

# Advanced Corn-to-Ethanol Platform

**Platform Coordinator:**

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## Advanced Corn-to-Ethanol Platform

### Goals

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



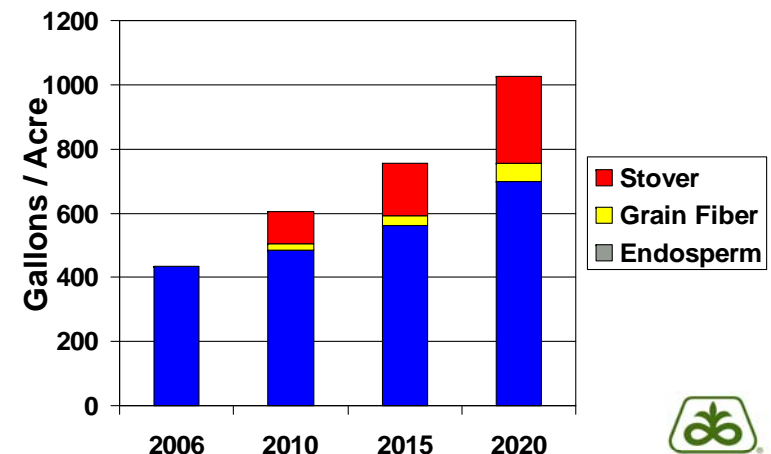
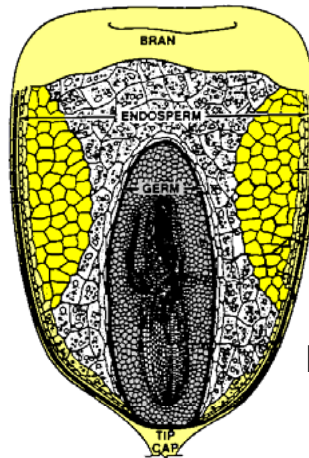
# Corn Has Significant Potential for Biofuels

## Ethanol Productivity Potential

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

Pericarp → **18 Gal/Acre (2010)**

Stover → **100 Gal/Acre (2010)**



<b>Grain Endosperm</b>				
	05	10	15	20
Bu/Ac	150	180	200	<b>250</b>
Gal/Bu	2.5	2.7	2.8	<b>2.8</b>
Gal/Ac	390	486	560	<b>700</b>

<b>Grain Pericarp</b>				
Ton/Ac	0	.45	.500	<b>.625</b>
Gal/Ton	0	40	60	<b>90</b>
Gal/Ac	0	18	30	<b>56</b>

<b>Stover</b>				
Ton/Ac	0	2.5	2.75	<b>3</b>
Gal/Ton	0	40	60	<b>90</b>
Gal/Ac	0	100	165	<b>270</b>

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

## Advanced Corn-to-Ethanol Platform

### **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

## Advanced Corn-to-Ethanol Platform

### Long-term objectives

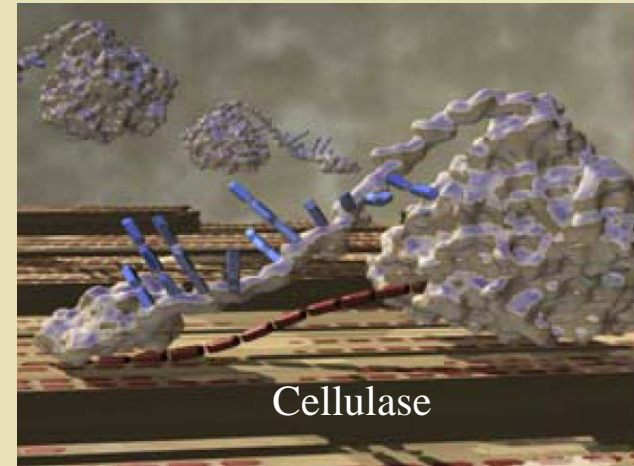
- Understand lignocellulose biosynthesis in corn grain and stover
- Develop new pretreatments for corn fiber and stover
- Develop economical technologies to integrate cellulose conversion with minimum retrofitting into today's starch-to-ethanol mills



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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



## Advanced Corn-to-Ethanol Platform

### 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



## Advanced Corn-to-Ethanol Platform

# 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

## Advanced Corn-to-Ethanol Platform

# 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](http://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.

## Advanced Corn-to-Ethanol Platform

# 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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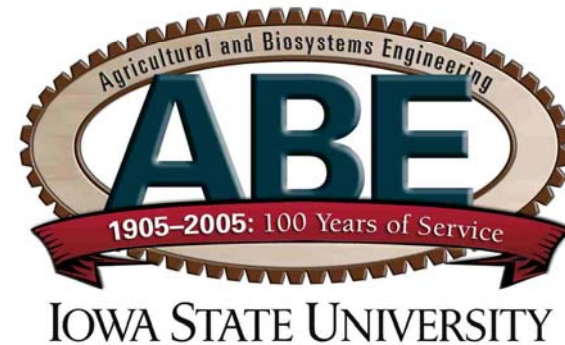
# Center for Crops Utilization Research



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



# Where to Find Us:



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