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Cotton & Circularity: The Natural Loop

Cotton begins its life as a natural fiber, grown from soil, sunlight, and water, sequestering carbon as it grows. This inherent connection to the earth makes it a perfect fit for a circular economy—a system designed to eliminate waste by enabling products to be reused, recycled, and ultimately, returned to the soil in a continuous loop.

True circularity begins at the source. Every part of the cotton plant has a purpose, ensuring nothing is wasted—all without requiring extra land, water, fertilizer, or other support.[1]

Cotton Fiber: The cotton lint is spun into the familiar, versatile fiber used for textiles.

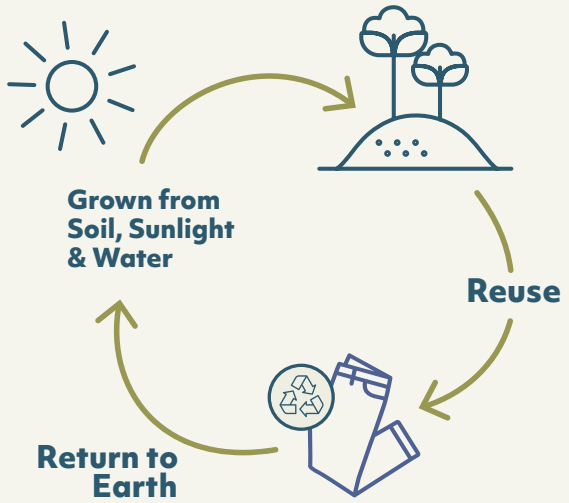
Cottonseeds: The seeds are pressed to create highly stable cottonseed oil,[2] used in applications from cooking to cosmetics and even biodiesel.[3]

Co-products: The remaining whole cottonseed serves as a protein-rich feed for cattle, with research showing it enhances both milk yield and fat content.[4] Approximately more than 50% of the annual U.S. whole cottonseed supply is fed to dairy cattle.[5] Stems and stalks can be tilled back into the ground to enrich the soil or used for bioenergy.[1]

Closing the Loop: Reuse and Recycling

High-quality cotton garments are durable, supporting long lifespans and a thriving secondhand market that reduces the need for virgin materials. When a cotton product reaches the end of its usable life, its journey continues.

100% **cotton products can be mechanically or chemically recycled back into new fiber.**



This fiber can then be transformed into new textiles, home goods, nonwovens, insulation, or even inputs for 3D printing and injection molding.

Cotton's Blue Jeans Go Green™ denim recycling program showcases this process in action. For two decades, old denim has been collected and transformed into a non-woven insulating material used in various applications from building insulation, industrial and pet bed inserts, and even cold-chain packaging.

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Returning to Earth: Biodegradability and Composting

As a natural fiber, cotton is designed to return to the soil.

Rapid Biodegradation: Cotton biodegrades reliably across different environments, including soil, freshwater, and marine ecosystems. In water, unfinished cotton often breaks down at similar rate as natural oak leaves, losing more than 70% of its mass within a month under activated sludge conditions.[6] Even with common textile treatments,[6] cotton's biodegradability remains effective.

Nutrient-Rich Compost: Composting cotton textile waste, such as denim scraps, can create nutrient-rich compost in under three months.[8] This process regenerates soil and avoids the release of methane, a potent greenhouse gas produced when textiles decompose in landfills.[9] A 2023 Cornell University study demonstrated this by burying denim in a compost pile; the cotton biodegraded within months, leaving only the synthetic threads behind.[8]

Avoiding Microplastic Pollution: This natural biodegradability offers a critical advantage over synthetic fibers like polyester, which are derived from petroleum and persist for centuries as plastic pollution. Recent studies on microfiber shedding highlight this difference: when cotton-polyester garments are washed, the cotton fibers biodegrade in about a month, while the polyester fibers remain, polluting our soil and waterways for decades.[7] This inherent quality protects our soil and waterways from plastic pollution.

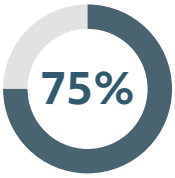
What new technologies are advancing cotton's circularity?

Innovation is unlocking new pathways to circularity for cotton waste.

- **Cotton-to-Glucose:** Emerging technologies can convert cotton textile waste into glucose.[10] This opens the door to creating new bio-based materials for products like detergents and cosmetics, further closing the material loop.
- **Bioenergy:** Cotton ginning byproducts and textile scraps can be processed into bioenergy. The 50 million metric tons of cotton stalk residues generated globally each year[11] could potentially produce about 118 TWh of bioenergy.[11,12,13] In addition, the roughly 17 million metric tons of cotton textile waste generated annually could supply another 40 TWh.[12,13,14,15,16] Together, this 158 TWh of potential energy would be enough to meet the annual household electricity needs of nearly 15 million U.S. homes[17,18]—enough to power the combined households of New York, Los Angeles, and Chicago.[14]
- **Biochar:** Through a process called pyrolysis, cotton stalks can be converted into biochar, a stable, carbon-rich solid. When added to soil, biochar sequesters carbon long-term and improves land health. Cotton stalk biochar has a carbon sequestration potential of 24%, outperforming biochar from other agricultural residues.[19]

What are the main benefits of cotton's circularity for the environment and consumers?

- **Reduces Landfill Burden:** By enabling reuse, recycling, and composting, cotton diverts waste from landfills, mitigating the production of harmful methane emissions.
- **Enhances Soil Health:** Composting and biochar production return vital nutrients and carbon to the soil, supporting regenerative agriculture and future crop productivity.
- **Aligns with Consumer Values:** Consumers increasingly connect cotton with sustainability.



A recent survey found that **75% of consumers associate cotton with circularity and want to see it used more widely in clothing**.[20]

For more information on cotton and circularity, visit **cottontoday.cottoninc.com**

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