Expected Impacts of Increased Ethanol Production

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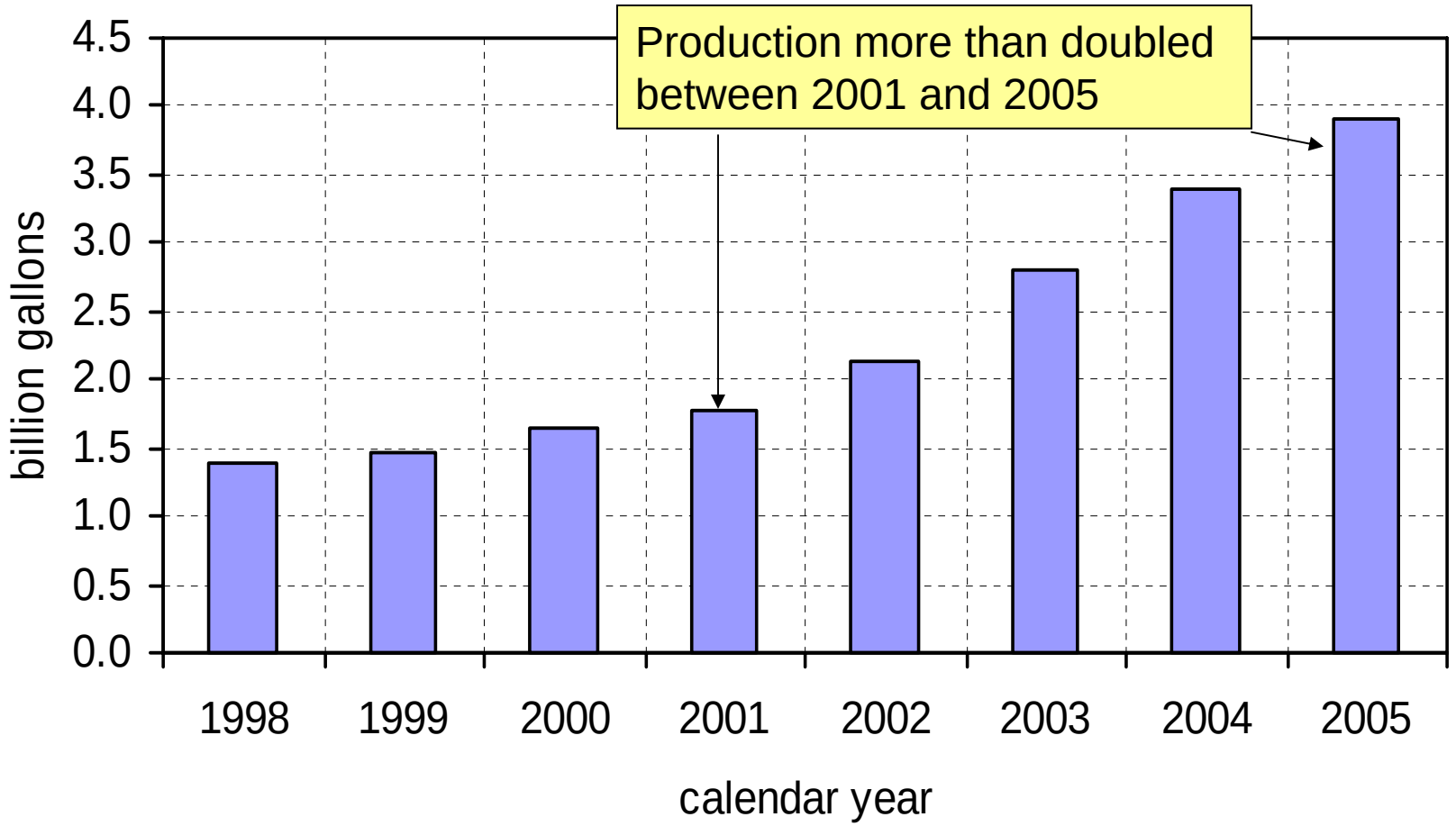
FAPRI
At the University of Missouri
Food and Agricultural Policy Research Institute

College of Agriculture, Food and Natural Resources

Agenda

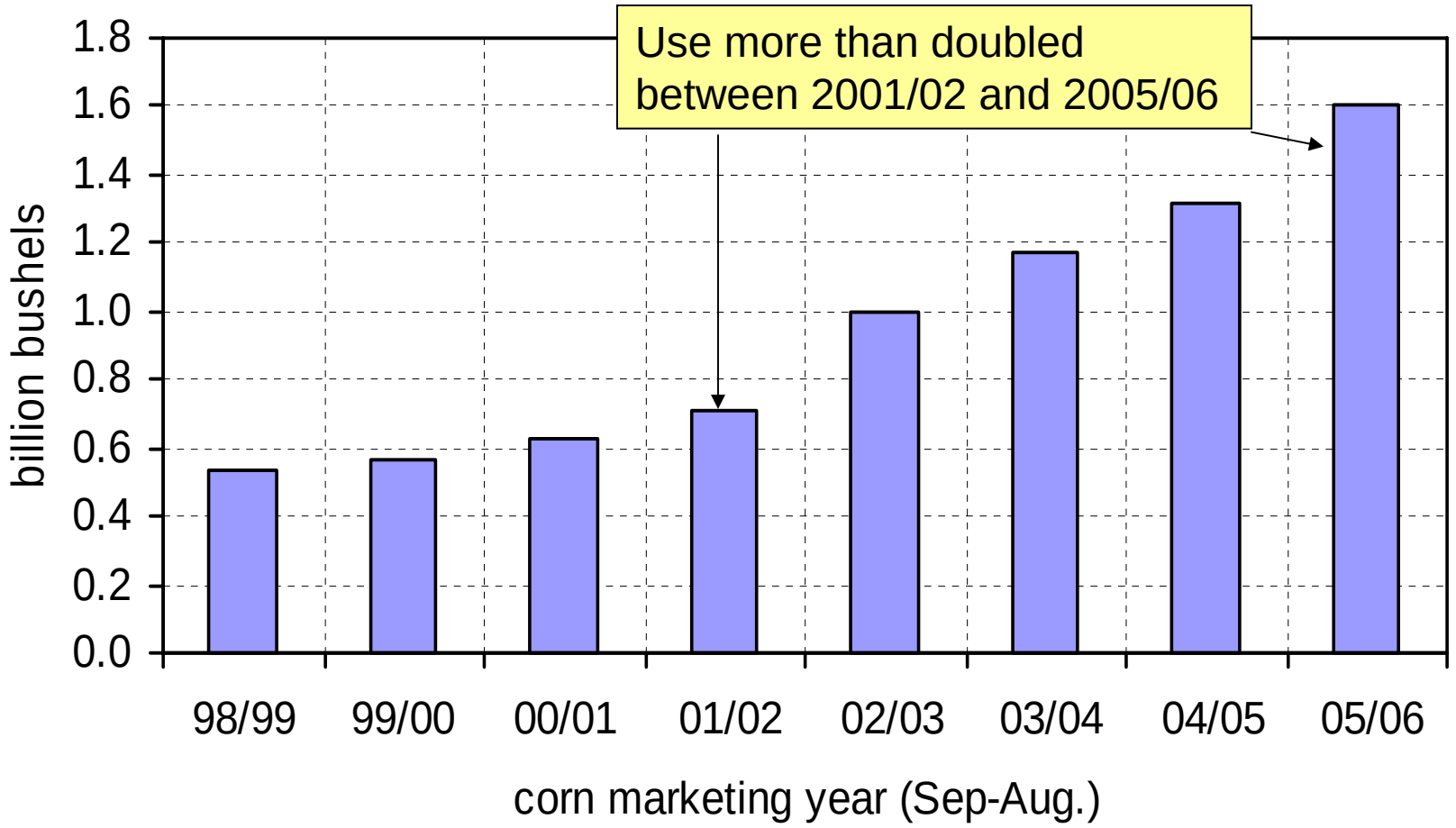
- Ethanol production
  - Past and future growth
  - What difference does it make for farm commodity markets?
  - What could change the outlook?

U.S. production of ethanol



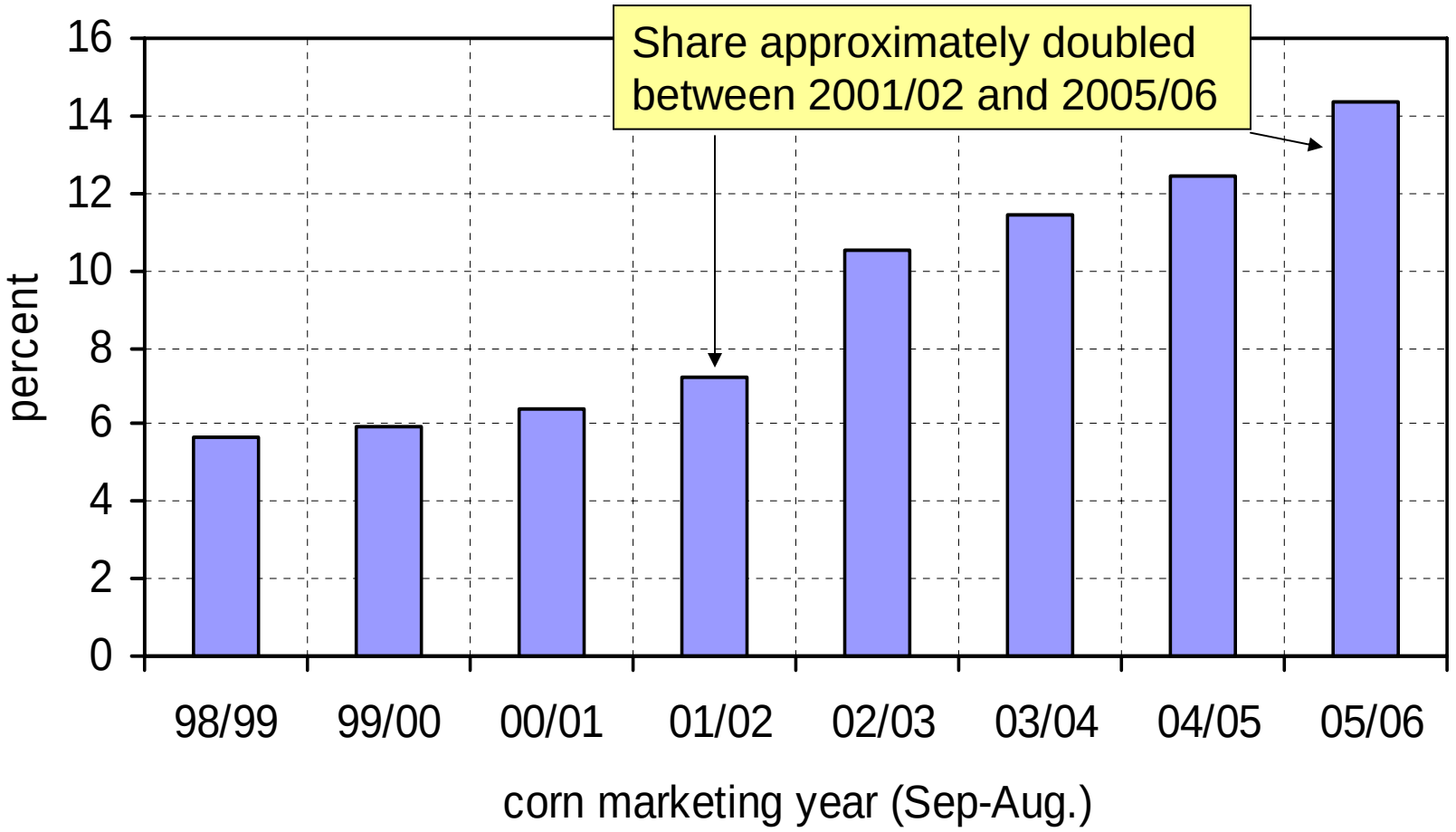
Source: Energy Information Administration

U.S. use of corn to produce ethanol



Source: July 2006 World Agricultural Supply and Demand Estimates and other USDA reports

Ethanol share of total U.S. corn use



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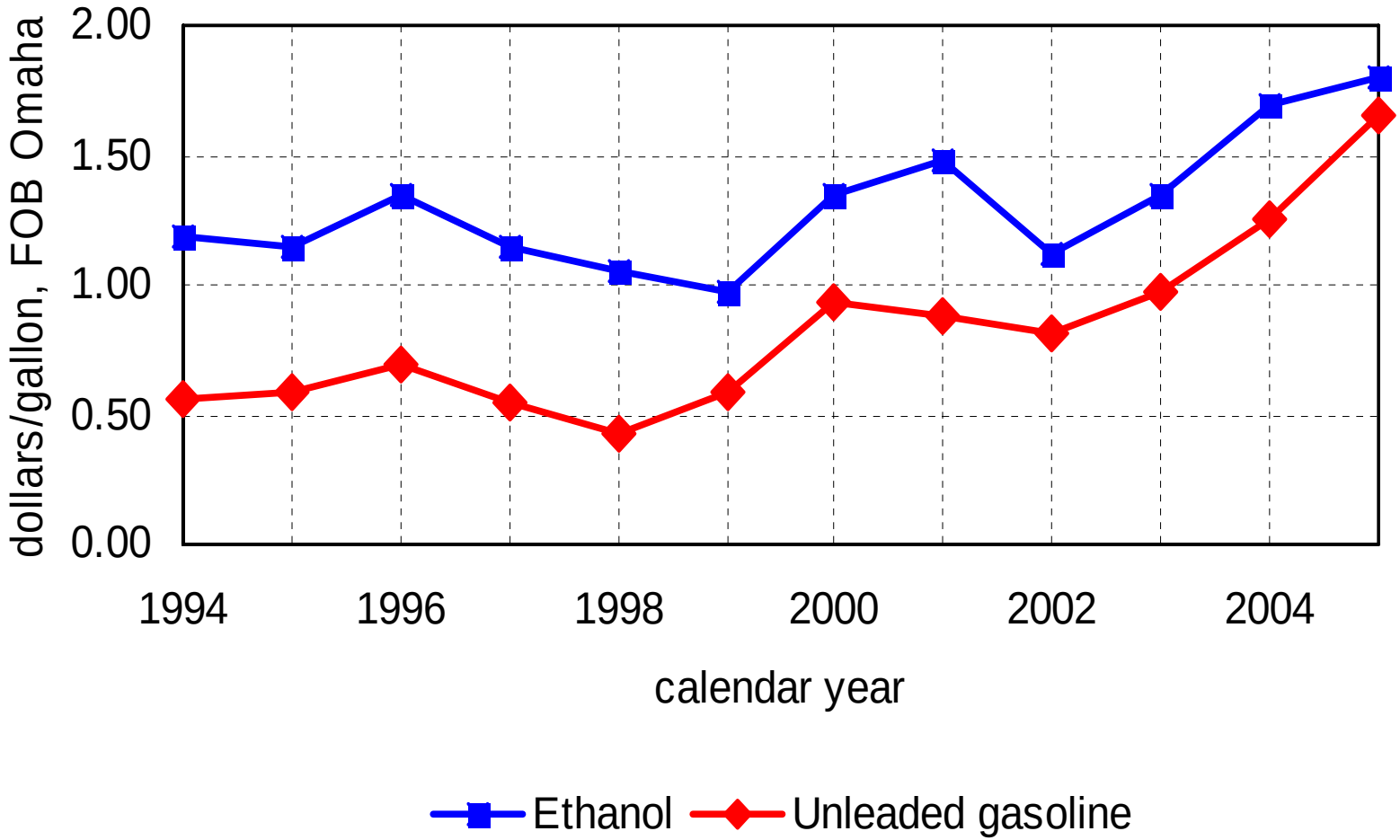
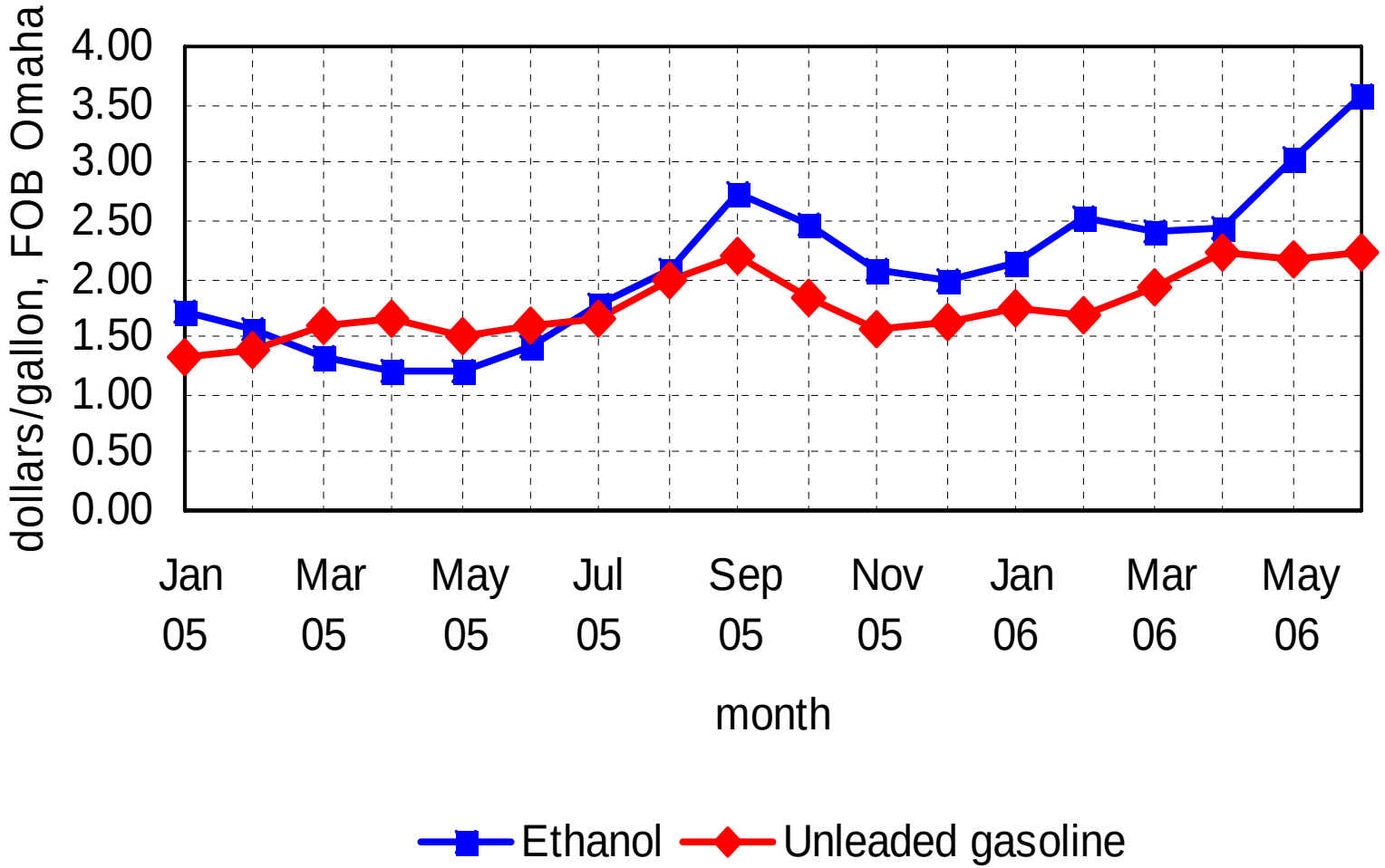
Ethanol and unleaded gasoline prices



Notes: Data are from http://www.neo.state.ne.us/statshtml/66.html. Retail prices exceed these rack prices because of taxes, distribution costs, etc. Ethanol qualifies for a 51 cent/gallon tax credit that reduces its retail price relative to gasoline.

Ethanol and unleaded gasoline prices



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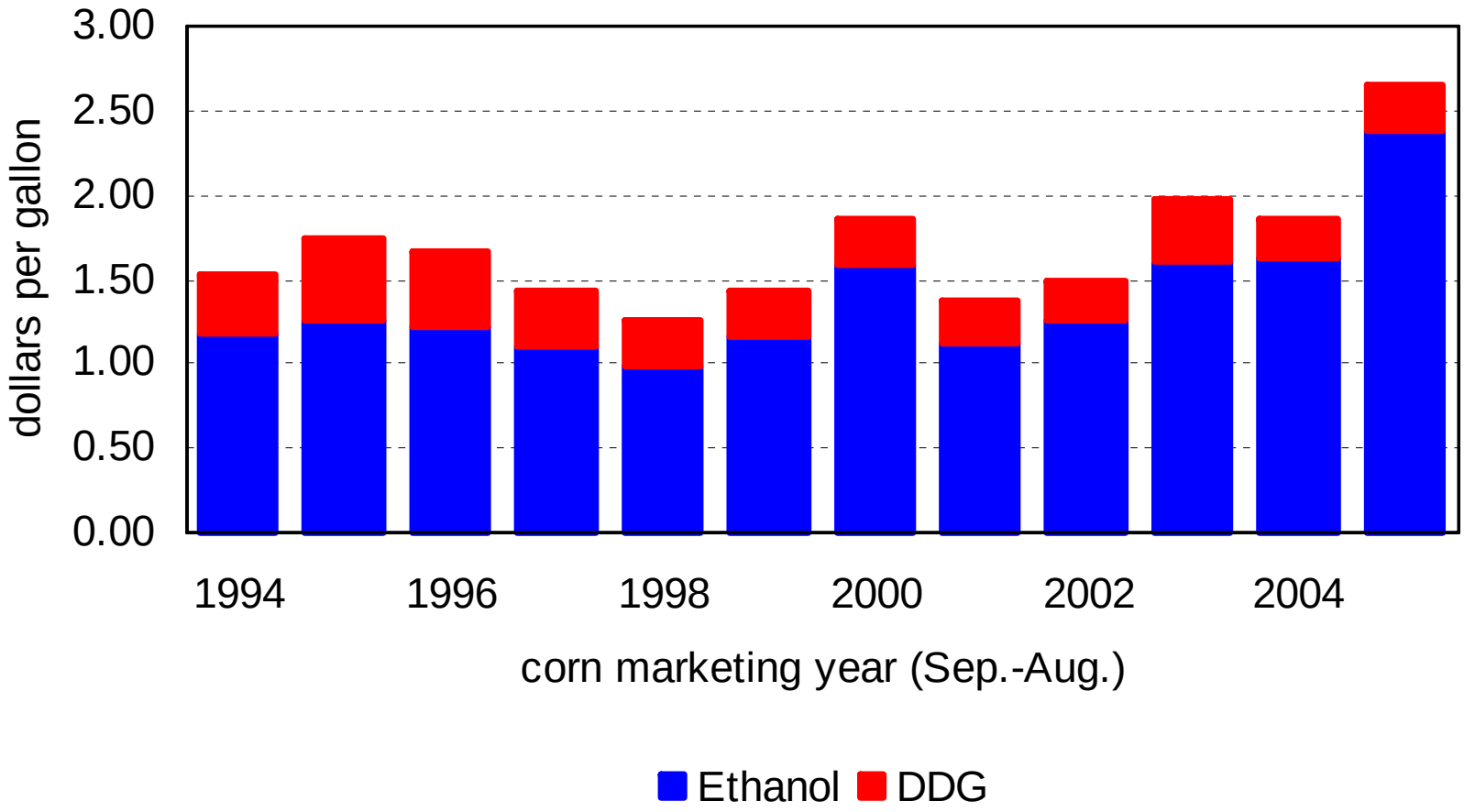
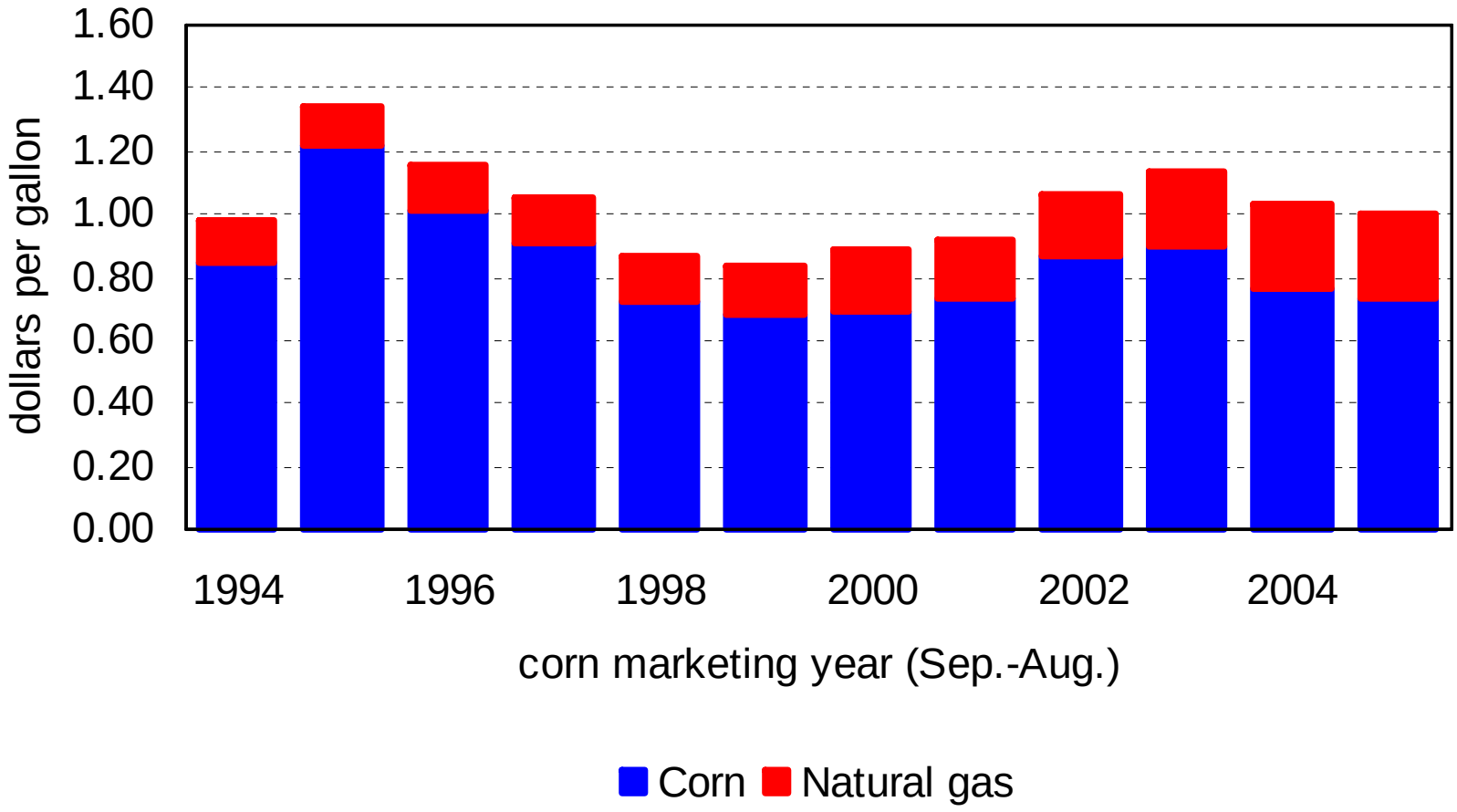
Selected revenues for dry mill ethanol plant



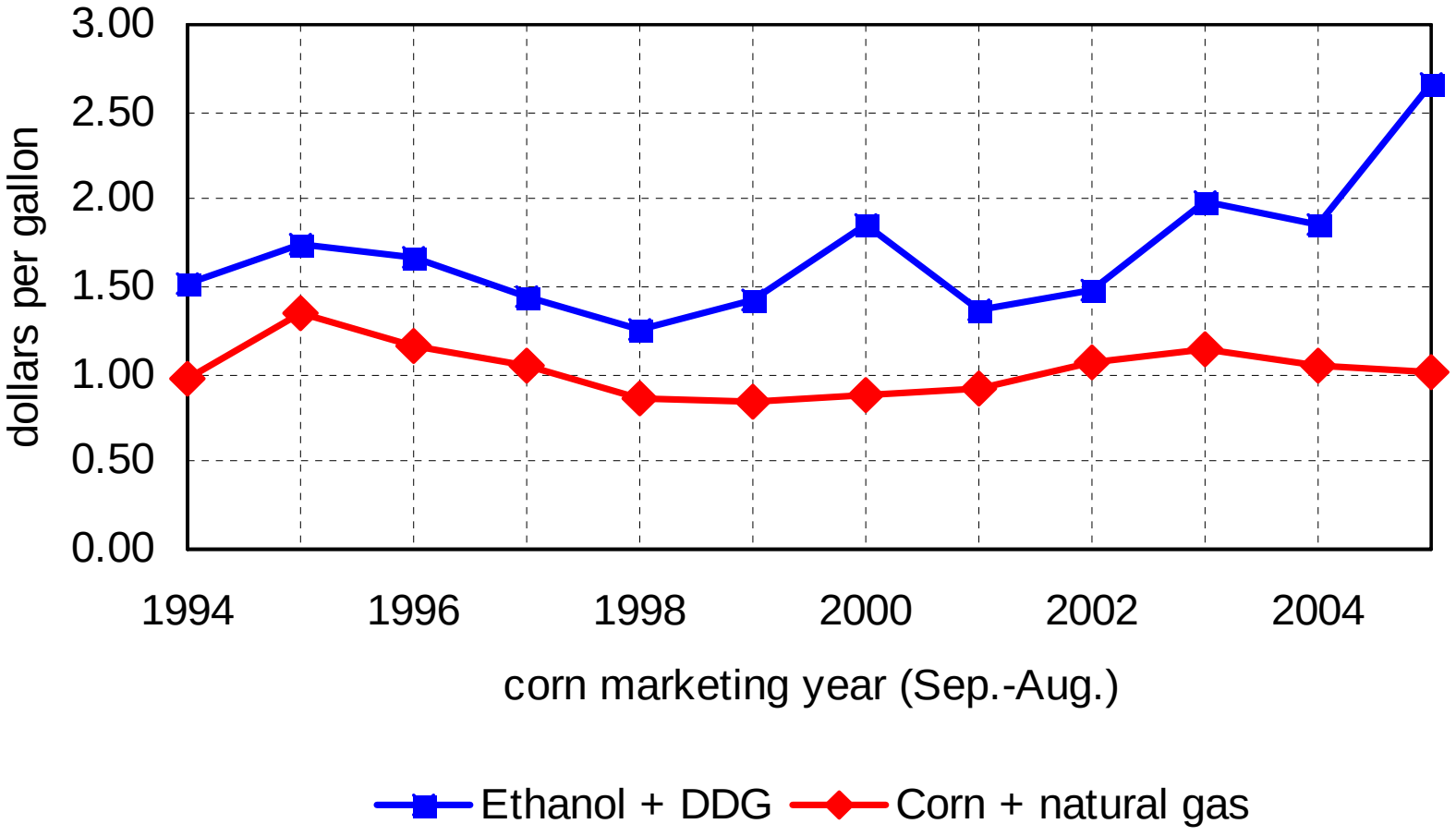
FAPRI calculations using FOB Omaha price for ethanol, Lawrenceburg, Indiana prices for distillers' grains, and assumed yields (2.7 gallons of ethanol and 17 lbs. of DDG per bu. of corn in 2005/06). Ethanol prices for 2005/06 are conservative estimates; actual FOB Omaha prices for Sep.-Jun. averaged $2.54/gallon.

Selected costs for dry mill ethanol plant



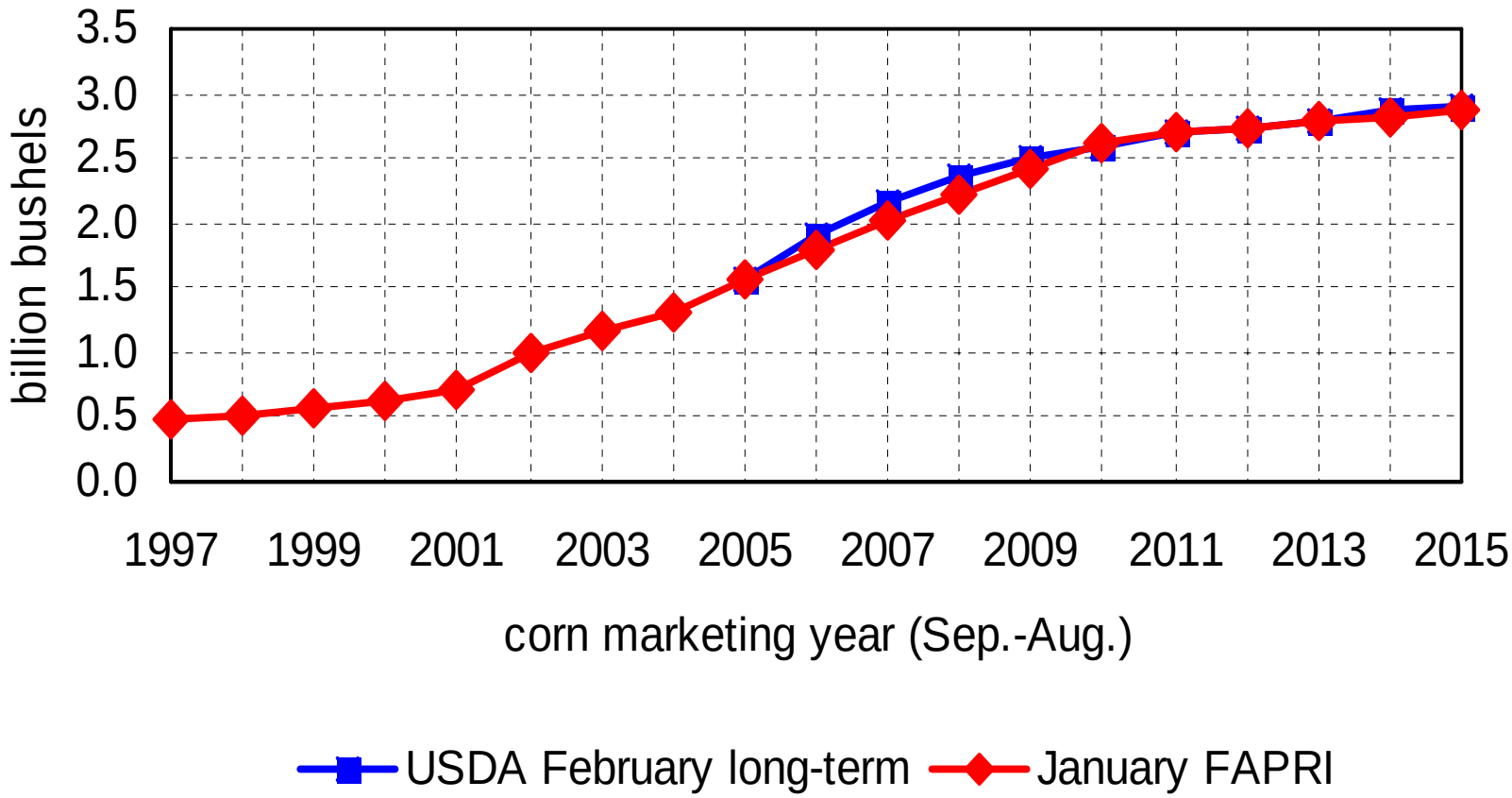
FAPRI calculations using the national season-average price for corn, an index of natural gas prices, and a yield of 2.7 gallons per bushel of corn in 2005/06

Selected revenues and costs for dry mill plant

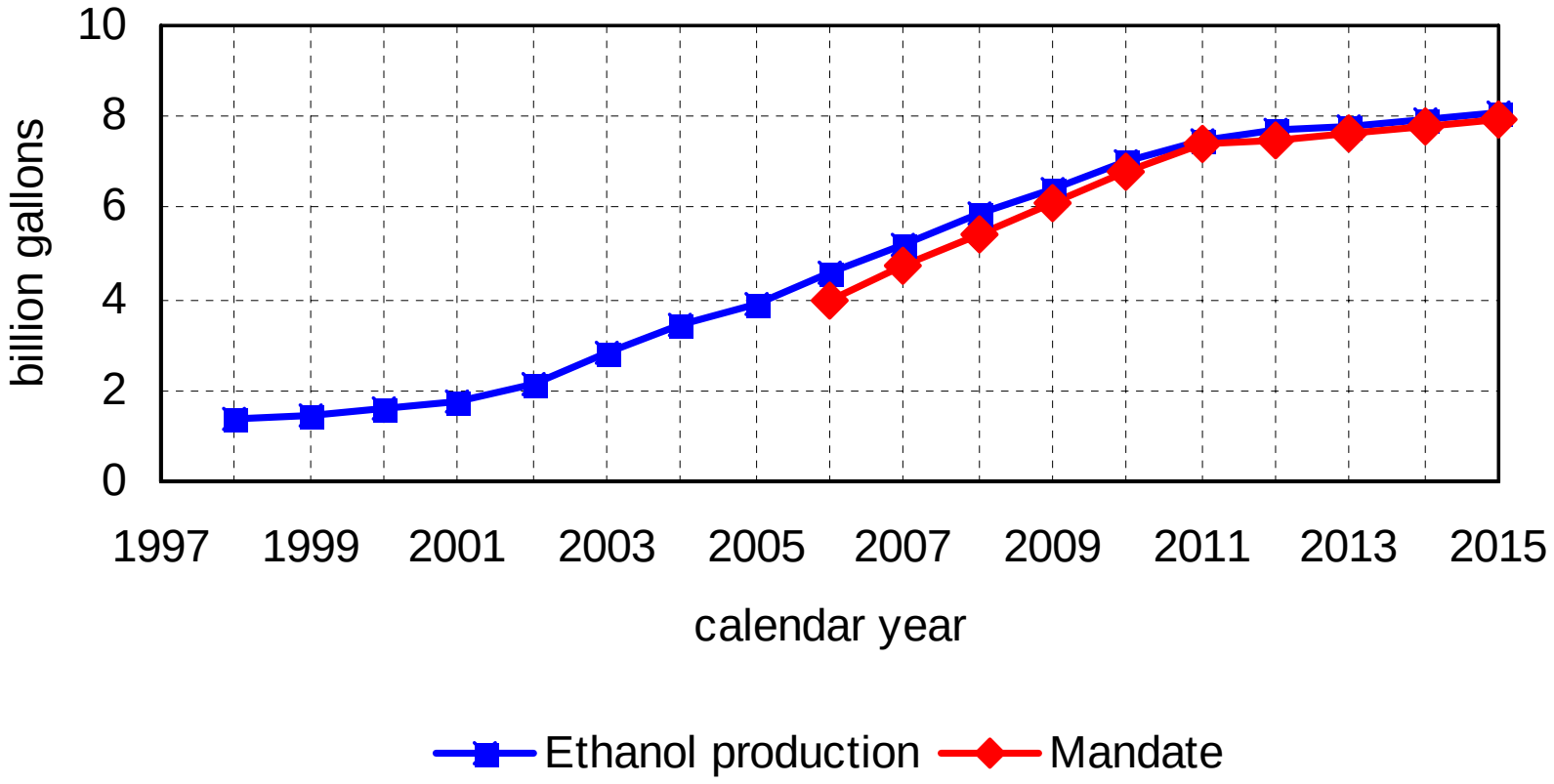


See previous two slides for calculations. Note that the costs shown exclude capital costs and all operating costs other than corn and natural gas, so actual profit margins would be smaller.

What we used to think: U.S. corn use for ethanol projections from early 2006



Ethanol production and renewable fuel mandate: FAPRI January estimates

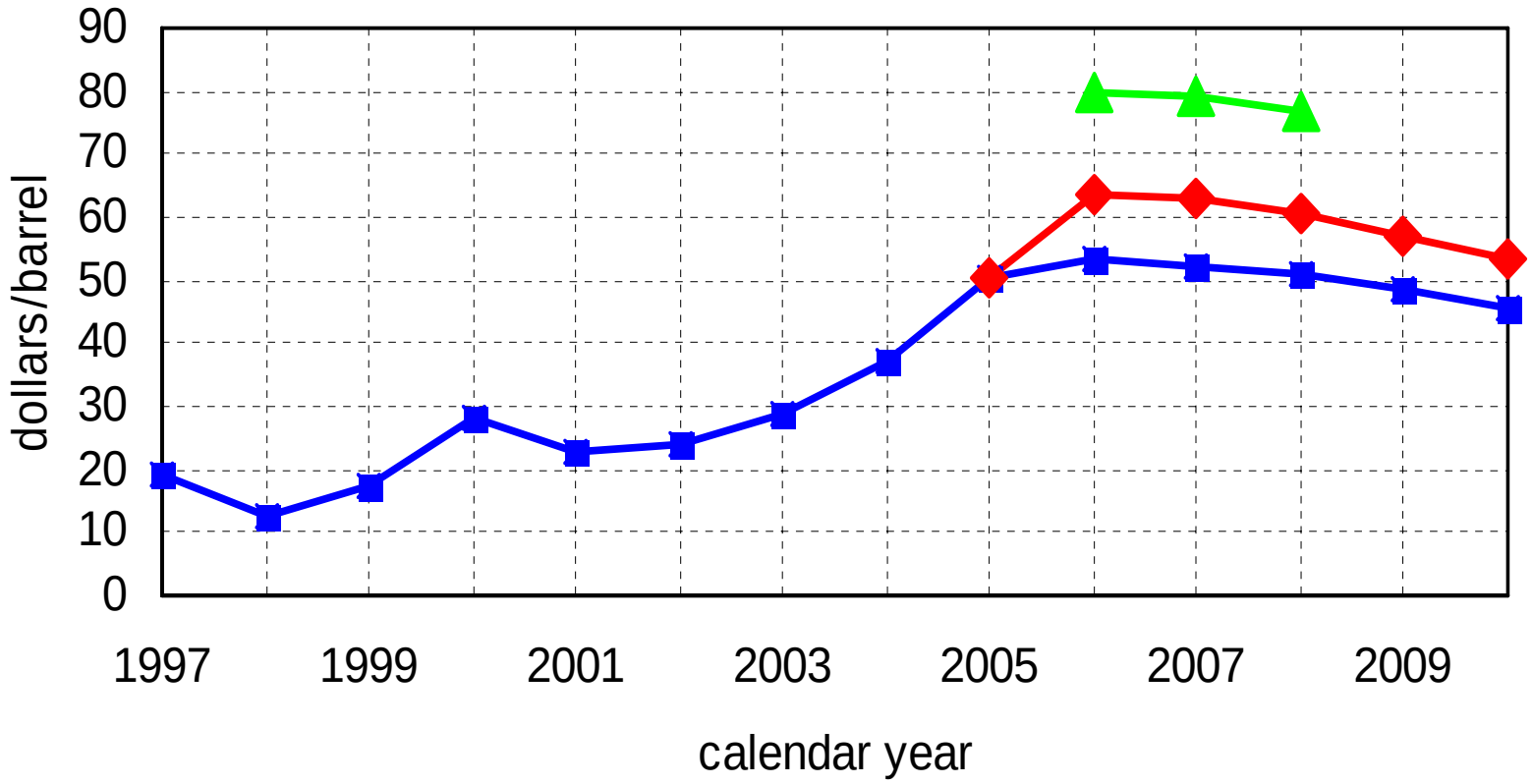


Source: FAPRI January 2006 baseline

Why estimates from just a few months ago now seem out of date

- We underestimated current pace of plant construction
  - USDA now estimates 2.15 billion bushels of corn used for ethanol in 2006/07
  - That's a 34% increase from 1.60 bil. bu. in 2005/06
- Futures markets suggest higher petroleum prices than assumed in our projections
  - Higher expected prices: more ethanol investment
  - Even if prices eventually fall, capacity will exist

Petroleum prices

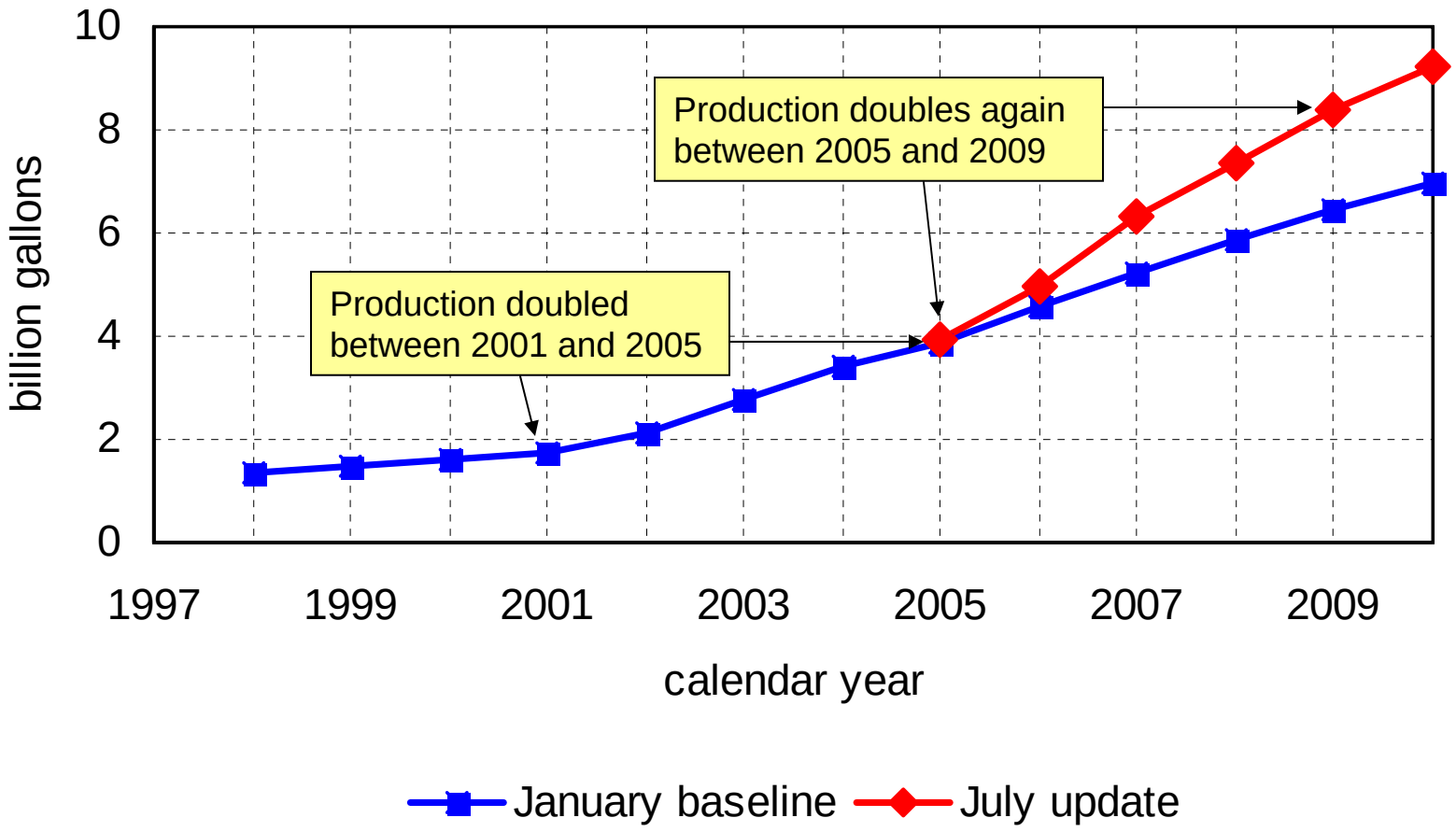


*Refiners acquisition price (Global Insight; July based on EIA projections for 2006 & 2007)
**Light sweet crude oil, NYM, July 14, 2006: Dec. 2006, Dec. 2007, and Dec. 2008 contracts

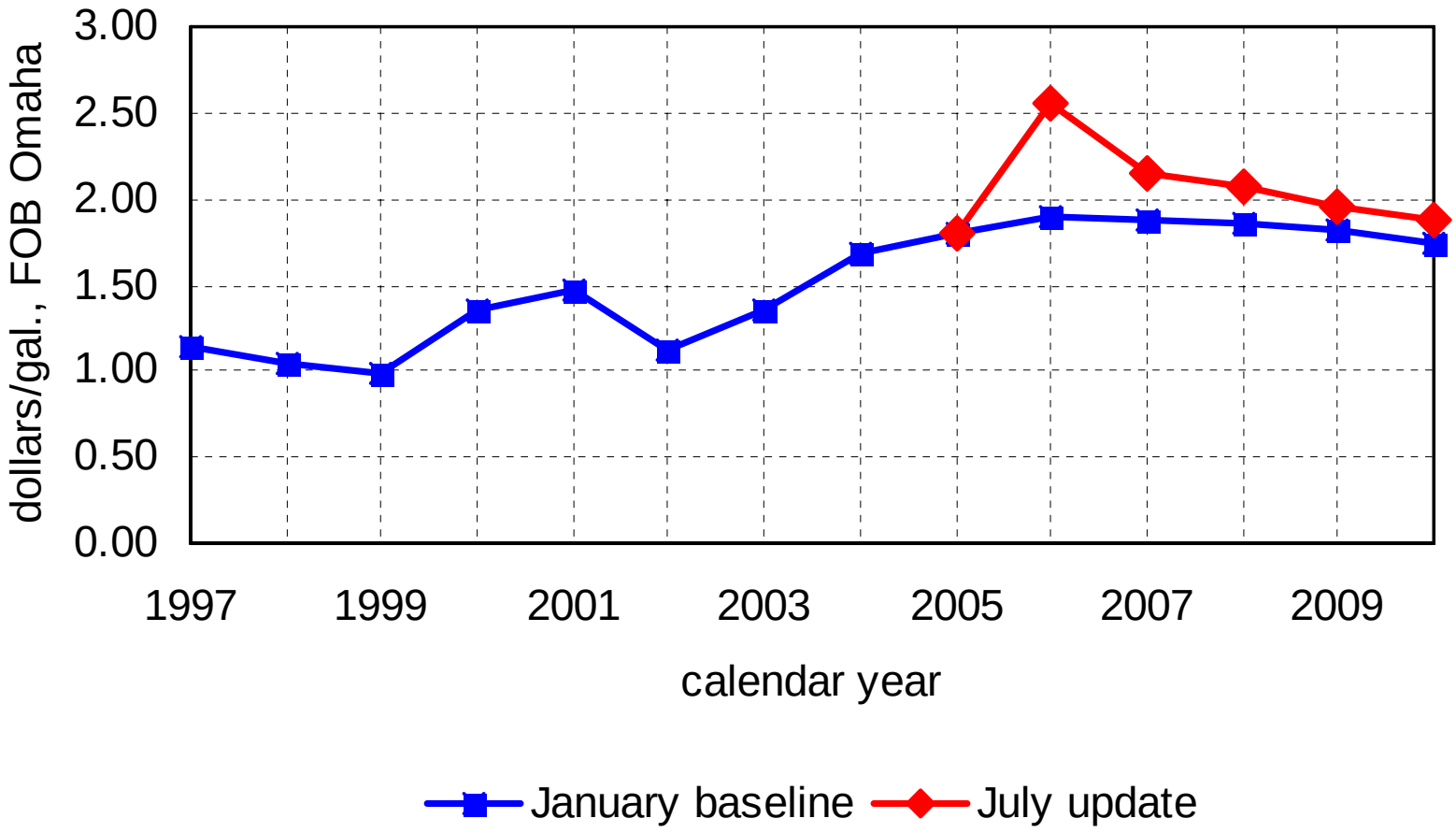
Other key baseline assumptions

- Current policies remain in place
  - Extend farm bill provisions
  - Extend $0.51/gallon ethanol tax credit
  - Continue $0.54/gallon tariff on imported ethanol
  - No policy changes because of WTO
- Average weather (relaxed in stochastic analysis)
- Macro-economy grows as forecast by Global Insight

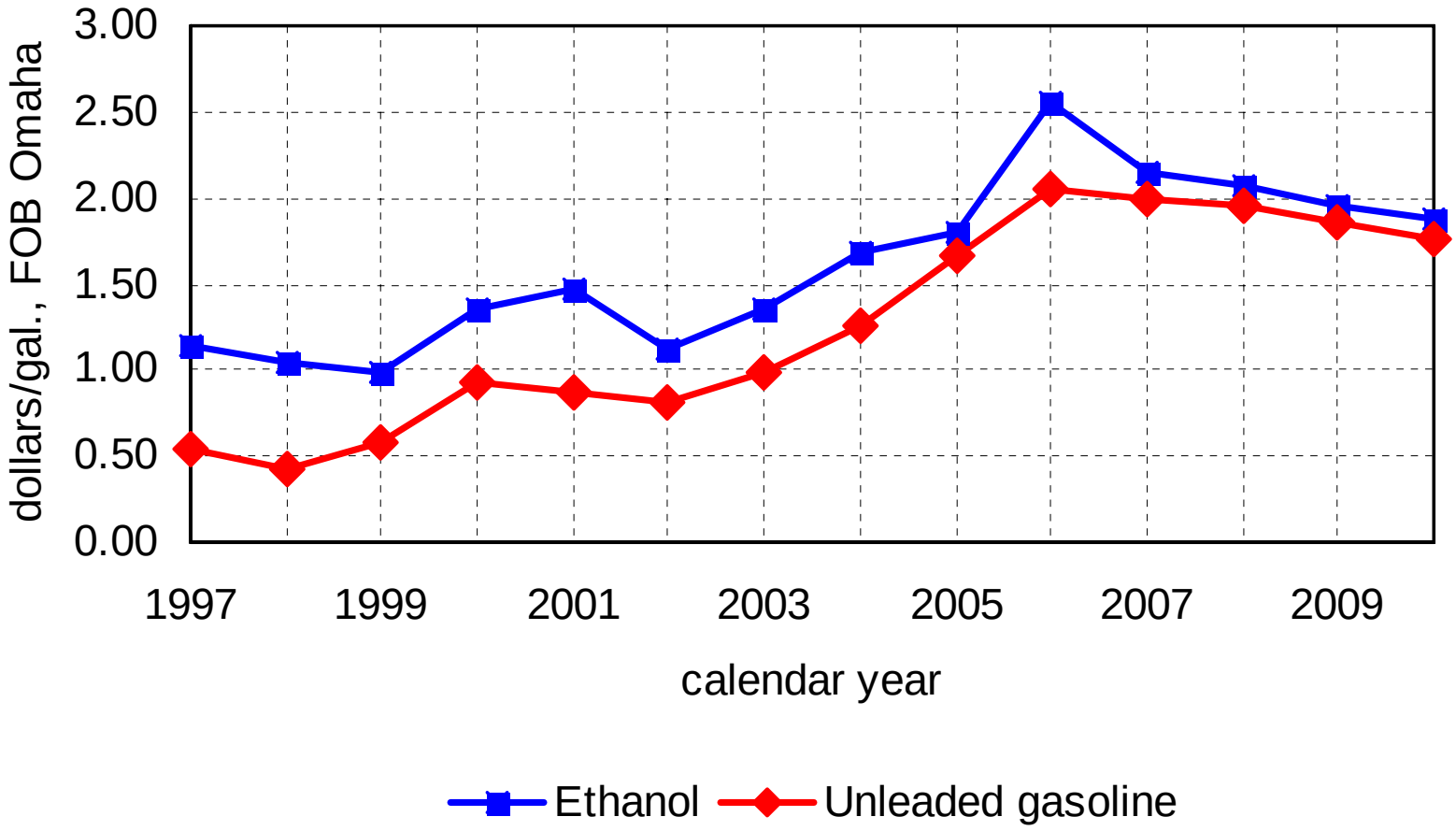
Ethanol production: FAPRI July vs. January



Ethanol prices: FAPRI July vs. January

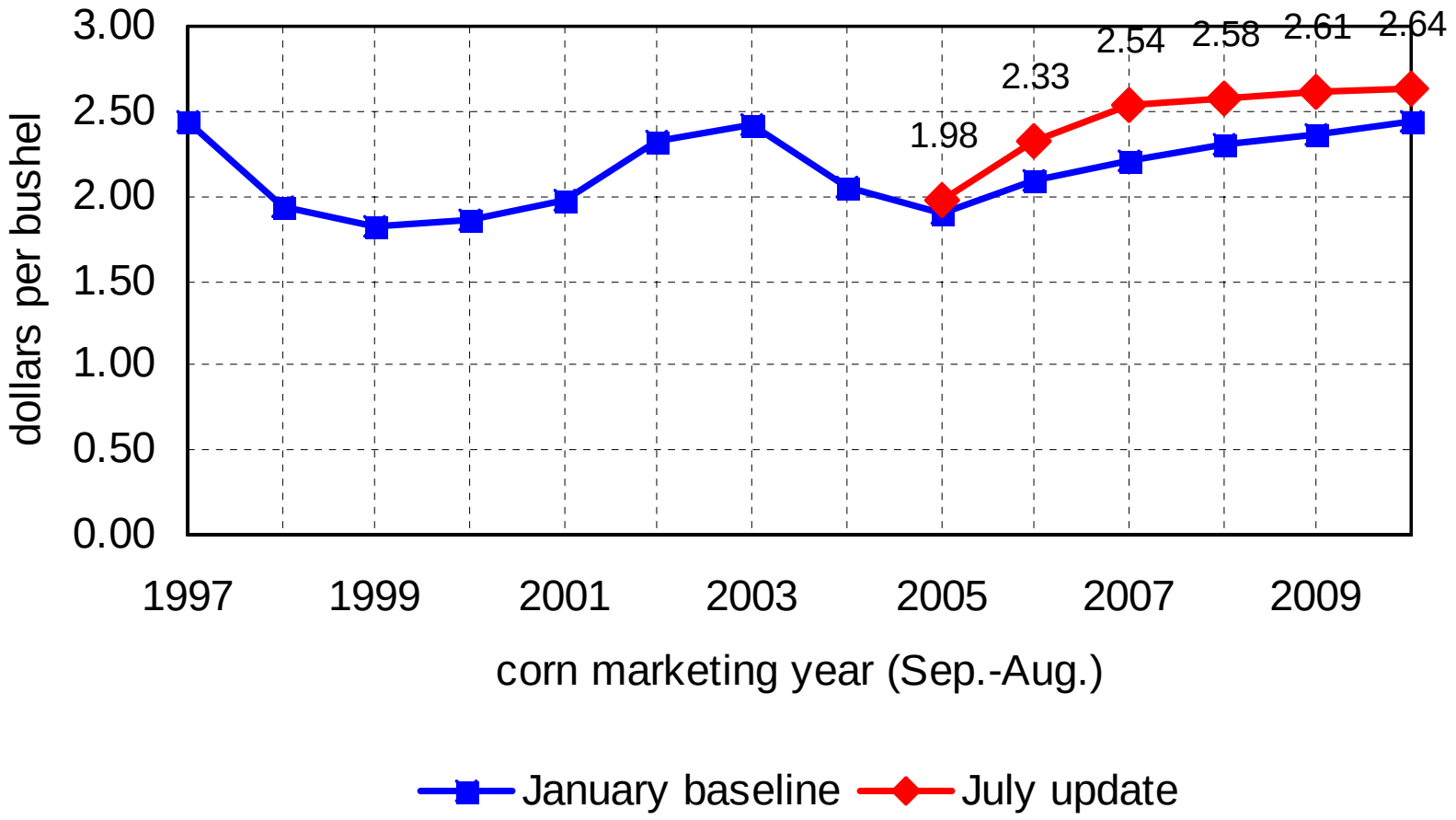


Ethanol and unleaded gasoline prices

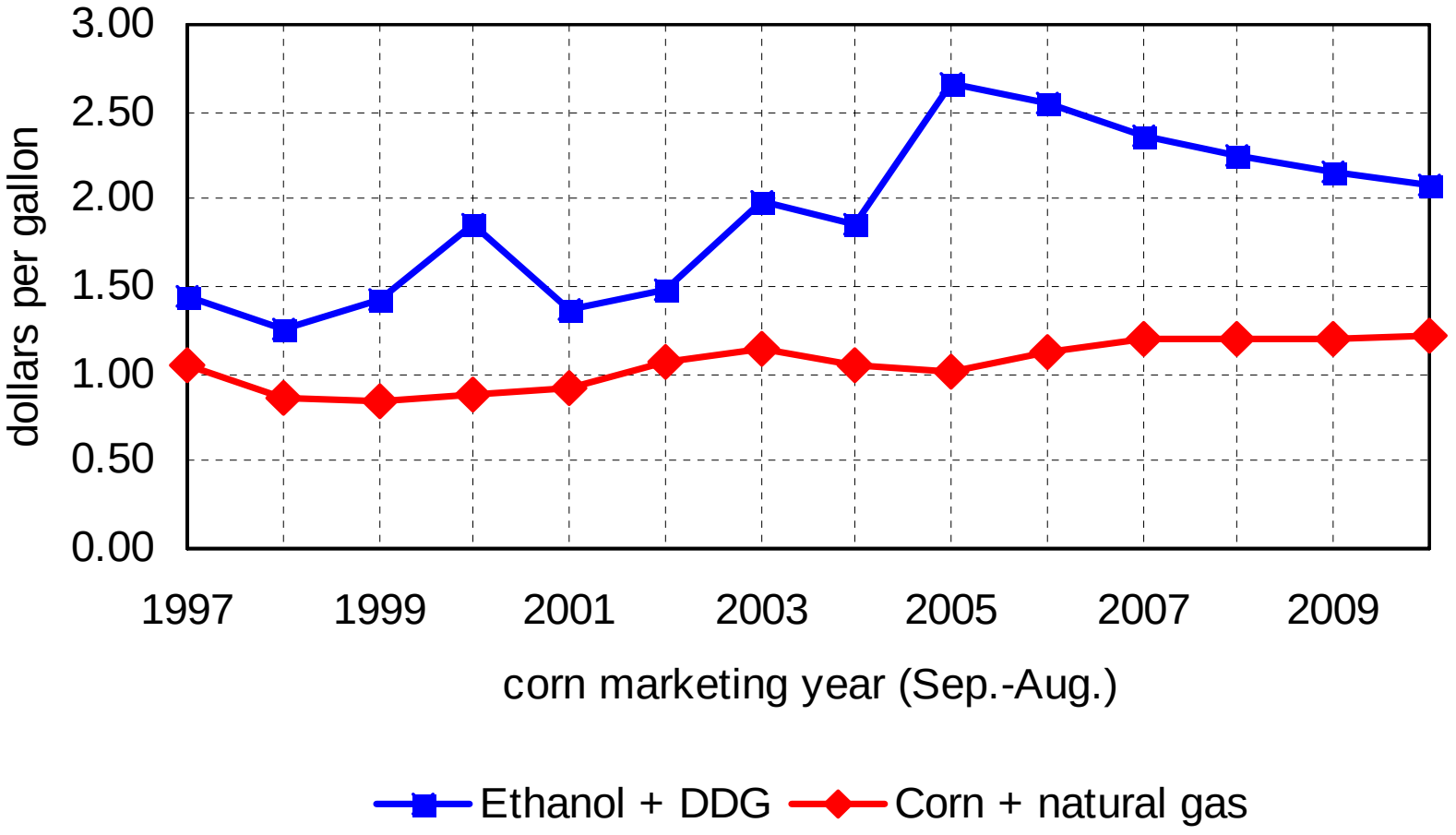


Source: FAPRI July 2006 baseline update. Retail prices exceed these rack prices because of taxes, distribution costs, etc. Ethanol qualifies for a 51 cent/gallon tax credit that reduces its retail price relative to gasoline.

Corn prices: FAPRI July vs. January



Selected revenues and costs for dry mill plant: July estimates



Note that the costs shown exclude capital costs and all operating costs other than corn and natural gas, so actual profit margins would be less than the indicated gap between selected revenues and costs.

U.S. corn outlook (bil. bu.)

	2005/06	2010/11	2010 vs. 2005
Production	11.11	12.50	1.39 (12.5%)
Feed & residual	6.10	5.97	-0.13 (-2.1%)
Ethanol	1.60	3.45	1.85 (115.9%)
Other domestic	1.38	1.38	0.00 (0.2%)
Exports	2.10	1.73	-0.37 (-17.4%)
Ending stocks	2.06	0.92	-1.09 (-55.5%)
Farm price/bu.	$1.98	$2.64	$0.66 (33.4%)

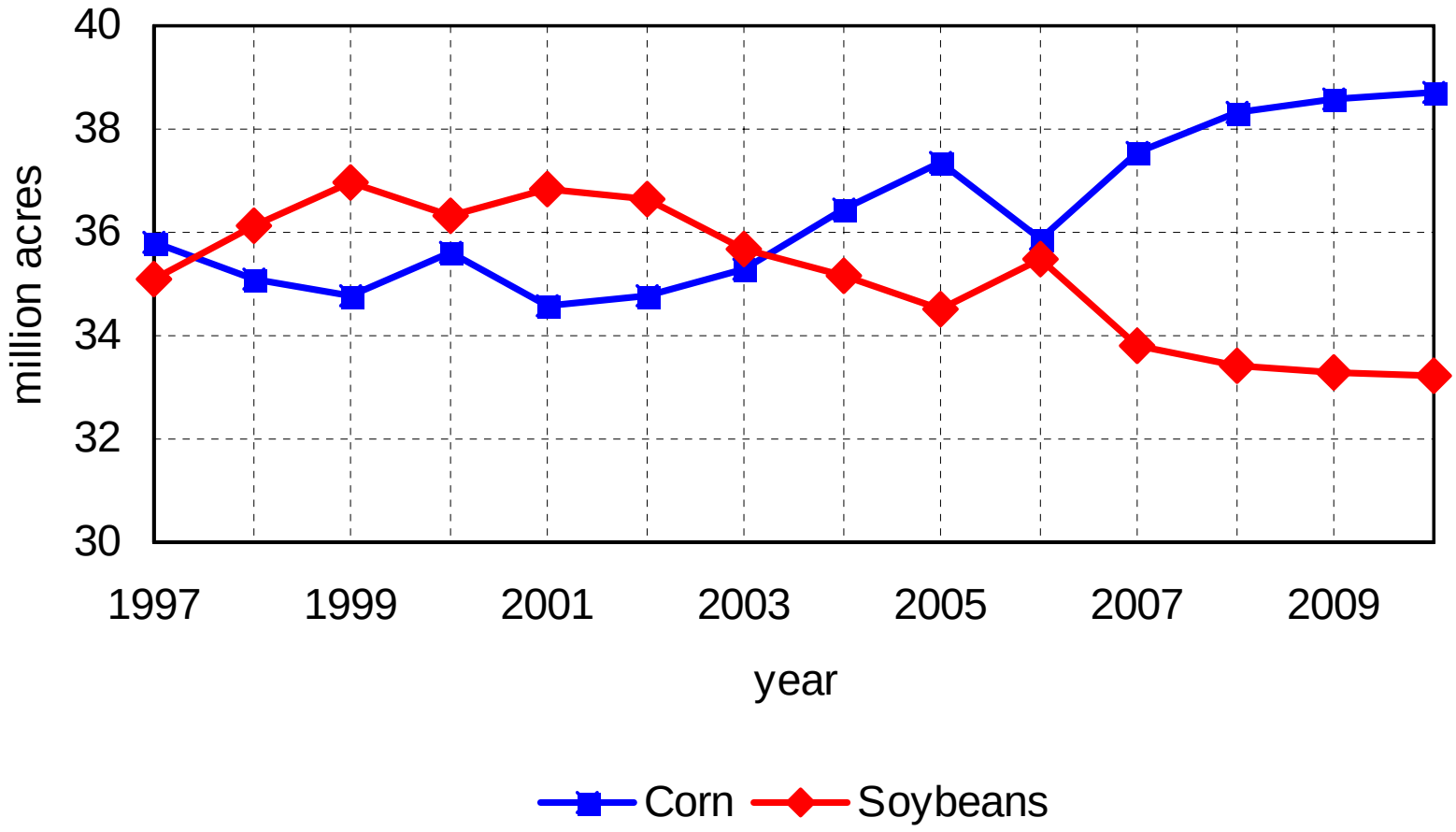
Source: FAPRI July 2006 baseline update

U.S. corn supplies

	2004	2005	2006	2010	2010 vs. 2006
Area planted	80.9	81.8	79.4	87.0	7.6 (9.6%)
Area harvested	73.6	75.1	72.1	79.9	7.8 (10.8%)
Yield	160.4	147.9	149.0	156.4	7.4 (5.0%)
Production	11.81	11.11	10.74	12.50	1.76 (16.4%)
Imports	0.01	0.01	0.01	0.01	0.00 (0.0%)

Source: FAPRI July 2006 baseline update. Area in million acres, yield in bushels per acre, production and imports in billion bushels.

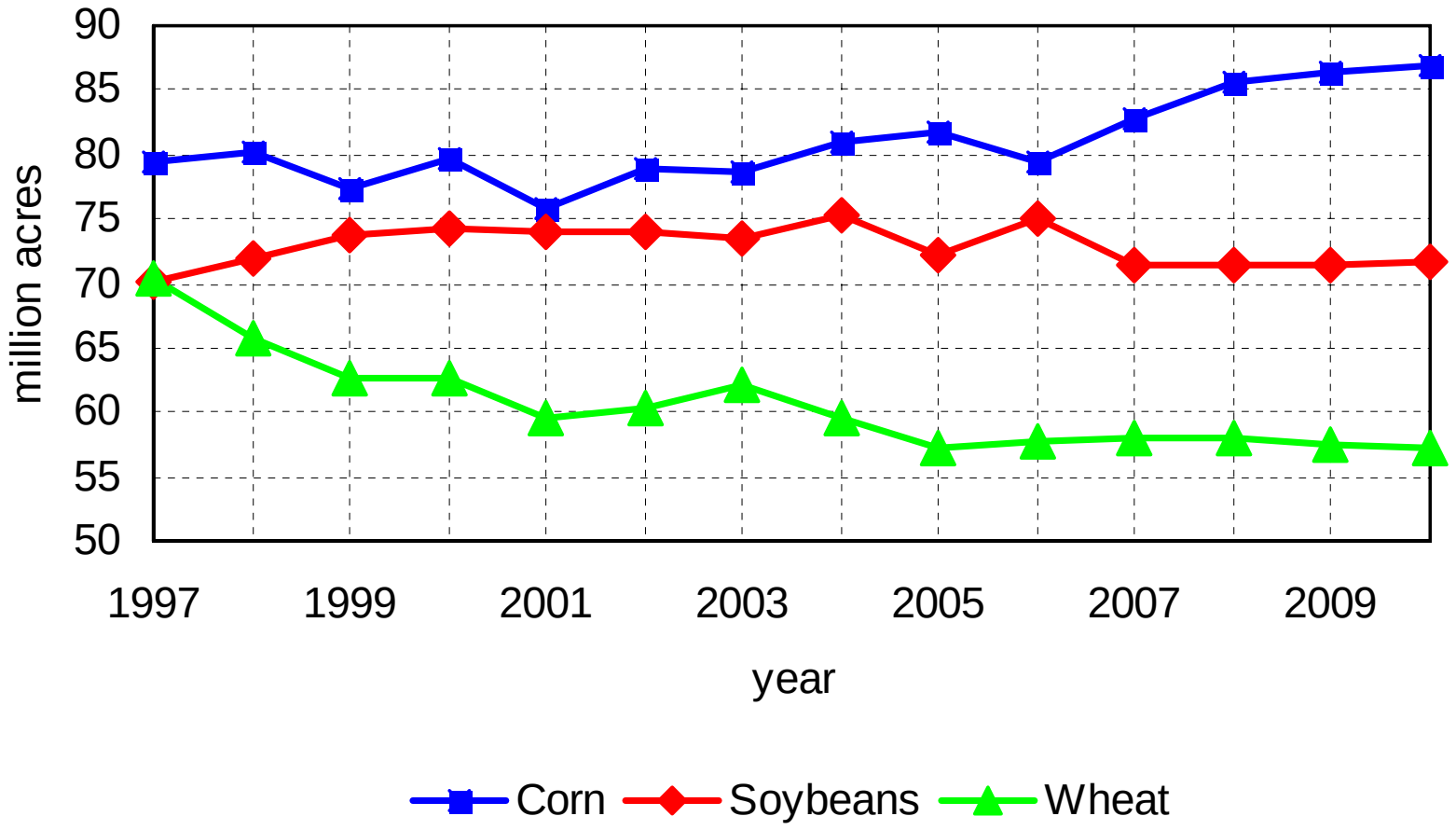
Corn Belt* acreage planted



*Iowa, Illinois, Indiana, Ohio, and Missouri

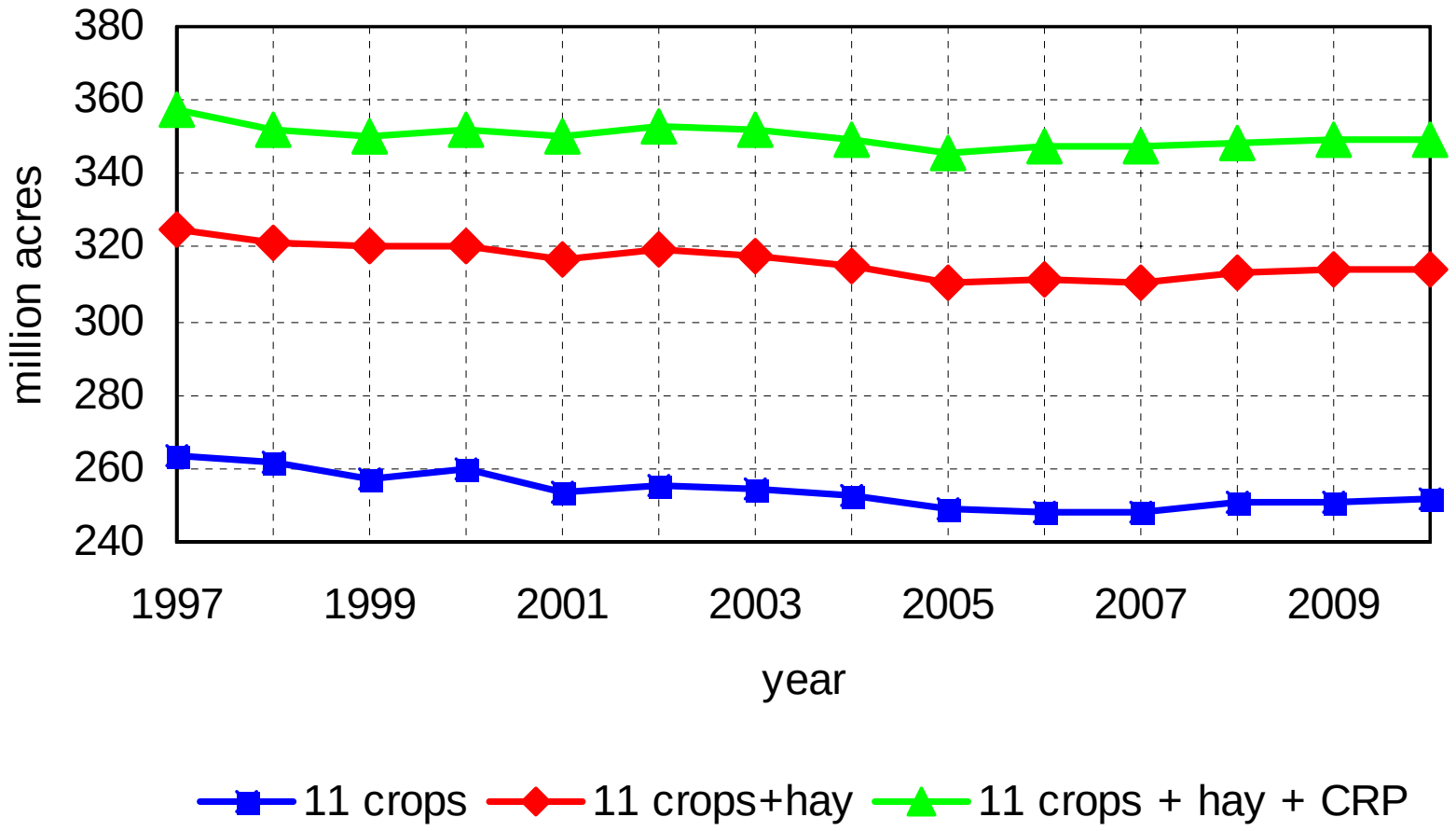
Source: FAPRI July 2006 baseline update

U.S. acreage planted



Source: FAPRI July 2006 baseline update

U.S. acreage in 11 crops*, hay, and CRP



*Corn, soybeans, wheat, upland cotton, sorghum, barley, oats, rice, sunflowers, peanuts, and canola

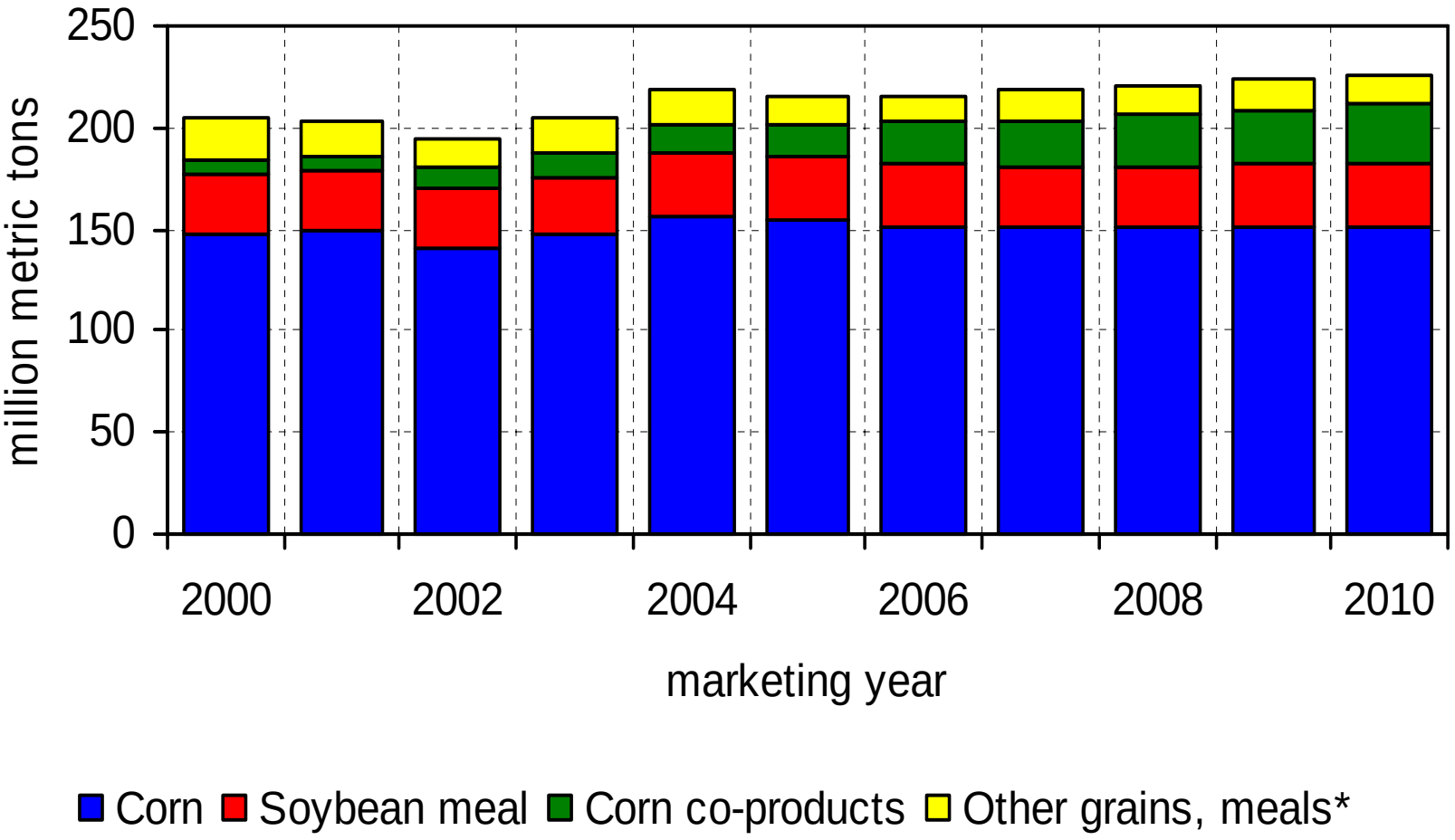
Source: FAPRI July 2006 baseline update

U.S. crop acreage planted

	2004	2005	2006	2010	2010 vs. 2006
Corn	80.9	81.8	79.4	87.0	7.6 (9.6%)
Soybeans	75.2	72.1	74.9	71.6	-3.3 (-4.5%)
Wheat	59.7	57.2	57.9	57.1	-0.7 (-1.3%)
Upland cotton	13.4	14.0	14.9	14.1	-0.8 (-5.3%)
7 other crops*	23.6	23.5	21.2	21.4	0.2 (1.1%)
Hay harvested	62.0	61.6	62.7	62.8	0.1 (0.2%)
CRP	34.9	35.6	36.0	35.0	-1.0 (-2.9%)
Sum of above	349.7	345.8	347.1	349.1	2.1 (0.6%)

*Sorghum, barley, oats, rice, sunflowers, peanuts, and canola.
Source: FAPRI July 2006 baseline update. Figures in million acres.

U.S. feed and residual use



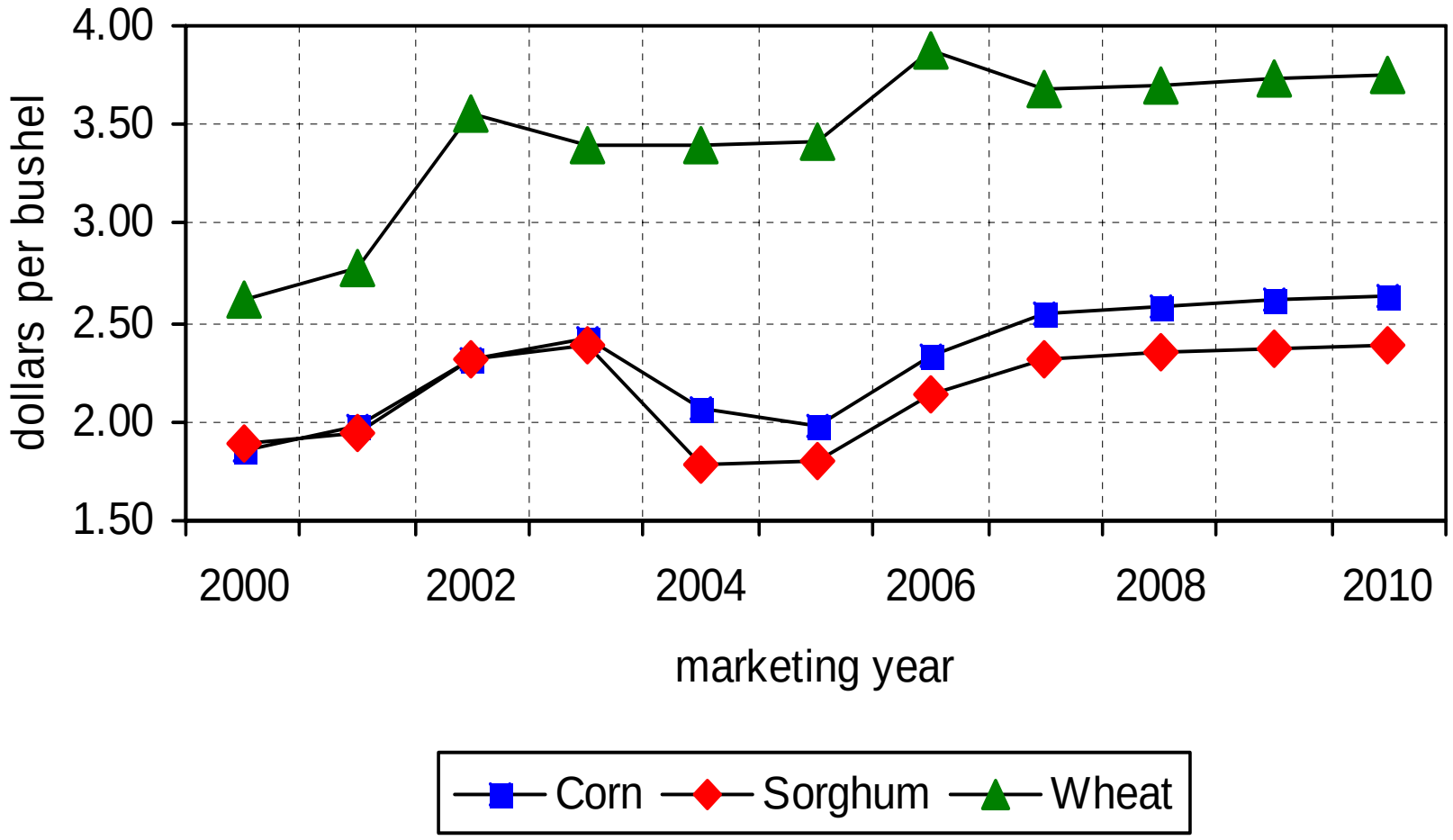
*Wheat, sorghum, barley, oats, sunflowerseed meal, cottonseed meal, and rapeseed meal
Source: FAPRI July 2006 baseline update

U.S. feed and residual use (mmt)

	2005/06	2010/11	2010 vs. 2005
Corn	154.95	151.73	-3.22 (-2.1%)
Corn co-products	15.86	28.70	12.84 (80.9%)
Soybean meal	30.30	30.85	0.55 (1.8%)
Other feeds*	14.82	14.59	-0.23 (-1.6%)
Sum of above	215.93	225.86	9.93 (4.6%)
Animal unit index	6.73	7.03	0.30 (4.5%)
Feed/animal unit	32.11	32.13	0.02 (0.1%)

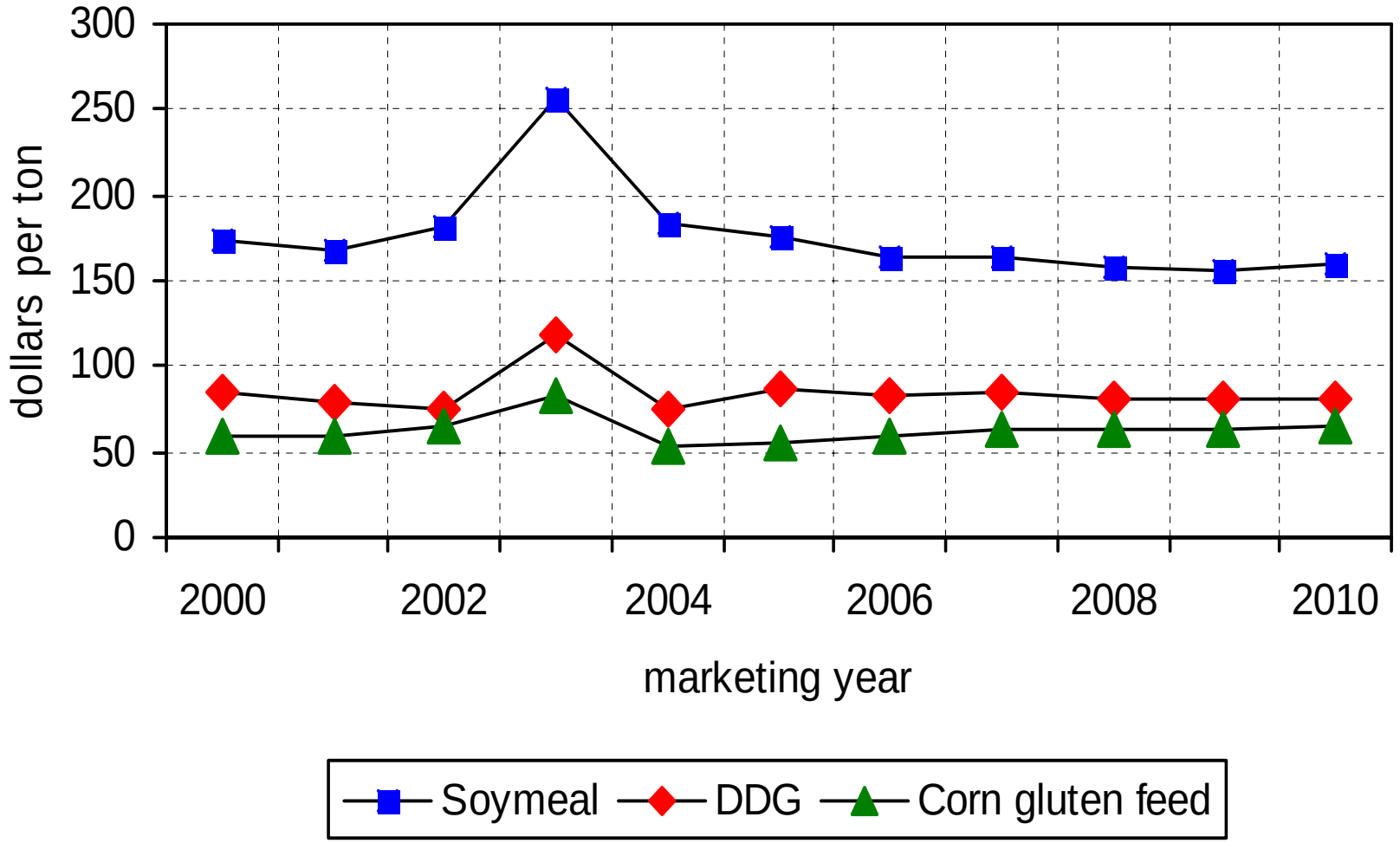
*Wheat, sorghum, barley, oats, cottonseed meal, sunflowerseed meal, and rapeseed meal
Source: FAPRI July 2006 baseline update

U.S. grain prices



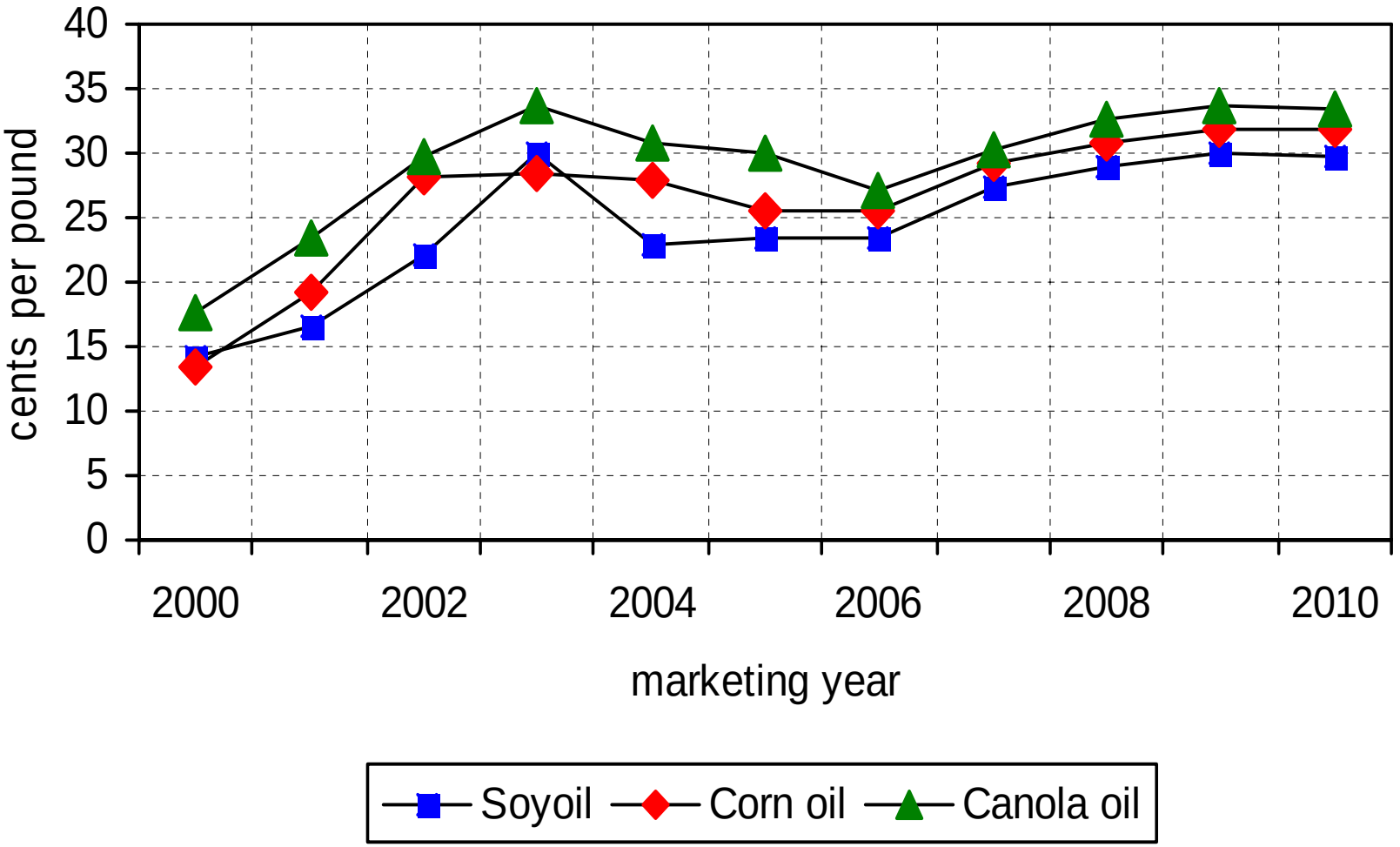
Source: FAPRI July 2006 baseline update

U.S. soymeal and corn co-product prices



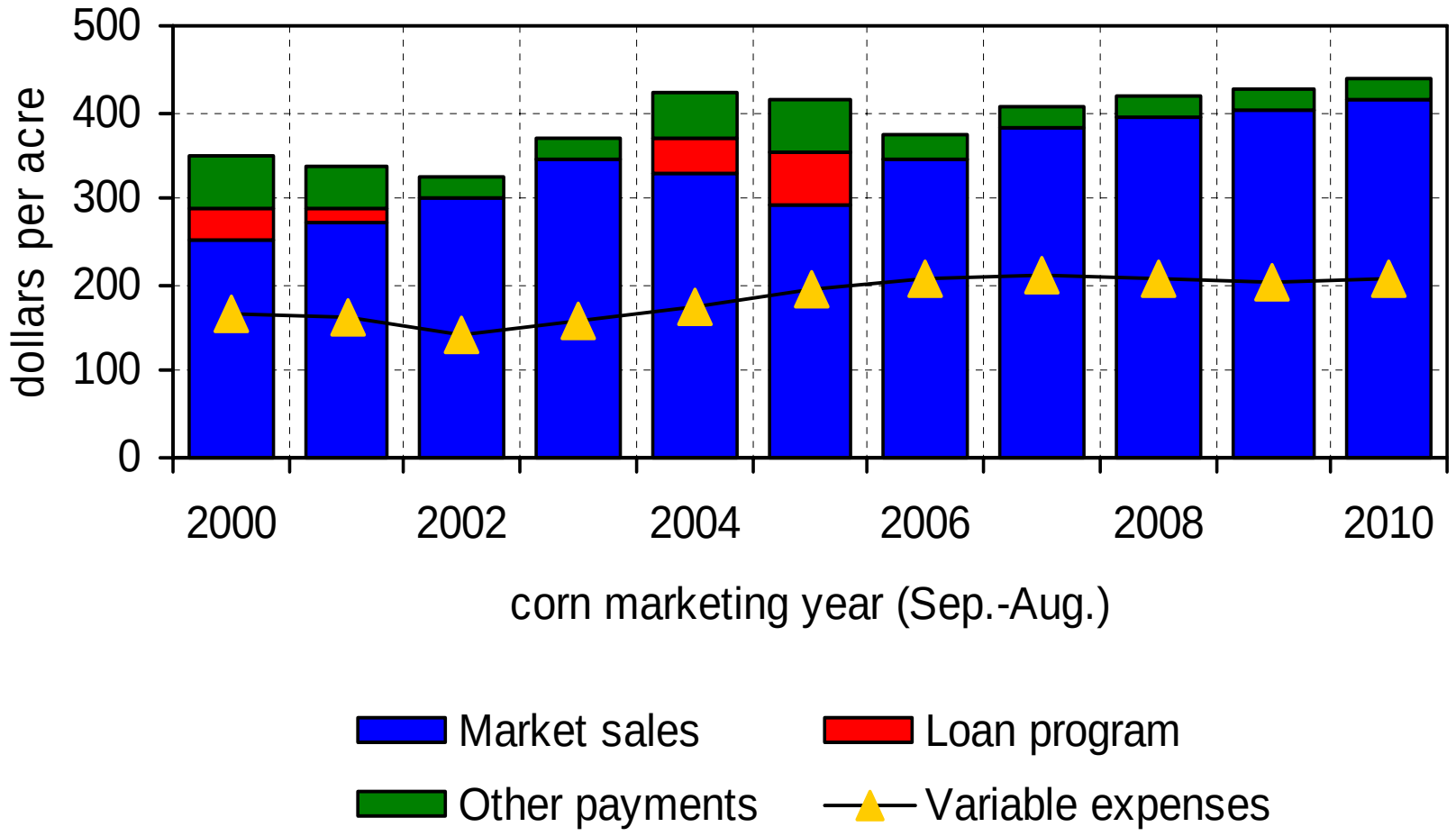
Source: FAPRI July 2006 baseline update

U.S. vegetable oil prices



Source: FAPRI July 2006 baseline update

U.S. corn returns



Source: FAPRI July 2006 baseline update

Livestock sector implications

- More biofuels mean higher grain prices
- But makes more co-products available, holding down prices for distillers grains, soybean meal
- Feeders predominantly using grain likely to lose (hogs, cattle far from ethanol plants)
- Feeders who use a lot of meal or co-products may actually gain, or at least not lose as much (cattle close to ethanol plants, maybe poultry)
- In case of drought, who “wins” battle for limited grain/oilseed supplies?
  - Livestock producers?
  - Foreign buyers?
  - Biofuel producers?

Biodiesel

- No published FAPRI estimates
- Little production until very recently, but lots of capacity under construction or planned
- Already very important in Europe
- Agricultural market implications
  - Higher prices for vegetable oil and oilseeds
  - Lower prices for protein meals
  - Important question: How much substitution among vegetable oils in biodiesel production or other uses?

Feedstock costs per gallon of biofuel

Corn price	Cost/gallon of ethanol*
$2.00/bu.	$0.72
$2.50/bu.	$0.90
$3.00/bu.	$1.08

Veg. oil price	Cost/gallon of biodiesel**
$0.20/lb.	$1.54
$0.25/lb.	$1.93
$0.30/lb.	$2.31

*Assumes 2.77 gal./bu. of corn

**Assumes 7.7 lbs. veg. oil/gallon

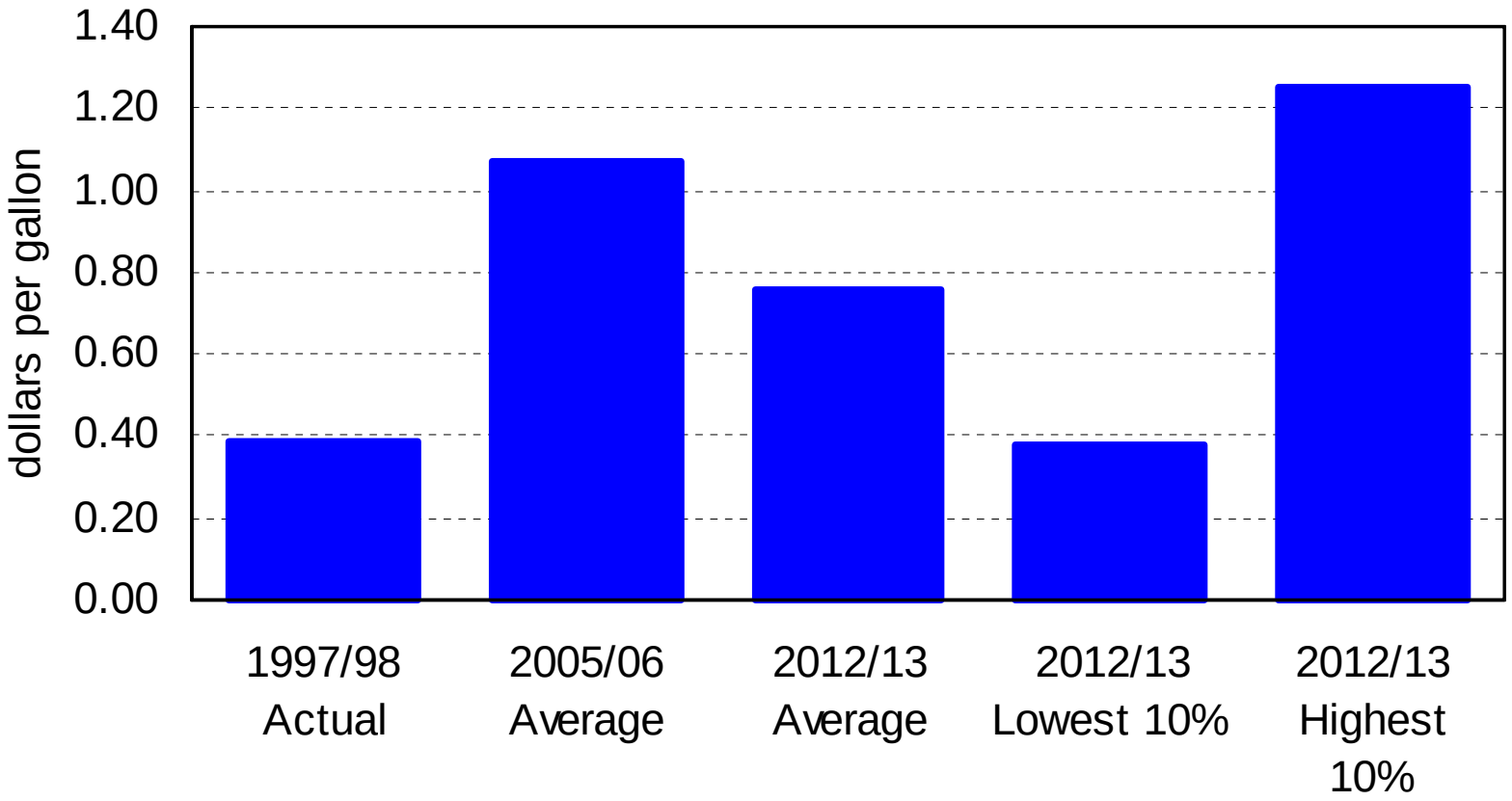
Policy issues

- Federal $0.51 tax benefit for ethanol
- Federal $1.00 tax benefit for biodiesel from “virgin” vegetable oil
- $0.54/gallon tariff on imported ethanol coming directly from non-Caribbean countries
- Other state and federal incentives
- Biofuel use mandate in 2005 Energy Bill
  - 7.5 billion gallons by 2012
  - Now appears unlikely to ever be binding—may have encouraged investment, but little future impact likely

What could go wrong?

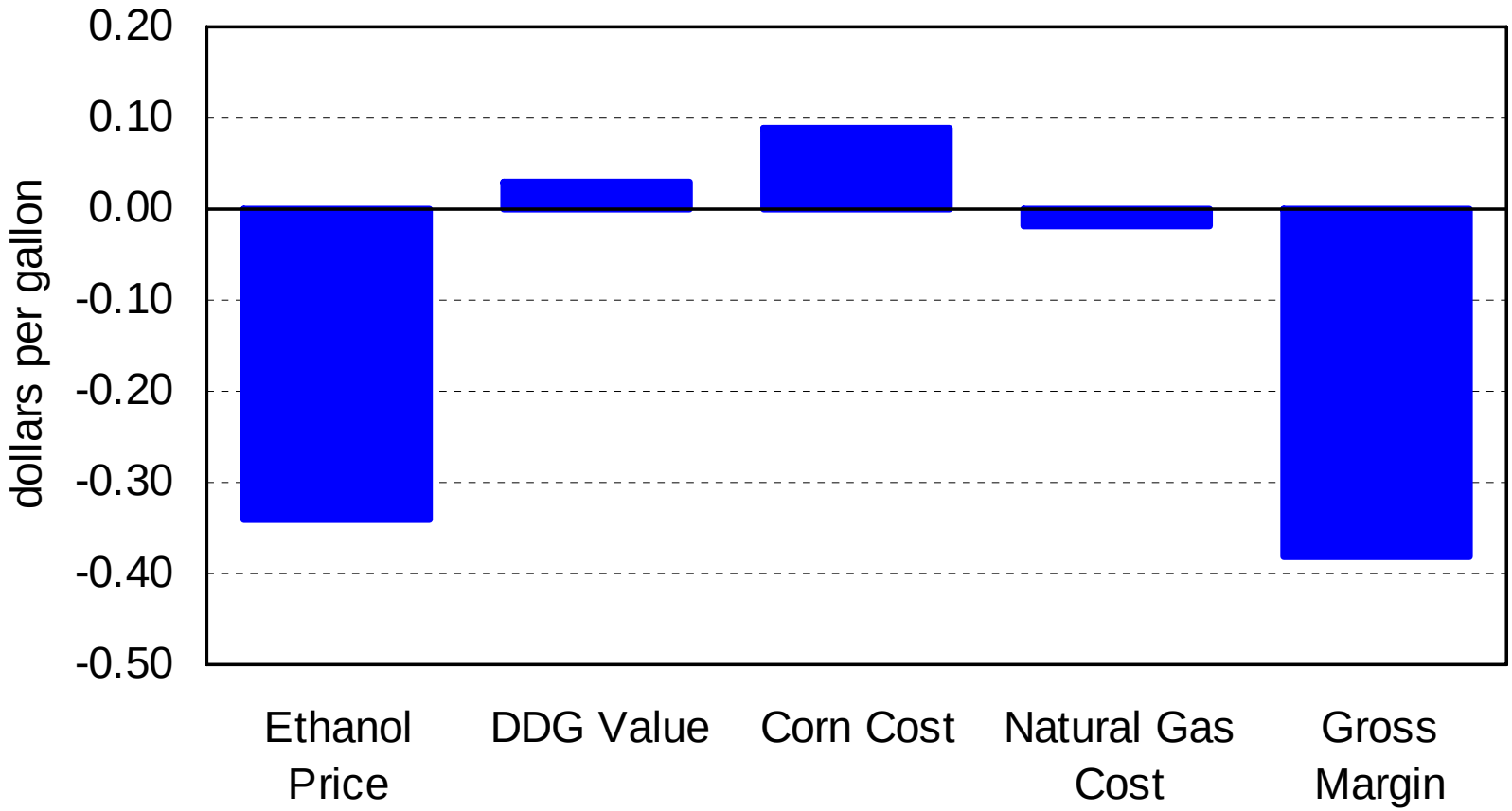
- From ethanol industry perspective:
  - Low ethanol prices
  - High corn prices
  - Change in policies
- From livestock sector perspective
  - “Too much, too fast”
  - Higher corn prices
  - Battle for available supplies if short crop
- We looked at some sources of variation around our January baseline—”stochastic analysis”

Gross margin comparisons



Source: FAPRI January 2006 stochastic baseline. Gross margin defined here as value of ethanol + distillers grains minus the cost of corn and natural gas. Note that this excludes capital and other operating costs, so the calculated margins exceed actual profit margins.

2012 gross margins: lowest 10% vs. average



Source: FAPRI January 2006 stochastic baseline. Gross margin defined here as value of ethanol + distillers grains minus the cost of corn and natural gas. Note that this excludes capital and other operating costs, so the calculated margins exceed actual profit margins.

Summary

- Current market and policy conditions encourage very rapid growth in biofuels
- Risks for biofuel industry
  - Downturn in petroleum prices
  - Run-up in grain, vegetable oil prices
  - Unfavorable change in policies
- Risks for farm sector
  - Volatility if “too much, too fast”
  - Livestock sector (and other users) in short crop year
  - Long-run link in prospects for ag. and energy markets

On our website…

- Analysis of 2005 Energy Policy Act: http://www.fapri.missouri.edu/outreach/publications/2005/FAPRI_UMC_Report_10_05.pdf
- Briefing materials for March 2006 meeting with Rep. Peterson: http://www.fapri.missouri.edu/outreach/publications/2006/FAPRI_UMC_Report_02_06.pdf
- Find the July 2006 baseline update and other new reports at: www.fapri.missouri.edu

Additional slides

Biofuel conversion factors, 2012

	Crop yield per acre	Vegetable oil yield	Biofuel yield per unit	Biofuel yield per acre
Ethanol from corn	158.6 bu.		2.77 gallons per bu.	439 gallons/a.
Ethanol from sugarbeets	23 tons		24 gallons per ton	552 gallons/a.
Biodiesel from soybean oil	42.8 bu.	11.3 lbs./bu.	7.7 lbs. per gallon	63 gallons/a.
Biodiesel from canola oil	1557 lbs.	0.383 lbs/lb.	7.7 lbs. per gallon	77 gallons/a.

Crop yields and vegetable oil yields from FAPRI Jan. 2006 baseline for 2012. Biofuel yields are assumptions from various sources

Implications of conversion factors

- Yields per acre may not be good indicator when selecting biofuel feedstuff
  - In U.S., corn usually cheaper than sugar, even though more ethanol/acre of sugar
  - In U.S., soyoil usually cheaper than rapeseed oil, even though more biodiesel/acre of rapeseed
- Per-gallon feedstock prices are greater for biodiesel than ethanol
  - Implies need higher price/gallon for biodiesel than for ethanol for economics to work (not quite this simple, but close)
  - Note biodiesel subsidy = $1.00 per gallon vs. $0.51 for ethanol
  - Biodiesel economics look more vulnerable to run-up in feedstock price