

Advanced Corn-to-Ethanol Platform

Platform Coordinator:

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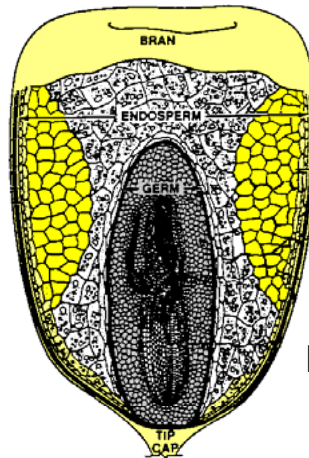
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Goals

- Improve efficiency and reduce costs of producing ethanol from corn.
- Introduce alternative feedstocks such as corn grain fiber and corn stover.



Corn Has Significant Potential for Biofuels

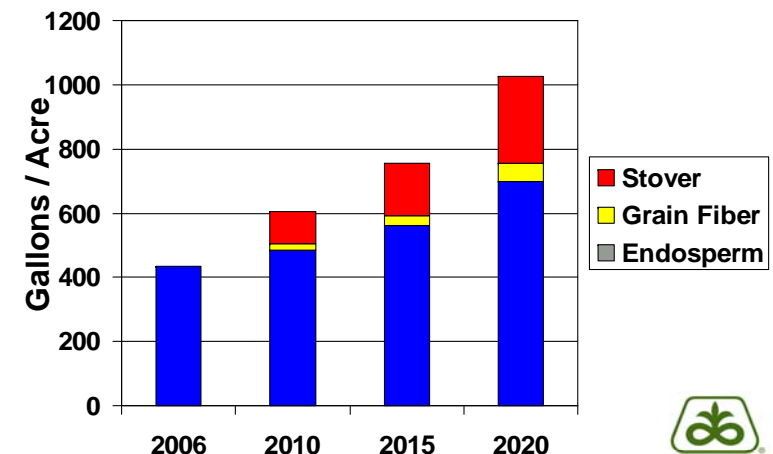


Ethanol Productivity Potential

Endosperm → **435 Gal/Acre**
@ 150 bu/ac grain yield

Pericarp → **18 Gal/Acre (2010)**

Stover → **100 Gal/Acre (2010)**



Grain Endosperm

	05	10	15	20
Bu/Ac	150	180	200	250
Gal/Bu	2.5	2.7	2.8	2.8
Gal/Ac	390	486	560	700

Grain Pericarp

Ton/Ac	0	.45	.500	.625
Gal/Ton	0	40	60	90
Gal/Ac	0	18	30	56

Stover

Ton/Ac	0	2.5	2.75	3
Gal/Ton	0	40	60	90
Gal/Ac	0	100	165	270

**1,000 gallons /
acre by 2020?**

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Short-term objectives

- Reduce operating and capital costs for dry-grind ethanol facilities
- Employ new enzymes and processes to utilize carbohydrate
- Develop lines of corn with fermentation productivity traits
- Increase feed value of ethanol co-products
- Develop new uses for co-products
- Develop new fermentation products

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Long-term objectives

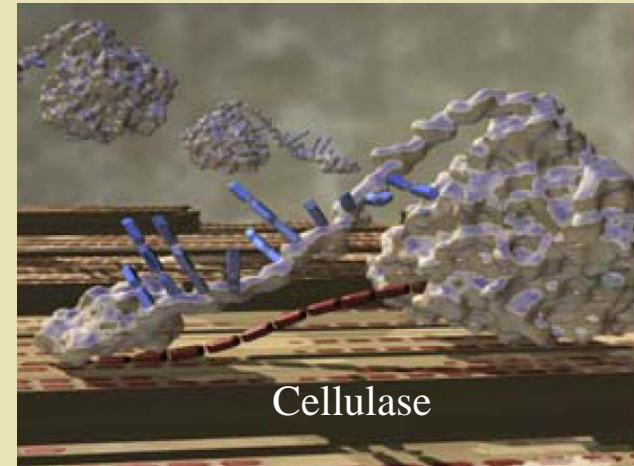
- Understand lignocellulose biosynthesis in corn grain and stover
- Develop new pretreatments for corn fiber and stover
- Develop economical technologies to integrate cellulose conversion with minimum retrofitting into today's starch-to-ethanol mills



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Long-term objectives (cont.)

- Engineer corn plants that can be readily disassembled and converted to fermentable sugars
- Develop improved enzymes and processing treatments to convert lignocellulose to fermentable sugars
- Develop value-added co-products for feed and other uses



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Three Projects

- Advancing dry-grind corn ethanol production
 - Tom Brumm & Larry Johnson
- Increasing the value of co-products
 - Paul Scott
- Enhancing the raw materials supply chain
 - Charles Hurburgh



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Strategies to advance dry-grind corn ethanol facilities

- Reduce energy consumption
- Increase ethanol yield
- Improve process/reactor design
- Increase revenue streams



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Limitations to increasing the value of co-products

- Excessive fat in DDGS for ruminant feeds
- Excessive fiber in DDGS for non-ruminant feeds
- Overly saturated oil in DDGS for swine feeds
- Poorly digestible protein and poor EAA balance
- Absence of high value products
- Incomplete starch conversion diluting feed value of DDGS

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Strategies to increase the value of co-products

- Modify the traits of the corn plant
- Improve processing and handling methods
- Identify new uses and value added products



Process and Product Quality Control in Bioprocess Raw Materials



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www.trace.eu.org

Raw Material Supply Issues

- Shortage of local grain storage (0.5 – 0.8 bln bu)
- Shifting of raw material transportation to short hauls by truck.
- Detection and management of key raw material factors (e.g. fermentable starch, germ size, fiber, moisture content, hardness)

Raw Material Supply Issues

- Certified quality management systems (ISO, etc) and supply chain organization for raw materials.
- Traceability of raw materials through processes
- Food safety factors affecting production (eg. mycotoxins, unapproved GMO).
- Segregation of unfit materials for other purposes.

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Raw Material Topic Areas

- Grain storage and its impact on the ethanol process
- Management operations for raw materials that impact efficiency, output quantity and quality
- Certified quality management systems and supply chain organization for raw materials
 - 23 faculty involved in some way

Food Safety Connection



- [Food Safety Consortium](#)
- [Food Safety Research Consortium](#)
- [Biosafety Institute for Genetically Modified Agricultural Products](#)
- [Center for Food Security and Public Health](#)
- [Iowa Grain Quality Initiative](#)



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Center for Crops Utilization Research



Committed to expanding value-added agriculture and the bioeconomy through research, development and outreach.

Where to Find Us:



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