

Energy Situation in Ag

. . . and some implications for land rents

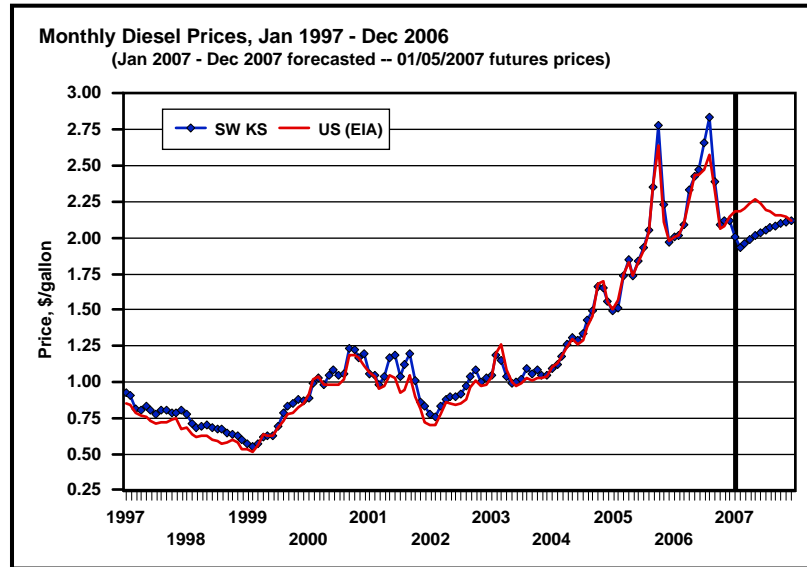
Terry L. Kastens, KSU Ag Economics
Kevin C. Dhuyvetter, KSU Ag Economics

Ag Profitability Conferences
Winter 2006-2007



Outlook

Diesel prices are forecasted to be below 2006 level, but still at historically high levels ...



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

Off-road Diesel Fuel Prices

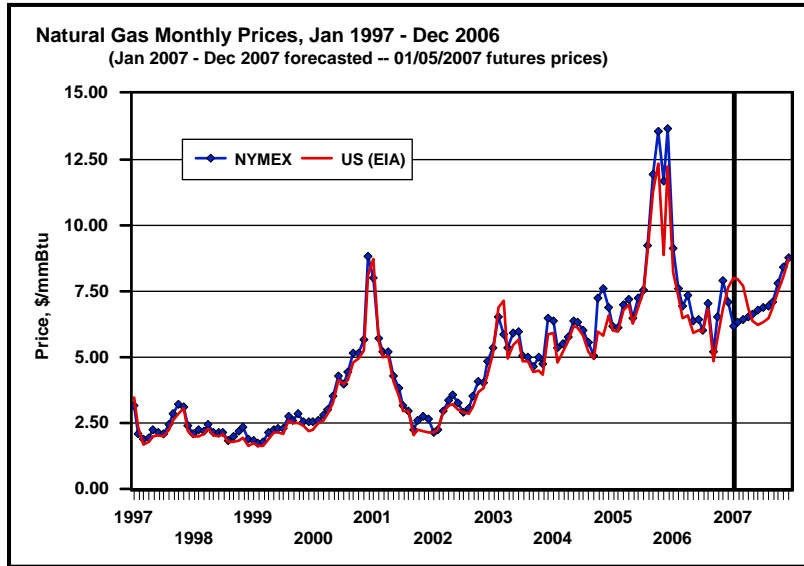
Year	Mar-Oct Diesel Price			Year-to-year percent change		
	SW KS	US (EIA)	Average	SW KS	US (EIA)	Average
2000	\$1.09	\$1.05	\$1.07	-----	-----	-----
2001	\$1.09	\$0.98	\$1.04	0.6%	-6.5%	-2.9%
2002	\$0.94	\$0.88	\$0.91	-14.1%	-10.1%	-12.2%
2003	\$1.05	\$1.05	\$1.05	12.1%	19.1%	15.5%
2004	\$1.37	\$1.35	\$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)	\$2.04	\$2.21	\$2.12	-15.4%	-5.6%	-10.6%
2007 - 2006	(\$0.37)	(\$0.13)	(\$0.25)	-15.4%	-5.6%	-10.6%
07 - Avg(00-04)	\$0.93	\$1.15	\$1.04	83.9%	108.2%	95.8%

F = forecast

Based on 1/5/07 futures closing prices

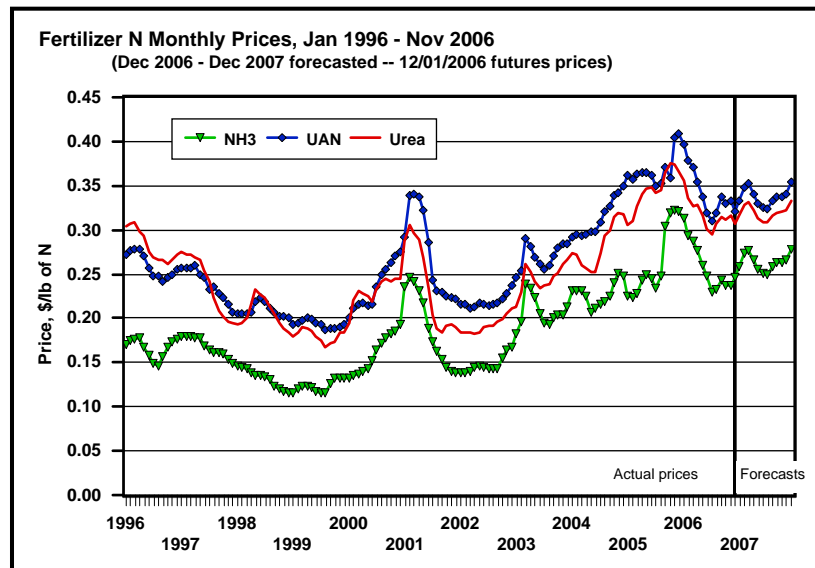
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Historical and forecasted natural gas prices



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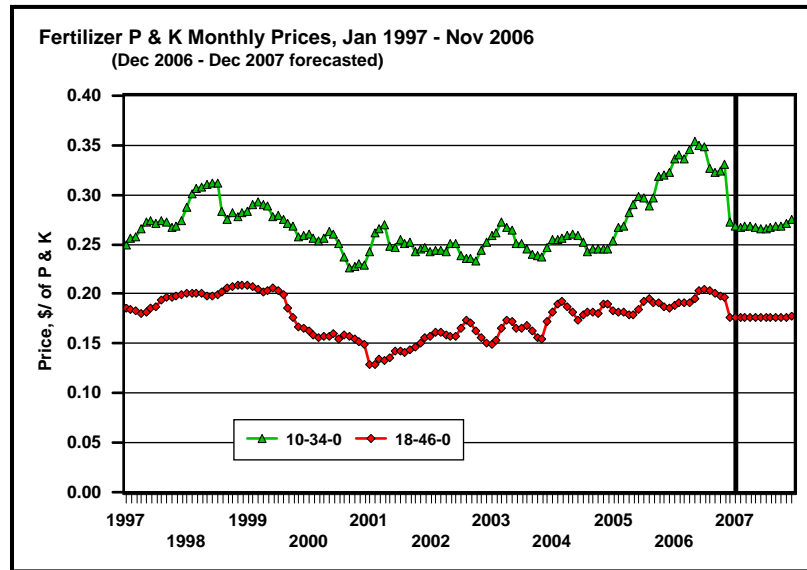
Historical and forecasted nitrogen prices, Corn Belt



... unfortunately, forecasts suggest price will still be high by historical standards in '07.

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Historical and forecasted phosphate prices



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

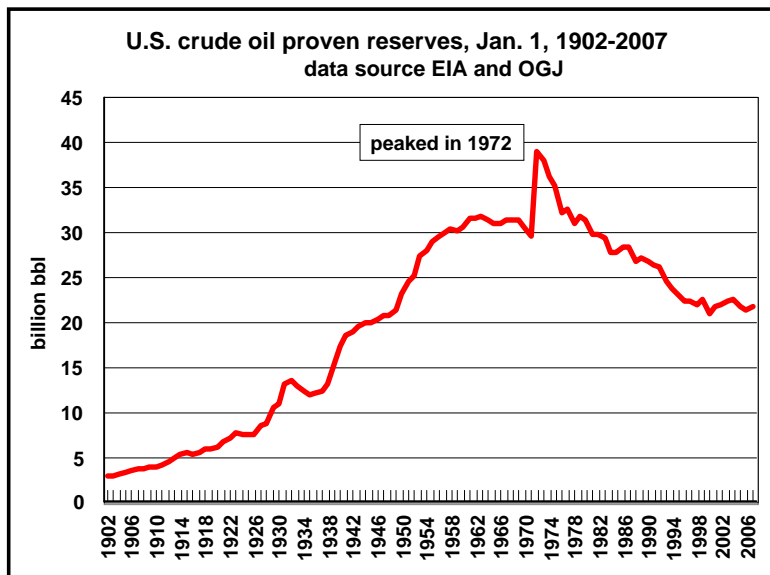
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Scarce Energy?

- 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

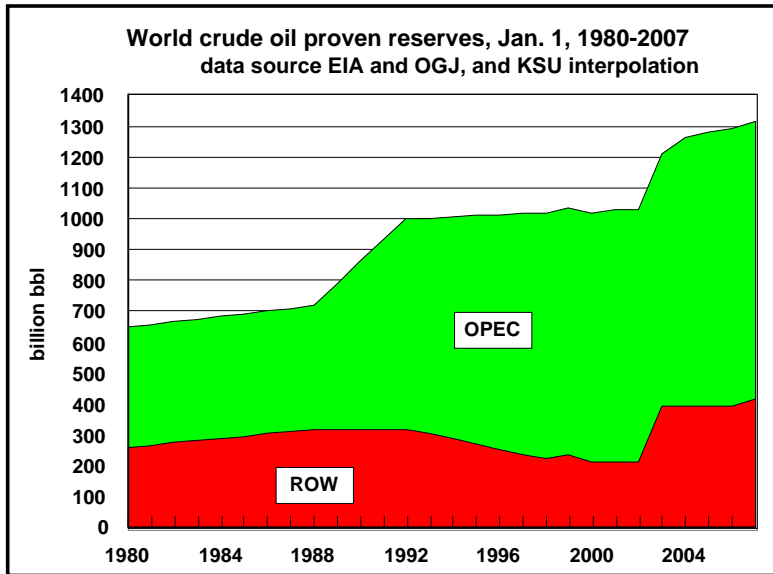
Scarcity is an economic issue, not a physical one

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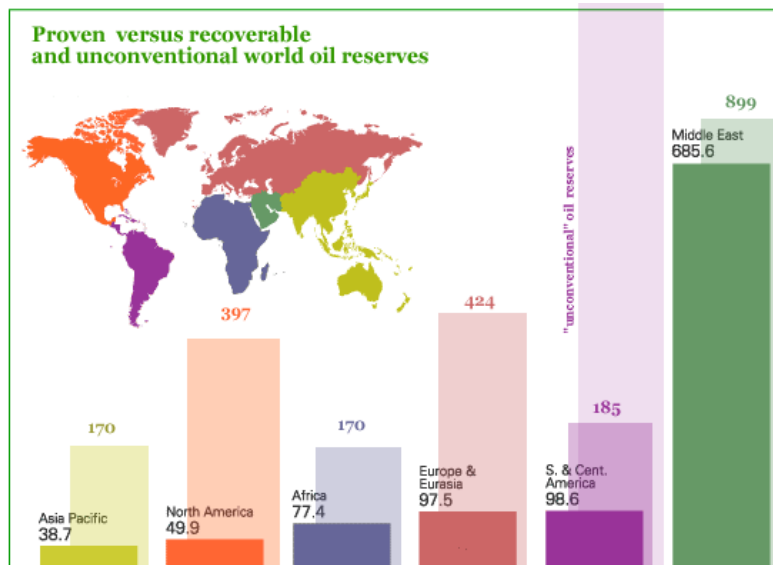


U.S. proven reserves are falling

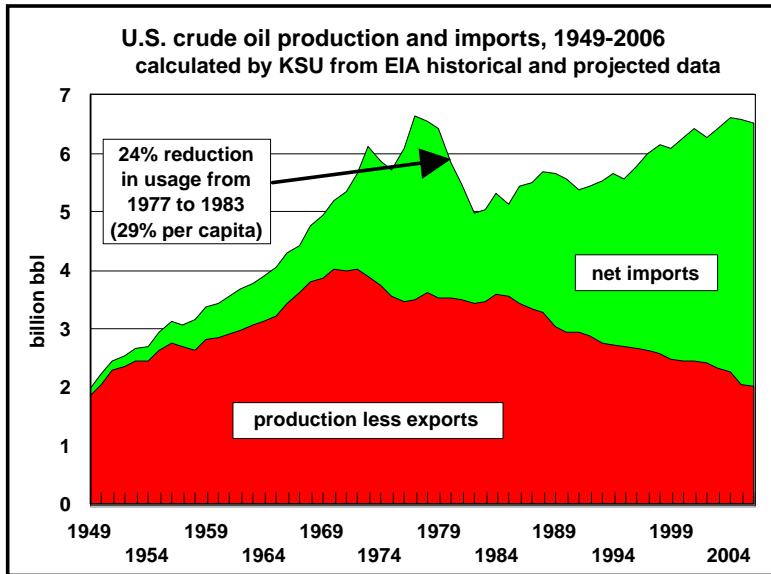
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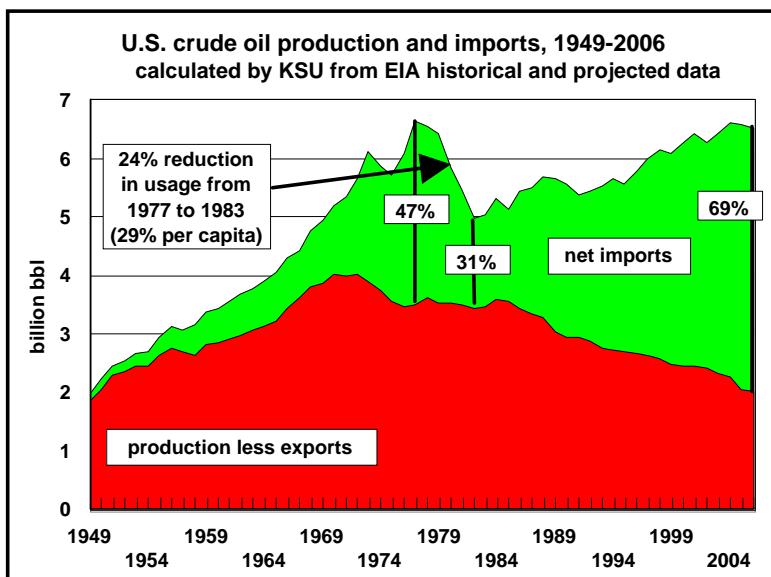
More dependency on OPEC, so also is a political issue



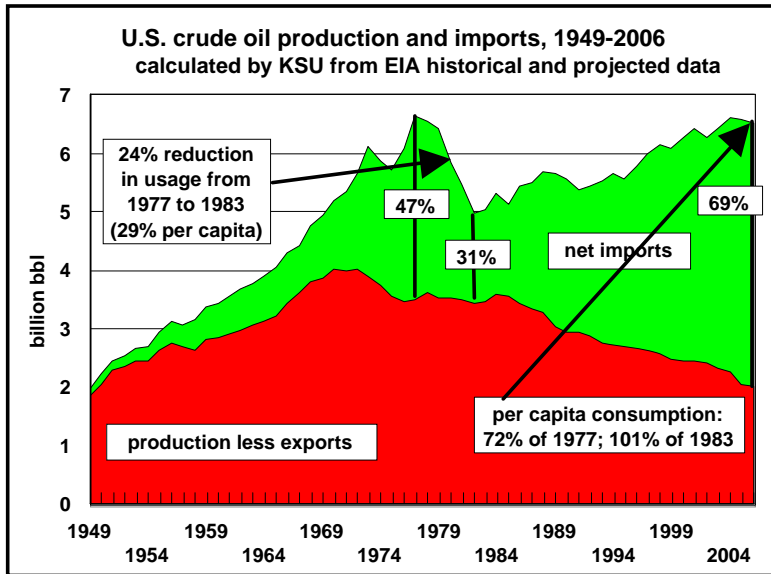
We can find a lot of oil in the western hemisphere if prices stay high



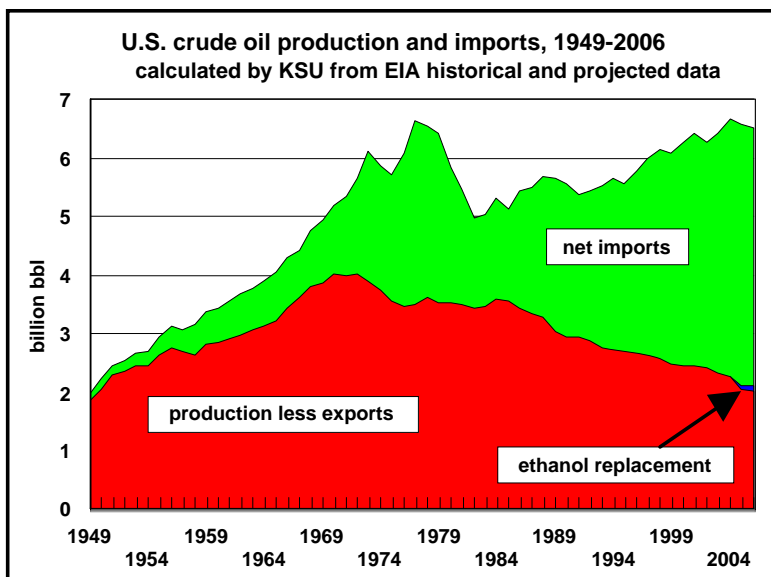
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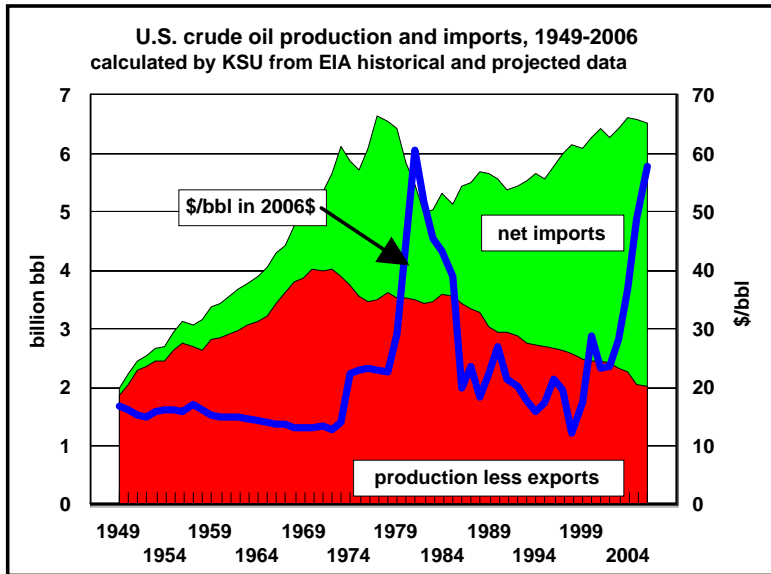


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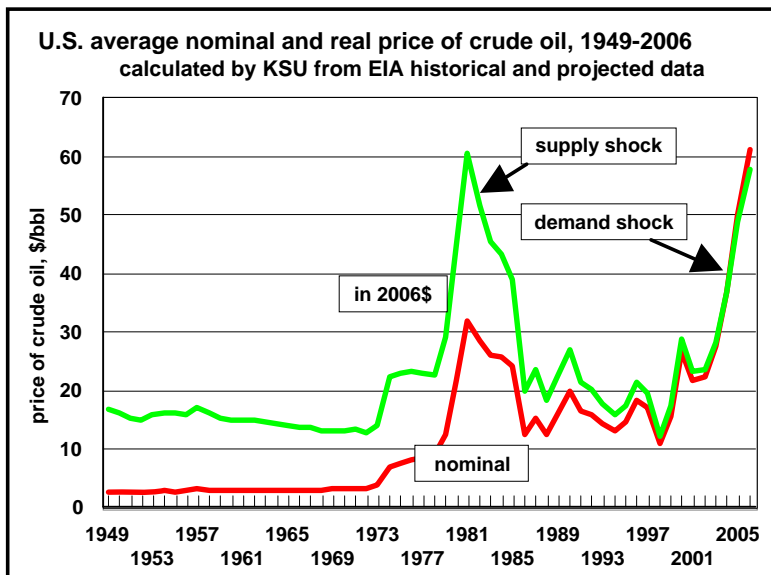


Is crude oil self-sufficiency a reasonable goal? Substitutes for crude? 7.5B gal ethanol might replace 0.098B bbl crude (2.18% of 2006 imports)

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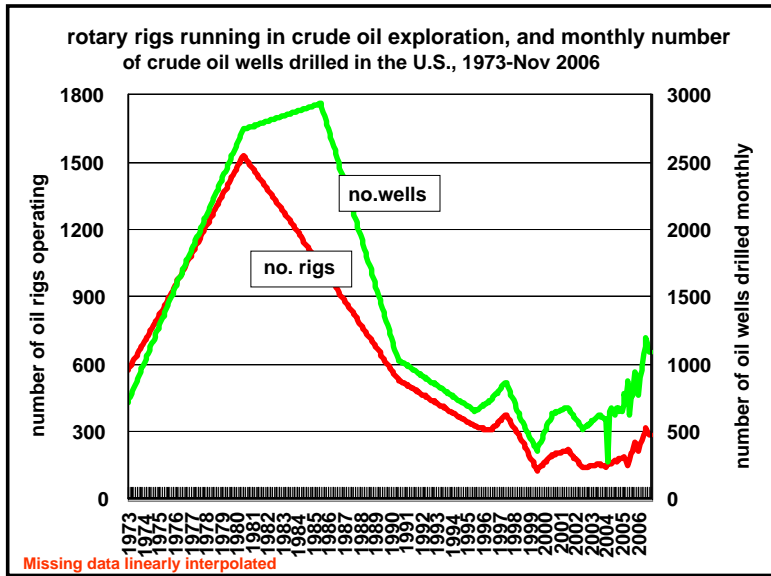


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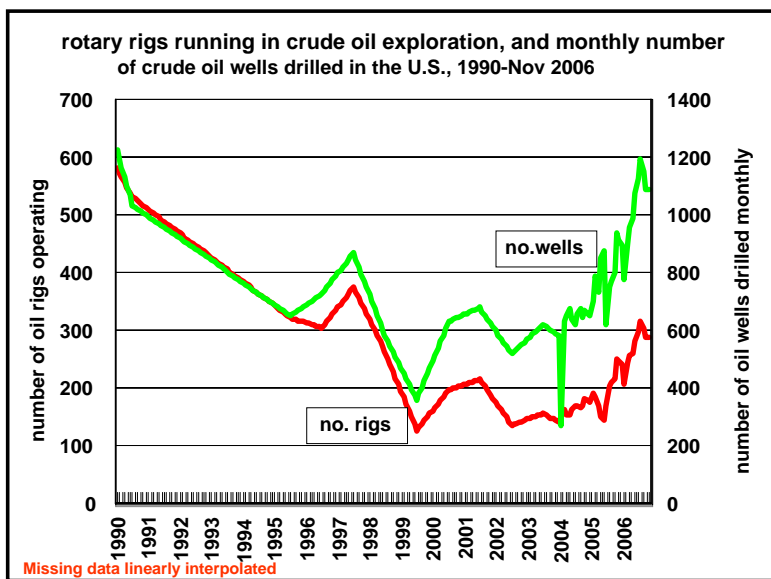


Markets will still work; but will prices fall as fast this time?

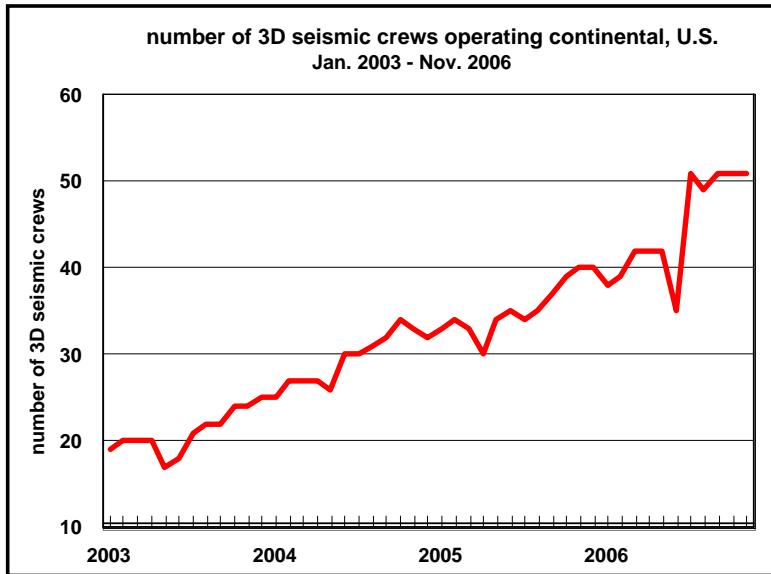
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Price decimated the U.S. oil industry in the late 1980s and 1990s



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



The petroleum industry is NOT sitting idly by!

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Renewable Energy

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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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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

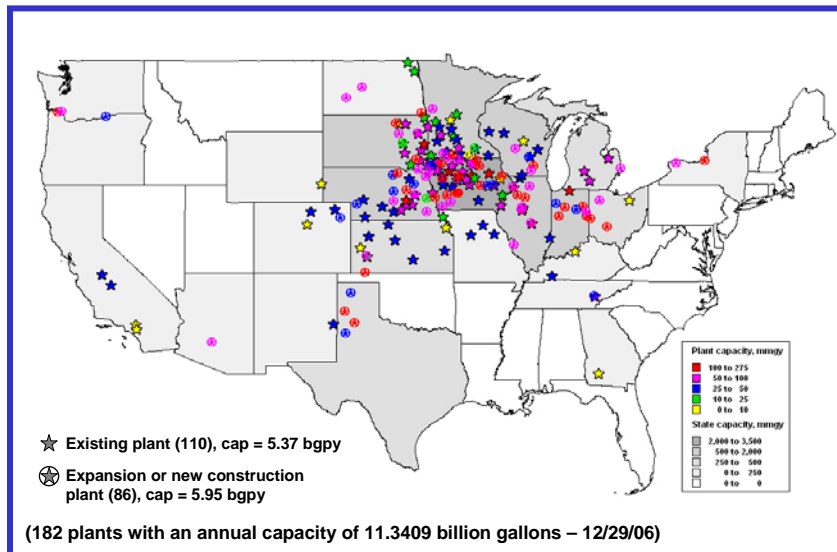
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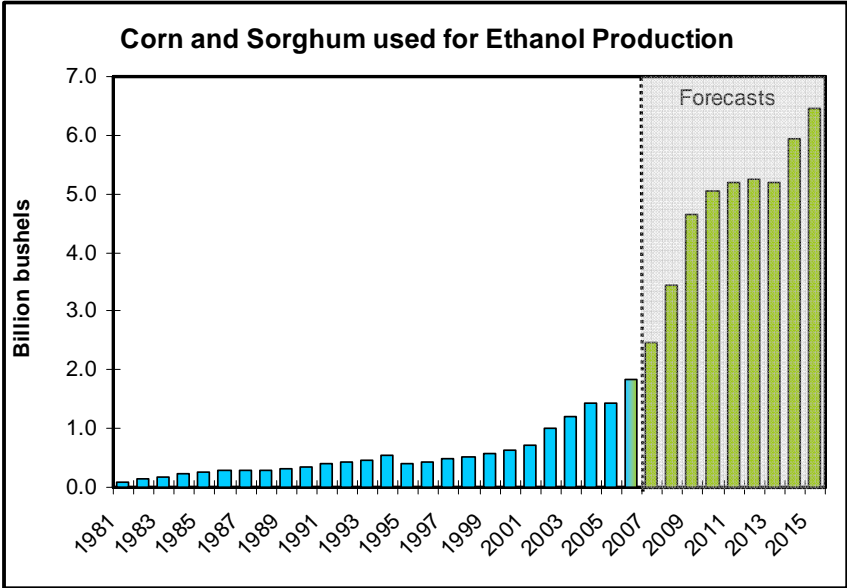
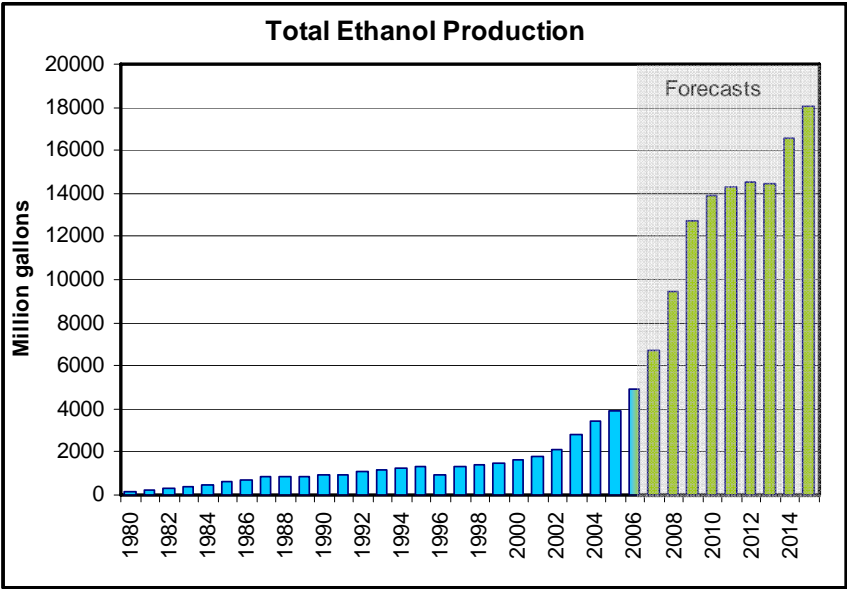
Existing and new ethanol plants

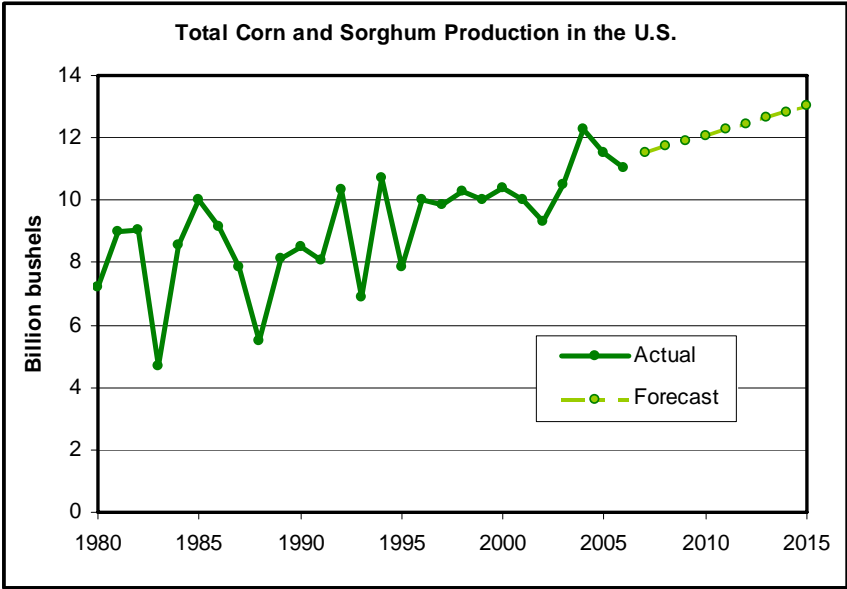
Source: Renewable Fuels Association (RFA), Kansas State University



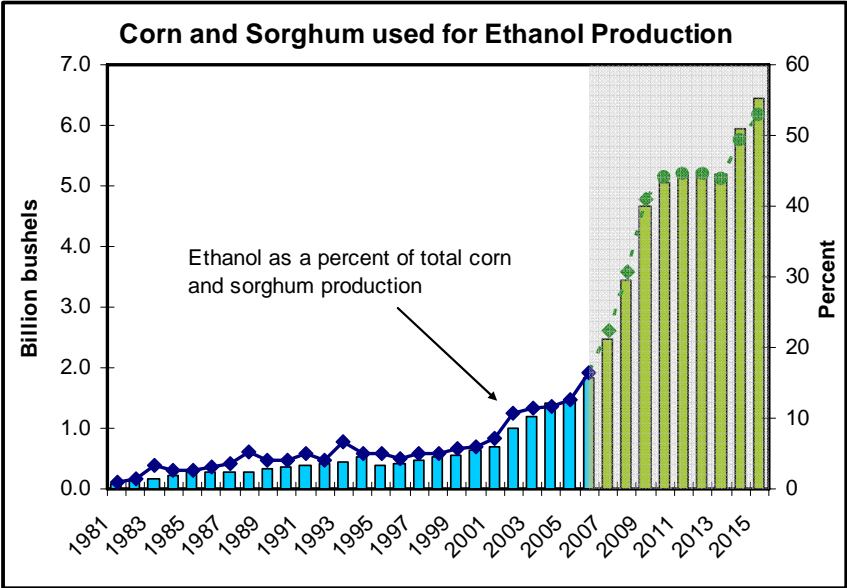
(143 plants with an annual capacity of 7.27 billion gallons – 7/26/06)

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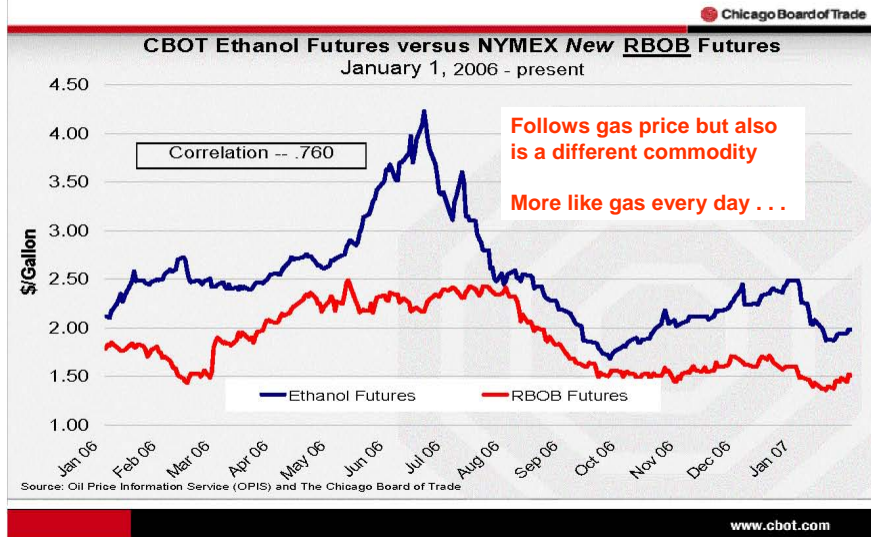




Linear trend is based on data from 1990-2006 only (no adjustment for acres)

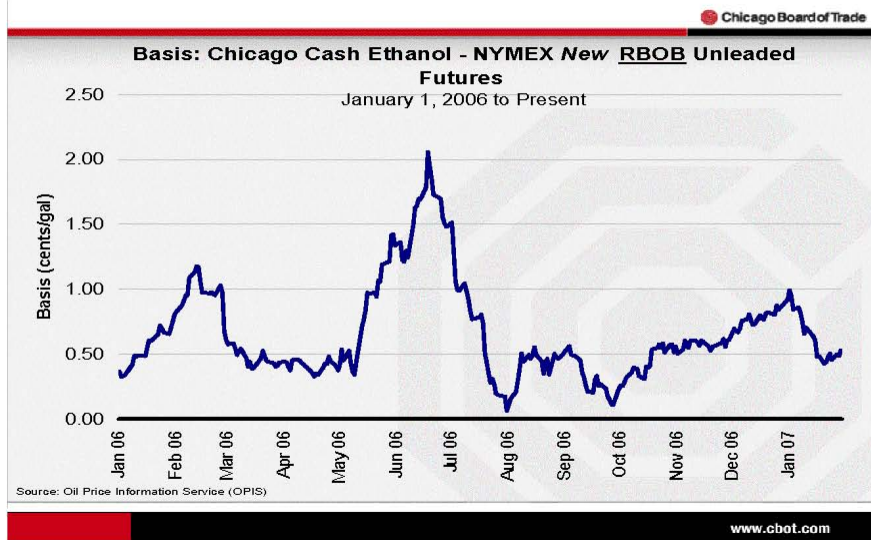


Fairly obvious why we will need considerably more corn acres

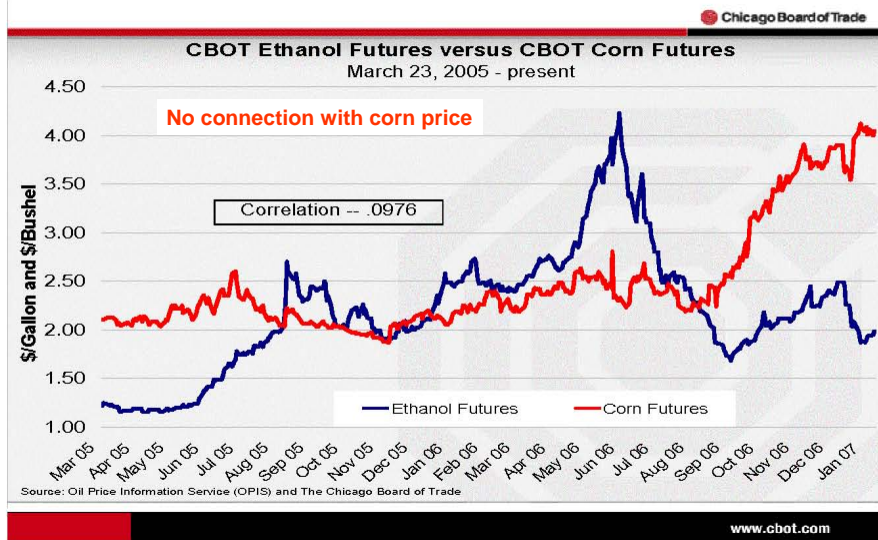
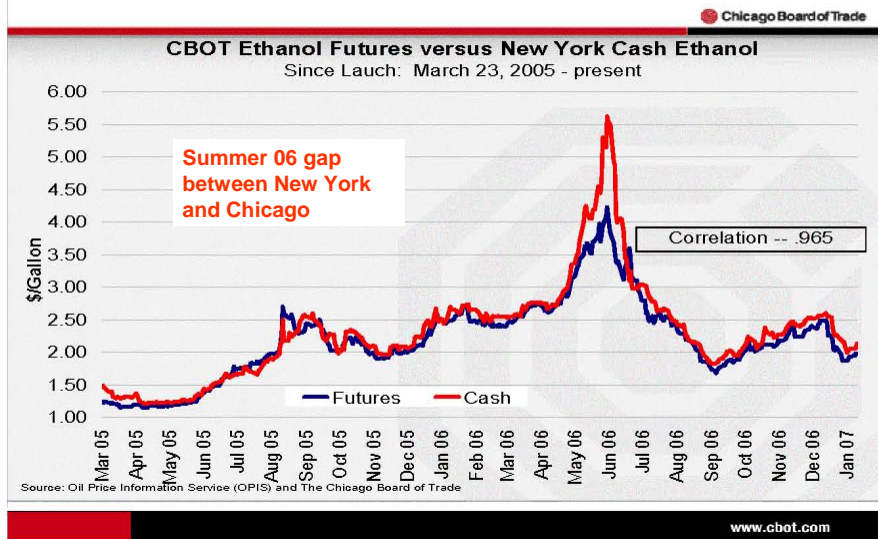


RBOB (reformulated blendstock for oxygenate blending); RFG w/o oxygenate; will completely replace RFG (which contained oxygenate) as gasoline being traded

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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			520	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

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Ethanol demand premium?

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Ethanol consideration for grain producers (Feb. 2007)

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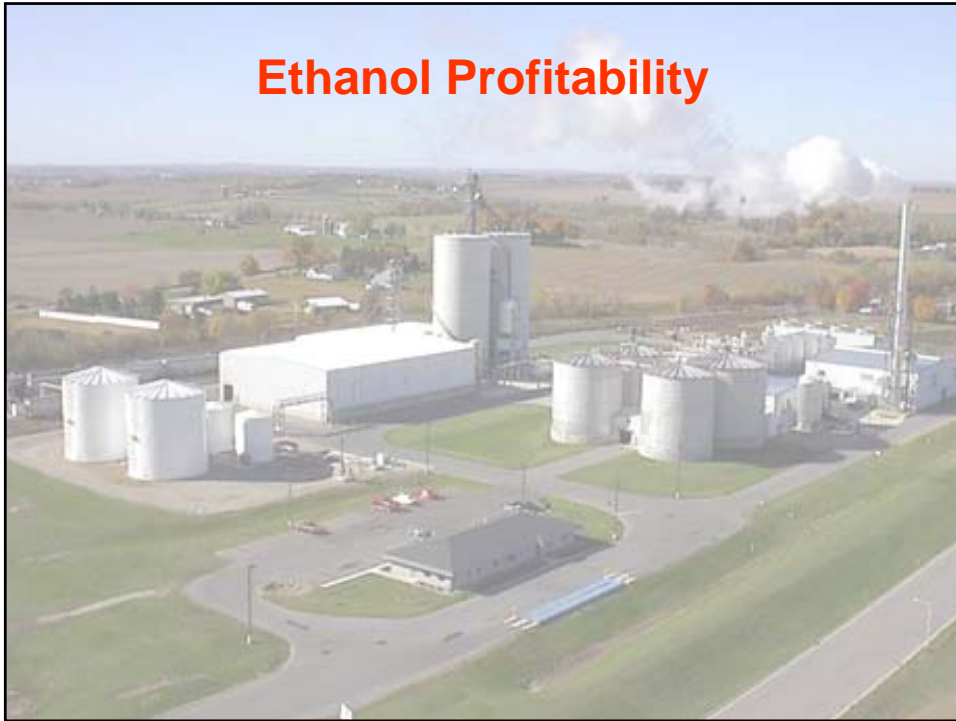
Contract	Open	High	Low	Last	Change	Bid	Ask	Vol	Op Int	Time
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MAY 07	0	4144	4084	4086*	-56			10113	281261	18:42
JUL 07	0	4220	4150	4154*	-54				543	18:42
SEP 07	0	4060	4010	4014*	-40				963	18:42
DEC 07	0	3982	3904	3914*	-34				633	13:49
MAR 08	0	4036	3974	3976*	-36				459	18:42
MAY 08	0	4070	4020	4020*	-34			5	5654	18:42
JUL 08	0	4120	4060	4060*	-30			103	21887	18:42
SEP 08	0	3850	3830	3850*	0			6	5059	18:42
DEC 08	0	3794	3764	3766*	-10			474	84242	18:42
JUL 09	0	3862	3854	3854*	4			11	472	18:42
DEC 09	0	0	0	3582*	2			107	8653	13:49
DEC 10	0	0	0			0	3600	0	0	18:42

Click on the chart icon to view the graphical chart

Ethanol demand premium?

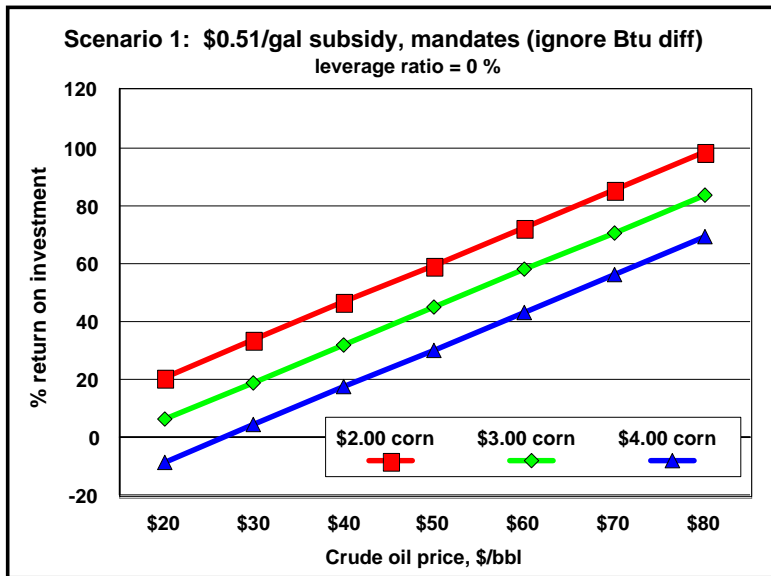
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Ethanol Profitability



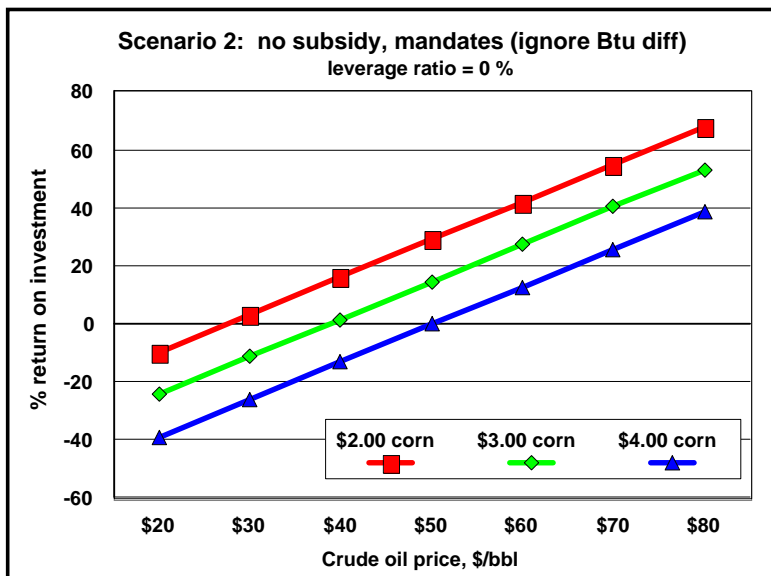
Ethanol Assumptions

- 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



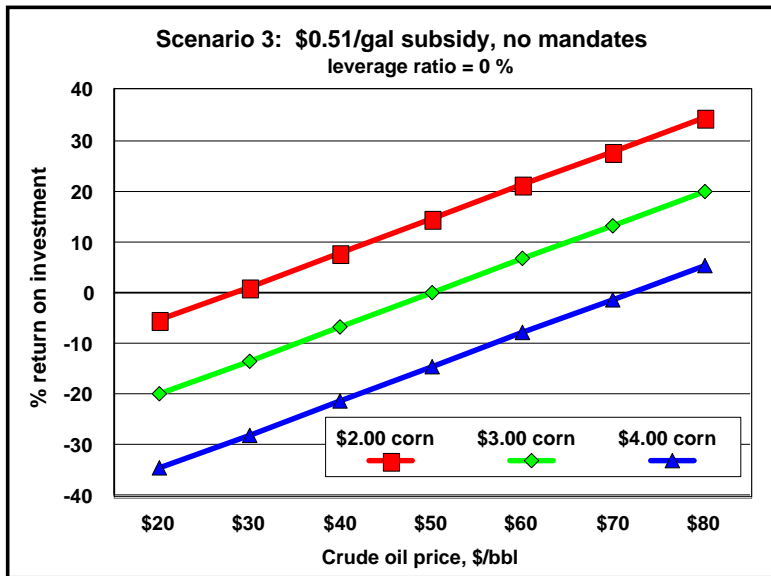
More or less today, ethanol premium due to mandates + subsidy

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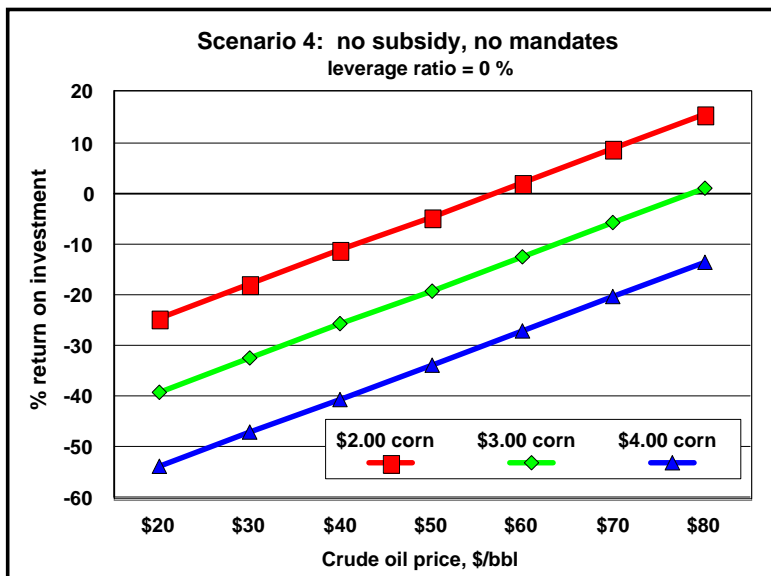
No subsidy but ethanol premium due to mandates continues

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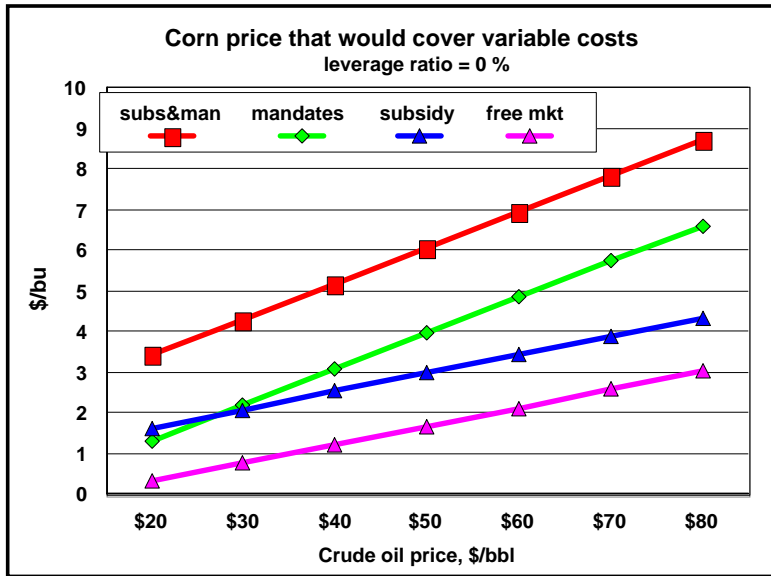
Subsidy continues, but no more ethanol premium due to mandates

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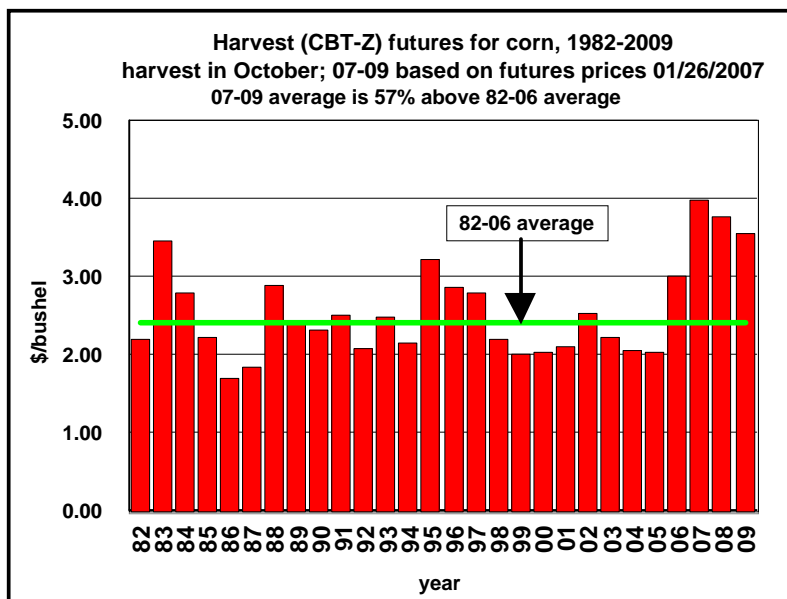


No subsidy, no premiums (ethanol truly a gasoline substitute)

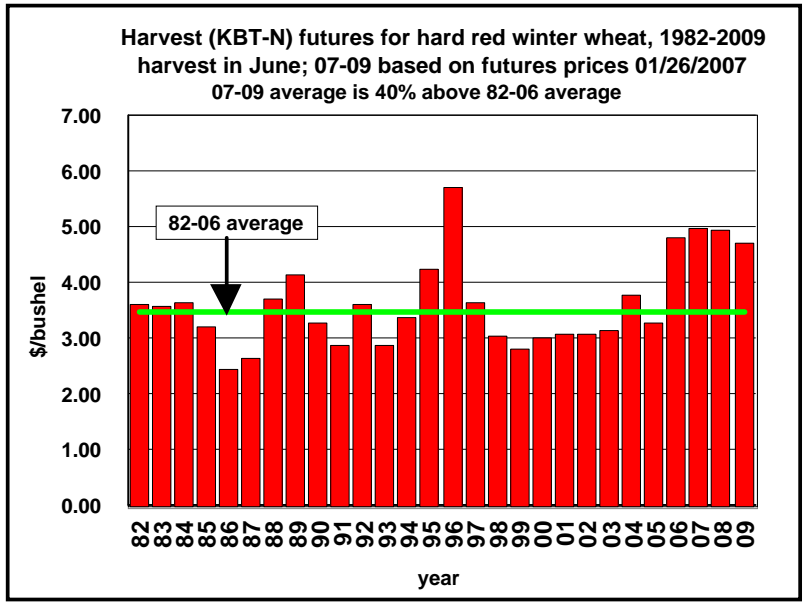
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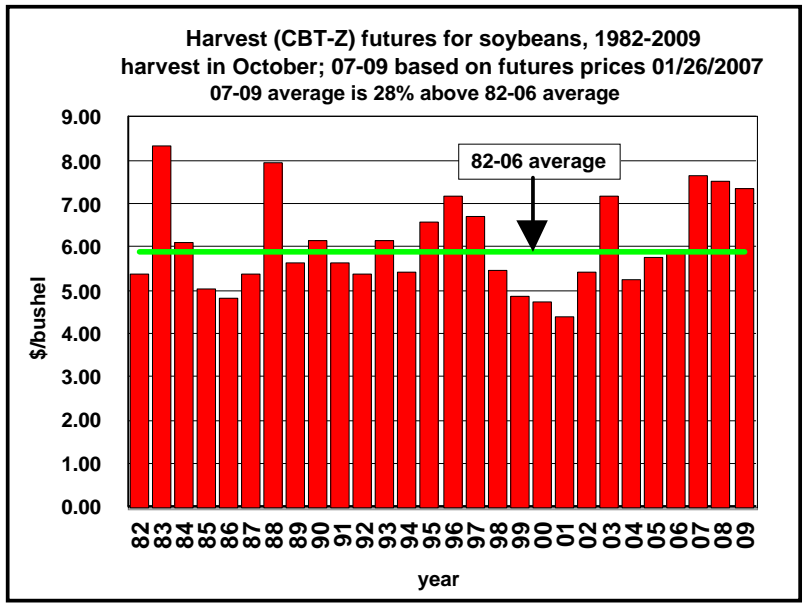
Since mothballing costs are high, not that far from total-cost breakeven



Unprecedented opportunity in corn production



But, wheat will be impacted as well . . .



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

KSU-Lease.xls -- Based on average budgets for eastern Kansas and long-run prices.

ALTERNATIVE METHODS OF ESTIMATING CASH RENT										Print cash rent info		1:28 AM 01/26/07	
Crop/System	Wheat	DC beans	Corn	Milo	FS beans	Wheat	Total	Per	Per				
Total tillable acre	----->									89.0	Planted	Per	
Planted acres of each crop	22.0	11.0	25.0	10.0	32.0	0.0	100.0	Acres	Acres				
A. Landowner's COST													
Land	\$43.00	\$0.00	\$43.00	\$43.00	\$43.00	\$43.00	\$3,627	\$38.27	\$43.00				
Irrigation equipment	\$0.00	\$0.00	\$0.00	\$0.00	\$0.00	\$0.00	\$0	\$0.00	\$0.00				
Total	\$43.00	\$0.00	\$43.00	\$43.00	\$43.00	\$43.00	\$3,627	\$38.27	\$43.00	Cash rent			
B. Landowner's EQUITABLE SHARE RENT ---- risk adj factor 0.0%													
Total income	\$175.75	\$111.80	\$260.10	\$194.25	\$207.15	\$175.75	\$20,170	\$201.70	\$226.63				
Landowner's share	33.1%	33.1%	33.1%	33.1%	33.1%	33.1%	33.1%	33.1%	33.1%				
Landowner's income	\$58.16	\$37.00	\$86.07	\$64.28	\$68.55	\$58.16	\$6,674	\$66.74	\$74.99				
Landowner operating expense	\$21.99	\$6.86	\$4.66	\$2.85	\$5.87	\$7.77	\$3,052	\$30.52	\$34.29				
Income less operating expense	\$36.17	\$10.13	\$41.41	\$31.43	\$42.67	\$48.39	\$3,622	\$36.22	\$40.70				
Less risk adjustment	0.00	0.00	0.00	0.00	0.00	0.00	0	0.00	0.00				
Cash rent equivalent	\$36.17	\$10.13	\$41.41	\$31.43	\$42.67	\$48.39	\$3,622	\$36.22	\$40.70	Crop share equivalent			
C. Amount tenant CAN AFFORD TO PAY													
Total income	\$175.75	\$111.80	\$260.10	\$194.25	\$207.15	\$175.75	\$20,170	\$201.70	\$226.63				
Total operating expense	\$136.63	\$126.82	\$232.28	\$188.99	\$162.01	\$63.70	\$16,962	\$169.62	\$190.58				
Return to land and irr equip	\$39.12	(\$15.02)	\$27.82	\$5.27	\$65.14	\$122.05	\$3,208	\$32.08	\$36.05				
Comparison of alternative cash rent methods													
Low	\$36.17	(\$15.02)	\$27.82	\$5.27	\$42.67	\$43.00	\$3,208	\$32.08	\$36.05				
Average	\$39.43	(\$1.63)	\$37.41	\$26.57	\$46.94	\$82.52	\$3,552	\$35.52	\$39.92				
High	\$43.00	\$10.13	\$43.00	\$43.00	\$55.14	\$122.05	\$3,627	\$36.27	\$43.00				
Returns above all costs (profit)	(\$3.88)	(\$15.02)	(\$15.18)	(\$37.73)	\$12.14	\$79.05	(\$619)	(\$6.19)	(\$6.95)				

KSU-Lease.xls -- Based on average budgets for eastern Kansas and current prices.

ALTERNATIVE METHODS OF ESTIMATING CASH RENT										Print cash rent info		2:07 AM 01/26/07	
Crop/System	Wheat	DC beans	Corn	Milo	FS beans	Wheat	Total	Per	Per				
Total tillable acre	----->									89.0	Planted	Per	
Planted acres of each crop	22.0	11.0	25.0	10.0	32.0	0.0	100.0	Acres	Acres				
A. Landowner's COST													
Land	\$43.00	\$0.00	\$43.00	\$43.00	\$43.00	\$43.00	\$3,627	\$38.27	\$43.00				
Irrigation equipment	\$0.00	\$0.00	\$0.00	\$0.00	\$0.00	\$0.00	\$0	\$0.00	\$0.00				
Total	\$43.00	\$0.00	\$43.00	\$43.00	\$43.00	\$43.00	\$3,627	\$38.27	\$43.00	???			
B. Landowner's EQUITABLE SHARE RENT ---- risk adj factor 0.0%													
Total income	\$230.20	\$146.00	\$422.80	\$325.15	\$267.00	\$230.20	\$29,038	\$290.38	\$326.27				
Landowner's share	33.1%	33.1%	33.1%	33.1%	33.1%	33.1%	33.1%	33.1%	33.1%				
Landowner's income	\$76.17	\$48.31	\$139.94	\$107.69	\$88.35	\$76.17	\$9,609	\$96.09	\$107.97				
Landowner operating expense	\$21.99	\$6.86	\$4.66	\$2.85	\$5.87	\$7.77	\$3,052	\$30.52	\$34.29				
Income less operating expense	\$54.19	\$21.45	\$95.28	\$74.75	\$62.48	\$67.41	\$6,557	\$65.57	\$73.67				
Less risk adjustment	0.00	0.00	0.00	0.00	0.00	0.00	0	0.00	0.00				
Cash rent equivalent	\$54.19	\$21.45	\$95.28	\$74.75	\$62.48	\$67.41	\$6,557	\$65.57	\$73.67	Crop share rent adjusts			
C. Amount tenant CAN AFFORD TO PAY													
Total income	\$230.20	\$146.00	\$422.80	\$325.15	\$267.00	\$230.20	\$29,038	\$290.38	\$326.27				
Total operating expense	\$136.63	\$126.82	\$232.28	\$188.99	\$162.01	\$63.70	\$16,962	\$169.62	\$190.58				
Return to land and irr equip	\$93.57	\$19.18	\$190.52	\$136.17	\$114.99	\$176.50	\$12,076	\$120.76	\$135.69				
Comparison of alternative cash rent methods													
Low	\$43.00	\$0.00	\$43.00	\$43.00	\$43.00	\$43.00	\$3,627	\$36.27	\$43.00				
Average	\$63.58	\$13.54	\$109.63	\$84.64	\$73.49	\$109.75	\$7,487	\$74.87	\$84.12				
High	\$93.57	\$21.45	\$190.62	\$136.17	\$114.99	\$176.50	\$12,076	\$120.76	\$135.69				
Returns above all costs (profit)	\$50.57	\$19.18	\$147.62	\$93.17	\$71.99	\$133.50	\$8,249	\$82.49	\$92.69				

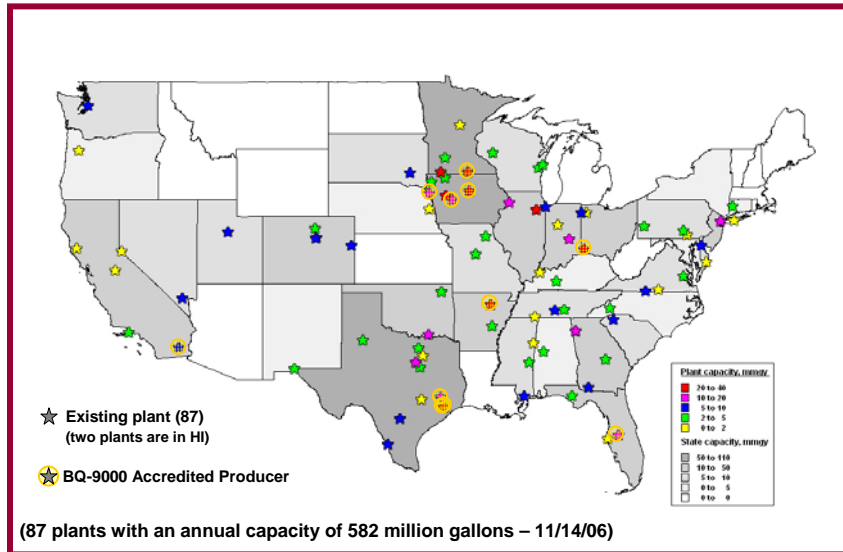
Pacific Ethanol stock price



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Existing biodiesel plants

Source: National Biodiesel Board, Kansas State University



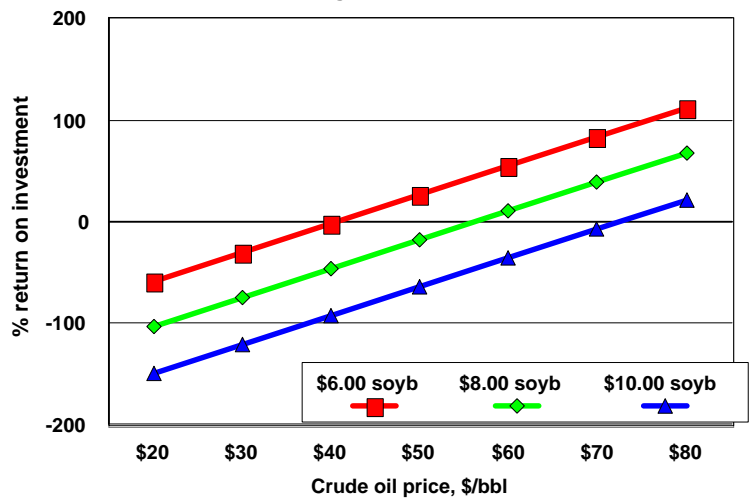
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Biodiesel Assumptions

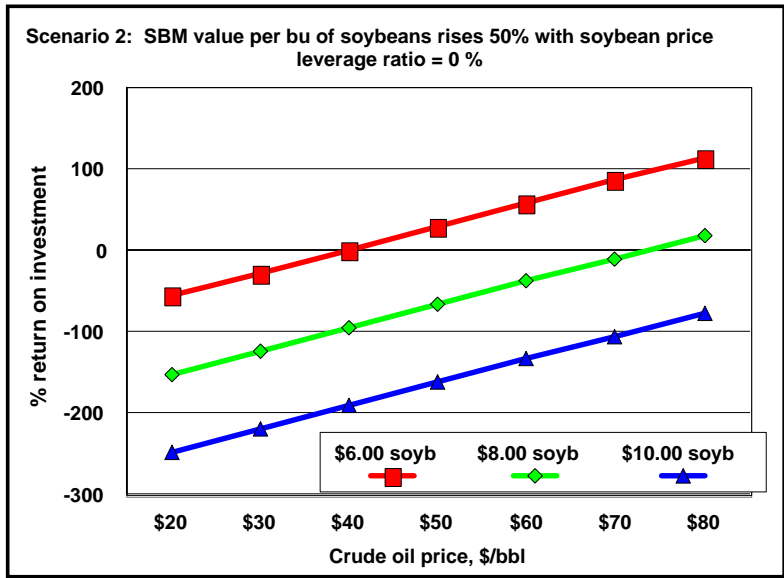
- 11 lb BO per bu of soybeans
- 7.5 lb BO in gal of biodiesel
- 7.3 lb in gal of biodiesel
- 0.0375 MCF natural gas/gal of biodiesel
- \$0.75/gal of biodiesel non-oil cost (incl. nat'l gas)
 - Implies \$0.51 cost w/o natural gas at base gas price of \$6.50/MCF
- \$0.93/gal annual capacity is initial investment (45M gal/yr)
- Glycerine credit = methanol cost
- 6% loan interest rate
- \$1.00/gal subsidy (no state subsidies)
- Sep01-Aug05 price relationships
 - 68.97% value of soybeans in SBM
 - 40.64% value of soybeans in BO
 - \$6.10 base soybean price (implies \$0.59/bu crushing margin)
- Diesel and natural gas prices predicted with a statistical model using crude oil as determinant (add subsidy)

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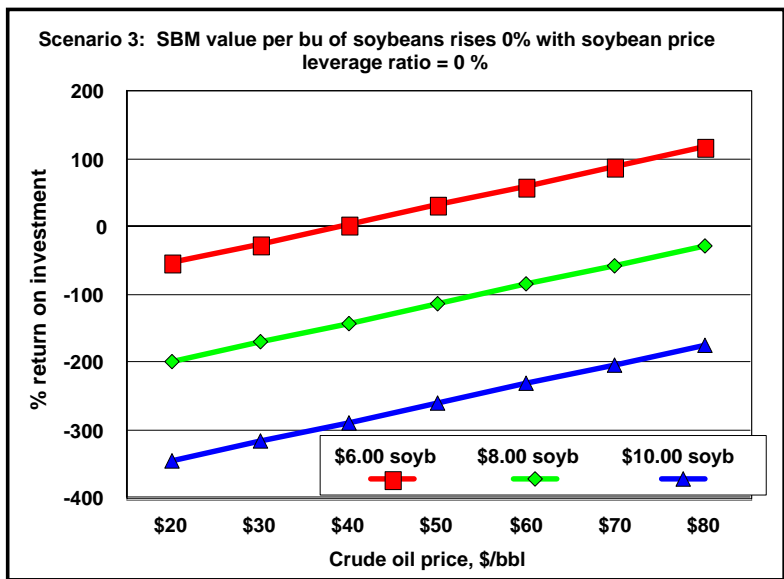
Scenario 1: SBM value per bu of soybeans rises 100% with soybean price
leverage ratio = 0 %



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CBT Soybean - D Futures Click on the chart icon to view the graphical chart print versio

Contract	Open	High	Low	Last	Change	Bid	Ask	Vol	Op Int	Time
MAR 07	0	7466	7380	7386*	-12			29751	197955	13:43
MAY 07	0	7620	7534	7542*	-22			13542	96537	13:43
JUL 07	0	7756	7674	7686*	-6					
AUG 07	0	7800	7740	7760*	4					
SEP 07	0	7854	7790	7794*	-14					
NOV 07	0	7990	7904	7912*	-16					
JAN 08	0	8020	7970	7970*	0					
MAR 08	0	8030	7970	7974*	-10					
MAY 08	0	8024	7980	7980*	-10					
JUL 08	0	8090	8040	8044*	0					
NOV 08	0	7874	7800	7810*	4			152	9841	13:43
NOV 09	0	7500	7480	7500*	0			15	128	13:43
JUN 0H				-1159266304						13:29

Biodiesel demand premium? Or, simply "buying" bean acres?

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December 12, 2006 by Jim Minter/LMC
- Livestock Outlook Radio Program
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- Factors Impacting Dairy Profitability in 2007 (revised)
December 11, 2006 by Kevin Shuyvetter and Terry Kastens
- Current Grain Outlook Newsletter
December 11, 2006 by Mike Woolverton
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December 5, 2006 by Kevin Shuyvetter
- Monthly W3 and Diesel Price Forecasts
December 3, 2006 by Kevin Shuyvetter
- Grain Outlook, presented at Kansas Commodity Classic
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