Biofuels: Status and Prospects in North America and the World

Chris de Brey, PhD

The Sulphur Institute

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TSI THE SULPHUR INSTITUTE

Our Mission:

TSI is the global advocate for sulphur, representing all stakeholders engaged in producing, buying, selling, handling, transporting, or adding value to sulphur.

U.S. Biofuel

- First Renewable Fuel Standard established in 2005: 7.5 billion gallons of biofuels by 2012
- Energy Independence and Security Act (EISA), 2007:
  - 9 million gallons biofuels by 2008 (from corn)
  - 36 million gallons of biofuels by 2022 (corn ethanol capped at 15 million gallons in 2015)
    - 15 million gallons corn ethanol
    - 21 million other (mostly cellulosic ethanol, some biodiesel)

Ethanol Refinery Locations
(by capacity: >80% in Upper Midwest)

Source: Renewable Fuels Association

U.S. Biofuel (Cont.)

- **EISA allows EPA to modify RFS if economic/environmental considerations warrant**
- **Interpretation of lifecycle GHG emissions can be reduced**
- **California low-carbon fuel standard increases environmental criteria**

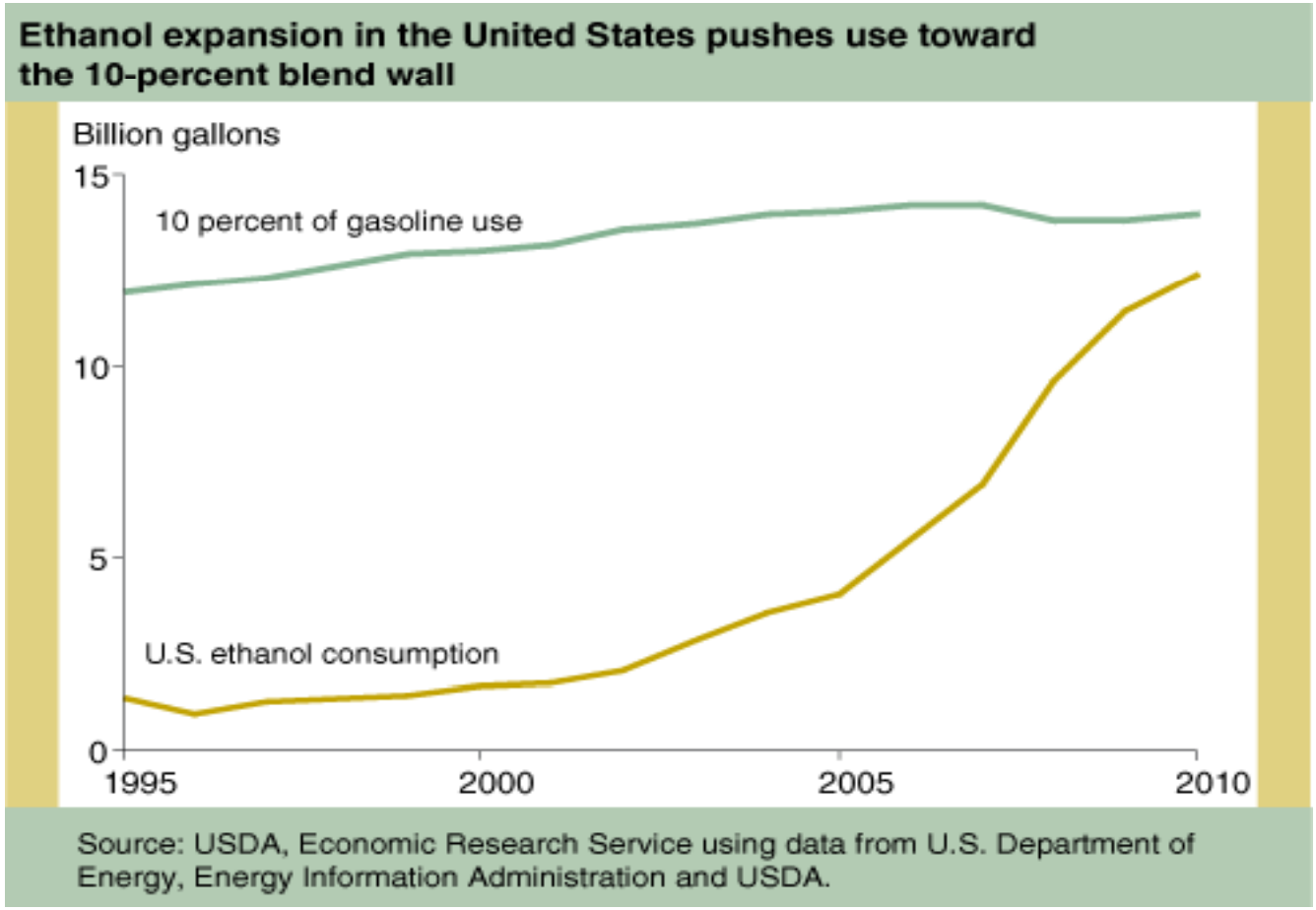
Challenges to meet EISA 2007 mandates

- **Supply challenges**
  - **New production technologies for cellulosic ethanol; 5-10 years away?**
  - **Supporting infrastructure needs to be built**
    - **New farming activities, long lead time, need profitability assurance for investment**
    - **Transportation infrastructure of bulky feedstock**

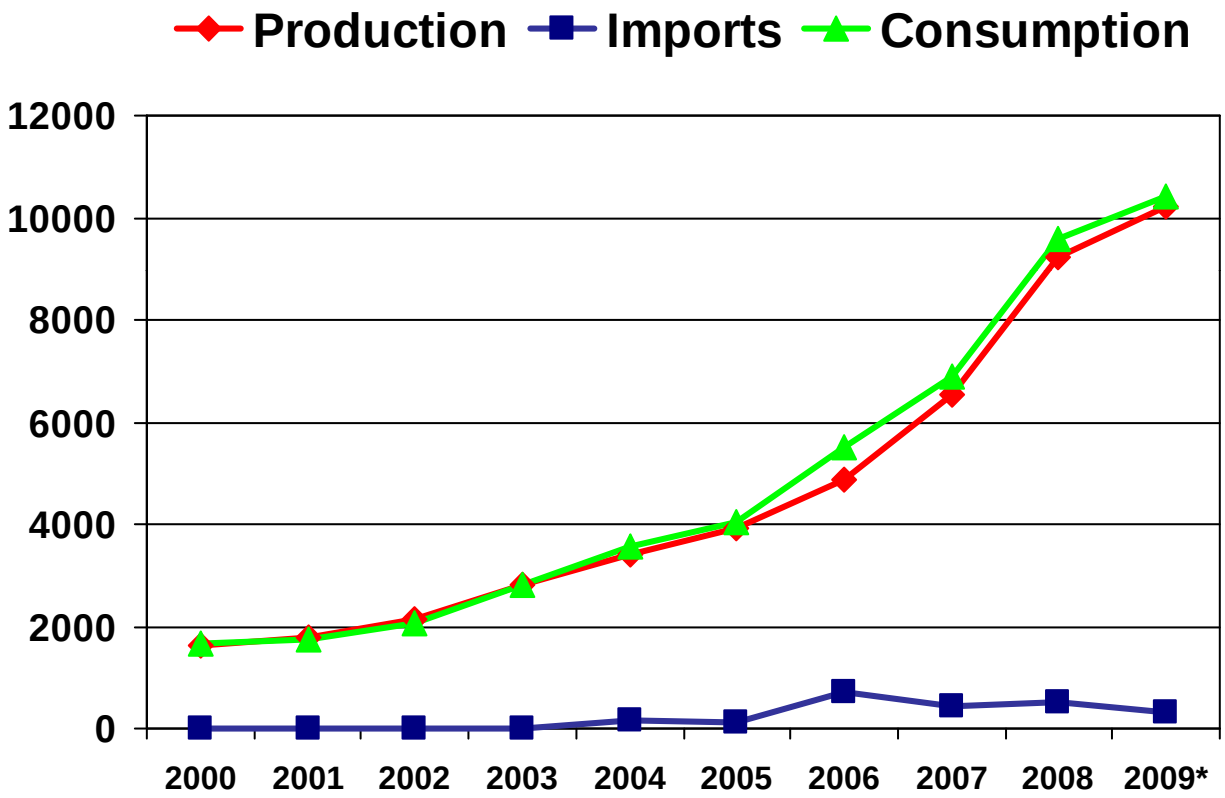
Challenges to meet EISA 2007 mandates (Continued)

- **Demand challenges**
  - **Most U.S. vehicles restricted by factory warranties to E10 (10%) ethanol content**
  - **Expansion to E13-20 under technical review**
  - **E85**
    - **flex-fuel vehicle fleet 6-7 million cars, 3% of total fleet**
    - **1,900 E85 service stations, about 2% of total**
    - **E85 use under 1% of gasoline use**
  - **Flat to declining gasoline use would force greater % of ethanol into mix**

Ethanol demand increase difficult with current situation



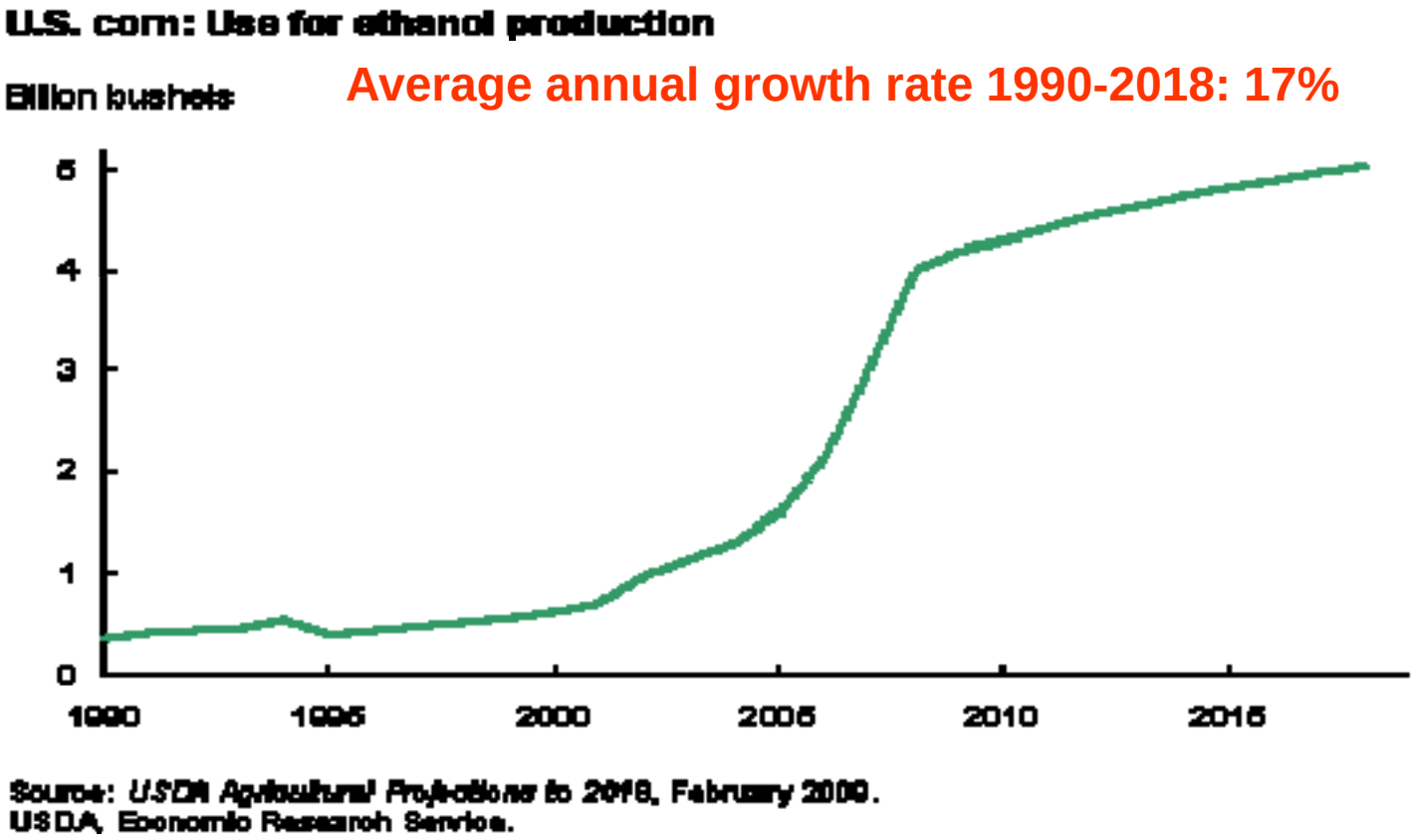
U.S. Ethanol Statistics
Million gallons



Source: Energy Information Administration

***Estimate, based on Jan-July data**

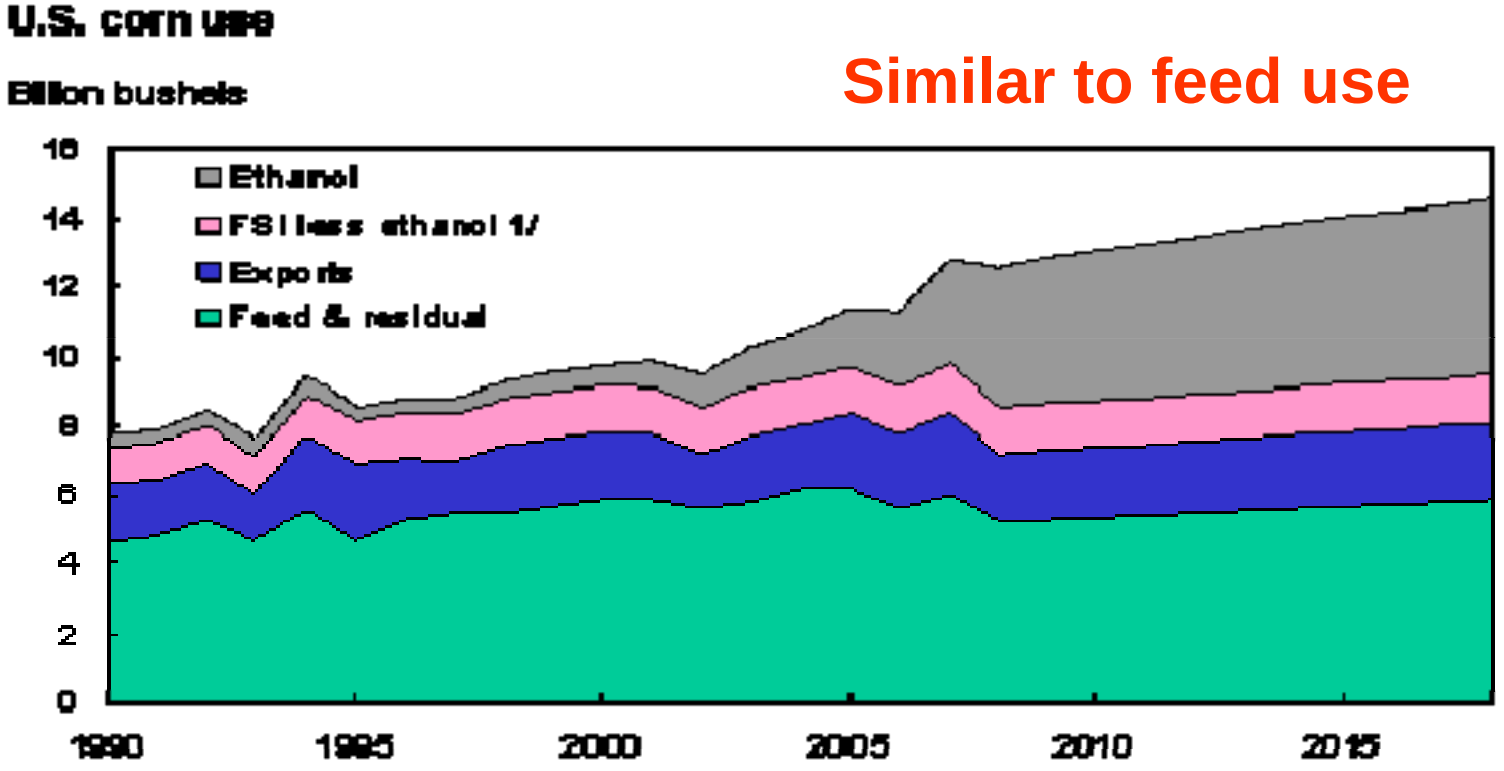
Corn use for ethanol expansion to slow



Assumptions from USDA Projection

- Continuation of 45 cents tax credit available to blenders of ethanol
- Continuation of 54 cents per gallon tariff on ethanol imports
- Gasoline demand growth to moderate, flatten
- Corn prices to be sustained by new use
  - Above long term average
  - Below high levels of early 2008

Ethanol to account for 35% of corn use by 2018



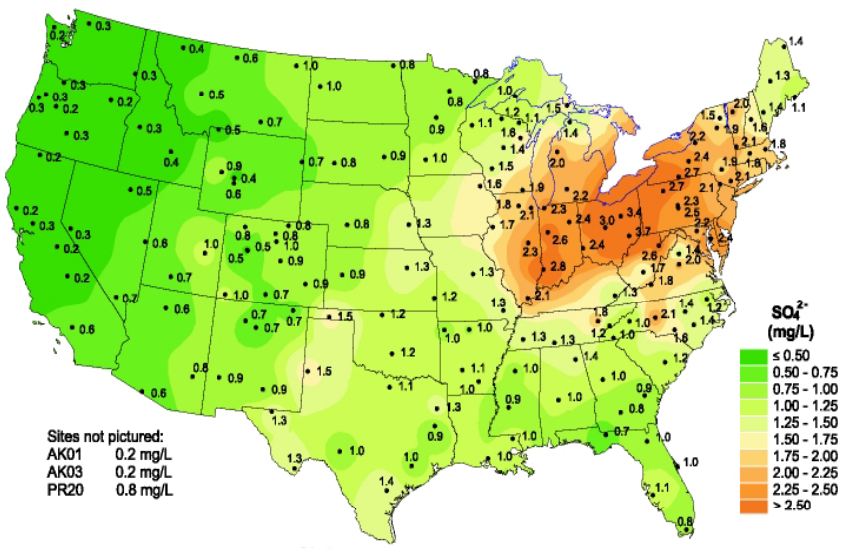
Ethanol Expansion Benefits all Fertilizers

- A new demand sector for corn
- From 4% share to 30% share in 20 years
- Contributes to a more robust corn market
- Corn is the single largest NPKS nutrient demand crop

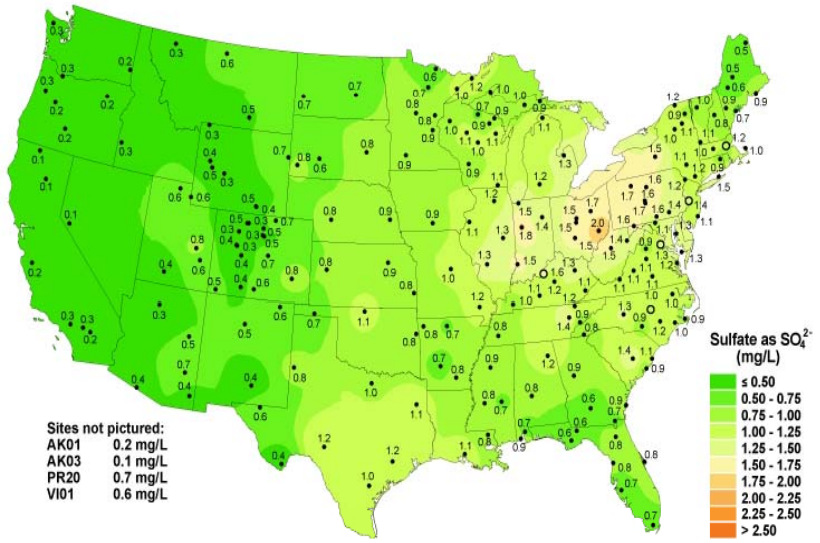
Sulphate ion deposition (mg/liter)

The need for more sulphur fertilizer in corn belt increasingly evident

1994

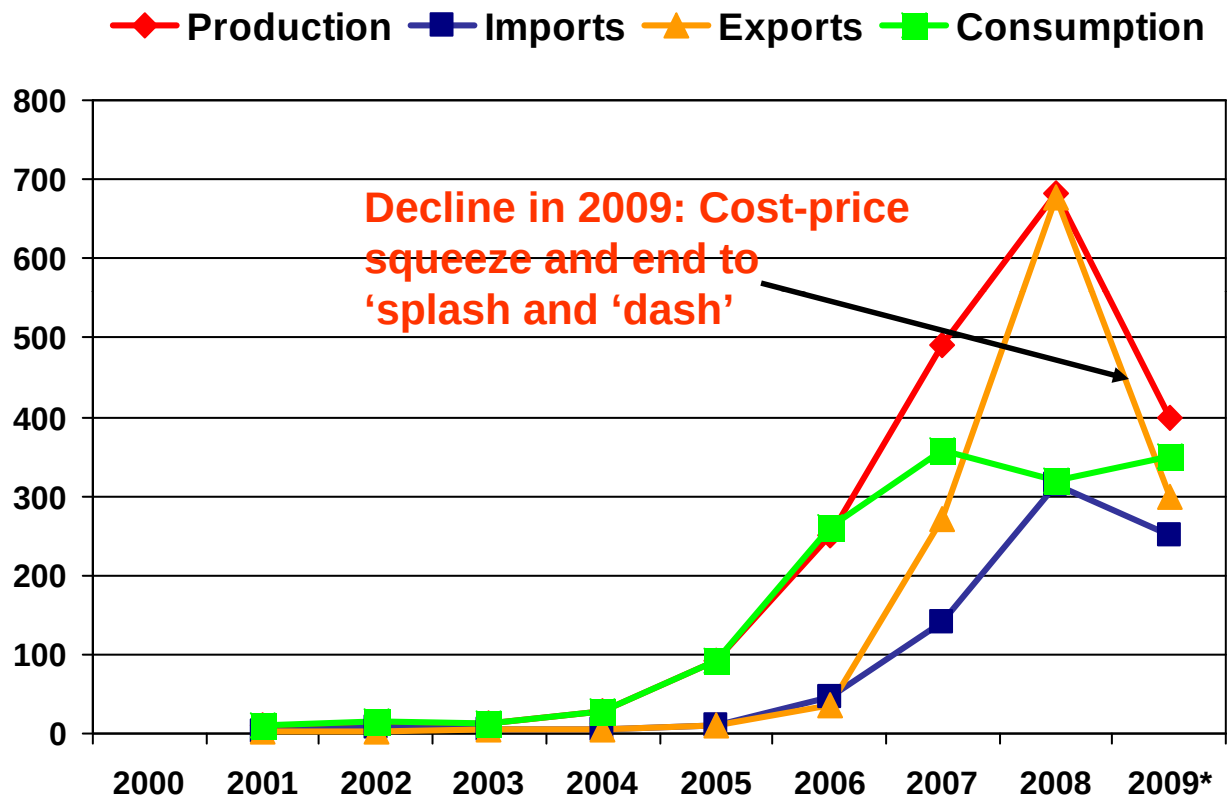


2008



Source: National Atmospheric Deposition Program/National Trends Network

U.S. Biodiesel Statistics
Million gallons



Source: Energy Information Administration

***Estimate**

Biodiesel: ‘Splash and Dash’ policy

- Provision passed in 2004, to encourage biodiesel use
- Federal excise tax credit of 1 cent per percent of biodiesel blended with petroleum diesel.
- Credit applied to biodiesel blends consumed in U.S. as well as that exported to other countries
- Biodiesel imports, and exports to EU boomed: ‘Splash’ biodiesel (domestic and imported) with <1% regular diesel, ‘Dash’ product to EU, where it receives further tax credit
- Practice stopped in early-mid 2009 by EU import tariffs on US-shipped product

Biodiesel: USDA Assumptions and Projection

- **Biodiesel tax credit set at $1 per gallon for all feedstocks in 2008, favoring non-soybean feedstocks (recycled oils, animal fats) which were at 50 cents**
- **Tax credit assumed to continue**
- **Biodiesel production to increase to 1 billion gallons by 2012 (meeting mandate); less than half from soybeans**

Canada Biofuels

Source: Canadian Renewable Fuels Association

Canada Biofuels (Cont)

- **Production of ethanol mostly from corn and wheat**
  - **Production in 2007: 211 million gallons**
  - **Production in 2008: 238 million gallons**
- **Production of biodiesel mostly from canola and soybeans**
  - **Production in 2008: 25 billion gallons**

Canada Biofuels (Cont)

- **Production set to rise dramatically:**

- **Government providing C$1.5 billion subsidy over 9 years to boost production**
- **Will require 5% ethanol content in gasoline by 2010 and 2% biodiesel content in diesel by 2011**
- **Production said to reach 530 million gallons (ethanol) and 130 billion gallons (biodiesel) by 2011, probably optimistic**

Concluding Remarks

- **Biofuel outlook likely to be driven more by policy decisions/mandates than by markets**
- **USA**
  - **>E10 ethanol**
  - **Interpretation of lifecycle GHG emissions**
  - **Policy funding research (cellulosic ethanol)**
- **Globally**
  - **Mandates of biofuel content in Brazil and EU**
  - **Improved economic conditions and high oil prices will reduce importance of policy components**

Biofuels Prospects Worldwide

United States, Brazil (ethanol) and the EU (biodiesel) continue to dominate

Production of biofuels (billion gallons)*

	United States		Brazil		European Union		Rest of World		World	
	Ethanol	Biodiesel	Ethanol	Biodiesel	Ethanol	Biodiesel	Ethanol	Biodiesel	Ethanol	Biodiesel
2009	10.4	0.4	6.3	0.3	1.5	2.5	2.9	1.8	21.1	5.0
2018	16.7	1.4	13.9	0.8	3.7	4.8	4.9	4.6	39.2	11.6

*Source: Based on OECD-FAO Agricultural Outlook, August 2009

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Biofuel Impacts on Sulphur

- **Increased U.S. corn use for ethanol will require more sulphur fertilizer due to reduced sulphur deposition**
- **In EU and Canada, reliance on canola (rapeseed) for biodiesel will require more sulphur fertilizer**
- **Cellulosic ethanol manufacture requires sulphuric acid**

Thank You

- **For more information:** Cdebrey@sulphurinstitute.org
- **Telephone: 202-296-2794**

TSI's Sulphur World Symposium 2010
April 12-15, 2010
Doha, Qatar

Participants will be updated about global and regional events impacting the sulphur marketplace from specialists directly involved in the business.

Call for Papers posted

Sulphur World Symposium 2009, held in Madrid, Spain, included almost 230 delegates from 33 countries. Upon request, we can forward the list of attending delegates

For more information about TSI's Sulphur World Symposia, visit:

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