The Long-Run Impact of Corn-Based Ethanol on the Grain, Oilseed, and Livestock Sectors: A Preliminary Assessment

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Objectives of Ongoing USDA-Funded Research Project

- Where is a logical conclusion to this ethanol boom?
- Will enough ethanol be produced to significantly reduce gasoline use?
- What macroeconomic impacts will there be?
- What will be the impact on crop prices and acreage?
- What will be the impact on current users of corn?
- What will be the impact competitiveness of U.S. agriculture?
- What will be the impact on regional and rural development?

One Logical End Point

- Calculate the corn price such that there is no longer an incentive to invest in another ethanol plant.

- Allow all other markets to adjust
  - Domestic feed use including distillers grains
  - U.S. acreage of corn and other crops
  - Foreign production of crops and livestock overseas
  - Exports

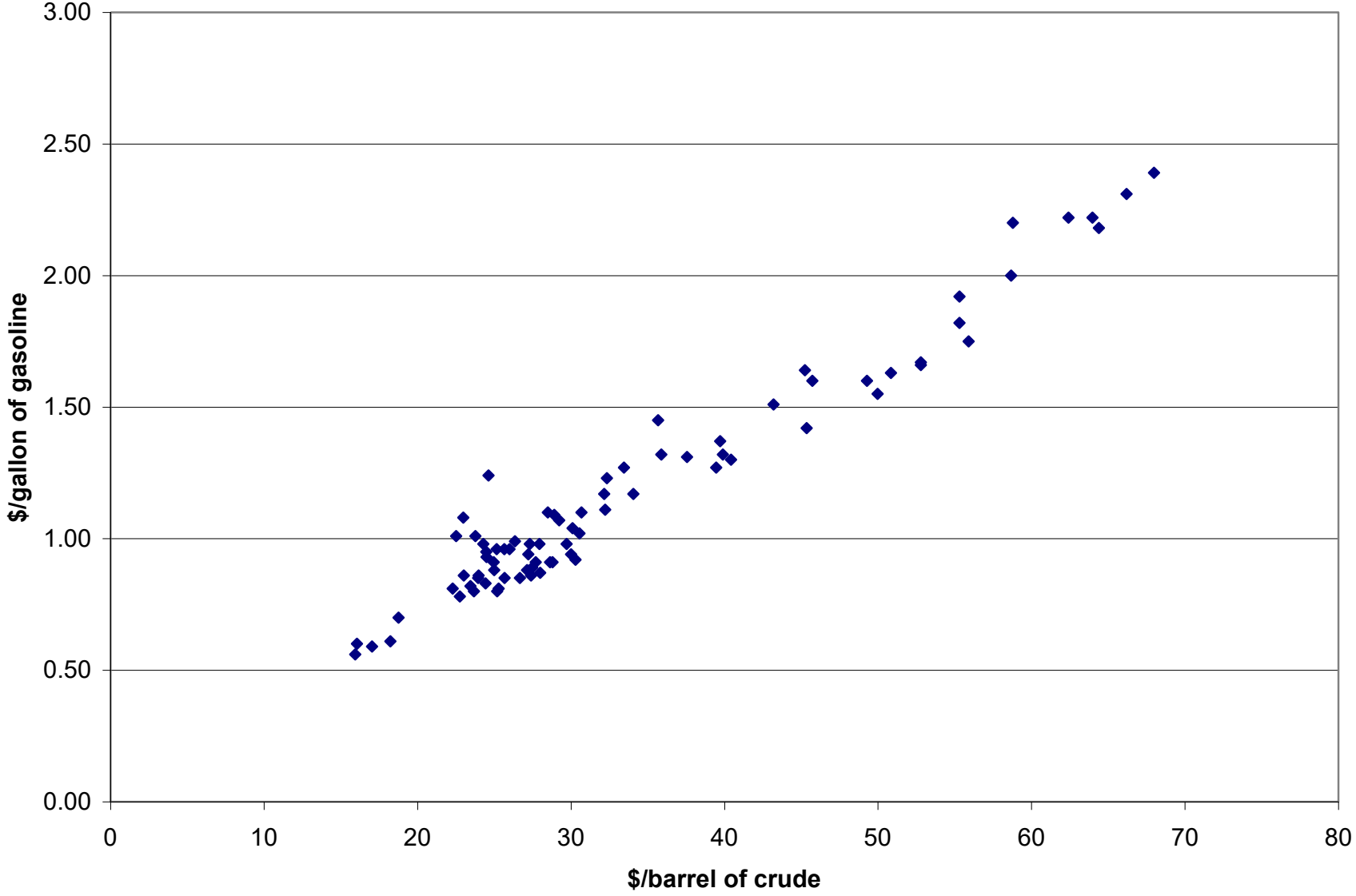
Assumptions

- Ethanol valued at BTU content
  - 2/3 that of gasoline at the wholesale level
- Distillers grains valued at $77/ton
  - Current price is $110/ton
- Cost of running an ethanol plant = $0.52/gal
- Cost of building an ethanol plant = $0.24/gal
- Future production efficiency = 3 gallons/bushel

Break-even corn price

Price of corn = 3* ((price of gasoline*0.667) + tax credit) +
price of DDG – cost of capital – operating cost

Relationship Between Crude Oil and Gasoline Prices



Corn price under different crude oil and tax credit scenarios

With federal tax credit

Crude Oil Price $/barrel	Gasoline Price $/gallon	Corn Price $/bushel
40	1.38	2.67
50	1.73	3.36
60	2.07	4.05
70	2.42	4.74
80	2.76	5.43

Without federal tax credit

Crude Oil Price $/barrel	Gasoline Price $/gallon	Corn Price $/bushel
40	1.38	1.14
50	1.73	1.83
60	2.07	2.52
70	2.42	3.21
80	2.76	3.90

Impact of $4.05 corn

- U.S. corn acres will increase
- World feed grain prices will increase
- Quantity of corn used for feed, food, and exports will decline
- World feed grain production will increase
- Livestock prices will increase

First Modeling Results

- Corn planted acreage = 95.6 million
- Corn Production = 15.5 billion bushels (Yield = 164 bu/ac)
- Ethanol production = 31 billion gallons
- Corn feed use declines by 1/3
- Exports go negative
- Soybean acreage declines by 13%

Impact on Livestock

- U.S. pork production declines by 10-15 percent to allow wholesale prices to rise to cover increased feed costs
- Beef cattle adjustments much less as their feed costs do not rise as much
- Dairy industry affected by an intermediate amount
- Poultry exports decline

Valid Critiques of Analysis

1. Three gallons per bushel conversion rate too high
2. DDG price too high unless they enter export market
3. Ethanol price too high once we hit 100% market penetration of 10% blend
4. Ignore contribution of cellulosic ethanol
5. Models of livestock use of distillers grains need to be improved
6. Likelihood that U.S. will import feed grains likely too high
7. Does not account for short crop years

Long-Run Break-Even Corn Prices at 2.85 gallons/bushel and Alternative DDG Prices

Price of Crude ($/barrel	Price of Dried Distillers Grains ($/ton)		
	0	**40**	**80**
40	1.87	2.21	2.55
50	2.53	2.87	3.21
60	3.19	3.53	3.87
70	3.84	4.18	4.52
80	4.50	4.84	5.18

Note: Fuel tax credit held fixed at $0.51/gallon

Short-Run Adjustments

- Ethanol production from 2007 crop pegged at 9.1 billion gallons (3.7 billion bushels)
- If exports and domestic corn use stay at projected 2006 crop use levels of 9.64 billion bu; and make no addition to stocks

➢ Need a 2007 corn crop of 13.1 billion bu. At trend yield of 153 bu/ac, we need 93.2 million acres

2008 Crop Year Adjustments

- Ethanol production from 2008 crop pegged at 12.2 billion gallons (4.65 billion bushels)
- If exports and domestic corn use stay at projected 2006 crop use levels of 9.4 billion bu; and make no addition to stocks

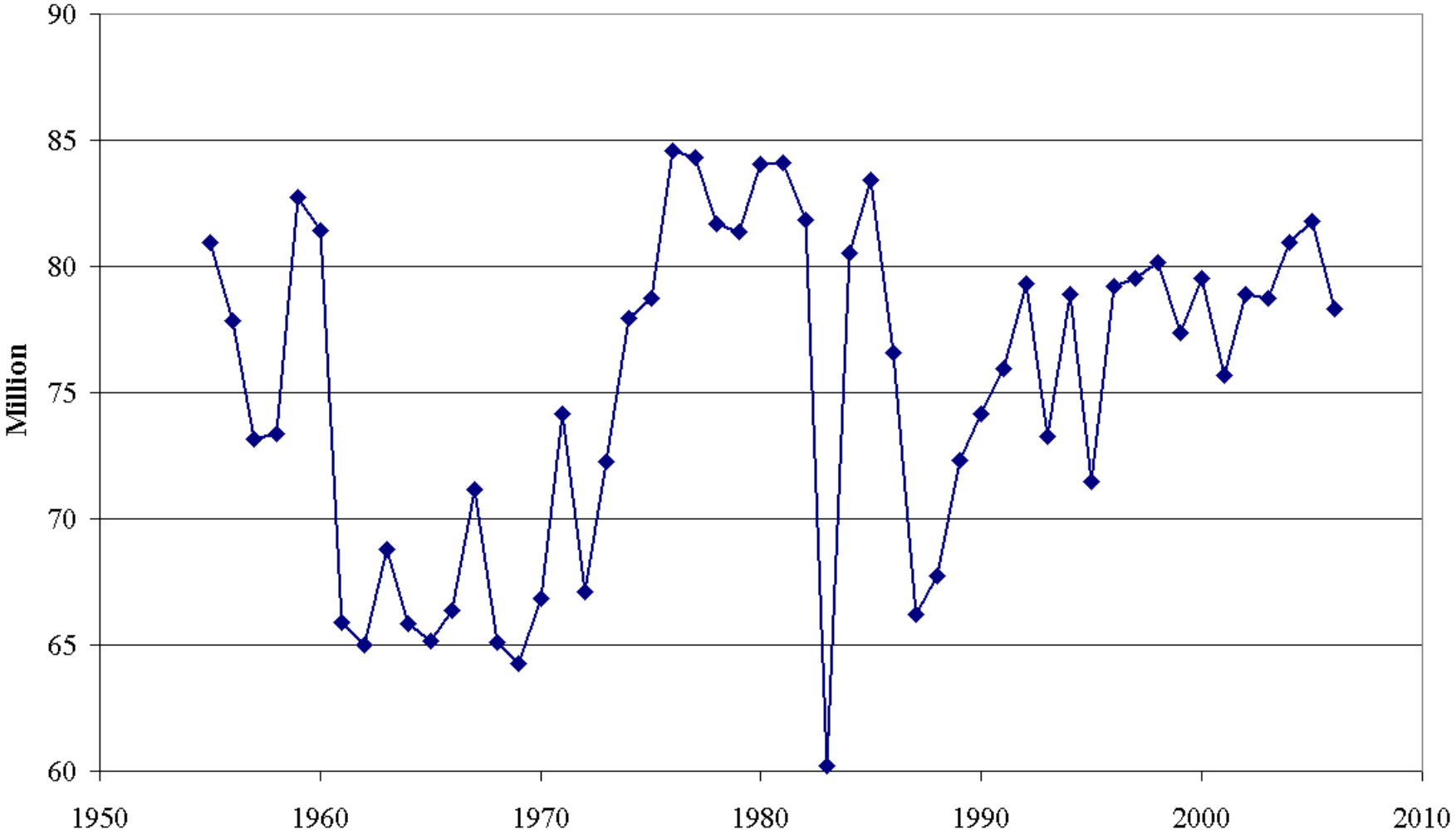
➢ Need a 2008 corn crop of 14.1 billion bu. At trend yield of 155 bu/ac, we need 98.1 million acres

2007 Crop Year Adjustments

- Feed use cut back by 10%
- Exports cut back by 25%
- Food use cut back by 5%

- Need 87 million acres in 2007
- Need 90 million acres in 2008
- We planted 78 million acres in 2006

U.S. Corn Planted Acreage



Impact of Yield Variability

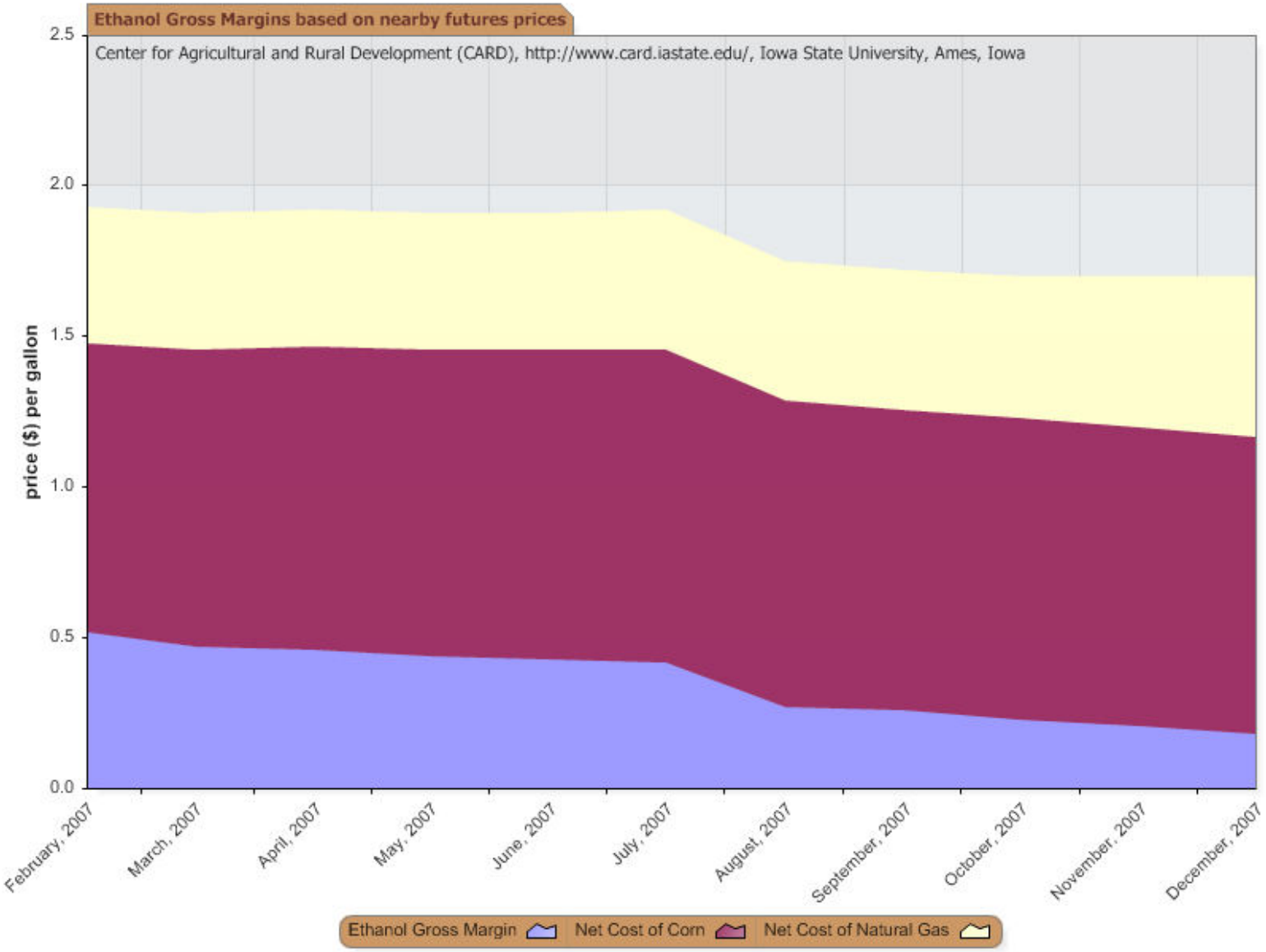
- 10% yield increase not an unreasonable occurrence
  - Given the built-in demand for corn, prices might not fall by more than it costs to store corn from one year to the next (50 cents?)
- 15% yield decrease a 1 in 12 chance
  - Corn prices would rise until ethanol plants shut down

Corn Price Ceiling Due to a Short Crop

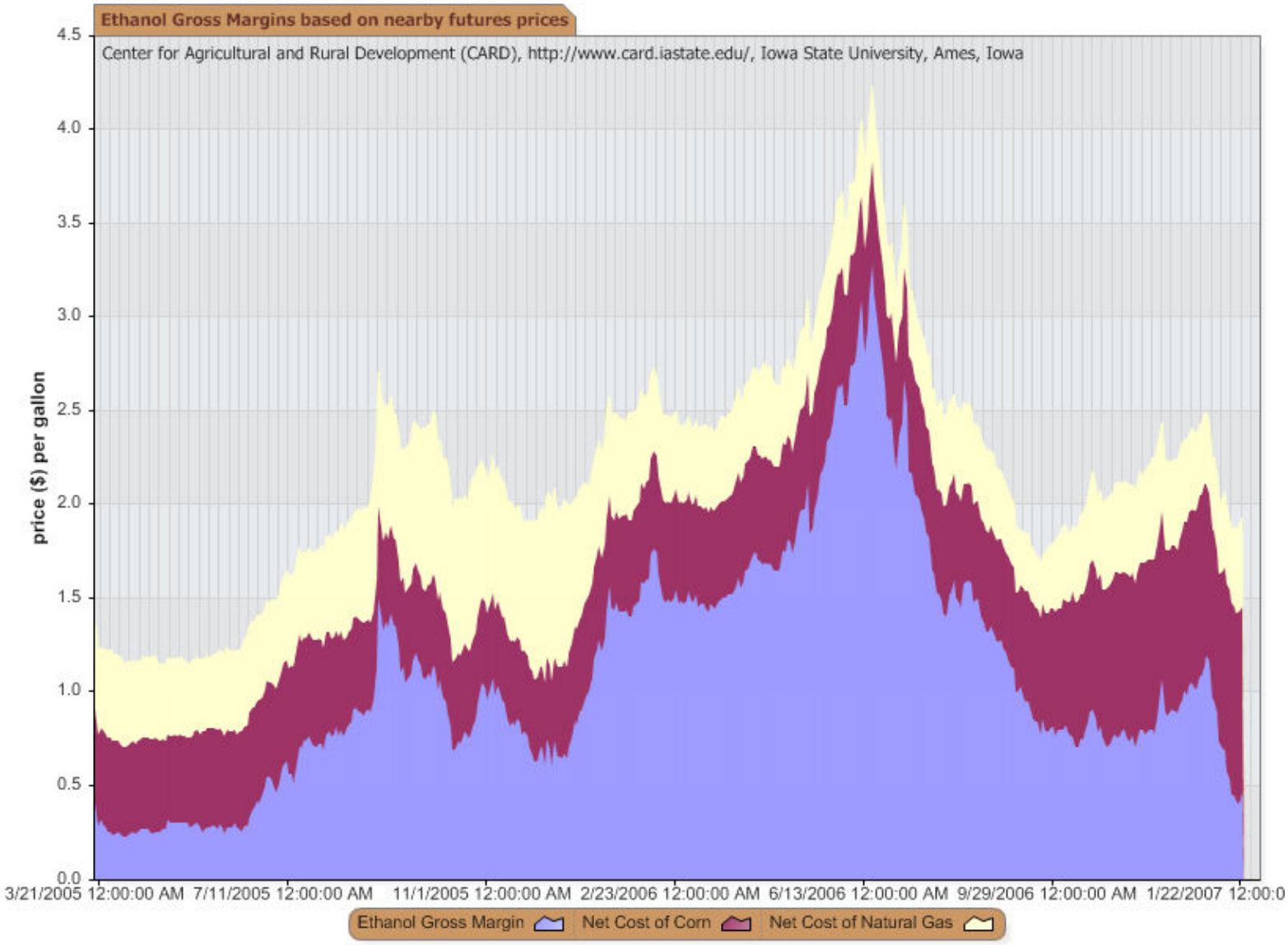
Price of Ethanol ($/gal)	Price of Dried Distillers Grains ($/ton) 80	120	160
1.25	2.65	2.99	3.33
1.50	3.33	3.67	4.01
1.75	4.00	4.34	4.68
2.00	4.68	5.02	5.36
2.25	5.35	5.69	6.03
2.50	6.03	6.37	6.71

Note: Reported corn prices equate per-bushel revenue to variable costs for an ethanol plant

Projected Gross Margins for Ethanol Plants



Historical Gross Margins for Ethanol Plants



Outlook for Price of Corn

- Next two to three years
  - Between $2.65 and $4.00, depending on size of ’07 and ’08 crops and the price of ethanol
- 3 – 5 years out
  - With 13 billion gallon capacity, price floor for corn will be where ethanol margins are zero
    - $2.65 with $1.25 ethanol and DDGs at $80/ton
    - $4.34 with $1.75 ethanol and DDGs at $120/ton

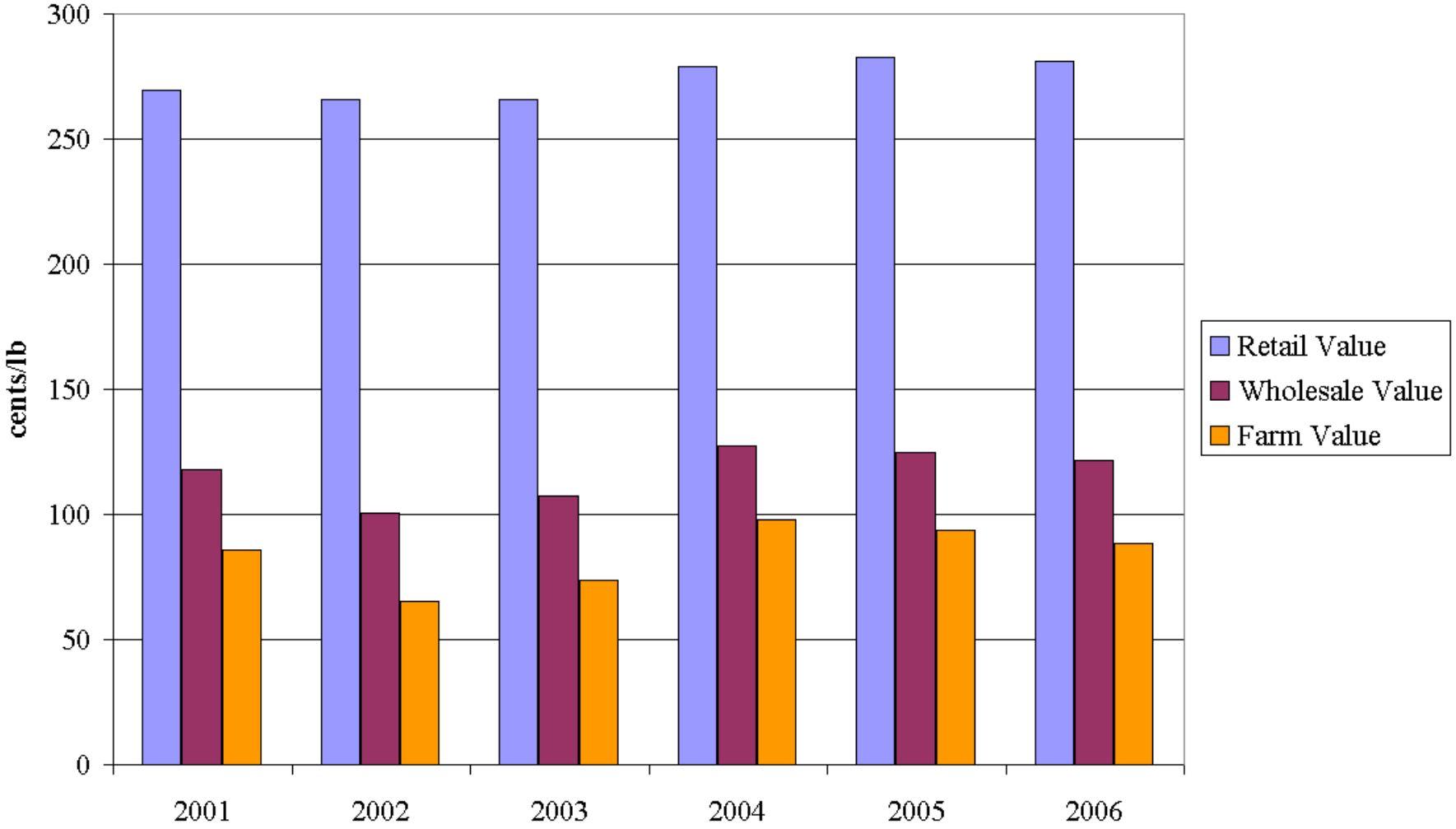
Long-Run Price of Corn

- Political momentum suggests incentives for renewables fuels are here to stay
- Cellulosic ethanol will be fed first from corn stover
- Increased production of energy crops will compete with corn ground
- New price plateau for world feed grains?

Impact on Livestock

- Higher feed prices lead to lower short-run margins
- Permanently lower margins will result in cut in production, higher prices, return to “normal” margins
- Livestock species that can adjust best to higher feed grain prices will do comparatively better
  - Uruguay’s grass-fed beef vs. Iowa hogs

Value of Pork Along the Marketing Chain



Impact of a Permanent Increase in Feed Costs on Pork Prices

- Farm prices will rise by 25%
- Wholesale pork prices will rise by 18%
- Retail prices will rise by 7%