Research for Biobased Industrial Products at USDA Laboratories

- ~$23 million/yr
- 19 projects
Research for Industrial Biobased Products at USDA Laboratories

- Biobased industrial products from food animal processing by-products (Rafael Garcia)
- Production and value enhancement of biosurfactants and biopolymers derived from agricultural lipids and coproducts (Dan Solaiman)
- Discovery and utilization of bioactive components from new crops and agricultural co-products (Mark Berhow)
- Amylose helical inclusion complexes for food and industrial applications (Fred Felker)
- Novel technology for renewable resource utilization (Joe Laszlo)
- Novel technologies for producing renewable chemicals and polymers from carbohydrates derived from agricultural feedstocks (Chris Skory)
- Bio-based lubricants from farm-based raw materials (Girma Biresaw)
- Improved utilization of proteinaceous crop co-products and residues (Gordon Selling)
- Novel starch-based materials (Victoria Finkenstadt)
- Development and utilization of new oilseed crops and products (Steve Cermak)
Research for Industrial Biobased Products at USDA Laboratories

- Functionalization of vegetable oils for use in the polymer, oleochemical, and lubricant industries (*Ken Doll*)
- Modification of natural polymers by novel processes (*Atanu Biswas*)
- Viscoelastic properties and polymer composite applications of nano-materials derived from agricultural byproducts and feedstocks (*Lei Jong*)
- Improvement and utilization of natural rubber- and castor oil-producing industrial crops (*Colleen McMahan*)
- Bioproducts from agricultural feedstocks (*Greg Glenn*)
- Discovery and development of natural product-based weed management methods (*Stephen Duke*)
- Engineering enzymatic redirection of natural crop oil production to industrial oil production (*Jay Shockey*)
- Novel microbial sensing and elimination technologies for protection of agricultural commodities (*Tony De Lucca*)
- Enhanced utilization of carbohydrates and polysaccharides from citrus processing waste streams (*Bill Widmer*)
Improvement and utilization of natural rubber- and castor oil-producing industrial crops (Colleen McMahan)

• Guayule
  - investigated ESTs associated with rubber production
  - developed method for in-vitro tissue culture
  - conducted LCA for guayule-based automotive tires
  - characterized blends of guayule-Hevea rubbers
  - $6.8 million (5-year) grant for developing guayule-based tire

• Russian dandelion
  - phenotypic characterization of different varieties
Enhancing profitability & sustainability upland cotton, cottonseed, & cotton byproducts through improvements in harvesting, ginning, & mechanical processes \((Greg\ Holt)\)

- Biodegradable composites from gin trash, mushroom mycelia and various sources of cellulosic biomass (e.g., flax, kenaf, switchgrass, wheat straw, etc.)
- Thermoplastic composites from cotton gin trash and waste plastic wrap from cottonseed modules
- Biodegradable protective packaging from cotton gin trash
- Converting cotton gin trash into hydromulch
Research for Industrial Biobased Products at USDA Laboratories

Functionalization of vegetable oils for use in the polymer, oleochemical, and lubricant industries (Ken Doll)

- Rapidly-biodegradable and inexpensive chewing gum
- Anti-wear additives for biobased lubricants

Novel technology for renewable resource utilization (Joe Laszlo)

- Microbial polysaccharide to replace gum Arabic
Research for
Industrial Biobased Products
at USDA Laboratories

Modification of natural polymers by novel processes *(Atanu Biswas)*

- Biobased nanoparticles for wetting surfaces

Biobased industrial products from food animal processing by-products *(Rafael Garcia)*

- Flocculent from poultry blood

Development and utilization of new oilseed crops and products *(Steve Cermak)*

- Estolide-based lubricants
Research for Industrial Biobased Products at USDA Laboratories

Novel technologies for producing renewable chemicals and polymers from carbohydrates derived from agricultural feedstocks (Chris Skory)

• Novel sugar-based chemicals from processing wastes
• Livestock prebiotic from wood waste

Production and value enhancement of biosurfactants and biopolymers derived from agricultural lipids and coproducts (Dan Solaiman)

• Microbial-based surfactants
Research for
Industrial Biobased Products
at USDA Laboratories

New bioactive and biobased products from plant cell
wall polysaccharides in sugar beet pulp, citrus peel and
other processing residues (Lin Shu Liu)

• Low-cost, biodegradable active (anti-microbial) packaging

Amylose helical inclusion complexes for food
and industrial applications (Fred Felker)

• Starch-based non-sticky skin lotions

Discovery and utilization of bioactive components from
new crops and agricultural co-products (Mark Berhow)

• Camelina meal for livestock feed
Bioproduts from agricultural feedstocks (Greg Glenn)

- Novel blow-spinning process for nano-fibers
- Biodegradeable fire-retardant gels to protect buildings
- Biobased matrix for encapsulating organic fertilizers
- Low-cost, biodegradable nanocomposites
- Biobased microbeads for protecting beehives

Improved utilization of proteinaceous crop coproducts and residues (Gordon Selling)

- Plywood adhesives from grains and oilseeds
- Low-cost, biodegradable glycerol-citrate polymers
- Starch-PLA blends for packaging and hygiene products
The USDA BioPreferred® Program

- Established by the 2002 Farm Bill
- Identifies and seeks to establish new markets for biobased products
- Two major program elements:
  - Federal Procurement Preference
  - Voluntary Labeling Program
Businesses with biobased products registered with USDA BioPreferred® program
Federal Procurement Preference

• USDA selects and prioritizes categories of biobased products for identification as "preferred" products for Federal purchasing.

• Federal agencies and their contractors must give preference to "BioPreferred" products when making purchases.
The Federal Procurement Preference

• Currently, 89 product categories
  – Operations and Maintenance
  – Construction
  – Janitorial and Cleaning
  – Vehicle Maintenance
  – Food Service

• Presidential memo mandates a 50% increase in product categories by next February
## Operations and Maintenance

<table>
<thead>
<tr>
<th>Product Category</th>
<th>Minimum Biobased Content</th>
</tr>
</thead>
<tbody>
<tr>
<td>Forming Lubricants</td>
<td>68%</td>
</tr>
<tr>
<td>Straight Oils</td>
<td>66%</td>
</tr>
<tr>
<td>Multi-Purpose Lubricants</td>
<td>88%</td>
</tr>
<tr>
<td>Parts Wash Solution</td>
<td>65%</td>
</tr>
<tr>
<td>Turbine Drip Oils</td>
<td>87%</td>
</tr>
<tr>
<td>Graffiti and Grease Removers</td>
<td>34%</td>
</tr>
<tr>
<td>Corrosion Preventatives</td>
<td>53%</td>
</tr>
</tbody>
</table>
## Construction

<table>
<thead>
<tr>
<th>Product Category</th>
<th>Minimum Biobased Content</th>
</tr>
</thead>
<tbody>
<tr>
<td>Acoustical Composite Panels</td>
<td>37%</td>
</tr>
<tr>
<td>Roof Coatings</td>
<td>20%</td>
</tr>
<tr>
<td>Carpets</td>
<td>7%</td>
</tr>
<tr>
<td>Membrane Concrete Sealer</td>
<td>11%</td>
</tr>
<tr>
<td>Structural Wall Panels</td>
<td>94%</td>
</tr>
<tr>
<td>Insulation Foam</td>
<td>7%</td>
</tr>
</tbody>
</table>
## Fleet

<table>
<thead>
<tr>
<th>Product Category</th>
<th>Minimum Biobased Content</th>
</tr>
</thead>
<tbody>
<tr>
<td>2 Cycle Engine Oils</td>
<td>34%</td>
</tr>
<tr>
<td>Cable and Chain Lubricants</td>
<td>77%</td>
</tr>
<tr>
<td>Diesel Fuel Additives</td>
<td>90%</td>
</tr>
<tr>
<td>Multipurpose Greases</td>
<td>72%</td>
</tr>
<tr>
<td>Sorbents</td>
<td>89%</td>
</tr>
<tr>
<td>Dust Suppressants</td>
<td>85%</td>
</tr>
<tr>
<td>General Purpose Deicers</td>
<td>93%</td>
</tr>
</tbody>
</table>
## Food Service

<table>
<thead>
<tr>
<th>Product Category</th>
<th>Minimum Biobased Content</th>
</tr>
</thead>
<tbody>
<tr>
<td>Disposable Containers</td>
<td>72%</td>
</tr>
<tr>
<td>Disposable Tableware</td>
<td>72%</td>
</tr>
<tr>
<td>Food Cleaners</td>
<td>53%</td>
</tr>
<tr>
<td>Dishwashing Products</td>
<td>58%</td>
</tr>
<tr>
<td>Oven and Grill Cleaners</td>
<td>66%</td>
</tr>
</tbody>
</table>
## Cleaning

<table>
<thead>
<tr>
<th>Product Category</th>
<th>Minimum Biobased Content</th>
</tr>
</thead>
<tbody>
<tr>
<td>Hand Cleaners &amp; Sanitizers</td>
<td>73%</td>
</tr>
<tr>
<td>Glass Cleaners</td>
<td>49%</td>
</tr>
<tr>
<td>Floor Cleaners and Protectors</td>
<td>77%</td>
</tr>
<tr>
<td>Adhesive and Mastic Removers</td>
<td>58%</td>
</tr>
<tr>
<td>Floor Strippers</td>
<td>78%</td>
</tr>
<tr>
<td>Multipurpose cleaners</td>
<td>56%</td>
</tr>
</tbody>
</table>
USDA voluntary labeling program

- Drive consumer and commercial markets for biobased
- Help consumer understand “biobased product”
- Aid buyer in locating products
- Assures consumers of biobased content percentages
How Certification and Labeling Program Works

• Independent third party, ASTM International, verifies biobased content through approved laboratories

• “USDA Certified Biobased Product” label affixed to qualifying products.