

Crude Oil, Biofuels, and Implications for Corn and Soybean Markets

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Grain Prices: Driven by Crude Oil & General Economy

Expect modest strength in corn & beans this winter

Beans will be sensitive to S. American crops

Don't Expect recovery to May-June '08 highs

- U.S. & world economy slowing substantially**
- Crude oil prices 63% below last July**
- Oil still high by historical standards**
- History says slow recovery in oil price likely**
- 2nd largest ethanol producer in bankruptcy**
- 4 or 5 others also in bankruptcy**
- Several new plants delaying start-up**
- Government biofuels mandates to have impact**

Key Developments to Watch for

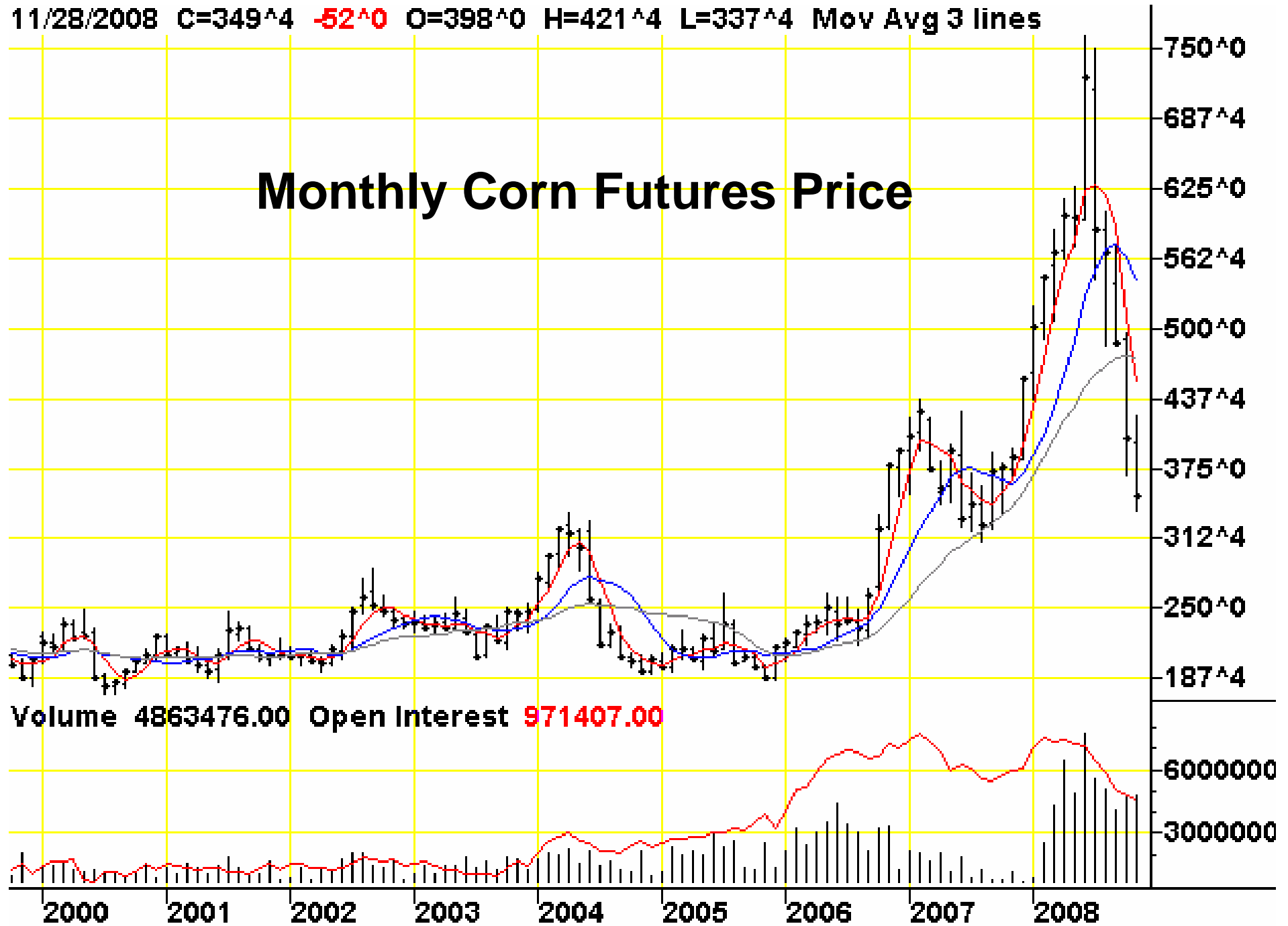
- Crude oil prices & Dow Jones Average**
- USDA January 9 final crop estimates & grain stocks**
- World crop estimates Jan. 9**
- How quickly bankrupt ethanol plants will be transferred to new owners**
- Weekly export sales, especially corn**
- Soybean crushing margins**
http://www.ams.usda.gov/mnreports/gx_gr211.txt
- Private crop planting intentions reports**

Lower grain prices will bring reduced global production

- **First impacts: wheat in spring 2009**
- **Also, South American soybean crop**
- **U.S. corn acreage for 2009?**
- **Ethanol mandates & industry expansion point to need for more corn in 2009 & next few years**
- ***Global Economic Problems: impact on demand?***

11/28/2008 C=349^4 -52^0 O=398^0 H=421^4 L=337^4 Mov Avg 3 lines

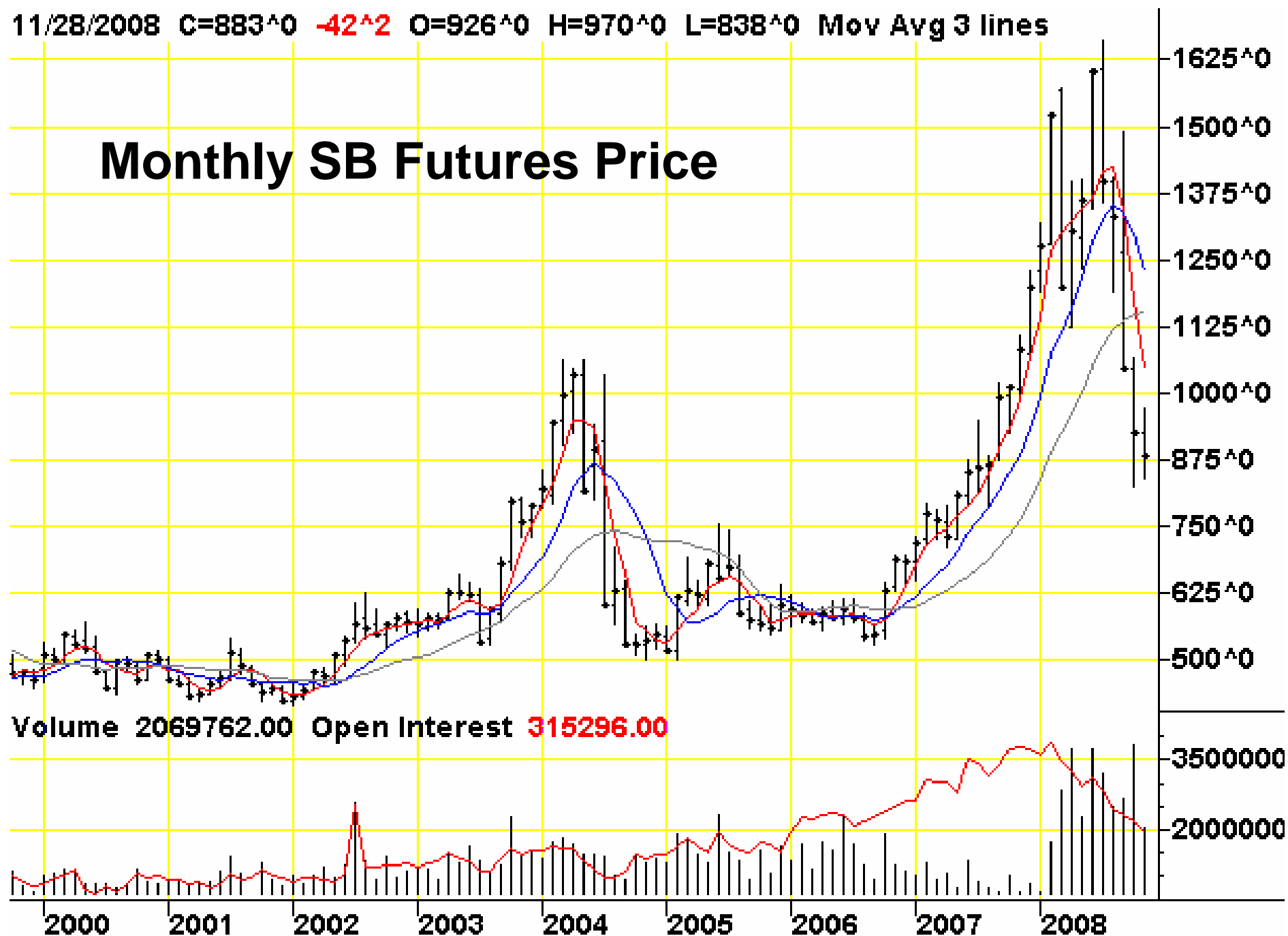
Monthly Corn Futures Price



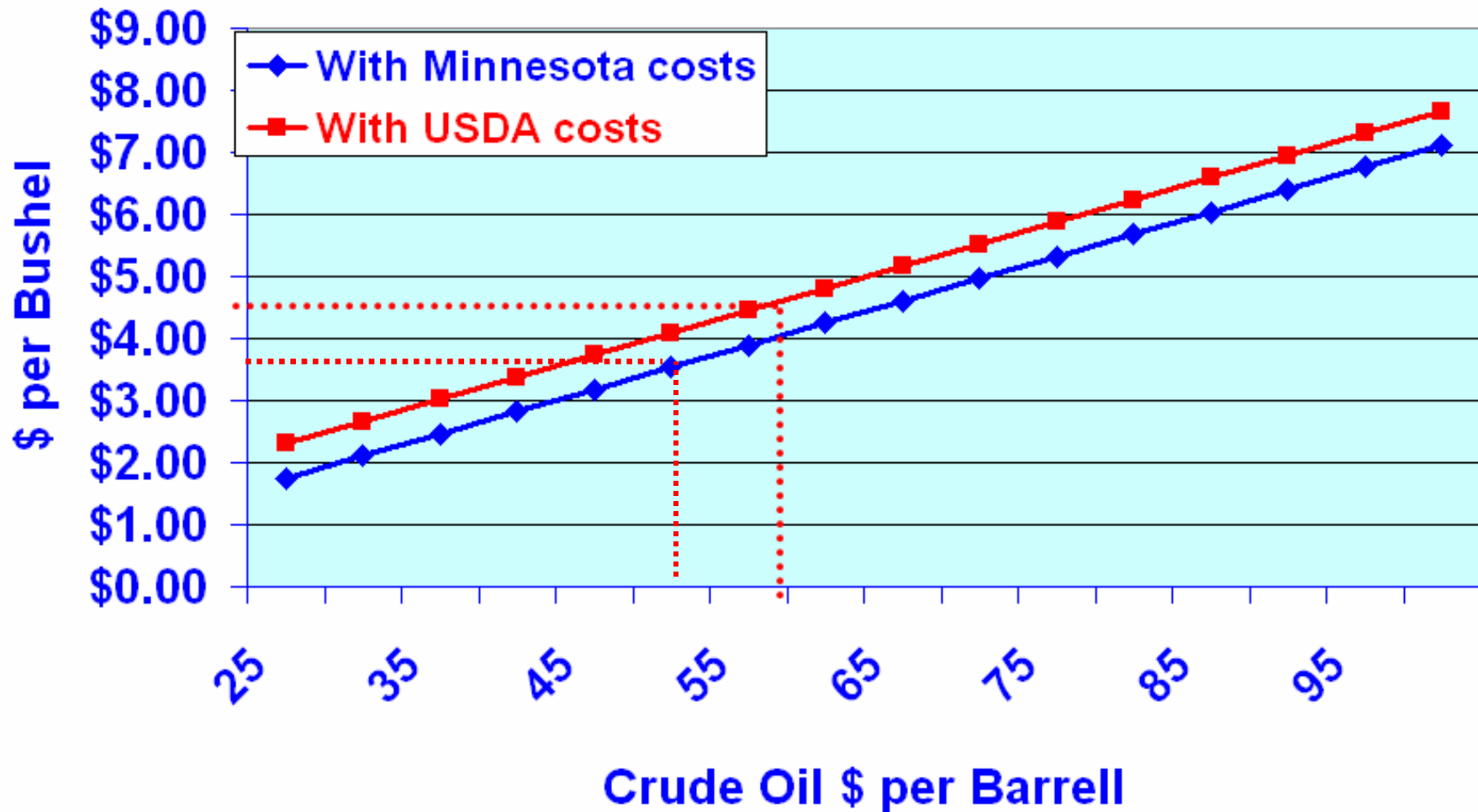
Volume 4863476.00 Open Interest 971407.00

11/28/2008 C=883^0 -42^2 O=926^0 H=970^0 L=838^0 Mov Avg 3 lines

Monthly SB Futures Price



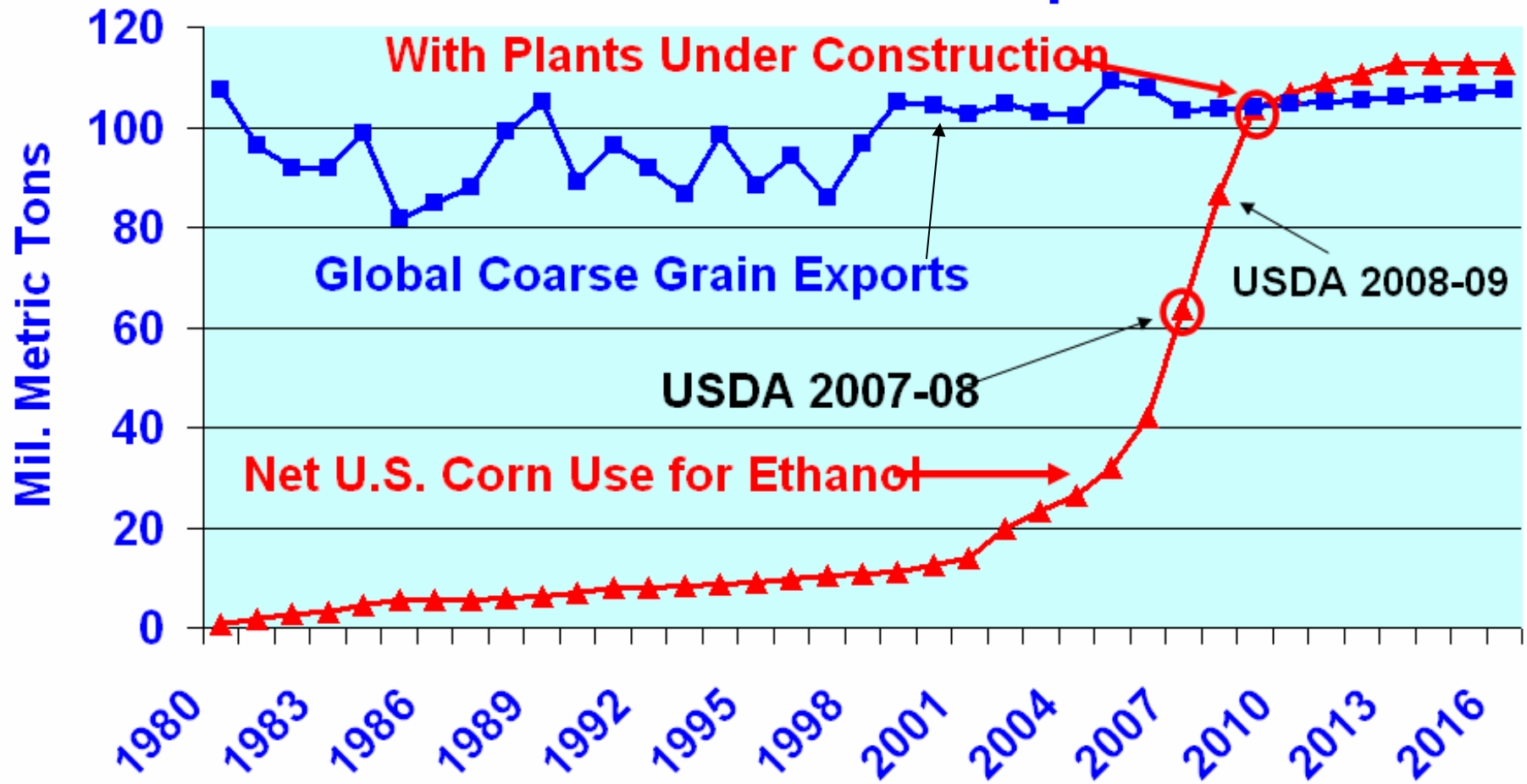
Approximate Maximum Price Ethanol Plants to Pay for Corn with Varying Crude Oil Prices



U.S. 2007 Energy Bill

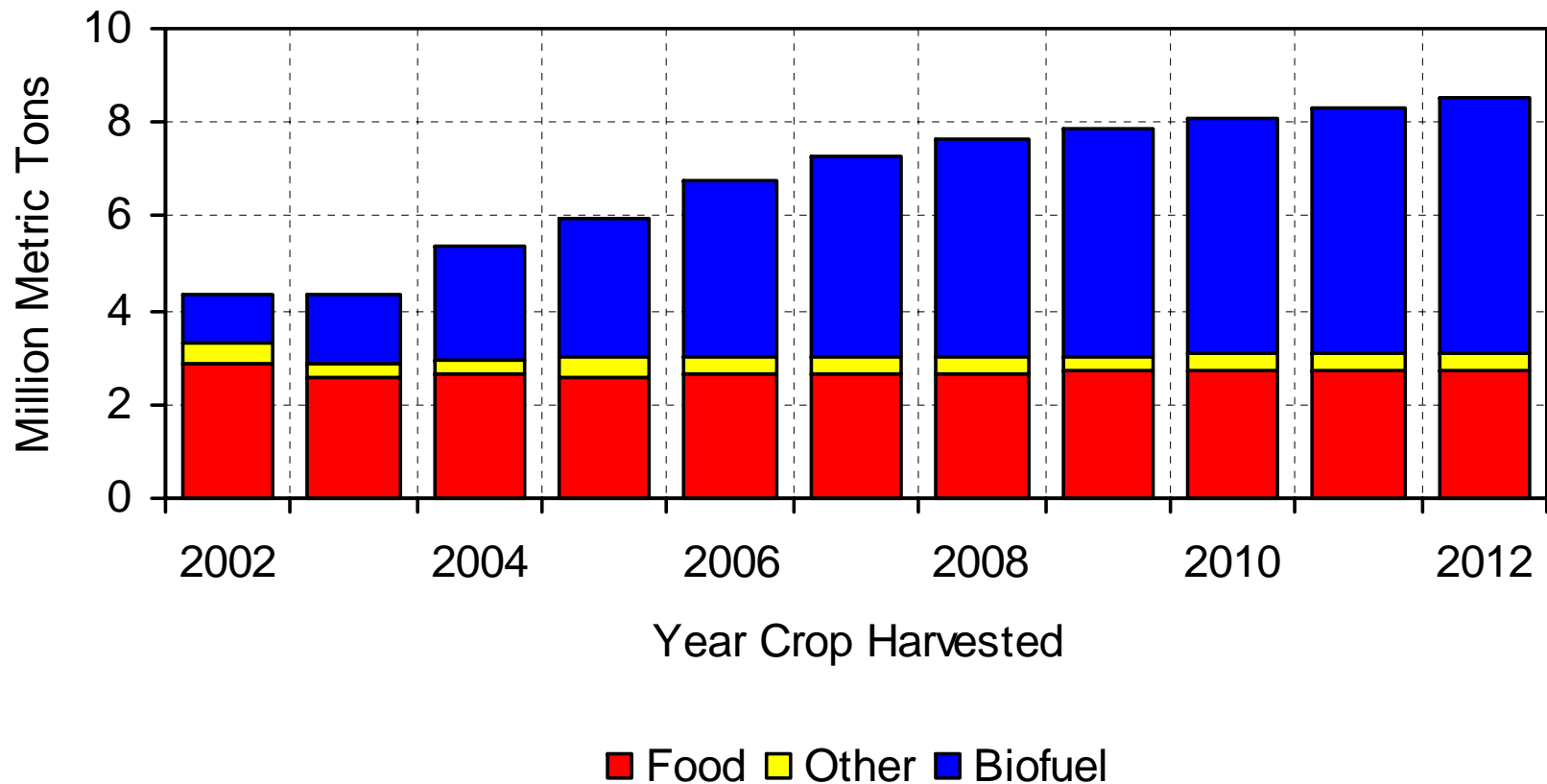
- **U.S. 2007 old RFS: renewable fuels 2007 production mandate @ 4.7 bil. gallons**
- **For 2008: Requires U.S. renewable fuels production at 9 bil. gallons**
- **For 2009: 11.1 bil. gallons**
- **For 2015: 15 bil. gallons corn-based ethanol (57 bil. liters)**
- **For 2009: 500 mil. gallons of biodiesel (900 mil. Gallons for 2015)**
- **Green House Gas Emissions -20%**

Figure 3. Mil. Tons Net U.S. Corn Use (after DDG credits) for Fuel Ethanol & Global Coarse Grain Exports



**(Growth 2007-12 = 147% of U.S. soybean oil exports)
(Food demand for vegetable oil highly inelastic)**

EU Use of Rapeseed Oil

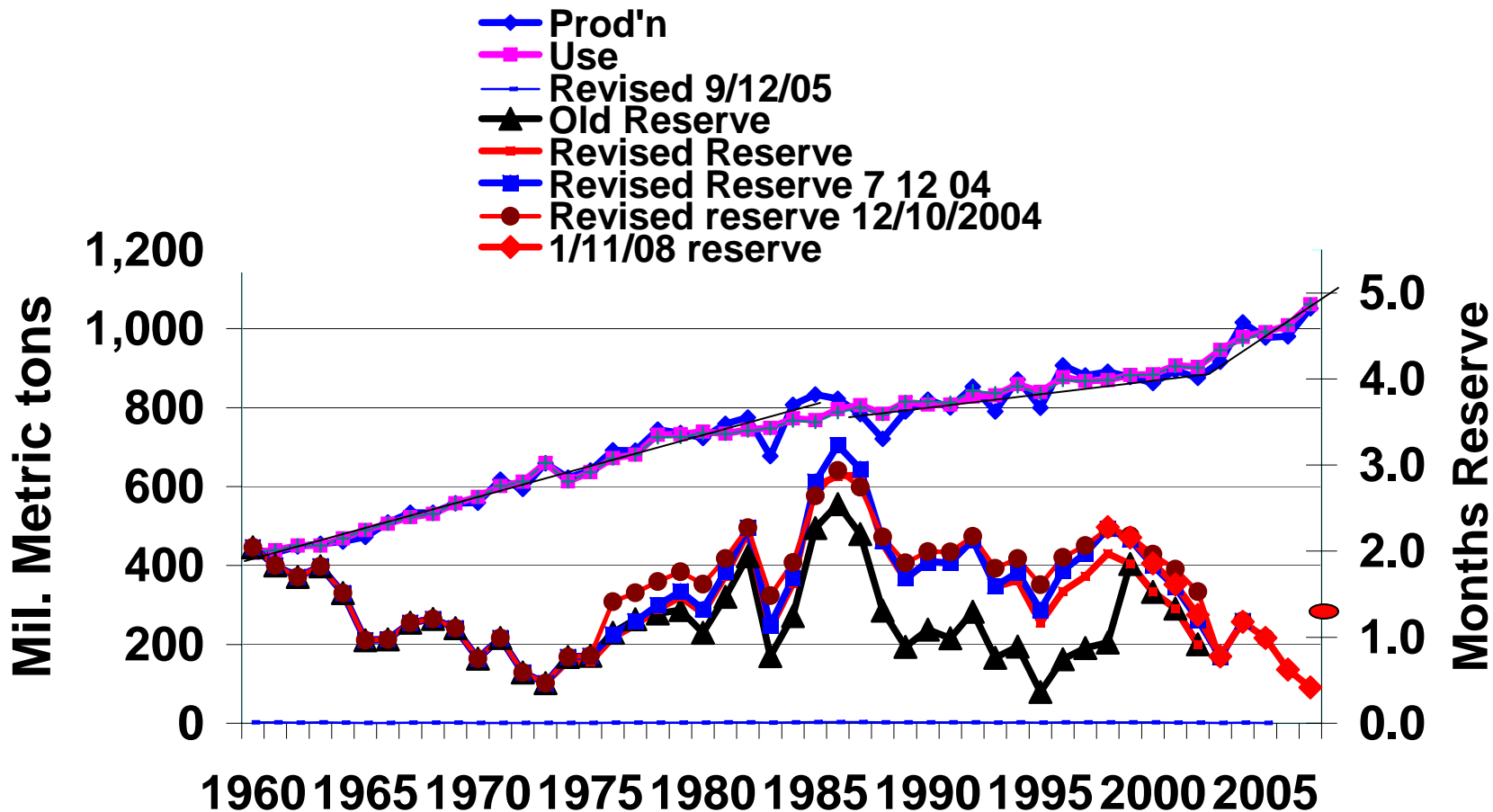


Source: FAPRI estimates

Pulls land away from food uses

World Feed Grain Production, Use & Months of Reserve Supply Beyond Pipeline Needs

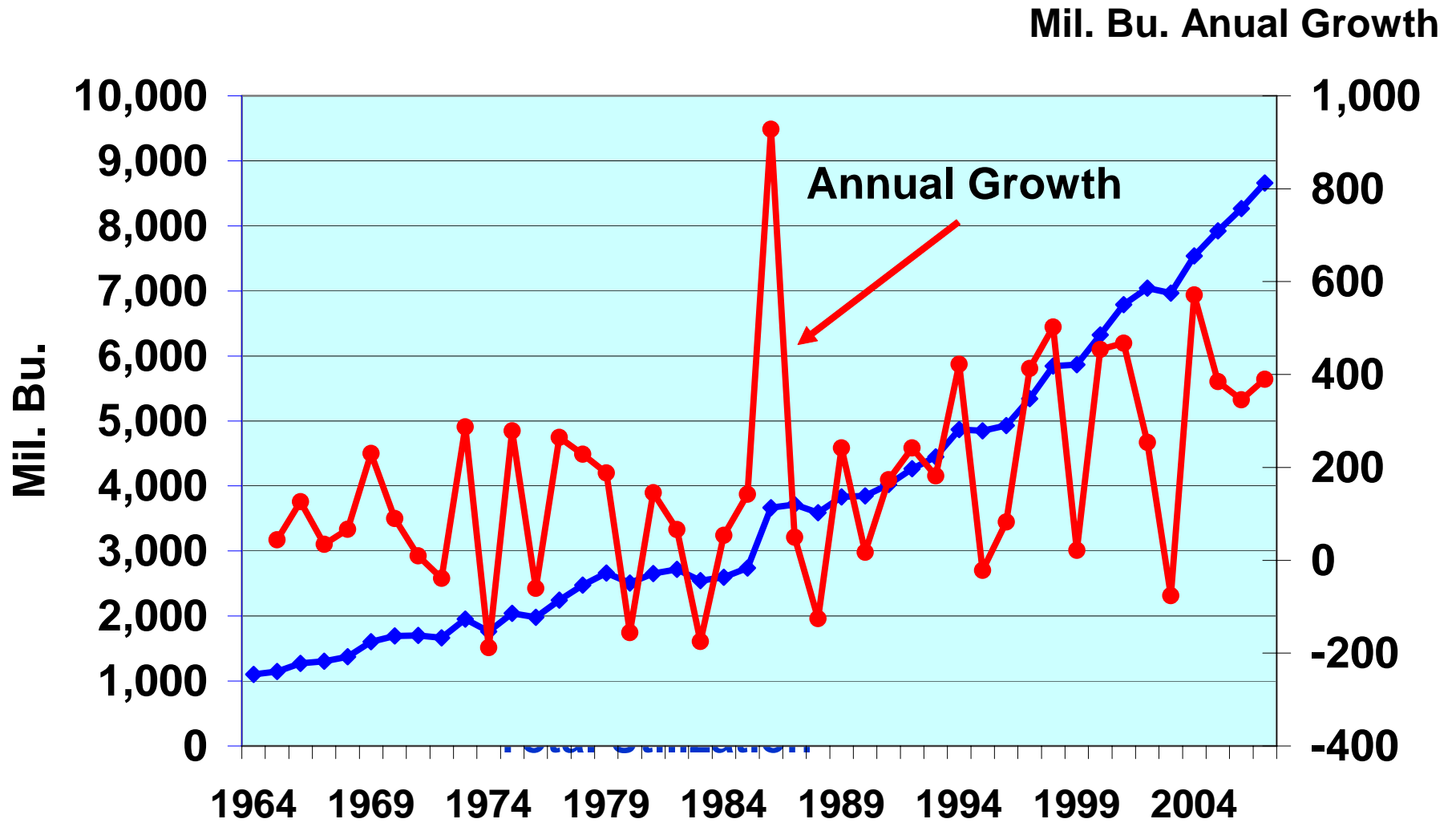
1/11/08



World Stocks are Near-Record Low -- USDA

1/11/08

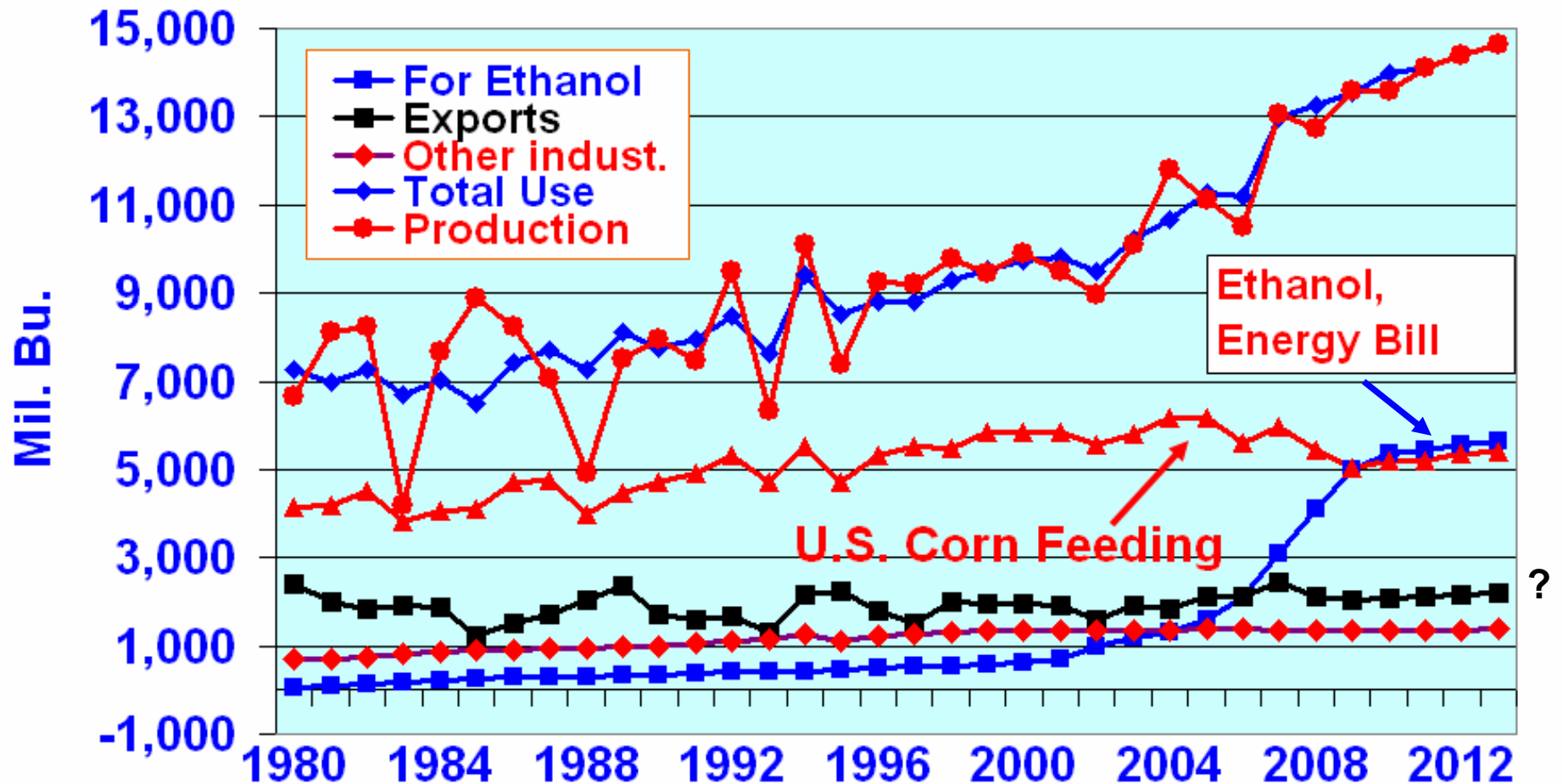
World Soybean Utilization



Key: how will world economy affect feed & exports?

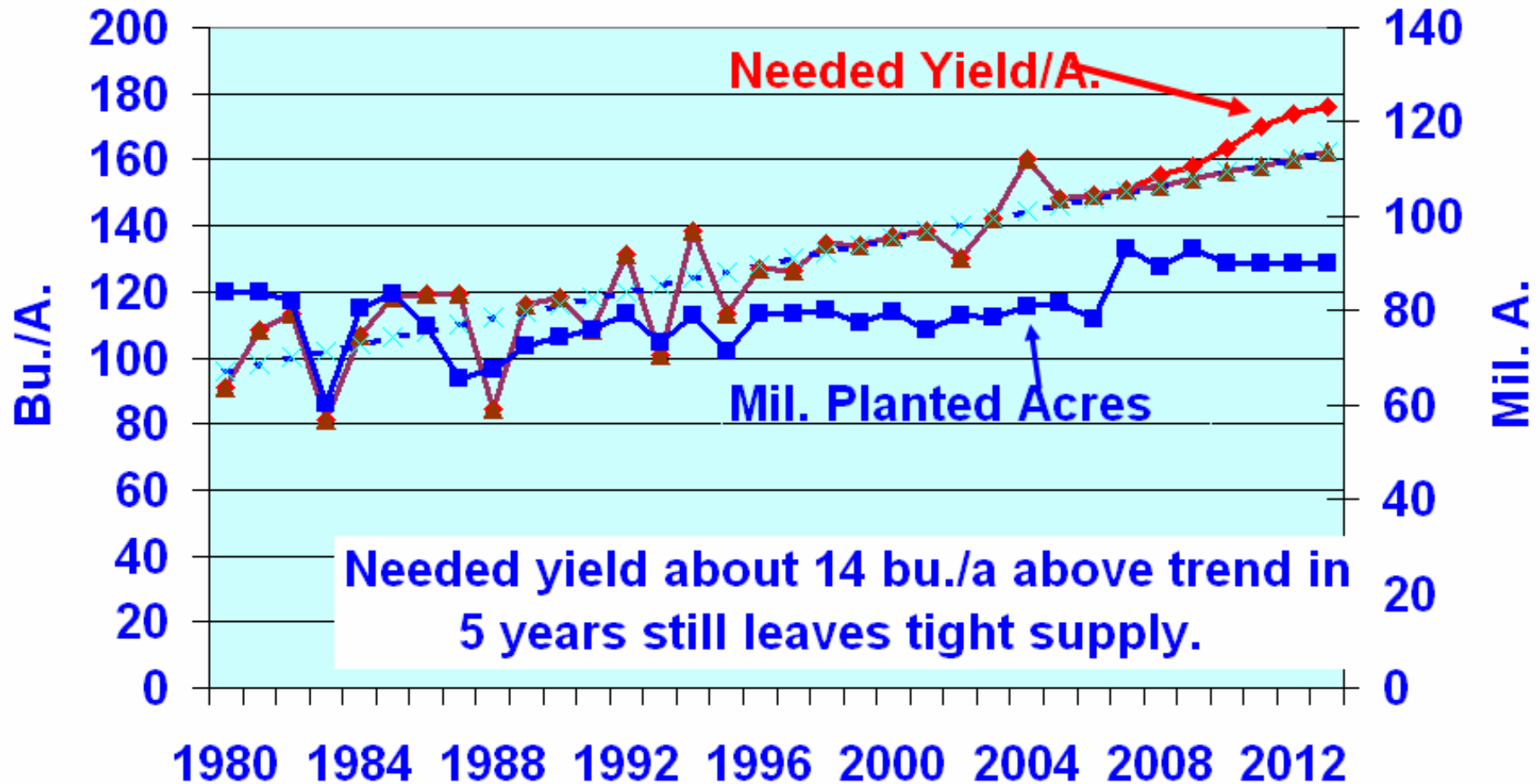
U.S. Corn Production and Use for all Purposes & For Ethanol Projected to 2012

R. Wisner, ISU Econ.



If we are approaching maximum available acres for corn

Needed U.S. Corn Area & Yield to Meet Ethanol & Other Demands vs. Trend Yield



Historical & Needed U.S. Corn Yield Deviation Needed From Trend

2000	0.7
2001	0.0
2002	-10.2
2003	0.0
2004	16.2
2005	1.8
2006	0.9
2007	0.9
2008	3.3
2009	3.8
2010	7.5
2011	11.8
2012	13.4
2013	14.0

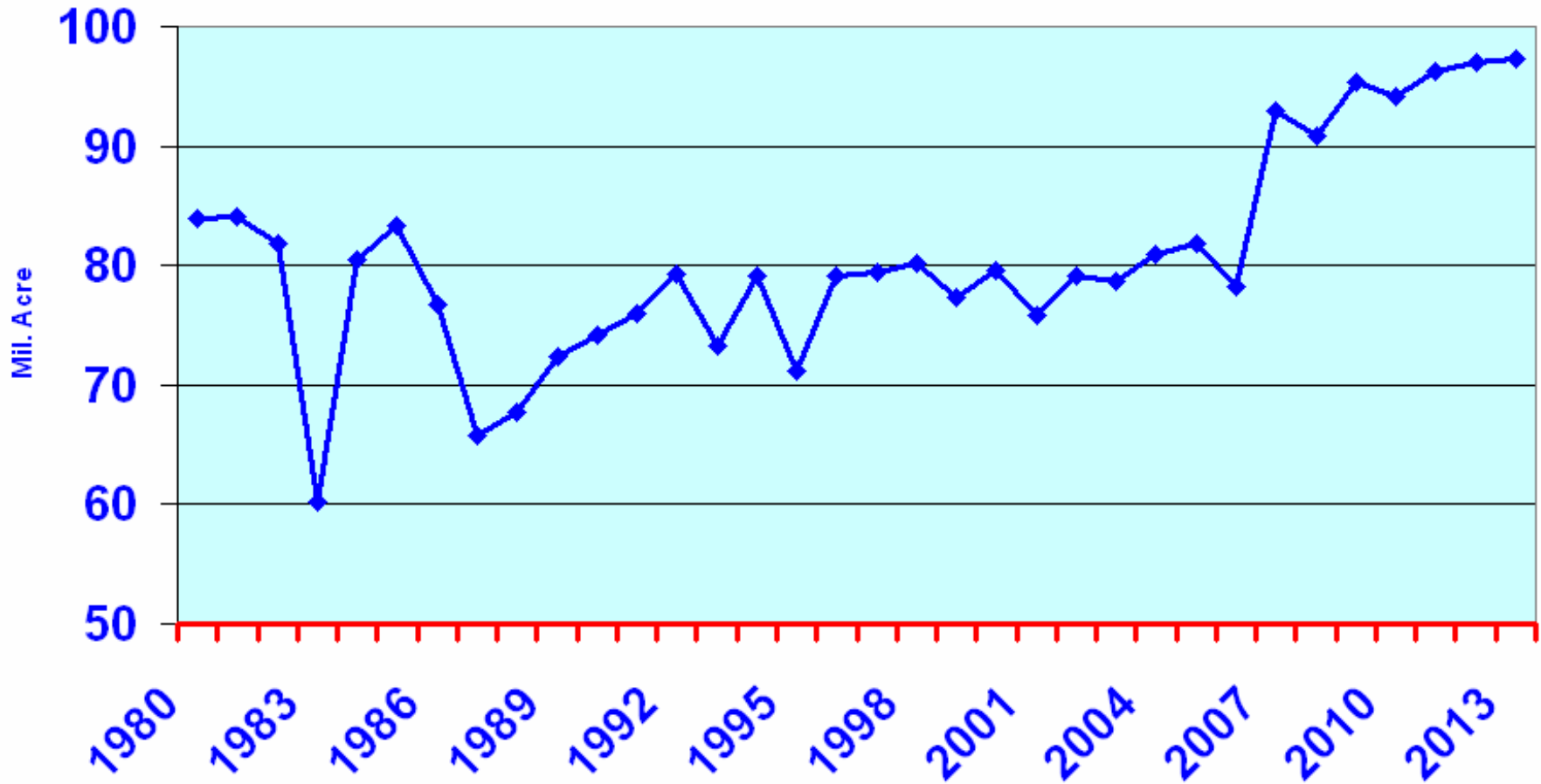
Other Considerations:

- Sharp increase in marginal Corn acres
- Very tight fertilizer supplies
- Corn-on-corn yield drag
- Low C-on-C yields in bad weather

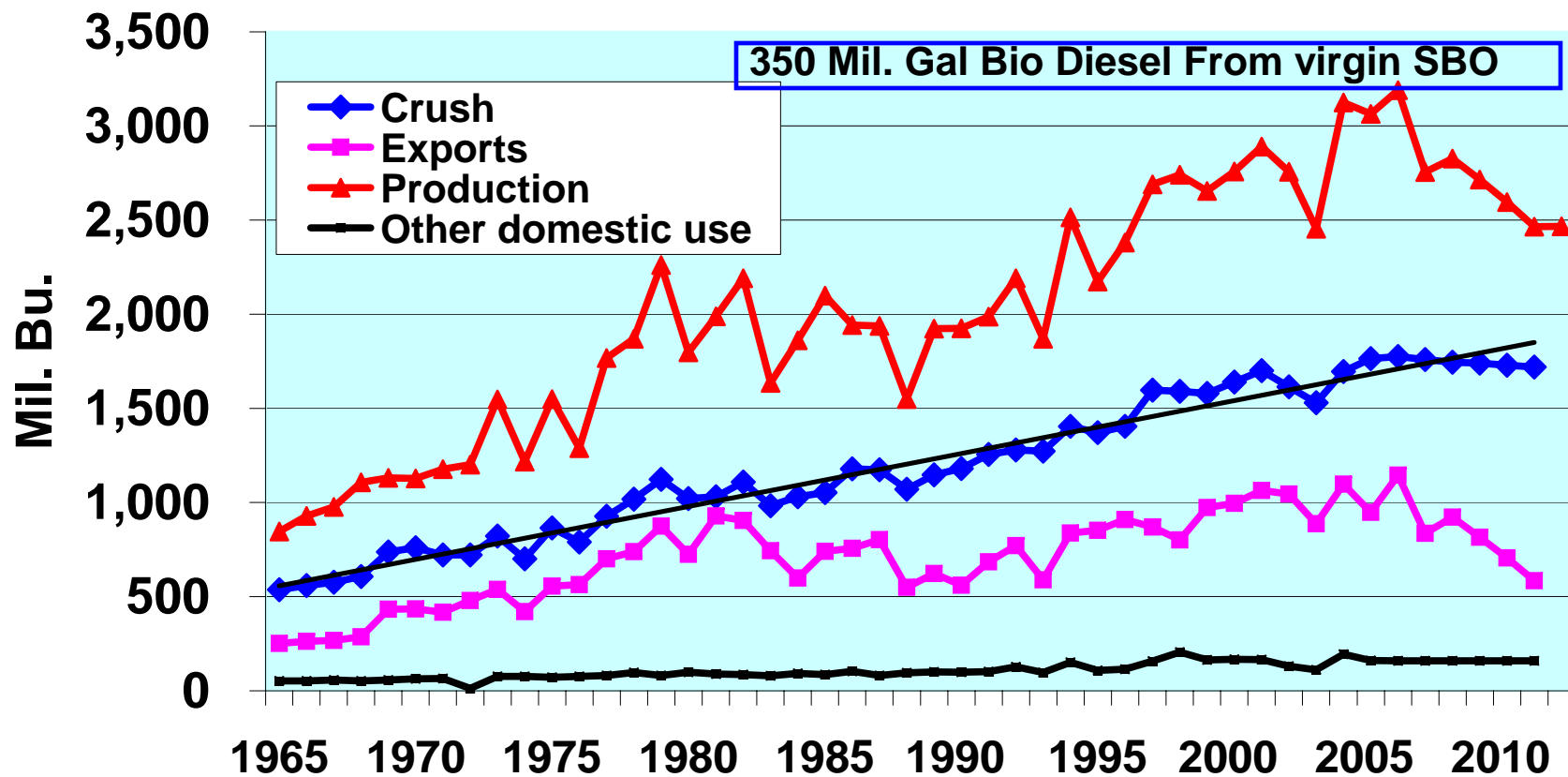
If extra acres are available

U.S. Corn Planted Acres Needed @ Trend Yield to Meet Projected Demand

R. Wisner, ISU



U.S. Soy Production, Use, & Exports to 2012 With 5.5 bil. Bu. Corn for ethanol



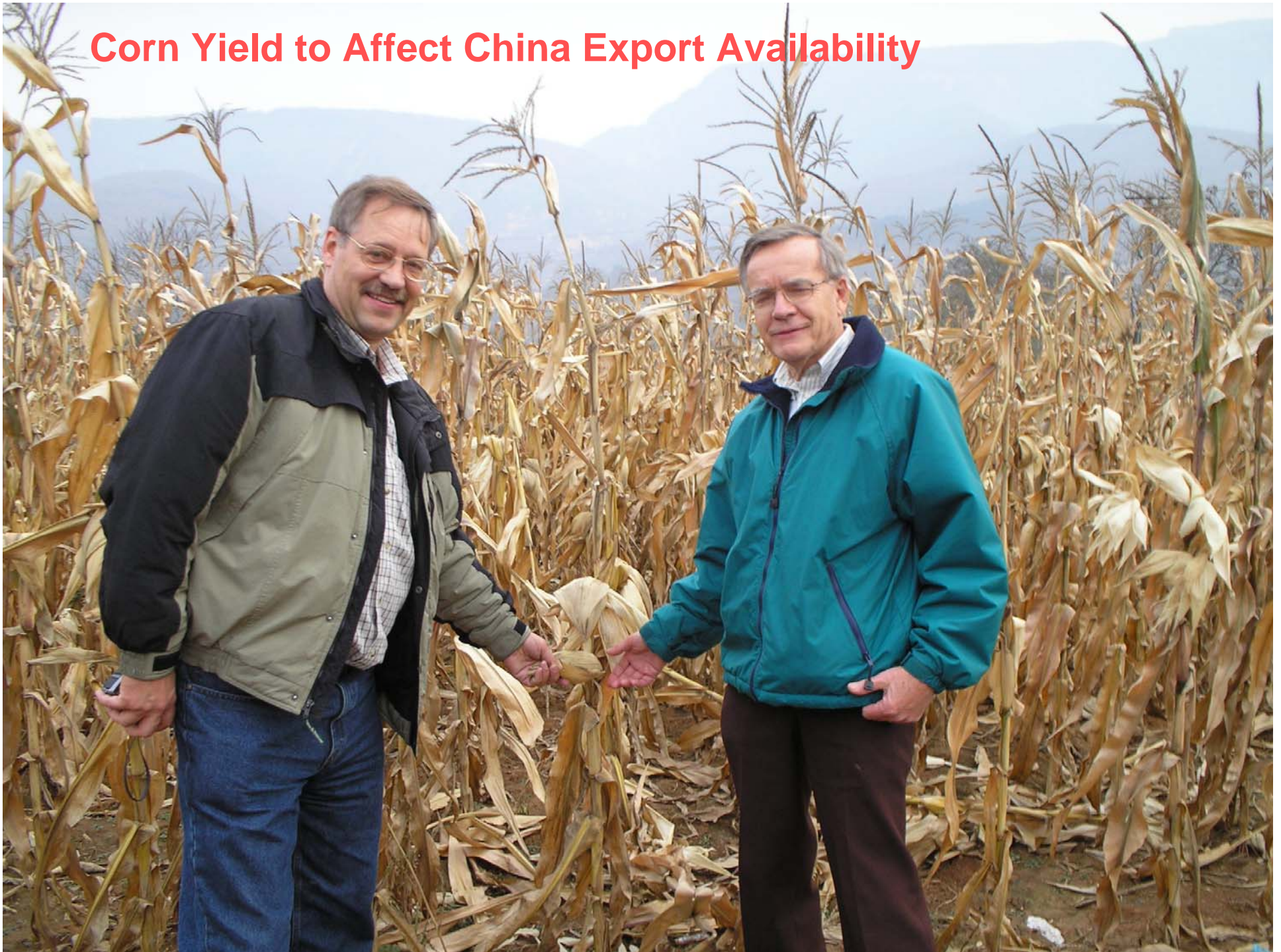
Assumes trend yields. Increased DGS Prod'n in 2012-13 replaces soybean meal from about 440 mil. bu. of soybeans

41 Countries Encourage Biofuels

Ethanol, demand growth & food inflation shifting
China from to corn exporter to importer?



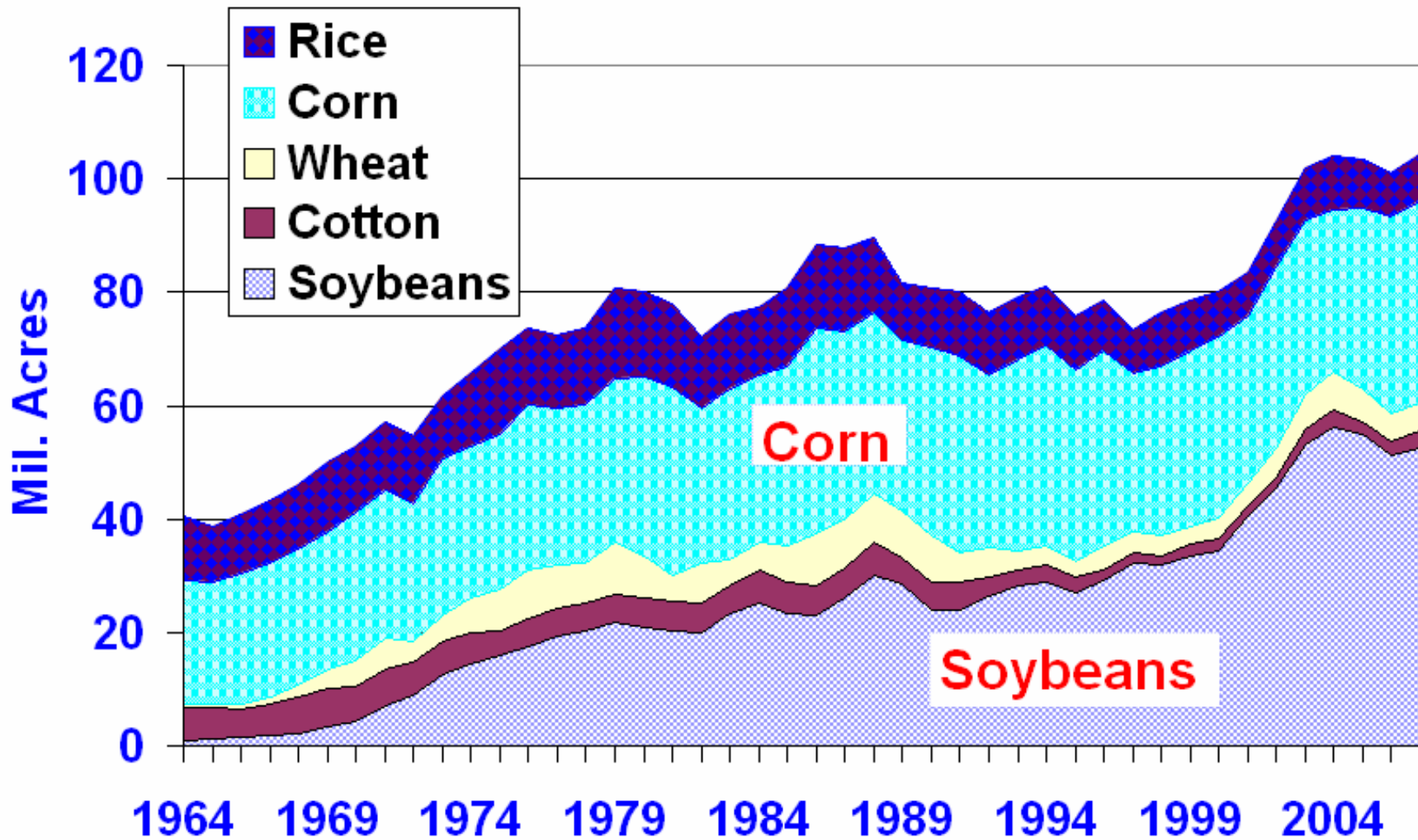
Corn Yield to Affect China Export Availability



3/08

Excluded Crops: Sugar, Coffee, Citrus & Other

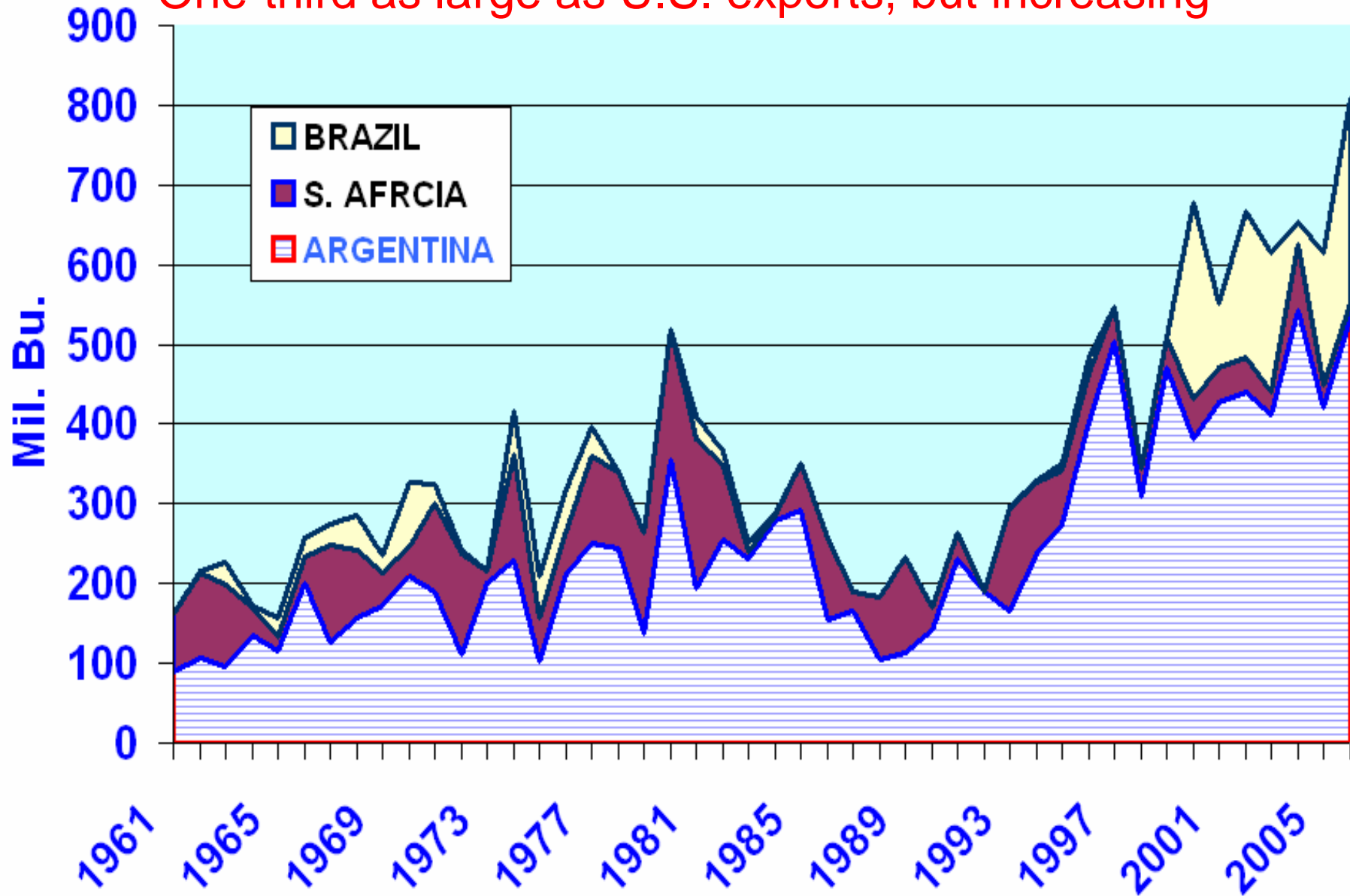
Brazil Major Crop Acres



4/09/07

Southern Hemisphere Corn Exports

One-third as large as U.S. exports, but increasing



Potential area to be cleared for crops

West Central Argentina, 2007



Newly Cleared Land In Brazil

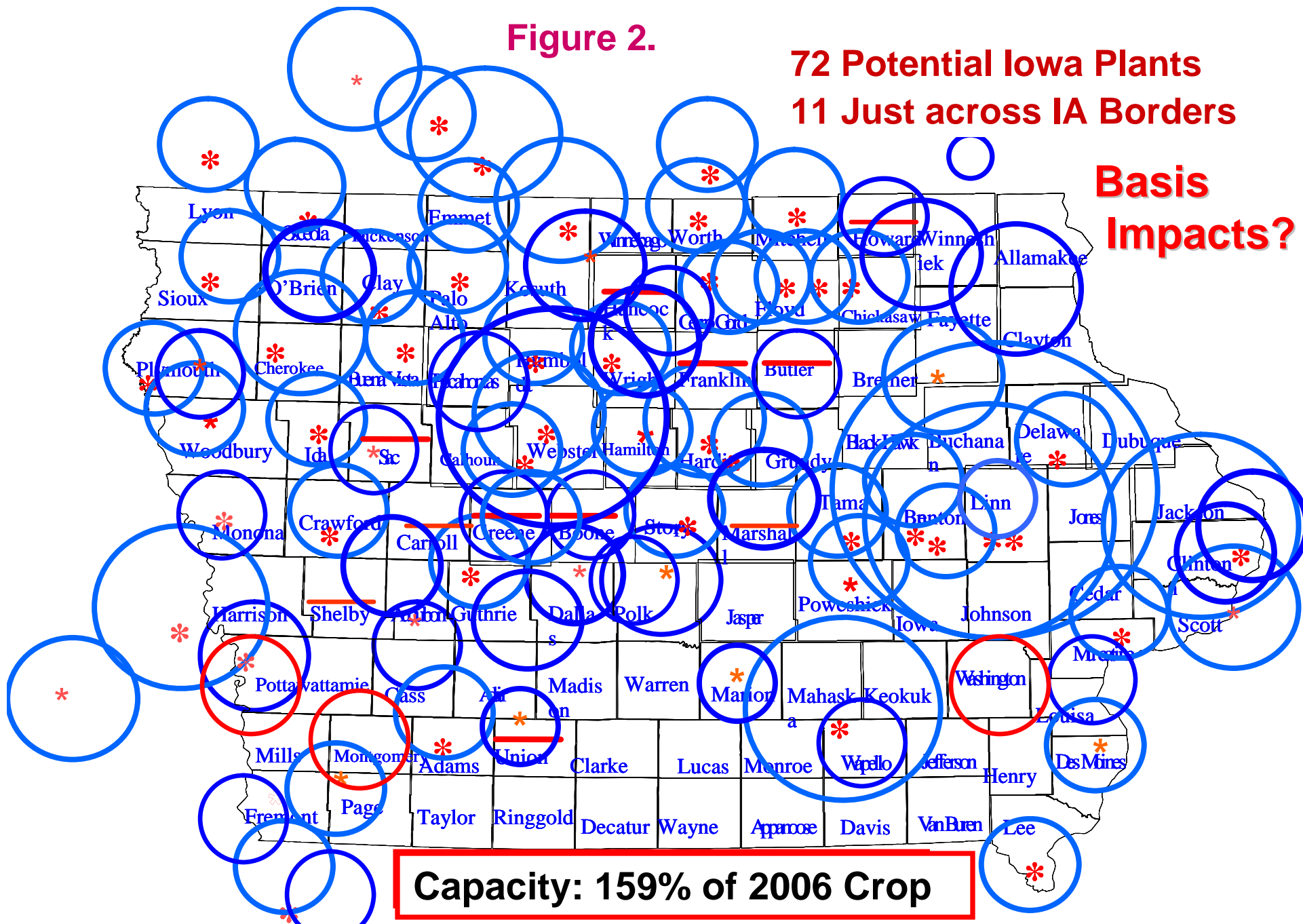
Planted to Upland Rice



Figure 2.

72 Potential Iowa Plants
11 Just across IA Borders

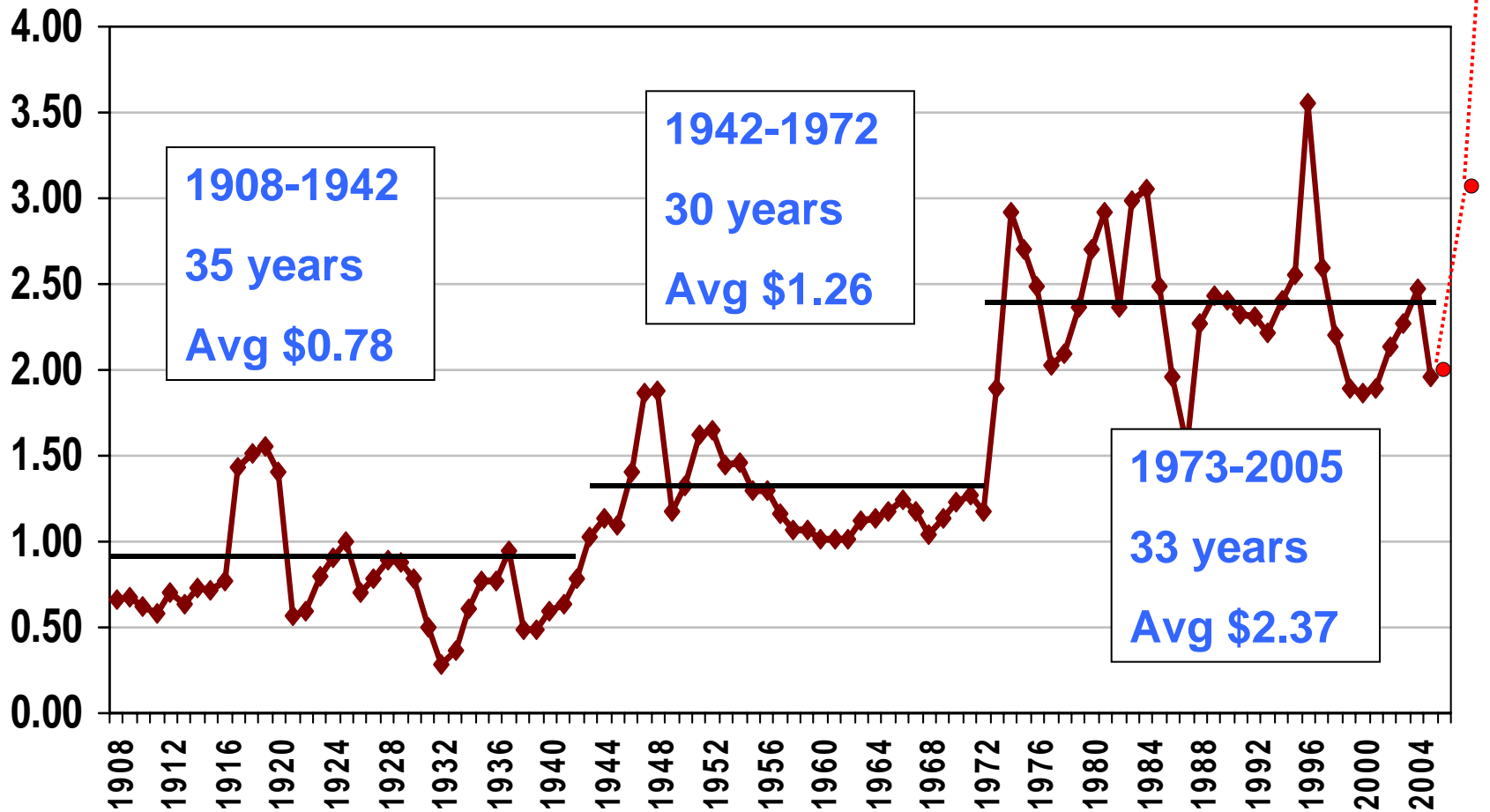
Basis
Impacts?



Iowa Corn Processing Plants, Current & Planned, 7/25/07

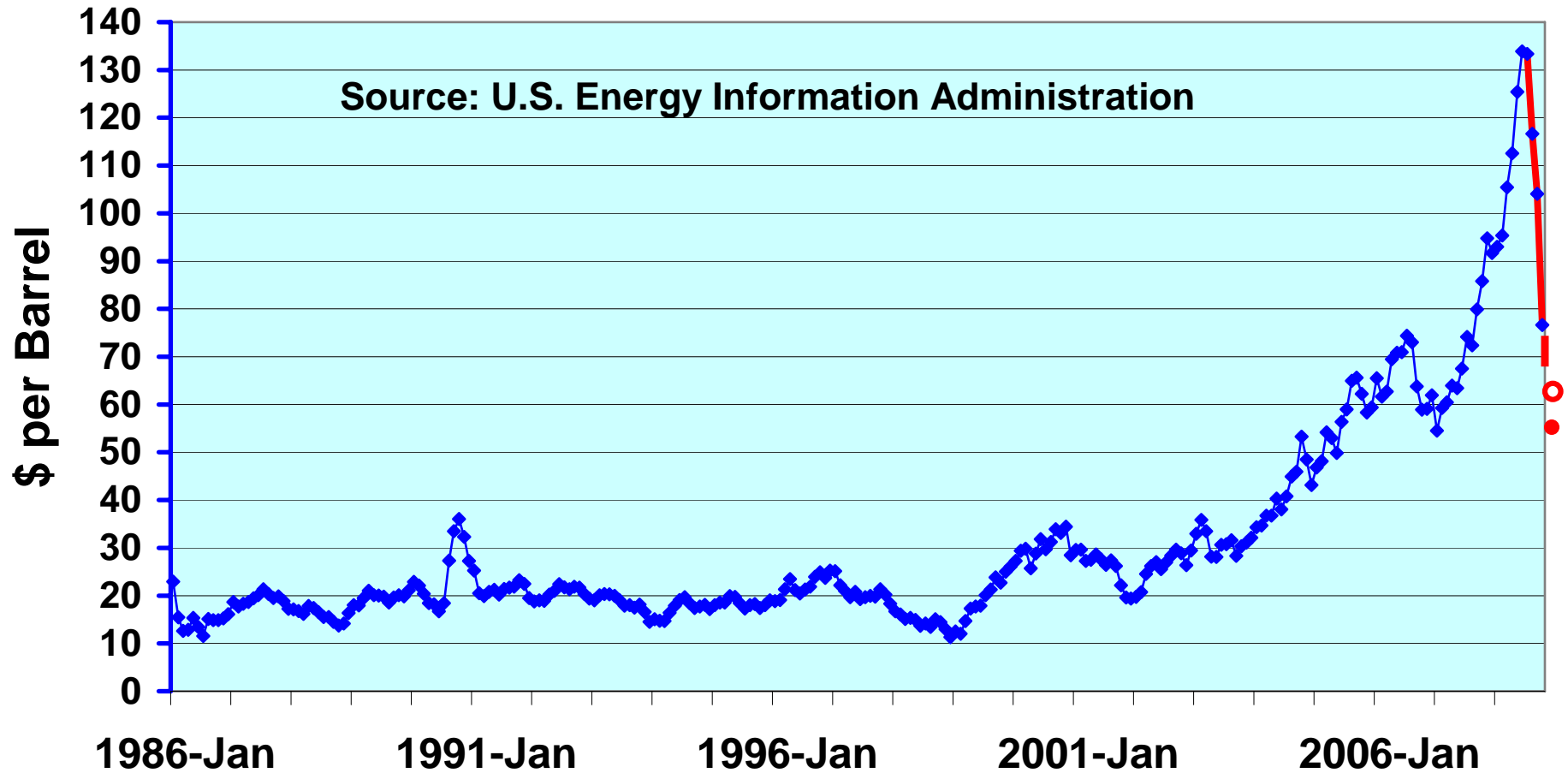
U.S. Annual Average Corn Price, 1908-2005

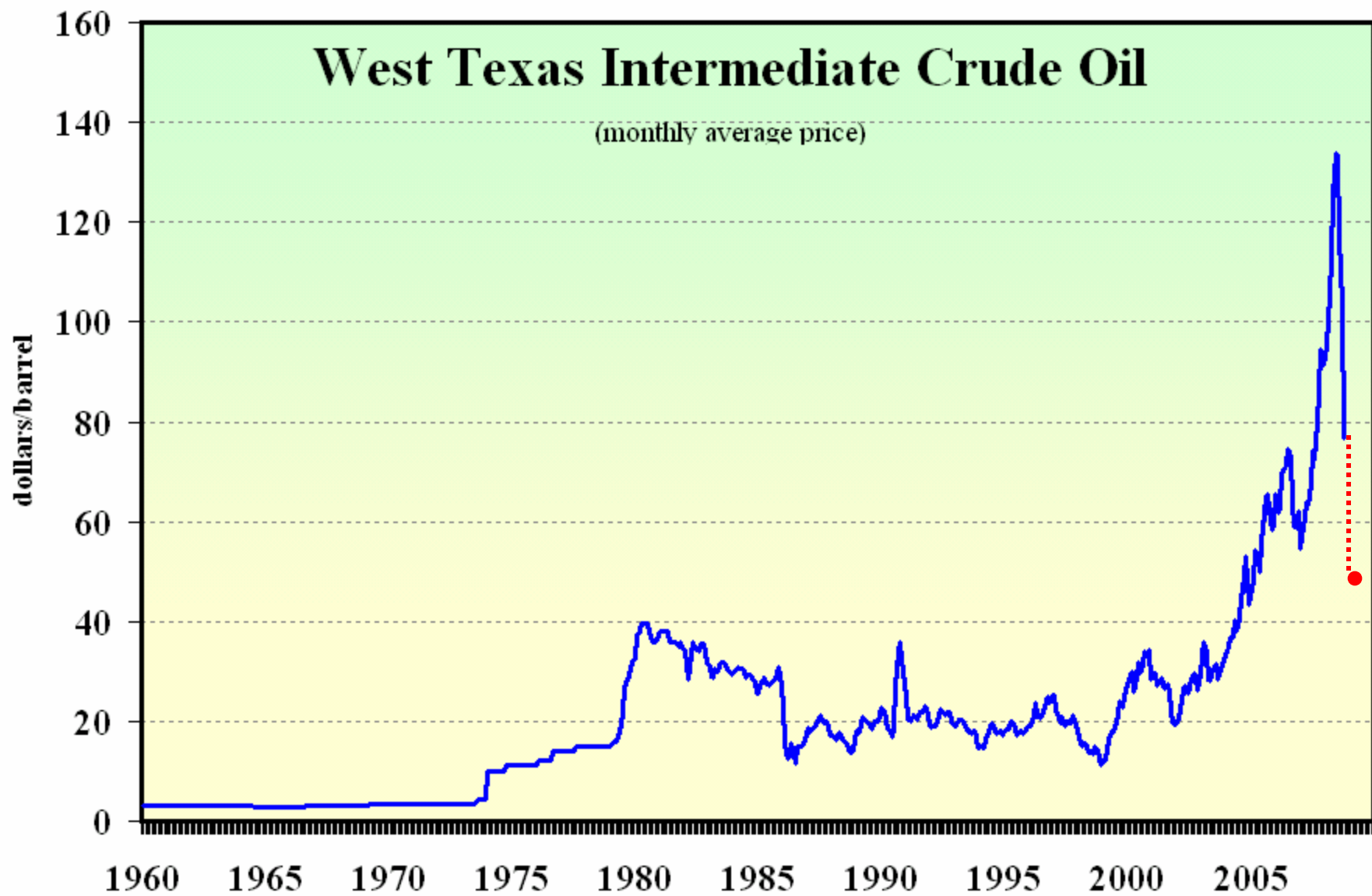
\$ Per Bushel



Data Source: USDA/NASS

Figure 1. Cushing, Oklahoma Monthly Average Crude Oil Prices 1986-2008





High Prices: the best cure for high prices

- **Supply Responses**

- Rapid expansion of ethanol
- Tar Sands in Canada

http://ffden-2.phys.uaf.edu/102spring2002_Web_projects/M.Sexton/

- Large oil discovery off E. coast of Brazil
- Cuba & China tapping oil off Cuban coast
- Large oil discovery in western Gulf of Mexico
- New oil coming on line in FSU, Nigeria
- Some older oil fields show declining production
- U.S. offshore drilling approved (but likely to be banned again)

Demand Developments

- **U.S. gasoline consumption declines for 1st time in 17 years**
- **Developing countries reduce gasoline subsidies in early summer 2008**
- **Developing country gasoline & crude oil use decline**
- **Deteriorating world economy reduces demand**

U.S. Gasoline Consumption Since 1945

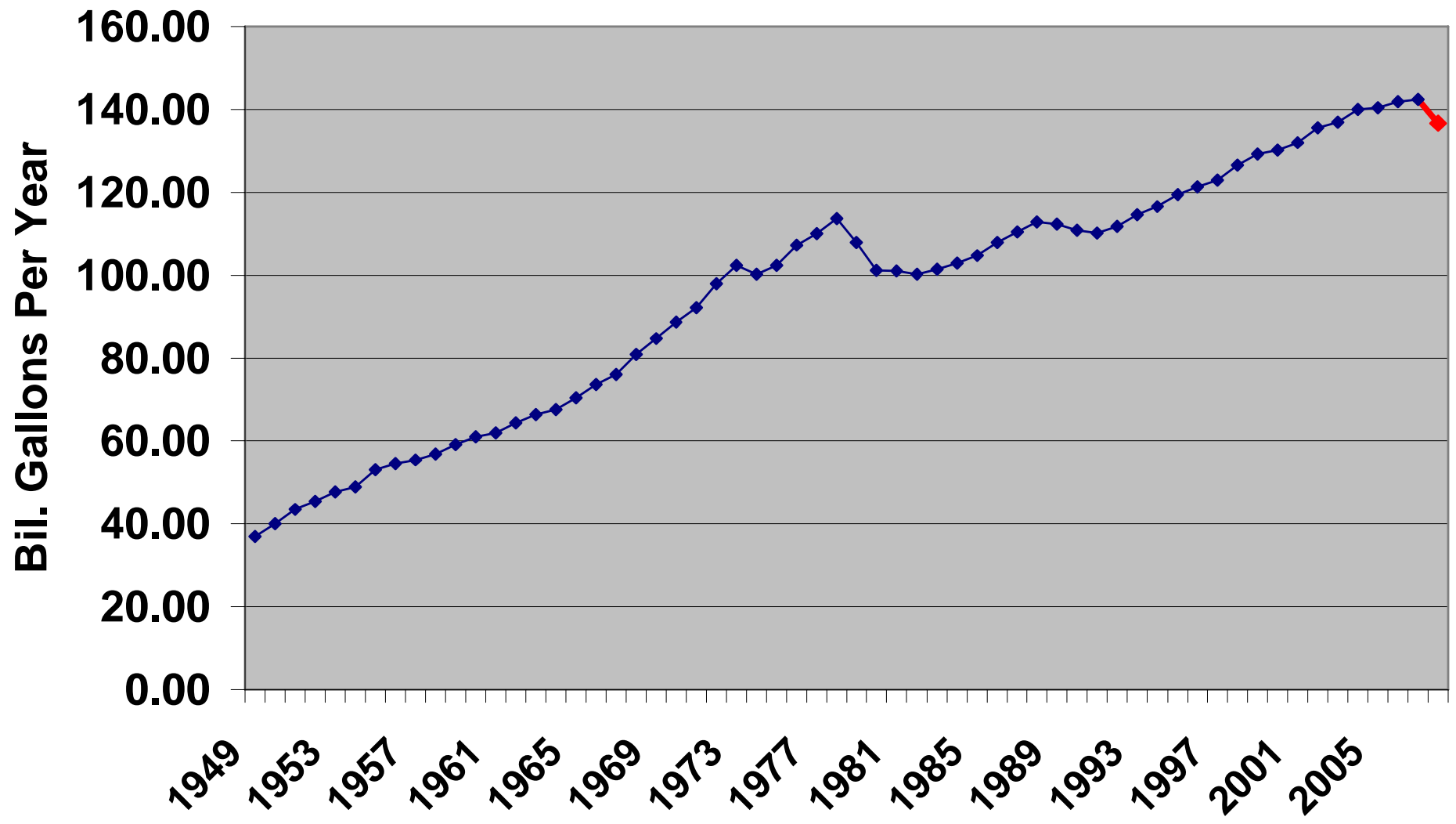
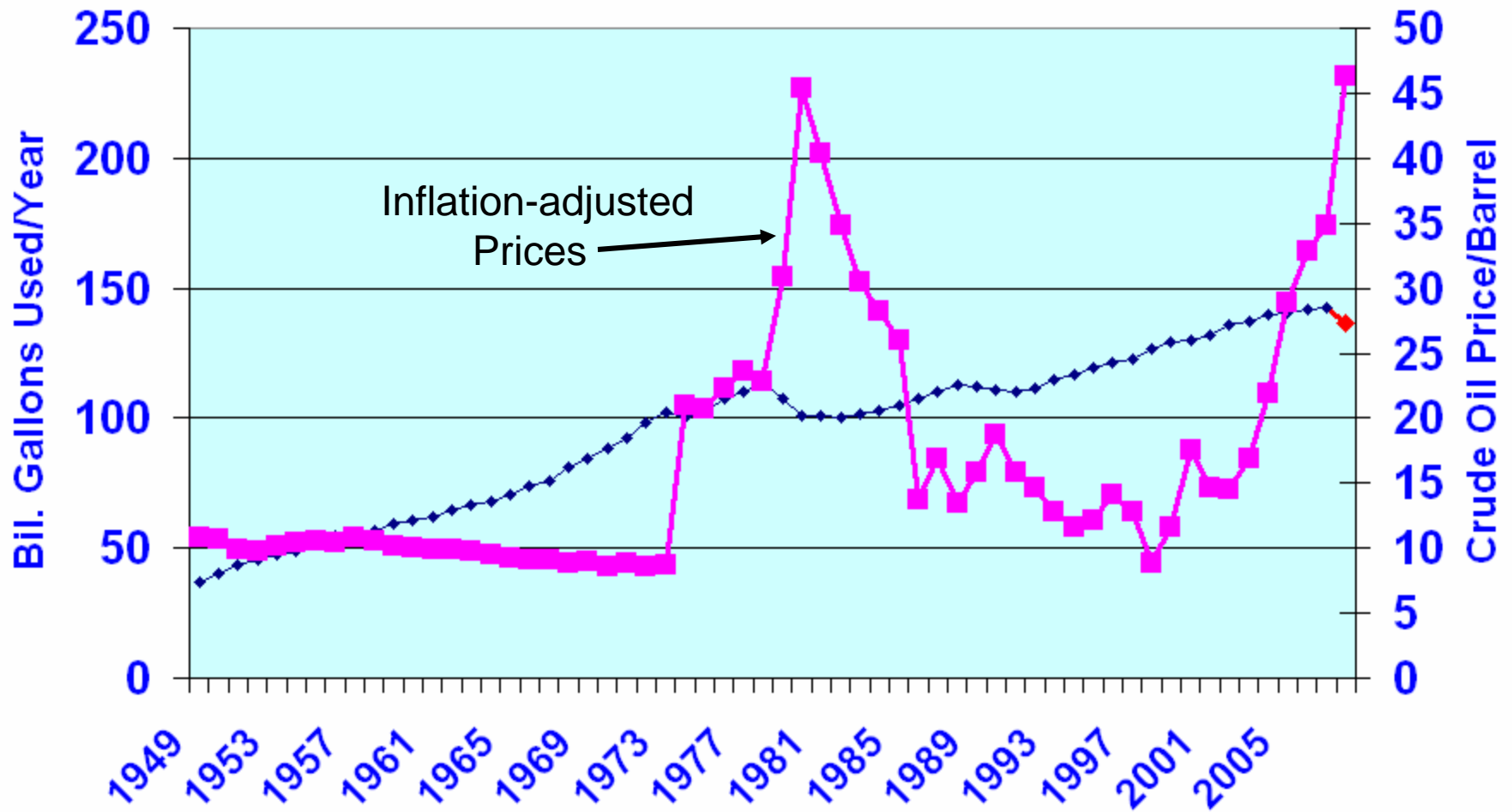


Figure 6. Annual U.S. Gasoline Consumption Since 1945 & Inflation-Adjusted Crude Oil Prices

(Crude oil prices are in 1982-1984 dollars)



Market reaction after previous oil shocks

- **Late 1970s: gasoline use declined for 4 straight years**
- **16 years were required before previous high regained**
- **Late 1980s: gasoline use declined for 3 years**
- **5 years were required to recover to previous high**

Figure 3. U.S. Monthly Total Gasoline & Ethanol Deliveries

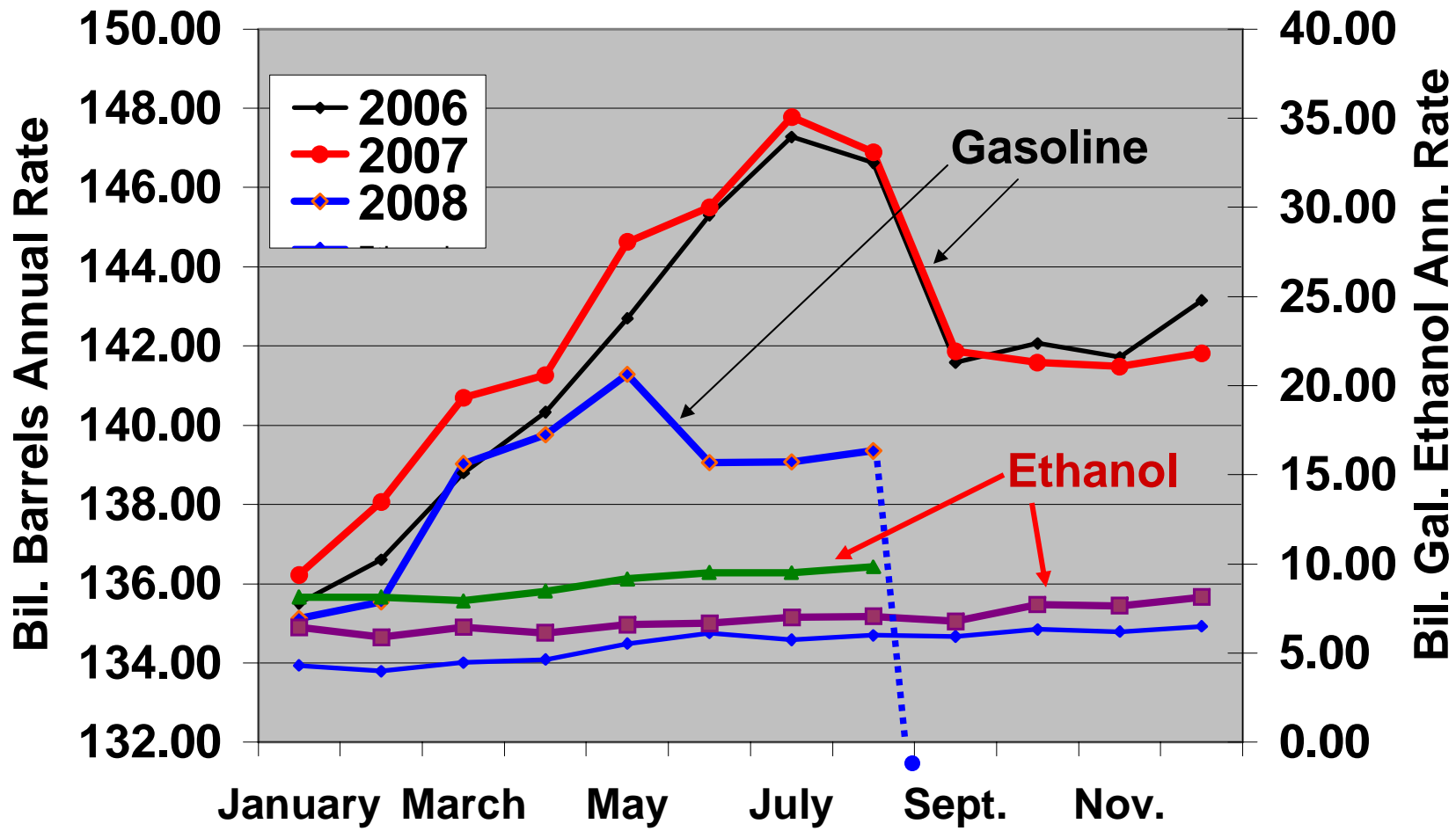


Figure 4. Annual U.S. Ethanol Production, Use & Stocks

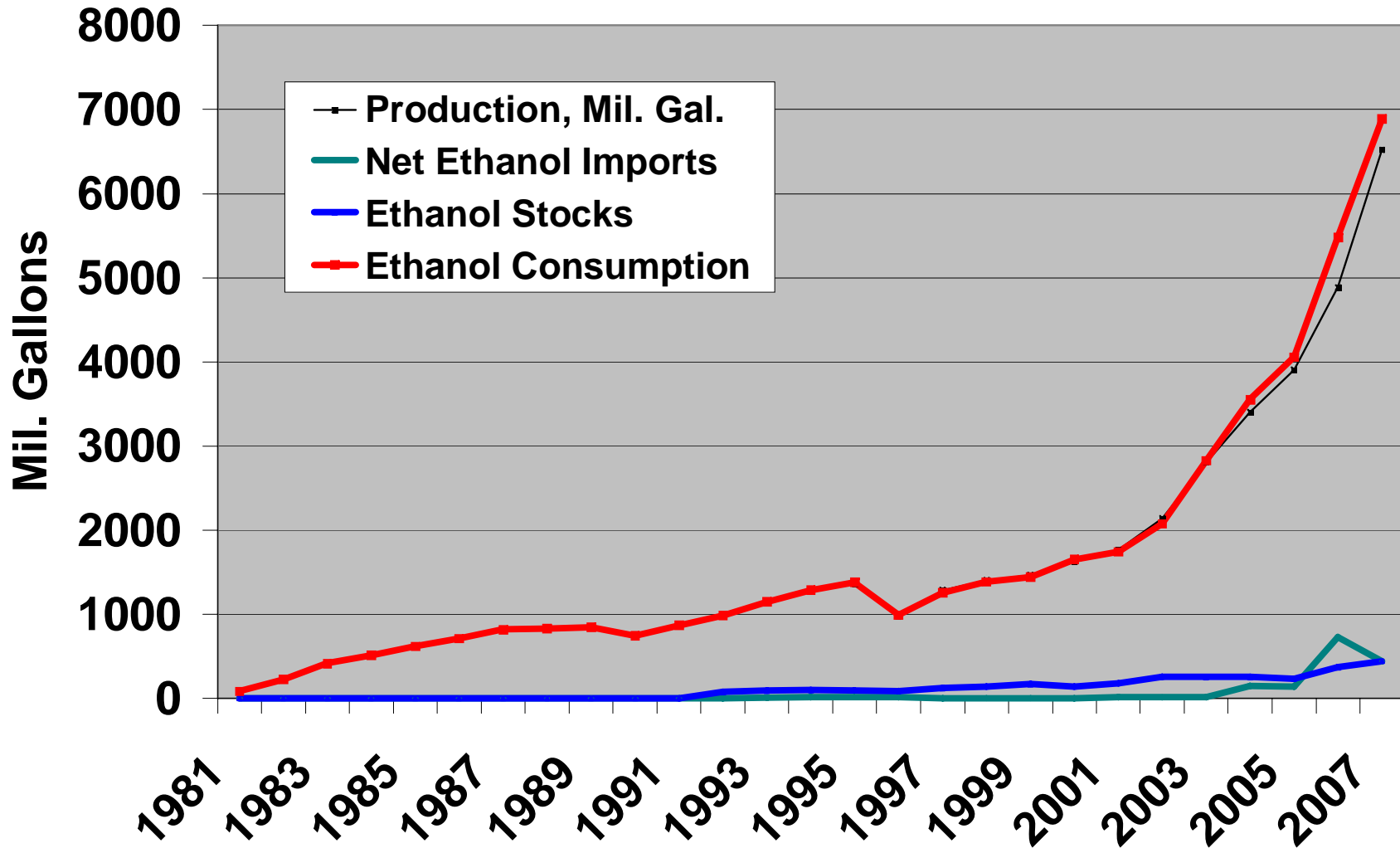
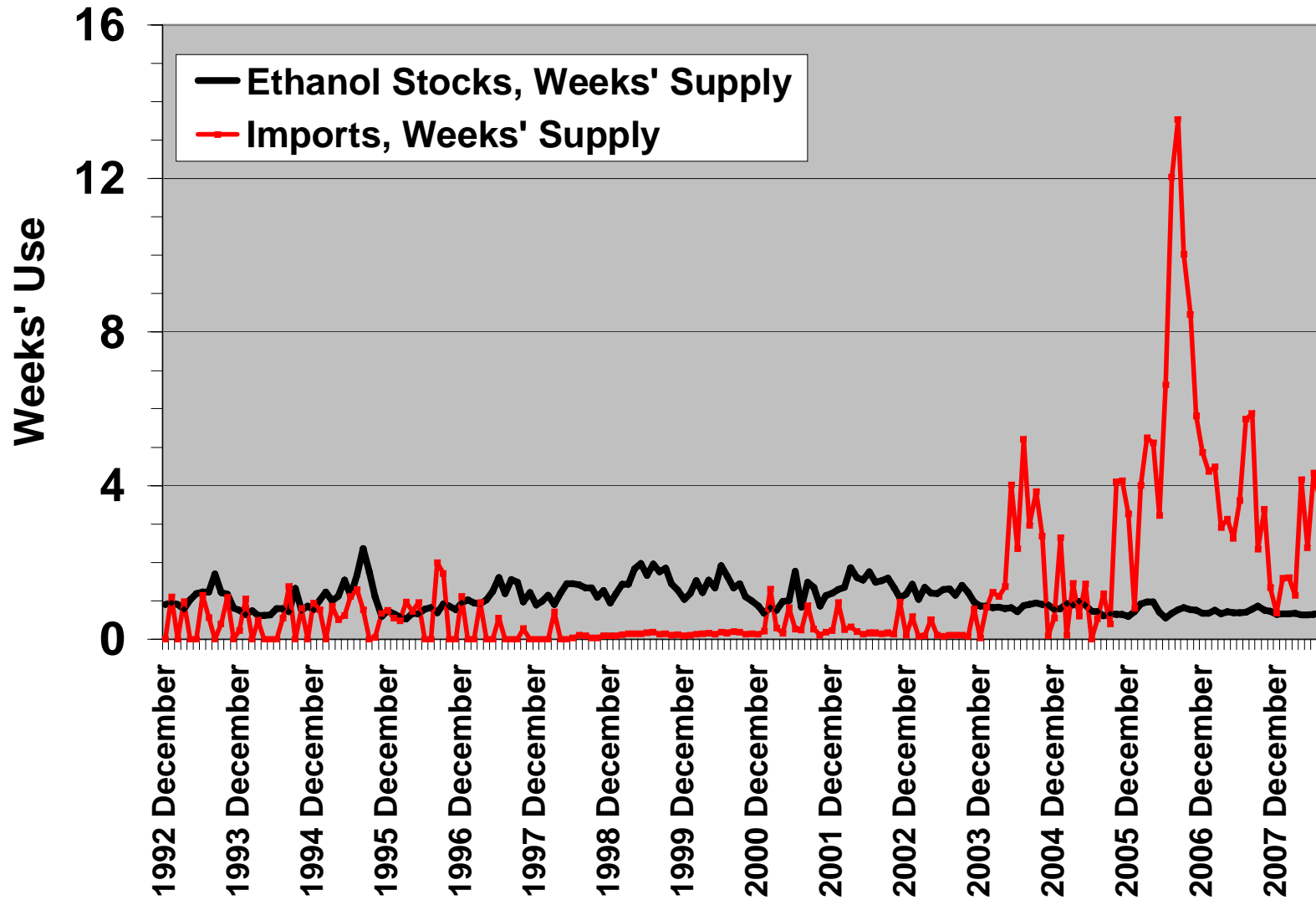


Figure 5. End-of-month U.S. Ethanol Stocks & Monthly Imports in Weeks' Use



Updated: 11/11/2008

Year: (production/marketing) ¹

Yield (bu. per acre)

Long-term Historical Yield Probability:

Supplies:

Planted acres (million)

Harvested acres (million)

Production (mil. bu.)

Beginning carryover (mil. bu.)

Total Supply (incl. imports)

Total Usage: (mil. bu.)

Feed & residual

Ethanol

Food, ind. & seed

Exports

Total Usage

Ethanol Usage: ²

Ethanol usage (bu. corn)

DDGS production (Mil. bu. corn equiv.)³

Ethanol usage (bu. per acre)

DDGS production (bu. per acre equiv.)

Ethanol usage (% corn production)

DDGS production (corn equiv.% of crop)

Mil. bu. increase in ethanol vs. prev. year

Ending Carryover: (mil. bu.)

Carryover as percent of supply

Carryover, weeks of total use

Prices:

U.S. weighted avg. farm price

Iowa weighted avg. farm price

Counter-cyclical pmt.

Harvest price (central Iowa)

Dec. futures price (harvest avg.)

Corn Balance Sheet

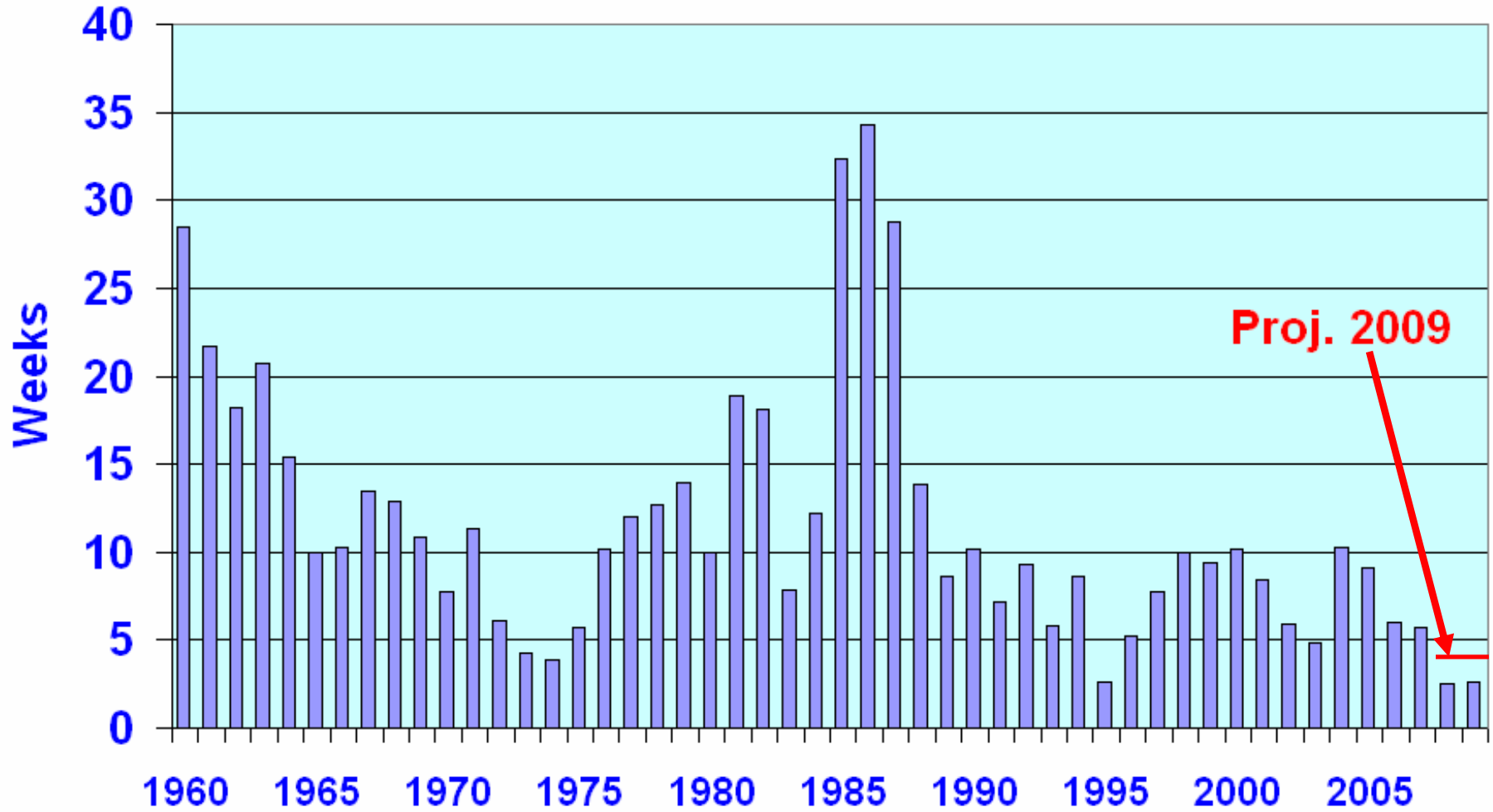
2007-08	Projected 2008-2009			Projected 2009-2010			Projected 2010-2011		
	Low	Med.	High	Low	Med. ⁴	High	Low	Med. ⁴	High
151.1	152.0	153.8	155.5	148.0	157.5	162.0	150.0	159.0	164.0
				18%	65%	17%	18%	65%	17%
93.6	85.9	85.9	85.9	90.0	90.0	90.0	94.0	94.0	94.0
86.5	78.2	78.2	78.2	82.4	83.0	83.0	86.4	87.0	87.0
13,073	11,883	12,020	12,157	12,195	13,073	13,446	12,960	13,833	14,268
1,304	1,624	1,624	1,624	1,095	1,095	1,095	1,012	1,012	1,012
14,398	13,523	13,660	13,796	13,307	14,182	14,556	13,989	14,860	15,295
5,974	5,425	5,450	5,475	4,900	5,400	5,500	5,200	5,500	5,600
3,026	3,940	3,950	3,975	4,350	4,450	4,475	4,775	4,850	4,875
1,338	1,335	1,340	1,350	1,340	1,345	1,350	1,340	1,345	1,350
2,436	1,815	1,825	1,850	1,875	1,975	2,000	1,850	2,000	2,050
12,773	12,515	12,565	12,650	12,465	13,170	13,325	13,165	13,695	13,875
3,026	3,940	3,950	3,975	4,350	4,450	4,475	4,775	4,850	4,875
634	845	847	852	944	966	971	1,049	1,066	1,071
35	50	51	51	53	54	54	55	56	56
7	11	11	11	11	12	12	12	12	12
23.1%	33.2%	32.9%	32.7%	35.7%	34.0%	33.3%	36.8%	35.1%	34.2%
4.8%	7.1%	7.0%	7.0%	7.7%	7.4%	7.2%	8.1%	7.7%	7.5%
909	914	924	949	400	500	525	325	400	425
1,624	1,008	1,095	1,146	842	1,012	1,231	824	1,165	1,420
11.3%	7.5%	8.0%	8.3%	6.3%	7.1%	8.5%	5.9%	7.8%	9.3%
6.6	4.2	4.5	4.7	3.5	4.0	4.8	3.3	4.4	5.3
\$4.20	\$4.05	\$3.90	\$3.80	\$4.70	\$4.00	\$3.90	\$4.75	\$3.85	\$3.55
\$4.15	\$4.00	\$3.85	\$3.75	\$4.65	\$3.95	\$3.85	\$4.70	\$3.80	\$3.50
\$0.00	\$0.00	\$0.00	\$0.00	\$0.00	\$0.00	\$0.00	\$0.00	\$0.00	\$0.00
\$3.30	\$3.50	\$3.50	\$3.50	\$4.50	\$3.60	\$3.55	\$4.50	\$3.50	\$3.20
\$3.80	\$3.85	\$3.85	\$3.85	\$5.10	\$4.10	\$4.05	\$5.20	\$4.10	\$3.80

Key Assumptions

- **Crude oil price \$75-\$85 per barrel**
- **Ethanol & biodiesel mandates unchanged & enforced**
- **Slow growth of world economy**
- **CRP early out not permitted**

6/10/08

Figure 1. U.S. Corn Carryover Stocks in Weeks Supply



Updated: 11/12/2008

Year: (production/marketing) ¹

Yield (bu. per acre)

Long-term historical yield probability:

Soybean Supplies:

Planted acres (million)

Harvested acres (million)

Production (mil. bu.)

Beginning carryover (mil. bu.)

Total Supply

Total Soybean Usage:

Crush (mil. bu.)

Seed & residual (mil. bu.)

Exports (mil. bu.)

Total Usage

Soy Bal. Sheet

Oil Yield, lbs./ bu. of soybeans ²

Biodiesel Usage:

Soybean oil use for biodiesel, mil. Lbs.²

Use for biodiesel, bushel equivalent

Soybean oil for biodiesel, % of oil from crop

Soybean oil for biodiesel, % of oil from crush

Ending Soybean Carryover: (mil. bu.)

Carryover as percent of supply

Carryover, weeks of total use

Prices:

U.S. weighted avg. farm price

Iowa weighted avg. farm price

Counter-Cyclical Pmt.

Harvest price (central Iowa)

Nov. Futures Price (harvest avg.)

Soy meal, Decatur, \$/T 48% protein

Soy oil, Decatur, cents/lb.

2007-08	Projected 2008-2009			Projected 2009-2010			Projected 2010-2011		
	Low	Med.	High	Low	Med.	High	Low	Med.	High
41.7	38.5	39.3	40.5	39.5	43.0	44.0	40.5	43.5	44.5
				18%	65%	17%	18%	65%	17%
64.7	75.9	75.9	75.9	74.0	74.0	74.0	72.0	72.0	72.0
64.1	74.4	74.4	74.4	72.8	73.2	73.2	70.9	71.2	71.2
2,676	2,863	2,921	3,012	2,876	3,148	3,221	2,871	3,097	3,168
574	205	205	205	168	168	168	270	270	270
3,260	3,077	3,133	3,224	3,050	3,325	3,394	3,149	3,373	3,445
1,801	1,735	1,750	1,770	1,775	1,800	1,825	1,800	1,850	1,855
92	180	170	165	180	175	175	180	175	175
1,161	1,010	1,045	1,060	935	1,080	1,100	970	1,050	1,075
3,055	2,925	2,965	2,995	2,890	3,055	3,100	2,950	3,075	3,105
11.5	11.3	11.4	11.5	11.3	11.4	11.5	11.3	11.4	11.5
3,050	3,100	3,150	3,200	3,375	3,400	3,450	3,650	3,750	3,775
264	273	277	279	298	300	301	323	329	328
9.9%	9.5%	9.5%	9.3%	10.3%	9.5%	9.4%	11.2%	10.6%	10.4%
14.7%	15.8%	15.8%	15.8%	16.8%	16.6%	16.5%	17.9%	17.8%	17.7%
205	152	168	229	160	270	294	199	298	340
6.3%	4.9%	5.4%	7.1%	5.3%	8.1%	8.7%	6.3%	8.8%	9.9%
3.5	2.7	2.9	4.0	2.9	4.6	4.9	3.5	5.0	5.7
\$10.10	\$9.25	\$9.00	\$8.75	\$8.50	\$7.80	\$7.70	\$8.25	\$7.30	\$7.10
\$10.05	\$9.20	\$8.95	\$8.70	\$8.45	\$7.75	\$7.65	\$8.20	\$7.25	\$7.05
\$0.00	\$0.00	\$0.00	\$0.00	\$0.00	\$0.00	\$0.00	\$0.00	\$0.00	\$0.00
\$8.45	\$8.50	\$8.50	\$8.50	\$8.40	\$7.50	\$7.30	\$7.90	\$6.80	\$6.50
\$9.45	\$9.10	\$9.10	\$9.10	\$9.15	\$8.20	\$8.00	\$8.65	\$7.50	\$7.20
\$335	\$270	\$259	\$239	\$237	\$208	\$203	\$230	\$196	\$183
52.3	40.5	38.5	38.0	38.5	36.5	36.0	37.5	34.0	33.5

Emerging Biofuels Technology

- **Biodiesel fuel from algae – 5 to 7 years out due to cost issues**
 - Can be produced in salt water
 - Favorable prospects in SW U.S.
- **Cellulose: processes are available, but cost issues remain + harvesting, storage, transport, & soil issues**
- **U. of Wisc. spin-off company has catalyst process for creating gasoline + petro chemicals from grain, biomass**
 - Energy efficiency much better than for ethanol
 - Avoids ethanol infrastructure issues
 - Useable at all blend levels with non-flex fuel vehicles

Emerging Biofuels Technology II

- **U.S. moving rapidly toward GHG emissions cap & trade policies**
 - California policies
 - About 15 Midwest states following, incl. Iowa
 - President asks Congress to deal with GHG issues
- **Ethanol GHG issues will be looked at more carefully (S. America land clearing issues)**
- **Increased focus on wind energy, use of urban wastes for electric power generation, methane capture from livestock (some with ethanol plants)**
 - Carbon market expected to become more significant
 - More research needed on impacts from cultivation of fallow lands, land clearing in S. America, etc.

What Could Change Prospects of Long-Term Tightening Global Grain Supply?

- Accelerated corn yield increases
- Further crude oil price collapse
- Early break-through in economical cellulose conversion
- Declining global livestock feeding
- U.S. \$0.47 blending credit reduced
- Eliminate \$0.54 import tax

U.S. Cellulose Ethanol

- **Mandates become aggressive after 2010**
- **At least 3-4 pilot plants being developed**
- **Government emphasis on alternative feedstocks**

Potential Feedstocks:

- **DDGS fiber**
- **Corn stover**
- **Prairie grasses**
- **Sugar, sweet sorghum**
- **Forest wastes**
- **Municipal & livestock wastes**

Research for major handling & storage challenges

Marketing Take Home Points

- Modest upward potential in corn & bean prices into Mid-February
- Demand slowing – especially corn exports & soy crush
- Uncertain how much added corn acres needed: watch ethanol & export sales
- Spring & summer market still to be quite sensitive to weather
- Biofuels mandates are important
- *Be aware of risk in contracting with ethanol plants*

Questions & Comments?

- <http://www.econ.iastate.edu/faculty/wisner/>
- <http://www.AgMRC.org/renewablefuels/>
- http://www.agmrc.org/renewable_energy/agmrc_renewable_energy_newsletter.cfm