Sustainable biorefinery system initiative

Biofuels and bioproducts from bioenergy sorghum

Strategic opportunity

Texas A&M AgriLife is working to establish a sustainable biorefinery system for deployment in Texas and the U.S. Gulf Coast for the production of carbon-negative renewable biofuels, biopower and bioproducts from bioenergy sorghum — a crop well-adapted to this region.

The sustainable biorefinery system would significantly increase the domestic supply of renewable biofuels, biopower and bioproducts, improve soil fertility, reduce greenhouse gas emissions, and increase energy security and economic competitiveness.

The sustainable biorefinery system will help meet passed-deadline bioenergy production mandates of the Energy Independence and Security Act of 2007 and future demand for renewable biofuels, including sustainable aviation fuel.

Objectives

A sustainable biorefinery system

Create a sustainable biorefinery system in the U.S. Gulf Coast region optimized for utilization of bioenergy sorghum, energycane and related feedstocks, that enables economical production of renewable biofuels, biopower and bioproducts, while capturing and sequestering carbon dioxide.

Improved bioenergy sorghum

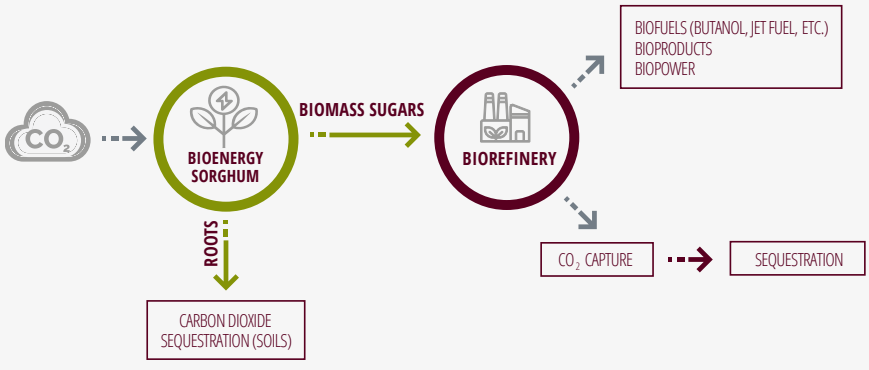
Continue improvement of bioenergy sorghum — a high-yielding, resilient feedstock for economical production of biofuels. Bioenergy sorghum can be grown with minimal inputs and nitrous oxide emissions while improving marginal cropland with soil organic carbon.

Increased biofuel production

Strengthen energy security, promote economic development and enhance environmental sustainability by significantly increasing domestic production of renewable biofuels, biopower and bioproducts.

Vision

Bioenergy sorghum grown on marginal cropland will increase soil organic carbon enhancing soil fertility while producing feedstock for sustainable biorefineries that produce biofuels, biopower and bioproducts, capture carbon dioxide and generate carbon credits.



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Background and barriers

- The 2005 Billion-Ton Study and its updates — sponsored by the U.S. Department of Energy and U.S. Department of Agriculture — showed that the U.S. could provide over a billion metric tons of dry biomass per year for conversion to biofuels, bioproducts and biopower without affecting food production.
- To protect food production, the Energy Security and Independence Act of 2007 required that 21 billion gallons of biofuels be produced from non-grain sources — like sorghum and energy cane — by 2021.
- These sources are not yet commercially viable.
- The main barrier is a lack of biorefineries that can use this feedstock optimally.

Opportunity along the Texas Gulf Coast

- The Billion-Ton Studies identified the Gulf Coast of the U.S. — extending into the lower Midwest, — as ideal for biomass feedstock production.
- Bioenergy sorghum is a highly productive, drought-resilient, low-input biomass crop for ethanol that can provide significantly more energy than it takes to process.
- 10 million acres of Gulf Coast annual cropland could produce 10 billion gallons of renewable biofuels

Solution

A biorefinery that processes high-moisture-stem feedstocks like bioenergy sorghum, using an efficient, low-cost technology, which has already succeeded at lab scale.

- Build a pilot biorefinery that takes up bioenergy sorghum feedstock.
- Analyze derived sugars for convertibility into biofuels.
- Analyze biomaterials for stability and efficacy.

10 million acres of cropland on the Texas Gulf Coast **=** **10 billion** gallons of renewable biofuel per year

Impacts of a sustainable biorefinery system

Environmental sustainability
- Large-scale carbon capture and greenhouse gas mitigation
- Improved marginal cropland soil fertility

Energy security
- Improved long-term U.S. renewable energy supply
- Increased supply of renewable biopower and hydrocarbon biopolymers

Economic development
- Increased agricultural productivity and expanded markets
- Enhanced rural economies though investment in sustainable biorefineries

Bioenergy sorghum hybrids with enhanced traits will be available within 5 years. The only way to realize their economic and environmental value is with a biorefinery that can process them.

Building momentum

Work to build a sustainable biorefinery system in the Gulf Coast region of Texas will require support from private donors, corporate partners and other organizations that believe in the potential of this effort and its impact on energy security, economic development and environmental sustainability.