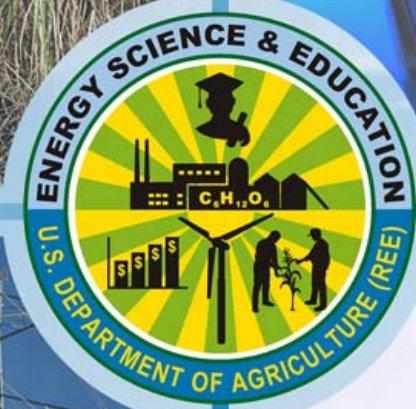


USDA/REE Energy Research, Education, and Extension Strategy



Ghassem R. Asrar
Deputy Administrator
Agricultural Research Service

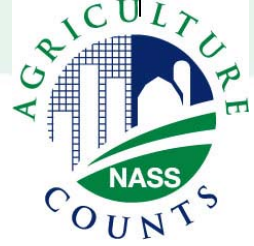


Research, Education, and Economics



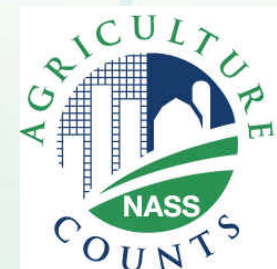
**USDA
Secretary of Agriculture**

**Under Secretary
For
Research, Education,
and Economics**



USDA/REE Energy Science and Education Workshop

- In September, 2007, REE held an “Energy Science and Education Workshop”.
- Attendees at this workshop included leaders in bioenergy and bioproducts research from the USDA, other federal agencies and the nations leading Institutions of higher learning.
- The product of this workshop is a roadmap for REE’s future bioenergy research, education and extension programs.



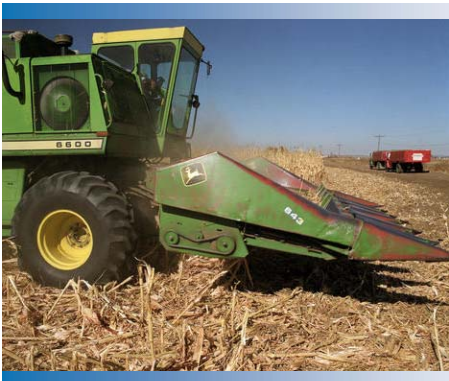
USDA Energy Research, Education, and Extension Strategy



Role

- ***Lead Research, Education, and Extension programs for sustainable production of agriculture-based and natural resource-based renewable energy and efficient use and conservation of energy***

... for the benefit of rural communities and the Nation



Vision *(External to USDA)*

“Growing a clean, efficient, sustainable energy future for America”

We have a vision that in five years the U.S. will have:

- Agriculture- and natural-resource-based energy that enhances stewardship of our environment.
- Sustainable, secure, renewable energy sources
- Vibrant and energy-efficient rural communities



Vision *(Internal to USDA)*

“USDA – a recognized leader in innovative energy solutions”

We have a vision that in five years the USDA will have:

- A workforce with expertise and foresight to address renewable energy challenges
- Robust partnerships with Federal agencies, universities and the private sector
- A fully integrated, systems approach to national and regional energy needs



Goals

(Our Focus for the Next 5 Years)

Mission Goals

- Sustainable agriculture and natural resource-based energy production
- Sustainable bioeconomies for rural communities
- Efficient use of energy and energy conservation
- Workforce development for the bioeconomy



Goal 1: Sustainable Agriculture and Natural Resource-Based Energy Production

Results by 2012:

- Whole life-cycle analyses of at least two potential regionally appropriate production systems.
- High quality, cost effective feedstocks are developed.
- High quality, cost effective feedstocks are sustainably produced following REE science-based conservation plans.
- Demonstrate at least two scalable conversion technologies suitable for regional energy production.
- Sustainable integrated harvesting, transportation, storage, conversion, and distribution systems exist.
- Analysis of environmental and economic impact of bioenergy production will have been conducted at the regional and national levels.
- Analytical tools have been developed to assess the site-specific impacts of bioenergy feedstock production.
- Comprehensive databases of feedstock characteristics are publicly accessible.



Goal 1: Sustainable Agriculture and Natural Resource-Based Energy Production

Key Strategies:

- Evaluate existing and develop new economic and biophysical effects models to assess the sustainability of regional production of energy and products.
- Assemble a critical mass of genetic resources, biological information, and expertise to develop one or more sustainable energy biomass crops or crop mixtures for each region.
- Identify, charge, and seek funding for multidisciplinary teams that will develop genetic, production, harvesting, storage, and conversion technologies and methods to support energy and coproducts availability; and for the development of subsequent educational strategies to facilitate adoption.
- Utilize tools and partnerships to facilitate research and education issues (i.e., DOE, Sun Grant Initiative (SGI) and to inform decisions at the local, regional, and national levels.



Goal 2: Sustainable Bioeconomies for Rural Communities

Results by 2012:

- **Decision tools are available and training in their use is provided to all farmers, rural communities, processors, and policy makers..**
- **Cooperative Extension educators are fully trained to support farmers, processors, and rural communities**
- **eXtension Communities of Practice are formed to support farmers, processors, and rural communities**
- **Biobased products and bioenergy coproducts have been evaluated for sustainability and market potential for regional integrated bioeconomies.**
- **Those farmers, communities, and processors displaced by a growing bioenergy industry in transitioning to new viable economic activities are assisted.**



Goal 2: Sustainable Bioeconomies for Rural Communities

Key Strategies:

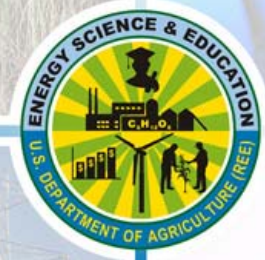
- Use environmental, economic, and social analyses as tools to inform activities and research.
- Train new and existing Cooperative Extension personnel to support activities within the rural bioenergy/bioeconomy and transitioning agricultural sector.
- Organize eXtension (on-line) Communities of Practice and develop web-based interactive user information.
- Evaluate market potential of biobased products and co-products as part of the rural bioeconomy portfolio.
- Evaluate and understand the changing market conditions for traditional agricultural commodities.
- Develop new and enhance existing tools and partnerships to inform decisions at local, regional, and national levels.



Goal 3: Efficient Use of Energy and Energy Conservation

Results by 2012:

- Energy education programs, including eXtension Communities of Practice established by Cooperative Extension personnel to reach traditional and non-traditional audiences.
- Energy intensity of agricultural production reduced by 10 percent.
- Establish a national agriculture- and natural-resource-based energy awareness campaign.
- Promote energy conservation awareness across the United States.



Goal 3: Efficient Use of Energy and Energy Conservation

Key Strategies:

- **Lead the establishment of a national energy extension network in partnership with land-grant universities and Federal agencies.**
- **Establish energy Communities of Practice in eXtension.**
- **Develop and publicize decision support tools for home energy and on-farm energy conservation.**
- **Establish an energy garden at the National Arboretum in collaboration with a national conservation group.**
- **Develop a university-based program for energy conservation education.**



Goal 4: Workforce Development for the Bioeconomy

Results by 2012:

- Triple the number of students in college- and university-based bioenergy & bioeconomy education programs.
- A large proportion of high school students are aware of and take action on bioenergy concepts and agriculture and natural resource roles in developing the country's energy future.
- Expertise is available to implement Cooperative Extension energy programs across all States.

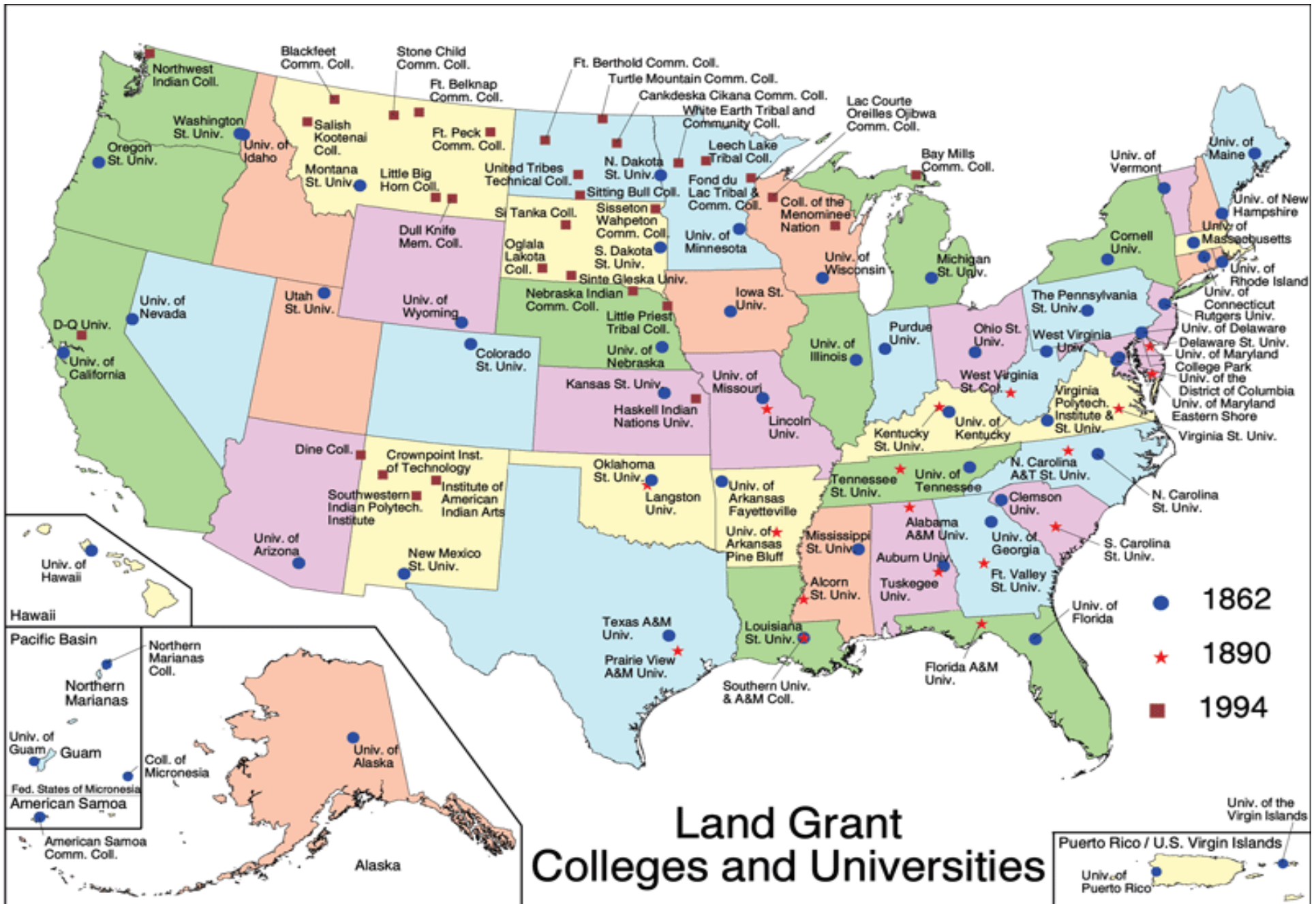


Goal 4: Workforce Development for the Bioeconomy

Key Strategies:

- Establish and publicize a roadmap of educational activities that will lead to careers in bioenergy and the bioeconomy.
- Conduct a workforce needs assessment for the local and regional bioeconomy sector, including projections of all roles.
- Coordinate educational programs where appropriate to develop national-scale centers of research and education (K-20 & adult and informal programs) delivered through robust distributed educational programs in every region.
- Add significant numbers of graduate- and postgraduate-level grants to existing programs with a focus on bioenergy.
- Increase to at least 50 percent number of LGUs offering bioeconomy courses.





U.S. Department of Agriculture
 Natural Resources Conservation Service
 Resource Assessment Division
 Washington, D.C. June 2003

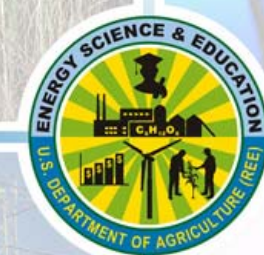
Map ID: m2783
 For Proper interpretation, see Explanation of Analysis for this map at our web site. Search for "USDASOTL" to locate our map index.

Source: U.S. Department of Agriculture
 Cooperative State Research, Education, and Extension Service
 Washington, D.C.



CSREES Funding of Bioenergy and Biobased Product Research

- National Research Initiative (NRI)
- Small Business Innovation Research (SBIR)
- The Agricultural Materials Program
- Section 406 National Integrated Water Quality Program



Key Bioenergy Projects Funded by CSREES

- **Genetic Engineering of Yeast for Co-Fermenting all 5 Cellulosic Sugars to Ethanol**
- **Genetic Engineering of Cellulose Biosynthesis in Trees**
- **Gasification and fermentation technologies to produce ethanol and chemicals**
- **Recycling of energy, chemicals, and materials from agricultural processing wastes**
- **Development of an aviation-grade ethanol**
- **Commercial process for producing biodiesel from waste fats and grease (3 plants under construction)**
- **Biodiesel Fuel Education Program**





UNITED STATES DEPARTMENT OF AGRICULTURE
Agricultural Research Service



- Scientific research arm of USDA
- Farm-to-table research scope
- Information and technology transfer
- National Programs
- 1,100+ projects
- 2,500+ scientists
- 9,000 employees
- 100+ lab locations
- \$1.1 billion annual budget (FY07)
- International collaboration
- Partnerships with universities and industry
- Stakeholder driven priority process



Bailey Ecoregions -- Divisions

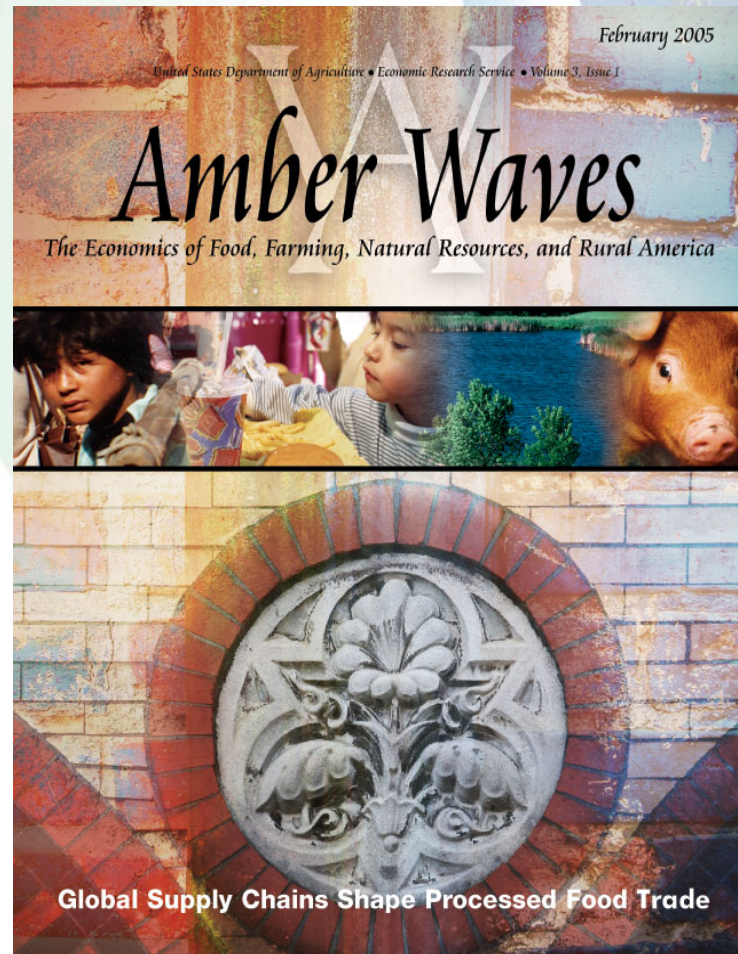


U.S. Department of Agriculture
Agricultural Research Service
Beltsville, MD April 2006

Data Source: Robert G. Bailey - USDA Forest Service
Albers Projection
Prepared by W. Dulaney - Hydrology and Remote Sensing Laboratory (HRSL)

Economic Research Service (ERS)

- USDA's principal social science research agency
- Develops and distributes economic and social science information and analyses



<http://www.ers.usda.gov>

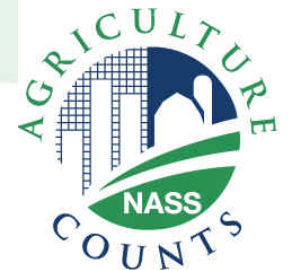


National Agricultural Statistics Service (NASS)

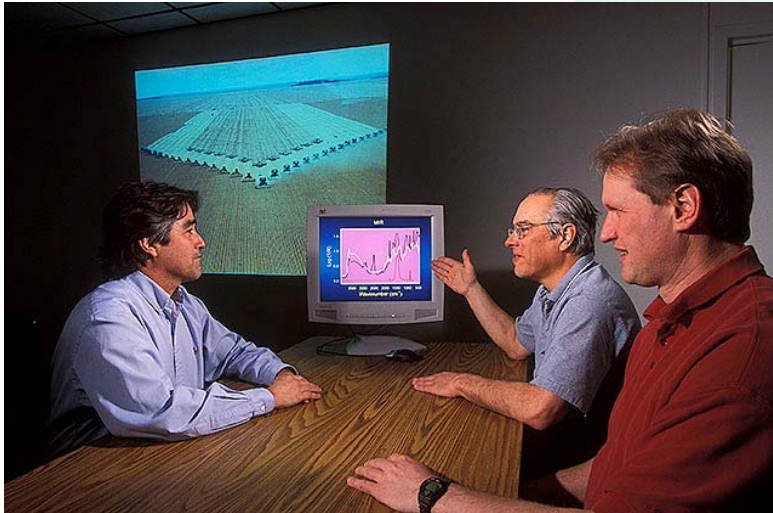
- **Production data and statistics on:**
 - **Livestock and animals**
 - **Crops and plants**
 - **Economics**
 - **Demographics**
 - **Environmental**



<http://www.nass.usda.gov>



Opportunities for Collaboration



- **Feedstocks:**
 - Development
 - Production
 - Logistics
- **Conversion technologies**
- **Co-products**
- **Biobased products**
- **Integration of Components**
- **Environmental Stewardship**



Research, Education, and Extension Is The Power to Move us Forward

Renewables – *Geothermal, Solar, Hydrogen, Biomass, Wind*



PHYSICAL SCIENCES

CHEMISTRY

PHYSICS

GEOSCIENCE

MATERIALS

BIOLOGICAL SCIENCES

BIOLOGY

HORTICULTURE

AGRONOMY

GENETICS

Technology
Disciplines
such as
Science and
Engineering

Social
Disciplines
such as
Economics,
Marketing,
and
Psychology

SOCIAL SCIENCES

GOVERNMENT POLICY

ECONOMICS

STATISTICS

PSYCHOLOGY

MARKETING

Energy Efficiency – *Buildings, Vehicles, Industrial & Distributed Energy*

Candidate Plants for Biofuel Garden and Exhibit



Corn
Barley
Sorghum
Sugar beet
Sunflower
Soybean
Canola
Camelina
Castor bean
Peanut
Lesquerella
Mustard
Sugar cane
Switchgrass
**Hybrid
popular**
Miscanthus
Alfalfa
Jatropha
Cuphea
Babassou
Palm
**African Oil
Palm**
Algae

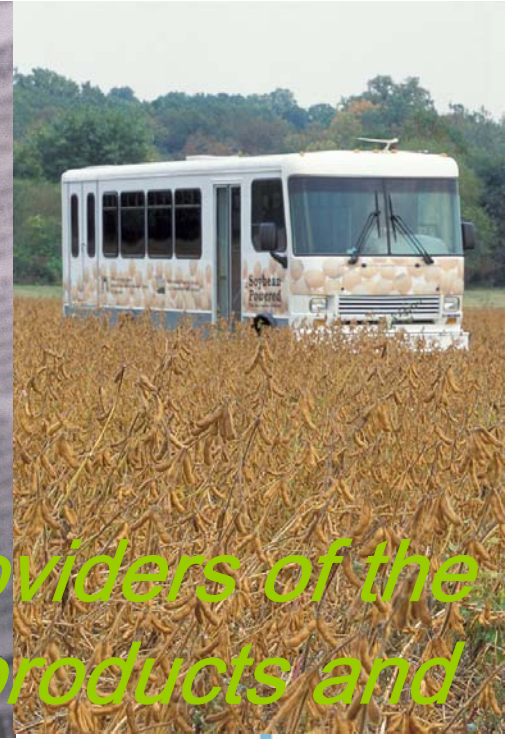
U. S. National Arboretum



USDA REE: Unique Resources and Capacities

- **Regional and local outreach**
- **Genetic resources, collections and crop breeding/genetics/genomic expertise for feedstock development**
- **Systems approach to feedstock development, production, and conversion**
- **Feedstock logistics (harvest, transportation, storage, and pre-treatment)**
- **The use of animal manures, crop & forest residues, and other residuals as feedstocks**
- **Development of biobased products and value-added co-products**
- **A network of dedicated laboratories for performing basic and applied research**
- **Integration of basic and applied research, education, and Cooperative Extension in land-grant universities**
- **Integration and coordination of activities among the REE agencies (ARS, CSREES, ERS, NASS)**





Agriculture and forestry as major providers of the Nation's energy/fuel and industrial products and an agricultural sector less dependent on fossil fuels.

