U.S. Ethanol Expansion:
How the Agricultural Sector Adjusts & Challenges to Future Expansion

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Presentation overview

• Market and policy setting for U.S. ethanol expansion
• Commodity market adjustments
  – Crops
  – Livestock
• 2007 Energy Act
• Challenges to cellulosic-based ethanol expansion
Market and policy setting for U.S. ethanol expansion

- Oil prices
- 2005 Energy Policy Act
- 2007 Energy Policy Act
Energy Policy Act of 2005
Role in ethanol expansion

• Mandated Renewable Fuel Program
  – Established minimum levels of renewable fuels to be used in gasoline

• Contributed to the elimination of the use of MTBE as a gasoline additive, adding to the expansion in ethanol
U.S. ethanol expansion

Ethanol expansion, implications for corn

• Corn is currently the most economically viable feedstock in the United States for ethanol production
• Most of the expansion in ethanol production is from corn-based dry mills
Corn-based ethanol production projections exceed 2005 renewable fuels program mandate


Ethanol’s role in gasoline and corn markets:
Current relationship

Ethanol is small relative to overall gasoline use

But ethanol accounts for a large and growing share of corn use

Stock-to-use ratio, 11.6%
Ethanol’s role in gasoline and corn markets:
Projected relationships in 10 years

Ethanol still small relative to overall gasoline use

- Ethanol: 8.6%
- Gasoline: 91.4%

2018

Ethanol accounts for one-third of corn use

- Ethanol: 33%
- Feed and residual: 40%
- Other FSI: 10%
- Exports: 17%

2017/18

Stock-to-use ratio, 8.4%


How does the agricultural sector adjust?
Crops
Crop sector effects of ethanol expansion

- Corn
  - Higher prices
  - Increased acreage
  - Reduced exports and non-ethanol domestic use
  - Lower stocks

- Soybeans
  - Lower acreage for competing crops, particularly soybeans
  - Reduced exports, domestic use, and stocks
  - Higher prices

Corn used for ethanol production
Large ongoing expansion

Corn price projections

$/bushel

Crop year


Corn acreage projections:
Planted area increases in response to higher corn prices

Million acres

Crop year

Corn use projections:
Feed use* declines

* Includes statistical "residual"

Corn export projections:
U.S. exports also fall

Corn stocks projections:
Ending stocks drop

Corn and soybean projected plantings:
Much of the corn area expansion comes from soybeans
Soybean price projections: Prices higher reflecting lower acreage and reduced supplies


How does the agricultural sector adjust? Livestock
Livestock sector effects of ethanol expansion

- Higher corn prices
- Greater availability of ethanol production coproducts
  - Distillers grains from dry mill ethanol production
- Different effects across livestock types
  - Reflects feed conversion efficiencies
  - Also, ruminants can use distillers grains more readily than monogastric animals, which favors use by beef cattle
- Lower production for all meats, particularly in 2009 as ethanol production continues its expansion

U.S. beef and pork production

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U.S. broiler production


2007 Energy Act
Cellulosic feedstock challenges

• Supply challenges #1
  – Technical conversion feasibility
  – Cost containment and economic viability
• Supply challenges #2
  – Feedstock production & economic viability
  – Feedstock storage and delivery infrastructure
• Supply challenges #3
  – Ethanol distribution infrastructure
    • Pump certifications for mid-level blends
    • Wider availability and accessibility of E-85 pumps
Cellulosic feedstocks: Demand challenges

• Demand challenges #1
  – 10 percent blend wall
    • Legislative and regulatory barriers to higher, mid-level blends (other than E-85)
    • Automobile fleet and warranties

• Demand challenges #2
  – E-85 expansion
    • Automobile fleet transition to more flex cars