Rising interest to develop substrates from alternative sources

Sustainability is in Our Jeans

THIS IS COTTONIZED HEMP

Sustainability / January 2021

Something you'll see a lot of this season (and beyond) is Cottonized Hemp. Why hemp? Because compared to cotton, it grows quicker, uses less water and leaves behind cleaner, healthier soils. Specially designed for Levi's®, this new innovative hemp yarn is soft like cotton — and easily woven into denim styles like our new 551™Z Authentic Straight. So you get the same authentic Levi's® look and feel in a garment that's easier on the environment.

Rising interest to develop substrates from alternative sources

Adidas invests in Finnish sustainable fibre firm Spinnova

June 10, 2021
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Last Updated 3 months ago

2 minute read

Sustainable Business

Adidas invests in Finnish sustainable fibre firm Spinnova

 Reuters

The Adidas logo is pictured during celebrations for German sports apparel maker Adidas' 70th anniversary at the company's headquarters in Herzogenaurach, Germany, August 9, 2019. REUTERS/Andreas Gebert

Rising interest to develop substrates from alternative sources

Over 60% of Adidas products to be sustainable in 2021

For the first time in 2021, over 60 per cent of Adidas products will be made with sustainable materials like recycled polyester or sustainable cotton. With this, the company moves closer toward its objective to end plastic waste, it said recently. From 2024 onwards, Adidas will shift to using only recycled polyester. Since 2018, it has been using exclusively sustainable cotton.

The SAFI Consortium aims to combine the creative efforts of its diverse stakeholders to create knowledge and foster technological developments that promote responsible and sustainable practices for fiber production, sourcing, conversion, and utilization to make a global impact.
Our partners
About our proposed consortium

1. The most systematic and aggressive global effort to unlock sustainable and alternative fiber potential.

1. Leverage on USDA – SunGrant federal funds $420,000*

1. We expect to raise $600,000 from consortium members, for a total $1 million research effort

4. 22 companies have agreed to participate (available in the web page go.ncsu.edu/fiber)

5. Great opportunity to perform high-risk R&D at the lowest cost

*Please contact us to discuss restrictions & opportunities in intellectual properties.
Goals – Feedstock & Conversion

- Develop pre-competitive and fundamental knowledge on the potential of nonwood fibers for different consumer good products applications

Specific objectives:

1. Comprehensive review on the global production of nonwood fibers.
2. Identify pretreatment and pulping routes to unlock fiber potential to develop suitable furnishes for tissue, textile, packaging, and nonwoven applications.
3. Investigate morphological, chemical and physical properties, for most important nonwood fibers (depending on # members).
4. Understand and model the pulping/bleaching/refining interaction and explore different fiber blending (including wood fibers) for synergies in product properties.
5. Develop techno-economics and life cycle analysis for the most attractive options.
Goals – Consumer perception

- Understanding consumer perception and behavior towards products containing sustainable and alternative fibers.

Specific objectives:

1. Understand consumer perception by contrasting consumer surveys and text and image analytics.

2. Identify and rank sustainability attributes based on consumer perception.

3. Develop trade-off models (performance, pricing, sustainability)

4. Explain current consumer behaviors based on demographics and psychographics and model evolution of consumer behaviors (demand) for the next 5-10 years.
Consortium information

- USD 30,000 per year, for two years
- **Start date: First week July 2021**
- We expect 12 consortium members

Benefits of joining

- Participate in a USD 1,000,000 research portfolio
- Unlock fundamental information for your business
- Participate in the direction of this global research effort (members to select feedstock & pulping methods of their interest)
- Interact with our PhD students and faculty
- Leverage 20+ years of experience researching a wide variety of nonwood materials at both bench and pilot scale

Faculty expertise

- Our scientists are well-known, with global expertise in:
  - Crops and soil science
  - Feedstock supply chain analysis
  - Fiber anatomy, morphology and chemistry
  - Pulping, refining and bleaching operations for nonwoods
  - Fiber and furnish physical properties
  - Hygiene tissue manufacturing at lab, pilot and commercial scale
  - Nonwoven substrate & textiles
  - Techno-economic analysis
  - Sustainability & life cycle analysis
  - Social science
Major Interests to Join SAFI Consortium

Interest across the value chain:

- Supply chain
- Fiber conversion
- Fiber & product performance
- Techno-economics
- Sustainability
- Consumer perception & behavior

Members’ preferences
Members’ preferences

Feedstock Interest

- Hemp
- Wheat straw
- Bamboo
- Flax
- Miscanthus
- Sorghum
- Jute
- Switchgrass
- Banana Tree
- African Palm Tree
- Cannabis
- Kenaf
- Rice straw
- Agave tequilana
- No preference
## Activities Roadmap

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<td><strong>1.1 Feedstock</strong></td>
<td><strong>2.1 Chemical characterization</strong></td>
<td><strong>3.1 Mechanical</strong></td>
<td><strong>4.1 Fiber</strong></td>
<td><strong>5.1 Technical feasibility</strong></td>
<td><strong>6.1 Life cycle assessment &amp; sustainability</strong></td>
<td><strong>7.1 Insights from experts</strong></td>
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<td>c. Bamboo</td>
<td>b.1 Cellulose</td>
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<td>d. Rice straw &amp; husk</td>
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<td>f. Sorghum</td>
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<td>i. Ryegrass</td>
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<td><strong>1.2 Availability</strong></td>
<td><strong>2.2 Physical characterization</strong></td>
<td><strong>3.2 Chemical</strong></td>
<td><strong>4.2 Furnish</strong></td>
<td><strong>5.2 OPEX</strong></td>
<td><strong>6.2. Life cycle methodologies</strong></td>
<td><strong>7.2 Insights from selected respondents</strong></td>
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<td>a. Spatial distribution</td>
<td>a. Fiber anatomy analysis</td>
<td><strong>3.2.1 Solvent</strong></td>
<td><strong>4.2.1 Freeness</strong></td>
<td><strong>5.2.1 Pulping cost</strong></td>
<td>a. Attributional life cycle assessment</td>
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<td>c. Volume by supply distance</td>
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<td>b. Alcohol/water</td>
<td>c. Response to fibrillation</td>
<td>c. Benchmark</td>
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<td><strong>1.3 Delivered cost</strong></td>
<td><strong>2.3 Advance analytics</strong></td>
<td><strong>3.2.2 Traditional pulping</strong></td>
<td><strong>4.2.2 Other</strong></td>
<td><strong>5.2.2 Scenarios</strong></td>
<td><strong>6.2.2. Life cycle methodologies</strong></td>
<td><strong>7.3 Survey</strong></td>
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<td>c. Maintenance cost</td>
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<td>d. Harvesting cost</td>
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<td><strong>3.2.3 Dissolving pulp</strong></td>
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<td>e. Storage cost</td>
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| **2.3 Advance analytics** | **3.3 Pulp assessment** | **4.3 Hand sheet** | **5.2 Scenarios** | **6.3 Social aspects of sustainability** | **6.4 Non-common sustainability metrics** | **7.5 Visual experiment** |
| | a. Viscosity | a. Strength | a. Responsible sourcing | a. Responsible sourcing | a. Model evolution of consumer behavior for the next 5-10 years based on demographics and psychographics |
| b. Kappa number | b. Softness | b. Social investment | b. Social investment | | |
| d. FQA | d. Response to creping | d. Gender equity | d. Gender equity | | |
| | e. Benchmark | e. No. of employees | e. No. of employees | | |
| | f. Other | | | | |
| | | | | | |

| **3.4 Bleaching** | **4.4 Regenerated cellulose characterization** | **5.4 TEA** | **6.4 Non-common sustainability metrics** | **7.6 Forecasts** | | |
| | a. Denier | a. Small scale pulping | a. Non and renewable resources | a. Model evolution of consumer behavior for the next 5-10 years based on demographics and psychographics |
| | b. Tensile Properties | b. Surface chemistry | b. Depletion of abiotic resources | | |
| | | c. Cell wall thickness | c. Depletion of abiotic resources | | |
| | | d. Fiber flexibility | | | |
| | | e. Other | | | |
| | | f. Other | | | |
| | | | | | |
Timeline Roadmap

Feedstock screening (fiber morphology & supply chain)
- Hemp, wheat straw, bamboo, flax, switchgrass, miscanthus, jute, sorghum (as suggested by industrial partners)

Feedstock metrics
- Physical pre-treatment
  - Fiber fractionation, mechanical treatments

Fiber production Pilot trials

Post-treatment
- (Refining, bleaching, fractionation)

Pulping methods
- Mechanical (CTMP, TMP, APMP, steam explosion)
- Chemical (soda, kraft, sulfite)
- Solvent (organic/acid, SEW, alcohol/water)

Integration
- Fiber interaction

Focus group screening & execution
- Pricing, recycled fiber, nonwood fiber, brown fiber

Consumer perception survey
- Pricing, recycled fiber, nonwood fiber, brown fiber

Projections on consumer appeal for the next 10 years

State-of-the-art assessment

Techno-economics & Life-Cycle Analysis

2021 Q4

2022 Q1-2

2022 Q2-3

2023 Q3-4

2021 Q3-4

2023 Q1

2022 Q3

2022 Q1-Q2

2021 Q4

2020

SAFI Confidential Information
Mentor by World-Class Scientists

Dr. Jameel
Pulping & Refining

Dr. Gonzalez
Tissue Manufacturing & Business

Dr. Chang
Lignocellulosic Chemistry

Dr. Phillips
Process Economics

Dr. Byrd
Nonwood pulping

Dr. Pal
Product development

Dr. Peszlen
Fiber Morphology

Dr. Pawlak
Fiber & product physical properties

Dr. Kelley
Sustainability

Dr. Venditti
Sustainable fibers

Dr. Ericka Ford
Sustainable textile fibers

Dr. David Suchoff
Alternative crops

Dr. Daniel Saloni
Supply chain

Dr. Melissa Pasquinelli
Textile molecular modeling

Dr. Jason Delborne
Social science scientist
Questions?

Let us know how we can help

go.ncsu.edu/SAFI

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