

## Ethanol Impact on Corn Production and Agribusiness



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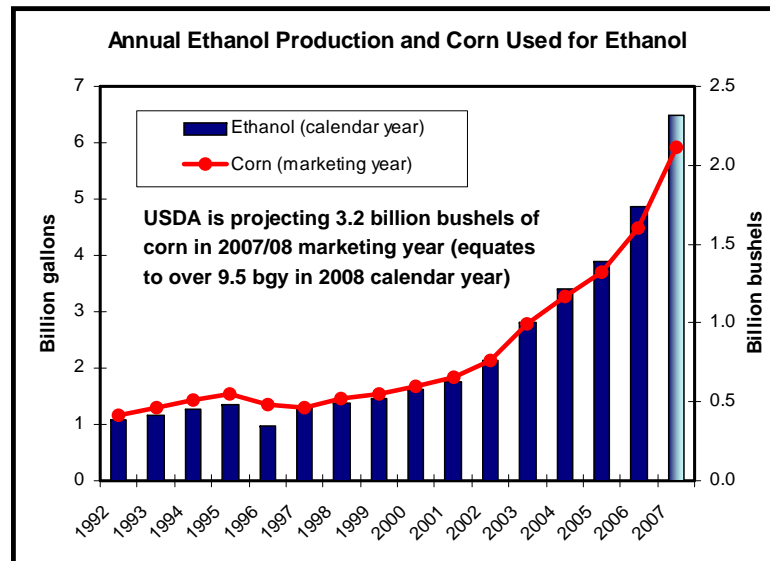
Presentation at 2008 KARA/KSU Crop Production Update  
Salina, KS, January 16-17, 2008

## Drivers of the Biofuels Industry

- Ethanol
  - States ban or restrict MTBE
    - Phaseout began in 2000; production stopped in 2006
  - Subsidies
    - 4 cents/gal blending credit 1978; 51 cents started 2004
  - Federal & state mandates for ethanol inclusion
    - Fed: 4 bgy in 2006 and 7.5 bgy in 2012
    - 12/07 Energy Bill: 36 bgy by 2022 (21 from cellulose)
      - 15 bgy corn grain ethanol 2015 and cap?
  - High energy prices
- Bio-diesel
  - Low sulfur requirements for diesel
  - Subsidies
  - High energy prices

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## Increases the demand for corn...

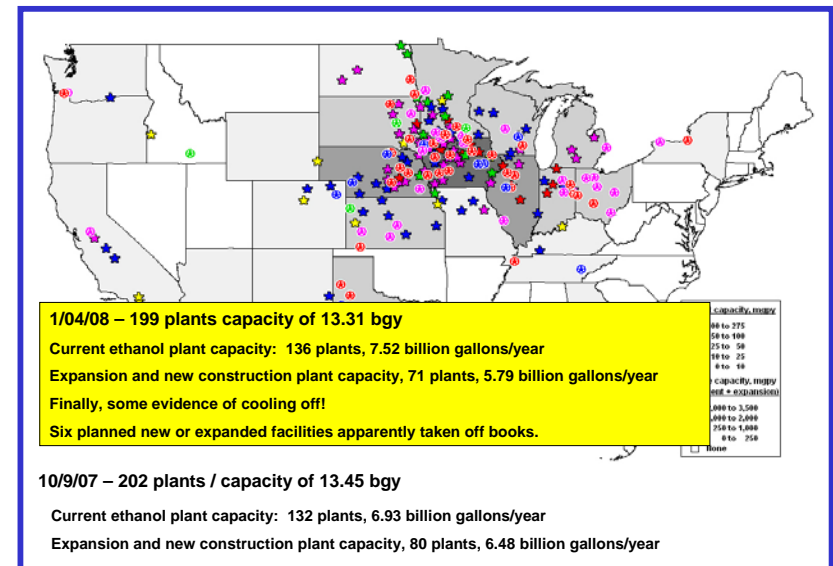


Source: Energy Information Administration (EIA), USDA NASS, and KSU

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## Existing and new ethanol plants

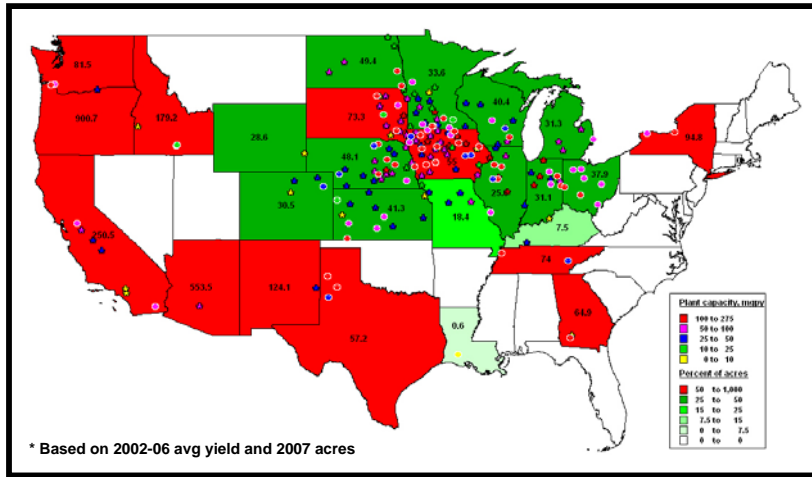
Source: Renewable Fuels Association (RFA)



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## % of Acres Needed for Current + Expansion Production\*

Source: USDA NASS and KSU



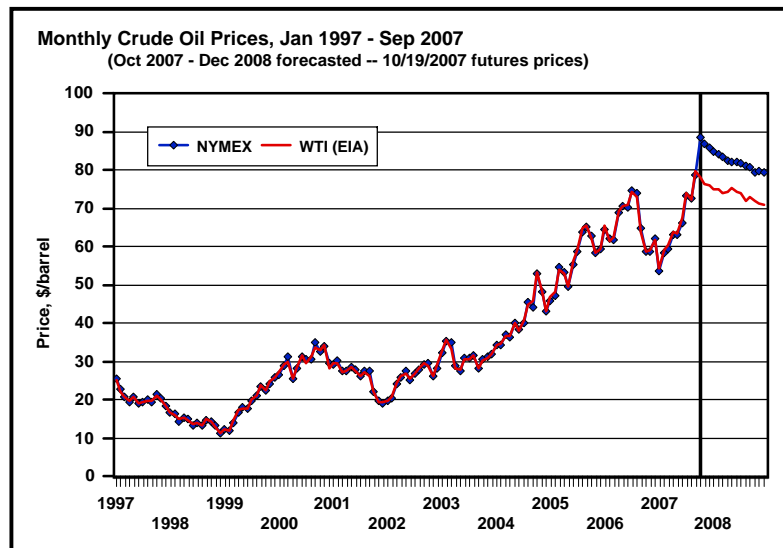
Ethanol expansion is going to create some interesting dynamics...

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Prices, profitability, etc.

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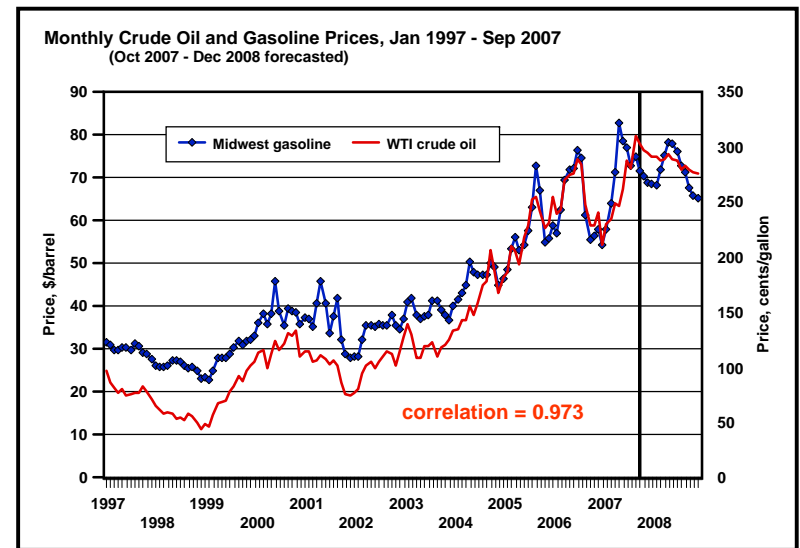
## Crude oil prices are at historically high levels...



Source: Energy Information Administration (EIA) and KSU

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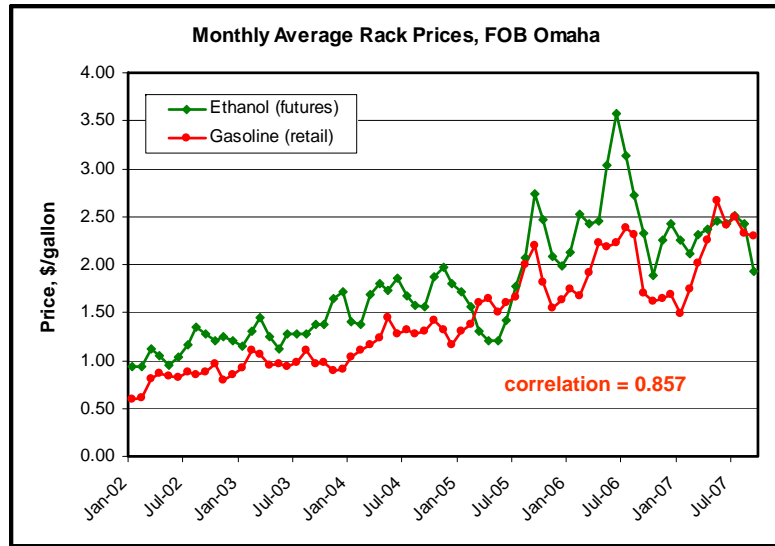
## High oil prices translate into high gas prices...



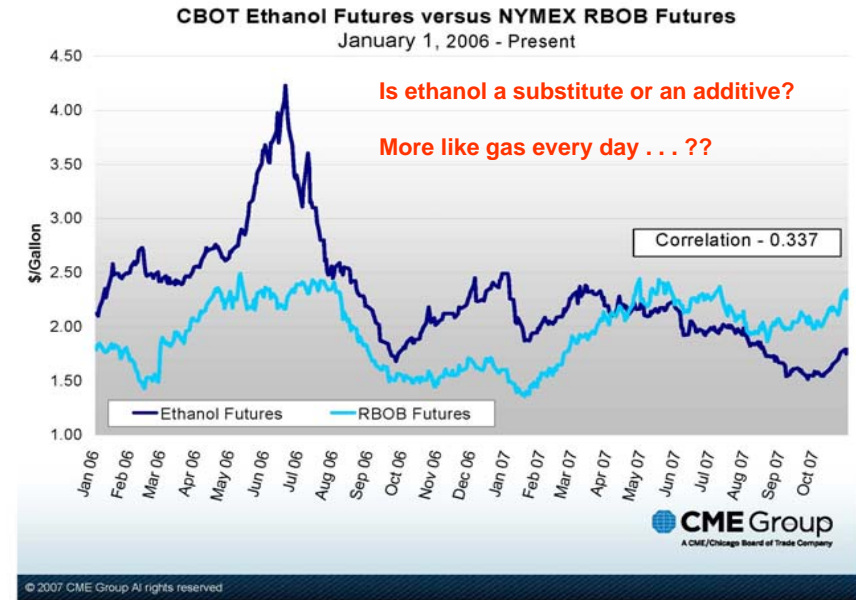
Source: Energy Information Administration (EIA)

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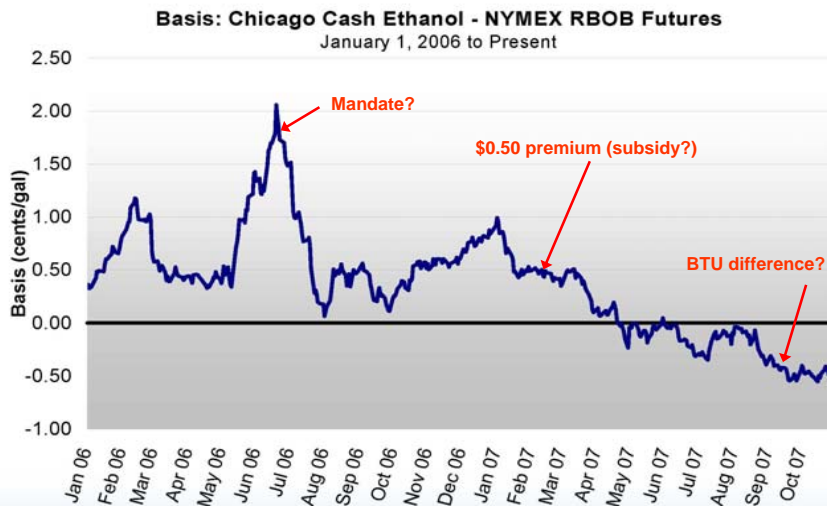
**Positive correlation → higher gas prices leads to higher ethanol prices...**



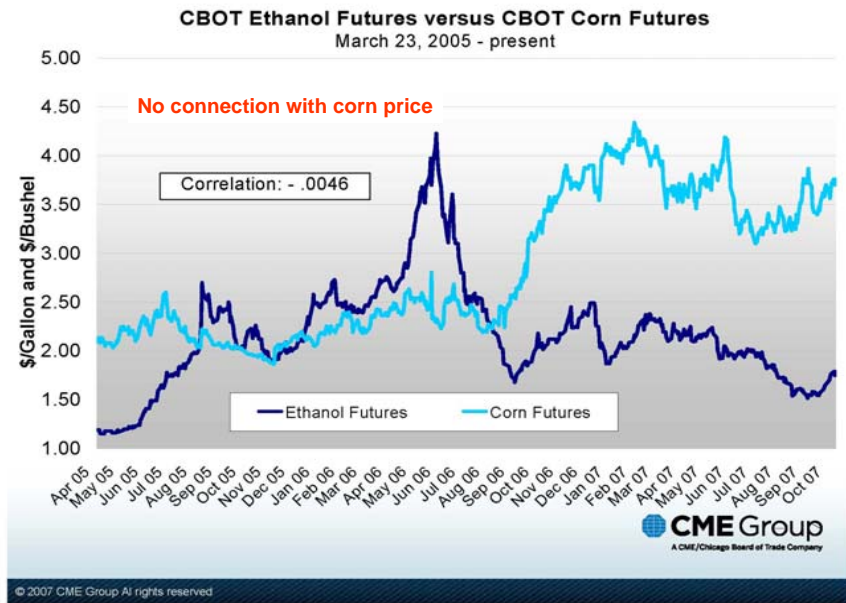
Source: Nebraska Ethanol Board and Nebraska Energy Office, <http://www.neo.ne.gov/statsthtml/66.html>



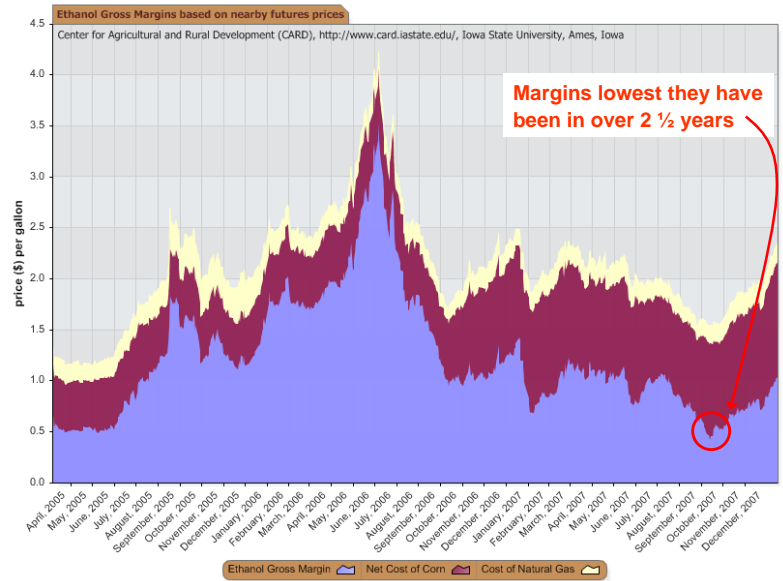
RBOB (reformulated blendstock for oxygenate blending)



Evolution of industry: left with energy difference plus subsidy (at \$3 gas unsubsidized ethanol should be \$2)? But, could get worse due to infrastructure issues.



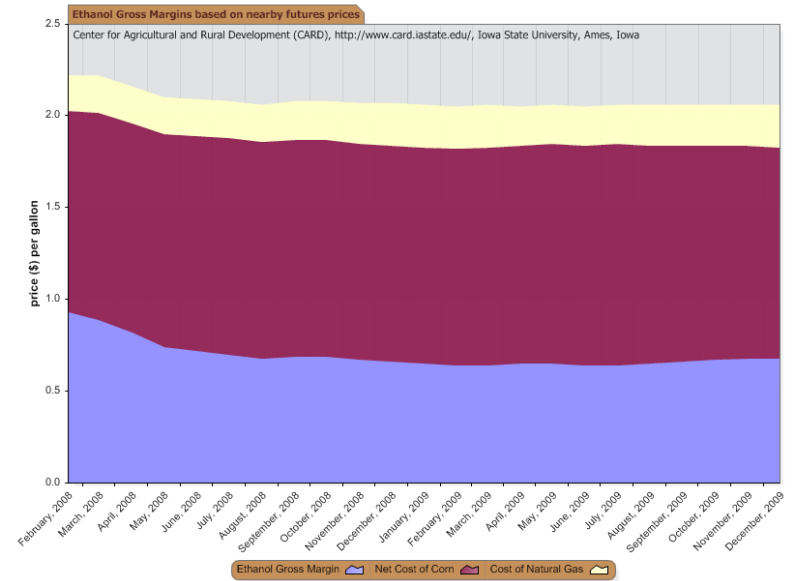
## Historical ethanol margins



from Iowa State CARD website (updated 1/5/08)

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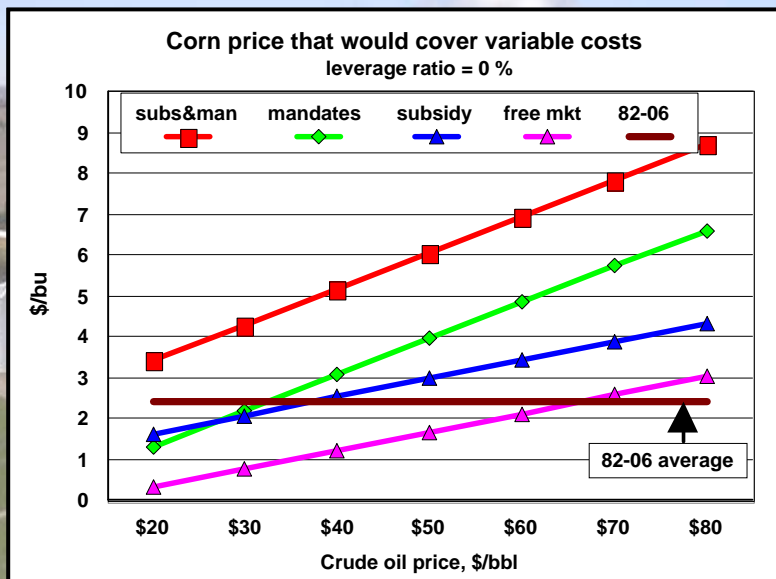
## Ethanol margin forecasts → Expansion?



from Iowa State CARD website (updated 1/5/08)

30

## Ethanol Profitability...



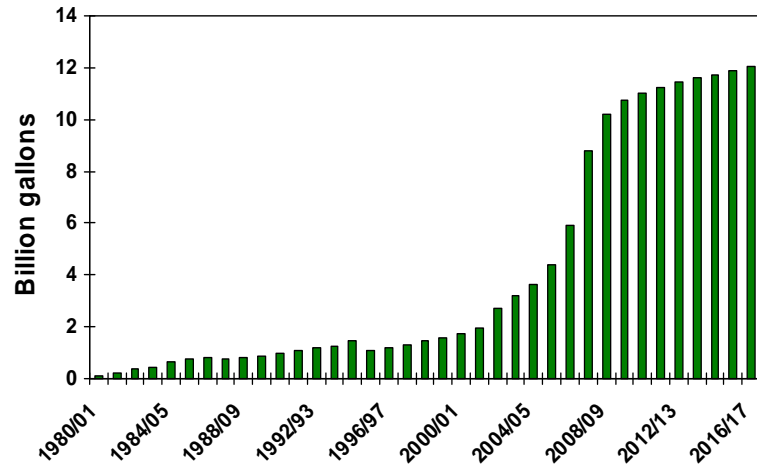
If mothballing costs are high, effective breakeven prices are higher

How much ethanol will be produced going forward?

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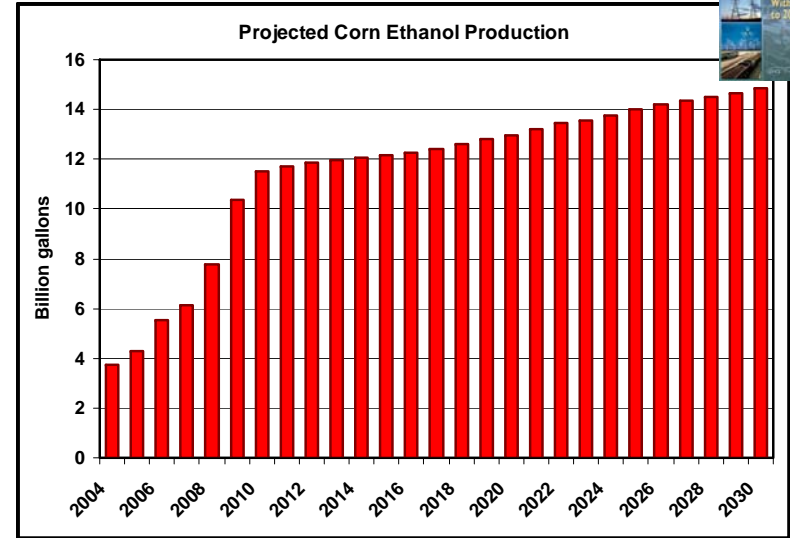
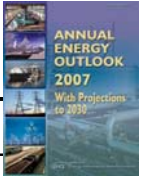
## Projected Corn Ethanol Production

expect 12 bil. gal. in 2016/17– 30% of corn crop



Source: Collins, K. "The New World of Biofuels: Implications for Agriculture and Energy." EIA Energy Outlook, Modeling, and Data Conference, March 28, 2007

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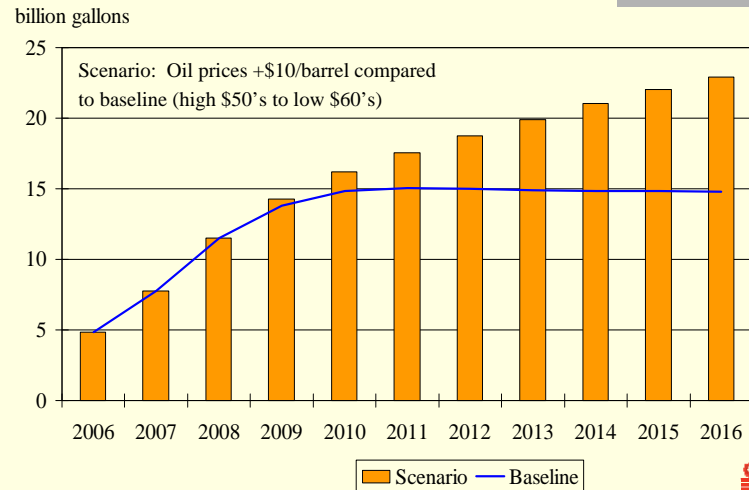


Source: Energy Information Administration, Report #DOE/EIA-0383(2007), February 2007

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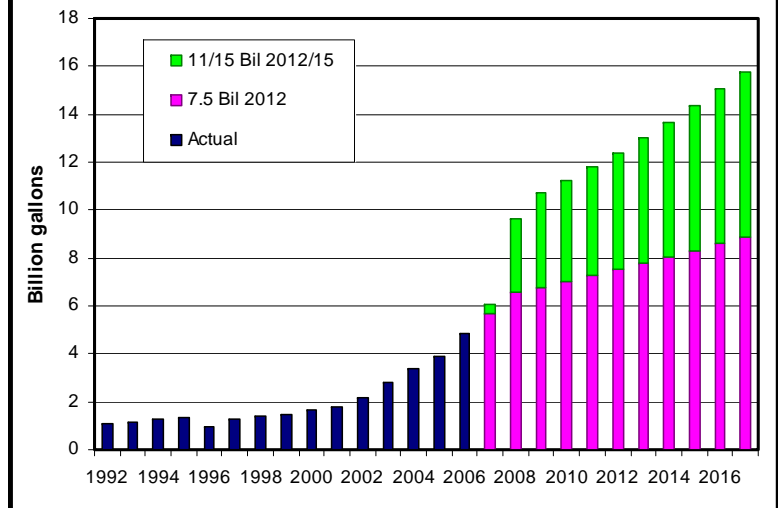
## Projected U.S. Ethanol Production

Source: Chad Hart, CARD, Iowa State University – Spring 2007

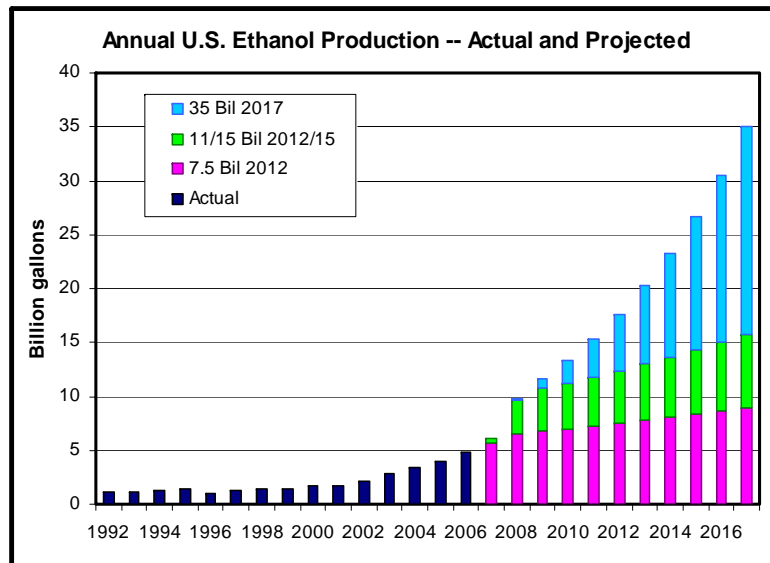


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## Annual U.S. Ethanol Production -- Actual and Projected



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## Biofuels are catching the eye of oil companies

- “Every option, from developing unconventional fossil fuel resources to pursuing renewable and other alternatives, will need to be pursued if the world expects to meet its growing energy demand through 2030, the **National Petroleum Council** concluded in a recent study.”

... Oil & Gas Journal, Aug. 6, 2007

... much of this journal issue was devoted to agrifuels

... a far cry from the “mood” of the oil industry regarding renewable energy even just 6 months ago

- Biofuels are NOT going away

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## Some negatives are creeping in . . .

- **Corn for ethanol increases food prices**
  - Probably okay on this one (at least in U.S.)
    - CARD: 30% higher corn price: 1.1% higher food prices
- **Ethanol production is dirty environmentally**
  - Probably okay on this one (i.e., fairly clean)
- **Livestock producers getting louder**
- **Infrastructure & technical issues**
  - Ethanol/gasoline separation, small refineries
  - Cars can use 10% (14 bgy); 5% (7bgy) easily
    - <3% cars FFV; Big3 says half in 2012 – but still only 25% of new cars will be FFV since foreign car makers aren’t making that pledge (they sell half the cars)

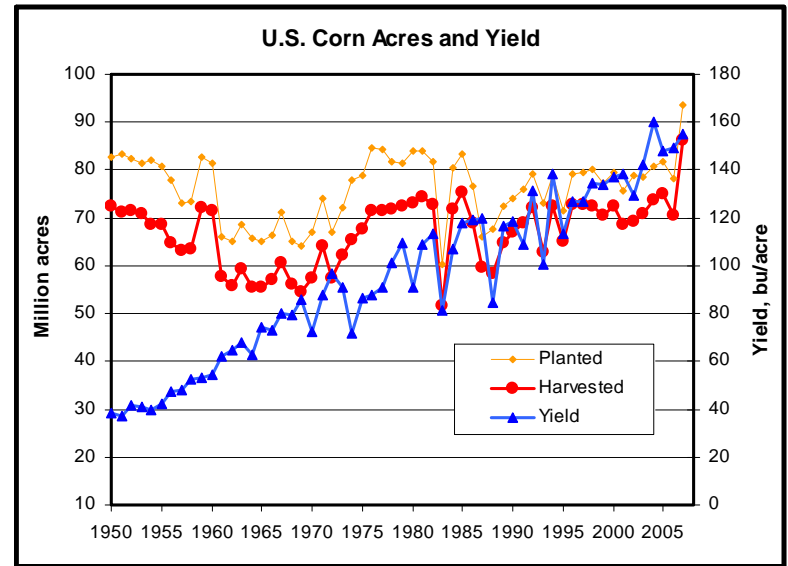
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## Future ethanol production?

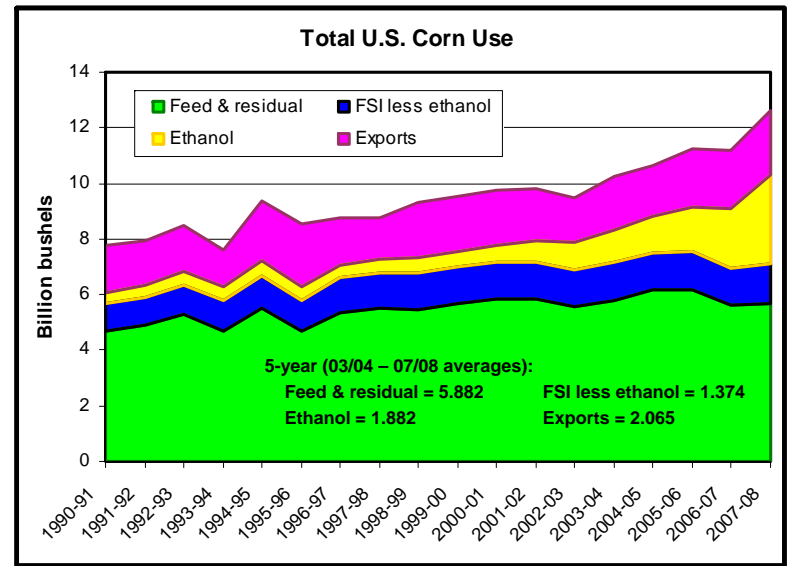
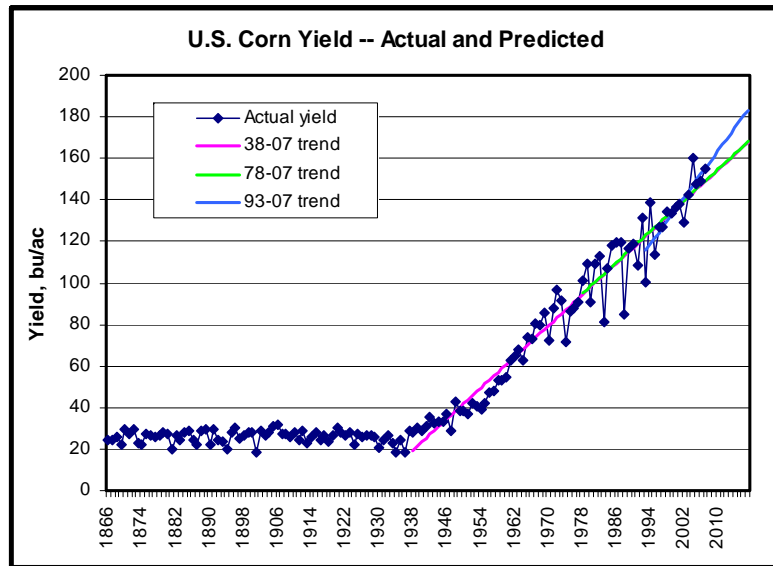
- **Not sure who’s crystal ball to believe**
  - Today’s 7 bgy easy to sustain; Next 7 bgy reasonable over time; beyond ???
  - Hard to predict politics
- **Impact of cellulosic ethanol?**
  - Maintaining SOM will allow only 6.5 bgy from corn stover; alternatives will be slowwww
- **Most predictions in the 11-15 bgy range over the next 3-5 years**
  - Reflects current actual + planned capacity
  - Approximates E-10 nationwide
  - What does this mean for corn acres?

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# Corn acres, yields, etc.



Average annual % change = 0.49% (planted); 0.64% (harvested); 3.37% (yield)  
 Geometric growth rate (50-52 to 05-07) = 0.04% (planted); 0.14% (harvested); 2.49% (yield)

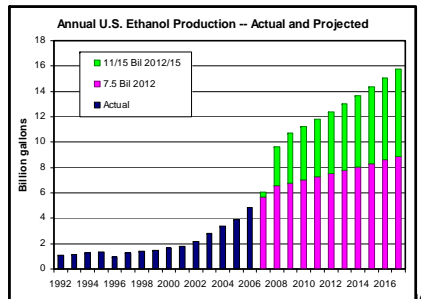
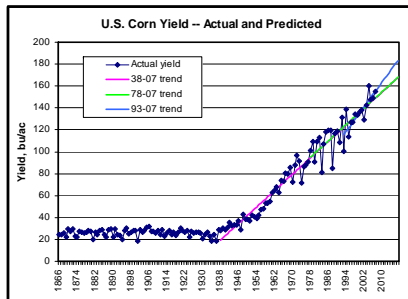


Source: USDA WASDE and KSU, 2006-07 is an estimate and 2007-08 is projection

## Corn acres needed...

### Assumptions:

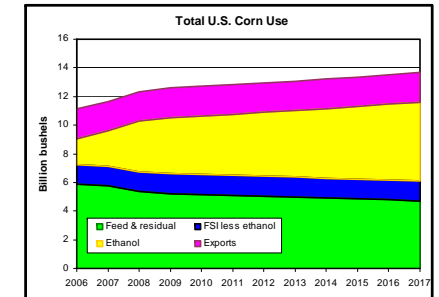
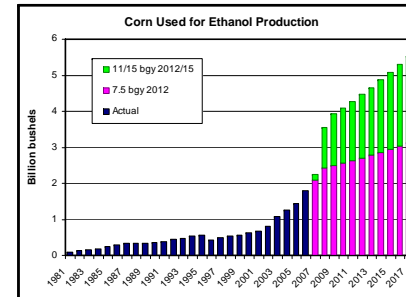
- Trend yield equal to average of 3 different trend lines (157.5 in 2010 173.0 in 2017)
- Ethanol production consistent with green bars (below)
- Exports, FSI less ethanol, and Feed & Residual held constant at 5-year average
- Maximum of 35% of corn bushels displaced with DDGS



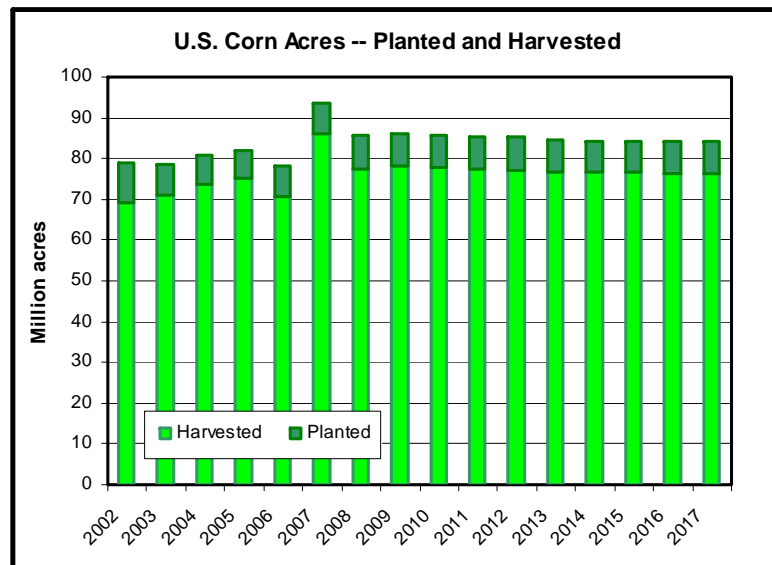
## Corn acres needed...

### Intermediate results:

- Corn used for ethanol based on total ethanol production and conversion rate of 2.7-2.9 gallons per bushel
- Corn used for Feed & Residual falls as more DDGS are fed to livestock
- Total corn use grows from 12.3 billion bushels in 2008 to 13.7 billion bushels in 2017

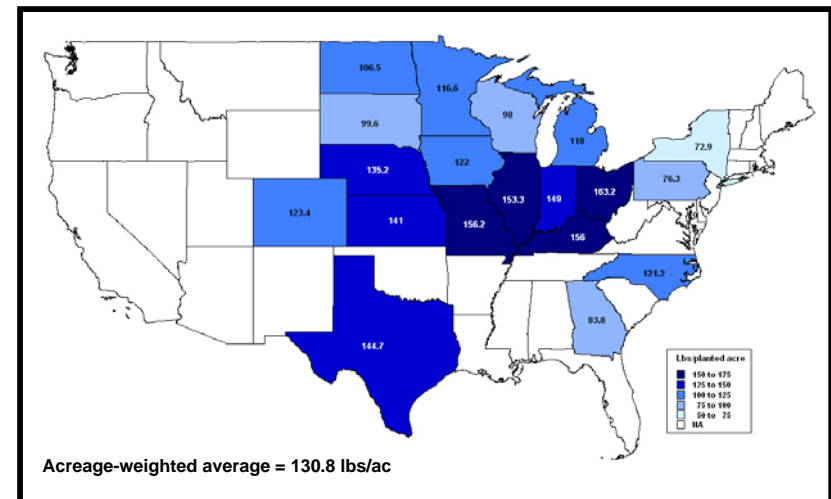


## Yield growth covers increased ethanol needs...



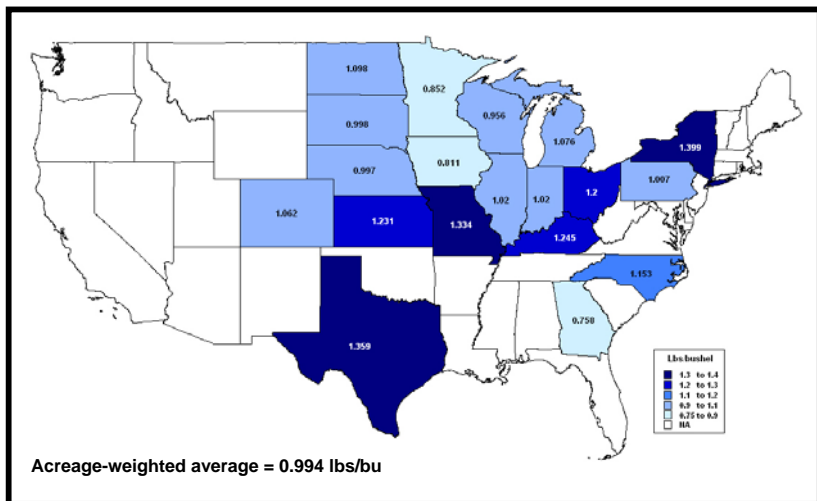
Source: 2002-07 USDA, 2008-2017 KSU projections

## Nitrogen use per planted acre of corn...



Source: USDA Agricultural Chemical Usage – Field Crops Summary (2006, 2004, 2002, 2001)

## Nitrogen use per bushel of corn...



Source: USDA Agricultural Chemical Usage – Field Crops Summary (2006, 2004, 2002, 2001)

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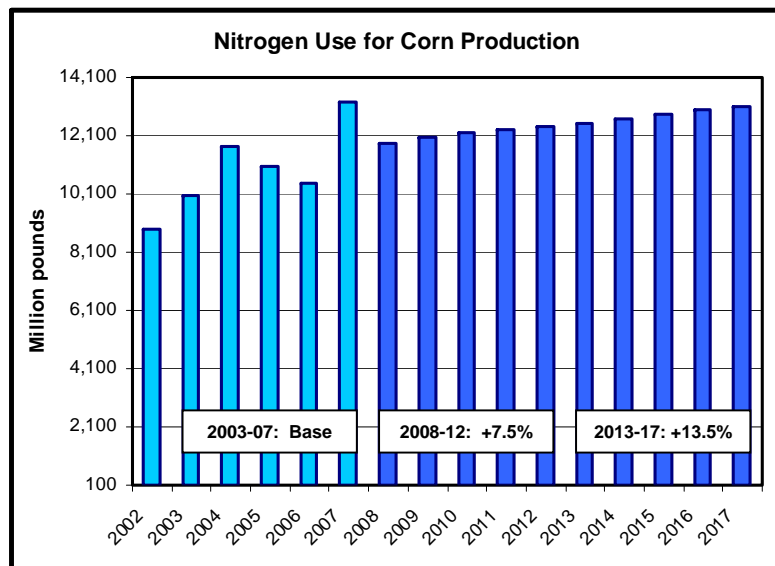
## Estimated nutrient use/demand for corn...

Year of survey	2005	2003	2001	2000	Average
States in survey	19	18	19	18	
<b>Weighted Averages</b>					
<b>Nitrogen</b>					
Lbs/ac	132.3	131.9	127.3	131.6	130.8
Lbs/bu	0.953	1.004	0.992	1.027	<b>0.994</b>
<b>Phosphate</b>					
Lbs/ac	47.0	46.6	44.0	47.0	46.2
Lbs/bu	0.338	0.351	0.341	0.364	<b>0.349</b>
<b>Potash</b>					
Lbs/ac	54.1	53.8	53.6	51.5	53.3
Lbs/bu	0.390	0.401	0.412	0.392	<b>0.399</b>

Source: USDA Agricultural Chemical Usage – Field Crops Summary (various years) and KSU

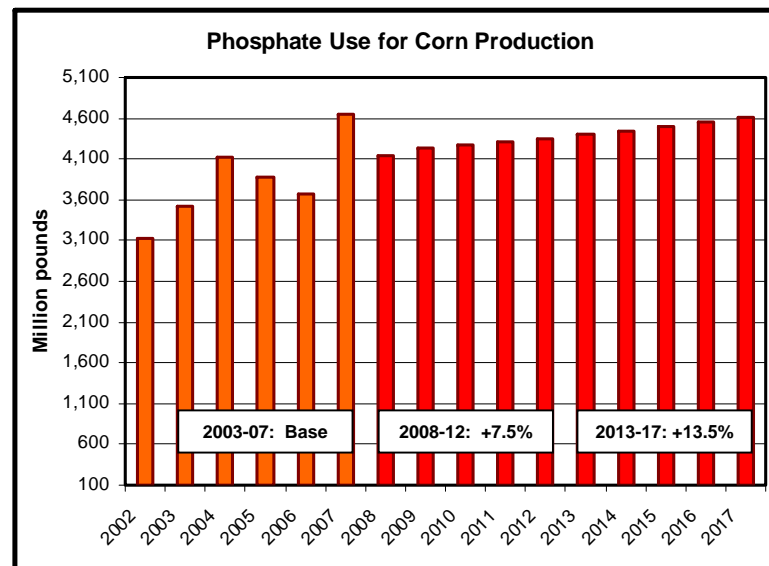
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## Nitrogen demand for corn...



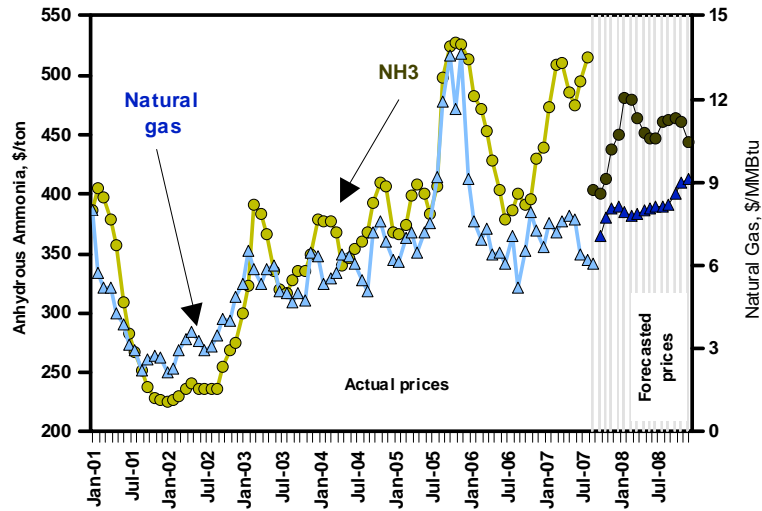
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## Phosphate demand for corn...



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Monthly anhydrous ammonia prices, Corn Belt basis.



Currently, prices of NH3 are not tied very close to cost of production (i.e., natural gas prices) . . . It's a demand driven market!

### NYSE's best in 2007

Updated 3d 12h ago | Comment | Recommend 1

The best-performing stocks on the New York Stock Exchange for the (more charts):

Company 2007 close % gain

Mosaic	\$94.34	341.7%
CF Industries Holdings	\$110.06	329.3%
Terra Industries	\$47.76	298.7%
Mechel OAO	\$97.14	281.2%
China Southern Airlines	\$65.45	220.1%
PotashCorp	\$143.96	201.0%
Siderurgica Nacional	\$89.57	198.8%
Trina Solar	\$53.80	184.7%
Excel Maritime Carriers	\$40.19	175.1%
AK Steel Holding	\$46.24	173.6%
Owens Illinois	\$49.50	168.3%
Bally Technologies	\$49.72	166.2%
Vimpel-Communications	\$41.60	163.5%
Chipotle Mexican Grill	\$147.07	158.0%
GraffTech International	\$17.75	156.5%
Calgon Carbon	\$15.89	156.3%
Suntech Power Holdings	\$82.32	142.1%
CNH Global	\$65.82	141.1%
New Oriental Edu&Tchnlgy	\$80.59	140.3%
National Oilwell Varco	\$73.46	140.1%
Yanzhou Coal Mining	\$97.06	139.4%
Jacobs Engineering	\$95.61	134.5%
Aegean Marine Petrol Netwtk	\$38.39	134.1%
McDermott International	\$59.03	132.1%
Agrium	\$72.21	129.3%
Alpha Natural Resources	\$32.48	128.3%

Great year to be in the fertilizer business

Won't fertilizer demand drop with the high fertilizer prices expected for 2008?

### Nitrogen Recommendations for Wheat

Yield goal, bu/ac	40	50	60	70	80
KSU N rec, lbs/ac	46	70	94	118	142

N price	Price adjusted N rec, lbs/ac				
\$0.20	46	71	95	119	143
\$0.30	42	65	88	111	134
\$0.40	38	60	82	104	126
\$0.50	33	54	75	96	117
\$0.60	29	49	69	89	108

N price	Price adjusted N rec reduction				
\$0.20	-0.9%	-0.8%	-0.7%	-0.6%	-0.6%
\$0.30	8.4%	6.9%	6.2%	5.8%	5.5%
\$0.40	17.8%	14.6%	13.1%	12.1%	11.5%
\$0.50	27.2%	22.3%	19.9%	18.5%	17.6%
\$0.60	36.5%	30.0%	26.8%	24.9%	23.7%

SOM= 2.0; STN= 30; Wheat price= \$3.20

Yes, demand would fall if wheat price were \$3.20.

**Nitrogen Recommendations for Wheat**

Yield goal, bu/ac	40	50	60	70	80
KSU N rec, lbs/ac	46	70	94	118	142

N price	Price adjusted N rec, lbs/ac				
\$0.20	51	76	102	127	152
\$0.30	49	74	99	123	148
\$0.40	47	71	96	120	144
\$0.50	45	69	93	117	140
\$0.60	43	67	90	113	136

N price	Price adjusted N rec reduction				
\$0.20	-11.1%	-9.1%	-8.2%	-7.6%	-7.2%
\$0.30	-6.8%	-5.6%	-5.0%	-4.7%	-4.4%
\$0.40	-2.5%	-2.1%	-1.9%	-1.7%	-1.6%
\$0.50	1.7%	1.4%	1.3%	1.2%	1.1%
\$0.60	6.0%	4.9%	4.4%	4.1%	3.9%

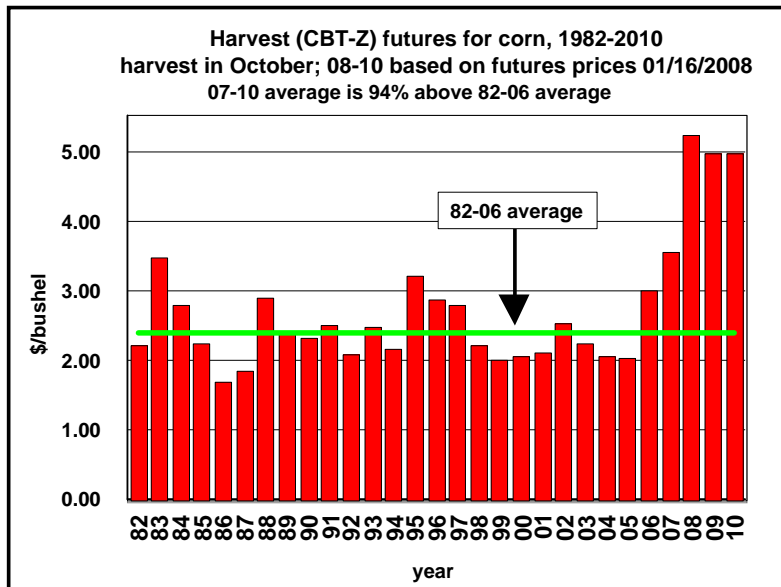
SOM= 2.0; STN= 30; Wheat price= \$7.00

But, not at \$7.00 wheat!

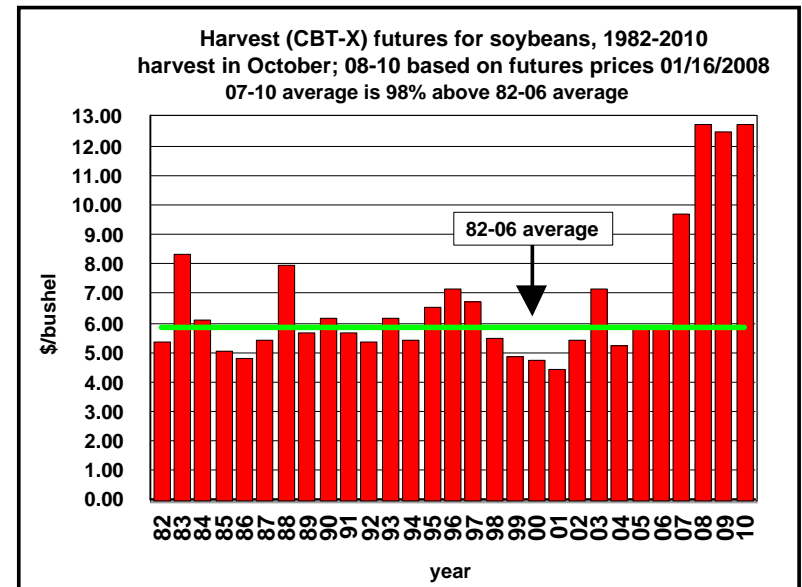
Can the ethanol industry continue to pay high commodity prices?

Put another way, how long will high prices last?

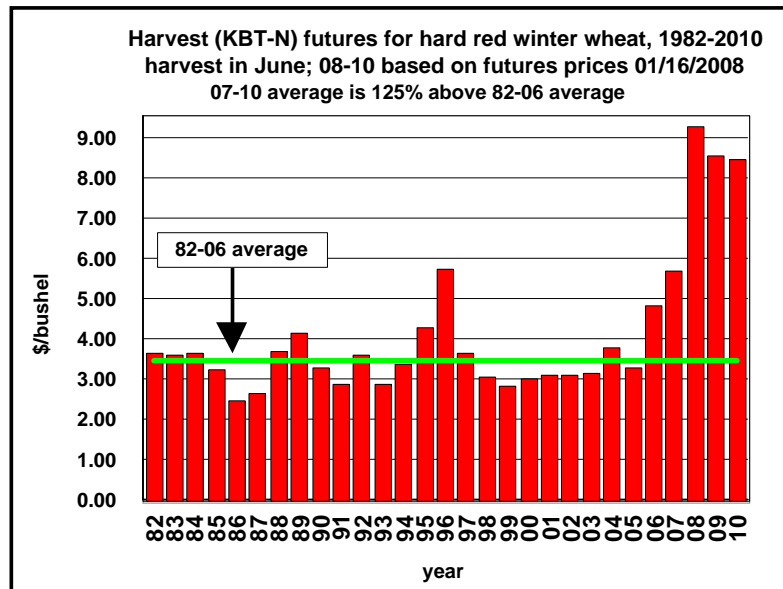
How long will strong prices stick around?



How long will strong prices stick around?



How long will strong prices stick around?



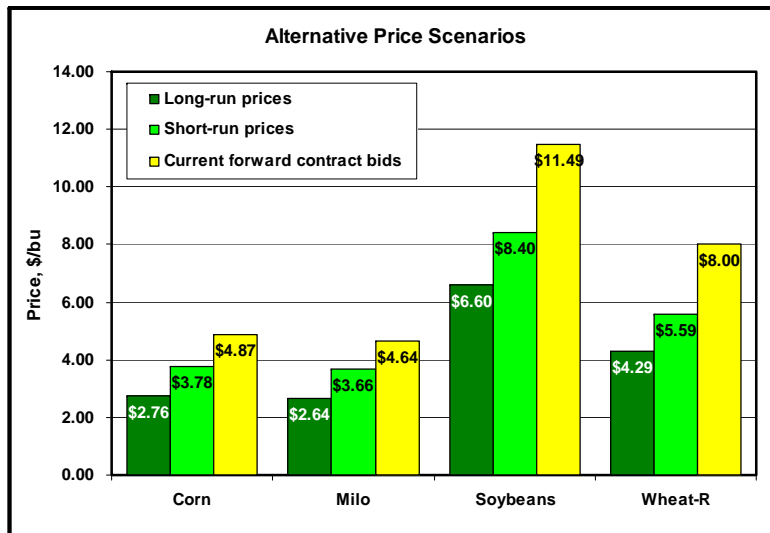
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KSU study of impact of high commodity prices on rental rates

Two approaches:  
Crop budgets & KSU-Lease  
Historical relationships

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Alternative Prices to Consider for Central Kansas

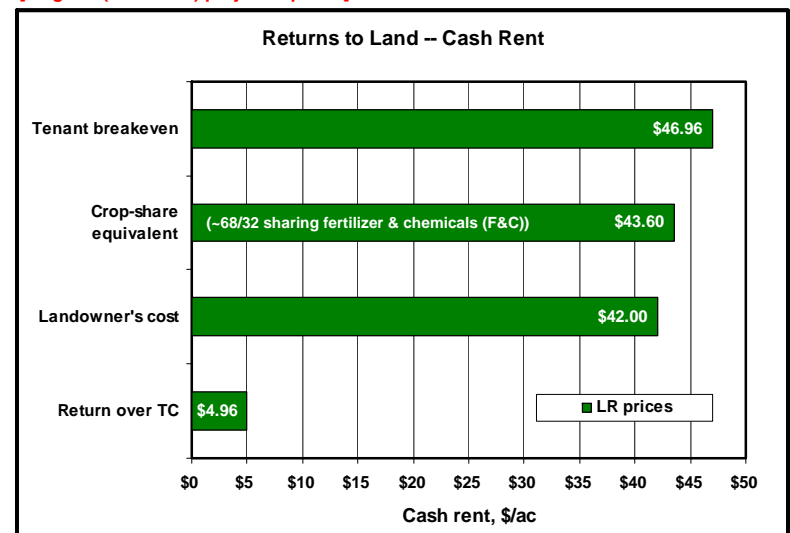


Long-run (08-12) and short-run (08) from MF-1013, current bids from McPherson (1/11/08)

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Estimated cash rents for Central Kansas

[long run (2008-2012) projected prices]

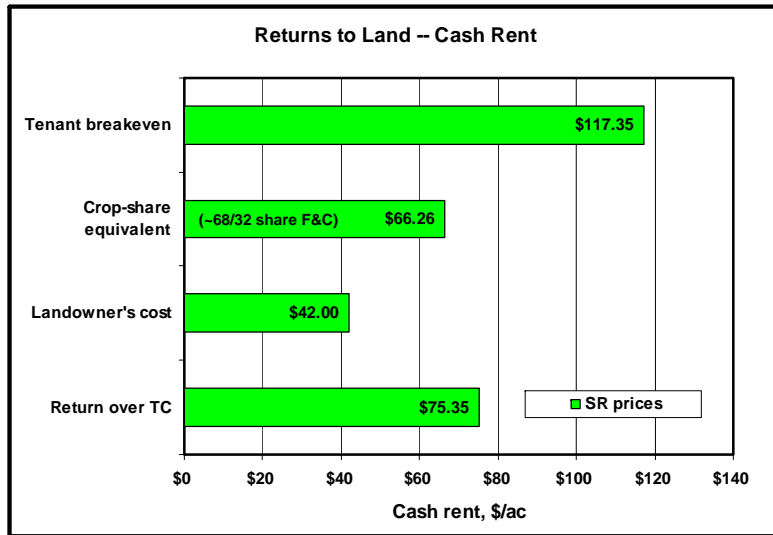


Based on KSU Farm Management Guides (October 2007) and KSU-Lease.xls (available at [www.agmanager.info](http://www.agmanager.info))

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### Estimated cash rents for Central Kansas

[short-run (2008) projected prices]

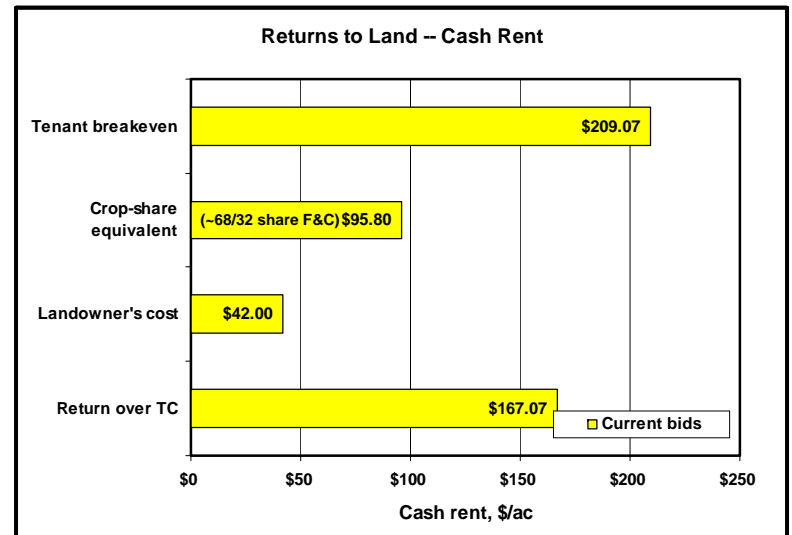


Based on KSU Farm Management Guides (October 2007) and KSU-Lease.xls (available at [www.agmanager.info](http://www.agmanager.info))

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### Estimated cash rents for Central Kansas

[forward contract bids (1/5/08) for 2008 harvest delivery]

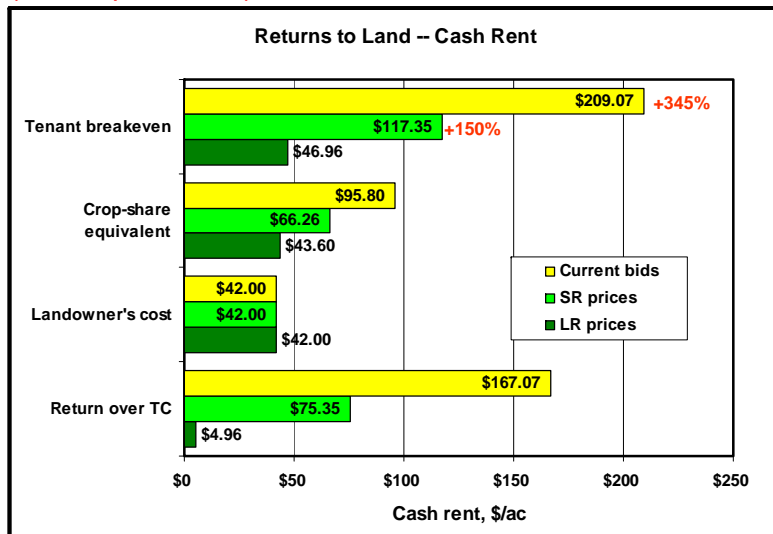


Based on KSU Farm Management Guides (October 2007) and KSU-Lease.xls (available at [www.agmanager.info](http://www.agmanager.info))

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### Estimated cash rents for Central Kansas

(alternative price scenarios)



Based on KSU Farm Management Guides (October 2007) and KSU-Lease.xls (available at [www.agmanager.info](http://www.agmanager.info))

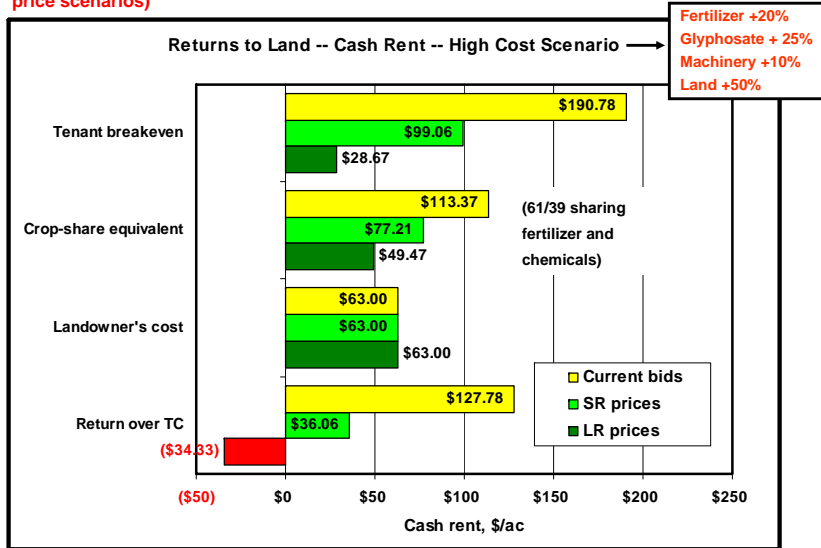
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### Really high rent potential . . .

- Previous example suggested that price increases of 35% to 80% could mean a rent increase of 150% to 345% (elasticity of 4.3)
- Will this happen?
- No!
  - Farmers bid up production inputs as they try to increase acres or yield/a to get the high profits:
    - Fertilizer, chemicals, machinery, labor

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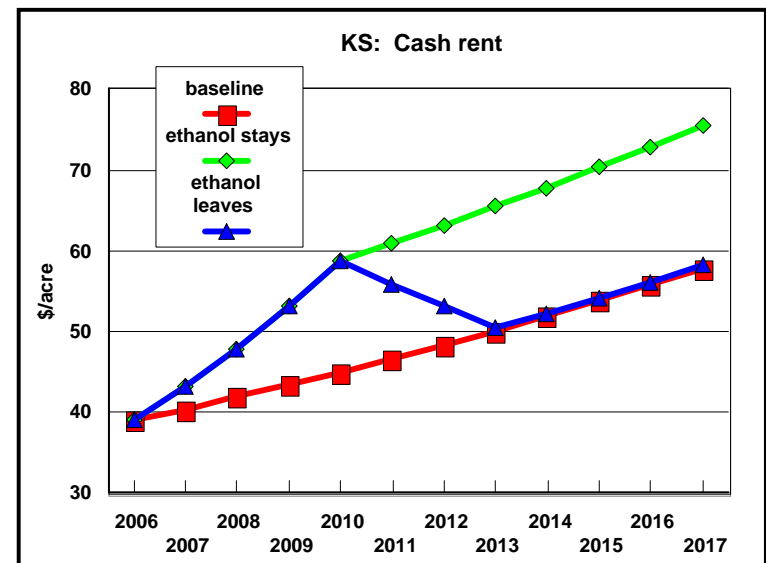
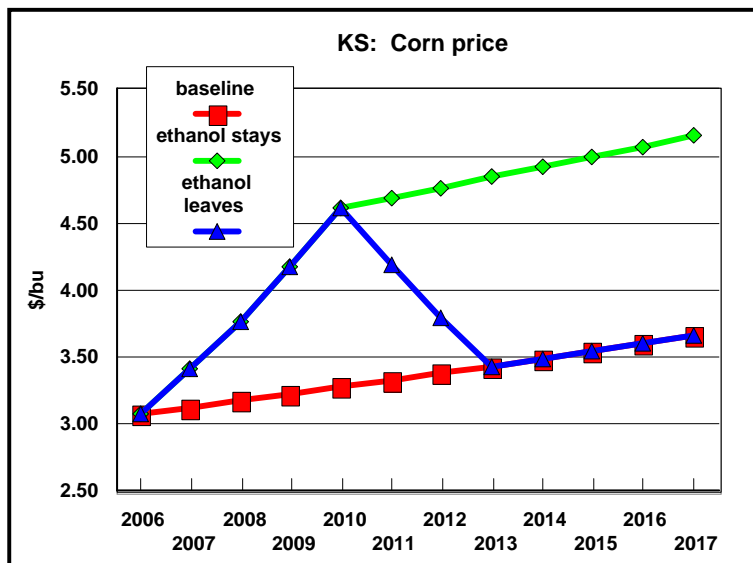
**Estimated cash rents for Central Kansas (alternative price scenarios)**

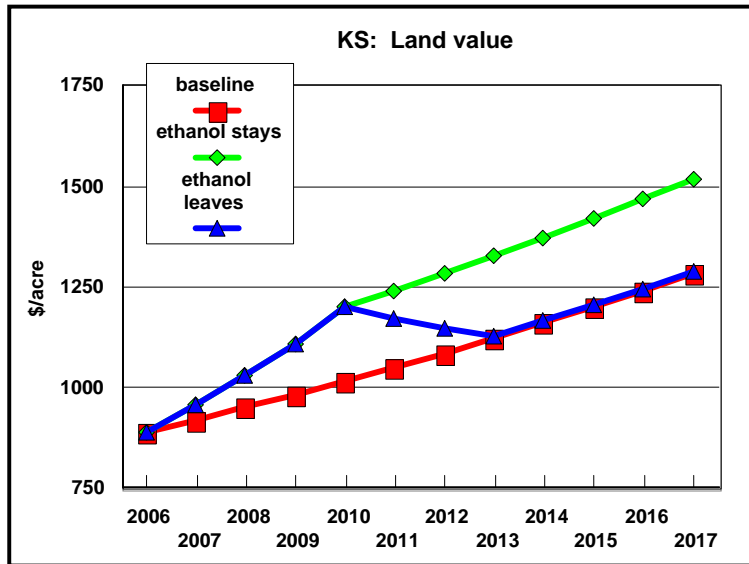


Based on KSU Farm Management Guides (October 2007) and KSU-Lease.xls (available at [www.agmanager.info](http://www.agmanager.info))

**A KSU study of three scenarios**

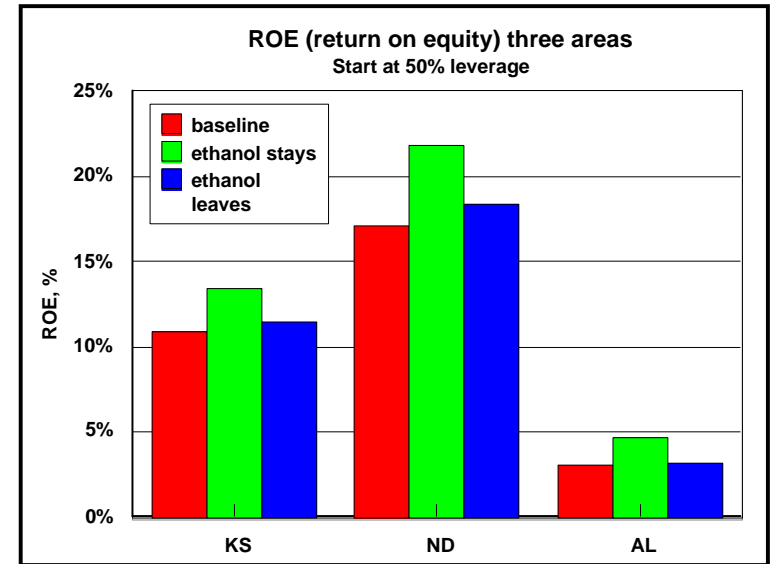
- **Scenario 1 – baseline (no ethanol)**
  - Historical average growth rates of corn yield and price drive rents, which drive land values
- **Scenario 2 – ethanol comes and stays**
  - Corn price grows rapidly to new plateau by 2010, then follows normal growth thereafter
- **Scenario 3 – ethanol comes and leaves**
  - Corn price grows rapidly to new plateau by 2010, then falls back to growth path that would have occurred without ethanol





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Ethanol will be good to states like ND, which is dominated by ag



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## Summary...

- Ethanol production likely to stabilize around 12-15 bgy over next several years (limited "new" expansion)
- Corn acres to support ethanol production
  - Increase from historical levels
  - With trend yields can be less than 2007
- Fertilizer
  - Use on corn will increase 7.5% in 2008-12 and 13.5% in 2013-17 compared to 2003-07
  - Strong demand will support high fertilizer prices
- Futures prices suggest commodity prices will remain at historically high levels for next several years (more of a world S&D issue than domestic one)
  - Rents and land values are going up!

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**AG MANAGER.INFO**  
Department of Agricultural Economics

A Website Providing Information and Tools For The Competitive Business

[www.agmanager.info](http://www.agmanager.info)

**Questions?**

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tkastens@ksu.edu

**Site Updates**

- Livestock Outlook Radio Program**  
October 22, 2007 by Jim Mintert/LMC
- Livestock and Hay Charts**  
October 19, 2007 by Jim Mintert
- Grain Outlook Radio Program**  
October 18, 2007 by Mike Woolverton
- Kansas Grain Price Differentials**  
October 18, 2007 by Daniel O'Brien
- Crop Basis Maps**  
October 18, 2007 by Kevin Dhuyvetter
- Updated Crop Basis Tool**  
October 18, 2007 by Kevin Dhuyvetter
- In The Cattle Markets**  
October 17, 2007 by Jim Mintert/LMC
- Current Grain Outlook Newsletter**  
October 15, 2007 by Mike Woolverton
- KSU-Vegetative Buffer Excel Tool**  
October 15, 2007 by Craig Smith and Jeff Williams
- KSU-Streambank Stabilization Excel Tool**  
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- KSU-Tillage Excel Tool**  
October 15, 2007 by Craig Smith, Kevin Dhuyvetter and Jeff Williams

**World Grain Supply and Demand Estimates**  
October 2, 2007 by Kevin Dhuyvetter

**Water Quality Indices and Net Returns for Corn**