National Institute of Food and Agriculture
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Biomass Research and Development Initiative (BRDI)

FY 2010 Awards

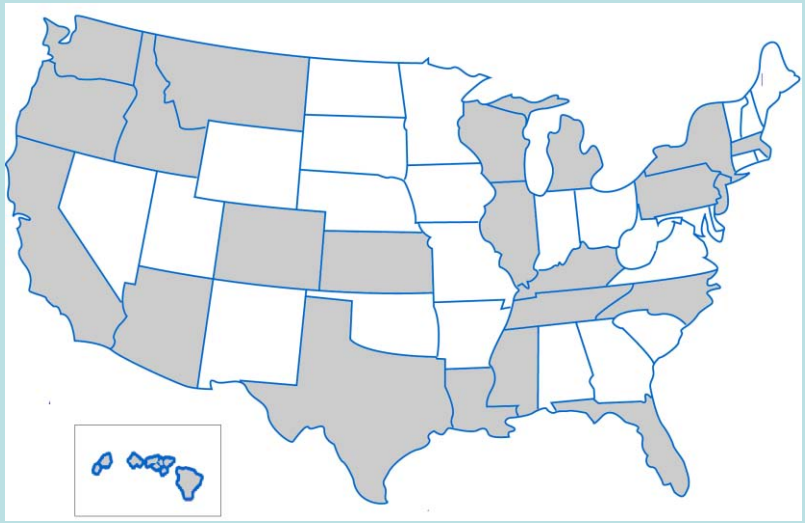
Briefing for Biomass R&D TAC

May 19, 2011

INVESTING IN SCIENCE | SECURING OUR FUTURE

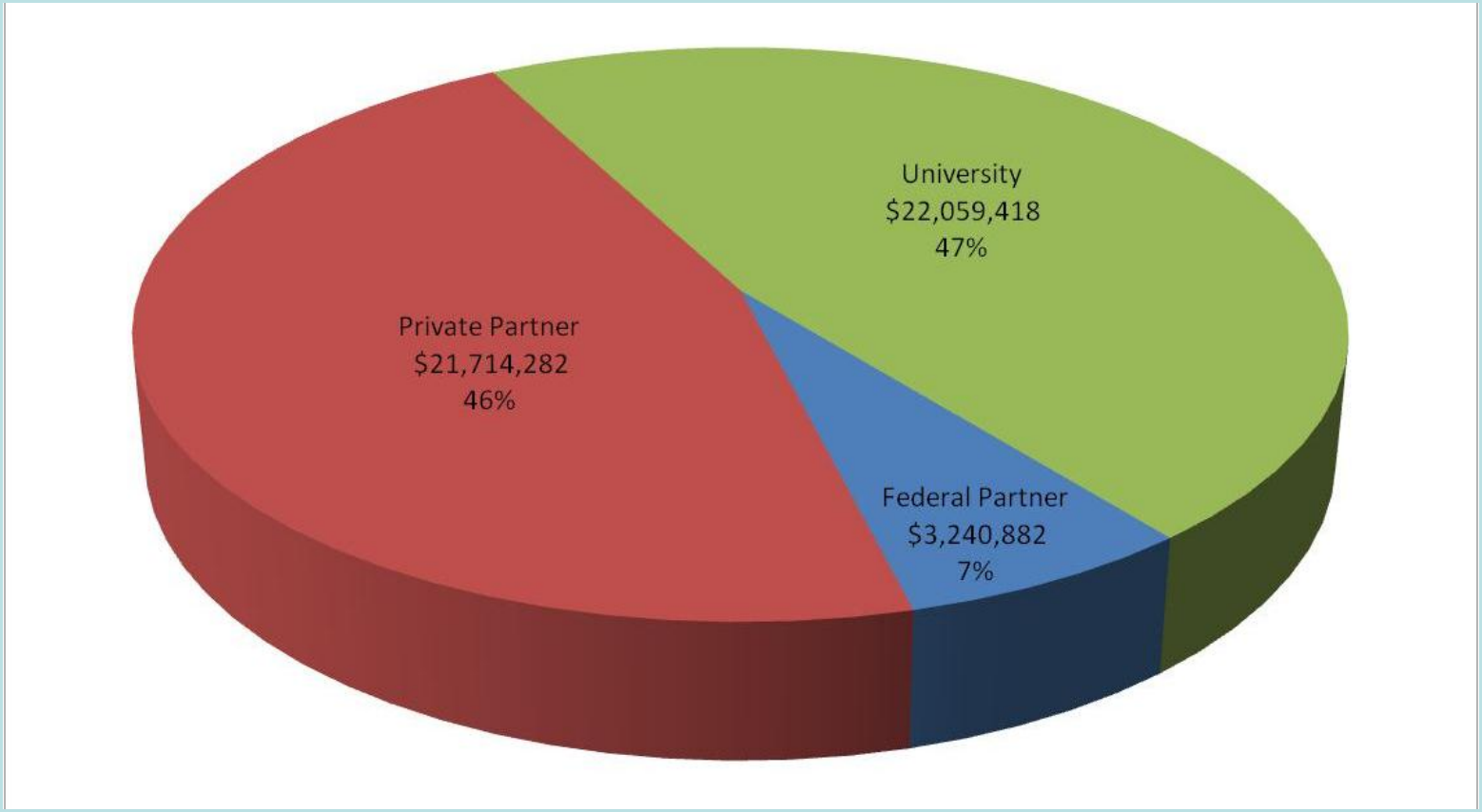
Numbers in Brief

- $47,014,582 in funding
- 63 total Co-PDs
- 23 states†
- Institutions
  - 8 Land-Grant institutions
  - 3 University Partners
  - 10 Federal Partners
  - 25 Corporate Partners
  - 1 Federally Recognized Indian Tribe



†Includes states with cost-share only

Funding by Type of Organization



Integrated Biorefinery at the Domtar Plymouth, North Carolina Paper Mill

- 7 Co-PDs
- 3 states (CA, NC, WI)
- 1 Land Grant Institution
  - North Carolina State University
- 5 Corporate Partners
  - Domtar Paper Company
  - HCL CleanTech
  - Metso Power
  - General Atomics
  - Biofuels Center of North Carolina
- 1 Federal Partner
  - USFS – Forest Products Laboratory

Integrated Biorefinery at the Domtar Plymouth, North Carolina Paper Mill

- Objectives
  - Build a demonstration plant to convert low-value mill side-streams and waste streams (wood chip screen rejects, black liquor, lignin) into higher-value sugar, tall oil, and lignin intermediates, plastics, surfactants, adhesives
  - Address technical barriers to developing new biofuels, and products from intermediates generated by acid hydrolysis
  - Perform an economic and environmental life cycle analysis to demonstrate the viability of scale-up to full commercial scale

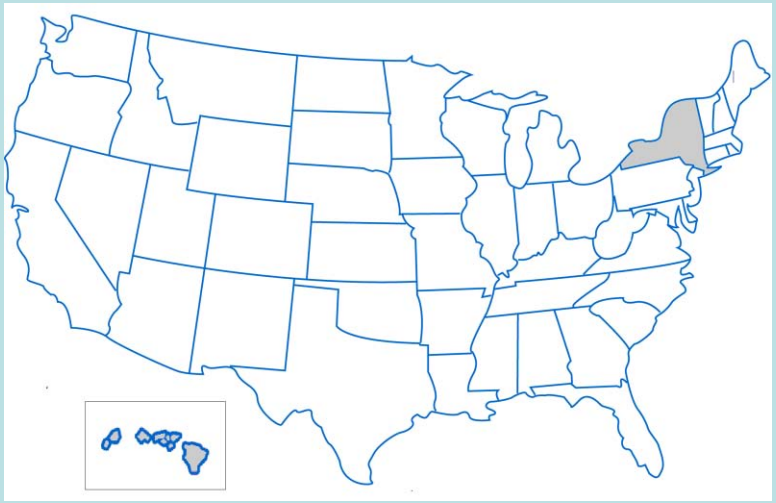
Integrated Biorefinery at the Domtar Plymouth, North Carolina Paper Mill

- Funding breakout
  - Total budget: $20,641,803
  - Federal share: $7,000,000
  - Allotment for Technical Areas
    - (A) 40%
    - (B) 46.5%
    - (C) 13.4%

CELLANA
ALGAE TECHNOLOGY. NATURALLY.

Developing a New Generation of Animal Feed Protein Supplements: Co-Products from Marine Algae Biofuel Production

- 3 Co-PDs
- 2 states (HI, NY)
- 1 Land Grant Institution
  - Cornell University
- 1 Corporate Partner
  - Cellana LLC



CELLANA
ALGAE TECHNOLOGY. NATURALLY.

Developing a New Generation of Animal Feed Protein Supplements: Co-Products from Marine Algae Biofuel Production

- Objectives
  - Characterize the chemical composition and nutritional values of algal proteins for use in swine and poultry feeds to replace soybean meal
  - Algal biomass byproduct remaining from oil extraction
  - Analysis of energy and environmental impacts of algae-to-biofuels pathway including animal feed co-product to serve as strategic guidance for commercial deployment

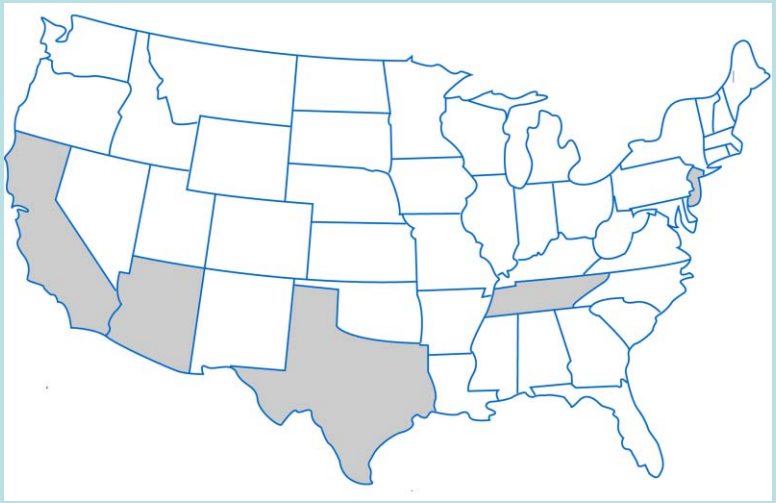
CELLANA
ALGAE TECHNOLOGY. NATURALLY.

Developing a New Generation of Animal Feed Protein Supplements: Co-Products from Marine Algae Biofuel Production

- Funding breakout
  - Total budget: $7,164,834
  - Federal share: $5,521,173
  - Allotment for Technical Areas
    - (A) 57%
    - (B) 31%
    - (C) 11.9%

Technology to Enable Local Production of Biofuels from Energy Crops

- 3 Co-PDs
- 5 states (AZ, CA, NJ, TN, TX)
- 2 Corporate Partners
  - Exelus
  - Ceres, Inc.
- 1 Federal Partner
  - Oak Ridge National Laboratory



Exelus

Technology to Enable Local Production of Biofuels from Energy Crops

- Objectives
  - Combine new technologies to expand viable energy crop acreage, permitting economical, small-scale conversion to fuels close to the farm
  - Incorporate drought and salt tolerance genes into high-yielding switchgrass and Miscanthus
  - Optimize catalyst for feedstock and for small scales ops to produce paraffinic syncrude
  - Analysis will include multi-scale modeling framework for “seed-to-wheel”

Exelus

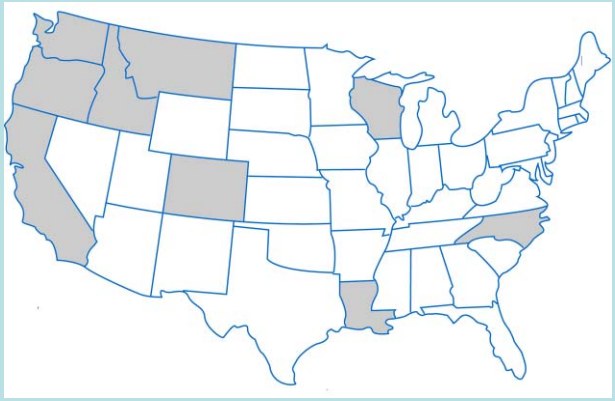
Technology to Enable Local Production of Biofuels from Energy Crops

- Funding breakout
  - Total budget: $6,482,495
  - Federal share: $5,185,004
  - Allotment for Technical Areas
    - (A) 45.7%
    - (B) 36.6%
    - (C) 17.6%

Integration of Biofuels and Bioproducts Production into Forest Products Supply Chains Using Modular Biomass Gasification and Carbon Activation

- 15 Co-PDs
- 8 states (CA, CO, ID, LA, MT, NC, OR, WA, WI)
- 2 Land Grant Institutions
  - University of Montana
  - Washington State University
- 1 University Partner
  - Humboldt State University
- 4 Corporate Partners
  - Bio Energy Conservation Global / Tucker Engineering Associates, Inc.
  - Tricon Timber
  - Jump Trucking
  - Green Diamond Resource Company
- 1 Federally Recognized Indian Tribe
  - Coquille Indian Tribe

- 4 Federal Partners
  - US Forest Service – Rocky Mountain Research Lab
  - US Forest Service – Forest Products Lab
  - US Forest Service – Southern Research Station
  - US Forest Service – Technology Development Center



Integration of Biofuels and Bioproducts Production into Forest Products Supply Chains Using Modular Biomass Gasification and Carbon Activation

- Objectives
  - Develop new trucking and equipment systems to improve access and processing of dispersed forest residues
  - Optimize biomass gasification to generate syngas, biochar as soil amendment and as fuel pellets
  - Use life-cycle analysis (LCA) to evaluate the impacts of biomass harvest and use of biochar as soil amendment on water, soil, and forest ecosystems
  - Financial analysis will address multiple ownership classes with variable land management objectives

Integration of Biofuels and Bioproducts Production into Forest Products Supply Chains Using Modular Biomass Gasification and Carbon Activation

- Funding breakout
  - Total budget: $6,946,631
  - Federal share: $5,309,320
  - Allotment for Technical Areas
    - (A) 29%
    - (B) 35.2%
    - (C) 34.8%

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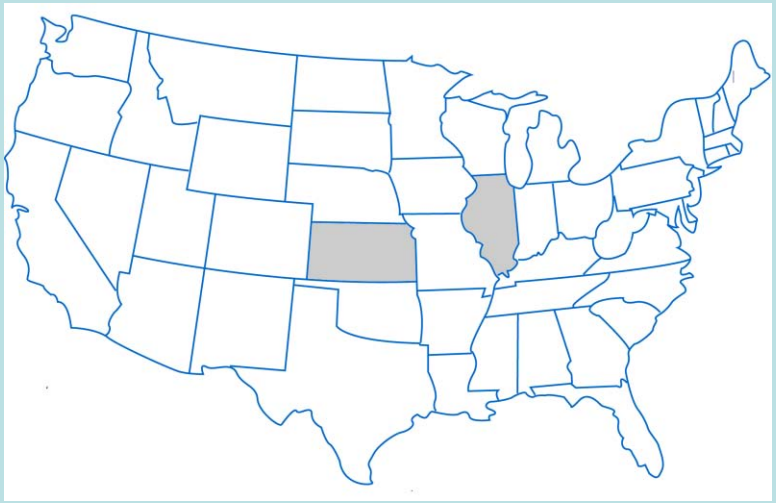
KU THE UNIVERSITY OF KANSAS

Green Technologies for Product Diversification in an Integrated Biorefinery

- 3 Co-PDs
- 2 states (IL, KS)
- 1 University Partner
  - University of Kansas
- 1 Corporate Partner
  - Archer Daniels Midland*



*Cost-share only

KU THE UNIVERSITY OF KANSAS

Green Technologies for Product Diversification in an Integrated Biorefinery

- Objectives
  - Develop and integrate novel green technologies for converting corn stover, lignin and vegetable oils into economically viable spectrum of industrial chemicals
  - Optimize a spectrum of chemical conversions to produce higher alcohols, carboxylic acids, aromatics, chemical intermediates
  - LCA will conform to ISO standards and will quantify energy efficiency, mitigation of CO2 emissions, waste reduction

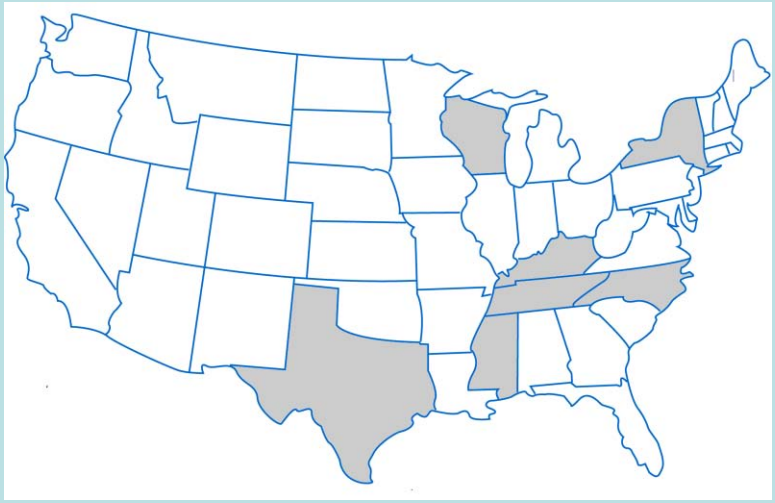
KU THE UNIVERSITY OF KANSAS

Green Technologies for Product Diversification in an Integrated Biorefinery

- Funding breakout
  - Total budget: $7,055,142
  - Federal share: $5,635,858
  - Allotment for Technical Areas
    - (A) 0%
    - (B) 85%
    - (C) 15%

On-Farm Biomass Processing: Towards an Integrated High Solids Transporting/Storing/Processing System

- 21 Co-PDs
- 7 states (KY, MS*, NC, NY*, TN, TX*, WI)
- 4 Land Grant Institutions
  - University of Kentucky
  - North Carolina State University
  - University of Wisconsin
  - Cornell University*
- 4 Federal Partners
  - USDA-ARS – Forage Animal Production Unit
  - Oak Ridge National Laboratory
  - USDA-ARS – National Sedimentation Laboratory
  - USDA-ARS – Grassland Soil and Water Research Laboratory
- 4 Corporate Partners
  - CNH America
  - Miles Enterprises*
  - H&R Agri-Power*
  - Walnut Grove Farm*



*Cost-share only

UNIVERSITY OF KENTUCKY

On-Farm Biomass Processing: Towards an Integrated High Solids Transporting/Storing/Processing System

- Objectives
  - Develop a reliable biomass feedstock supply system using agricultural residues (corn stover and wheat straw) and energy crops (switchgrass, and miscanthus) with enhanced plant genetics, improved crop management practices to increase yield, reduced environmental impacts, and reduced biomass harvest and transportation costs
  - Develop on-farm storage/processing of bales – fungal pretreatment followed by anaerobic fermentation to produce a slurry of butanol, ethanol, acetone, organic acids and economic transport
  - Develop and validate integrated geographic information system (GIS) and life cycle models to provide strategic guidance to the development of the proposed on-farm processing system

UNIVERSITY OF KENTUCKY

On-Farm Biomass Processing: Towards an Integrated High Solids Transporting/Storing/Processing System

- Funding breakout
  - Total budget: $9,102,561
  - Federal share: $6,932,786
  - Allotment for Technical Areas
    - (A) 41.4%
    - (B) 44%
    - (C) 14.6%

UF UNIVERSITY of FLORIDA

Next-Generation Sweet Sorghums - Sustainable Production of Feedstocks for Fuels, Chemicals and Value-Added Products

- 8 Co-PDs
- 1 state (FL)
- 1 Land Grant Institution
  - University of Florida
- 4 Corporate Partners
  - U.S. EnviroFuels, LLC
  - CardnoEntrix, LLC*
  - Life Cycle Associates, LLC*
  - SCF Processing, Ltd.*

*Cost-share only

UF UNIVERSITY of FLORIDA

Next-Generation Sweet Sorghums - Sustainable Production of Feedstocks for Fuels, Chemicals and Value-Added Products

- Objectives
  - Determine the genetic basis for efficient water use in sorghum with focus on root architecture and water use during photosynthesis
  - Develop high-biomass, high-sugar sweet sorghums with associated advancements in the production process
  - Optimize conversion of bagasse to ethanol with steam explosion pretreatment, enzymatic saccharification, microbial co-fermentation of 5 and 6 carbon sugars to produce ethanol, lignin based nanotubes and reinforced PLA polymers
  - Perform a life-cycle analysis to assess the environmental impacts and economic analysis of commercial scale fermentation of combined sugars from juice and bagasse, and including markets and employment potential

UF UNIVERSITY of FLORIDA

Next-Generation Sweet Sorghums - Sustainable Production of Feedstocks for Fuels, Chemicals and Value-Added Products

- Funding breakout
  - Total budget: $7,099,429
  - Federal share: $5,430,439
  - Allotment for Technical Areas
    - (A) 33.7%
    - (B) 46.6%
    - (C) 19.5%

FY 2011 Solicitation

- FOA announced April 15
- DOE administers pre-application process
- USDA administers full application process
- USDA funding up to $25M
- DOE funding up to $5M
- Pre-applications due May 31
- Invited full applications August 3
- Awards anticipated early January 2012

FY 2011 Solicitation

- Topics of interest same as FY 2010: advanced biofuels, biobased products, chemicals, small scale processing
- Integration of three technical areas
- New topic – demonstrate use of biodiesel in farming equipment and processing facility ops to produce ethanol