SUPPORTING ENERGY SECURITY & DEVELOPING THE BIOECONOMY

Producing renewable energy, fuels, chemicals, and other products from biomass offers opportunities to meet demand while reducing agricultural waste, lowering reliance on fossil fuels, and creating revenue streams across rural America. Research and innovation are required to develop biomass production systems that are technically and logistically possible in diverse settings, do not conflict with food, feed, and fiber production, and have minimal environmental impacts. With continued investment in infrastructure, interdisciplinary research, and public-private partnerships, the Land-grant University system is poised to address the challenges of developing the bioeconomy.

RESEARCH PRIORITIES

- Reliable methods and data for cost-benefit analyses of biofuels and bioproducts
- New uses for byproducts and residues of biofuel production
- New and improved biomass feedstocks
- New chemical compounds derived from biomass
- Efficient processing technology
- Evidence-based guidance for policy and marketing decisions

CAPACITY & RESOURCES

- Institutions in all 50 states and many U.S. territories with research sites representing diverse ecosystems, communities, and food production systems
- State-of-the-art research laboratories, processing facilities, and tools
- Transdisciplinary teams of skilled scientists, engineers, and agricultural professionals
- Impartial, peer-reviewed science, technology, and recommendations
- Far-reaching Extension networks to work with and inform communities across the U.S.
- Existing partnerships with the Department of Energy and other government agencies, farm and commodity groups, the private sector, and others

SUCCESS STORIES

Developing the bioeconomy will provide an alternative, sustainable source of energy and products, create new revenue streams for farmers and rural areas, and reduce greenhouse gases and waste. Land-grant Universities have shown that investments in research drive major advances and impacts. For example:

60% of the plywood industry now uses a soy-based glue developed by **Oregon State University** instead of formaldehyde-based adhesives that can harm human health.

68 million gallons of crude bio-oil could be produced from swine waste in **North Carolina**, according to **North Carolina A&T University** research. This bio-oil could be processed into transportation fuels, binders for use in road paving, fertilizers, or other bioproducts.

The carbon footprint of energy beets developed by **North Dakota State University** researchers is

30% lower than sugar beets — and — ***50%*** lower than corn grain.

Making sugarcane a more attractive feedstock for biofuel production, **University of Florida** researchers increased the oil content of sugarcane tissues **80-fold** and genetically modified cell walls, improving ethanol production efficiency by more than ***60%.***

140,000 gallons of biodiesel could be produced from scum, a byproduct of wastewater treatment plants that is usually disposed of in landfills. According to **University of Minnesota** research, treatment plants selling this biodiesel could earn up to ***$600,000 per year.***

Iowa State University designed a conveyor belt system for cultivating algae from wastewater that is being tested by the world's largest wastewater treatment facility in **Chicago**. Compared to a conventional system, it produces ***10 times more biomass.***

A **University of Florida** researcher identified areas of the sorghum genome that could control resistance to anthracnose fungus. This would enable expansion of this promising biofuel feedstock in the **Southeast**, where hot, humid weather provides ideal conditions for fungus growth.

Experts believe biofuel crops like corn and soybeans are not ideal forage for honey bees. **University of Wisconsin** researchers are helping farmers manage their lands to support native pollinators, which could protect against crop failure if the agricultural landscape shifts to include more biofuel crops and honey bees continue to decline.

Some federal regulators, scientists, farmers, and the public are concerned about gene flow from genetically modified crops to non-engineered plants. **University of Tennessee** researchers created switchgrass plants that have sterile seeds and pollen and do not flower, preventing the potential for gene flow.

The Grand Challenges are part of the *Science Roadmap for Food and Agriculture* developed by the Experiment Station Committee on Organization and Policy (ESCOP) to guide food and agricultural research. A unit of the Association of Public and Land-grant Universities, ESCOP governs the research activities of Land-grant Universities and Agricultural Experiment Stations. Borne out of the Hatch Act of 1887 and the Evans-Allen Act of 1977, these premier institutions are supported by USDA NIFA and by collaborations across federal, regional, state, nonprofits, and private institutions. For more information:

- escop.info
- aplu.org

To learn about the research needs, resources, and success stories for other Grand Challenge areas, see the rest of this series: escop.info/roadmap

Experiment Station Committee on Organization and Policy (ESCOP)