

IOWA STATE UNIVERSITY

BioCentury Research Farm

WAYS TO COLLABORATE

The BCRF offers a variety of opportunities for Iowa State University scientists and industry clients to collaborate on research projects and have access to our unique facilities and equipment. These collaborations will provide solutions that pave the way to meet national energy, economic and environmental directives.

OPPORTUNITIES FOR INDUSTRY

Collaborative Projects – Work with Iowa State University faculty and staff through joint solicitations or industry sponsorships.

Fee for Service – Conduct research on-site using BCRF facilities and expertise.

Space and Equipment Leases – Lease space and equipment to conduct proprietary research.

Industry Incubator – Locate your company or organization at the BCRF to carry out proprietary research and development.

OPPORTUNITIES FOR SCIENTISTS

By utilizing the BCRF, Iowa State University scientists can receive a number of benefits including access to field plots and equipment, access to BCRF facilities and equipment and opportunities for research team development.

The BCRF assists scientists with industry collaborative grant proposals and results reporting. Scientists can receive help connecting with companies to commercialize technologies developed in their research programs.



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Research to power the **next generation**
of **biofuels** and **biobased products**

www.biocenturyresearchfarm.iastate.edu

A RESEARCH BIOREFINERY TO HELP YOU INNOVATE.

DESIGNED FOR THE BIORENEWABLES INDUSTRY

The BioCentury Research Farm is the premier integrated biomass to fuels and products production and processing facility in the nation. With capabilities not available at other public institutions, the BCRF can initiate and conduct research and demonstration of new technologies.

The BCRF brings together scientific expertise to accelerate innovation and production capacity associated with biobased fuels, chemicals and products.

Our modern facilities and equipment are available to aid research activities including biomass feedstock production and cropping systems; harvest, storage and transportation logistics of biomass feedstocks; and biomass conversion. Large pilot-scale research can be carried out and in many cases scaled to commercial production.

We provide a venue for educating and training future scientists, producers and Extension experts and developing partnership opportunities with industry.

The BCRF is a College of Agriculture and Life Sciences facility.

OUR MAIN SERVICES

- » Research plots and acreages for feedstock production
- » Year-round development and testing of harvest, storage and transport equipment
- » Hydraulic presses for biomass compaction studies
- » Dry storage for up to 40 tons of biomass
- » Handle, dry and mill up to 2.5 tons of biomass per day
- » Fine milling, sieving and pelletizing
- » Large pilot-scale biochemical conversion of biomass including a dry-grind ethanol plant
- » Thermochemical processing using pilot-scale fast pyrolysis and gasification
- » Pilot-scale algal cultivation systems
- » Large pilot-scale biopolymers processing
- » Support for small business incubator activities
- » Technical consulting services

ALGAE PRODUCTION

The 720-square-foot algal production facility is equipped to quickly grow substantial amounts of algal biomass for on- and off-campus research projects including renewable fuels, biobased products, nutraceuticals and livestock feed. It enables researchers to conduct pilot-scale research year-round in a geothermally heated and cooled greenhouse. Approximately 1.3 to 4.5 kilograms of dried algal biomass can be produced per week.

The facility is outfitted with various cultivation systems including raceway ponds, flat panel photobioreactors, and biofilm-based reactors. A portable pilot-scale biofilm algal biomass production system is available to set up at remote locations. The facility also has a research lab outfitted with smaller cultivation systems and growth and sample analysis equipment.



BIOPOLYMERS PRODUCTION

The biopolymer processing facility converts vegetable oils into thermosets – soft rubbery polymers that can be melted and re-formed over and over again. These biopolymers are being evaluated for use in several different industries including asphalt paving, adhesives, coatings and packing materials. At full production, the facility produces approximately 1,000 pounds of biopolymers per day.





THERMOCHEMICAL PROCESSING

All major thermochemical pathways to biofuels and bioproducts are being explored including gasification to syngas, fast pyrolysis to bio-oil, and solvent liquefaction. These substrates are extracted and upgraded to a variety of products: biochar, hydrogen, ethers, alcohols, sugars and hydrocarbons. The pilot-scale gasifier is capable of processing up to one ton of biomass per day and is equipped with a novel gas cleaning and analysis system. The pilot-scale fast pyrolysis unit processes up to one-half ton per day when operated autothermally and features patented pretreatment and stage fractionation technologies. The continuous solvent liquefaction unit processes up to one kilogram per hour and is capable of solvent separation and recycle.

Research

- » Fast pyrolysis and bio-oil upgrading
- » Production and recovery of pyrolytic sugars
- » Gasification and syngas cleaning
- » Solvent liquefaction
- » Biochar
- » Biopower
- » Algae conversion
- » Biorenewables systems analysis

FEEDSTOCK PRODUCTION

Substantial research plots and large-scale acreages are available for biomass feedstock production. Research program areas include plant breeding and genomics, crop selection and development, comparative cropping systems, soil conservation and nutrient management.

1,000+ acres
available for
feedstock studies

HARVEST, STORAGE AND TRANSPORTATION



Research-driven innovation is improving the efficiency and economic feasibility of biomass harvesting and transportation technologies. Project areas focus on developing in-field harvesting and densification methods, biomass logistics and materials handling. Biomass production and harvesting equipment and methods are tested year-round.

Biomass feedstock storage research trials are conducted in controlled and real world environments. Alternative storage systems are available and tested on-site. Corn stover bale storage trials are conducted without protection, under tarps and in enclosed buildings. Three hoops structures are available for projects. These trials help identify the most cost-effective storage systems for different biomass crops.



BIOMASS PREPARATION



Biomass feedstocks are dried, ground and sized in the biomass storage and pretreatment building. Various dryers, grinders, mills and sieves are available to process biomass for biofuels projects. The building also features a fine particle biomass preparation lab that is used for fine grinding, sieving, pelleting, milling, briquetting and particle size distribution determination. The lab is designed to accommodate 12 independent equipment stations. The BCRF is one of the few facilities in the nation capable of grinding and sizing large quantities of research quality biomass feedstocks while still accommodating small-quantity projects.

BIOCHEMICAL PROCESSING

Biochemical processing research is further developing pretreatment, fermentation and ethanol recovery strategies enabling successful commercialization of biofuels and biochemicals. The BCRF is equipped to replicate the entire dry-grind ethanol process at large pilot scale, allowing researchers to develop new technologies that add higher value co-products and reduce water and energy consumption in grain ethanol production. Industry and faculty also use the facility to scale-up new biotechnology products and processes for crop seed technologies through finished consumer products.

Equipment

- » Fermentation vessels (500-liter and 1,000-liter working capacities)
- » Horizontal decanter centrifuge
- » Membrane filtration system
- » Distillation column
- » Stillage evaporator
- » Pilot-scale rotary steam tube drying system (500 pounds of DDGS capacity per day)