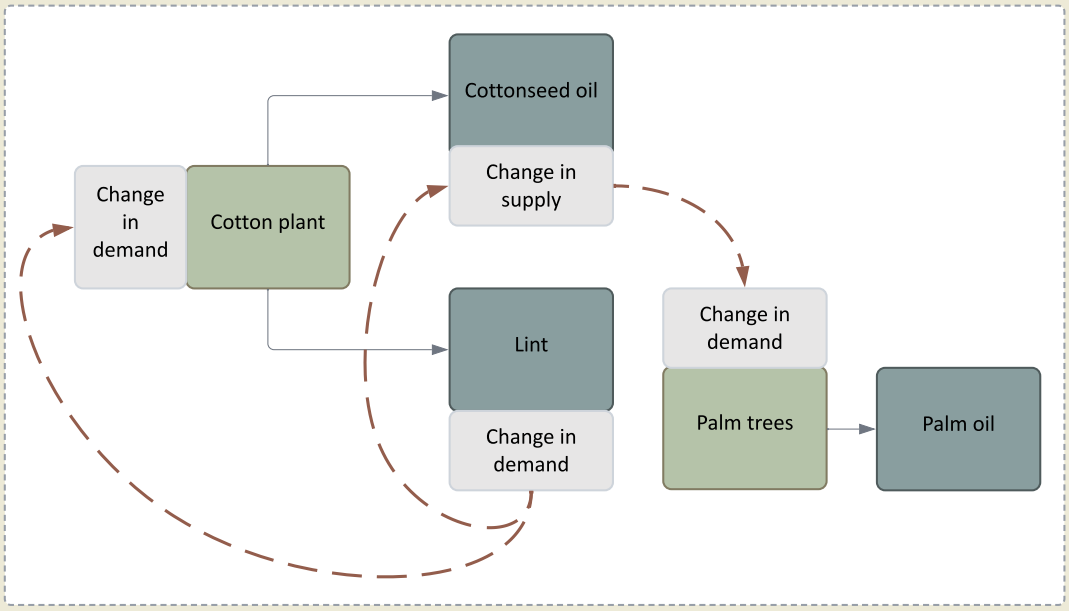
When comparing two products, LCA practitioners can use the attributional approach, which can inform the difference in the two supply chains. However, if a company switches from one product or process to another, the supply chain will actually change. Taking this change into account is what is called a consequential approach in LCA. In the cotton lifecycle, for example, cotton lint is produced alongside co-products such as cottonseed oil. Under an attributional approach, impacts are allocated between lint and seed, but the boundaries stop there. In the consequential approach, a change in the use of cottonseed oil would likely create a change in the demand for palm oil — the unconstrained oil under current market conditions. In this way, consequential LCAs capture the ripple effects of market changes that attributional LCAs omit.

If only cotton lint and cottonseed oil were produced from the cotton plant, the impacts of the cotton lint would be assessed as the impact of producing the cotton plant and extracting the oil less the impact of palm oil equivalent to the extracted cottonseed oil. The result is that the lint impacts will change based on the average impact of palm oil production. Figure 1 shows a simplified example of attributional and consequential LCA models.

Attributional LCA Model | *Modeling the supply chain.*



Consequential LCA Model | *Modeling what happens if the supply chain is disrupted.*



***Lint impact** = Cotton plant impact + Cottonseed oil extraction impact – Palm oil impact equivalent*

Figure 1: Simplified example of attributional and consequential LCA models.

The consequential approach requires solid knowledge of market conditions and is more difficult to understand and model. However, it goes beyond the attributional approach to capture the market effects of change. Consequential modeling is recommended for comparisons where the choice between options is likely to significantly change the market.

While more complex to model, the consequential approach offers a more accurate assessment of system-wide impacts resulting from sourcing shifts. Unfortunately, few such studies exist for cotton (Nguyen et al., 2021), and most brand-level decisions still rely on attributional data due to its accessibility and simplicity.

Shifting to cotton origin/suppliers, it is worth considering that when growers do not get support via orders, incentives, knowledge co-creation, or long-term partnerships, their livelihoods are put at risk and they cannot improve on production costs, yields, or resilience in the face of a changing climate (Mehmood et al., 2024). A particular region or even country could be left behind in implementing sustainable production practices and both mitigation and adaptation efforts to global climate change can be hindered.

This case underscores a broader lesson: LCA is a valuable tool for identifying environmental hotspots and guiding long-term strategies, but it should not be used in isolation to justify sourcing decisions or public claims particularly when comparing across regions or systems that differ in context, practices, or data quality.

"The core challenge is that we´re switching between things and taking credit for change whereas change hasn´t happened, it is just a switch. Unless there is an actual market change, and this is where we start to get into the differences of attributional and consequential LCA,

"What can I really claim in terms of making change happen?".

It is one thing to say, "this is my footprint", and another one to claim that switching from cotton to another fiber or blend has helped improve climate change or water scarcity. This last piece in particular is the one that is misleading. The approach that moves the sector forward is fixing the supply chain instead of ignoring the problem by going somewhere else without moving the state of play."

Joël Mertens — Cascale

Instead, brands should commit to a long-term engagement approach with their suppliers. Just shifting regions may not change the impact of the apparel industry and it would not be an additional change. Whereas supporting a grower to adopt new practices is (ODI, 2009; Voora et al., 2023). By developing a baseline assessment of current practices, identifying areas for improvement, and investing in capacity-building at the farm level, brands can achieve measurable environmental and social outcomes. This approach aligns with principles of additionality, where impact is generated through targeted interventions that would not otherwise occur (WRI-WBCSD, 2003). Figure 2 presents the two different pathways described in this example.

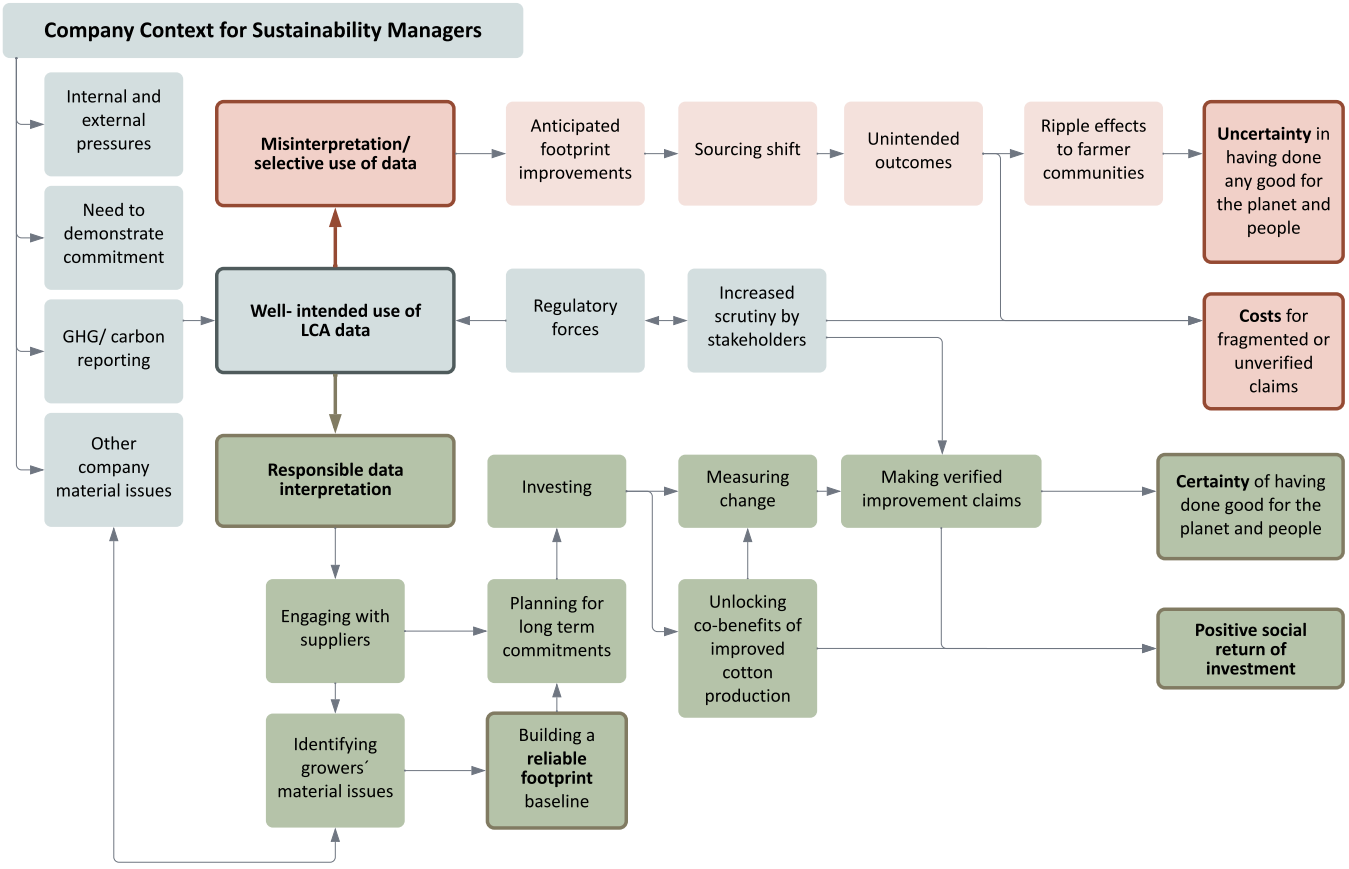


Figure 2: Potential example pathways that sustainability managers using LCA data for decision making could take.

Ultimately, the greatest value of LCAs lies not in the final emissions figure, but in the insight it provides into system trade-offs, data gaps, and opportunities to mitigate risk and support stakeholders.

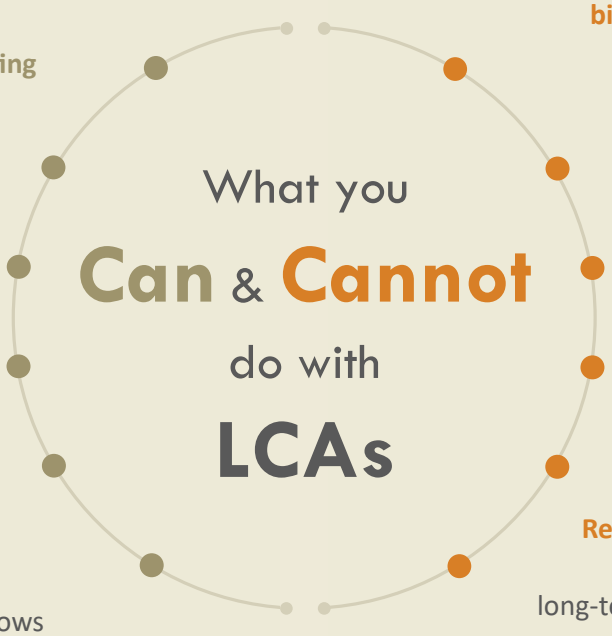
For example, when cotton sector stakeholders were consulted on their top sustainability concerns (ESG, 2021), environmental indicators like greenhouse gas emissions were frequently secondary to urgent issues such as labor issues, working conditions, and equitable value distribution. Conventional LCAs do not capture these social dimensions, although complementary approaches such as Social Life Cycle Assessment (S-LCA) have been developed to begin addressing them. Even so, social impacts remain difficult to quantify and are not consistently integrated into decision-making, despite their critical importance to the cotton sector's future.

As this example illustrates, **truly responsible sustainability strategies must combine science-based tools like LCAs with local farmer and cotton industry engagement, policy alignment, and a commitment to equity throughout the supply chain.** Only then can brands meaningfully contribute to the Sustainable Development Goals and uphold the principle of leaving no one behind (UNIDO, 2023).

What LCAs Can and Cannot Do

The preceding sections have outlined examples of the misuse and misinterpretation of LCAs within the cotton sector, demonstrated through real-world insights and a case example that underscores the consequences of using LCA data without methodological alignment or contextual understanding. As brands, programs, and policymakers increasingly rely on environmental data to inform strategy, it is critical to clarify what LCAs are capable of delivering and where their boundaries and limitations lie.

Building upon the challenges and risks outlined above, this section provides a foundation for understanding the appropriate role of LCAs within a broader comprehensive sustainability strategy. The following points distinguish what LCAs can offer the cotton sector from what they cannot, helping stakeholders apply LCAs responsibly and in alignment with other tools and data sources.



Identify environmental hotspots and supply chain risks (e.g., irrigation, energy use), which guides interventions and support to address greatest impact across supply chains.

Support regulatory compliance (e.g., CSRD, PEF), which provides data for meeting evolving disclosure requirements.

Support Scope 3 emissions reporting and science-based target setting by providing high-quality, consistent input data. LCA data can complement GHG accounting by revealing methodological boundaries and system-wide effects that traditional Scope 3 reporting and SBTi frameworks may overlook, helping reduce the risk of misleading claims from simple emission factors, even if the broader system impacts don't support that claim.

Track long-term change, which allows assessment of environmental improvements over time.

Highlight trade-offs, which helps balance the benefits and tradeoffs of interventions.

Enhance transparency when contextualized, which builds trust through credible, data-driven communication.

Accurately compare cotton types or regions without aligned methodology considering the same level of data inputs and contextual factors, as context-specific data and assumptions make cross-comparisons misleading.

Capture social, economic, or compelling biodiversity and microfibers impacts, as LCAs focus on well-studied environmental categories. It misses relevant environmental aspects of emerging concern for which robust impact characterization factors are under development.

Serve as a stand-alone sustainability metric, as sustainability is multi-dimensional and LCAs are only one tool among many.

Reflect short-term changes in farming practices, as LCAs are designed for long-term trend analysis, not seasonal nor incremental shifts.

Support overgeneralized or headline claims, as LCAs simplify nuanced environmental and social realities, risking misinformation (IWTO, 2022).

Justify prescriptive sourcing decisions in isolation, as LCAs overlook complex trade-offs and risks unintended consequences.

Recommendations

Based on the insights gathered from stakeholder consultations, technical review, and sector analysis, the following recommendations outline how different actors across the cotton value chain can strengthen the use of LCAs and drive toward more credible, equitable, and science-based sustainability strategies.

Brands and Manufacturers

- Consider supporting cotton programs and farming communities to collect and verify data, including fair compensation for farmers who provide data. The role is to invest in capacity building and supply chain improvements, supporting data collection, traceability, and sustainable practices that align with verified programs rather than reactive sourcing shifts. This would benefit brands and manufacturers in strengthening their relationship with suppliers and addressing risks at the farm level at the earliest possible stage, while adding value to their corporate sustainability strategy.
- Working with cotton programs to agree on consistent indicators and aligning with established frameworks (e.g., the Australian Cotton Sustainability Data Framework) would be key.
- **Use LCAs for hotspot identification and continuous improvement, not sourcing shifts based on isolated LCA scores**. In a desired scenario, brands would engage supply chain partners to co-develop solutions and support continuous improvement rather than shifting suppliers based solely on LCA numbers. They would communicate claims transparently, including limitations, assumptions, data sources, functional units, and methodologies. Claims would follow established frameworks and avoid making selective data usage. For brands, this approach would add value by strengthening credibility, reducing reputational risk, and building trust with consumers, regulators, and investors. It would demonstrate a commitment to continuous improvement and collaboration, while avoiding accusations of "greenwashing" or selective reporting. In practice, this would support more resilient supply chains, improved supplier relationships, and alignment with emerging regulatory and market expectations.
- To support responsible decision-making, brands could use available resources targeted at ensuring LCA data is being adequately used. This paper includes an example of good practice in the form of succinct guidelines including example tables and a decision tree developed by the Better Cotton Initiative (see Appendix section). *How to Use LCA Guidelines* translates core good practice principles into practical steps for using LCA data in claims, sourcing strategies, and emissions reporting. Complementary tools, such as the Higg MSI, may serve as a starting point but should always be used alongside farm-level data and system-specific insights.

"Cotton programs have an important role to play in helping to educate brand and retail customers about the realities and contexts of cotton farming in various parts of the world as well as how this relates to the tools being used to assess fibres. We owe it to our farmers to ensure they have a role in shaping solutions, and that their concerns are heard and understood. We'll never move the needle unless farmers have a prime role in shaping solutions, in collaboration with the supply chain."

Brooke Summers — Cotton Australia

"We've identified that improving nitrogen use efficiency is a priority for reducing our carbon footprint and LCA doesn't do anything to a help a farmer to reduce it. We cannot do an LCA on the range of nitrogen management options because the underpinning science of the emissions associated with those options is not there. Our focus is on the fundamental research so we can understand which options have the most impact."

Allan Williams — Cotton Research and Development Corporation

Cotton Programs and Standards

- Lead the development and harmonization of consistent indicators and data quality frameworks, ensuring alignment with LCA/LCI tools such as PEF. By doing so, programs create the foundation for brands, manufacturers, and farmers to implement credible, comparable data collection and reporting systems. For example, work on this topic has been attempted in the past through the Delta Framework indicators. Commitment towards reviewing current measured indicators and updating indicator sets to obtain primary data to feed LCA assessments could be considered.
- Work toward standardizing and streamlining data collection by developing harmonized methods for input use, yields, and farming practices, recognizing the variability across systems. This approach can reduce reporting burdens over time, improve data comparability, and support more reliable LCA outcomes. To strengthen credibility and traceability, two forms of validation are important:
  - Critical review of LCA studies, in line with ISO standards, helps ensure methodological rigor and appropriateness of conclusions particularly for comparative LCAs.
  - Incorporating third-party data validation is one way to strengthen credibility and traceability but should not be seen as the default solution. More common in carbon offset programs, it can help verify farm-level data accuracy and support transparency. In these schemes, concepts like additionality ensuring claimed improvements exceed business-as-usual scenarios offer valuable lessons. Applying similar principles could support integrity in cotton sustainability claims and ensure that reported gains are real, measurable, and attributable to interventions.

Credible cotton sustainability claims start with trusted, transparent data as the foundation. Prioritizing trust and credibility in farm-level data, focusing on accuracy, consistency, and clear governance over how data is collected and used will be essential. Incorporating third-party validation may also strengthen credibility and traceability. Implementation may require phased collaboration across stakeholders, and there may be more cost-effective and accurate ways to demonstrate the data can be trusted than using third-party validation.

- Ensure transparency in data use, modeling assumptions, and methods so results are trusted and meaningful. Build feedback loops so farmers see value from data collection.
- Secure fair compensation, benefit-sharing models, and incentives linked to data contributions and sustainability improvements, including market access and financial rewards.

Policymakers and Regulators

- Don’t use LCAs alone to inform policy.
- Establish policy platforms that bring together governments, industry actors, standards setters, and civil society to co-develop fair, transparent, and credible LCA frameworks while ensuring alignment, not fragmentation (ICA, 2024).
- Set enforceable standards for environmental claims, including guidelines for labeling and marketing that prevent misinformation and reflect the full spectrum of environmental and social impacts.
- Promote harmonization of methodologies and integration of social, economic, and biodiversity indicators across other jurisdictions and across other agriculture industries to align with complex real-world sustainability challenges.
- Support ethical data governance frameworks that balance transparency with farmer privacy and data sovereignty, enabling responsible data-sharing systems that protect producer interests and build trust.

Integrating LCAs into Broader Sustainability Efforts

This section builds on the previous recommendations and outlines how LCA should be positioned as part of a comprehensive sustainability strategy. It frames LCA as one method among many that, when integrated with complementary indicators, can help achieve credible, inclusive, and actionable sustainability outcomes. LCAs should form part of a toolkit including:

- Social, environmental and economic indicators
- Farmer-led and project-based monitoring.

Together, these indicators offer a more complete picture of what sustainability looks like in practice. They help the sector move beyond compliance and narrow environmental accounting toward a more inclusive, balanced approach to progress. Outcomes such as reductions in GHG emissions per bale, improvements in productivity and income, increases in on-farm biodiversity, or enhanced soil health support continuous improvement, highlight good practices, and guide investment in the right tools and partnerships. Crucially, credible sustainability performance depends not only on reducing negative impacts and increasing positive impacts, but on how those impacts are measured, communicated, and acted upon equitably and transparently across the entire value chain.

It is essential to ensure that transparency and strong performance are not penalized due to data availability, quality, misinterpretation, or granularity.

For example, programs submitting high-quality primary data may appear to have higher environmental impacts simply because their data reflects real conditions more accurately than other data records or studies or more generic datasets that lack the robust data collection. When granular LCA models include specific inputs, such as localized fertilizer applications or energy use profiles, they often show higher impact values than generalized assessments that smooth over complexity. Without careful interpretation, such results can imply underperformance and disincentivize transparency. Thus, LCA results should be interpreted alongside data quality scores.

To avoid undermining trust and slowing progress, sustainability claims and comparisons must reflect the full complexity of agricultural systems and be grounded in aligned methodologies, clearly defined system boundaries, and consistent functional units. A key aspect of this complexity is the impact of seasonal variability such as rainfall, temperature, insect pressure, etc. which in turn affects both yield and inputs, and therefore LCA metrics. Reporting LCAs need to focus on long-term trends to better take into account the impacts of seasonal conditions. Only then can data-driven decision-making support fair recognition, equitable investment, and shared accountability across supply chains.

Improvements in the environmental, social, and economic spheres are possible by transitioning to low-carbon, nature-positive, and climate-resilient approaches to cotton growing under each singular geographical context. For this to happen, increasing investment in the sector is necessary. It has been estimated that investments in agri-food systems are required to increase by 40 times from current levels. A global annual amount of 1.1 trillion USD is needed until 2030 to achieve emissions reduction and climate resilience targets under the Paris Agreement. 65% of it needs to come from international public and private finance sources (CPI & FAO, 2025). The specific amount needed for the cotton sector needs to be determined on a case-by-case basis. It is significant. Cotton is a relevant crop for 100-300 million families around the world and occupies 2.3% of the global crop land (UNIDO, 2023).

This is not just a technical imperative; it is a matter of integrity, equity, and impact. Now is the time for brands, cotton programs, and policymakers to lead by example: invest in better data, reward transparency, collaboratively manage value chain risks and opportunities, and ensure that sustainability performance is measured and recognized in ways that drive genuine, inclusive transformation with value to farmers, their communities and the natural environment.

"Moving beyond compliance and narrow environmental accounting toward a more inclusive, balanced approach to progress is what cotton programs can bring to the sector."

Lars van Doremalen — Better Cotton Initiative

Final Call to Action

Real progress will come from investment in farmer-centered improvements backed by science and transparency, aligning around responsible use of LCAs. The sector must collaborate to ensure that LCA tunnel vision does not distort the path to sustainability. While the focus of this position paper is on LCAs in the cotton sector, the challenges and opportunities identified through stakeholder consultations point to deeper systemic issues that shape how LCAs are used and misused in practice. The following cross-cutting themes highlight recurring tensions between intention and implementation, data and reality, and measurement and meaning. They reflect not only technical shortcomings in LCA methodologies, but also broader misalignments in governance, incentives, and stakeholder engagement.

To address these challenges, we present strategic recommendations that go beyond the LCA framework itself to all the identified actors. These actions are designed to improve the credibility, equity, and impact of sustainability measurement systems ensuring that they serve not just brands or compliance targets, but also producers, natural ecosystems, and long-term climate goals. The recommendations are tailored for brands and policymakers, as two key actors who hold the levers to shift sustainability from fragmented, misleading claims to integrated, science-based, and farmer-informed progress.

Funding Capacity Building and Farm-level Decision-making

To strengthen sustainability outcomes in the cotton sector, the most critical recommendation is to strategically invest in capacity building, data collection, and quality control by the most cost-effective means and farm-level improvements. Public and private investments should be pre-positioned where they can deliver the highest leverage, for example, in agricultural extension services, local research and development, and farmer-led monitoring systems that are foundational to scaling regenerative or agroecological practices. These efforts not only help producers implement effective, context-sensitive interventions but also build the infrastructure for improved data quality and long-term impact tracking, particularly in regions or production systems not currently covered by formal cotton programs. They also improve resilience at the farm level, which can result in risk reduction along the supply chain.

Standards and Enforcement

To ensure that sustainability efforts in the cotton sector are effective, fair, and trustworthy, policymakers must provide clear standards and, in some instances, regulatory frameworks and robust enforcement mechanisms for environmental claims and reporting. This is critical not only to protect consumers and responsible actors from misleading or oversimplified claims and messaging but also to safeguard responsible brands and producers from being undercut by actors who rely on generic, unverifiable, or selectively presented data.

In particular, standards and regulations could:

- Establish minimum methodological standards for sustainability claims, including clear rules around comparability, data transparency, and functional units.
- Require full disclosure of data sources, assumptions, and LCA methodologies used in environmental reporting and marketing.
- Prohibit unsupported fiber-to-fiber or region-to-region comparisons, unless grounded in methodologically aligned, peer-reviewed, and purpose-built comparative studies.
- Differentiate between attributional and consequential LCA approaches, providing guidance on appropriate use cases and the limitations of each.

To support these goals, governments and international standard-setting bodies should work collaboratively with farmers, industry actors, civil society, and scientific experts to develop harmonized methodologies that reflect the complexity of agricultural systems. These frameworks must account for the nuances of data availability, context specificity, and evolving best practices in environmental modeling.

LCA Narrative and Literacy Training

Brands, in turn, should align around a shared, responsible narrative for the role of LCAs in cotton. Rather than using LCAs as a competitive tool or basis for simplistic fiber-to-fiber or region-to-region comparisons, it should serve as a means to identify environmental hotspots and guide investments in improvements. Comparative claims should be avoided unless based on consistent and methodologically aligned studies, specifically modeled to be comparative studies that are critically reviewed, with careful consideration of attributional versus consequential LCA approaches.

To support this, brands should also invest in LCA literacy across internal teams and supply chain stakeholders. Training programs that improve understanding of LCA boundaries, uncertainties, and appropriate applications can help reduce greenwashing risk, strengthen partnerships with producers, and lead to more informed sourcing decisions.

Data Measurement and Sharing

Ethical, interoperable data-sharing frameworks are also essential. Policymakers and brands should work together with cotton programs and farmers to develop systems that enable traceability and transparency while protecting farmer privacy and data sovereignty. These systems should reflect strong data governance principles and be inclusive of both program-certified and uncertified cotton producers.

Finally, brands should support farmer-inclusive measurement frameworks built on consistent sustainability indicators that can serve multiple purposes, one of which are LCAs. These frameworks should emphasize outcome-based indicators such as soil health, biodiversity, and water stewardship, and can draw on existing resources like the Australian Cotton Sustainability Data Framework (Cotton Australia & Cotton Research Development Corporation, 2025). Using, applying, and/or investing in sector-led initiatives like Textile Exchange's Regenerative Outcome Framework (Textile Exchange, 2020) and LCA+ approach, and Cascale's cotton LCA methodology (Cascale, 2024) can help ensure that sustainability efforts are not only measurable but also meaningful to those implementing them.

"LCA definitely has use but is it not the holy grail, it is not a silver bullet solution. The world is working on LCAs but not taking any of this to the field, to farmers. Understanding what the numbers mean should be the starting point of conversation."

Deepika Mishra — U.S. Cotton Trust Protocol

Collaborative Action

This position paper should be seen not as an endpoint but as a platform and a call for collaborative action.

Through clearer alignment between cotton program and brand practices and supportive public policy, the cotton sector can shift from fragmented sustainability claims toward credible, transparent, and inclusive sustainability progress anchored in science, equity, and agricultural reality – where value is shared equitably by brands and farmers alike.

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Appendix

Guidance One

How to Use LCA Data

Introduction

Rationale and Target Audience

The Better Cotton Initiative (BCI) seeks to provide members with further guidance on how to responsibly use cotton Life Cycle Assessment (LCA) data when making environmental claims. The main objective of this document is to guide the proper use of LCA data.

Proper data use can increase benefits while reducing risks. One particular risk is greenwashing (when an organization claims a product is more environmentally responsible than it is, leading to stakeholder distrust). This document offers best practices for leveraging LCA data and ensures alignment with global green claims legislation and traceability requirements. This document is intended to provide clear guidance on **how organizations sourcing BCI Cotton can and cannot use the LCA data** from cotton fiber LCA studies, BCI data in Higg MSI, Scope 3 intervention projects, and yearly GHG footprints for sustainability reporting. It is important to note the use of BCI data and any claims stemming from its use are subject to the requirements of the BCI Claims Framework.

Section One

LCA and GHG Accounting Scopes

LCA is a standardized methodology for assessing environmental impacts across all stages of a product or process life cycle. It evaluates resource use, emissions, and ecological footprints from raw material extraction to disposal. LCA measures greenhouse gas (GHG) emissions, or “carbon footprint”, as well as other impact metrics.

Figure 1 presents a case for the LCA of a garment. It is a system boundary diagram showing the product system, depicting the general unit processes that are accounted for in the study. A garment lifecycle involves many more steps than assessing cotton lint, where the agricultural and ginning stages are the only two major processes. In this case, the study is a cradle-to-cradle analysis assessing cotton lint input, garment production, use, and recycling at the end of life.

LCAs evaluate the impact of a product or a service in terms of a unit of a fulfilled function and calculate impacts, such as GHG emissions. The Greenhouse Gas Protocol for carbon accounting includes Scope 1, 2, and 3 GHG emissions. An LCA assessment accounts for all three Scopes; however, this impact is most commonly presented as total GHG emissions. In order to organize the resulting GHG emissions from the LCA assessment into 1, 2, and 3 Scope GHG emissions, it is vital to understand at which point in the lifecycle the emissions are being considered, as well as from whose perspective.

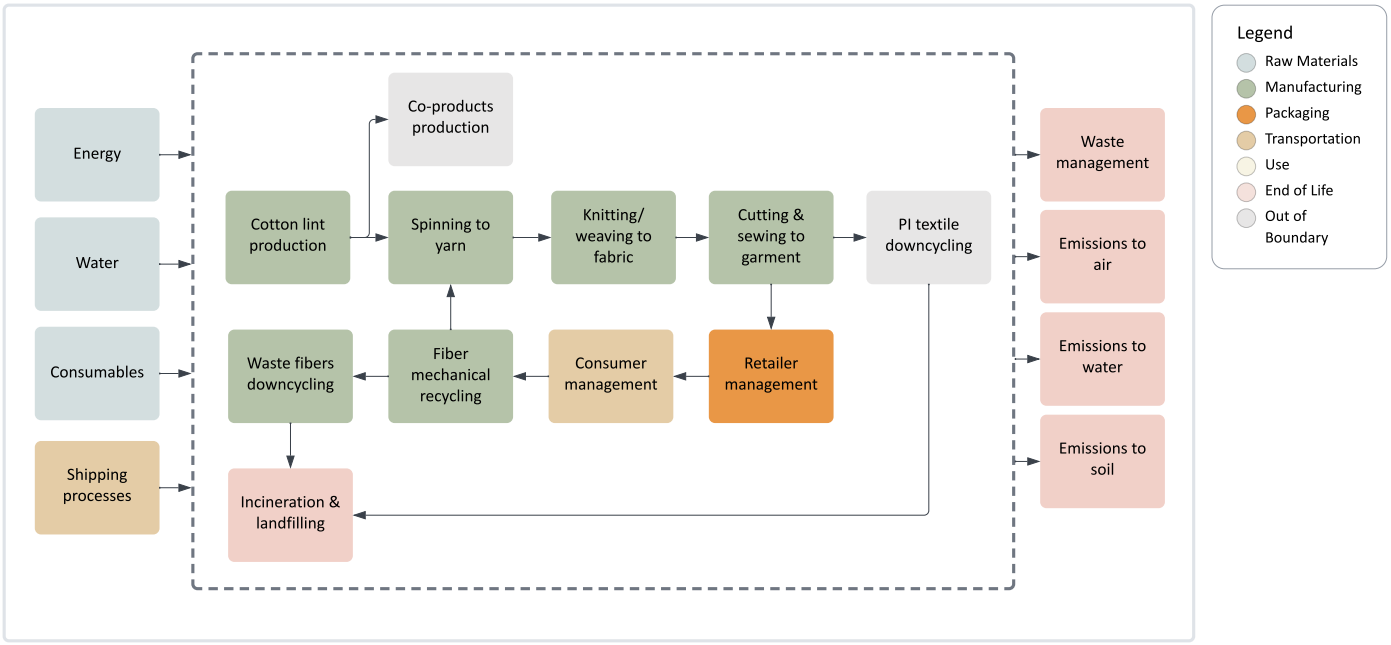


Figure 1. System boundaries for the LCA of a garment from cradle-to-cradle.

For example, for the retailer of a garment, Scope 1 may include air conditioning, fugitive emissions, and fuel combustion from its trucks transporting apparel to different locations. Scope 2 may include electricity consumption in the warehouse and retail stores. Scope 3 may include the remaining emissions, such as the emissions that occurred due to manufacturing the owned vehicles to the emissions from making and applying the fertilizers used in cotton production.

From the cotton farm perspective, Scope 1 includes emissions from fertilizer application, Scope 2 may include electricity used for irrigation, and Scope 3 may include the emissions from fertilizer production, for example.

Thus, the cotton farm's Scopes 1, 2, and 3 emissions are all part of the retailer's Scope 3 emissions.

Better Cotton Initiative (BCI) members include cotton producers, cotton suppliers and manufacturers, brands and retailers, and certification bodies. For each type of member, Scopes 1, 2, and 3 imply a different set of operations at each level in the supply chain.

Unlike GHG accounting, an LCA always includes all of these impacts and Scope 3 is never optional. Further, LCA includes other metrics, such as ozone depletion, eutrophication (excess nutrients), and resource consumption.

A simple way to distinguish LCA metrics from GHG scope metrics is that LCAs focus on products, processes or services, while GHG scope reporting centers on entities or organizations. Cotton LCA metrics are often used in organizations' GHG reports, specifically in regard to Scope 3 accounting. There are multiple sources of cotton LCA data available, but it's important to consider their limitations when using them.

GHG emissions from cotton lint production are an important sustainability metric for all members. Accurate use of LCA GHG data for Scopes 1, 2, and 3 therefore requires an understanding of life cycle stage and stakeholder perspective.

Section Two
Sources of Cotton LCA Data

Cotton LCA data is based on cotton LCA studies and LCA datasets.

- **An LCA study**, depending on its goal and scope, will assess a specific cotton for a certain organization, within a country or region, with specific agronomic inputs, practices, and yield.
- **An LCA dataset** is derived from one or multiple studies. Datasets are available through LCA databases and are usually built following specific quality criteria and published after an extensive review process before they are available for use by database users to develop more LCA studies. For the case of cotton, several LCA databases provide generic datasets users can integrate into a model to calculate a yarn or a garment's environmental impact.

LCA studies depend on methodological sources, and choices made when assessing cotton lint production will affect the results. *This means results from different LCA studies cannot be compared if the methodological and data sources used in the LCA studies are different*. For example, LCA metrics can be representative of a country's average production, based on statistics and assumptions, or be specific to an organization using primary data to represent its operation. Moreover, the methodological choices in an LCA model play an important role in the results. For this reason, cotton lint LCAs require thoughtful interpretation to ensure accurate application. It's also why many programs set specific guidelines regarding how an LCA must be conducted.

While separate LCA studies should not be directly compared, the following sources of data can be used by Better Cotton Initiative (BCI) members to explore the impact of cotton production:

- **BCI Cotton Datasets available through the Higg Materials Sustainability Index (Higg MSI) Platform**. Higg MSI uses LCA to measure material impacts, including cotton. BCI submits LCA datasets to Higg MSI, which are based on primary data collected by BCI's implementation partners and are thus representative of BCI farms' production processes as a whole. Currently, information is available for India; the assessment and submission to the MSI Contributor tool for the remaining regions is in progress. While the Higg MSI may be useful for assessing the production of a whole garment, because the data comes from different sources making different choices, comparisons using the Higg MSI should be used with care.
- **BCI Study Reports.** BCI has published a comparative GHG emissions study of BCI Production and comparable production across five countries (India, Pakistan, China, Tajikistan, Turkey) and GHG emissions for countries contributing over 80% of BCI's total production (India, Pakistan, China, Brazil and USA). In both reports, the impact is representative of the period 2015-2018. Newer and updated GHG reports will be available on a periodic basis beginning in 2026. The update is to be based on a farm footprinting report plan and updated baseline for comparison. Like the Higg MSI data, these data may be used for the carbon footprint of a garment, for example, and allow for comparisons of products made from cotton from different countries. Comparison with other fibers is not recommended.
- **Other Higg MSI Cotton Datasets** are available for a range of cotton products, independent from BCI, including cotton representative of other programs, and cotton producing regions unaffiliated with any program. Users of any dataset must review each dataset detail and choose accordingly, on a case-by-case basis, depending on what is sought to be represented (e.g., geographic sourcing, sourcing from standards or certified materials, etc). These datasets should not be used for cotton sourcing comparisons.
- **Commercial LCA Databases**, like ecoinvent, WFLDB, Agrifootprint, GaBi, and others are another source of information for the impacts of cotton lint production offering country, regional, or global estimates. Here, users must be aware of identifying the correct product they are looking for: cotton, cotton seed, seedcotton, lint, or others. Understanding the complexity of LCA databases may require some level of practice in the field

- **Private Independent Studies** on cotton and lint production at the farm level developed for farms or farm organizations, or with farms' data, are another potential source of information if they have been critically reviewed for ISO 14044 compliance. The cotton is usually the highest quality for use in a product LCA or footprint. An example of this kind of study is the LCA of cotton cultivation systems commissioned by C&A Foundation. In general, independent studies are valuable when the commissioner needs to be able to compare cotton alternatives for decision making or for marketing purposes.

In all cases, data timeframe, impact allocation choices between seedcotton and lint, and impact assessment method, among other aspects, make each dataset and study unique. This is why independent studies and datasets should not be used for comparisons. Making comparative claims without having a proper comparative ISO conformant critically reviewed LCA study for substantiation can pose risks (see section four) for member organizations.

Section Three

Uses of Cotton LCA Datasets and LCA Metrics

In general, LCA is a great tool for impact contribution and hotspot analysis, understanding levers for environmental improvement, product comparison based on their function, assessing more than only GHG emissions, and thus identifying environmental tradeoffs when comparing different products or intervention alternatives.

Co-benefits of doing LCA may include fostering relationships with suppliers while collecting data and co-creating positive interventions in the supply chain to reduce impact.

In order to compare LCA values, the product systems must adhere to consistent methodological choices. It is inaccurate to compare LCA metrics from independent studies unless they follow the same specific guidelines. And even if the guidelines are the same, these comparisons are not allowed under ISO standards for LCA. For product comparisons, ISO standards require a comparative LCA study; this means that for product comparison, a case-by-case specific comparative LCA study must be developed.

Using independent datasets or independent single product studies to make sourcing decisions is also not viable because methodological choices, uncertainty drivers, and even temporal aspects of the information may differ. Comparative LCAs ensure consistency and functional equivalence. Thus, for sourcing decisions, it is advisable that companies develop a specific comparative LCA study for their specific decision goals.

The following table summarizes the potential cotton lint LCA uses based on the source of LCA data. Observing this guideline is meant to help Better Cotton Initiative (BCI) members understand what type of LCA data can be used for different purposes.

Table 1. Available cotton LCA data sources and their potential application for different uses.

LCA use/ data source	**Higg MSI database (including BCI datasets)**	**LCA commercial databases**	**Independent assessments**
Hotspot analysis *(e.g., Is fertilization more impactful than irrigation?)*	At material category and production phase level, as available in the Higg product module	Sometimes at country level	At any level, including farm level
Fiber/ lint comparison *(e.g., Is cotton from x less impactful than y?)*	Comparisons are not allowed	Not advisable without carefully reviewing dataset assumptions and methodological aspects	Yes, from studies comparing the fiber/lint in question
Cotton products comparison *(e.g., Is yarn from x less impactful than y?)*	Comparisons are not allowed	Not applicable, but could be an input to independent assessments	Yes, from comparative studies
Identifying tradeoffs from intervention projects *(e.g., Will increasing yield by incrementing fertilizer input be beneficial for all environmental aspects?)*	Not applicable	Not applicable	Yes, if defined as part of the Goal and Scope of the study
Fostering relationships with suppliers *(e.g., Would cotton x and y suppliers be open to implement changes to source 100% renewable electricity in irrigation?)*	Not applicable	Not applicable	Yes, if suppliers are involved in data collection efforts and next steps after learnings from study
Report on Scope 3 metrics *(e.g., What data can be used to report the GHG emissions of the cotton we source?)*	Potentially, disclosing caveats	Potentially, disclosing caveats	Yes, if the study is specific to or for the reporting organization

Section Four

Risks of Misusing LCA Metrics

Environmental claims not backed by robust assessments or following established standards are considered greenwashing and pose specific risks.

- **Reputational risks**: allegations of greenwashing can diminish trust and cause reputational damage. Erosion of trust can result in short and long term damage to the brand, and diminished support from core stakeholders including consumers and investors. These risks are amplified by the nature of social media and how quickly information is shared.
- **Regulatory risks**: specific communication and reporting regulations exist to require companies to explain green claims, and to investigate and enforce actions against misconduct. These regulations vary by country, so it is critical to understand the regulations in the countries in which an organization chooses to operate.
- **Litigation risks**: civil litigation against organizations accused of greenwashing – in particular, climate-related greenwashing is becoming increasingly common.

Section Five

Greenwashing and Regulatory Compliance

Greenwashing refers to misleading sustainability claims that exaggerate environmental benefits. Common examples include vague claims (e.g., "eco-friendly" without substantiation), cherry-picking favorable data while ignoring negative impacts or tradeoffs, and using unverified or self-declared sustainability labels. In order to avoid this, Better Cotton Initiative (BCI) members should align to the following key regulations, among others, when developing claims.

- **EU Green Claims Directive**: Requires verifiable and scientifically sound claims.
- **ISO 14021 & ISO 14067**: Guidelines on self-declared environmental claims and carbon footprint quantification.
- **US Federal Trade Commission (FTC) Green Guides**: Framework for ensuring truthful environmental marketing.

For ensuring compliance, it is recommended to use third-party verified data where possible, provide accessible documentation to substantiate claims, and avoid comparative claims unless they are based on standardized methodologies.

Section Six

Best Practices for Using LCA Data in Claims

These are the best practices for using LCA data in claims. Following these best practices will help minimize the risks of greenwashing.

Transparency and Accuracy

Following ISO 14044 requirements for claims will protect against the risks identified above.

- Clearly state the scope and boundaries of the LCA study used (e.g., cradle-to-gate vs. cradle-to-grave).
- Use the best available data; in the best-case scenario, this would be the most up-to-date and peer-reviewed data available. When the best available is somewhat old and not totally representative of a specific geography, this should be documented explaining the caveat and the justification for why this data metric was chosen.
- Avoid overgeneralizing results—LCA findings vary based on region, production method, assumptions, and LCA assessment method. The method used, including Global Warming Potential (GWP) factors, should be disclosed.
- An internal review (external for ecolabeling) is recommended prior to sharing impact scores or footprints.
- For comparisons, claims can only be published if supported by a third-party reviewed ISO conforming comparative LCA report. Backing claims with uncertainty analysis is recommended.
- For traceability purposes, data sources (published reports, database, or other) shall be specified.

Example 1

Incorrect	The water scarcity score for our sourced cotton fiber is 3.5.
Correct (LCA practitioner language)	The water scarcity impact for 1 kg of our sourced cotton fabric is assumed to be 3.5L at gin gate. The value is the best available at the moment for our company. It is based on available data for India for the period 2016-2023. The dataset was taken from ecoinvent 3.10 database and assessed using the AWARE method 1.06.
Correct (marketing language)	In 2023, the water scarcity impact for 1 kg of our sourced cotton fabric was measured at 3.5L. Footnote 1. 1. This value was calculated at the gin gate stage and is based on available data for India for the period 2016-2023 using datasets from the ecoinvent 3.10 database, and calculated using the AWARE method 1.06 assessment method.

Contextualizing Results

- Provide comparative references where applicable.
- Clarify the units of measurement and time frame (e.g., kg CO_2e per kg of fiber).
- Highlight limitations and uncertainties in the data to ensure claims remain balanced and factual.

Example 2

Incorrect	Sourcing Better Cotton Initiative (BCI) fiber has a footprint impact of 3.5 kgCO_2e.
Correct (LCA practitioner language)	Based on a study developed for BCI by the firm Anthesis, GHG emissions from BCI production across China, India, Pakistan, Tajikistan, and Turkey are, on average, 3.589 kgCO_2e/ kg lint. The study considered data for 3 growing seasons, between 2015 and 2018, and includes agriculture, transportation, and ginning operations. 84% of emissions were allocated to lint, and 16% to cotton seed. The study report is available in this link.
Correct (marketing language)	GHG emissions from BCI in China, India, Pakistan, Tajikistan, and Turkey averaged 3.589 kgCO2e/ kg of lint in 2018. 84% of emissions were allocated to lint, and 16% to cotton seed. Footnote 1. 1. Study considered data for 2015-2018 growing seasons and included agriculture, transportation, and ginning operations. Full study report available here.

Avoiding Misrepresentation

- Do not use LCA data selectively to make misleading claims.
- Ensure claims reflect an entire product lifecycle, not just a single stage for the benefit of the stakeholder making the claim. Likewise, if the claim pertains to a specific lifecycle stage, ensure transparency.
- Refrain from implying absolute environmental benefits without considering trade-offs.

Example 3

Incorrect	Our intervention program for improved carbon management achieved a 15% reduction in global warming.
Correct (LCA practitioner language)	Our intervention program for improved carbon management was assessed with LCA. The results showed a 15% reduction in GHG emissions at the farm gate per lb of harvested cotton. However, trade-offs were found as the remaining of impact categories assessed, including eutrophication, and water scarcity show a 5-10% increase in impact.
Correct (marketing language)	According to LCA analysis, our intervention program for improved carbon management resulted in a 15% reduction in GHG emissions per pound of harvested cotton for the time period X compared to Y. The LCA analysis also identified increases in eutrophication (5%) and water scarcity (10%), indicating trade-offs with the intervention program. We plan to explore these in more detail as we consider how to advance this program. Footnote 1 1. The LCA study was performed by ... (provide study details)

The Better Cotton Initiative (BCI) LCA data available through the Higg MSI database can be used in claims to be disclosed to the public. These claims have to refer to explicit environmental impact magnitude(s). Comparative assertions are not supported by BCI.

For all stakeholders, the requirements for using the BCI LCA data are the following:

- Claim text should be truthful, clear, accurate, unambiguous, and proportionate.
- Although the involved lifecycle stages, geography, and temporality are reported as part of the Higg MSI dataset documentation, it is recommended this information is also described as part of the claim for transparency purposes.
- Should include a link to or QR to the Higg MSI database access page and refer the name of the dataset used.
- Should consider country-specific consumer protection regulations, if applicable.
- Claim text should not be used in conjunction with unambiguous statements or stand-alone terms like carbon neutral, climate neutral, net zero, or sustainable.
- Consideration of offsets or any Beyond Value Chaim Mitigation should be clearly stated in text and separate from the LCA claim
- Claims should use published indicators only.

Section Seven
Conclusion and Next Steps

Responsible use of LCA data strengthens credibility and trust among stakeholders. Better Cotton Initiative (BCI) encourages members to:

- Follow best practices in LCA interpretation and communication. This includes avoiding the use of independent LCA metrics for making comparisons and sourcing decisions.
- Align claims with regulatory requirements to avoid greenwashing, and regularly update them as new data emerges.
- Seek third-party verification for added credibility. In some cases (e.g., the Green Claims Directive of the European Union), claims are subjected to verification as part of regular checks required from

government entities. In addition, verification must also be conducted when substantiated complaints are submitted by persons or organizations with legitimate interest.

- Seek independent legal review of intended claims against applicable regulations.
- Consider that LCA is more than the GHG emissions indicators, helping to overcome a limited carbon tunnel vision. At the same time, LCA has limitations, such as the fact that it does not consider holistic sustainability. It focuses on environmental impacts only. Other tools need to be used to measure socioeconomic impacts.

Guidance Two

How to Use LCA Data in Scope 3 Accounting

Introduction

Rationale and Target Audience

A significant body of literature already exists on the life cycle impacts of cotton, other fibers, textiles, and LCA (Life Cycle Assessment) methods, which are used globally by industry operators, policy developers, regulators, and academic researchers. However, despite international standards such as ISO 14040, ISO 14044, and the Greenhouse Gas Protocol, there remains variability in LCA practice. This leads to variability in potentially comparable results, which in turn affects policy development, corporate use, and regulatory effectiveness.

This guidance is for Better Cotton Initiative (BCI) members who seek to establish or improve scope 3 accounting with the use of supply chain data, including LCA data.

Section One

Cotton GHG Footprint Data in Scope 3 Accounting

Available data for reporting Scope 3 Greenhouse Gas Emissions (GHG) is diverse. Practitioners may use available cotton lint or fiber impact indicators from published reports by different organizations, refer to the values found in LCA generic commercial databases, or seek specialized LCA databases like the Higg MSI. Values may be similar to the ones in the following table, which depicts the Global Warming Potential (GWP) for 1 kg of cotton lint as modeled in the ecoinvent 3.10 database, analyzed under different impact methods for climate change.

Table 1. Some examples of cotton LCA datasets from the ecoinvent 3.10 database and its impact result under different IPCC methods.

Dataset	Geography	Temporality	IPCC 2013 100y	IPCC 2021 100y	IPCC 2021 100y with carbon uptake
Fibre, cotton {GLO}| market for fibre, cotton | Cut-off, U	Global	2011 data, last updated in 2024	4.06	4.1	1.01
Fibre, cotton {IN}| fibre production, cotton, ginning | Cut-off, U	India	2017 data, last updated in 2024	9.48	9.57	6.62
Fibre, cotton {RoW}| fibre production, cotton, ginning | Cut-off, U	Rest of the World	2018 data, last updated in 2024	2.16	2.17	-0.963

It is not only the choice of dataset and database[1] that matters, but also the geography and data temporality. As seen from the example above, the choice of method also yields different results.

Independent cotton LCA studies and dataset metrics use specific system boundaries[2] and technologies[3] for production, coproduct allocation choices, timeframe for validity, and overall assumptions. Moreover, as shown above, the results vary depending on the LCA method used for the assessment. For this reason, the selection of cotton LCA data (whether taken from a dataset analysis or a published LCA report) must take into consideration the functional unit and key methodological aspects.

When a dataset for a database is created, the process follows an established methodology and goes through critical review to ensure representativeness, consistency, and overall quality. Something similar occurs when developing an LCA study for publishing. LCA practitioners are responsible for developing studies in accordance with a defined goal and scope, while study reviewers are responsible for ensuring alignment with the ISO LCA 14040 standards and any other methodological framework implied. Aside from that, the correct use of LCA impact indicators when building Scope 3 GHG inventories is the responsibility of the data user.

The GHG protocol Scope 3 guidance, which is the most commonly recommended for Scope 3 accounting, specifies what type of data can be used to estimate emissions. The choice is based on data availability. If the goods supplier can provide cradle-to-gate GHG data, then such primary data should be used considering the supplier's specific method of calculation. If only some data is available from the supplier, then a hybrid method is suggested. If no data is available from the supplier, average data is acceptable, relying on LCA databases.

Considering the SBTi, for example, primary data usage is recommended for measuring progress against targets in the apparel and footwear sector. However, it is also recognized that most companies will likely need to rely on the Higg MSI LCA data, although there is no specific recommended nor preferred LCA database. The recommendation set by this program guidelines is that, to choose a LCA database, companies should consider the transparency, completeness, and applicability of the data.

[1] Databases are libraries of datasets representing production processes. Each dataset within a database represents a modeled product (cotton lint, for example) with singular characteristics.

[2] Cradle to farm gate, or cradle to ginning gate, or cradle to user gate, for example.

[3] Consider irrigation, pest management, or fertilization packages, for example.

It is recommended that Better Cotton Initiative (BCI) members chose a study or a dataset that is representative of what they are producing, supplying, or sourcing. This is to avoid public relations risks and ensure high quality data is used. Specific considerations include:

- **Geography coverage:** should be as close as possible to the actual location
- **Temporality coverage:** should be aligned to the reporting year or the most recent available
- **Technology representativeness:** should check similar growing practices are modeled (tillage, no tillage, irrigation method, etc.) or address this representativeness by using the specific data provided by the standards from whom the cotton is being sourced.

Furthermore, besides the above-listed aspects, it is necessary to check what processes are included within the dataset. For example, cotton crop production, ginning, and transportation could be one case of included processes or system boundaries. Another example could be including crop production and ginning, but not transportation, for example. If the chosen data follow the GHG Protocol, the scope of the study (Scope 1, 2, and what is included in Scope 3) should be clearly documented.

Section Two

Suggested Data Sources for Scope 3 Reporting: Decision Tree

The following decision tree is aimed at helping Better Cotton Initiative (BCI) Members determine which available data is best depending on the guidance and reporting requirements. Commercial and not country, program or site specific publicly available LCA data would most likely not be useful for reporting if the member's objective is to show improvement over time, to drive and show changes in agricultural practices, or to estimate land-based removals accounting to claim carbon credits.

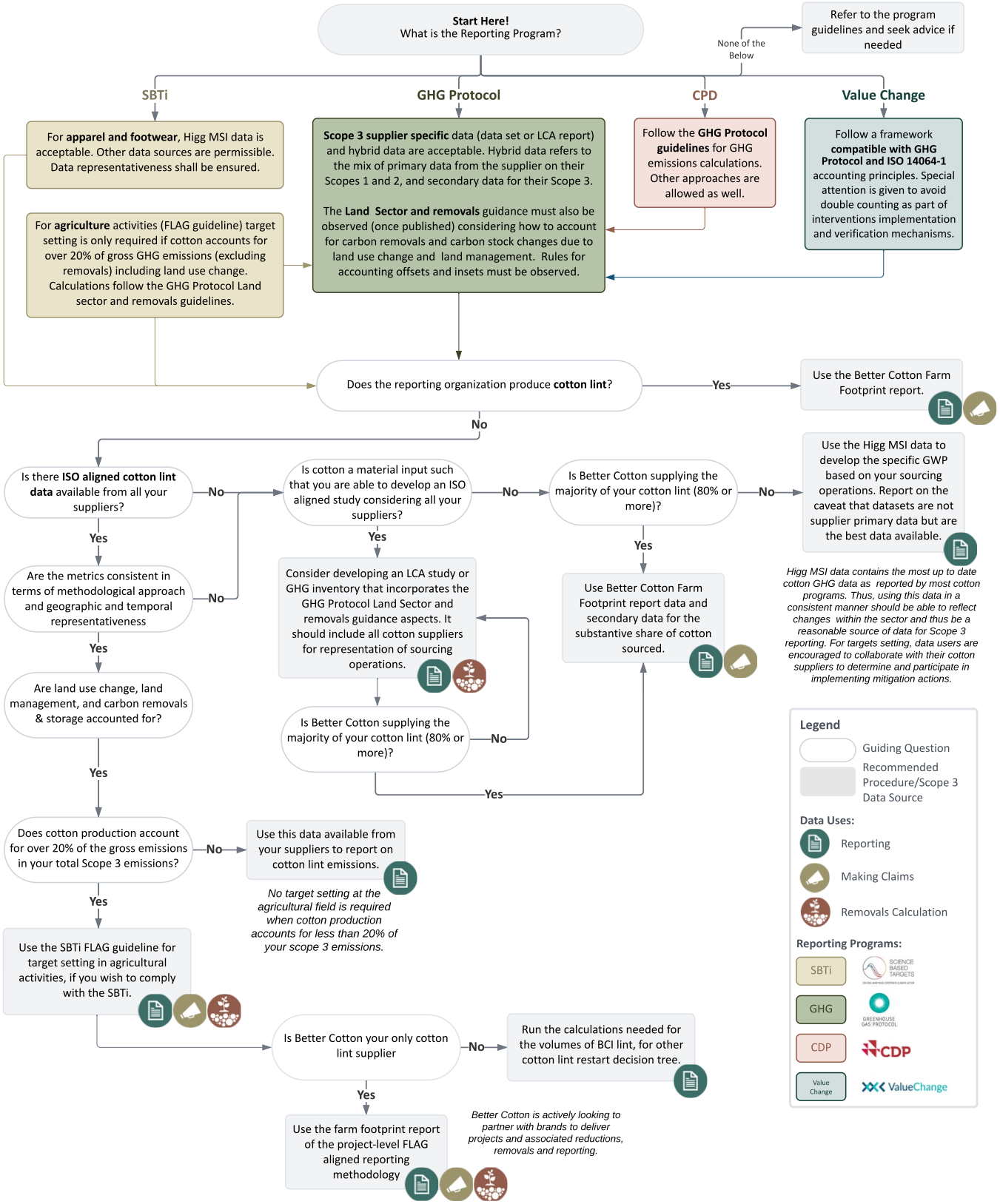
The decision tree focuses on four common reporting programs, signaling the general requirements each one has for Scope 3 data. Based on who the reporting party is (a cotton producer or a cotton buyer) and the availability of primary data, coupled with the need to follow certain methodological aspects for some of the programs, the gray boxes suggest what data could be used.

When members do not have the capacity or do not need to delve into the process of calculating their cotton supply chain specific emissions, use of the BCI farm footprinting report and Higg MSI datasets Global Warming Potential (GWP) impact is recommended.

Beyond Scope 3 accounting and reporting, a potential co-benefit of reporting is the possibility of making claims in some cases. For example, including the farm footprinting report, there is potential for claims on variation over time on BCI farms (for example, Production in India with partners that have been in the program since 2022 shows a decrease of xx% in emissions intensity from 2022 - 2026). Likewise, when following the GHG Protocol methodology for Land Sector and Removals and the Value Chain Initiative guidelines, carbon removals are accounted for. These would be derived from farm interventions seeking to increase carbon uptake in soils and biomass. Thus, these kinds of initiatives could potentially be turned into sustainability claims.

Which Cotton Production Data Should I Use?

The following decision tree is aimed at helping Better Cotton Members determine which data is best depending on the guidance and reporting requirements they are compliant with.



Section Three

Traceability Considerations

For data traceability aspects, environmental metrics used for general Scope 3 reporting must be used consistently and must reference data sources. It is recommended that general descriptors on data quality assessment, such as geographical, temporal, and technological representativeness, are documented as well.

For Scope 3 with Science Base Target Initiative (SBTi) Forest Land and Agriculture (FLAG) requirements, in addition to the above, the FLAG guidelines should be followed documenting methodological choices and data sources. The same applies to Scope 3, net emissions, and the accounting of removals.

- Depending on the accounting category for land use and management emissions, specific data quality requirements apply based on the level of physical traceability of the sourced cotton (unknown origin, jurisdiction, specific sourcing region, specific land management unit, etc.).
- For reporting land management CO_2 removals, primary data traceability requirements apply; thus, the primary carbon stock change has to be specific to the site being reported.
- Moreover, when companies source from certification programs such as the Better Cotton Initiative (BCI), they need physical traceability of the purchased cotton to account for scope 3 emissions and removals. This means more granular data geographically and technologically specific to the sourced cotton is needed.

Regarding supply chain traceability, the need to fulfill guideline requirements is often dependent on the size of the reporting company. For example, the need for mitigation activities and GHG emissions reduction reporting may not be required. In the other extreme, for some companies, implementing improvements is practically impossible because the emission sources (for some suppliers) are untraceable. The decision tree use is viable when the cotton suppliers are either traceable or semi-traceable. Otherwise, the use of a generic global cotton dataset could be recommended.