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Minnesota Renewable Energy Roundtable

March 2018

Toby Ahrens

National Program Leader,
Agricultural Bioproducts

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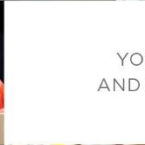
BIOENERGY, CLIMATE,
AND ENVIRONMENT



FOOD PRODUCTION
AND SUSTAINABILITY



YOUTH, FAMILY,
AND COMMUNITY



FOOD SAFETY
AND NUTRITION



INTERNATIONAL
PROGRAMS

USDA NIFA

NATIONAL INSTITUTE OF FOOD AND AGRICULTURE



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AGENDA

- **Updates from DC**
- **NIFA Programs**
 - **Overview**
 - **Bioproducts, Bioenergy, and Bioeconomy Programs**
- **Small Business Innovation Research**



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Washington DC update



- Secretary Sonny Perdue: “Do Right and Feed Everyone”
- Sonny Ramaswamy leaving NIFA in May 2018
- 2018 budget: Spending caps have been agreed upon, but officially on CR through March 23
- NIFA gets its funding authority from the Farm Bill... 2018?



USDA Strategic Goals (2018-2022)

1. Ensure USDA programs are Delivered Efficiently, Effectively, and with Integrity and a Focus on Customer Service
2. Maximize the Ability of American Agricultural Producers to Prosper by Feeding and Clothing the World
3. Promote American Agricultural Products and Exports
4. Facilitate Rural Prosperity and Economic Development
5. Strengthen the Stewardship of Private Lands through Technology and Research
6. Ensure Productive and Sustainable Use of our National Forest System Lands
7. Provide all Americans access to a safe, nutritious, and secure food supply



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National Institute of Food and Agriculture (NIFA)

MISSION: Invest in and advance agricultural **research, education, and extension** to solve societal challenges.

GOALS: Our scientific goals include catalyzing exemplary and relevant research, education, and extension programs:

- Achieve **global food security** and fight hunger
- **Mitigate climate change impacts** on agricultural, forest, and rangeland systems
- Improve and **increase the production of goods and services** from working lands while **protecting the nation's natural resource base** and environment
- **Contribute to the nation's bioeconomy, and enhance food production systems by creating ecosystem services** through sustainable production of bioenergy and biobased industrial products
- **Combat childhood obesity** by ensuring the availability of affordable, nutritious, and safe food and providing individuals and families science-based nutritional guidance
- Ensure the development of **human capital**, communities, and a diverse workforce



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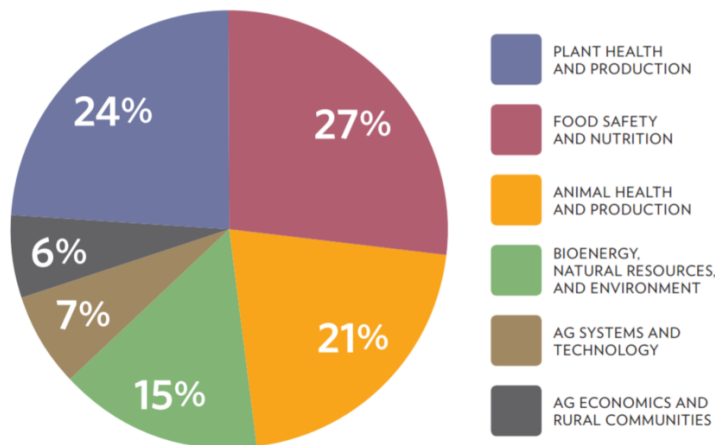


WE ACHIEVE THOSE GOALS through extramural funding of:

- Competitive awards: **Agriculture and Food Research Initiative** (\$350M in FY16)

- Capacity grants: Includes land-grant institutions and state ag experiment stations

FY 2016 AFRI INVESTMENTS
BY FARM BILL PRIORITIES



~2/3 of
budget

- Smith-Lever Act, Evans-Allen Research Program, 1890 Institutions** (\$439M in FY16 for Land Grant Institutions)
 - Hatch Act of 1887** (\$244M in FY16 for State Agricultural Experiment Stations)
- And many other competitive and capacity programs
 - Expanded Food and Nutrition Education Program** (\$68M in FY16)
 - Specialty Crop Research Initiative** (\$51M in FY16)
 - McIntire-Stennis Cooperative Forestry** (\$34M in FY16)

NOTE: Funding amounts shown reflect appropriated funds



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NIFA Supports...

MN State Liaison: Mary Purcell-Miramontes
(mpurcell@nifa.usda.gov)

➤ **30 Competitive Federal Financial Assistance Programs:**

- Agriculture and Food Research Initiative (AFRI),
<https://www.nifa.usda.gov/program/agriculture-and-food-research-initiative-afri>
- Specialty Crop Research Initiative (SCRI),
<https://www.nifa.usda.gov/program/specialty-crop-research-initiative-scri>
- Organic Agriculture Research and Extension Initiative (OREI),
<https://nifa.usda.gov/funding-opportunity/organic-agriculture-research-and-extension-initiative>
- Beginning Farmer and Rancher Development Program (BFRDP),
<https://www.nifa.usda.gov/program/beginning-farmer-and-rancher-development-program-bfrdp>
- Crop Protection and Pest Management (CPPM),
<https://www.nifa.usda.gov/program/crop-protection-and-pest-management-program>
- **Sun Grant Program**, <https://nifa.usda.gov/funding-opportunity/sun-grant-program>



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Agriculture and Food Research Initiative (AFRI) is NIFA's flagship competitive grants program

Program Areas designed to align with Farm Bill Priorities

- Plant health and production, plant products
- Animal health and production, animal products
- Food safety, nutrition, and health
- Bioenergy, natural resources, environment
- Agriculture systems and technology
- Agriculture economics and rural communities



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AFRI Program: MN in 2017

<https://nifa.usda.gov/afri-funded-projects-state>

Title	Investigator
LINKAGES BETWEEN PLANT SPECIES RICHNESS AND SOIL CARBON DIVERSITY AS DRIVERS OF SOIL MICROBIOME COMPOSITION AND FUNCTION	Castle, S. C.
INNOVATIVE HANDS-ON UNDERGRADUATE ENTREPRENEURS IN URBAN AGRICULTURE (IHUEUA)	Anderson, N. O.
INTEGRATED MANAGEMENT AND DIAGNOSTICS OF EMERGING VIRUSES IN FRESH TOMATO PRODUCTION	Bratsch, S.
DECONTAMINATION OF FOOD AND FOOD-PROCESSING SURFACES FROM VIRAL AND BACTERIAL PATHOGENS BY COLD PLASMA TECHNOLOGY	Goyal, S.
TOOLS TO LINK PHENOTYPE TO GENOTYPE IN THE HORSE	McCue, M.
RURAL WORKFORCE AND ENTREPRENEUR RECRUITMENT AND RETENTION	Olson, K.
UNDERSTANDING AND BUILDING CAPACITY TO ADDRESS CHANGING WATER AVAILABILITY IN THE UPPER CORN BELT	Davenport, M. A.
CONNECTING SMALL & MEDIUM-SIZED FARMS TO EXISTING WHOLESALE MARKETS THRU BACK-HAULING FROM RURAL GROCERY STORES	Draeger, K.

among others...



AFRI Food and Agricultural Science Enhancement (FASE) Grants

New Investigator Grants (no set-aside)

Strengthening Grants (11.25% of AFRI funding)

Eligibility:

- **EPSCoR states**
- **Minority-serving institutions not among the most successful**
- **Small or mid-sized institutions not among the most successful**

Pre- and Postdoctoral Fellowship Grants (3.75% of AFRI funding)

- Sabbatical Grants
- Equipment Grants
- Seed Grants
- Strengthening Standard Grants
- Strengthening CAP (Coordinated Agricultural Project) Grants
- Strengthening Conference Grants

Renewable Chemicals: Feedstock to Product Value Chain



Certification



Production



Harvest



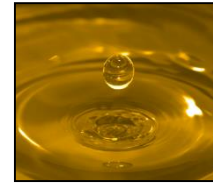
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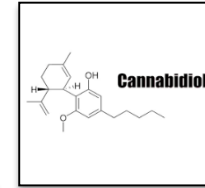
Meals



Fiber



Processed
Oils



Pharma



Foods & Feeds



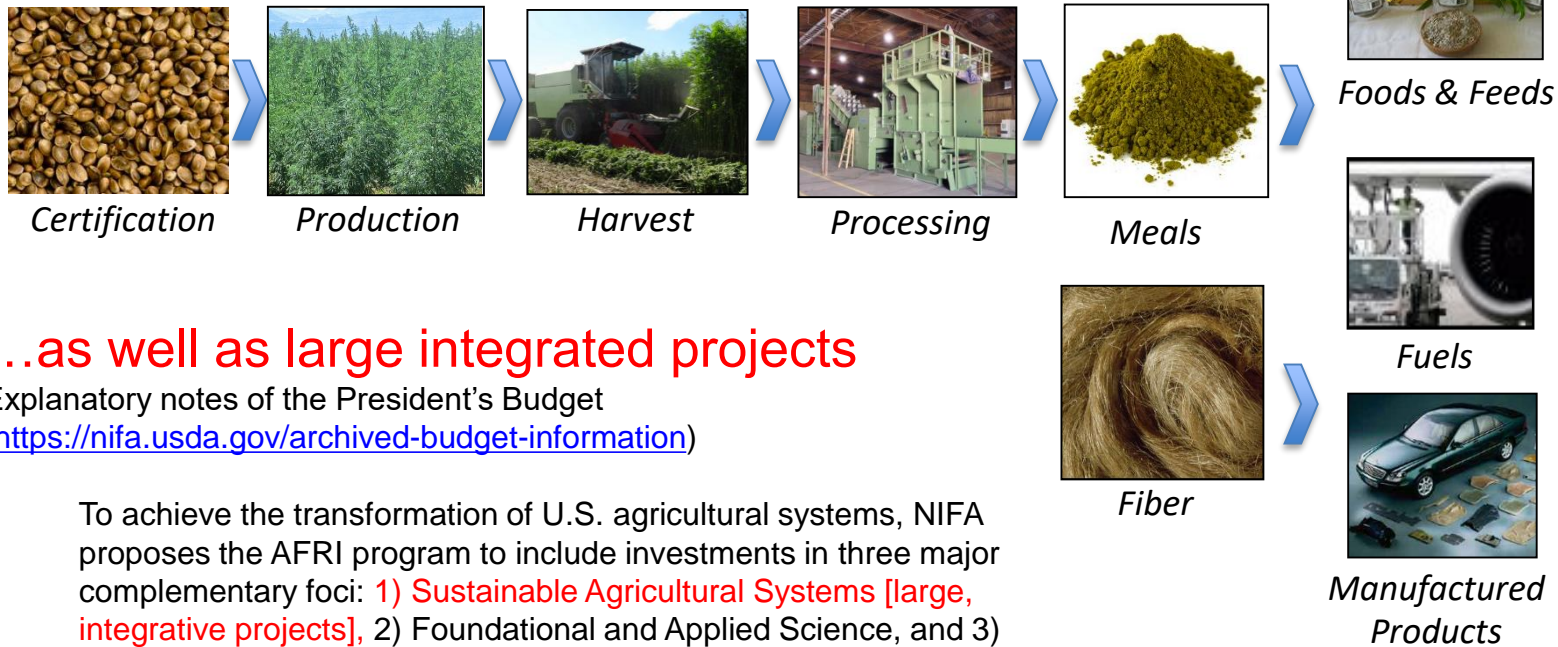
Fuels



Manufactured
Products

Renewable Chemicals: Feedstock to Product Value Chain

Funding to address individual bottlenecks...



...as well as large integrated projects

Explanatory notes of the President's Budget
(<https://nifa.usda.gov/archived-budget-information>)

To achieve the transformation of U.S. agricultural systems, NIFA proposes the AFRI program to include investments in three major complementary foci: **1) Sustainable Agricultural Systems [large, integrative projects]**, 2) Foundational and Applied Science, and 3) Education and Workforce Development.



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Renewable Chemicals: Feedstock to Product Value Chain

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AFRI Plant Health and Production and Plant Products

Agricultural Production Systems
Pests and Beneficials in Agricultural
Production Systems
Physiology of Agricultural Plants
Plant Breeding for Agricultural
Production

AFRI Agricultural
Systems and
Technology
Agricultural
Engineering
Bioprocessing and
Bioengineering



Certification



Production



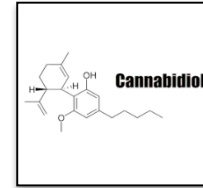
Harvest



Processing



Processed
Oils



Pharma



Foods & Feeds



Meals



Fuels



Fiber



Manufactured
Products

Biomass
Research and
Development
Initiative

AFRI Food
Safety,
Nutrition,
and
Health

AFRI
Animal
Nutrition,
Growth,
and
Lactation

AFRI
Sustainable
Bioenergy
and Bio-
products

Minor Crop Pest
Management
Program

Sustainable
Agriculture Research
and Education (SARE)

AFRI Critical
Agricultural
Research and
Extension

Crop Protection and Pest Management
Extension IPM
Regional IPM Centers
Applied Research and Development

USDA-NRCS
Conservation
Innovation
Grants

AFRI Exploratory
Research Program

USDA Small Business Innovation
Research Grants

USDA RD Value-Added Producer Grants

USDA AMS Fed-State
Marketing Improvement
Program



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Renewable Chemicals: Feedstock to Product Value Chain

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AFRI Plant Health and Production and Plant Products

Agricultural Production Systems
Pests and Beneficials in Agricultural
Production Systems
Physiology of Agricultural Plants
Plant Breeding for Agricultural
Production

**AFRI Agricultural
Systems and
Technology**
Agricultural
Engineering
Bioprocessing and
Bioengineering

**Biomass
Research and
Development
Initiative**



Certification



Production



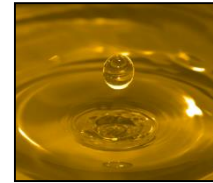
Harvest



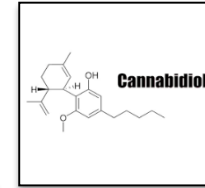
Processing



Meals



Processed
Oils



Pharma



Foods & Feeds



Fuels



Manufactured
Products



Fiber

AFRI Food
Safety,
Nutrition,
and
Health

AFRI
Animal
Nutrition,
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**AFRI
Sustainable
Bioenergy
and Bio-
products**

**Minor Crop Pest
Management
Program**

**Sustainable
Agriculture Research
and Education (SARE)**

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Agricultural
Research and
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Crop Protection and Pest Management
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Bioenergy & Bioproducts Division Portfolio

AFRI: Agriculture and Food Research Initiative, Sustainable Bioenergy and Bioproducts

- **Foundational Program**

- Grants address bioproducts (lignin, nano-cellulosics, etc); feedstock genetics and evaluation; logistics; conversion; policy, social and environmental impacts

- **Dr. Neil Nelson, UMN Duluth, \$1M for hybrid poplar genetic development for yield and disease resistance for a bioenergy feedstock**

- **Coordinated Agricultural Projects (CAPs)**

- Large transdisciplinary awards to stimulate regional supply chains of bioenergy and bioproducts

SBIR: Small Business Innovative Research

USDA & DOE Joint solicitations

- Plant Feedstock Genomics Program
- Biorefinery Optimization
- Biomass Research and Development Initiative



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FOCUS + SCALE = IMPACT

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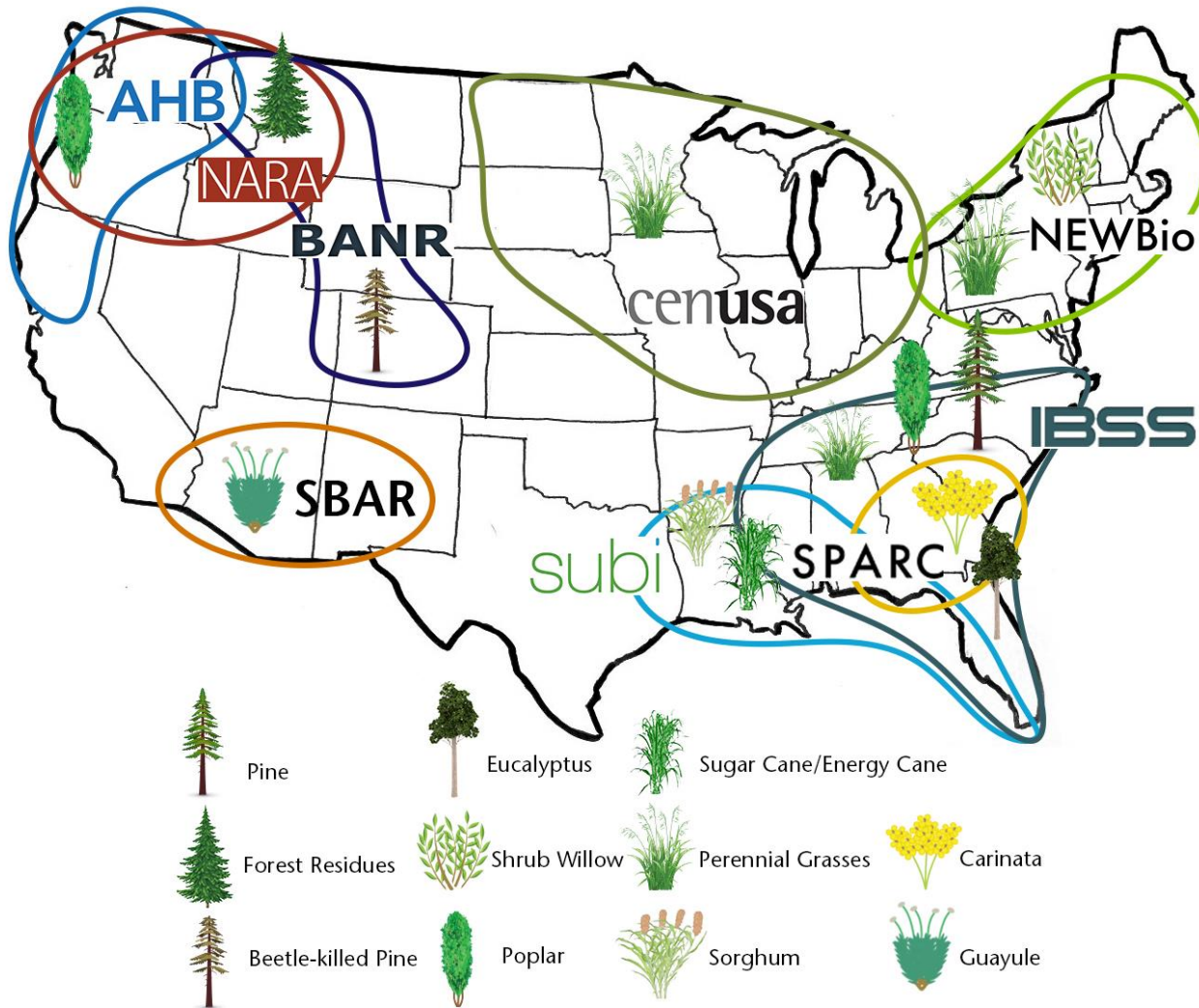


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CAP Feedstocks and Project Regions



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Two NEW AFRI CAPs Join the Community

SPARC led by University of Florida

- Partnering with Agrisoma and ARA, others
- Targeting alternative jet fuel and animal feed from the oilseed crop *Brassica carinata* (Carinata)



SBAR led by University of Arizona

- Partnering with Bridgestone America , New Mexico State, others. Targeting natural rubber, industrial chemicals, and alternative jet fuel from the dry land crops guayule (why-oo-ley) and guar.



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Sustainable Production and Distribution of Bioenergy for the Central USA

www.cenusa.iastate.edu



2011, \$25M

Research Partners

Iowa State University

Purdue University

University of Illinois–Champaign

University of Minnesota–Twin Cities

University of Nebraska–Lincoln

University of Vermont–Burlington

University of Wisconsin–Madison

USDA ARS

Why Focus on Perennial Grasses?

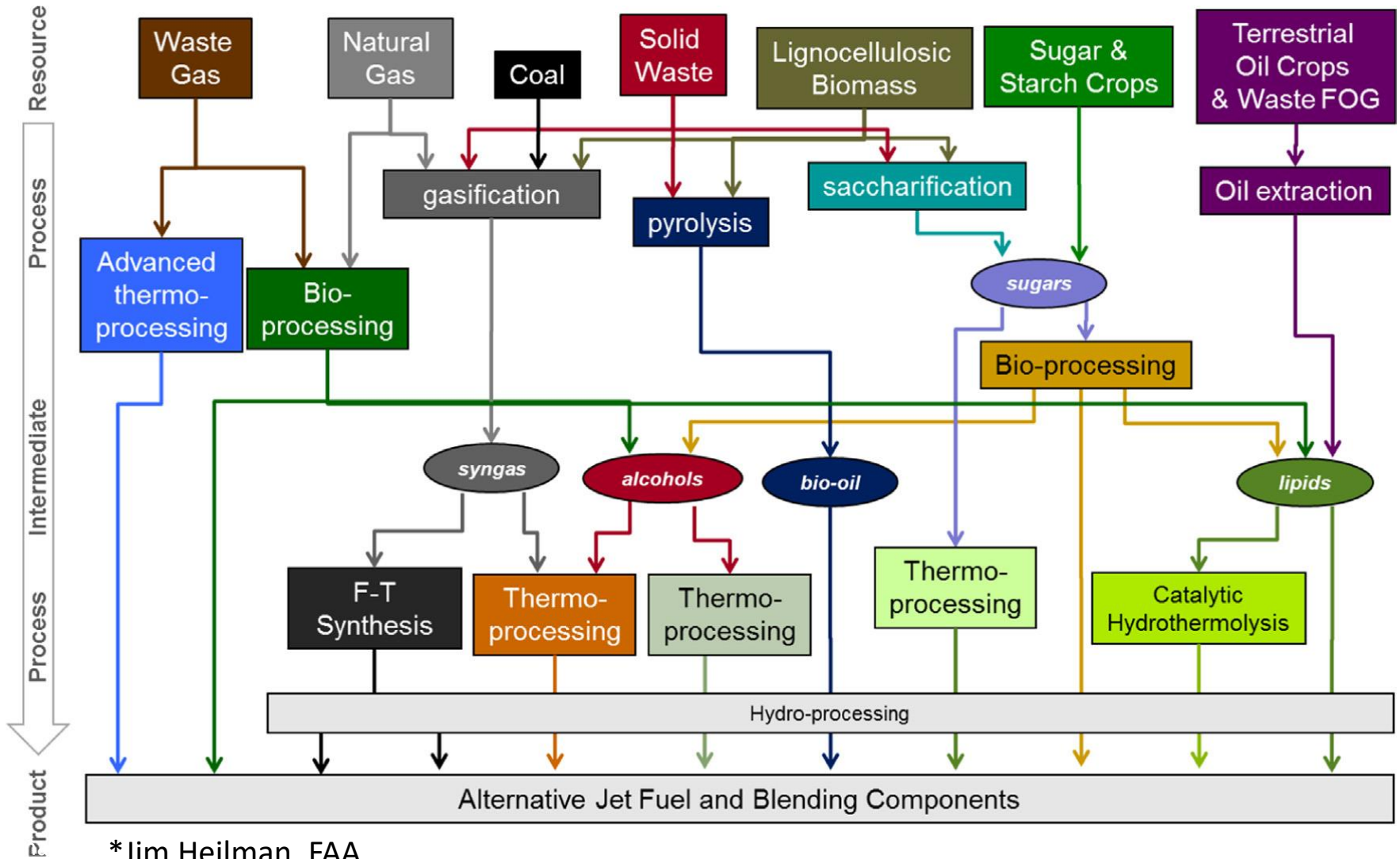
- Yields high biomass
- Utilizes native species
- Reduces soil erosion
- Improves soil quality
- Increases carbon sequestration
- Reduces water runoff
- Increases water infiltration
- Provides wildlife habitat



Growing Region Map



UMN headed System Performance team

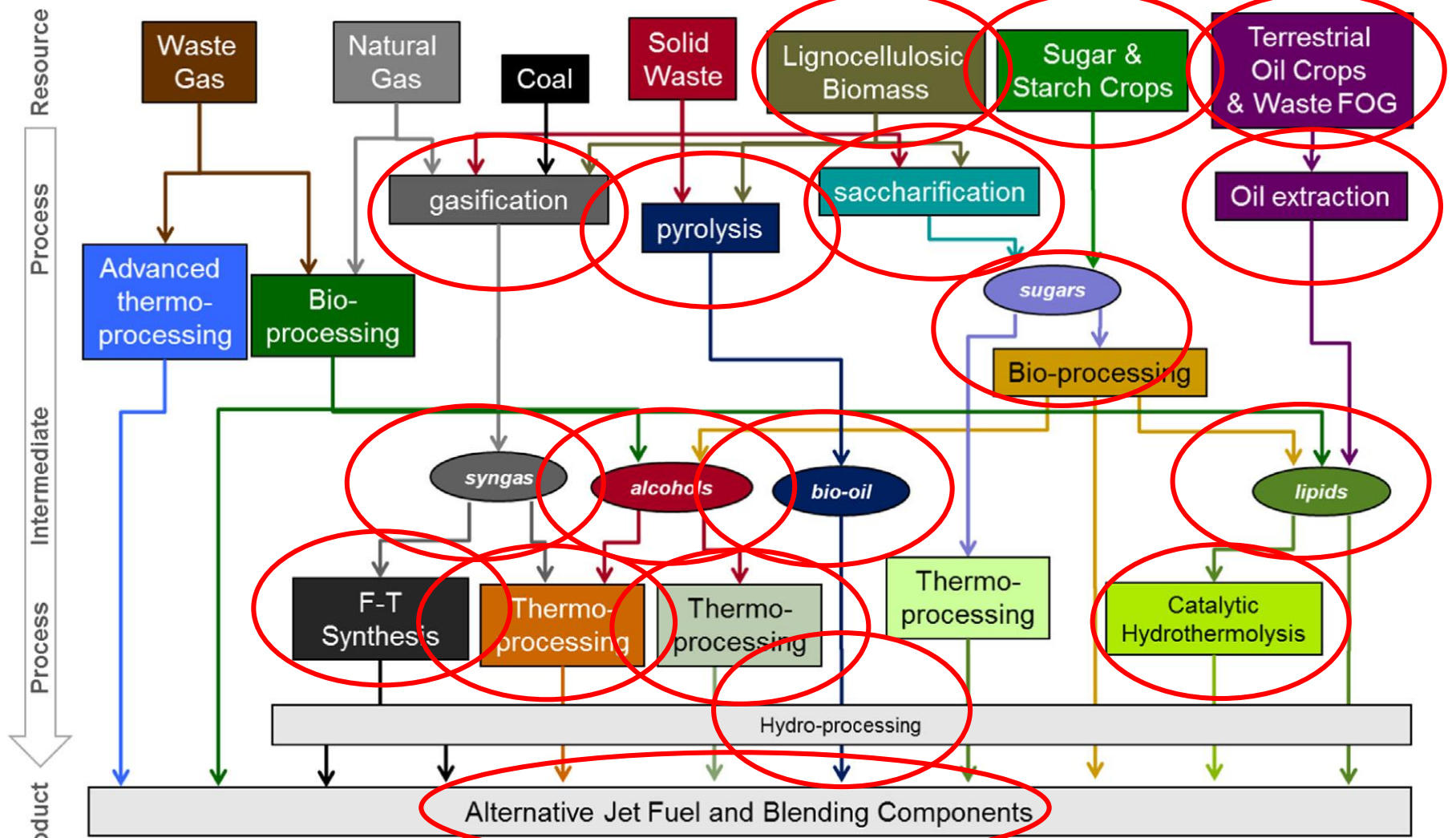


NIFA CAPs

NARA, CenUSA, NewBIO, IBSS, BANR, AHB, SBAR

SUBI

SPARC



*Jim Heilman, FAA

Or alternative products, co-products...



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Renewable Chemicals Efforts Across USDA Mission Areas

Farm and Foreign Agricultural Services



BCAP: Biomass Crop Assistance Program has incentivized >800 producers on >47,000 acres in 12 states to establish and produce 7 different energy crops. Commodity oilseeds don't qualify but new oilseeds do (eg. Camelina).

Rural Development



9003: Loan guarantees for existing and pioneer biorefineries, renewable chemicals, and biobased product manufacturing

Research, Education, and Economics



Intramural research on feedstock production, logistics, conversion, and product development at many locations including the Bioproducts Research Unit in Albany, CA and the National Center for Ag Utilization Research in Peoria, Ill (including a microbial culture collection).

Among other Mission Areas: Marketing and Regulatory Programs; Food Safety; Food, Nutrition, and Consumer Services; Natural Resources and Environment

Biopreferred Program



Labelling and federal procurement program, ~2500 products in >100 product categories carry the Biobased Label



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SMALL BUSINESS INNOVATION RESEARCH PROGRAM



USDA SBIR programs:

- Stimulate innovations in the private sector
- Strengthen the role of small businesses in meeting federal research and development needs
- Increase the commercialization of innovations derived from SBIR-supported private sector research and development efforts
- Foster participation by women-owned and socially and economically disadvantaged small businesses

Phase I Deadline & Timeline

- FY 2018 Phase I Solicitation has been released: <https://nifa.usda.gov/funding-opportunity/small-business-innovation-research-program-phase-i>
- FY 2018 Phase I proposal deadline October 5, 2017
- Panels expected to meet in January & February of 2018
- Award Decisions expected to be made in March 2018
- Phase I Grant Period expected to be from June, 2018 through January, 2019



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SBIR Topic Areas and Contacts

Dr. Charles Cleland

Forests and Related Resources

Dr. Robert Nowierski

Plant Production and Protection –
Biology

Dr. Rachel Melnick

Plant Production and Protection - Engineering

Dr. Robert Smith

Animal Production and Protection

Dr. Karelyn Cruz

Air, Water and Soils

Scott Dockum

Program Coordinator, SBIR

Dr. Jodi Williams

Food Science and Nutrition

Dr. Brent Elrod

Rural and Community Development

Dr. Gene Kim

Aquaculture

Dr. Toby Ahrens

Biofuels and Biobased Products

Dr. Denis Ebodaghe

Small and Mid-Size Farms

Elden Hawkes

Program Specialist, SBIR



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USDA SBIR Topic Area 8.8: Biobased Products & Biofuels

- In general, a very broad category that covers process improvements or new product development for biobased products
 - New non-food biobased products from new industrial crops
 - New process for the manufacture of biobased industrial products, chemicals or biofuels
 - Except:
 - Aquaculture including photosynthetic algae (apply to 8.7)
 - Woody biomass production or logistics (apply to 8.1)
 - Engineering aspects of plant production & logistics (apply to 8.13)
 - Genetic engineering of plants (apply to 8.2)
- **If you are unsure about where it fits, ask us! All of the Topic Area leads communicate constantly...**



Examples of Recent SBIR Awardees in Minnesota

RURAL AND COMMUNITY DEVELOPMENT (Topic Area 8.6)

DETECTING DISTRESS EVENTS OF ISOLATED ELDERLY LIVING IN REMOTE RURAL REGIONS (2016, Phase I)

- MOAI Technologies (Plymouth, MN)

HOME TELEMEDICINE SYSTEM FOR RURAL TECHNOLOGY DEPENDENT CHILDREN (2017, Phase II)

- Advanced Medical Electronics Corporation (Maple Grove, MN)

PLANT PRODUCTION AND PROTECTION – ENGINEERING (Topic Area 8.13)

WILDFIRE MOBILE EMERGENCY PERIMETER SYSTEM (2017, Phase I)

- Architecture Technology Corporation (Eden Prairie, MN)

AQUACULTURE (Topic Area 8.7):

FISHMEAL ALTERNATIVE FROM RENEWABLE FEEDSTOCK (2017, Phase I)

- Sasya (Plymouth, MN)

FOOD SCIENCE AND NUTRITION (Topic area 8.5)

HIGH THROUGHPUT SALMONELLA DETECTOR (2016, Phase II)

- NVE Corporation (Eden Prairie, MN)



Final Thoughts (1/2)

Shift to bioenergy AND bioproducts or bioproducts alone...

- Energy security argument has changed
- Environmental benefits should be spelled out
 - Don't assume that just because it is bio-based that it is inherently good.
- Economic arguments also need to be well-articulated
 - Price or performance benefit
 - Potential addressable market share
 - Understanding place in the value/supply chain
 - Technoeconomics including final product specifications after separations/purification, etc



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Final Thoughts (2/2)

Foundational research will continue to be balanced with interdisciplinary efforts and partnerships

- Industrial partners and public-private partnerships: market relevance!
- A majority of students in scientific fields will not go on to careers in academia – include training that will help them in the private sector
 - Soft skills (communication, teamwork, creativity, etc)
 - Entrepreneurship, joint efforts with business schools, etc



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BIOENERGY, CLIMATE,
AND ENVIRONMENT

Please engage with us any time!

Toby Ahrens

National Program Leader,
Agricultural Bioproducts

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Thank you!

- NIFA is the extramural funding arm of USDA and makes a big effort to coordinate investments with other USDA mission areas and other agencies
- Regional supply chains a top priority to support a vibrant, robust bioeconomy. Education and Extension are critical links.
- Renewable chemicals are expected to play a role in the bioeconomy, but research needs remain before major inroads in commodity markets.
 - Developments in co-products, ecosystem service valuation, germplasm improvement, and agronomic practices can build on demonstrated supply chains
- Soft skills are also critical!



Education and Training

- Multicultural Scholars
- National Needs Graduate Fellowships
- Higher Education Challenge (HEC)
 - Curriculum development, instructional delivery systems and expanding student career opportunities
 - Faculty preparation and enhancement for teaching
 - Facilitating interaction with other academic institutions
- AFRI Education and Literacy Initiative (ELI)



Education and Literacy Initiative (ELI)

- Professional development opportunities for K-14 teachers and education professionals total **\$150,000 for 3 years**
- Training of undergraduate students in research and extension (total **\$300,000 for 4 years**)
- Fellowships for predoctoral candidates (total **\$95,000 for 2 years**) and postdoctoral scholars (total **\$165,000 for 2 years**)
- Approximately \$18M



2014 Farm Bill changes to NIFA Programs

- **Matching Requirement Provision**

<https://nifa.usda.gov/resource/new-matching-requirements-competitive-grant-awards>

- **Centers of Excellence Provision**

<https://nifa.usda.gov/centers-excellence>

- **Commodity Boards Provision**

<https://nifa.usda.gov/commodity-boards>

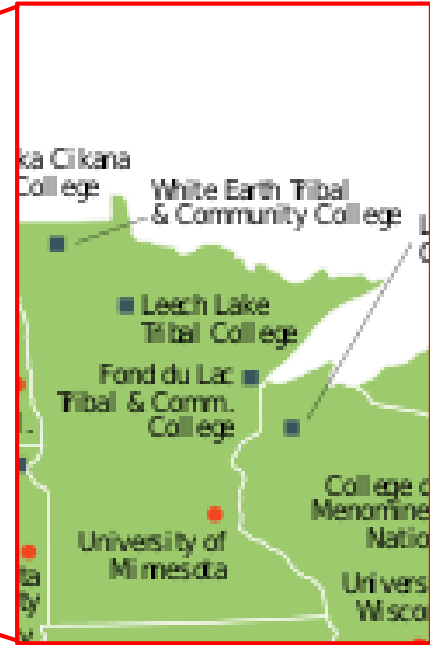
2018 Farm Bill & Legislative Principles:

<https://www.usda.gov/sites/default/files/documents/2018-farm-bill-and-legislative-principles.pdf>



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NIFA LAND-GRANT COLLEGES AND UNIVERSITIES



- 1862
- ☆ 1890
- 1994

* Central State University (CSU), in Ohio, has been designated as an 1890 LGU. Under the law, CSU will be eligible to receive certain capacity funds in October 2014 and others in fiscal year 2016.
 ** College of the Muscogee Nation and Keweenaw Bay Ojibwa Community College are designated as 1994 LGUs and will be eligible to receive capacity funds in October 2014.