



Eastern Regional Research Center

Bioethanol, Biohydrogen, and Biobased Products from Grains, Agricultural Residues and Energy Crops - A Research Program of the Crop Conversion Science and Engineering Research Unit

Agricultural Research Service
U.S. Department of Agriculture
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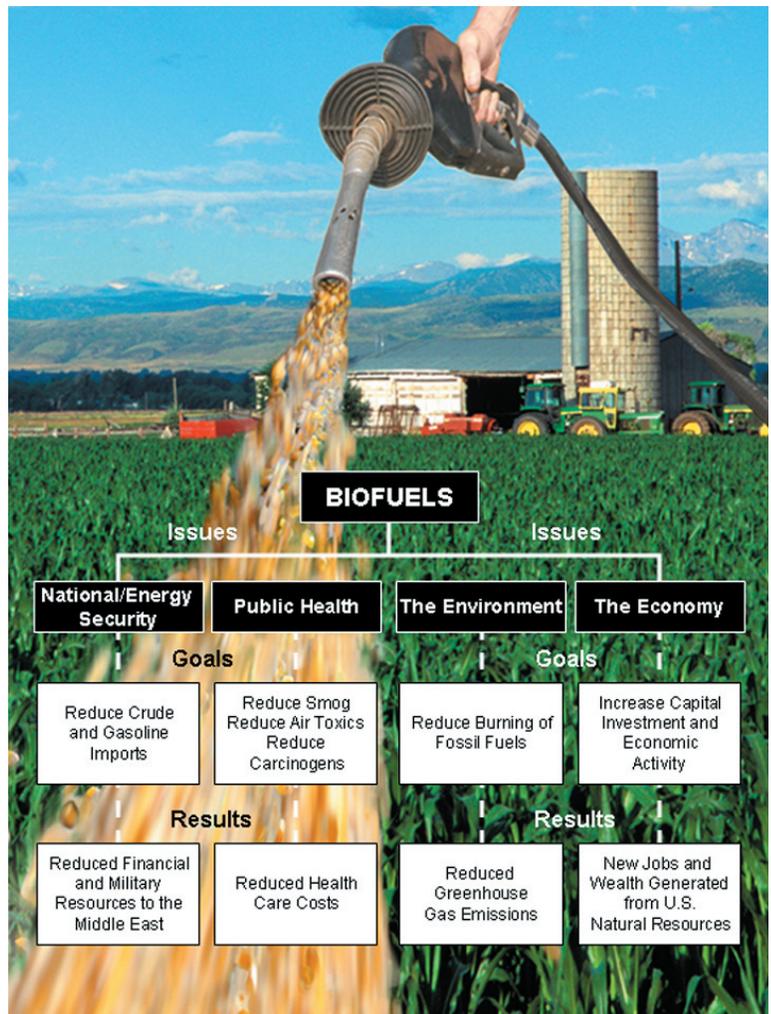
The ERRC is one of four government-funded Regional Research Centers in ARS, established by Act of Congress in 1938. The scientific investigations of ERRC have had a favorable impact on the welfare of American farmers, industries, and the consuming public. In times of excess supplies of agricultural commodities, surplus to our need for export and domestic consumption, utilization research has pointed toward new ways to use that surplus. When national priorities were focused on areas such as food safety, nutrition, energy production and conservation and avoidance of pollution, research progress in each of these fields made contributions to the resolution of problem areas. Today, multi-disciplinary teams sharing techniques, insights and advanced scientific instruments and facilities, provide low cost, shelf-stable, nutritious and safe food, fiber, biofuels, and non-food or industrial products to the marketplace.

The Crop Conversion Science & Engineering Research Unit (RU) is one of six RUs at ERRC in the Federal System fostering utilization of grains, agricultural residues and energy crops for conversion to bioenergy and biobased product technologies for U.S. Stakeholders. Kevin B. Hicks, Research Leader; Tele: 215-233-6579; email: khicks@errc.ars.usda.gov

Mission (Bioethanol, Biohydrogen): Multi-disciplinary research studies to develop fundamental knowledge and novel processes (including enzymatic, chemical, physical, fermentation and other environmentally sustainable approaches) for the cost effective conversion of agricultural crops and their coproducts into value-added biofuels and biobased products.

- ▶ Develop new, cost effective, alternative approaches for corn and barley processing and fractionation using enzymes, immobilized enzymes and other environmentally sustainable processes that maximize yields of products
- ▶ Assist in creating a new hullless barley-to-ethanol industry in corn-deficient regions – Mid-Atlantic States
- ▶ Develop improved processes to convert low valued crop-related biomass, byproducts and energy crops into renewable hydrogen or liquid fuels – integrate this technology into co-located dry grind ethanol plants
- ▶ Develop small-scale thermo-chemical technologies that economically, efficiently and sustainably produce hydrogen, bio oil, and coproducts from agricultural materials

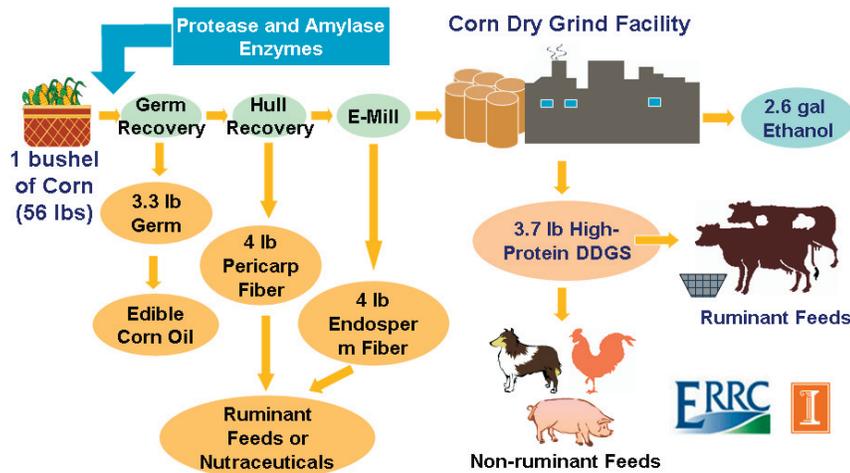
Centers of Excellence: Process Engineering Unit with Facilities and Expertise to do laboratory and Pilot Plant research involving basic theoretical investigations, process development, scale-up, simulation and economic feasibility studies making technologies directly transferable to end-users; Computer Cost Modeling for Bioethanol, Biohydrogen Production (Super® Pro Designer Model; Aspen Plus/Microsoft Excel® Model)



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Selected Ongoing and Potential Research Opportunities for Stakeholders

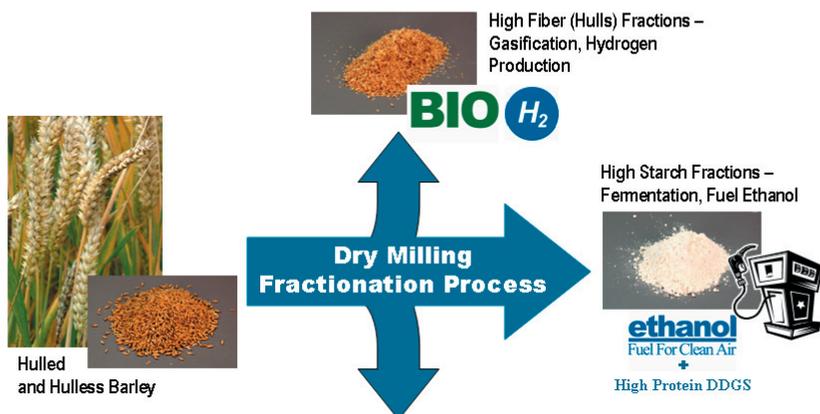
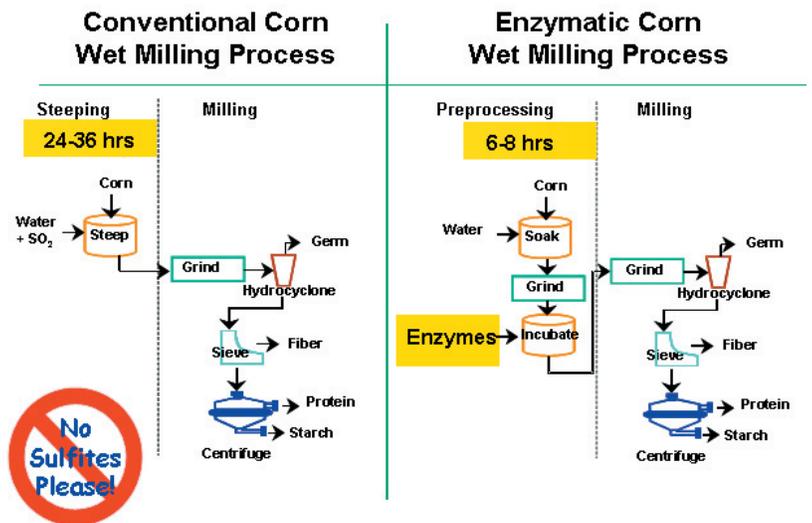
*"Ethanol's production drives economic development, adds value to agriculture, and moves our nation toward energy independence. Its use cleans America's air and offers consumers a cost-effective choice at the pump."
(Ref: American Coalition for Ethanol, 2006)*



Our new enzymatic (e-mill) fuel ethanol process (Johnston, et al., U.S. Patent 6,899,910, 2005) produces more valuable coproducts than the conventional dry grind process



Our new enzymatic corn wet milling process (U.S. Patent 6,566,125, 2003) eliminates hazardous sulfites and saves energy



Our new technologies to convert hulled and hulless barley to fuel ethanol allow fuel ethanol production outside the corn belt