FROM FARM TO BRANDS:
US COTTON INDUSTRY’S APPROACH TO SUSTAINABILITY

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Chief Sustainability Officer
Presented to TAWC
January 17th, 2019
35 Years of Reduced Environmental Impact

- Land Use: 31%
- Soil Loss: 44%
- Water: 82%
- Energy: 54%
- GHG: 30%

Field to Market: Keystone Alliance for Sustainable Agriculture 2016
https://fieldtomarket.org/national-indicators-report-2016/
Cotton Apparel Life Cycle Assessment
LCA Goal, Scope Functional Units

Cradle-to-Gate Fiber

- Cotton Cultivation USA
- Cotton Cultivation China
- Cotton Cultivation India
- Cotton Cultivation Australia

Average Cotton Fiber

1000 kg Fiber

Gate-to-Gate Fabric

- Global Average Knit Single Jersey Fabric Manufacture
- 1000 kg Knit Fabric
- Global Average Knit Single Pique Fabric Manufacture
- 1000 kg Knit Fabric
- Global Average Woven Twill Fabric Manufacture
- 1000 kg Woven Fabric

Cut & Sew

Garment Use

Garment End of Life

Gate-to-Garment Garments

- Cut & Sew
- Garment Use
- Garment End of Life

Raw Materials, Energy, Fuels, Water

1000 kg Knit Fabric

1000 kg Woven Fabric

Emissions to Air, Water, and Soil (Waste)

Cradle to Grave Boundary

Gate to Gate Boundary

Functional Units

USA

Australia

China

India

- 3953 Knit casual collared shirts used & disposed
- 2780 Knit casual collared shirts used & disposed
- 1796 Woven casual pants used & disposed
RESULTS
Overall Results for A Knit Collared Shirt

- Global Warming
- Energy
- Water Quality
- Water Consumption

Categories:
- Seed to Bale
- Textile Manufacturing
- Use & Disposal
- Transport
Agricultural Phase Details

- **Global Warming**
- **Energy**
- **Water Quality**
- **Water Consumption**

- Transportation
- Field Fuel Use
- Packaging
- Ginning
- Pesticides
- Irrigation
- Fertilizer
- Field Emissions
- Carbon Credit
- Crop Rotation
- Reference System
Microplastics Under Pressure

Plastic makes the headlines

Invisible plastic: microfibers are just the beginning of what we don’t see
Mary Catherine O’Connor

The tiny pollutants in our clothes are forcing us to look harder for, and think more carefully about, the ways humans have shaped the environment.

Brands are put under pressure

http://plasticpolluters.org/
Microplastics in the Environment

Fibers Removed from Accelerated Wash

Cotton

Rayon

Polyester

Cotton/Polyester

Condition 1
Without Detergent at 44°C

Preliminary research from North Carolina State University, Dr. Richard Venditti
Biodegradation curves of the Textile Yarns (ASTM D6691)

4 duplicates of each sample

Inoculum – Seawater

Preliminary Results

Less remaining material

Cotton
67%

Rayon
60%

50/50 Polyester/Cotton
33%

Polyester
No biodegradation
U.S. Cotton Sustainability Goals
How We Define Sustainable Agriculture

Meeting the needs of the present while improving the ability of future generations to meet their own needs by:

- Increasing productivity to meet future food and fiber demands
- Improving the environment
- Improving human health
- Improving the social and economic well-being of agricultural communities
Key Performance Indicators (KPI)

- **Yield**: pounds of fiber per acre.
- **Soil erosion rate**: tons of soil loss per acre per year (estimated from RUSLE2).
- **Irrigation Water Use Efficiency**: pounds of fiber per acre above dry-land yield divided by inches of irrigation applied.
- **Energy Use**: total energy in BTUs from seed to bale per pound of cotton fiber produced. Includes energy to create inputs such as the fertilizer as well as direct energy used on the farm.
- **Greenhouse Gas Emissions**: pounds of CO$_2$ equivalent emitted per pound of fiber.
- **Biodiversity**: measure of different crop types and natural ecosystem area on a farm.
- **Soil Carbon**: carbon content of the soil.
- **Water Quality**: dimensionless index that reflects IPM and fertilizer practices on the farm.
- **Farm Profitability**: financial returns above variable costs.
- **Generation of Economic Value**: reflects the direct contribution of agricultural production at the farm gate to state and national gross domestic product.
- **Worker Safety**: based on worker illness and injury, and fatalities.
- **Labor Productivity**: Hours of labor to produce a pound of cotton (field to gin).
- **Market share**: Percentage of cotton’s share of the global fiber market
- **Fiber Competitiveness**: Fiber quality attributes and process-ability
<table>
<thead>
<tr>
<th>Goal</th>
<th>Target</th>
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<tbody>
<tr>
<td>13% Increase in Land Use Efficiency</td>
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<tr>
<td>15% Reduction in Energy Use</td>
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<tr>
<td>50% Reduction in Soil Loss</td>
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<tr>
<td>39% Reduction in GHG Emissions</td>
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<tr>
<td>18% Increase in Irrigation Water Use Efficiency</td>
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<tr>
<td>30% Increase in Soil Carbon</td>
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Two-thirds of U.S. growers use conservation tillage.

- 45% None or Strip
- 35% Conventional
- 17% Conservation

Goal: 30% Increase Soil Carbon

2/3 of the cotton fields with a net gain in soil carbon

Carbon depletion associated with tillage intensity

Carbon increase associated with reduced tillage and/or cover crops.
The Field to Market Soil Conservation metric is based on the NRCS model of soil erosion where $T$ represents a balance between soil formation and soil loss (i.e. $T = \text{zero net soil loss}$).

The 10 year Goal is $T$ averaged across the U.S. which is 5 tons per acre soil loss.
What Will Drive Improvements in Soil Loss?

• More use of cover crops for weed suppression

• More adoption of rainfall capture practices (residue and surface roughness) as rain events become more severe

• Expanded producer outreach programs to reach those few growers whose fields experience high erosion rates by demonstrating the profitability of improved soil stewardship.
Green House Gas Emissions

Goal: 39% Reduction

The Green House Gas Goal of 0.85 lbs of CO₂e per pound of fiber is ambitious since it matches the spirit U.S. commitment under the Paris Accord and exceeds our historic trend line by 30% and our current F2M FieldPrints.

This metric does not account for carbon sequestered in the fiber (biogenic carbon) which matches current GHG emissions and would designate cotton as carbon neutral.

Drivers for this GHG improvement include:

- Yield and Nitrogen Use Efficiency gains
- Carbon capture from cover crops & no-till

Field to Market: Keystone Alliance for Sustainable Agriculture 2016
https://fieldtomarket.org/national-indicators-report-2016/
Greenhouse Gas

U.S. AVERAGE

LA Project Average

Ten–yr. Goal

Grower ID

(lb. CO2e/fiber)
Cotton production uses 3% of the world’s agricultural water.
U.S. Water & Yield Trends

Decreased water use: 40%
Increased yields: 50%

Source: USDA Farm and Ranch Irrigation Surveys
Irrigation Water Use Efficiency (WUE)

Goal: 18% Increase

- **Historic**
- **Goal**

Field to Market: Keystone Alliance for Sustainable Agriculture 2016
https://fieldtomarket.org/national-indicators-report-2016/
What Will Drive WUE Gain?

The Goal represents an 18% increase in Water Use Efficiency. Based on current F2M grower metrics (next slide) and historic trend this Goal appears reasonable.

• Yield increase (as previously discussed) will improve WUE

• Continued investment in better water delivery systems (e.g. drip, pipe planner, laser leveling, low pressure nozzles)

• Improved irrigation scheduling tools (e.g. computer programs, crops/soils sensors)
Common Themes for Improvement

- Yield Increase
- Cover Crops
  - Soil improvement (erosion, quality & carbon)
  - Weed suppression
  - Rainfall capture (Water Quantity & Quality)
- Precision Management
  - Optimizing fertilizer and water use
  - Robots to reduce GHG, energy, labor, and as harvested when boll opens, less field loss and better quality.
Fieldprint Calculator Adoption

- API data collection needed to meet goals

<table>
<thead>
<tr>
<th>Time</th>
<th>Participation in FTM (acres)</th>
<th>Comment</th>
</tr>
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<tbody>
<tr>
<td>Now</td>
<td>100,000</td>
<td>To date at least 100 farmers have Field Printed at least one cotton field. The average cotton acres per farm in the US is ~1,000 acres</td>
</tr>
<tr>
<td>5 years</td>
<td>1,000,000</td>
<td>Add an additional 900 farmers to the list of using the Field Print Calculator</td>
</tr>
<tr>
<td>10 years</td>
<td>2,500,000</td>
<td>Add an additional 1,500 farms to the list of farms using the Field Print Calculator</td>
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<tr>
<td>30 years</td>
<td>100% of US Cotton Acres</td>
<td>All U.S. farms use the Field Print Calculator on at least one field.</td>
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Walmart Launches Project Gigaton to Reduce Emissions in Company’s Supply Chain

Through release of a sustainability toolkit, Walmart asks suppliers to reduce greenhouse gas emissions by one gigaton – the equivalent to taking more than 211 million passenger vehicles off of U.S. roads for an entire year.

BENTONVILLE, Ark., April 19, 2017 – Today, during Walmart’s annual Milestone Summit, the company launched a sustainability platform inviting suppliers to join Walmart in committing to reduce greenhouse gas emissions resulting from their operations and supply chains. Dubbed Project Gigaton, this initiative will provide an emissions
Brand Engagement in Sustainability

- Walmart
  - Soil health
  - Water sensor
  - Traceability
  - Fieldprint Calculator use

- Wrangler
  - Soil health project in Texas
  - Louisiana Fieldprint Calculator Project
Walmart Water Sensor Project

Project Summary

**Description:** Promoting the use of water sensors in cotton fields through research & education.

**Solving for:** Inconsistent irrigation scheduling in humid regions can result in over or under watering crops. The use of water sensors has the potential to increase yields and water use efficiency.

**Estimated Duration:** Long-Term (24 months)

**Progress**

- Partnered with UGA to support pilot water sensors study
  - *22 farmers participating in 2017*
  - Opportunity to expand participation in 2018 with additional support
- *Secured two brand sponsors*
For some brands, goals are not enough

What you did is not enough

Goals are not enough
U.S. Cotton Trust Protocol

Beltwide Cotton Conferences
January 8-10, 2019
New Orleans, LA
US COTTON TRUST PROTOCOL TO HELP MEET SUSTAINABILITY GOALS

The US Cotton Trust Protocol – an integrated data collection, measurement and verification procedure that will document US cotton production practices and their environmental impact – will help the cotton industry to meet its 2025 sustainability goals. Introduced by Cotton Council International at the Cotton Sourcing USA Summit in Scottsdale, AZ, data generated by the Protocol will benchmark farmers’ gains towards the industry goals and will provide the global textile supply chain additional assurances that US cotton is produced in a responsible manner.

Details of the Protocol are being fine-tuned, and a pilot program will be launched in 2019 and fully implemented with the 2020 cotton crop year. Participating growers will have to adopt a data tool that allows for the quantitative measurement of key sustainability metrics, such as the FieldPrint Platform. Growers will also have to complete a self-assessment checklist of best management practices, with a sampling of participating producers subjected to independent verification.
U.S. COTTON TRUST PROTOCOL – CONCEPTUAL DESIGN

1. Voluntary Enrollment/Producer Information
INDIVIDUAL PRODUCER ENROLLMENT
PRODUCER DATA

- Who Are You?
- Where Are Your Farm(s) Located – State & County?
- Which Crops Do You Farm Besides Cotton?
- How Many Cotton Acres Do You Plant?
- Create Username and Password
1. Voluntary Enrollment/Producer Information

2. Self-Assess Best Management Standards
NINE CATEGORIES WITH MORE THAN 100 QUESTIONS

- SOIL HEALTH
- NUTRIENT MANAGEMENT
- WATER MANAGEMENT
- CROP PROTECTION
- HARVEST PREPARATION
- WILDLIFE HABITAT
- FIBER QUALITY AND TRACEABILITY
- FARMSTEAD MANAGEMENT
- WORKER RELATIONS
Soil Health

The first step in developing the farm’s soil management plan is to evaluate each field for erosion potential. Important factors include slope, slope length, soil type, rainfall potential, wind erosion potential and surface residue. The soil management plan should correct situations with potential for erosion.

Guiding Principle

Assure soil resources are protected and sustained.

Management Planning

1. Assure farm meets Conservation Compliance provisions of the US Farm Law
   - YES: I do now on most of my fields.
   - I am trying this on one or more fields.
   - I will consider in the next 3 years.
   - Not appropriate for my area. See comment.

2. Work with advisors who have expertise in soil health
   - YES: I do now on most of my fields.

Tillage Operations

3. Utilize conservation tillage practices such as minimum, strip, mulch or no-till.

4. Prevent or alleviate soil compaction through prescribed tillage operations, controlled traffic patterns and avoidance of traffic where soil moisture is above field capacity.

5. Use permanent and/or annual windbreaks to reduce wind erosion.

6. Apply practices to minimize plant damage from wind erosion (e.g., surface residue or sand dunes).
1. Voluntary Enrollment/Producer Information

2. Self-Assess Best Management Standards

3. FieldPrint Calculator/Qualified Data Partner
MEASUREMENT

- One of the requirements of the Protocol is for the producer to adopt the use of a “data tool” that allows for quantitative measurement of key sustainability metrics.

- An example is the Field to Market tool named the FieldPrint Calculator. This tool allows a farmer to put their inputs every year into a system that measure the environmental impacts of crop production and identify opportunities for improvement.

- Other tools would be FtM Qualified Data Management Partners
  - Land.DB; AGRIBLE; MyFarms
1. Voluntary Enrollment/Producer Information

2. Self-Assess Best Management Standards

3. FieldPrint Calculator/Qualified Data Partner

4. Statement of Commitment
COMMITMENT

A statement of commitment by the grower to responsible production, including health, safety and environmental awareness.

For enrolling in the U.S. Cotton Trust Protocol, this certificate attests the commitment to responsible production practices and continuous improvement of:

JOHN R. DOE

Attested to on January 9, 2019

John R. Doe
Member

Aggregator
U.S. COTTON TRUST PROTOCOL – CONCEPTUAL DESIGN

1. Voluntary Enrollment/Producer Information

2. Self-Assess Best Management Standards

3. FieldPrint Calculator/Qualified Data Partner

4. Statement of Commitment

5. Independent Quality Control – 2\textsuperscript{nd} Party or 3\textsuperscript{rd} Party
VERIFICATION

- Validate accurate use of the on-line enrollment tool such as the self-assessment questionnaire, letter of commitment and the data tool.

- A random and statistically valid sample of the producers will be selected each year for an independent third-party verification of their questionnaire and data.
U.S. COTTON TRUST PROTOCOL – CONCEPTUAL DESIGN

1. Voluntary Enrollment/Producer Information
2. Self-Assess Best Management Standards
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Participation of Aggregators

Enroll Producers
WHO ARE AGGREGATORS?

- Merchandising firms
- Industry organizations
- Brands/Retailers
1. Voluntary Enrollment/Producer Information
2. Self-Assess Best Management Standards
3. FieldPrint Calculator/Qualified Data Partner
4. Statement of Commitment
5. Independent Quality Control – 2nd Party or 3rd Party
6. Means to Achieve Industry Goals

Participation of Aggregators
1. Voluntary Enrollment/Producer Information
2. Self-Assess Best Management Standards
3. FieldPrint Calculator/Qualified Data Partner
4. Statement of Commitment
5. Independent Quality Control – 2nd Party or 3rd Party
6. Means to Achieve Industry Goals
7. Data Passed to the Textile Supply Chain
DATA TO THE SUPPLY CHAIN

- Objective is to provide merchandiser with the ability to pass aggregated data to the textile supply chain

- Focus on flexibility to meet the needs of the customer and traceability
PILOT IN 2019

- The Protocol is a work in progress
- IT development by The SEAM in Memphis
- Seeking critical feedback from farmers, merchandiser, mill, brands, retailers and NGOs
U.S. Cotton Trust Protocol

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