# Sustainable Aviation Fuel
## Grand Challenge and Roadmap: USDA Programs and Funding Opportunities

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# SAF GC Agency Roles in MOU

## DOE

- Continue investments and develop expertise in sustainable technologies to develop cost-effective, low-carbon liquid fuels and enabling coproducts from renewable biomass and waste feedstocks
- Continue a significant multi-year SAF scale-up strategy committed to in FY21
- R&D aimed at creating new pathways toward higher SAF production
- Advance environmental analysis of SAF
- Collaborate with EPA to expedite regulatory approvals of SAF with significant life cycle GHG reductions

## DOT/FAA

- Develop overall strategy to decarbonize aviation
- Coordinate ongoing SAF testing and analysis
- Work with standards organizations to ensure safety and sustainability of SAF
- Continue International technical leadership
- Promote end use of SAF
- Support infrastructure and transportation systems that connect SAF feedstock producers, SAF refiners, and aviation end users
- Collaborate with EPA to expedite regulatory approvals of SAF with significant life cycle GHG reductions

## USDA

- Continue investments and build expertise in sustainable biomass production systems
- Decarbonize supply chains
- Invest in bio-manufacturing capability and workforce development
- Community and individual education
- Provide outreach and technology transfer to producers, processors, and communities to accelerate adoption and participation
- Commercialization support
- Collaborate with EPA to expedite regulatory approvals of SAF with significant life cycle GHG reductions

**Next Step: Implement SAF Grand Challenge Roadmap**

https://www.energy.gov/sites/default/files/2021-09/S1-Signed-SAF-MOU-9-08-21_0.pdf

# SAF Grand Challenge Roadmap

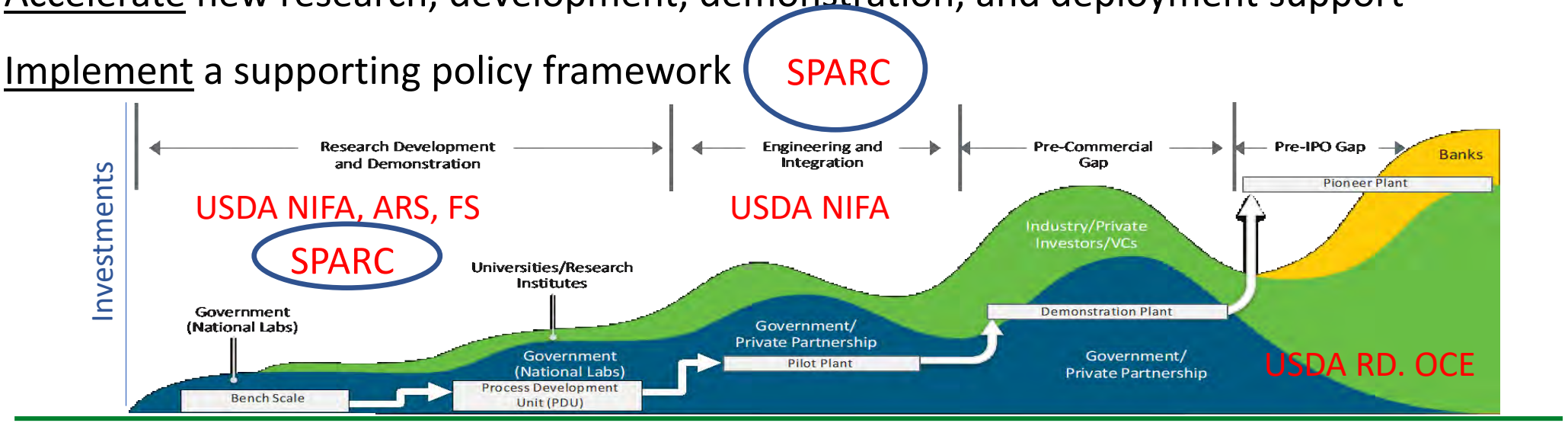
*To enable the production of 3 billion gallons of SAF per year by 2030 and 35 billion gallons by 2050*

# SAF GC Roadmap Scope

**Objective: Create a multi-agency plan of federal agency actions that will support stakeholders to build the SAF supply**

Derisk technology, supply chains and markets, and reduce barriers:

- Leverage existing government research, development, demonstration, and deployment support
- Accelerate new research, development, demonstration, and deployment support
- Implement a supporting policy framework



# SAF GC Roadmap – Structure

## Six Action Areas

1. Feedstock Innovation
2. Conversion Technology Innovation
3. Building Supply Chains
4. Policy & Valuation Analysis
5. Enabling End Use
6. Communicating Progress & Building Support

**Action Area Example: Feedstock Innovation**

**Description**: *Conduct R&D on sustainable feedstock supply system innovations across the range of SAF-relevant feedstocks and identify optimization to reduce cost, reduce technology uncertainty and risk, increase yield and sustainability, and optimize SAF precursors.*

## Workstreams

Workstreams define critical activities within action area

Anticipate 4 to 6 workstreams per action area. Examples below:

| **WORKSTREAM FI.1: Understand resource markets and availability**<br>*Develop databases and market analysis for commodity and commercially available feedstocks under increased demand for SAF, and assess and analyze the factors effecting the availability of non-commodity/commercial feedstocks* |
|---|
| DELIVERABLE: An understanding of the supply and demand dynamics for feedstocks under the proposed production levels for SAF and development of common databases for SAF feedstocks.<br>IMPACT: Identification of feedstock availability and limitations for SAF conversion technologies and supply/cost curves<br>KEY THEMES: Reduce cost, Expand production |
| **WORKSTREAM FI.2: Maximize sustainable lipid (FOGs) supply for 2030**<br>*Given near term relevance of SAF conversion of lipids to meeting 2030 goals, take a coordinated approach to lipid feedstock R&DDD to support expansion to meet 2030+ goal, development of a lipid multi-generational Project Plan; coordination of USG support for near term lipid crop expansion (e.g. oilseed cover crops)* |
| DELIVERABLE: More lipids available for HEFA conversion pathway<br>IMPACT: Increase the probability for the production of 3 BG/year SAF by 2030<br>KEY THEMES: Expanded SAF production (for 2030 goal) |

# Feedstock Innovation and Building Supply Chains

- The Feedstock Innovation and Building Supply Chain Teams are inventorying Federal Programs, projects, and activities in these workstreams:
  - Understanding feedstock resource markets and availability
  - Increasing production of purpose-grown biomass resources and collection of wastes and residuals
  - Improving feedstock supply logistics
  - Increasing the reliability of feedstock handling systems
  - Improving sustainability (economic, environmental, and social) of biomass and waste supply systems
  - Building biomass supply systems that provide ecosystem services and enhance food and feed crop production
  - Building supply chains through growing and supporting regional stakeholder coalitions through outreach, extensions, and education
  - Modeling biomass feedstock supply chains
  - Designing and implementing supply chain demonstrations

# SAF Grand Challenge Roadmap: USDA SAF-Relevant Programs and Funding Opportunities

*To enable the production of 3 billion gallons of SAF per year by 2030 and 35 billion gallons by 2050*

# USDA Programs and Projects Support SAF

- Agricultural Research Service (FI, CI, SC)
  - Focus on sustainability and optimization of commodity row crops, oilseed crops, cover crops, dedicated biomass crops (crop improvement, production, logistics)
  - Work on biomanufacturing and coproducts from fuel production
  - Technology Transfer Opportunities
- Rural Development (EU)
  - Biorefinery Assistance Program Loan Guarantees up to $250 M for SAF Biorefineries
- Natural Resources Conservation Service (SC)
  - Crop production assistance
- Office of the Chief Economist, Economic Research Service (PA)
  - Policy, economic analysis, and Partnerships for Climate-Smart Commodities Program
- Forest Service (FI, SC)
  - Woody biomass production and coproducts

# USDA Programs and Projects Support SAF

- National Institute of Food and Agriculture (FI, SC)
  - Small Business Innovation Research Program
  - AFRI SAS Coordinated Agricultural Project Program (2011-Present) $10M/award
    - Public – Private Partnerships building and demonstrating regional biomass supply chains with focus on economic, environmental, and social sustainability

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    - Northwest Advanced Renewables Alliance (WSU, Weyerhaeuser, Gevo +) Woody biomass >> SAF
    - Advanced Hardwood Biofuels NW (UWA, WSU, ORSU, Greenwood Resources +) Poplar >> SAF
    - Southeast Bioproducts Initiative (LSU, Virent +) Energy cane >> SAF
    - **SPARC (UFL, UGA, ARS, Nuseed, ARA, university partners) oilseed Carinata >> SAF**
    - IPREFER (W ILU, SILU, UMN, CoverCress, REG) oilseed pennycress >> SAF
    - Sustainable Bioeconomies for Arid Regions (UAZ, Bridgestone Americas +) Guayule bagasse >> SAF
    - Mid-Atlantic Biomass Systems (WVU, SUNY-ESF, PSU, industry +) Woody biomass + >> SAF

# USDA Partnerships for Climate Smart Commodities

Pilot Projects up to $100 Million (A once in a generation investment!)

- Create market opportunities for U.S. agricultural and forest products produced using climate-smart practices and include innovative, cost-effective methods for quantification, monitoring and verification of greenhouse gas and carbon sequestration benefits.
- Pilot projects must focus on the on-farm, on-ranch or forest production of climate-smart commodities and associated reductions of greenhouse gas emissions and/or carbon sequestration.
- Broad Eligibility: County, city or township governments; special district governments; state governments; small businesses; for profit organizations: Native American tribal governments; nonprofits that do or do not have a 501(c)(3); public and private institutions of higher education

# USDA Partnerships for Climate Smart Commodities

- **The GEVO Climate-Smart Farm-to-Flight Program (Links to the Sustainable Aviation Fuel Grand Challenge)**

- The project aims to create critical structural climate-smart market incentives for low carbon-intensity corn as well as to accelerate the production of sustainable aviation fuel to reduce the sector's dependency on fossil-based fuel. This project includes an immediate market opportunity to sell climate-smart, low-climate-impact corn.

- **Lead Partner:** Gevo, Inc.

**Other Major Partners:** Southwest Iowa Renewable Energy, LLC, Google, Farmers Edge, EarthOptics, South Dakota State University, Regen Ag Labs, Yard Stick, Double H Ag Services, Farmers Edge, AgSpire, PrairieFood, Stine Seed Farm, Holganix, Trace Genomics, MidState Agronomy, Double H Ag Services, Colorado State University, Iowa State University, Standing Rock (SAGE) Renewable Energy Power Authority
**Primary States Expected:** MN, SD, NE, IA, Tribal
**Major Commodities:** Corn

- **Approximate Funding Ceiling:** $30,000,000

# USDA Partnerships for Climate Smart Commodities

- **Climate-Smart Camelina**
- This large-scale pilot project aims to measure and validate the climate-smart advantages of Camelina sativa (L.) in both rotational and winter cover crop production systems and build associate climate-smart biofuels markets. The project will accelerate farmer adoption of camelina as a non-food crop grown on idle acres to produce more plant-based feedstock for renewable biofuels and chemicals with low carbon intensity and no land-use change while increasing carbon capture in the soil.
- **Lead Partner:** Global Clean Energy Holdings, Inc.
  **Other Major Partners:** Sustainable Oils, Bakersfield Renewable Fuels, ExxonMobil, Farmobile/AGI, Davis Instruments, Pessl Instruments, EarthDaily Agro, Intelinair, Earth Optics, Yard Stick, ARVA Intelligence
  **Primary States Expected:** ID, CO, KS, MO, MT, OK, OR, TX, WA, WY, Tribal
  **Major Commodities:** Camelina
- **Approximate Funding Ceiling:** $30,000,000

# The Future of Carinata is Key to the Future Bioeconomy

- Thanks to the SPARC consortium led by the University of Florida and Nuseed Carinata is now seen as an important piece of the oil-based feedstock future.
- Looking forward to a valued and successful Carinata Biomaterials Summit!

# Thank You!

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