



**Office of the Chief Economist
Office of Energy Policy and New Uses**

INCREASING ETHANOL/BIOFUELS

By

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at

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Ethanol production has grown rapidly since 2000

- Current production capacity – 7.229 billion gallons
- From 134 plants; 28% of capacity is farmer owned
- Capacity increases by 2009: plants under construction/expanding – an additional 6.217 billion gallons
- From 77 plants that are under construction/expansion
- 26 states have ethanol plants

Source: Renewable Fuels Association



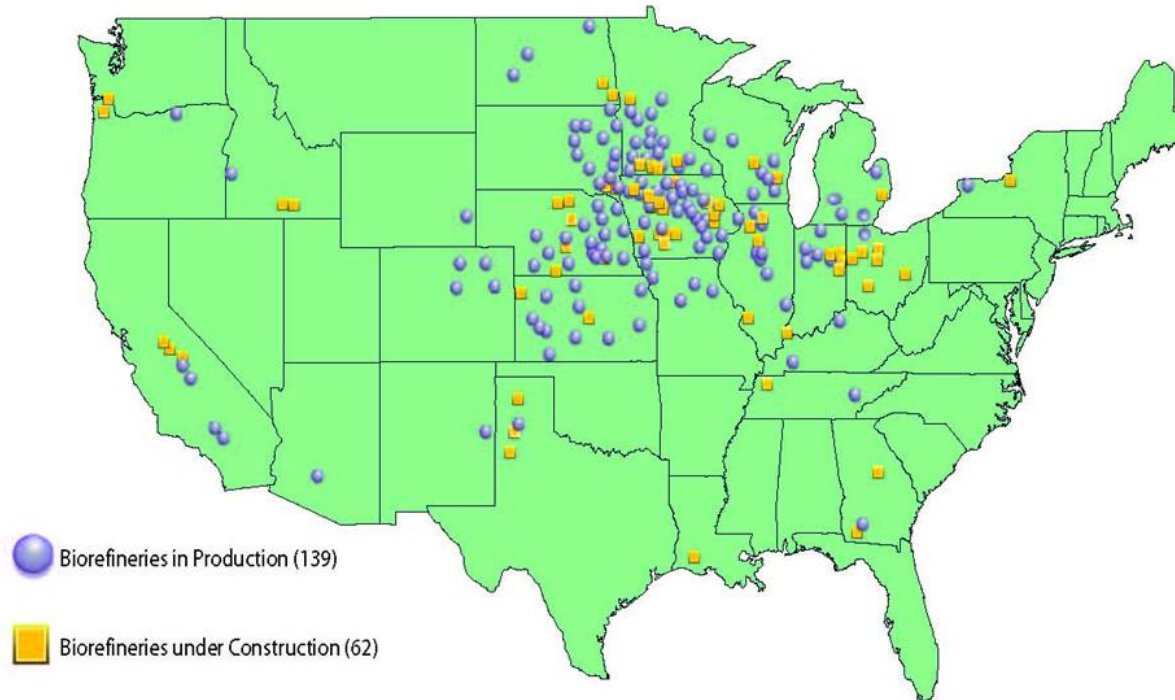
2007 Production/Demand Data

- Demand – 6.847 billion gallons
- U.S. production – 6.486 billion gallons
- Imports (primarily Brazil) and stocks make up the production shortfall

Source: Renewable Fuels Association



U.S. Ethanol Biorefinery Locations



Source: Renewable Fuels Association
01.24.08



Biodiesel feedstock source (2007)

– Refined soybean oil	62.74%
– Crude soybean oil	16.64%
– Cottonseed oil	0.21%
– Inedible tallow/grease	4.36%
– Other Fats/oil	16.05%

Source: National Biodiesel Board



• U.S. Biodiesel Capacity

Year	Plants	Million gallons
2001	9	50
2004	22	157
2006	86	580
2007	165	1,850
2008	171	2,243

Source: National Biodiesel Board



Why has ethanol industry grown?

- As an oxygenate additive for gasoline
- As an MTBE replacement
- Ethanol excise tax credit and state incentive programs
- USDA program to buy down feedstock costs for new production
- Renewable fuel standard created market certainty
- High and rising oil prices
- Low priced feedstocks in earlier years
- High levels of profitability



U.S. Public policy continues to be supportive

- Biomass Research and Development Act
- Energy Title of 2002 Farm Bill and Prospective changes for 2008
- Energy Policy Act of 2005 – 7.5 billion Gal. Renewable Fuel Standard
- Ethanol incentives – 51 cents/gal. tax credit
- Biodiesel incentives -- \$1.00/gal. tax credit for virgin oil, half that for used cooking oil



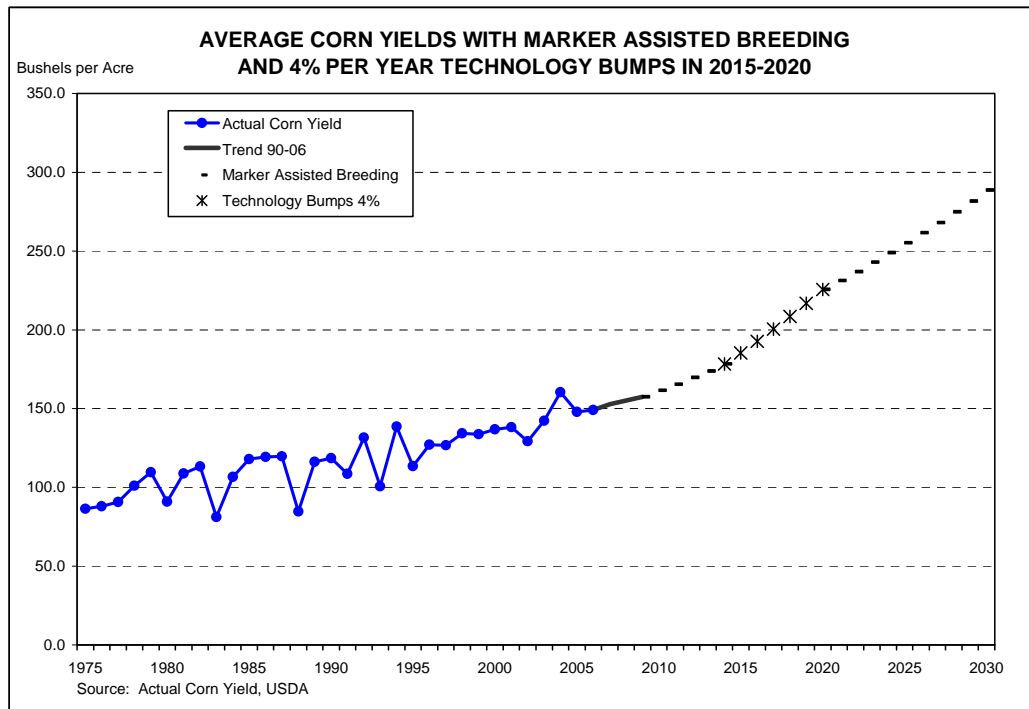
U.S. crop utilization for biofuels

(based on 2007-2008 marketing year)

- 24% of the current corn crop will go to produce 8.4 billion gallons of ethanol
- 14% of soybean oil production will go to biodiesel



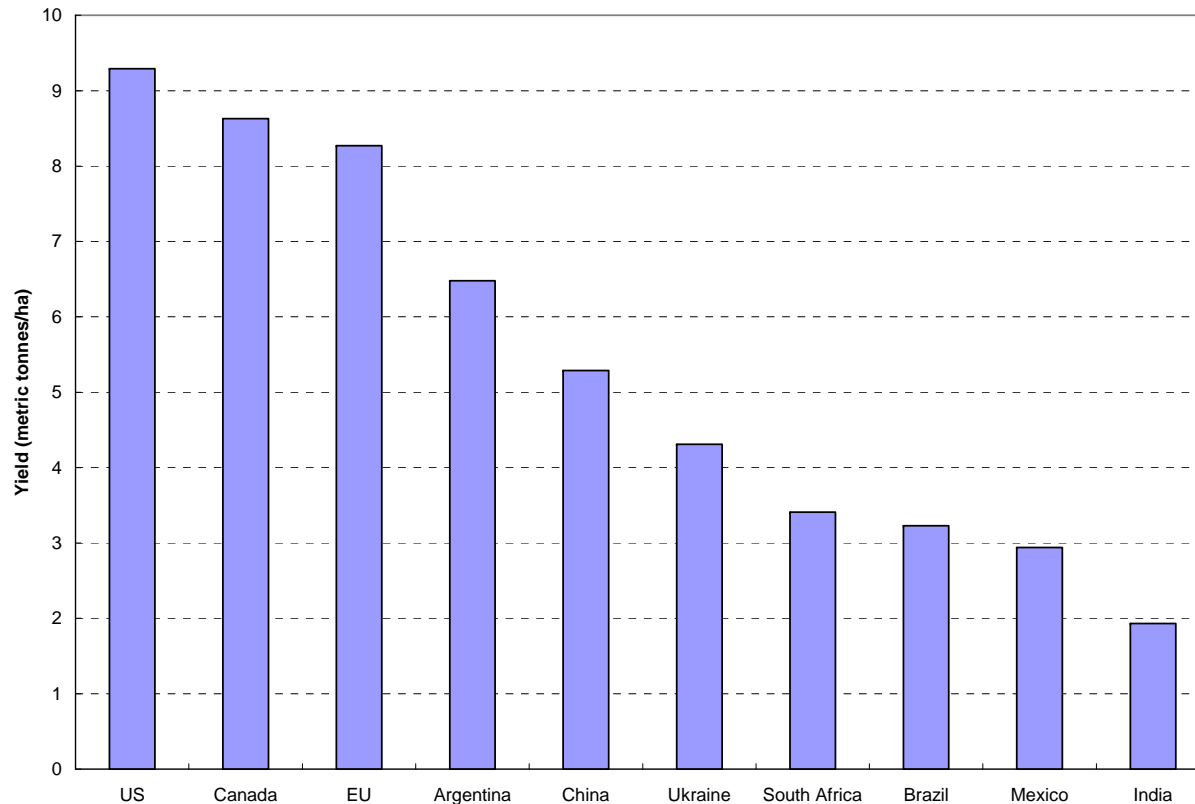
Projected U.S. corn yield increases





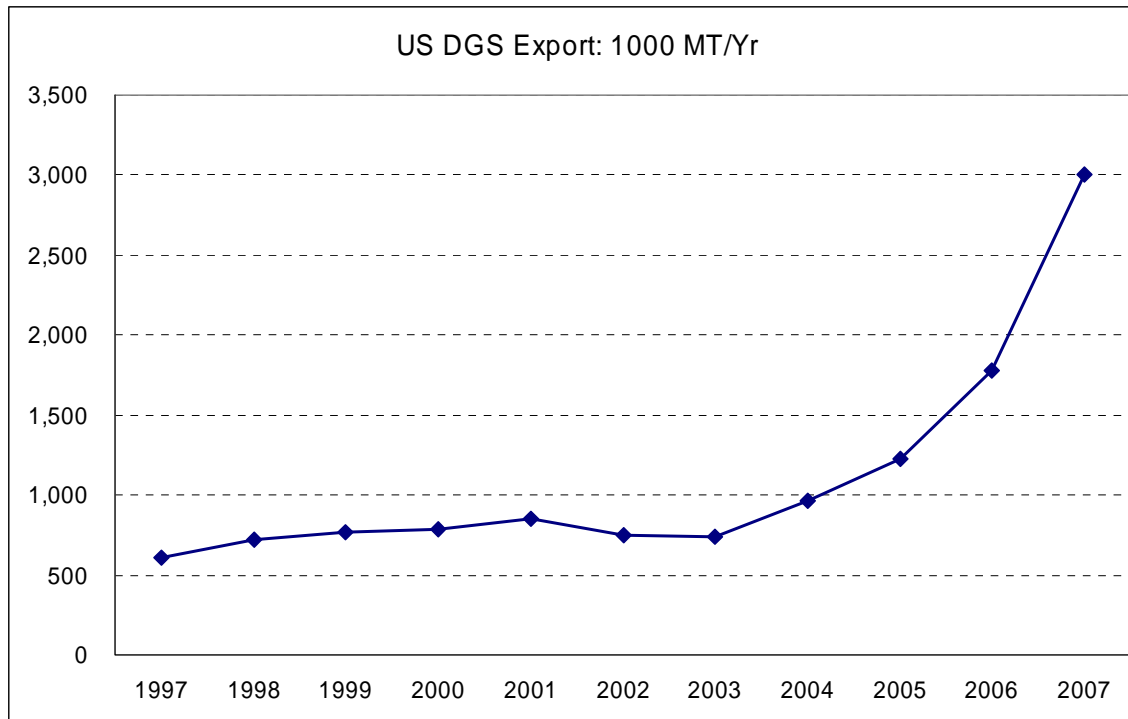
International corn yields

Source: USDA, National Agricultural Statistics Service





U.S. DDGS exports have sharply increased





NEW U.S. PUBLIC SECTOR INVESTMENTS UNDER CONSIDERATION

- Bush Administration farm bill proposals include \$1.6 billion in new funding for renewable energy, including bio-energy
- Includes \$2.1 billion in guaranteed loans for cellulosic projects
- \$500 million for bio-energy and bio-products research
- \$500 million for renewable energy systems and energy efficiency grants
- Dept. of Energy will invest up to \$385 million in pilot plants to support cellulosic ethanol development



CHALLENGES TO OVERCOME IN ACHIEVING GREATER BIO-FUELS USE

- Water availability for ethanol plants
- Logistics issues related to marketing of bi-products and improved feed use
- Logistics issues related to feedstock access
- Logistics issues related to product distribution and integration into fuel supply



CELLULOSIC FUEL ISSUES

- Significant technological breakthroughs are needed to achieve potential contribution
- Price at which feedstock is available
- Transportation, storage and handling issues
- Sustainable access to feedstocks
- Appropriate scale of processing plants
- Integration of ethanol into U.S. fuel system



The Energy Independence and Security Act of 2007

- will guide the future of U.S. biofuels
- Sets new Renewable Fuel Standard
 - 9 billion gallons in 2008
 - Phase in to 36 billion gallons in 2022
 - Categorizes biofuels for the RFS
- Provides grants, studies, and infrastructure



- **Conventional biofuels**

- Ethanol derived from corn starch
- Must achieve 20% Green House Gas emissions reduction compared to baseline lifecycle Green House Gas emissions
- Current production exempt from emissions reduction
- RFS ramps up to 15 billion gallons by 2015
- Conventional biofuels RFS is capped at 15 billion gallons



- **Advanced biofuels**
 - Renewable fuel other than ethanol derived from corn starch (renewable biomass)
 - Must achieve a 50% Green House Gas reduction compared to baseline lifecycle GHG emissions
 - Includes cellulosic biofuels and biomass based biodiesel
 - RFS ramps up from .6 billion gallons in 2009 to 21 billion gallons in 2022



- **Cellulosic biofuels**
 - Counts as “advanced” biofuels
 - Derived from any cellulose, hemicellulose, or lignin derived from renewable biomass
 - Must achieve a 60% Green House Gas emission reduction
 - RFS ramps up from 0.1 billion gallons in 2010 to 16 billion gallons in 2022



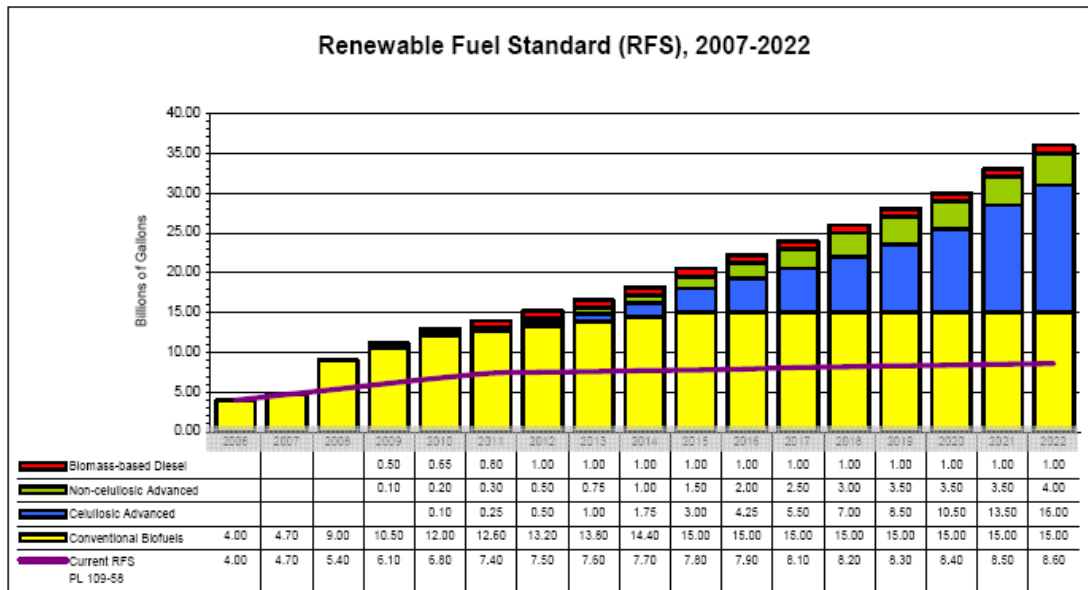
- **Biomass based diesel fuel**
 - Ramps up from 0.5 billion gallons in 2009
 - Capped at 1 billion gallons in 2012



- **Biomass grants under EISA of 2007**
 - \$500 mil. annually for FY08-FY15 for biofuels with at least 80% reduction in lifecycle GHG emissions
 - \$25 mil. Annually for FY08-FY10 for biofuels production in states with low production levels
 - \$200 million annual grant program for FY08-FY14 to install E-85 refueling infrastructure



Renewable Fuel Standard



Source: Hart Energy Consulting, Government Affairs, 2007

The law establishes definitions for categories of renewable fuels identified in the RFS:



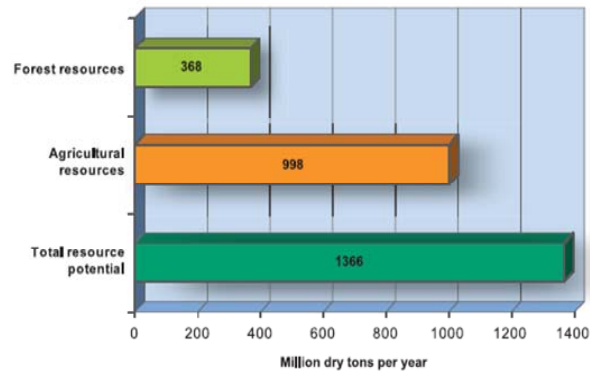
U. S. Biofuels Policy

- Limit RFS policy support to grain based biofuels
- Emphasize support in RFS to non grain based biofuels development and production
- Emphasize reduction in Green House Gas emission
- Support creative research initiatives



Are There Sufficient Biomass Resources to Replace 1/3 of the U.S. Petroleum Requirements?

- Yes, land resources can provide a sustainable supply of more than 1.3 billion dry tons annually and still continue to meet food, feed, and export demands (USDA baseline)
- Realizing this potential will require R&D, policy change, stakeholder involvement
- Required changes are reasonable given current trends and time for biorefinery scale-up and deployment



From R. Perlack of Oak Ridge National Laboratory



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Why are commodity prices rising?

- Rising oil prices affect every part of the U.S. economy
 - Early April, 2008, U.S. oil prices at \$95.65 per barrel, compared to \$24.38 per barrel at same time in 2003
- Growth in food demand
 - Driven by population growth and rising incomes in Asia, Latin America, Middle East, and Africa
 - Desire for more meat in diet and other diet improvements
- Foreign supplies have been reduced
 - By adverse weather in several major production regions over past three years
 - Restrictions on exports by some countries have made supply situation even tighter
 - Some countries have rejected GMO varieties of crops
- Declining value of the U.S. dollar
 - Has boosted the purchasing power of some customers
 - Resulted in increased buying of all commodity futures as a hedge against falling value of financial assets
 - Speculative buying of commodity futures by hedge funds, etc.
- Growth in feedstock demand for biofuels



U.S. Food Price Inflation

- Has generally dampened overall inflation for past couple of decades
- Agricultural commodity prices, although projected to fall from current heights, are expected to remain higher than previously
- As a consequence food prices may not play the same inflation dampening role of the past couple of decades
- Farm gate value of commodities is a relatively small part of the retail price for food



CONCLUSIONS

- U.S. is developing broad based renewables/bio-fuels vision and programs
- Conservation is part of vision: increased energy efficiency for autos, buildings, appliances
- Use of feedstocks that do not compete with food or feed is a high priority
- Grain based bio-fuels have an important but finite role and will continue to be high quality fuel additives
- New bio-liquid and bio-crude products are coming
- Too early to pick winning alternative fuel source
- U.S. and world food prices, thus far, have been affected more by factors other than biofuels