

# Biofuels: Here to Stay or a Passing Fad?

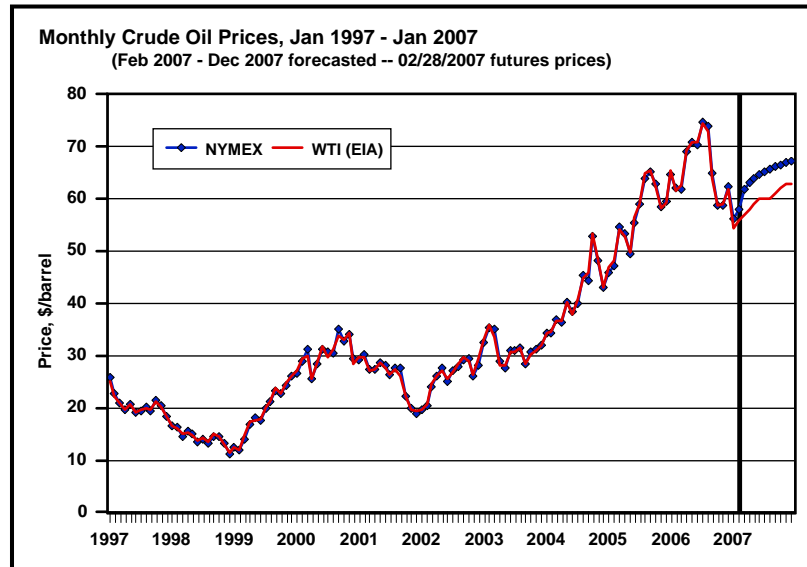
Terry L. Kastens, KSU Ag Economics  
Kevin C. Dhuyvetter, KSU Ag Economics

Agricultural Credit Conference  
Manhattan, KS  
March 26-27, 2007



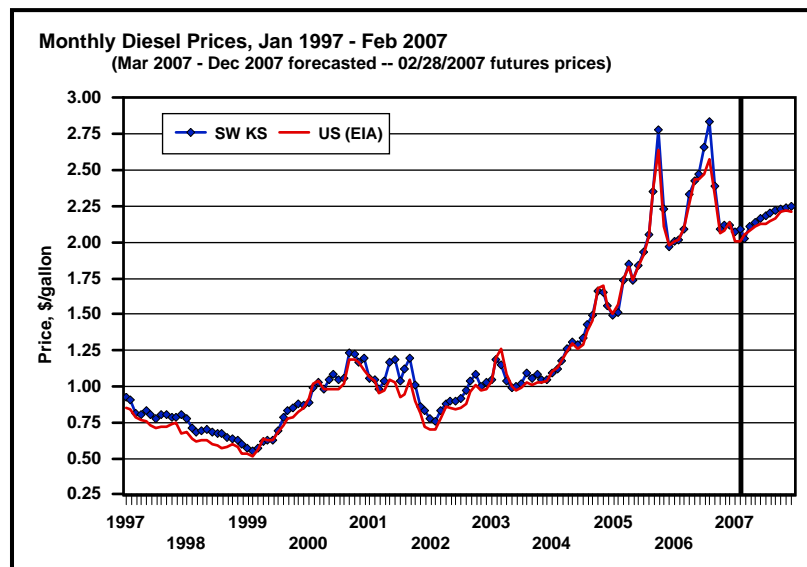
## Outlook

Crude oil prices are forecasted to be below 2006 level, but still at historically high levels, and increasing throughout the year ...



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Diesel prices are down from recent highs, but increasing crude oil prices translate into increasing diesel prices ...



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## Historical and forecasted diesel prices during principal farming months...

### Off-road Diesel Fuel Prices

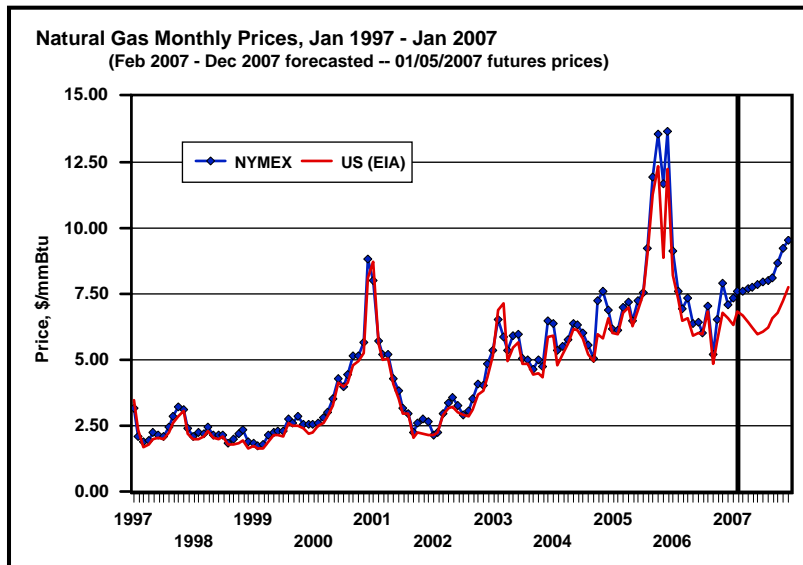
Year	Mar-Oct Diesel Price			Year-to-year percent change		
	SW KS	US (EIA)	Average	SW KS	US (EIA)	Average
2000	\$1.09	\$1.05	\$1.07	----	----	----
2001	\$1.09	\$0.98	\$1.04	0.6%	-6.5%	-2.9%
2002	\$0.94	\$0.88	\$0.91	-14.1%	-10.1%	-12.2%
2003	\$1.05	\$1.05	\$1.05	12.1%	19.1%	15.5%
2004	\$1.37	\$1.35	\$1.36	30.0%	28.9%	29.5%
2005	\$2.04	\$2.01	\$2.02	48.5%	49.2%	48.9%
2006	\$2.41	\$2.34	\$2.37	18.6%	16.0%	17.3%
2007 (F)	\$2.16	\$2.13	\$2.14	-10.5%	-8.8%	-9.7%
2007 - 2006	(\$0.25)	(\$0.21)	(\$0.23)	-10.5%	-8.8%	-9.7%
07 - Avg(00-04)	\$1.05	\$1.07	\$1.06	94.7%	101.0%	97.8%

F = forecast

Based on 2/28/07 futures closing prices

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## Historical and forecasted natural gas prices



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## Running out of oil and U.S. energy independency

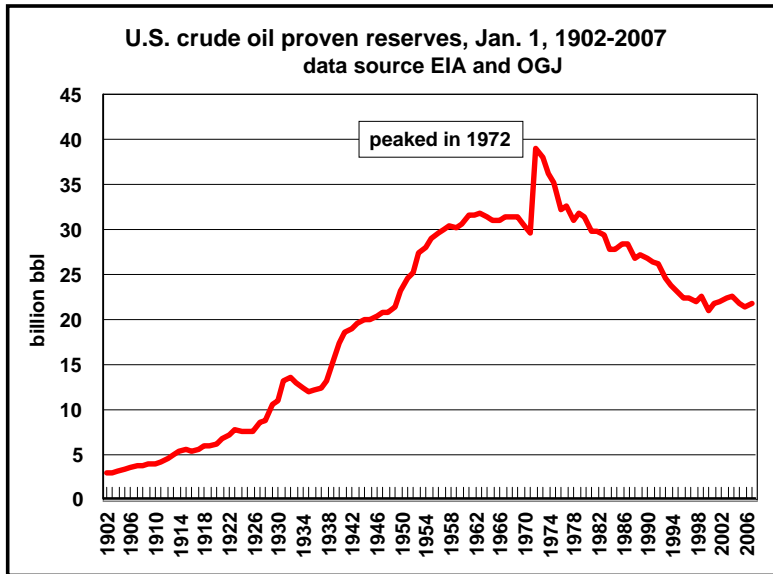
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### Scarce Energy?

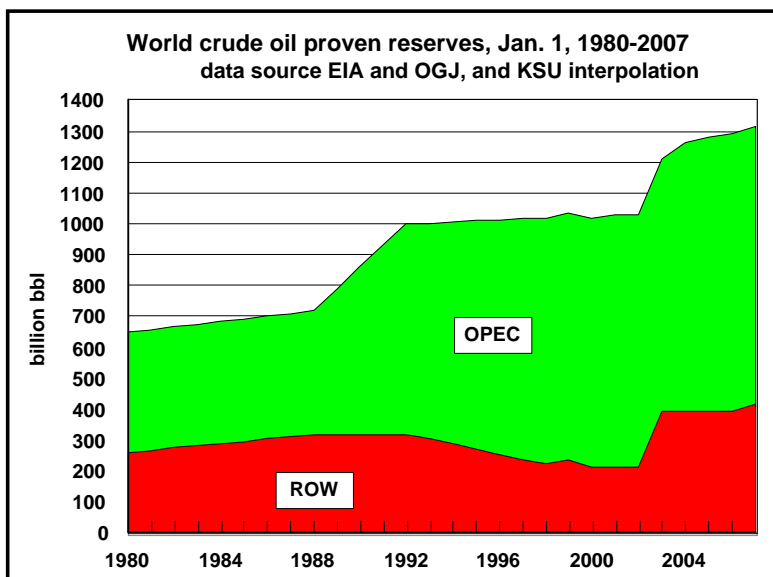
- 1859: Drake discovers oil in Pennsylvania
- 1879: USGS formed to deal with running out of oil
- 1882: 95M bbl remain (Institute of Mining Engineers)
- 1918: 3 million cars on the road
- 1919: auto industry shouldn't ignore that only 20 years left (Scientific American)
- 1926: 4.5B bbl left in U.S. (Federal Oil Conservation Board)
- 1930: 18 million cars
- 1932: 10B bbl left in U.S. (Federal Oil Conservation Board)
- 1944: 20B bbl left in U.S. (Petroleum Administrator for War)
- 1950: 100B bbl left in world (American Pet. Institute)
- 1980: proven oil reserves 648B bbl
- 1993: proven oil reserves 999B bbl
- 2000: proven oil reserves 1016B bbl
- 2007: proven oil reserves 1317B bbl

Scarcity is an economic issue, not a physical one

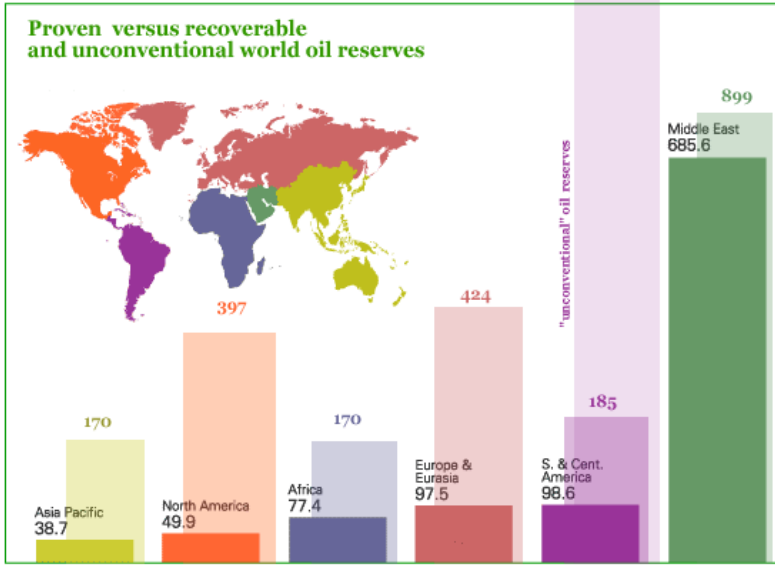
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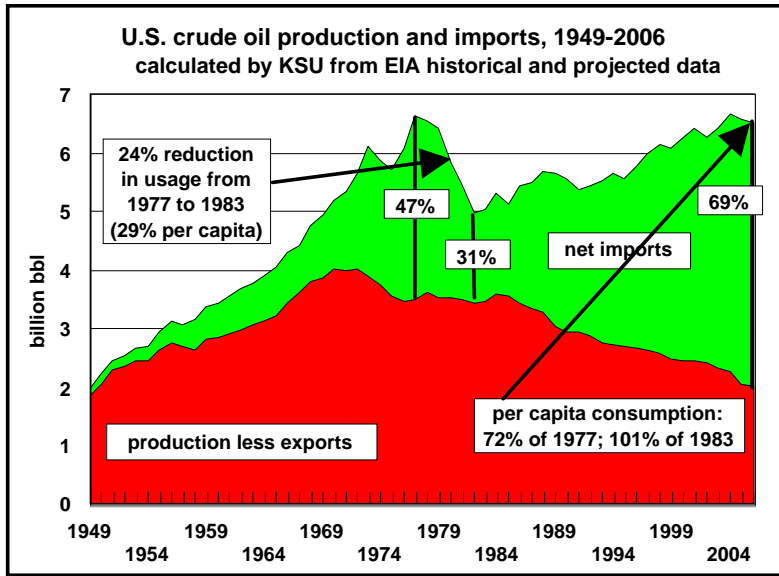
U.S. proven reserves are falling

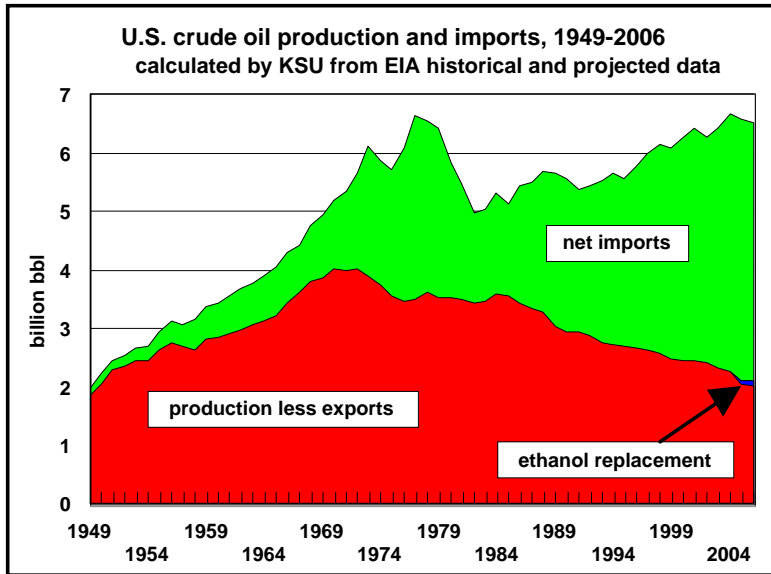


More dependency on OPEC, so also is a political issue

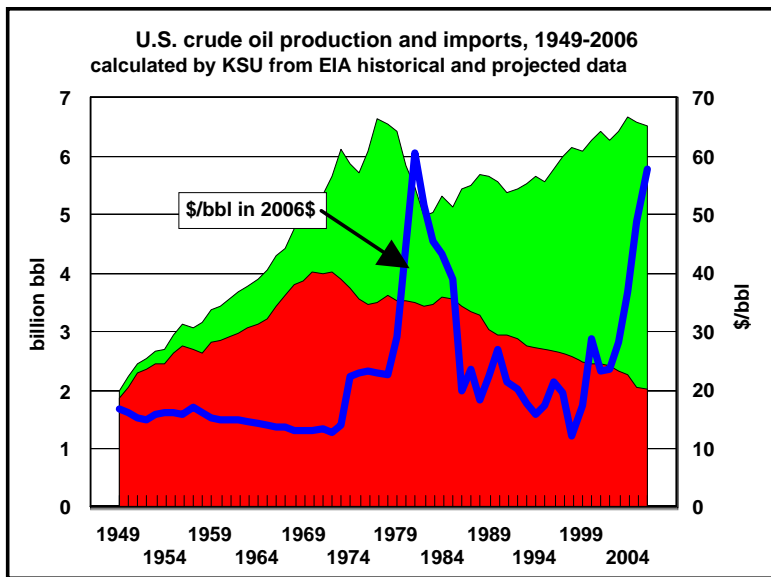


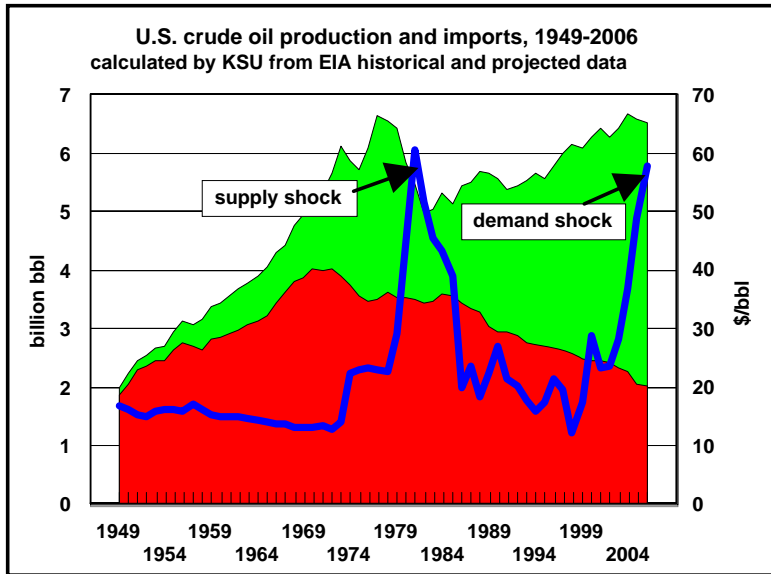
We can find a lot of oil in the western hemisphere if prices stay high



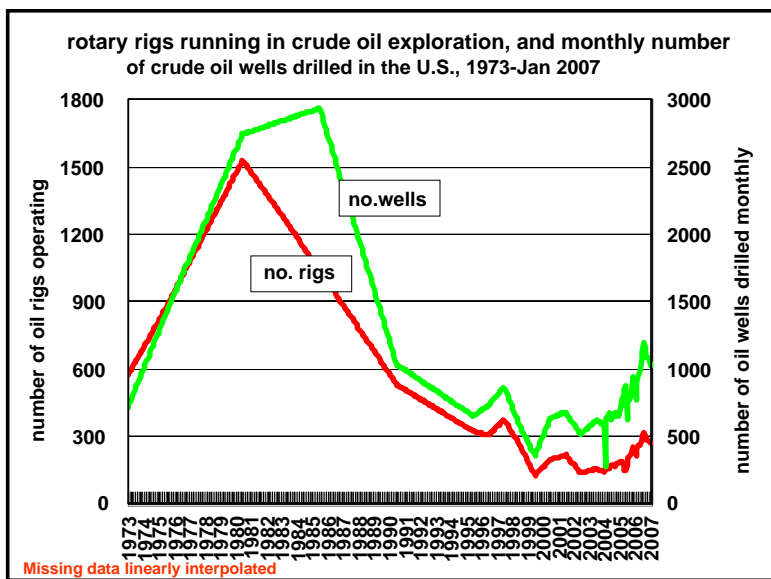


Is crude oil self-sufficiency a reasonable goal? Substitutes for crude? 7.5B gal ethanol might replace 0.098B bbl crude (2.18% of 2006 imports)

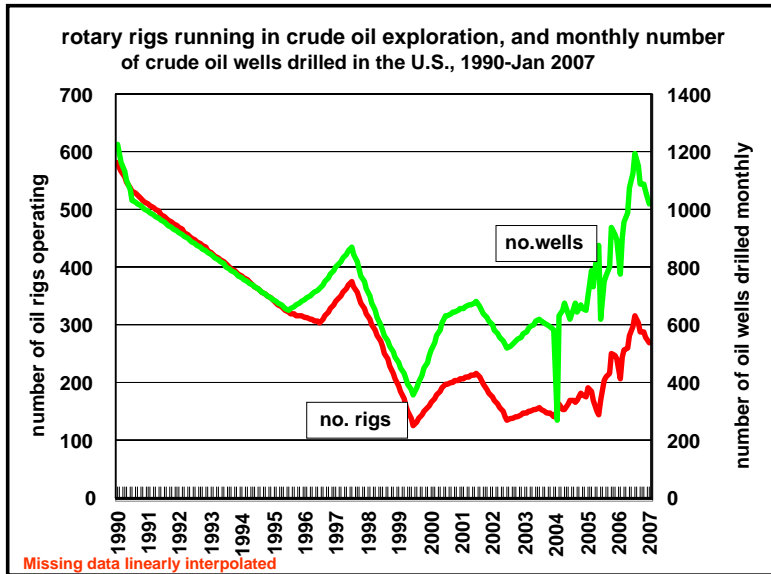




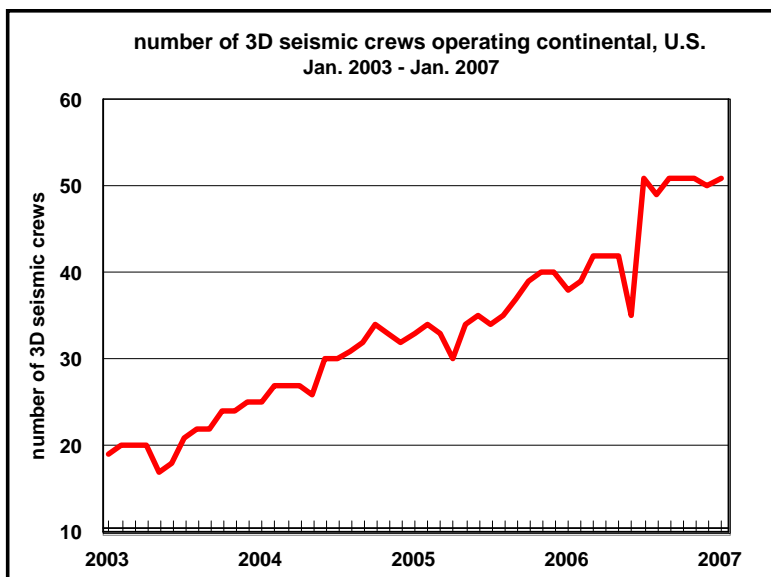
Markets will still work; but will prices fall as fast this time?



Price decimated the U.S. oil industry in the late 1980s and 1990s



Markets will work again and supply will increase as demand is tempered



The petroleum industry is NOT sitting idly by!

## Renewable Energy

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### Drivers of the Biofuels Industry

- **Ethanol**
  - States ban MTBE
  - States mandate ethanol inclusion
  - Subsidies
  - High energy prices
- **Bio-diesel**
  - Low sulfur requirements for diesel
  - Subsidies
  - High energy prices

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## Major Renewable Energy Opportunities for Kansas Agriculture

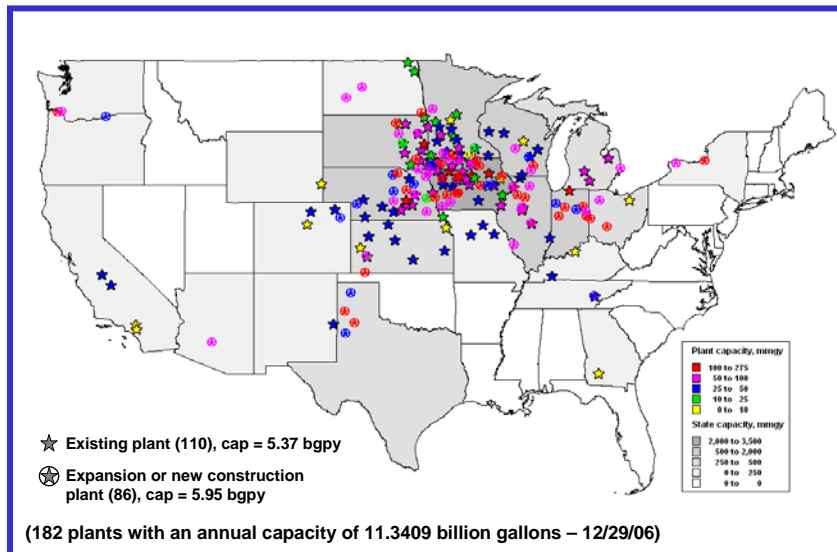
- Ethanol from Commodity Crops
  - corn
  - sorghum
- Biodiesel
  - soybeans
  - animal fats
  - other feedstocks (annual and perennial oils)
- Bioethanol
  - herbaceous energy crops (switchgrass)
  - corn and other crop stovers
- Anaerobic Digestion of Livestock Manures
  - dairy operations only

Source: Richard Nelson, Biological and Agricultural Engineering, KSU

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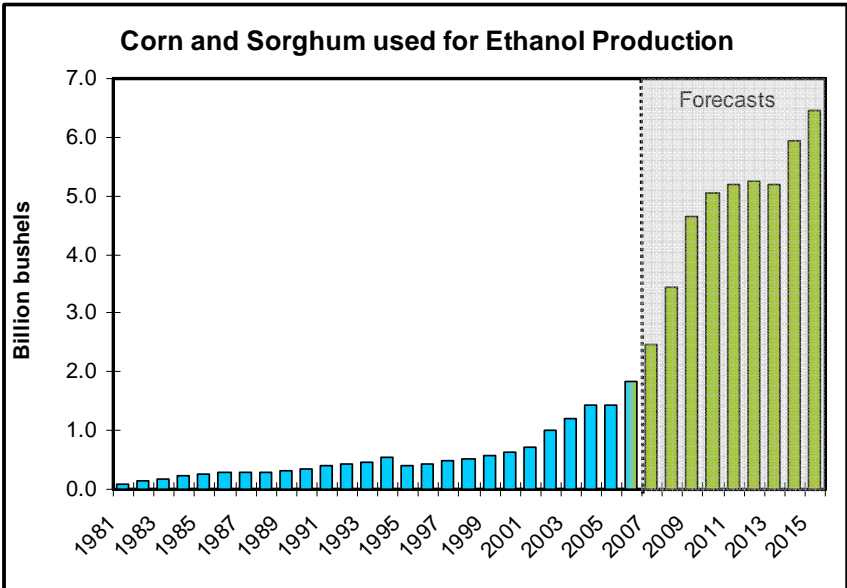
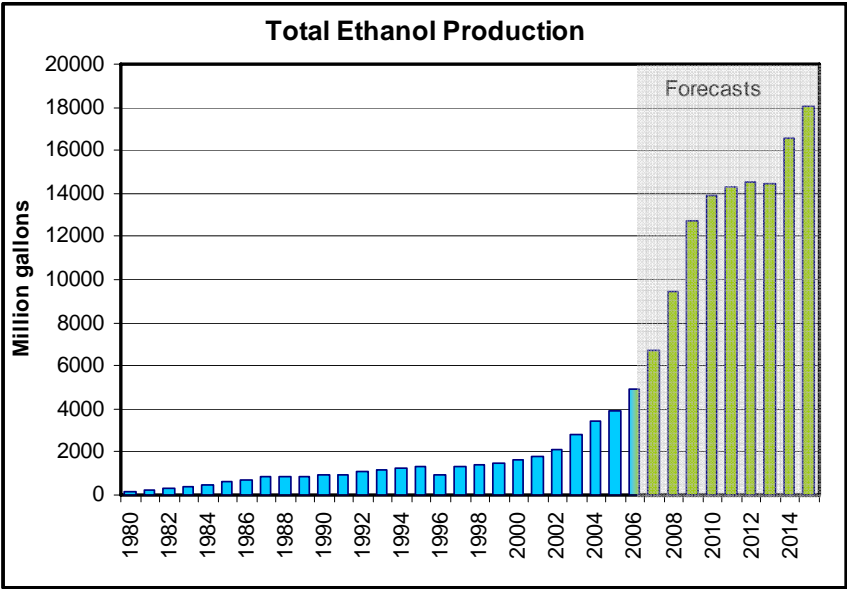
## Existing and new ethanol plants

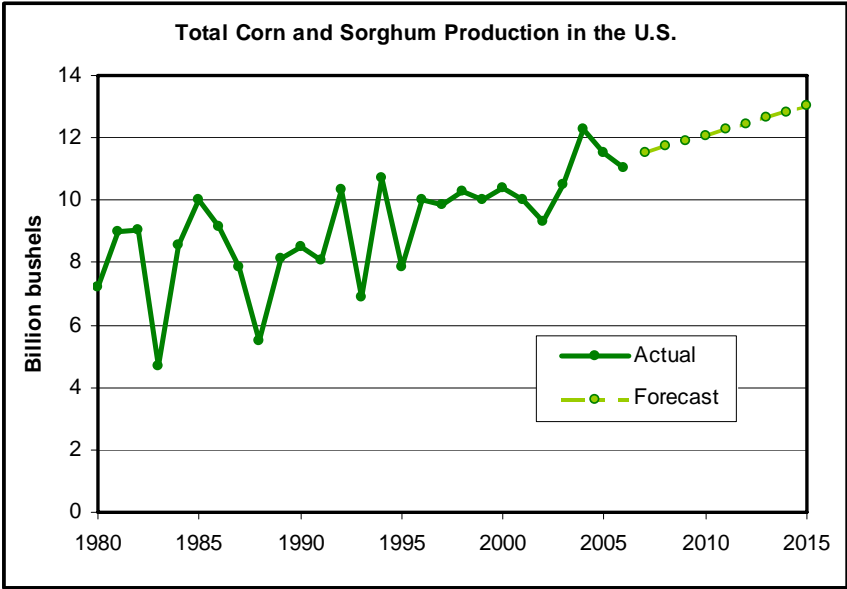
Source: Renewable Fuels Association (RFA), Kansas State University



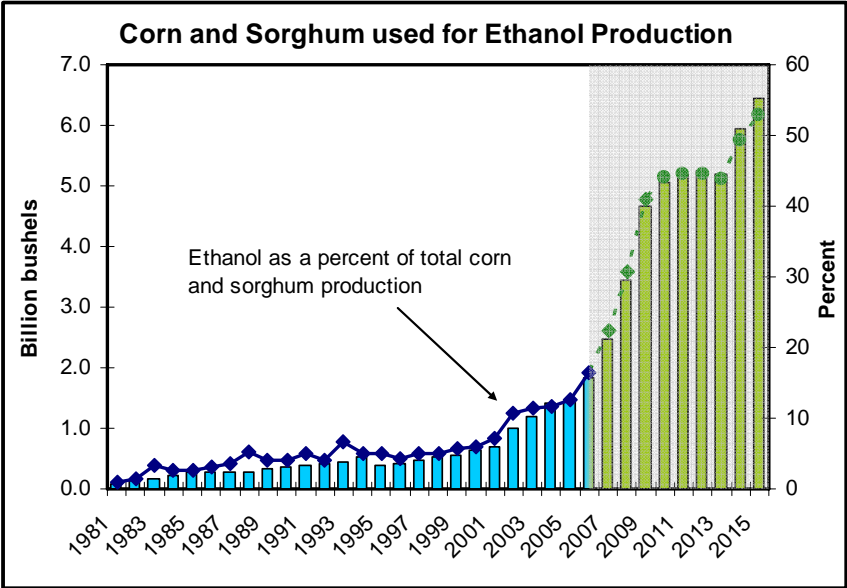
(143 plants with an annual capacity of 7.27 billion gallons – 7/26/06)

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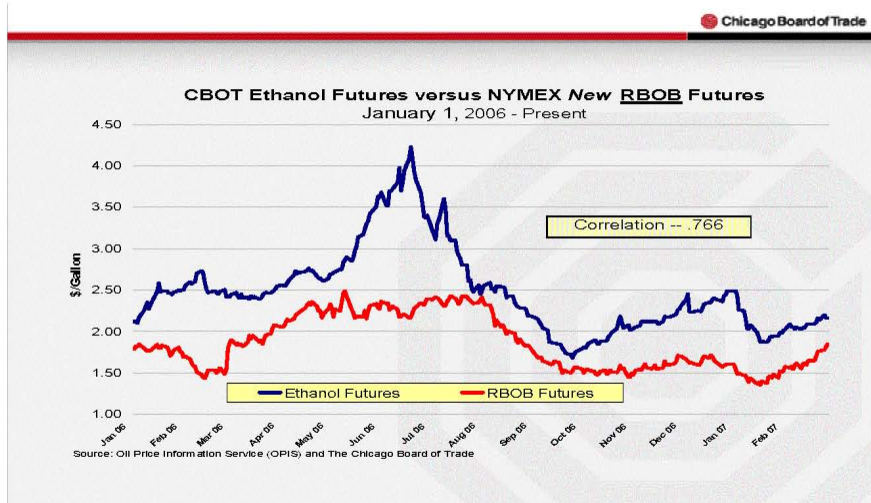


Linear trend is based on data from 1990-2006 only (no adjustment for acres)



Fairly obvious why we will need considerably more corn acres

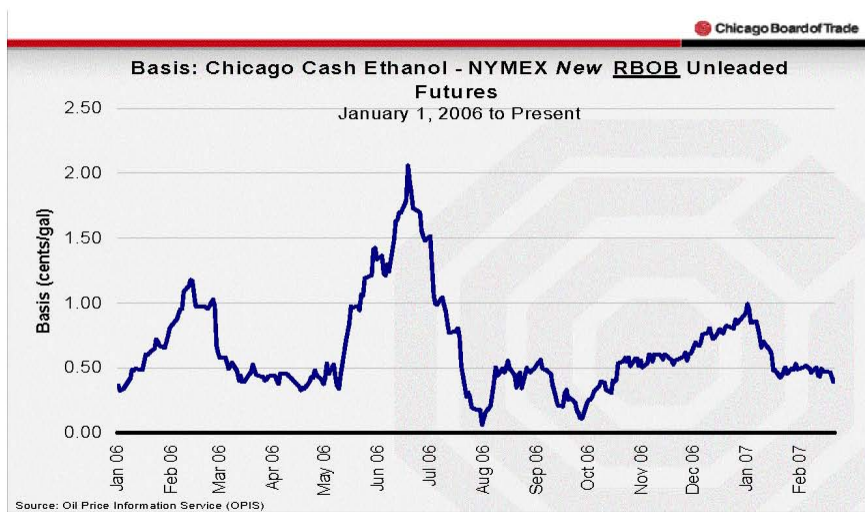
Is ethanol a substitute or an additive? More like gas every day . . .



RBOB (reformulated blendstock for oxygenate blending); RFG w/o oxygenate; will completely replace RFG (which contained oxygenate) as gasoline being traded

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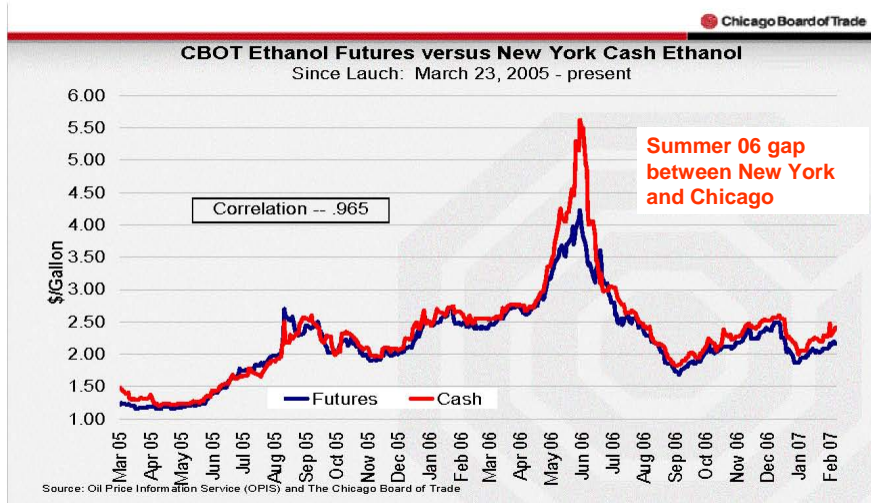
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Settling in on \$0.50 premium (subsidy?)  
But, what about BTU difference?

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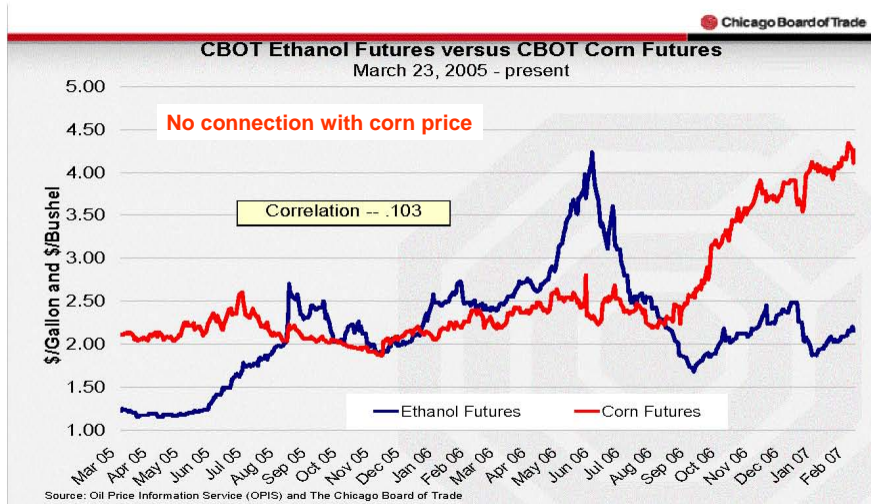
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New York saw ethanol \$3.50 above gasoline in summer 2006!

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## Ethanol consideration for grain producers (July 31, 2006)

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CBT Corn - D Futures  Click on the chart icon to view the graphical chart [print version](#)

Contract	Open	High	Low	Last	Change	Bid	Ask	Vol	Op Int	Time
SEP 06	0	2392	2364	2372*	-4			26498	403640	13:43
DEC 06	0	2560	2530	2534*	-6			46402	546433	13:43
MAR 07	0	2696	2670	2672*	-10			4029	118973	13:43
MAY 07	0	2790	2766	2770*	-6			570	24978	13:43
JUL 07	0	2880	2850	2856*	-6				961	13:43
SEP 07	0	2934	2910	2930*	-10				750	13:43
DEC 07	0	3024	3000	3004*	-14				518	13:43
MAR 08	0	3120	3114	3114*	-10				853	13:43
MAY 08	0	3194	3174	3174*	-24			5	2947	13:43
JUL 08	0	3260	3240	3242*	-16			1145	8856	13:43
SEP 08	0	0	0	3204*	-14			0	544	13:44
DEC 08	0	0	0	3236*	-20			1315	55004	13:43
DEC 09	0	3390	3376	3380*	-16			187	463	13:43

Click on the chart icon to view the graphical chart

Ethanol demand premium?

## Ethanol consideration for grain producers (Mar 12, 2007)

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DAY CORN (C) [10 minute delay] [Future Symbol Search](#) | [Symbol Lookup](#)

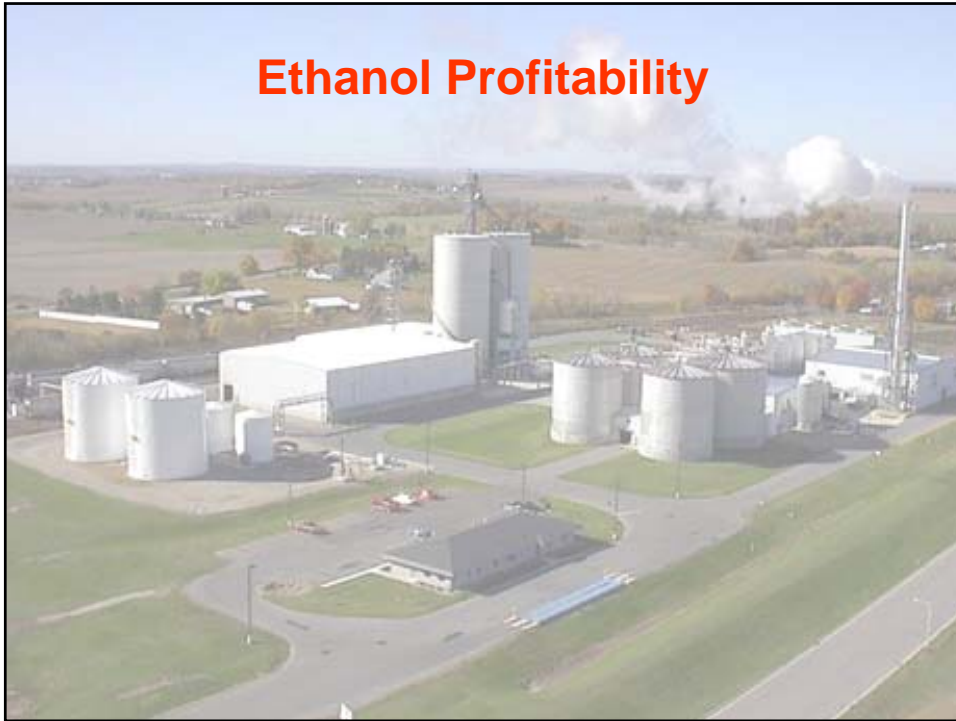
More Info	Month	Last	Chg	Open	High	Low	Volume	Open Int	Trade Time
chart options	Mar-07	399'6s	-8'4	406'6	408'4	398'0	115	3708	03/12/07 13:44
chart options	May-07	409'2s	-8'2	416'4	418'4	407'2	701	513829	03/12/07 13:44
chart options	Jul-07	419'6s	-7'6	425'4	429'0	417'4	383	285806	03/12/07 13:44
chart options	Sep-07	410'0s	-6'6	414'4	416'4	408'0	83	65584	03/12/07 13:44
chart options	Dec-07	402'6s	-5'0	406'4	408'4	400'0	410	400310	03/12/07 13:44
chart options	Mar-08	411'6s	-5'0	414'4	416'4	410'0	4	35245	03/12/07 13:44
chart options	May-08	414'4s	-6'0	420'0	420'4	414'0	4	6342	03/12/07 13:44
chart options	Jul-08	418'0s	-6'4	423'0	423'6	416'0	4	23410	03/12/07 13:44
chart options	Sep-08	400'0s	-4'0	399'0	401'0	398'0	6	6111	03/12/07 13:44
chart options	Dec-08	386'4s	-3'4	388'4	391'0	386'4	53	91073	03/12/07 13:44
chart options	Jul-09	395'0s	-2'0	398'4	398'4	395'0	5	549	03/12/07 13:44
chart options	Dec-09	376'4s	-2'0	378'0	379'0	376'0	192	10922	03/12/07 13:44
chart options	Jul-10	382'4s	-4'4	383'0	383'0	382'4	4	50	03/12/07 13:44
chart options	Dec-10	364'0s	-2'0	366'0	366'0	363'0	4	474	03/12/07 13:44

Mon, Mar 12, 2007 4:37 PM CDT \*Quotes are in market time

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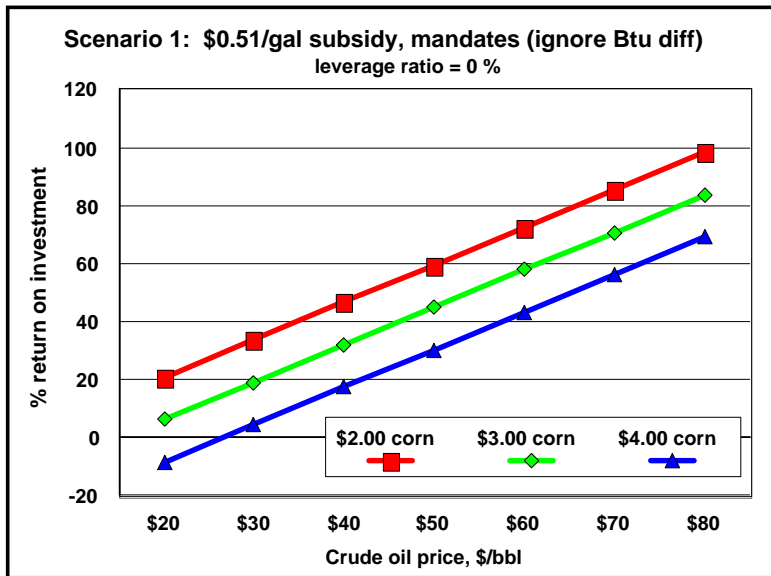
Ethanol demand premium?

## Ethanol Profitability



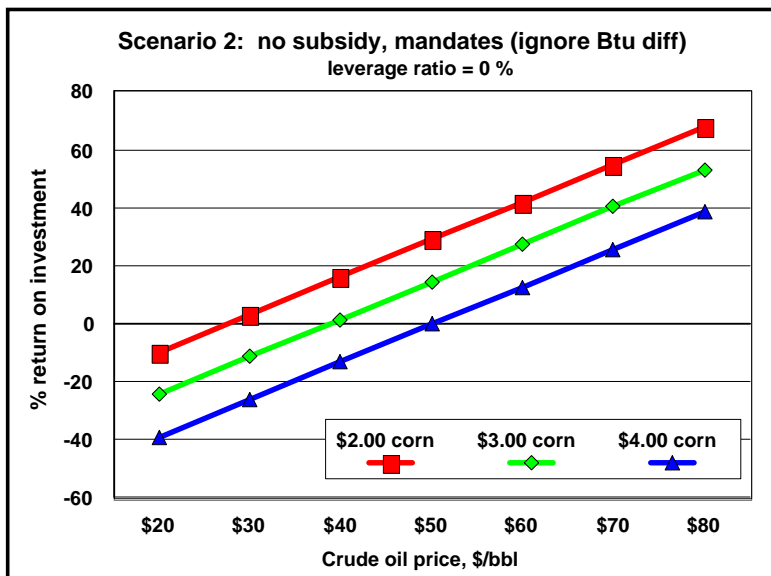
## Ethanol Assumptions

- 2.75 gal ethanol/bu of corn
- 18 lb DDG/gal ethanol
- DDG valued at 1.0263 of corn price
- 0.038 MCF natural gas/gal of ethanol
- 0.05 gal gasoline added to a gal ethanol to make 1.05 gal
- Btu of ethanol (with denaturant) is 62.73% of gasoline
- 0.80 Kwh/gal ethanol at \$0.06/Kwh cost
- \$1.67/gal annual capacity is initial investment
- 6% loan interest rate
- \$0.51/gal subsidy (no state subsidies)
- \$0.2202/gal costs for non-corn, non-natural gas, and non-denaturant
- Natural gas and gasoline prices predicted with a statistical model using crude oil as determinant
- Ethanol price based on gasoline & subsidy & Btu adjustment



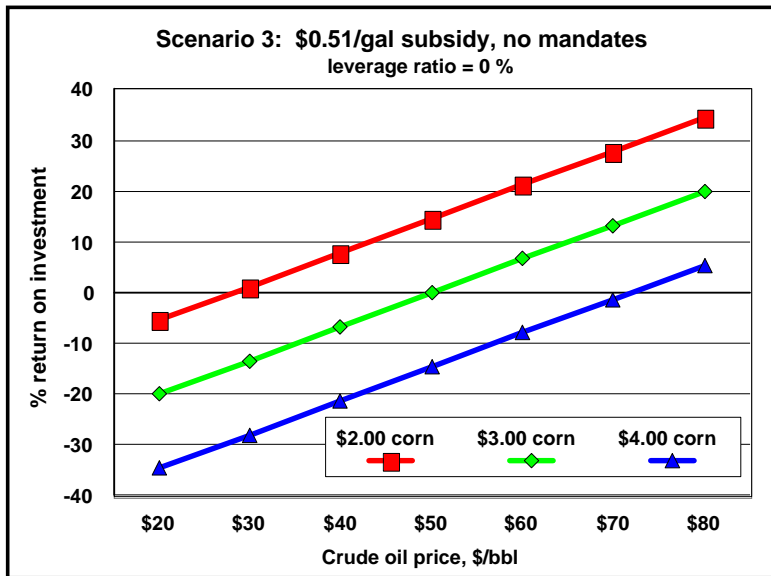
More or less today, ethanol premium due to mandates + subsidy

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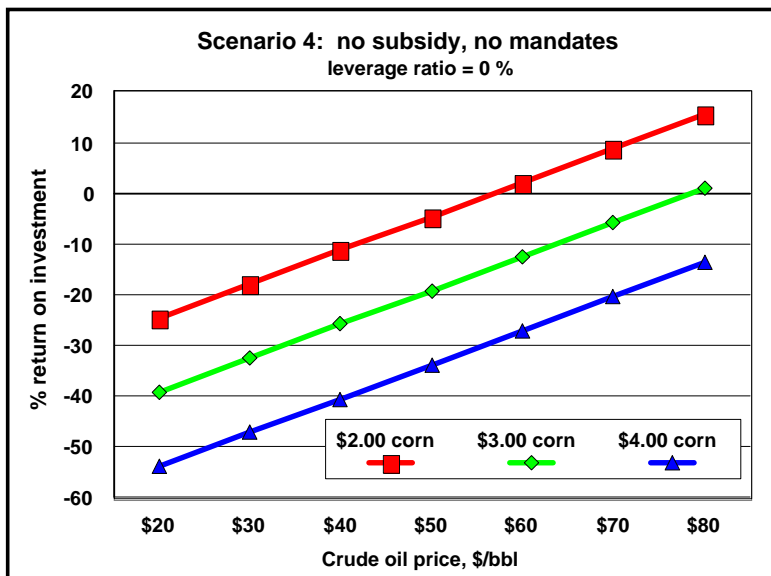
No subsidy but ethanol premium due to mandates continues

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Subsidy continues, but no more ethanol premium due to mandates

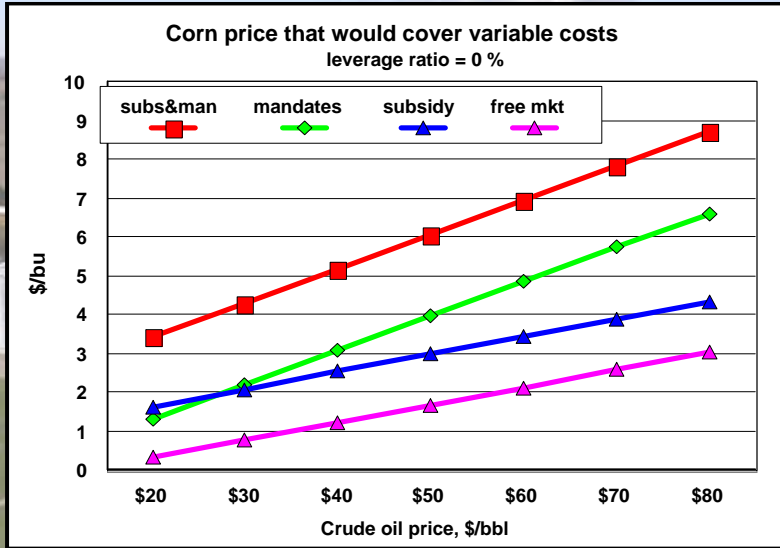
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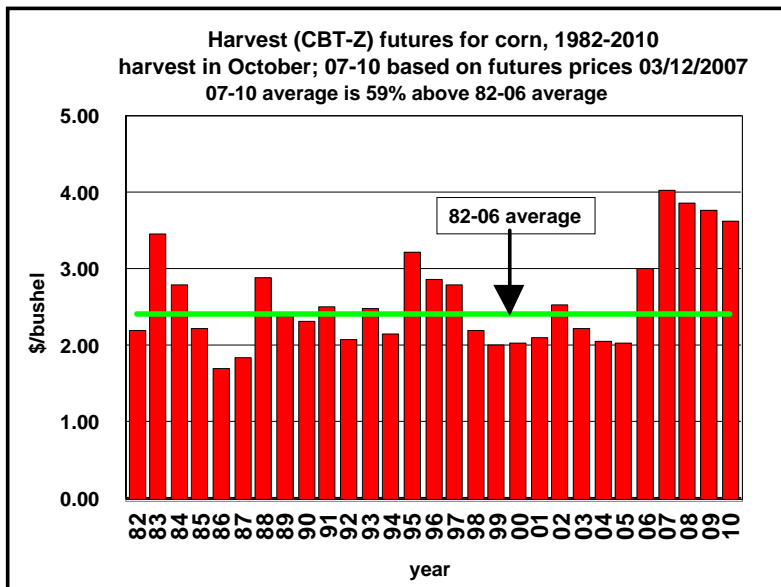
No subsidy, no premiums (ethanol truly a gasoline substitute)

65

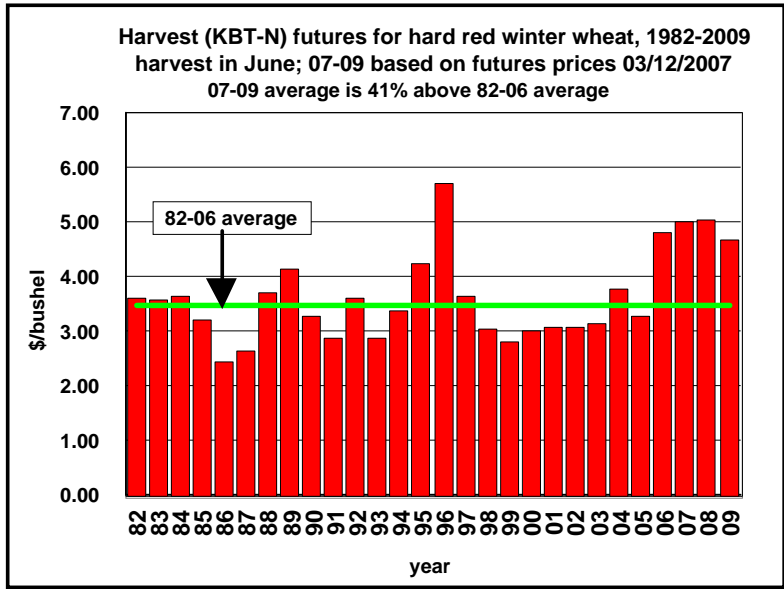
# Ethanol Profitability...



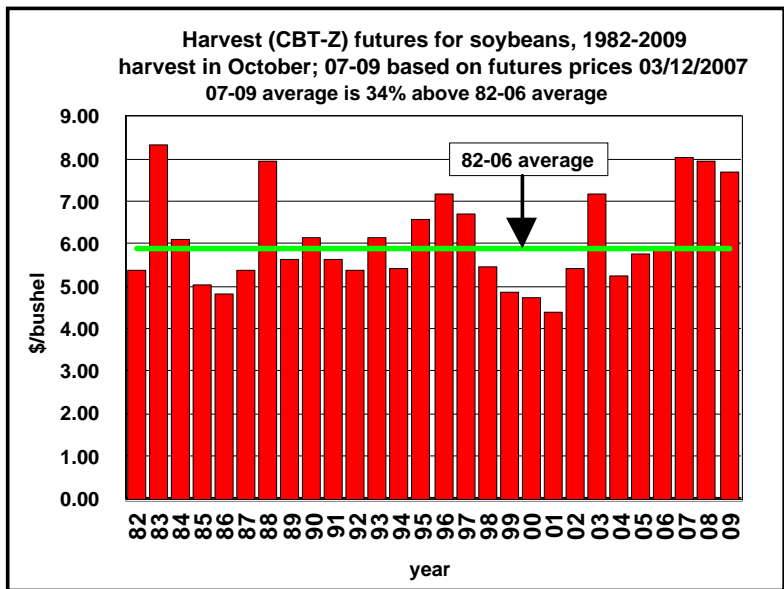
If mothballing costs are high, effective breakeven prices are higher



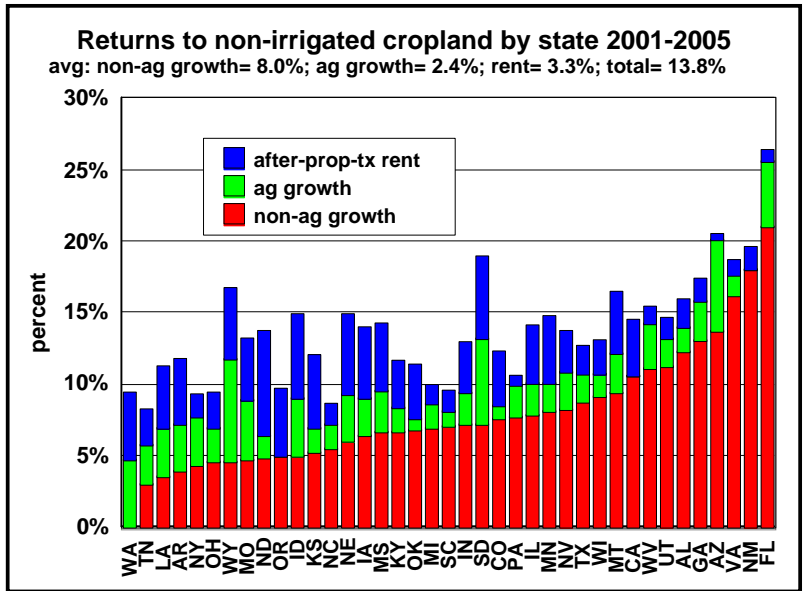
Unprecedented opportunity in corn production – even 4 years out!



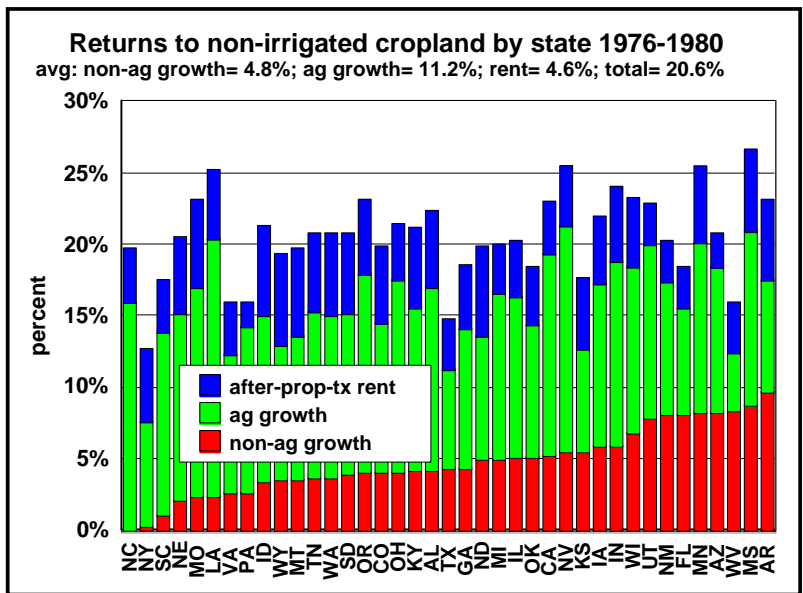
But, wheat will be impacted as well . . .



As will be soybeans . . . as acres are drawn to bio-fuel crops

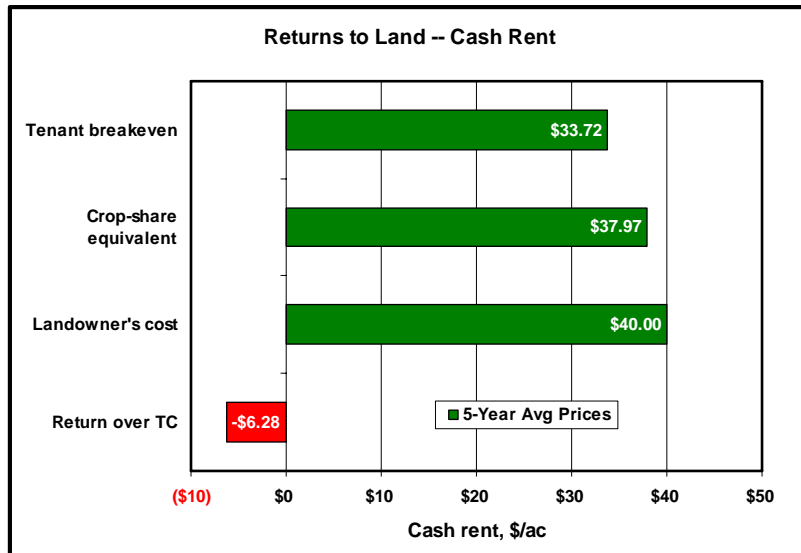


Non-ag growth much more important lately; total returns not especially high



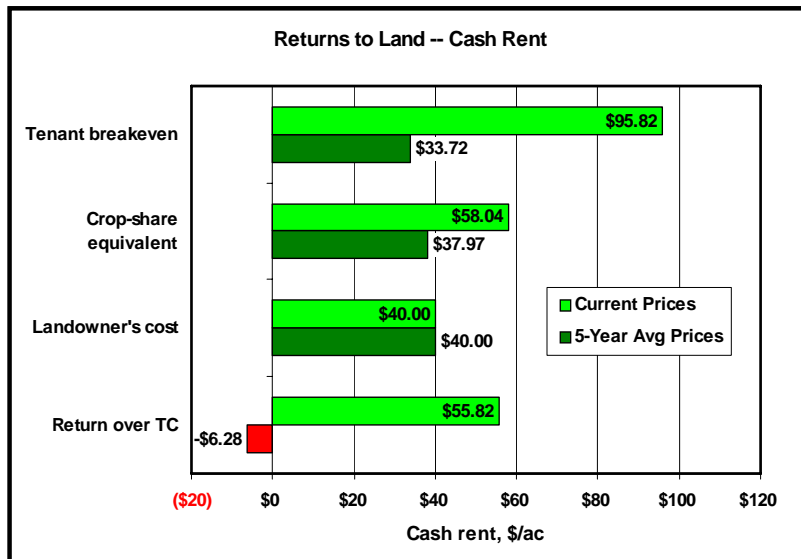
Dominated by growth in ag rents (inflation); total returns very high

**Estimated cash rents for Central Kansas (5-year proj. prices, Aug 2006)**



Based on KSU Farm Management Guides and KSU-Lease.xls  
(available at [www.agmanager.info](http://www.agmanager.info))

**Estimated cash rents for Central Kansas (2007, forward bids 3/12/07)**



Based on KSU Farm Management Guides and KSU-Lease.xls  
(available at [www.agmanager.info](http://www.agmanager.info))