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FiveWinds
STRATEGIC CONSULTING



“textile bio-based materials design challenge”
Ökobilanz von bio-basierten Materialien

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Projects

Case Study

Questions



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Introduction to PE INTERNATIONAL, Inc.

Global Presence

PE INTERNATIONAL
Hauptstraße 111-115
Leinfelden Echterdingen



- **Global presence:** 20 PE offices in all key markets and global sales partners
- **Local experts:** > 200 people worldwide representing 20 different nationalities
- **Proven success since 1991:** 2,000 person-years of experience

What we offer

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Integrated solutions for product and corporate sustainability management



Sustainability Consulting

- Sustainability Strategy
- Management Systems
- Stakeholder Engagement
- Carbon Footprints / Offset / CDM
- Life Cycle Assessment
- Energy efficiency studies

Corporate Sustainability

- Sustainability Management Solution
- GRI, CDP, UN Global Compact, ISO 14001, OHSAS 18000, etc.
- Corporate Carbon Footprint

Product Sustainability

- Product Life Cycle Assessment solution
- Design for Environment
- Product Carbon Footprint
- Scenario analysis / decision support

Databases & Content

Vorstellung PE INTERNATIONAL

Ausgewählte Kunden

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- Automotive
- Automotive suppliers
- Electronics
- Construction materials
- Surface treatment
- Construction
- Heating
- Associations
- Finance
- Public bodies
- Energy
- Food/Retail

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Auswertung von Studien zur ökologischen Betrachtung von nachwachsenden Rohstoffen bei einer stofflichen Nutzung

Gefördert durch die Fachagentur Nachwachsende Rohstoffe

→ Gesamtbetrachtung der stofflichen Nutzung

→ 156 Studien

→ Ziel: Bewertung und Entwicklung von Handlungsempfehlungen

Tendenzen der Umweltwirkungen nachwachsender Rohstoffe im Vergleich zu konventionellen Rohstoffen

Wirkungskategorie		Tendenz Biokunststoffe
Treibhauspotenzial	↑	weil CO_2-neutral
Energiebedarf	↑	meist in Korrelation mit GWP
Photosmog	↗	Tendenz Vorteil, resultiert aus Transporten, Energiegewinnung, Verbrennungen → Einsparungen
Ozonabbaupotenzial	↘	Tendenz Nachteil
Versauerungspotenzial	↘	Tendenz Nachteil, Düngemittel LW
Eutrophierung	↘	Tendenz Nachteil, Düngemittel LW
Ökotoxizität	→	Einsparung konventioneller Stoffe vs. Stoffeinträge Landwirtschaft (Pflanzenschutz), stark Produktabhängig, stark abhängig von Anbauart
Humantoxizität	↗	Tendenz Vorteil, Einsparungen in Energiebereitstellung & -gewinnung, weniger Verbrennungsvorgänge

FACHAGENTUR NACHWACHSENDE ROHSTOFFE e.V.

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Fachhochschule Hannover
University of Applied Sciences and Arts



Daten und Bottlenecks bei der ökobilanziellen Bewertung von Biopolymerwerkstoffen und Produkten

→Projektleitung Institut für Biokunststoffe und Bioverbundwerkstoffe (IfBB) - als Erweiterung des Projektes „Marktetablierung einer Biopolymerdatenbank“ .

→Betrachtung verfügbarer Ökobilanzen zu Biokunststoffprodukten

→Grobbewertung 30-50 Studien

→Feinbewertung 3-6 Studien

→ Ziel: Bewertung und Entwicklung von Handlungsempfehlungen

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Case Study – Scope

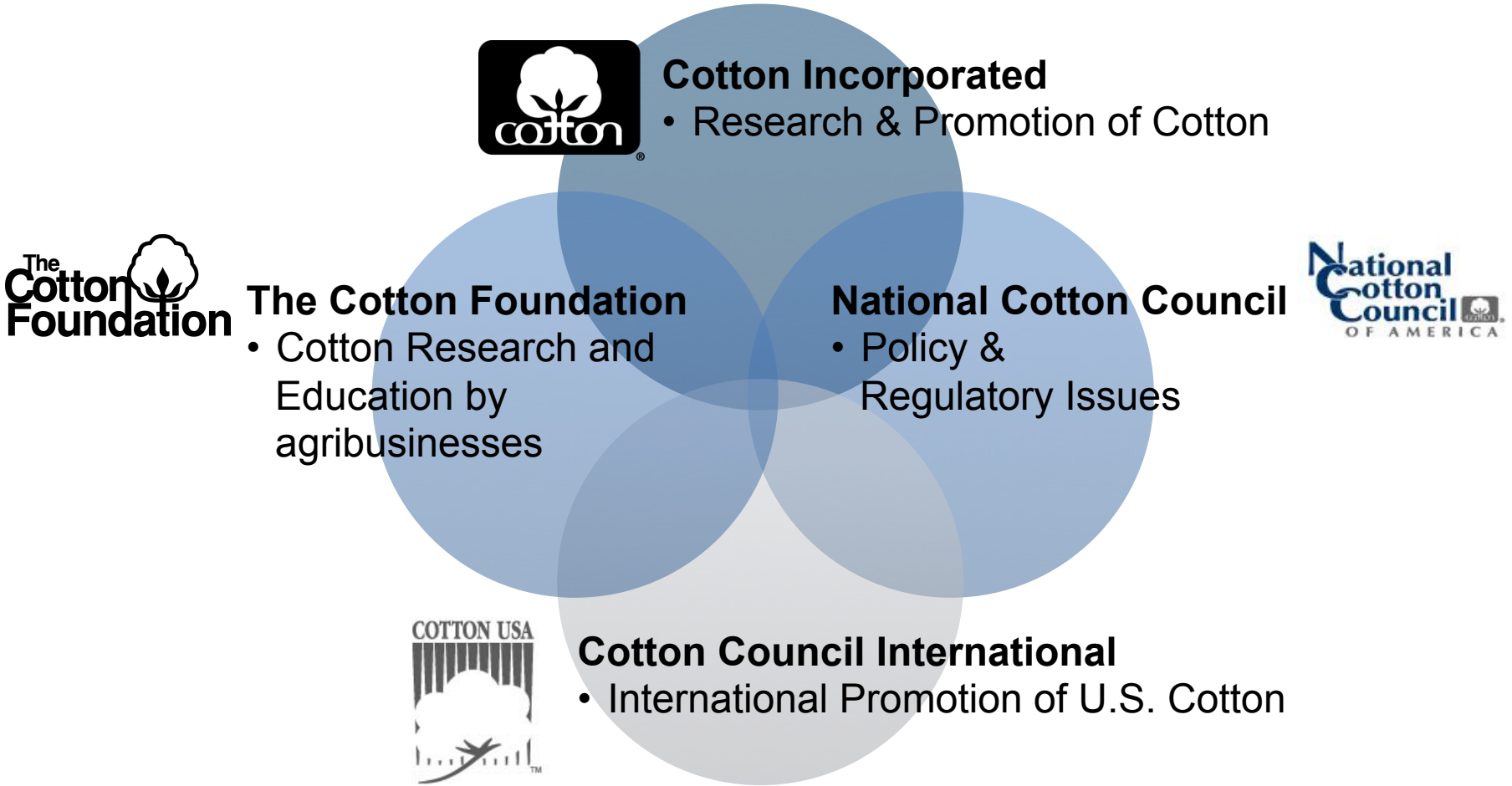
Questions



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Project Sponsor/ Management



Goal & Scope

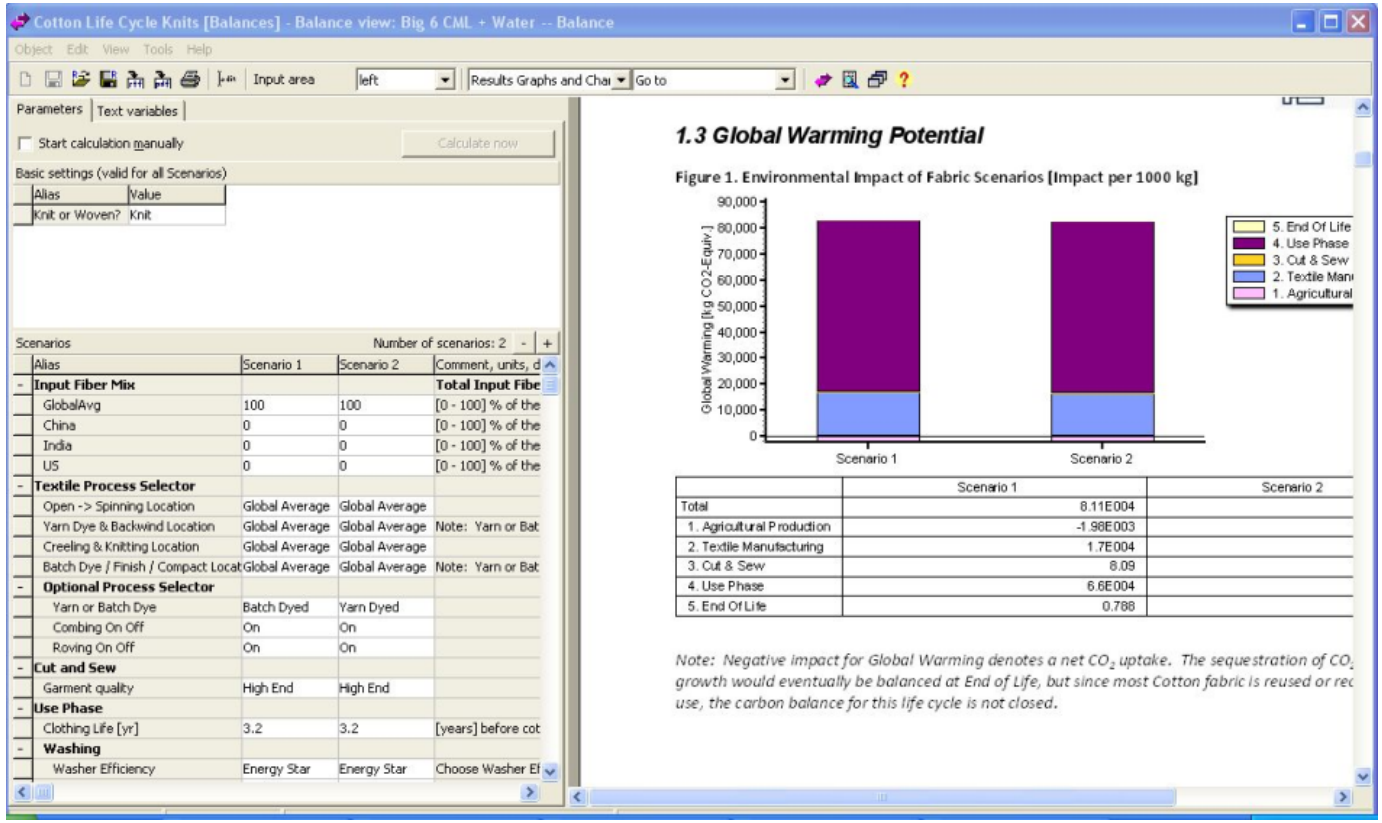
- Goals
  - Build current, representative, and well-documented Life Cycle Inventories (LCIs) for cotton fiber and fabric
  - Benchmark cotton's environmental performance
  - Provide Life Cycle Assessments (LCA) of textile products (knit golf shirt and woven casual pant) made from cotton to identify areas for improvement.
  - Create an interactive design tool (i-report)



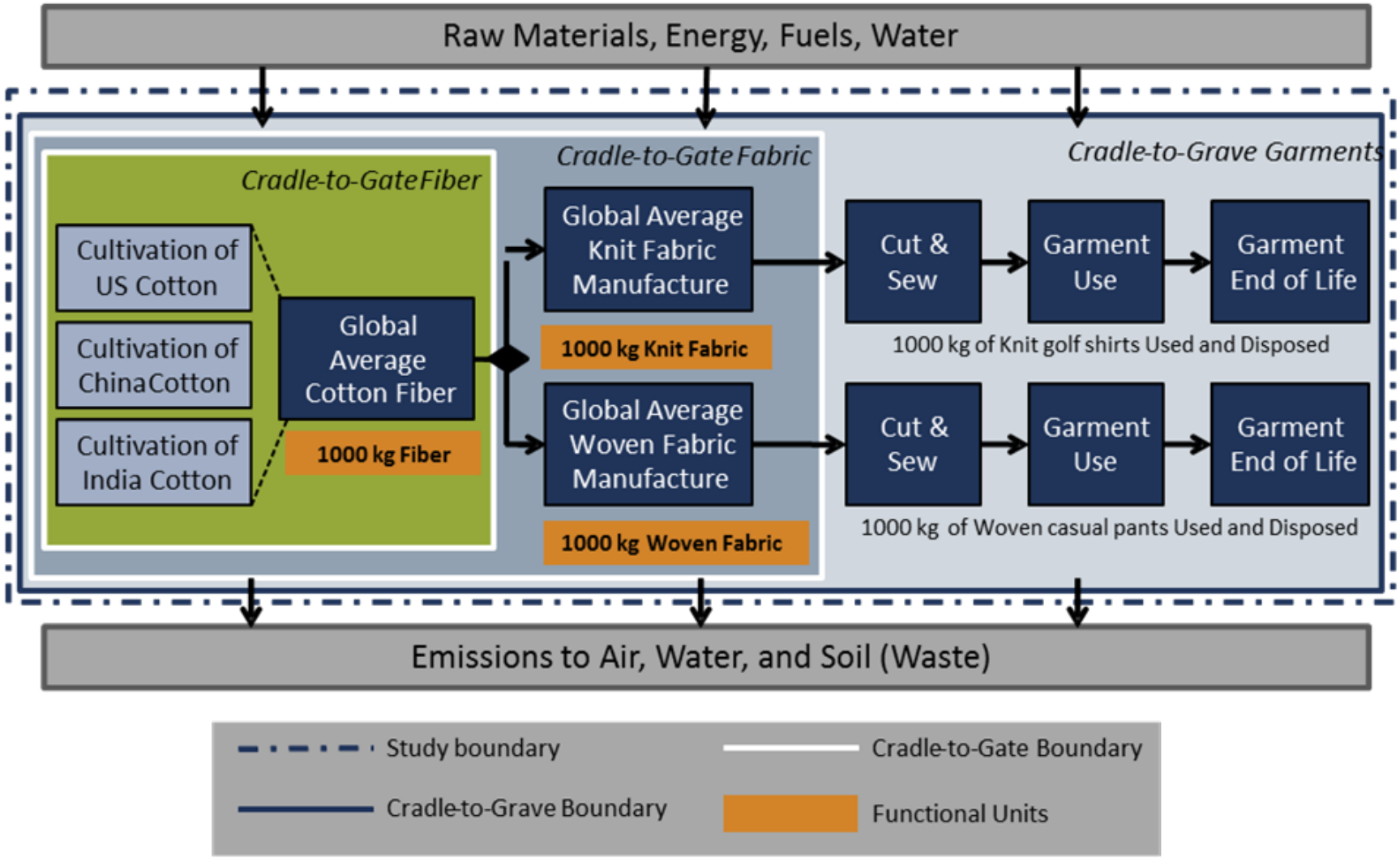
- Full Critical Review to add credibility
- Published LCIs of cotton fiber and fabric datasets

Goal & Scope

- Create an interactive design tool (i-report)
  - Tool accessible to non-LCA-experts
  - Easy side by side comparisons
  - Parameters allow users to evaluate ‘what-if’ scenarios



System Boundaries & Functional Units



Data Collection – Cotton Production

- We collected data on cotton growth & cultivation from
  - 4 regions in the US
    - Far west, Southwest, Mid-south, Southeast
  - 3 Regions in China
    - Jangtze River, Yellow River, Northwest
  - 3 Regions in India
    - South, Central, North

- Data collected on
  - Soil type
  - Weather / Climate Data
  - Amount of seed planted
  - All chemicals applied
  - Number of trips across the field (Fuel use)
  - Transportation field to gin
  - Ginning energy use
  - Type of bags and ties
  - Water use



Data Collection & Modeling

Textile Processes

- We collected data from 16 textile mills in China, India, Turkey and the US
  - Global and Regional Averages for Knit fabric
    - Opening through Spinning,
    - Preparation and Yarn Dyeing / Backwinding,
    - Knitting, and
    - Preparation and Batch Dyeing / Finishing / Compaction
  - Global and Regional Averages for Woven fabric
    - Opening through Spinning,
    - Beaming through Weaving
    - Preparation and Continuous Dyeing / Finishing / Sanforizing



The i-report allows for up to 100 combinations of Knit fabric manufacturing and 320 combinations of Woven fabric manufacturing.

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Case Study - Results

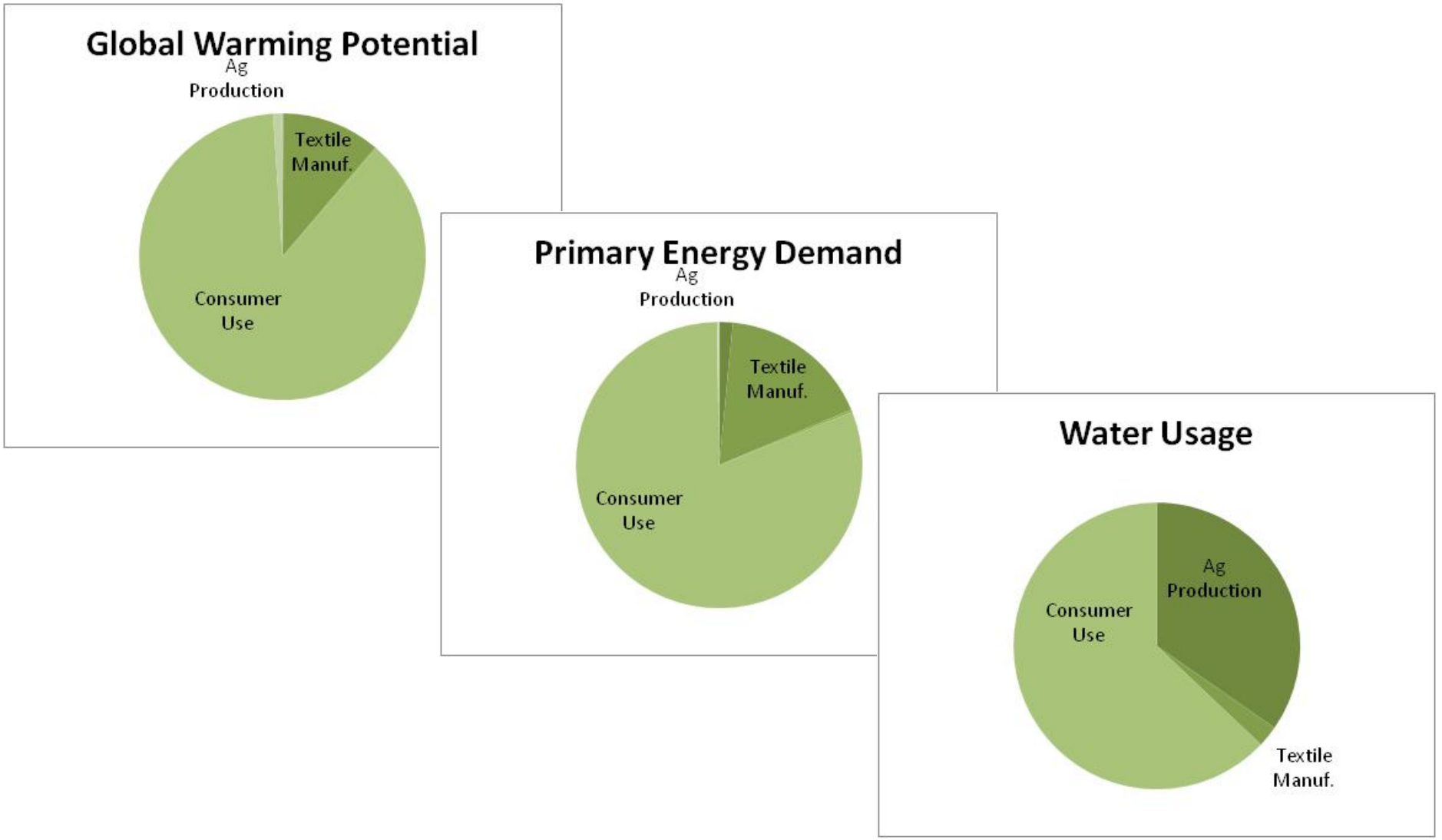
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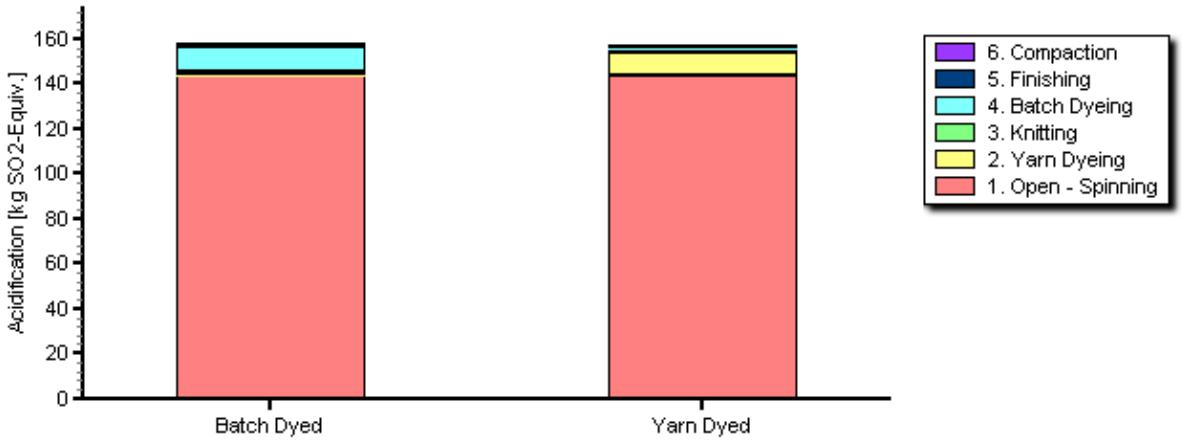
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LCIA Results - Cradle-to-Grave Overview

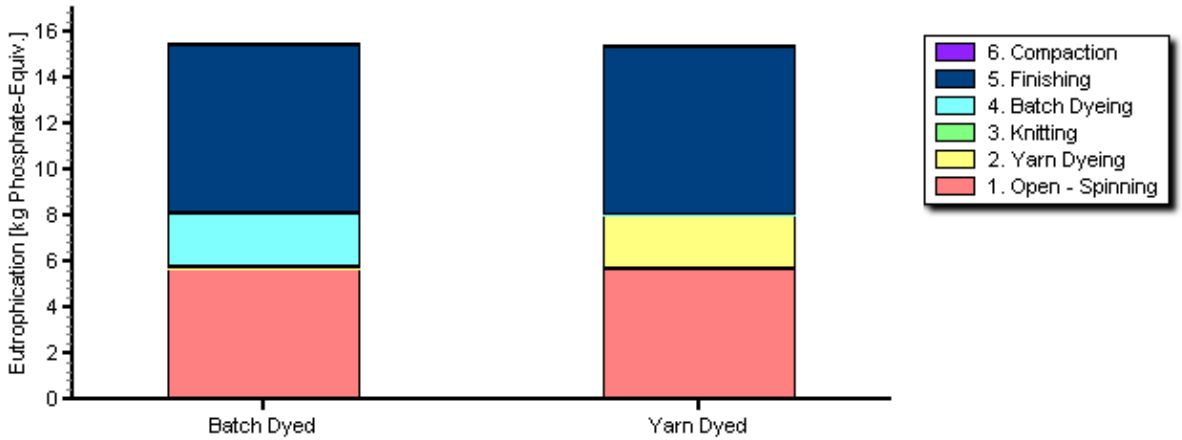


LCIA Results - By Textile Process Step

- The main textile contributors are energy use and wastewater emissions.
  - Electricity demand in fiber processing (Opening-Spinning)
  - Energy for conditioning, processing, and heating water

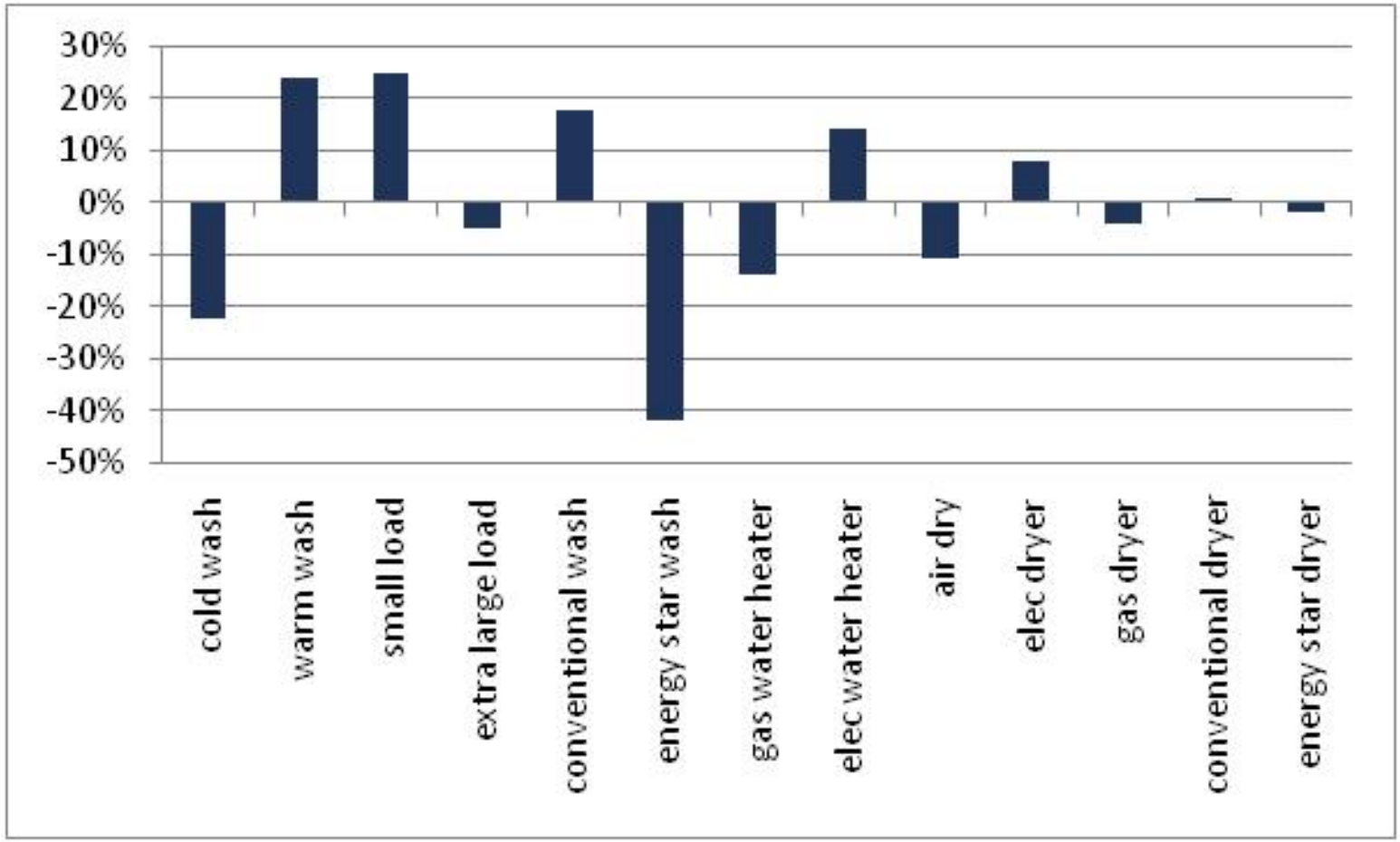


- Major EP contributors include wastewater treatment emissions and power generation



LCIA results - Consumer behavior

Sensitivity analysis evaluated the effects of changing each consumer action independently.



Publication and Carbon Trust Certification

- **Critical Review completed successfully**
  - Experts in agriculture, textiles, and LCA
  - An Executive Summary of the LCA report is available on cottontoday www.cottoninc.com
  - A publicly available Technical Note will be available in coming months

- **Global Average cradle-to-gate LCIs will be published in the GaBi Professional database, ecoinvent, USLCI**
  - 1000 kg Cotton Fiber
  - 1000 kg Knit Cotton Fabric (Batch Dyed)
  - 1000 kg Knit Cotton Fabric (Yarn Dyed)
  - 1000 kg Woven Cotton Fabric (Continuous Dyed)

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