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Office of Energy Policy and New Uses**

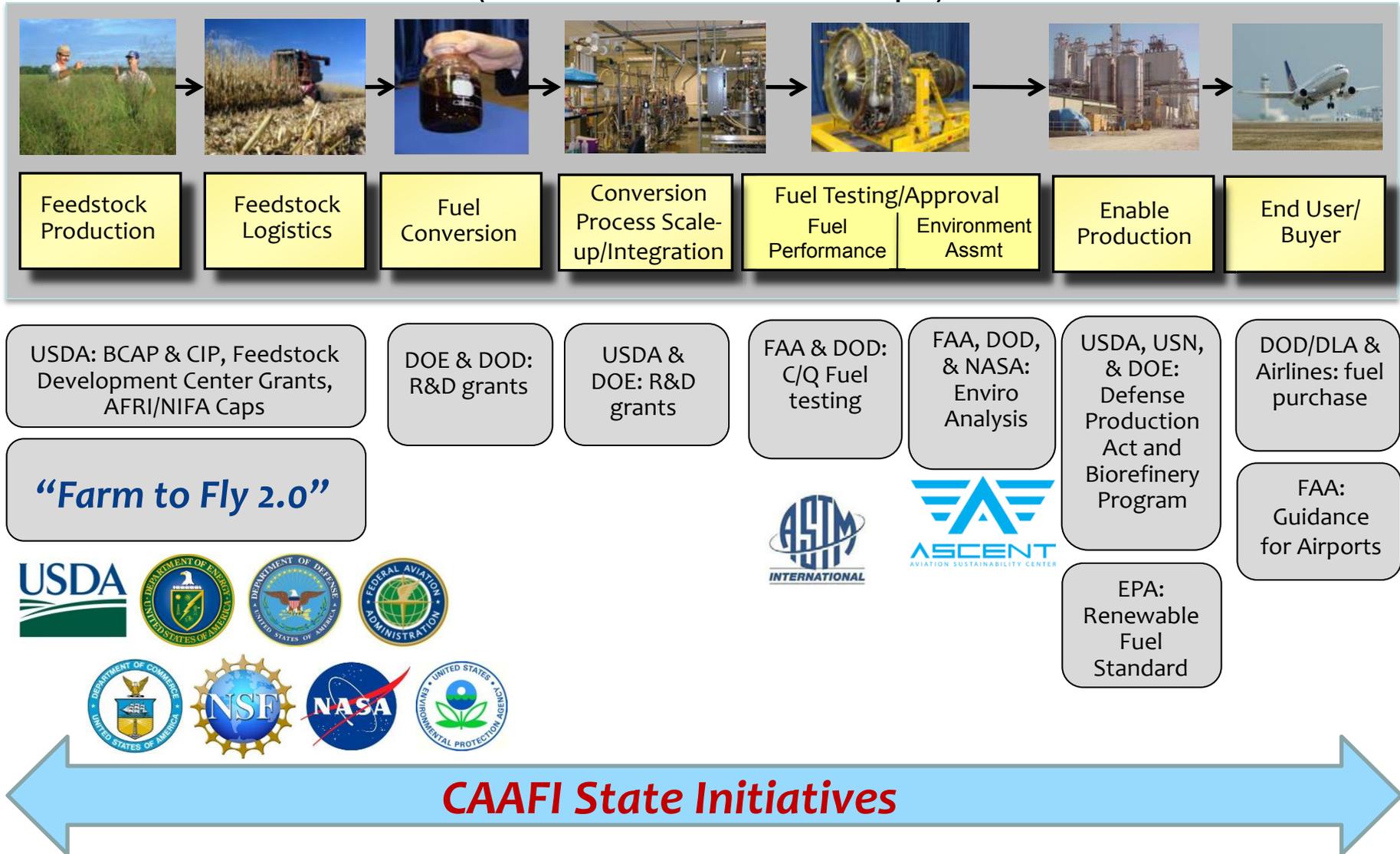
# **USDA: Feedstocks and the AJF Supply Chain The Broad Picture**

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Office of Energy Policy and New Uses  
Office of the Chief Economist  
United States Department of Agriculture**



**Alternative Aviation Fuel Workshop  
Macon, Georgia  
September 14, 2016**

# Efforts across Alternative Jet Fuel Supply Chain\* (Public-Private Partnerships)



\*Jim Heilman, FAA

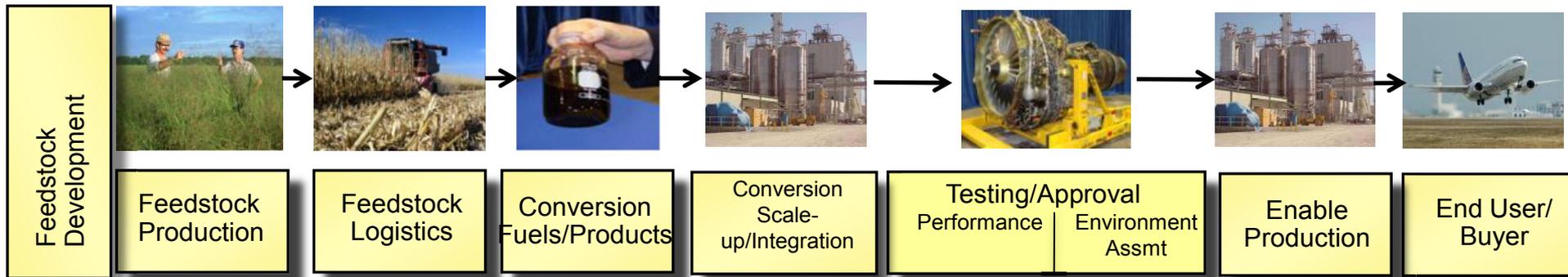


# Agenda

- **Research**
  - **Biomass Research Centers**
  - **Coordinated Agricultural Project**
- **Policy**
  - **Title IX**
- **Partnerships**
  - **Interagency Working Groups**
  - **Defense Production Act**
  - **Farm to Fly 2.0**



# Supply Chain Approach for the Bioeconomy



**Feedstock Development & Production**  
**Research and Education**

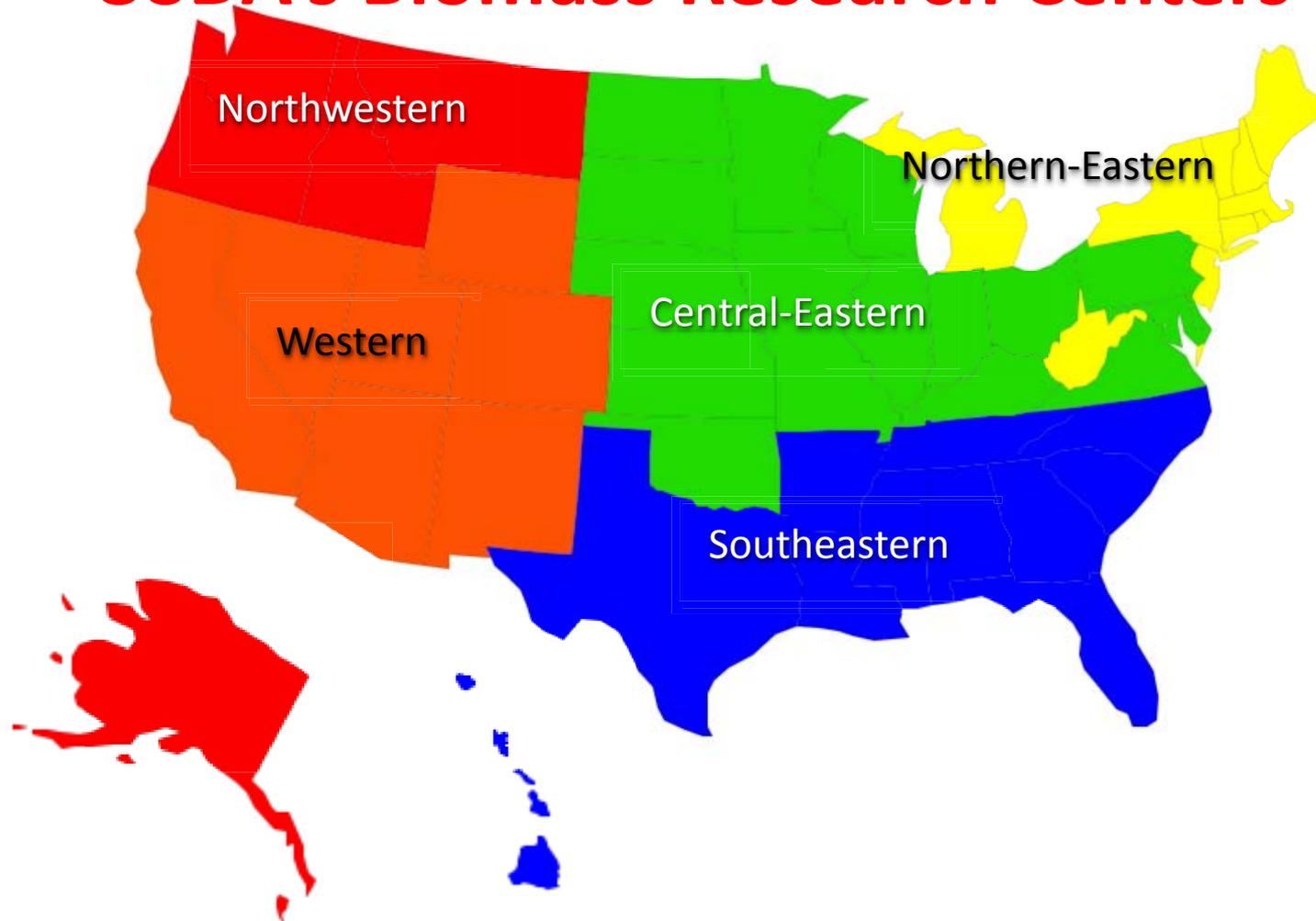
**Feedstock pathways – Integration - Scale Up**  
**Commercial Production**

**End –Use Markets**  
**Alternative Fuels**  
**Heat & Power**  
**Renewable Chemicals**  
**Biobased Manufacturing & Products**



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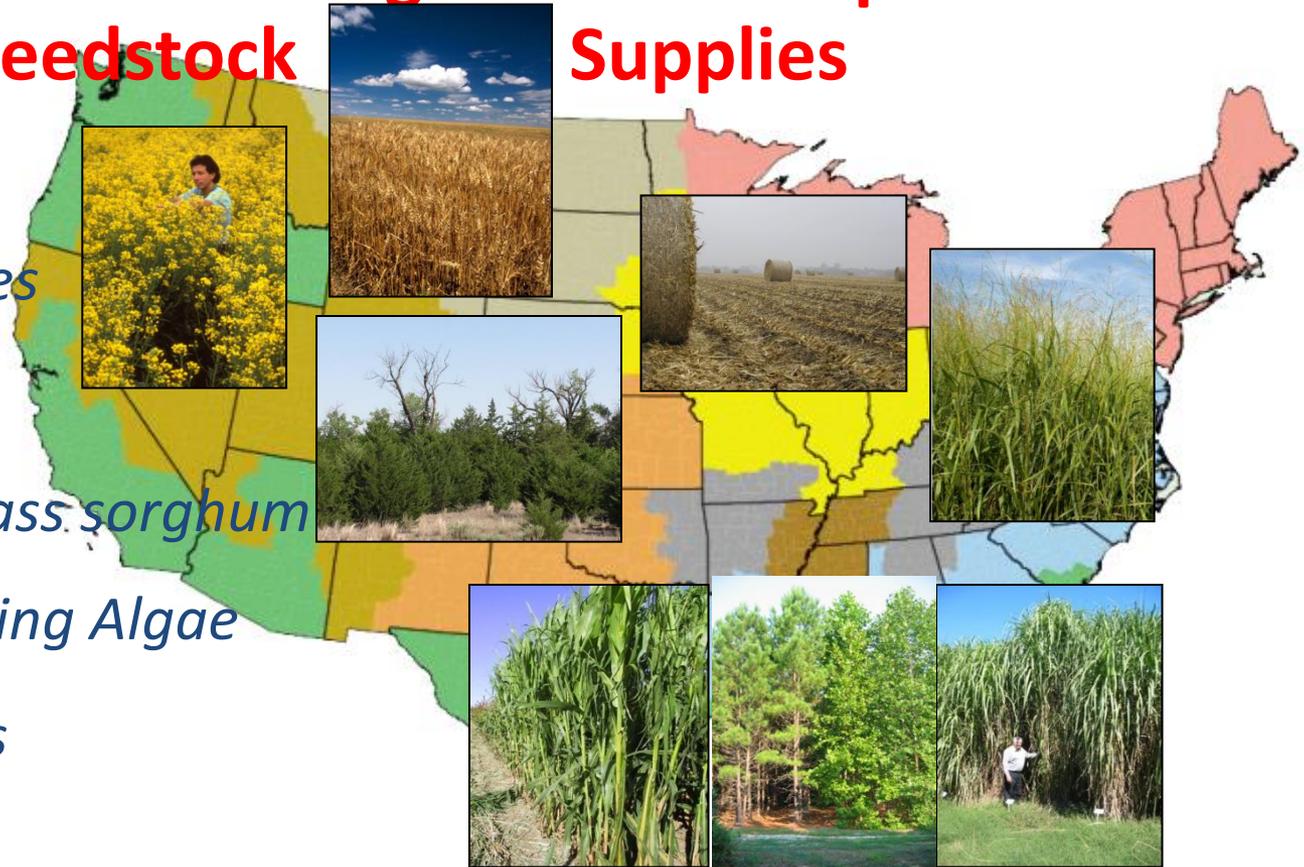
## USDA's Biomass Research Centers





## Use Region-based Strategies to Develop Sustained Feedstock Supplies

- *Crop residues*
- *Perennial grasses*
- *Energy cane*
- *Non-food biomass sorghum*
- *Oil Seeds including Algae*
- *Woody Biomass*



*No one feedstock will meet all national biofuel needs*



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# **National Institute of Food and Agriculture**

## ***Sustainable Bioenergy and Bioproducts Vision***

***Facilitate the development of sustainable regional production systems for biofuels, biopower, industrial chemicals, and biobased products, through partnerships and collaboration, for increased rural economic vitality, ecosystems services, and national energy security.***

# Background: Coordinated Agricultural Projects

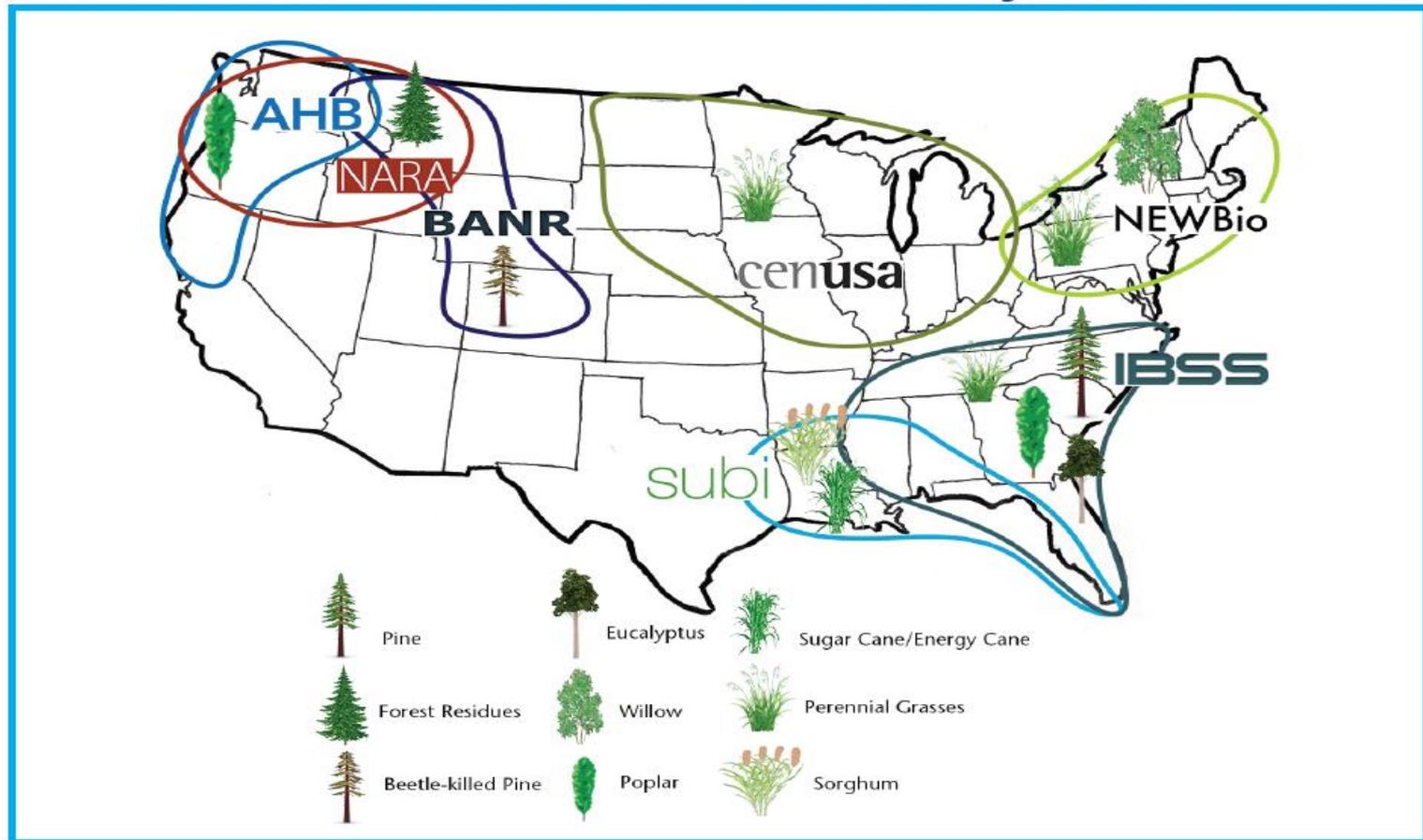
## **Regionally-appropriate Biomass Feedstock Systems**

- Focus on non-food feedstocks for alternative jet fuel:
  - ✓ Woody biomass (NARA, AHB, BANR, IBSS)
  - ✓ Energy cane (SUBI)
  - ✓ Perennial grasses (IBSS)
  - ✓ Sorghum (SUBI)

## **Transdisciplinary and systems approach**

- Focus on feedstock development, production, and delivery
- Must partner with feedstock users & well-align with appropriate conversion technologies and industry for bioproduct production

# AFRI Biofuel Feedstocks and Project Locations





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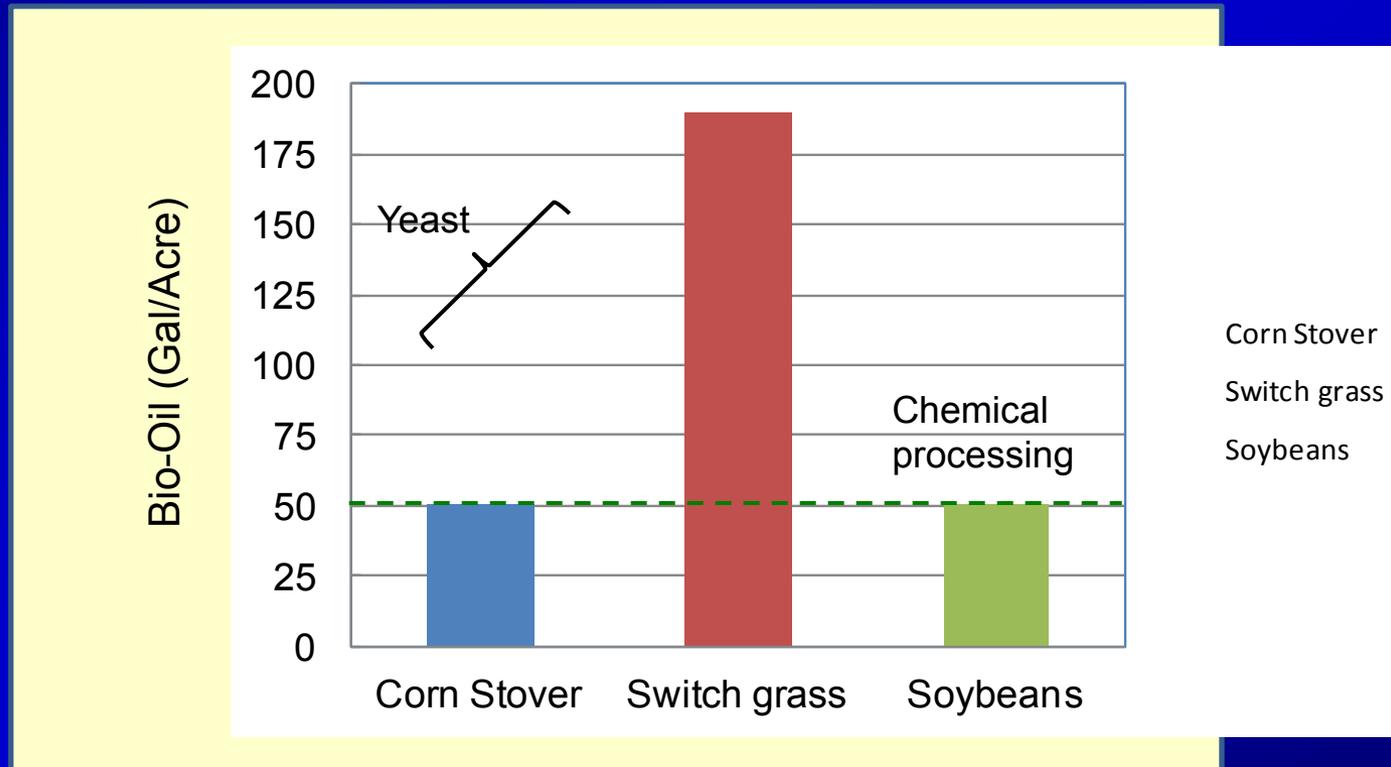
# ARS Project: Biochemical Technologies to Enable Commercial Production of Biofuels from Lignocellulosic Biomass

***Objective 1***—Develop technologies that enable the commercial production of marketable lipid-based advanced biofuels from lignocellulosic biomass hydrolyzates. (SY: Slininger, Dien, Liu)

Goal 1—Develop oleaginous yeast and associated processes for converting hydrolyzates of lignocellulosic biomass to lipids for biodiesel, jet fuel and valuable co-products for other uses.

(Hydrolyzate emphasis –herbaceous biomass, especially switchgrass)

# Pending yields, oleaginous yeast may have the capability of producing ~50-190 gal bio-oil per crop acre



As a reference, ~50 gallons of oil/acre are produced from processing soybeans.



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## **Agricultural Act of 2014 (Title IX - Energy)**

- *Biorefinery, Renewable Chemical, and Biobased Product Manufacturing Program(9003)*
- *Biomass Crop Assistance Program (9010)*



## **9003 Biorefinery Assistance Program Overview**

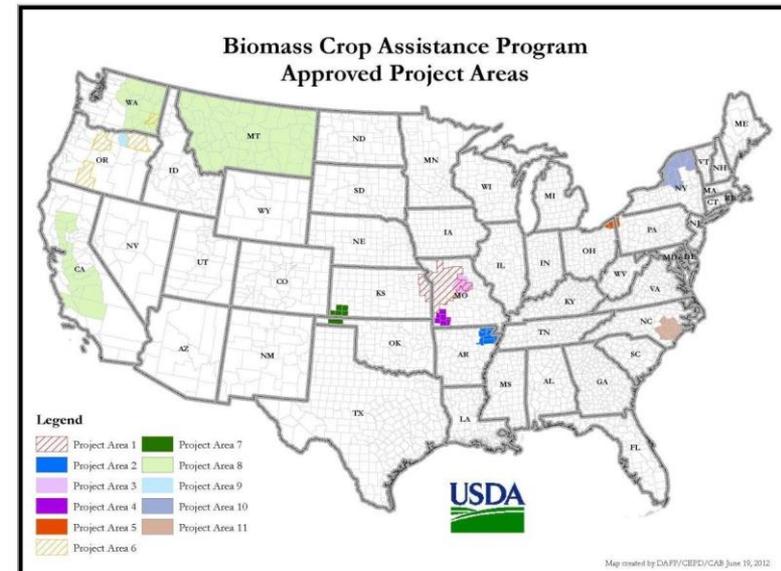
- **Provides loan guarantees of up to \$250 million for the construction and retrofitting of commercial scale biorefineries that produce advanced biofuels**
- **Investments in “First of its kind” commercial production**
- **Purpose -- Assist in the development of new and emerging technologies for the development of:**
  - **Advanced Biofuels**
  - **Renewable Chemicals**
  - **Biobased product manufacturing**



# Biomass Crop Assistance Program

BCAP provides incentives to create a supply of feedstock for the cellulosic biofuels industry. Two categories of financial assistance:

1. Establishment and annual payments for perennial crops, for non-woody and woody perennial biomass crops
2. Collection, harvest, storage, and transportation (CHST) of eligible materials (low value biomass forests and fields) for use in a biomass conversion facility.





# Biomass Crop Assistance Program - Activity

- **Incentivizing** nearly 1,000 growers and landowners farming nearly 49,000 acres to establish and produce dedicated, nonfood energy crops for delivery to energy conversion facilities.
- In 2016, **\$1million** was allocated toward the sign up of up to 1,000 acres in project area 5 for miscanthus in Ohio and Pennsylvania and project area 10 for shrub willow in New York.
  - In 2014 and 2015, USDA approved 209 contracts for matching payments of \$15.8 million toward the collection/harvest of approximately 300,000 dry tons of forest residues from National Forest and BLM public lands - forest residues removed for the reduction or containment of disease or insect infestation and reduction of fire threat.
  - In 2016, USDA allocated \$1.5 million toward the sign up for matching payments with sign up running from June 15th to August 4th.



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## **USDA Partnerships**

### ***Defense Production Act (USDA, DOE, NAVY)***

- ***Fulcrum Brighton Biofuels***
- ***Emerald Biofuels***
- ***Red Rock Biofuels***

### ***Farm to Fleet Program***

U.S. Departments of Agriculture (USDA) and Navy's joint "Farm-to-Fleet" venture makes biofuel blends part of regular, operational fuel purchase and use by the military. The announcement incorporates the acquisition of biofuel blends into regular Department of Defense (DOD) domestic solicitations for jet engine and marine diesel fuels. The Navy will seek to purchase JP-5 and F-76 advanced drop-in biofuels blended from 10 to 50 percent with conventional fuels.



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## **USDA Partnerships**

### ***Environmental Protection Agency***

- ***Feedstock Pathway Reviews***
- ***RFS Volumes***

### ***Farm to Fly 2.0***

***Partnership to accelerate sustainable production and use of alternative jet fuel***

- **USDA**
- **DOE**
- **DOT**
- **Commercial Airline Industry**



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The [Feedstock Readiness Level \(FSRL\) Tool](#), developed in collaboration the FAA, Volpe, US Department of Agriculture (ARS, OEPNU). Designed to track development and availability of the raw materials (or feedstocks) required to make alternative jet fuels;

Activity	Scale	Description	(1) Production	Prod Rating	(2) Market	Ma Ra
Preliminary Feedstock Evaluation	1	Basic Principles	Identify potential feedstock for a specific conversion technology		Identify current feedstock producers, feedstocks and coproduct users, and wastes	
	2.1	Concept Formulated	Estimate likely range of production environments and competing land uses		Assess feedstock market alternatives	
	2.2		Identify production system components		Identify potential coproducts and other benefits (e.g., carbon sequestration)	
	2.3		Develop enterprise budget for potential feedstock		Identify waste disposal requirements	
	2.4		Identify possible consequences of expanded production, articulate responses to trade-off's		Identify harvest techniques, post-harvest collection, transportation, and storage logistic options	
Feedstock Experimental Testing	3.1	Proof of Concept	Screen candidate genetic resources for feedstock yield		Estimate feedstock production costs	
	3.2		Screen candidate genetic resources for biofuel conversion potential		Evaluate current and alternative future scenarios for establishing a feedstock sector - feasibility study	
	4.1	Preliminary Technical Evaluation	Perform coordinated regional feedstock trials to determine potential for yield improvement and		Identify biorefiners for targeted feedstock market development and link feedstock producers to	
	4.2		Compare performance of candidate feedstock with alternative feedstock choices		Identify specific alternatives for reducing production and supply uncertainties (i.e., contracts and loan	
	4.3		Implement agricultural extension and education programs to promote		Implement education programs to establish interest in production and	

Activity	Scale	Description	(1) Production	Prod Rating	(2) Market	Ma Ra
Pre-commercial Feedstock Assessment	5.1	Production System Validation	Define range of adaptation for feedstock and identify production uncertainties		Develop and refine post-harvest logistics and storage	
	5.2		Conduct on-farm, field-scale production cost trials and assess production impacts on resource concerns		Assess maximum market potential for feedstock and coproducts	
	5.3		Establish partial budget costs and returns		Evaluate waste disposal and other costs	
	5.4		Establish price points for feedstock market competitiveness with competing land uses		Develop feedstock offtake options and pathways to realizing market potential	
	6.1	Full-Scale Production Initiation	Establish source material nurseries and begin feedstock production scale-up process		Ancillary service providers apply knowledge gained to advise producers and other supply chain participants	
	6.2		Produce feedstock planting materials to meet demand		Determine feedstock production capacity when linked to market outlets - price and quantity	
Commercial Feedstock Deployment	7	Feedstock Availability	Commercial-scale production and feedstock delivery to conversion facility - payments made for feedstock		Utilize risk management tools to reduce uncertainty of feedstock production	
	8	Commercialization	On-going monitoring and research to improve production system performance while managing		Market established - make necessary adjustments to the supply chain as the feedstock market evolves <sup>d</sup>	
	9	Sustainable Feedstock Production Capacity Established	Full array of private services support feedstock production sector - understanding of feedstock sector evolves		Market functions to support sustainable feedstock production	



# Supply Chain Approach for the Bioeconomy





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**THANK YOU**