USDA Update:
Building the Biobased Economy

Todd Campbell

USDA Rural Development

BIOMASS RESEARCH AND DEVELOPMENT
TECHNICAL ADVISORY COMMITTEE
NOVEMBER 17TH, 2016

In announcement inviting applications for 9003 Program…

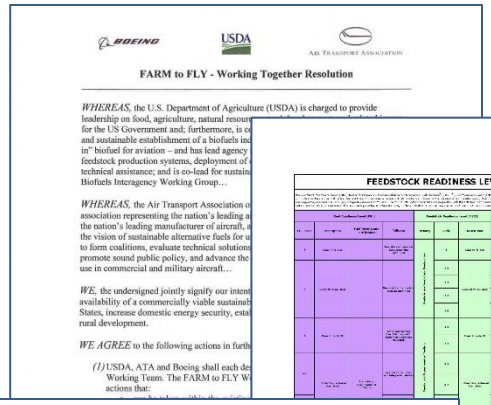
"The bioeconomy is a catalyst for economic development in rural America, creating new jobs and providing new markets for farmers and ranchers. Investing in the businesses and technologies that support the production of biofuels and biobased products is not only good for farm incomes. The whole economy benefits from a more balanced, diversified and consumer-friendly energy portfolio, less dependence on foreign oil and reduced carbon emissions."

--Secretary Tom Vilsack, USDA

http://www.usda.gov/wps/portal/usda/usdahome?contentid=2016/07/0174.xml&navid=NEWS_AUSUMS&navtype=RT&parentnav=ENERGY&edeployment_action=retrievecontent

Working Together with CAAFI/FAA, DOE, and U.S. Navy

Farm to Fly (2010, 2012 report) Navy/DPA/F2Fleet (2010, 2011, 2013) Farm to Fly 2.0 (2013, DOE 2014)


FARM to FLY - Working Together Resolution

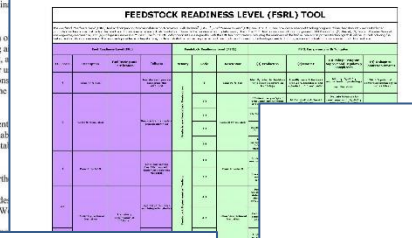
WHEREAS, the U.S. Department of Agriculture (USDA) is charged to provide leadership on food, agriculture, natural resour...

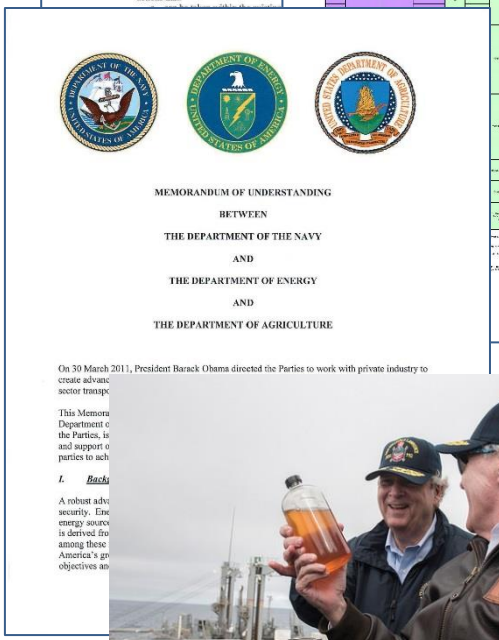
WHEREAS, the Air Transport Association o... association representing the nation's leading a... the nation's leading manufacturer of aircraft, a... the vision of sustainable alternative fuels for u... to form coalitions, evaluate technical solutions... promote sound public policy, and advance the... use in commercial and military aircraft...

WE, the undersigned jointly signify our intent... availability of a commercially viable sustainab... States, increase domestic energy security, esta... rural development.

WE AGREE to the following actions in furth...

(1) USDA, ATA and Boeing shall each de... Working Team. The FARM to FLY W... actions that;


FEEDSTOCK READINESS LEVEL (FSRL) TOOL


MEMORANDUM OF UNDERSTANDING

BETWEEN

THE DEPARTMENT OF THE NAVY

AND

THE DEPARTMENT OF ENERGY

AND

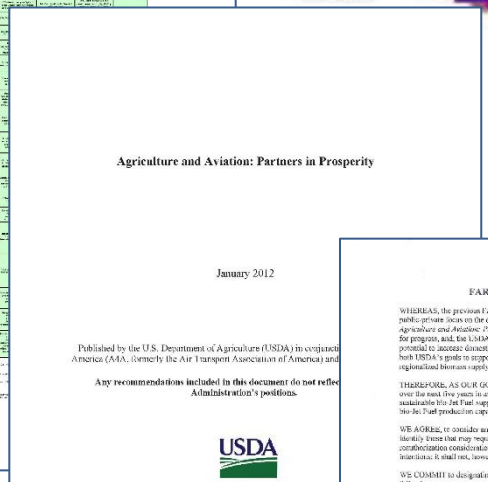
THE DEPARTMENT OF AGRICULTURE

On 30 March 2011, President Barack Obama directed the Parties to work with private industry to create advanc... sector transp...

This Memora... Department o... the Parties, is... and support o... parties to ach...

I. Back...

A robust adv... security. End... energy source... is derived fro... among these... America's gr... objectives an...


Agriculture and Aviation: Partners in Prosperity

January 2012

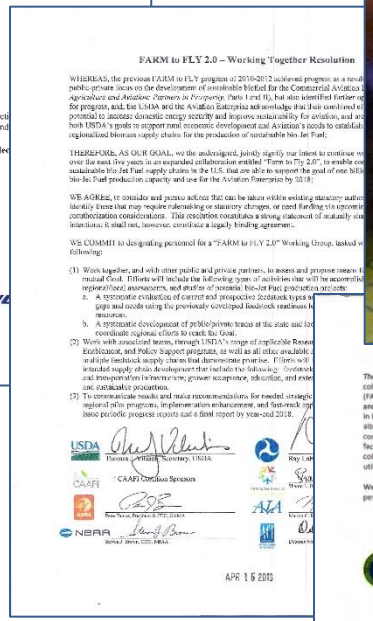
Published by the U.S. Department of Agriculture (USDA) in conjunct... America (AAA, formerly the Air Transport Association of America) and...

Any recommendations included in this document do not reflec... Administration's positions.

USDA

Airlines for America

BOEING


FARM to FLY 2.0 – Working Together Resolution

WHEREAS, the previous FARM to FLY program of 2010-2012 achieved progress as a result... public-private focus on the development of sustainable biofuel for the Commercial Aviation... *Agriculture and Aviation: Partners in Prosperity*, Parts I and II), but also identified further op... for progress, and, the USDA and the Aviation Enterprise acknowledge that their combined st... potential to increase domestic energy security and improve sustainability for aviation, and ac... both USDA's goals to support rural economic development and Aviation's needs to establish... regionalized biomass supply chains for the production of sustainable bio-Jet Fuel;

THEREFORE, AS OUR GOAL, we the undersigned, jointly signify our intent to continue w... over the next five years in an expanded collaboration entitled "Farm to Fly 2.0", to enable co... sustainable Bio-Jet Fuel supply chains in the U.S. that are able to support the goal of one Bill... bio-Jet Fuel production capacity and use for the Aviation Enterprise by 2018;

WE AGREE, to consider and pursue actions that can be taken within existing statutory auth... identify those that may require rulemaking or statutory changes, or need funding via upcomin... coordination considerations. This resolution constitutes a strong statement of mutually sig... intentions; it shall not, however, constitute a legally binding agreement;

WE COMMIT to designating personnel for a "FARM to FLY 2.0" Working Group, tasked w... following:

(1) Work together, and with other public and private partners, to assess and propose means f... mutual Goal. Efforts will include the following types of activities that will be accomplis... regional/local assessments, and studies of scientific bio-Jet Fuel production projects;

a. A systematic evaluation of current and prospective feedstock types that... gaps and needs using the previously developed feedstock readiness le... assurances.

b. A systematic development of public/private teams at the state and lo... coordinate regional efforts to reach the Goal.

(2) Work with associated teams, through USDA's range of applicable Research... Technical, and Policy Support programs, as well as all other available... multiple feedstock supply chains that demonstrate promise. Efforts will... intended supply chain development that include the following: feedstock... and transportation infrastructure; grower acceptance, education, and extens... are sustainable production.

(3) To communicate results and make recommendations for needed strategic... regional pilot programs, implementation enhancement, and fast-track opp... issue periodic progress reports and a final report by year-end 2018.

USDA Thomas J. Vilsack, Secretary, USDA

CAAFI Coalition Sponsors

NBAA

AIA

APR 15 2013

Farm to Fly 2.0 – Department of Energy Signature Amendment

The Department of Energy (DOE) recognizes the value of the "Farm to Fly 2.0" Program as a critical collaboration between the Department of Agriculture (USDA), the Federal Aviation Administration (FAA), and key aviation industry organizations. DOE supports the development of commercially viable and sustainable advanced jet fuel conversion technologies in the US. Specific areas of DOE involvement in Farm to Fly 2.0 could include but not be limited to: (1) techno-economic analysis of innovative alternative jet fuel pathways; (2) life-cycle greenhouse gas emissions assessments of alternative jet fuel conversion processes, (3) development and support of pilot and/or demonstration-scale conversion facilities that can produce jet fuel using promising process technologies, and (4) assisting and collaborating on fuel certification/testing/approval processes for jet fuels from sustainable feedstocks utilizing new and emerging conversion technologies.

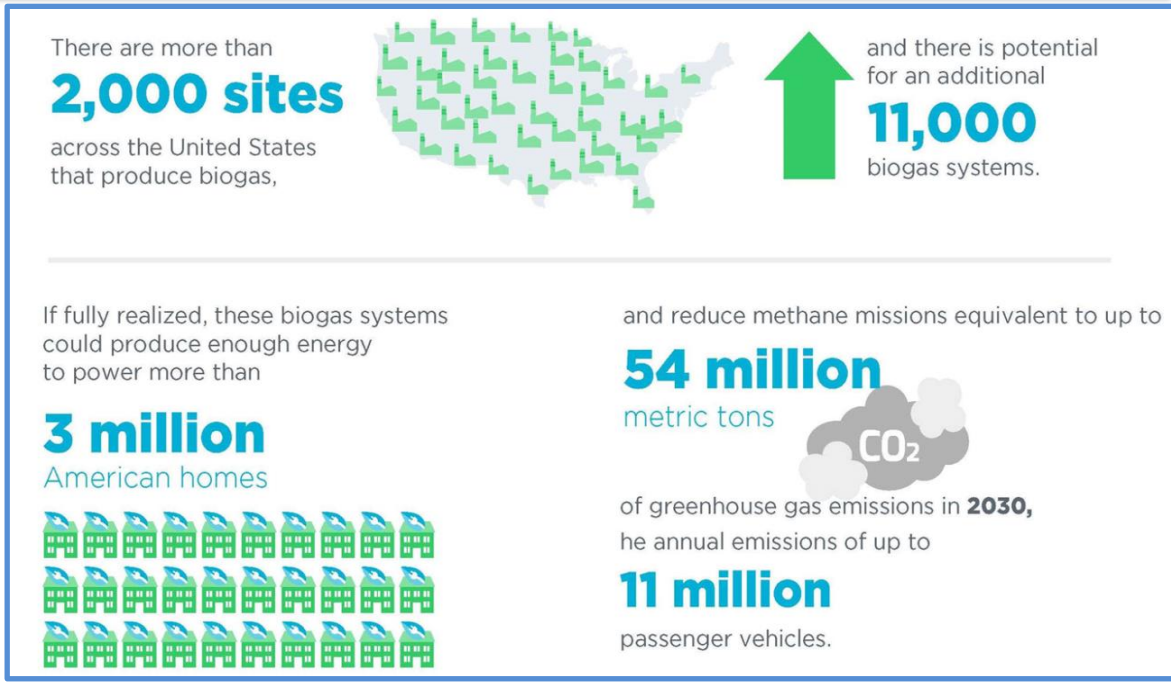
We agree to act in accordance with and support the "Farm to Fly 2.0" Initiative, and commit DOE personnel and resources to the existing "Farm to Fly 2.0" working groups as appropriate.

Ernest J. Moniz, Secretary, DOE

Biogas Opportunities Roadmap and the Food Waste Challenge

Biogas Progress Report Highlights:

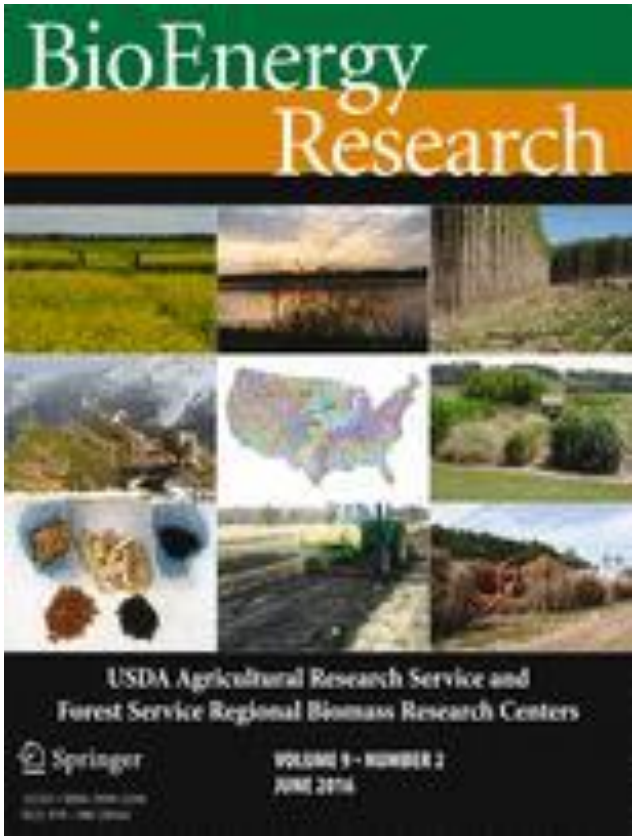
- Inclusion in RFS Pathways II cellulosic advanced fuels
- DOE Resource Assessment on Renewable Hydrogen Potential from Biogas
- USDA published final Rural Energy for America Program (REAP) rule, streamlined application and scoring



- DOE's BETO Multi-Year Program Plan explicitly calls out "wet waste", a key in biogas
- USDA Rural Utility Services loan guarantees to distributed generations projects that produce electricity (with Power Purchase Agreements) to serve rural areas.
- USDA 9003 Program interim rule and funding notice to provide loan guarantees to commercial, municipal, and industrial biogas plant deployment.
- http://www.usda.gov/oce/reports/energy/Biogas_Opportunities_Roadmap_8-1-14.pdf
  http://www.rd.usda.gov/files/Biogas-Roadmap-Progress-Report-v12.pdf
- Will also help to support the United States' first-ever Food Waste Reduction Goal, calling for total of 50-percent reduction by 2030 (133 billion pounds of waste per year)

USDA Regional Biomass Research and Agricultural Utilization at Regional Research Centers

- Special Edition of BioEnergy Research reviews the research accomplishments of Agriculture Research Service (ARS) and Forest Service (FS) on biomass and bioenergy.
- The first 12 articles of issue encapsulate much of the research that was reported by the USDA Regional Biomass Research Centers since their inception in 2010.
- For a electronic copy of the report, use the following link: Volume 9, Issue 2, June 2016 Special Edition of BioEnergy Research



- More on Cooperative Research and Development Agreement (CRADA) and Technology Transfer to move research to marketplace

External Research supported through the National Institute for Food and Agriculture (NIFA)

- Agriculture and Food Research Initiative (AFRI)
  - $21M available through Sustainable Bioenergy and Bioproducts challenge area, which creates or sustains jobs by enhancing existing food and fiber production systems, boosts ecosystems by reducing greenhouse gases and improving water and habitat quality, and providing renewable energy, chemical, and product options.
  - Received proposals for four awards up to $15M
  - Invested ~$237 million in research, education, extension grants since '09
- Biomass Research and Development Initiative (BRDI) Request for Application due out soon, Joint USDA-NIFA and DOE-BETO
- Joint Feedstock Genomics for Bioenergy Program solicitation due out this month, joint USDA-NIFA and DOE-Office of Science
- Biorefinery Optimization solicitation may be out before the end of the year, joint USDA-NIFA and DOE-BETO

Biomass Crop Assistance Program (BCAP) and New Risk Mitigation Tools for Producers

- BCAP incentivizing nearly 1,000 growers on 49,000 acres to establish and maintain new dedicated biomass crops for delivery to USDA-approved conversion facilities.
- Retrieval payments are provided at a dollar for dollar match match, up to $20 per dry ton for eligible materials including corn residue, diseased or insect-infested wood materials, or orchard waste.
- More at www.fsa.usda.gov/bcap or contact a FSA county office.
- Risk Management Agency recently announced insurance for carinata written under canola and rapeseed plans Montana, North Dakota, and South Dakota; Builds on available tools mad available for camilina, miscanthus, switchgrass
- Learn more about crop insurance and the modern farm safety net at www.rma.usda.gov.

Biomass Crop Assistance Program (BCAP)

- BCAP Matching Payments sign up runs Jan. 9 to Mar. 15, 2017
- $1.5 million is available to eligible material owners delivering to over 56 qualified biomass conversion facilities
- Eligible biomass will be forest residue from the National Forest System and agricultural residue
- BCAP FY 2016 Activity:
  - Number of BCAP Project Area Contracts……852
  - Amount of BCAP Project Area Payments……$3,957,106
  - Number of BCAP Matching Payments……240
  - Amount of BCAP Matching Payments……$5,326,627

Pioneer Plants through the Biorefinery, Renewable Chemical, and Biobased Product Manufacturing Assistance Program (9003)

- 3 new projects green lighted to Phase 2 with current pool
- The program provides loan guarantees of up to $250 million to develop, construct and retrofit commercial-scale biorefineries and to develop renewable chemicals and biobased product manufacturing.
- For this announcement, USDA will seek applications in two cycles. Applications for the first funding cycle were due **October 3, 2016.** Applications for the second cycle are due **April 3, 2017**.
- Newly implemented two-phase application process to help identify projects that have made most progress in the development stage, greatest capacity for implementation and loan closing.
- First two cycles under the new process yielded complete applications from projects producing biogas, biodiesel, cellulosic ethanol, biobased lubricants and oils, lignin cake and syrup, and fertilizers.
- For more information, p. 48377 of the July 25, 2016, Federal Register.
- Application materials on USDA's Rural Development website.

Expanding markets with a Biofuel Infrastructure Partnership

- USDA is partnering with 21 states through the Biofuel Infrastructure Partnership (BIP) to nearly double the number of fueling pumps nationwide that supply renewable fuels to American motorists.
- With the matching commitments by state and private entities, the BIP is investing a total of $210 million to strengthen the rural economy, with match amounts and requests outpacing the $100 million available.
- These awards are estimated to expand infrastructure by nearly 5,000 pumps at over 1,400 fueling stations.
- More information: www.fsa.usda.gov/programs-and-services/energy-programs/bip/index

Strengthening Markets with BioPreferred

- More than 2,700 biobased products on store shelves carrying BioPreferred label, Represents companies in over 40 countries on six continents; Apply on BioPreferred.gov
- Over 100 designated product categories representing around 15,000 products included in the mandatory federal purchasing initiative

Tide PurClean, recently certified through the BioPreferred Program

BioPreferred Economic Impact Report

- To learn more about the viability of the U.S biobased industry and bioeconomy read the original published BioPreferred Economic Impact Report (2015) and Updated Economic Impact Analysis of the U.S. Biobased Product Industry (2016)

The Number of Jobs Contributed to the U.S. Economy by the U.S. Biobased Products Industry in 2014

4.22 Million

Up from 4.02 Million in 2013

Value added Contribution to the U.S. Economy from the U.S. Biobased Products Industry in 2014

$393 Billion

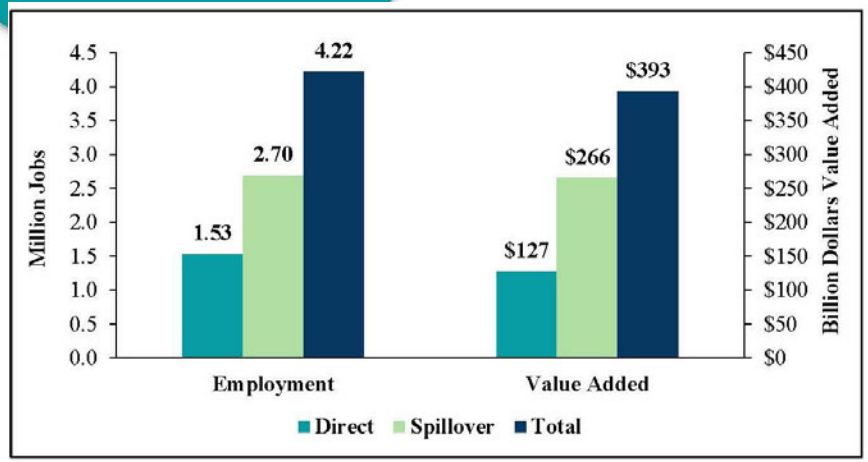
Up from $369B in 2013

The Jobs Multiplier

2.76

For every 1,000 Biobased Products jobs, 1,760 more jobs are supported in the United States
Up from 2.64 in 2013

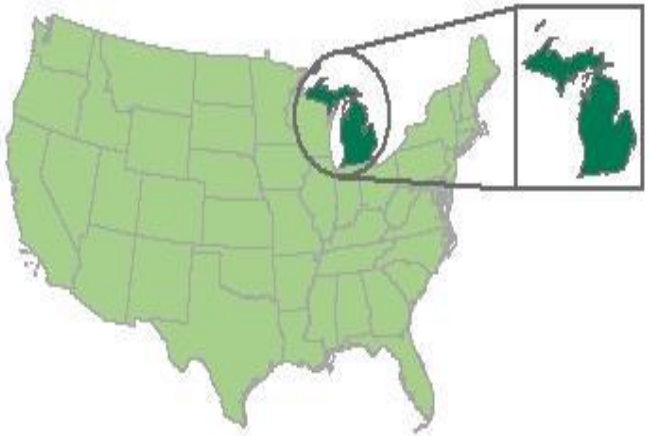
2016 report shows increase of 200,000 total jobs and $24 billion additional value-added contribution to the U.S. Economy from 2013 to 2014



What's new this year? State by State Analysis of all 50 States

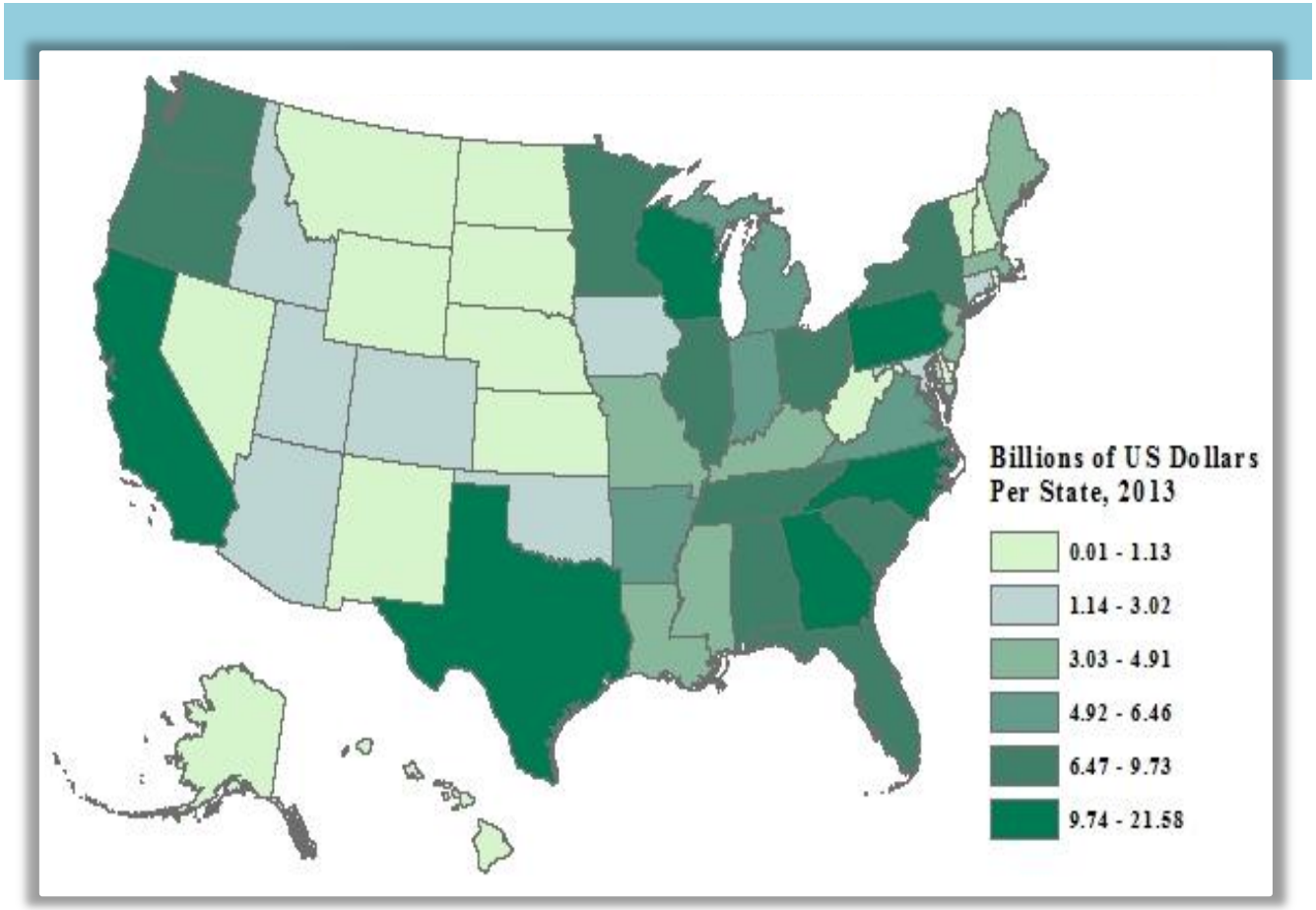
Michigan

- Total Jobs: 81,820
- Direct Jobs: 37,790
- Total Value Added: $6.426 I
- Direct Value Added: $2.882



- 52 Michigan companies currently participate in the BioPreferred Program.
- Example: Biobased Chemicals – Lear Corporation (Southfield, MI; lear.com) Lear Corporation produces SoyFoam, derived from soybean oil, for automotive interior applications on North American Ford and other customer vehicles.

Direct Value Added Contribution by the Biobased Products Industry in Each State and the District of Columbia in 2013



For more information on USDA Energy and Bioeconomy Programs, visit: www.usda.gov/energy

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The Bioeconomy Initiative:
A National Strategy for the Billion Ton Vision

Todd Campbell

USDA Rural Development

BIOMASS RESEARCH AND DEVELOPMENT
TECHNICAL ADVISORY COMMITTEE
NOVEMBER 17TH, 2016

Biobased Economy Expansion over Several Administrations Perspectives on the Growth of the U.S. Bioeconomy

- Executive Order 13134 issued in August 1999, President Clinton launched a national Bioenergy Initiative, "a national partnership...to produce power, fuels and chemicals from crops, trees and wastes." The Executive Order established a goal: to "triple the U.S. use of biobased products and bioenergy by 2010.“

- The Biomass Research and Development Act of 2000, later amended by Section 9001 of the Food Conservation and Energy Act of 2008 (FCEA) and most recently reauthorized in the Agricultural Act of 2014, established the Biomass Research and Development Board (BRD). The BRD is co-chaired by the USDA and DOE with 6 other agencies servicing on the BRD. The Biomass Research and Development Board (Board) coordinates research and development activities concerning biobased fuels, products, and power across federal agencies.

The Biomass Research & Development Board

- Board facilitates coordination among federal government agencies that affect the research, development, and deployment of biofuels and bioproducts.

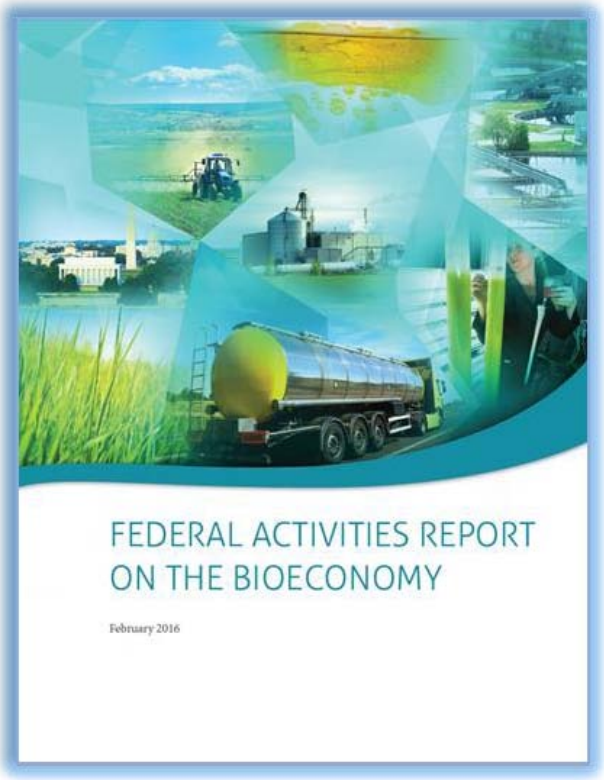
Agency	Feedstock Supply	Biomass Conversion	Bioenergy Distribution	Bioenergy End Use
DOE	● ● ● ●	● ● ● ● ●	● ● ●	● ● ● ● ●
USDA	● ● ● ● ●	● ● ● ●	● ● ● ● ●	● ● ● ●
DOT	● ● ● ●	● ● ●	● ● ● ● ●	● ● ● ● ●
EPA	● ● ● ● ●	● ● ● ● ●	● ● ● ● ●	● ● ● ●
DOI	● ●	●		
NSF	● ● ●	● ● ● ●	●	
DoD		● ●	● ● ● ●	● ● ● ●

● Use an integrated systems approach
● Provide the science and the technology
● Public and private collaboration to overcome barriers and accelerate deployment
● Develop a workforce for the future bioeconomy
● Understand and inform policy

BR&DB
BIOMASS RESEARCH & DEVELOPMENT BOARD

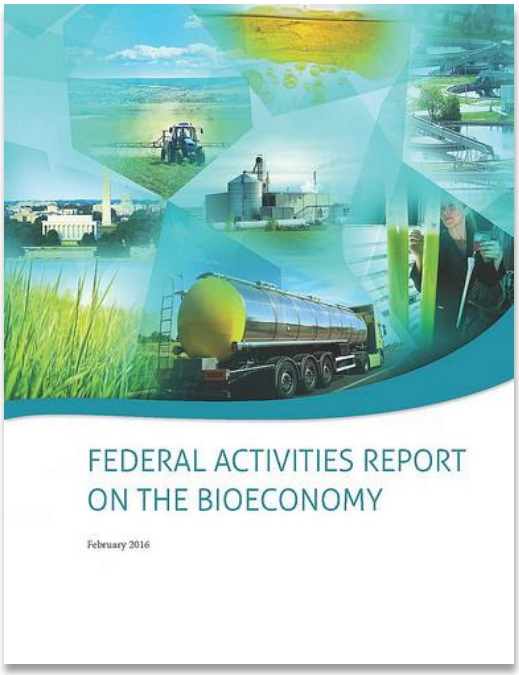
Federal Activities Report on the Bioeconomy (FARB)

In February, the Biomass R&D Board released the Federal Activities Report on the Bioeconomy. This report aims to educate the public on the wide-ranging, federally funded activities that are helping to bolster the bioeconomy.



- The **vision** for the Billion Ton Bioeconomy is to sustainably reach the full potential of biomass-derived products as a way of expanding our nation's economy. In doing so, the bioeconomy will provide multiple economic, environmental, and social benefits to the Nation.
- The **goal** of the Billion Ton Bioeconomy is to develop and provide innovative ways to remove barriers to expanding the sustainable use of Nation's abundant biomass resources for biofuels, bioproducts, and biopower, while maximizing economic, social, and environmental outcomes.

The Billion Ton Bioeconomy Vision



FARB

- Released in February 2016

Challenges & Opportunities

- Released November 2016

Action Plan

- Target release FY17, possibly in first 100 days of next administration

Report Outline

- Introduction
  - Purpose of the report
  - Background of the Bioeconomy Effort
- The Bioeconomy Initiative
  - Path to building the Initiative
  - Overview of the Bioeconomy Vision as stated in the FARB
  - Highlights and Learnings from the FARB
  - Expected benefits for 2030 as defined by Analysis IWG
- Challenge Areas (as identified by Stakeholders)
- Ongoing Interagency Areas of Importance and Growth for the Initiative
- Next Steps/Path Forward
  - How to move from the Strategy Report to an Action/Implementation Plan
  - Additional Stakeholder Involvement
  - Call for partners from industry/research community to 'Join the Initiative'
- Conclusion

Key Challenges Identified

This report discusses seven of the high-priority challenges recognized by the bioeconomy stakeholder community, identified below:

- Major technical hurdles for development and scale.
- Steep competition from traditional petroleum-derived resources.
- A lack of necessary infrastructure.
- Access to capital for large financial investments.
- Uncertainties about sustainability—understanding environmental, social, and economic outcomes.
- Growth instability and increased investment risk caused by policy uncertainty
- The need for a strong and capable workforce.

Key Opportunities

Specific opportunities within each challenge as potential growth areas for the future of the Initiative are detailed below:

- Develop feedstock and fundamental innovations that reduce cost and technology risk in the supply chain.
- Seek opportunities to utilize low-cost waste resources.
- Quantify, communicate, and enhance beneficial effects and minimize negative impacts.
- Create increased public demand for biomass-derived products in a bioeconomy.

Key Opportunities Continued

- Develop bioproducts that can accelerate biofuel production.
- Enable the testing and approval of new biofuels and bioproducts.
- Expand the market potential for biomass.
- Encourage private-sector financing
- Support stable, long-term policies.
- Ensure a ready workforce to meet the needs of the bioeconomy

Sample of Stakeholder Feedback

- Federal sector can address several needs across the supply chain:
  - Access to capital
  - Speed to market
  - Loan guarantees
- Promote incentives available for low carbon biomass that accomplishes additional goals:
  - Restoring degraded land
  - Double/triple cropping
  - Better management of waste
- Suggestions on defining the bioeconomy
  - Establish a normalizing currency in order to value biomass-derived feedstocks as tradable commodities; i.e. $/megajoule conversion formula for each feedstock based on sugar content.
  - Provide granular description of economic impact of bioeconomy; where are the jobs located and what type of jobs are/will be available?
  - Ensure that chemicals, materials, and products are all emphasized.
  - Include a broad range of activities that are part of the bioeconomy; i.e. end use products such as automobiles.
- Suggestions on advancing the bioeconomy
  - Aggressively pursue inclusion of rural communities; eliminate regulatory bottlenecks that may impact rural opportunities.
  - Enlist support of investment community, oil and gas industry, and automobile manufacturers

Stakeholder Engagement Workshops with ATIP Foundation

- Agricultural Technology Innovation Partnership (ATIP) Foundation, a consortium of State Economic Development organizations, co-host a series of regional Bioeconomy Forums with a coordinating entity to garner input from a broad range of stakeholders to seek their input, relative to the initiative's vision, strategies, and implementation to help shape a multiyear implementation plan being prepared by the Biomass R&D Board.

Dates & Locations	
September 16, 2016	Atlanta, GA
September 29, 2016	Mineral Wells, TX
October 3, 2016	Seattle-Tacoma, WA
October 18, 2016	Orono, ME
November 15, 2016	Wooster, OH

- Builds on Billion Ton Bioeconomy listening sessions conducted by USDA and DOE, Feb-May 2016 through webcast and at four major conferences:
  - Advanced Bioeconomy Leadership Conference in DC;
  - International Biomass Conference in Charlotte, NC;
  - World Congress on Industrial Biotechnology in San Diego, CA;
  - Symposium on Biotechnology for Fuels and Chemicals in Baltimore, MD.
- **Total consultation with ~600 people and ~3000 hours of recorded input for analysis**

FY16 Highlights and Accomplishments, FY 17 Goals

Q3 BR&D Board Meeting Outcomes:

- Presentations on the Great Green Fleet and the Federal Alternative Jet Fuel Strategy
- Approved establishment of new Sustainability Interagency Working Group to develop sustainability framework to be included in Action Plan, need called out in the FARB and the Challenges and Opportunities report.
- Agreed upon Summary Sheet of Challenges and Opportunities for use at ATIP Regional Forums/Stakeholder Workshops

Bioeconomy Analyses Manuscript:

- "An Assessment of the Potential Products and Economic and Environmental Impacts Resulting from a Billion Ton Bioeconomy"
- Approved for publication in *Biofuels, Bioproducts, & Biorefining*

Next Steps:

Launch the Bioeconomy on biomassboard.gov web page, Central website to house all Bioeconomy Initiative related materials, including workshop reports, event calendar, videos, and more

Coordinate with the Board, OpsCo, IWGs, and Writing Team to:

- Continue Development of scoping document for the Action Plan
- Host a workshop in 2017 to determine path forward for Action Plan
- Develop and release the Bioeconomy Initiative Action Plan

A BILLION DRY TONS OF SUSTAINABLE BIOMASS

HAS THE POTENTIAL TO PRODUCE

1.1 MILLION Direct Jobs
and keeps about
$250 BILLION
in the U.S.
(direct contribution and inflation adjusted)

85 BILLION*
kWh of electricity
to power
6 MILLION
households. Plus
1050 TRILLION BTUs
of thermal energy.

50 BILLION
gallons of biofuels
displacing almost
25%
of all transportation fuels.

50 BILLION POUNDS
of biobased chemicals and bio-products, replacing a significant portion of the chemical market.

400 MILLION TONS
of CO_2e reductions every year.

STEPS TO BUILDING THE BIOECONOMY

1. Accelerate research & technology development
2. Develop production, conversion and distribution infrastructure
3. Deploy technology
4. Create markets and delivery systems

Projections based on:

- 2016 Billion Ton Study Report (Forthcoming)
- EIA 2015 AEO
- 2015 USDA Long-Term Forecast
- Various data sources

* Includes 27 billion kWh and 90 TBtu from livestock anaerobic digestion

For more information on USDA Energy and Bioeconomy Programs, visit: www.usda.gov/energy

For Biomass R&D Board, visit: http://www.biomassboard.gov/

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