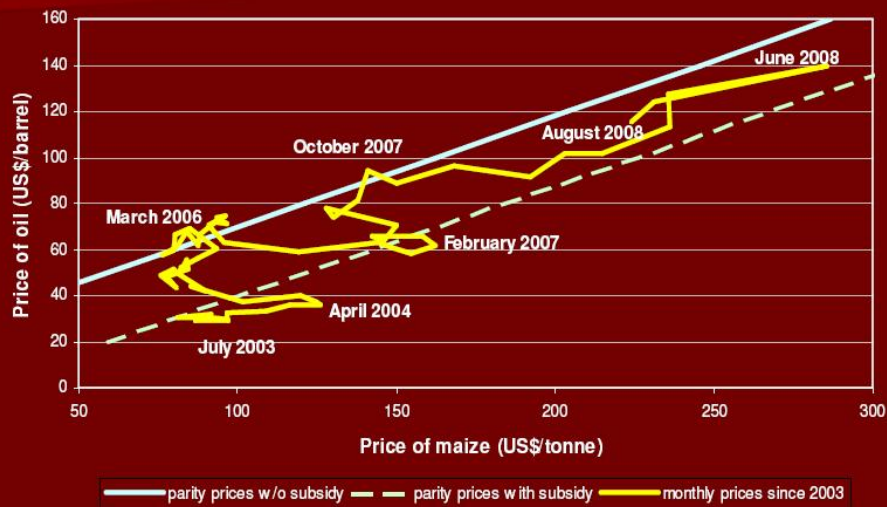


Prices of crude oil and maize, 2003-2008



Monthly prices are from the Commodity Research Bureau (www.crbtrader.com).
Parity price lines for US ethanol are from Tyner and Taheripour 2007.



Relationship of Oil and Corn Pricing

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- New Models to Measure and Monitor
 - Carbon footprint/emissions
 - Carbon sequestration
 - Total energy requirements
 - Offsets
 - Direct and indirect land use
 - Cap and Trade values and market

Environmental Policy Considerations

- RFS sets minimum level of renewable fuels for blending. (.6 billion gpy 2009 – 21 billion gpy 2022)
 - Economic/Market Impact
 - Mandates alternative biofuel production
 - Redirects production toward biomass
 - Forces oil companies to consider higher blending ratios
 - Modest decrease in oil demand (short-term)

Renewable Fuel Standards (RFS)



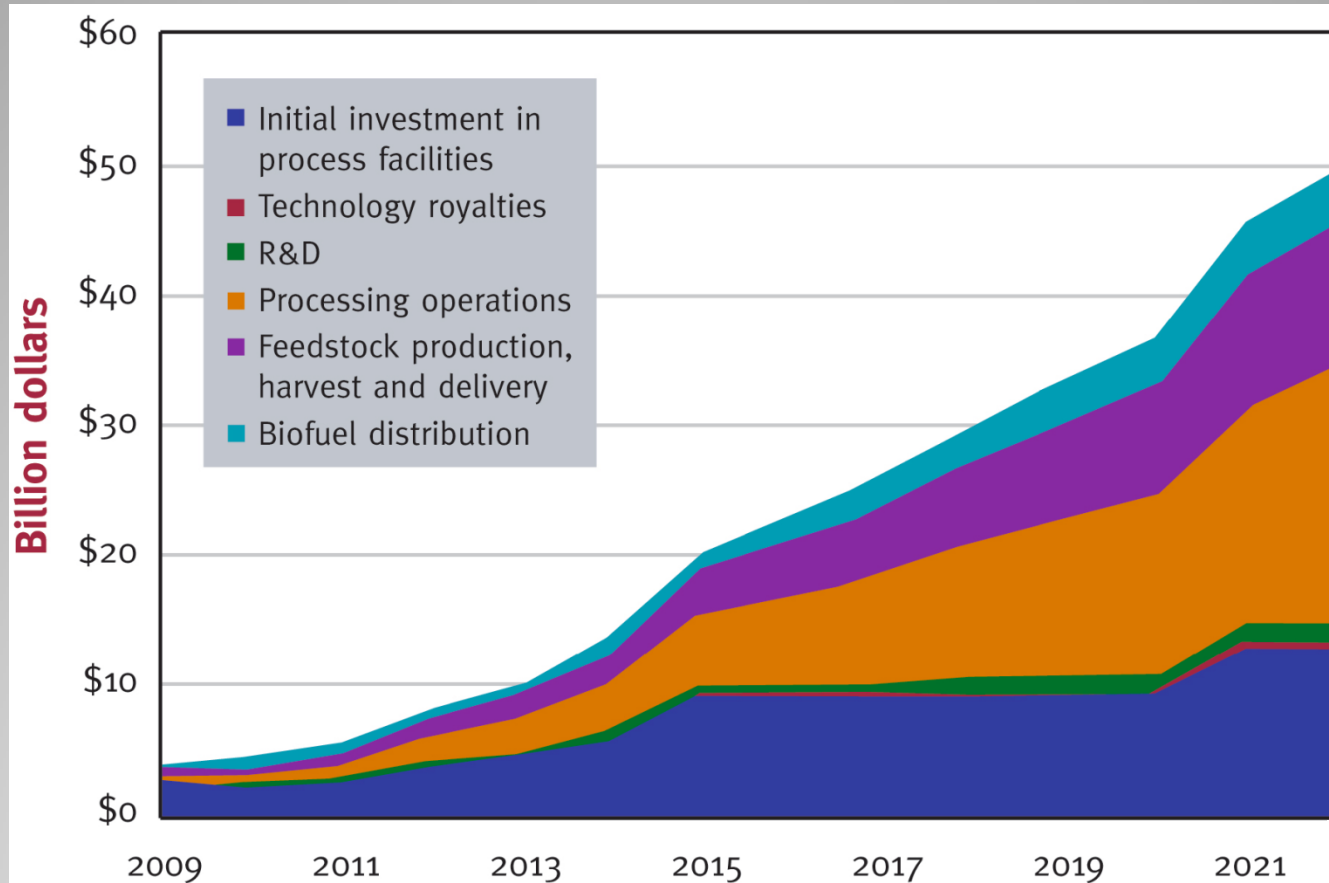
Opportunities in Biofuels

- Achieving \$2.00 Gallon (\$2.32 - \$2.63 or \$0.528/liter US)
 - Biomass \$40.00 to \$60.00 US/Ton
 - On-site enzyme production (\$.02 - \$.04/Gallon)
 - Enzyme C5/C6 conversion > 75%
 - 40% C5
 - 60% C6
 - Fermentation conversion of C5 > 20%
 - Fermentation conversion of C6 > 80%
 - Looped or two phased fermentation
 - Dewater technology with reflux distillation

Biomass to Ethanol Economics

- The Emerging Energy Technology Industry
 - Biofuels
 - Wind, hydro, solar, photovoltaic
 - Biomass to electrical
 - Hydrogen
 - Energy efficiency - smart grid technology
 - Energy materials
 - Many other sectors

Jobs and Economic Development



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US Economic Impact of Advanced Biofuels Production: Perspectives to 2030

- Direct non-agricultural job creation 190,000
- Capital investment of \$12.2 billion
- Reduced petroleum imports 36 billion gpy
- Capacity for 470 mm tons of biomass US
 - Projected agricultural value of \$28.2 billion

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Projected Economic Impacts of EISA by 2020



The Green Carbon Revolution

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- University Research Partners



- Savannah River National Laboratory
- Clemson University
- South Carolina State University (Clyburn Transportation Center)



- Corporate Partners

- Spinx Corporation
- Fagen Engineering
- Dyadic International (Enzyme research only)
- ArborGen



Active BioEnergy Partners



- Novel pretreat and recovery
- Fungal Hydrolysis
- High conversion rate C6/C5
- C5 Fermentation development
- Phase I: Pilot Plant (Bench Scale)
 - Process Equipment design & installation
- Conceptual P&ID Development Phase II
 - Advanced pretreatment process switchgrass
 - Advanced cellulose hydrolysis C5 & C6 Expression (Plus 75% total convertible)
- Field trials switchgrass – sweet sorghum

Summary: Research Discoveries and Progress FY 2007-09

- Oil pricing will determine pricing of biofuels for next fifteen years.
- Land for food production debate will increase as world population increases by 12% to 18% by 2025.
- Demand for biofuels re-ignites in 4 years above blending demand.
- Carbon credit market drives clean oil technology and new biofuel production.
- Liquid fuel market increases by 40% by 2025.

Conclusions

CONTACT INFORMATION

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Questions