

# Economic Impact of Biofuel Production on Pork Production

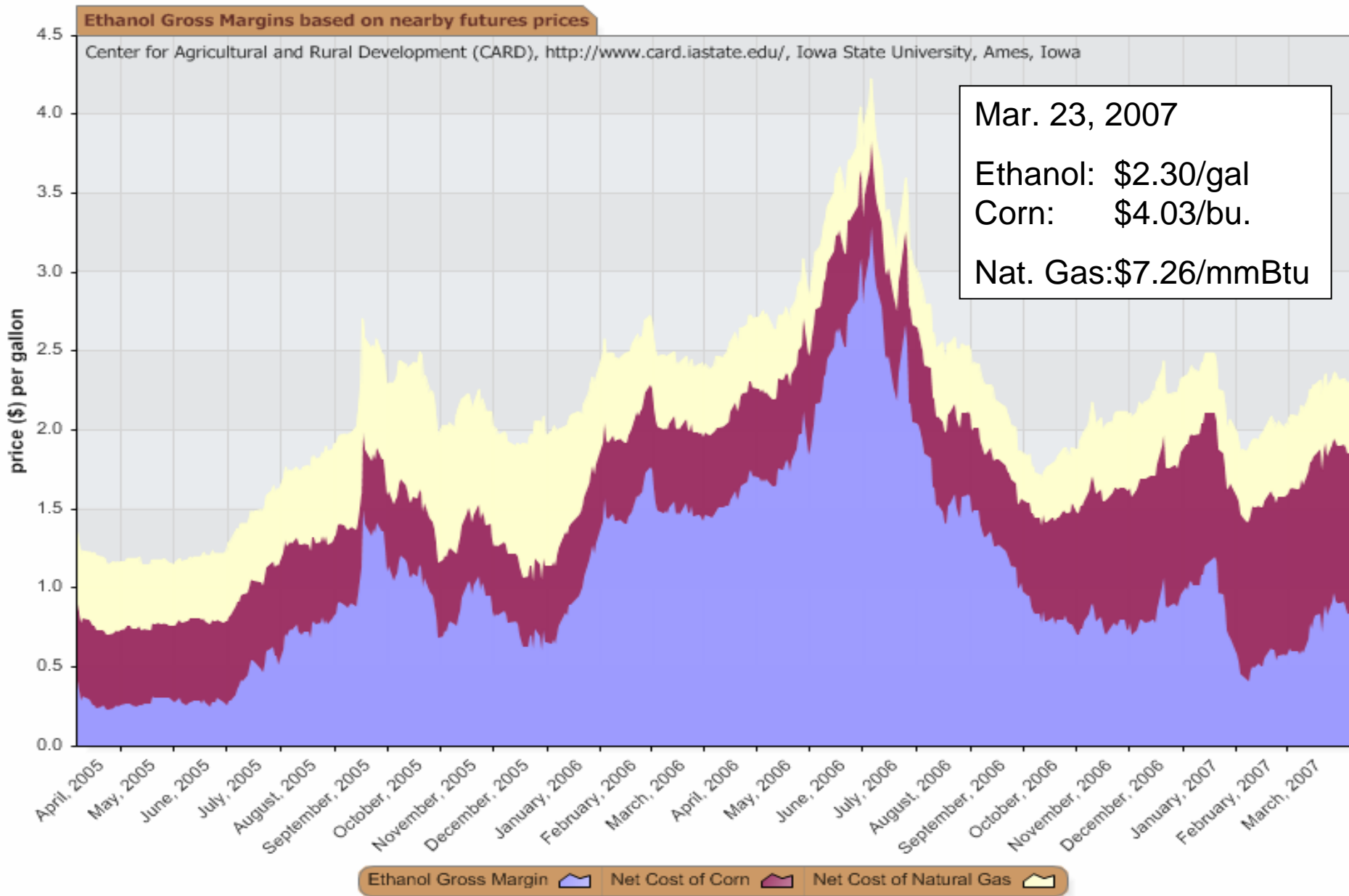
Glynn Tonsor  
Dept. of Agricultural Economics  
Michigan State University

2007 State-Wide Pork Industry Information Meetings  
March 26-29, 2007

# Corn Futures (as of 3/23/07)

May-07	\$	4.03
Jul-07	\$	4.15
Sep-07	\$	4.10
Dec-07	\$	4.09
<hr/>		
Jul-08	\$	4.29
Dec-08	\$	4.02
<hr/>		
Jul-09	\$	4.10
Dec-09	\$	3.87
<hr/>		
Jul-10	\$	3.91
Dec-10	\$	3.73

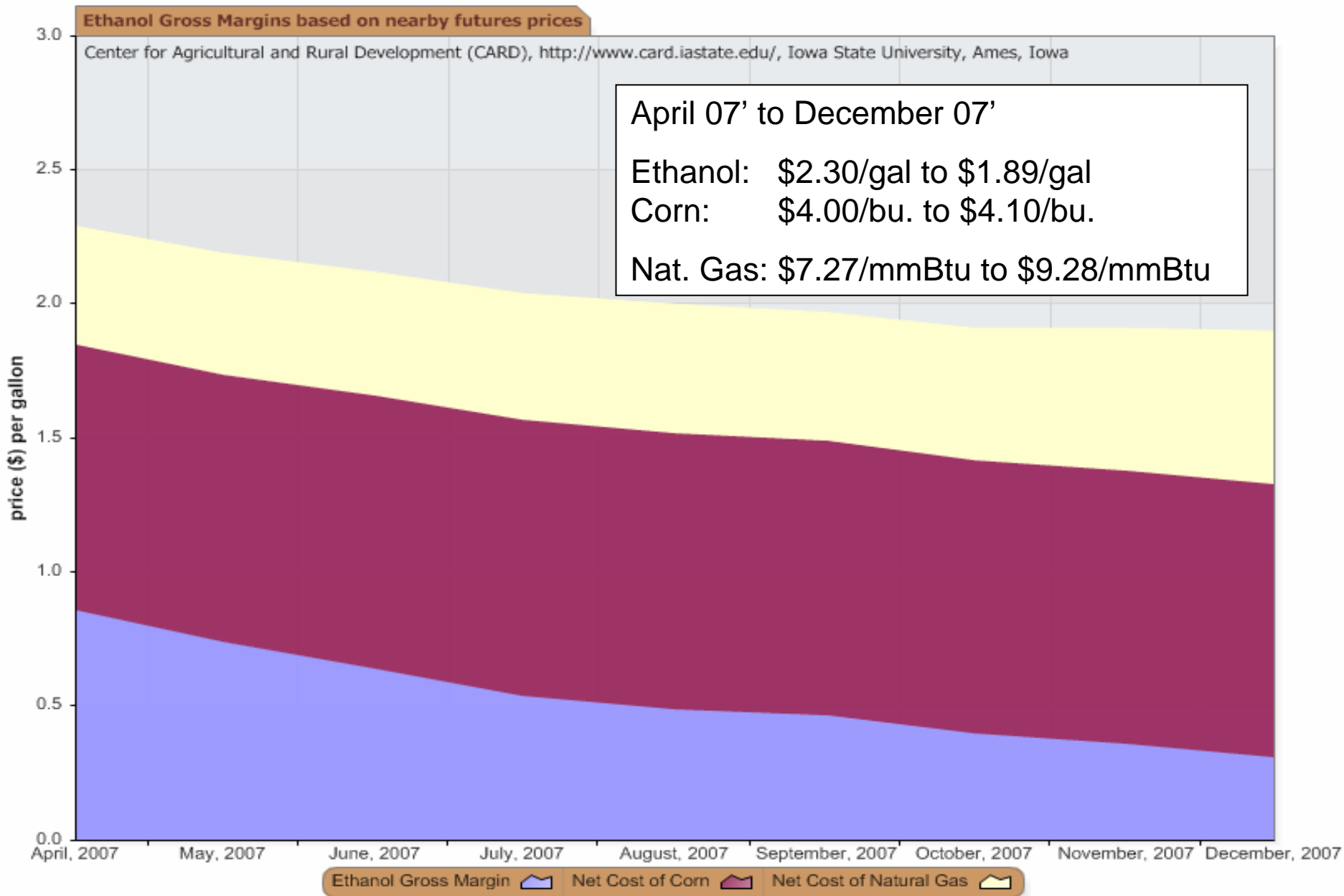
# Historical Ethanol Gross Margins



Source: CARD: [http://www.card.iastate.edu/research/bio/tools/hist\\_eth\\_gm.aspx](http://www.card.iastate.edu/research/bio/tools/hist_eth_gm.aspx)

Assumes 1 corn bu. & 165,000 British thermal units of natural gas are required to create 2.7 gallons of ethanol and 17 DDGS lbs.

# Projected 2007 Ethanol Gross Margins



Source: CARD: [http://www.card.iastate.edu/research/bio/tools/proj\\_eth\\_gm.aspx](http://www.card.iastate.edu/research/bio/tools/proj_eth_gm.aspx)

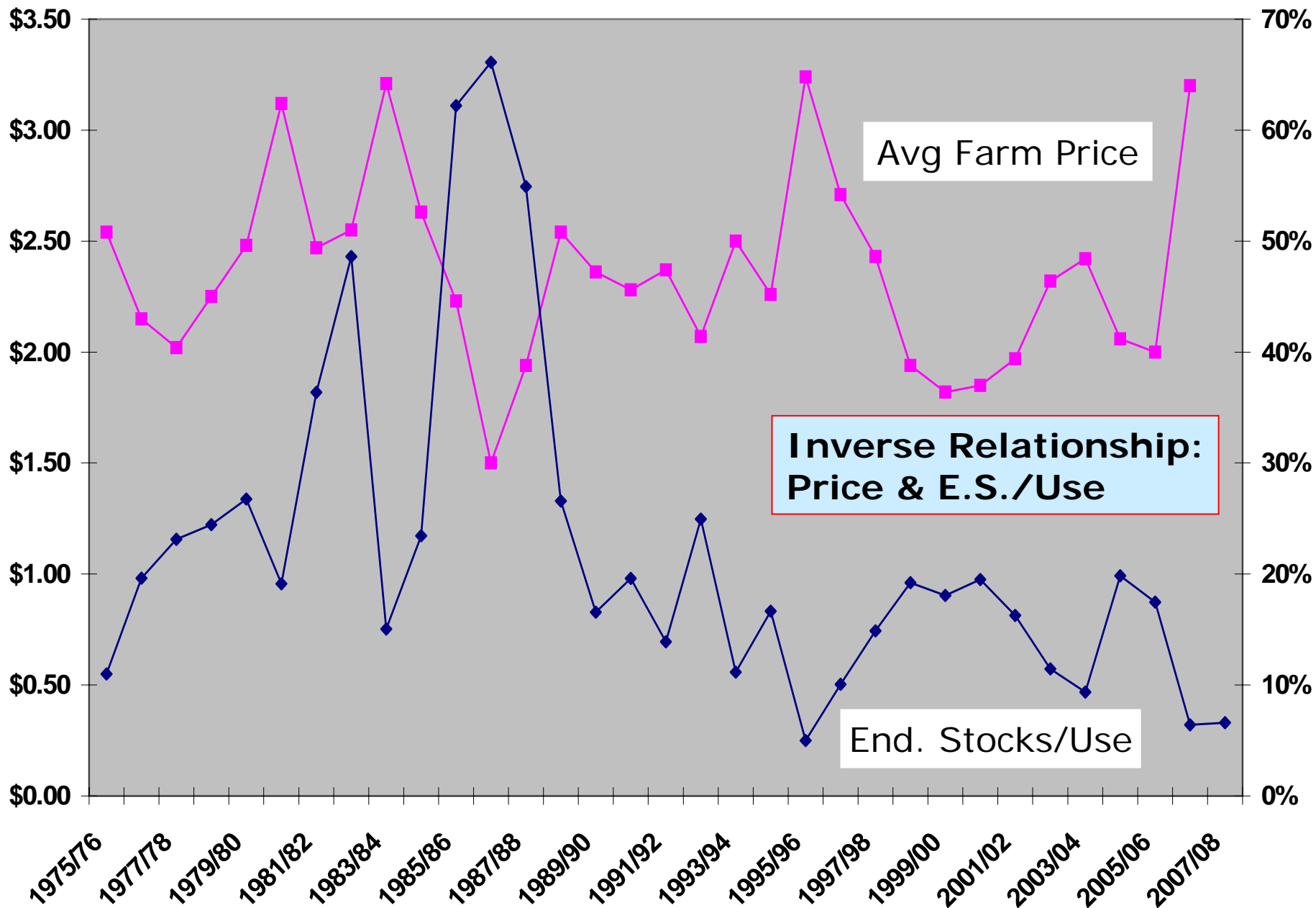
Assumes 1 corn bu. & 165,000 British thermal units of natural gas are required to create 2.7 gallons of ethanol and 17 DDGS lbs.

# SUPPLY/DEMAND BALANCE SHEET FOR CORN

	2002-03	2003-04	2004-05	Estimated 2005-06	Projected 2006-07	Hilker 2007-08	Hilker 2008-09
<b>(million acres)</b>							
<b>Acres Planted</b>	<b>78.9</b>	<b>78.6</b>	<b>80.9</b>	<b>81.8</b>	<b>78.6</b>	<b>87.6</b>	<b>91.6</b>
<b>Acres Harvested</b>	<b>69.3</b>	<b>70.9</b>	<b>73.6</b>	<b>75.1</b>	<b>70.6</b>	<b>80.4</b>	<b>84.4</b>
<b>Bu./Harvested Acre</b>	<b>129.3</b>	<b>142.2</b>	<b>160.4</b>	<b>148</b>	<b>149.1</b>	<b>151</b>	<b>153</b>
<b>(million bushels)</b>							
<b>Beginning Stocks</b>	<b>1596</b>	<b>1087</b>	<b>958</b>	<b>2114</b>	<b>1967</b>	<b>752</b>	<b>702</b>
<b>Production</b>	<b>8967</b>	<b>10089</b>	<b>11807</b>	<b>11114</b>	<b>10535</b>	<b>12140</b>	<b>12913</b>
<b>Imports</b>	<b>14</b>	<b>14</b>	<b>11</b>	<b>9</b>	<b>10</b>	<b>10</b>	<b>10</b>
<b>Total Supply</b>	<b>10578</b>	<b>11190</b>	<b>12776</b>	<b>13237</b>	<b>12512</b>	<b>12903</b>	<b>13626</b>
<b>Use:</b>							
<b>Feed and Residual</b>	<b>5563</b>	<b>5798</b>	<b>6158</b>	<b>6141</b>	<b>5975</b>	<b>5750</b>	<b>5550</b>
<b>Food, Seed and Industrial</b>	<b>2340</b>	<b>2537</b>	<b>2686</b>	<b>2981</b>	<b>3535</b>	<b>4450</b>	<b>5350</b>
<b>Ethanol for fuel</b>	<b>996</b>	<b>1168</b>	<b>1323</b>	<b>1603</b>	<b>2150</b>	<b>3100</b>	<b>4000</b>
<b>Total Domestic</b>	<b>7903</b>	<b>8335</b>	<b>8844</b>	<b>9122</b>	<b>9510</b>	<b>10200</b>	<b>10900</b>
<b>Exports</b>	<b>1588</b>	<b>1897</b>	<b>1818</b>	<b>2147</b>	<b>2250</b>	<b>2000</b>	<b>2000</b>
<b>Total Use</b>	<b>9491</b>	<b>10232</b>	<b>10662</b>	<b>11270</b>	<b>11760</b>	<b>12200</b>	<b>12900</b>
<b>Ending Stocks</b>	<b>1087</b>	<b>958</b>	<b>2114</b>	<b>1967</b>	<b>752</b>	<b>702</b>	<b>726</b>
<b>Ending Stocks, %of Use</b>	<b>11.5</b>	<b>9.4</b>	<b>19.8</b>	<b>17.5</b>	<b>6.4</b>	<b>5.8</b>	<b>5.6</b>
<b>U.S. Loan Rate</b>	<b>\$1.98</b>	<b>\$1.98</b>	<b>\$1.95</b>	<b>\$1.95</b>	<b>\$1.95</b>	<b>\$1.95</b>	<b>\$1.95</b>
<b>U.S. Season Average Farm Price, \$/Bu.</b>	<b>\$2.32</b>	<b>\$2.42</b>	<b>\$2.06</b>	<b>\$2.00</b>	<b>\$3.20</b>	<b>\$3.40</b>	<b>\$3.40</b>

**Source: USDA and Jim Hilker. (02 - 09 - 07)**

### Ending Stocks/Use Ratio vs Avg Price



Avg Farm Price

**Inverse Relationship:  
Price & E.S./Use**

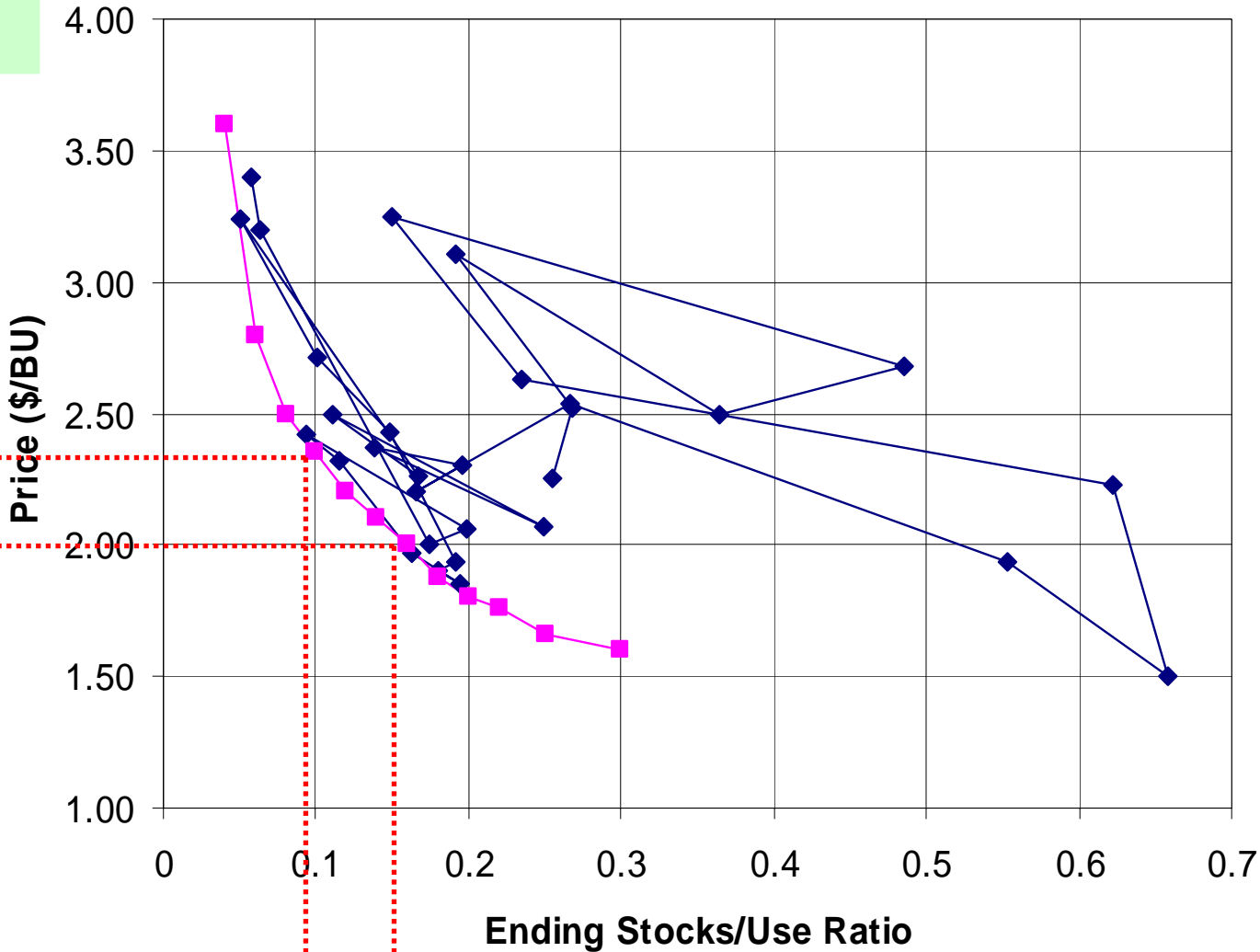
End. Stocks/Use

# U.S. Corn Price vs Ending Stocks/Use Ratio 1978 - 2007

EndStocks/Use  
.15 to .10 =  
\$2.00 to \$2.30

Ratio: .10  
Price: \$2.30

Ratio: .15  
Price: \$2

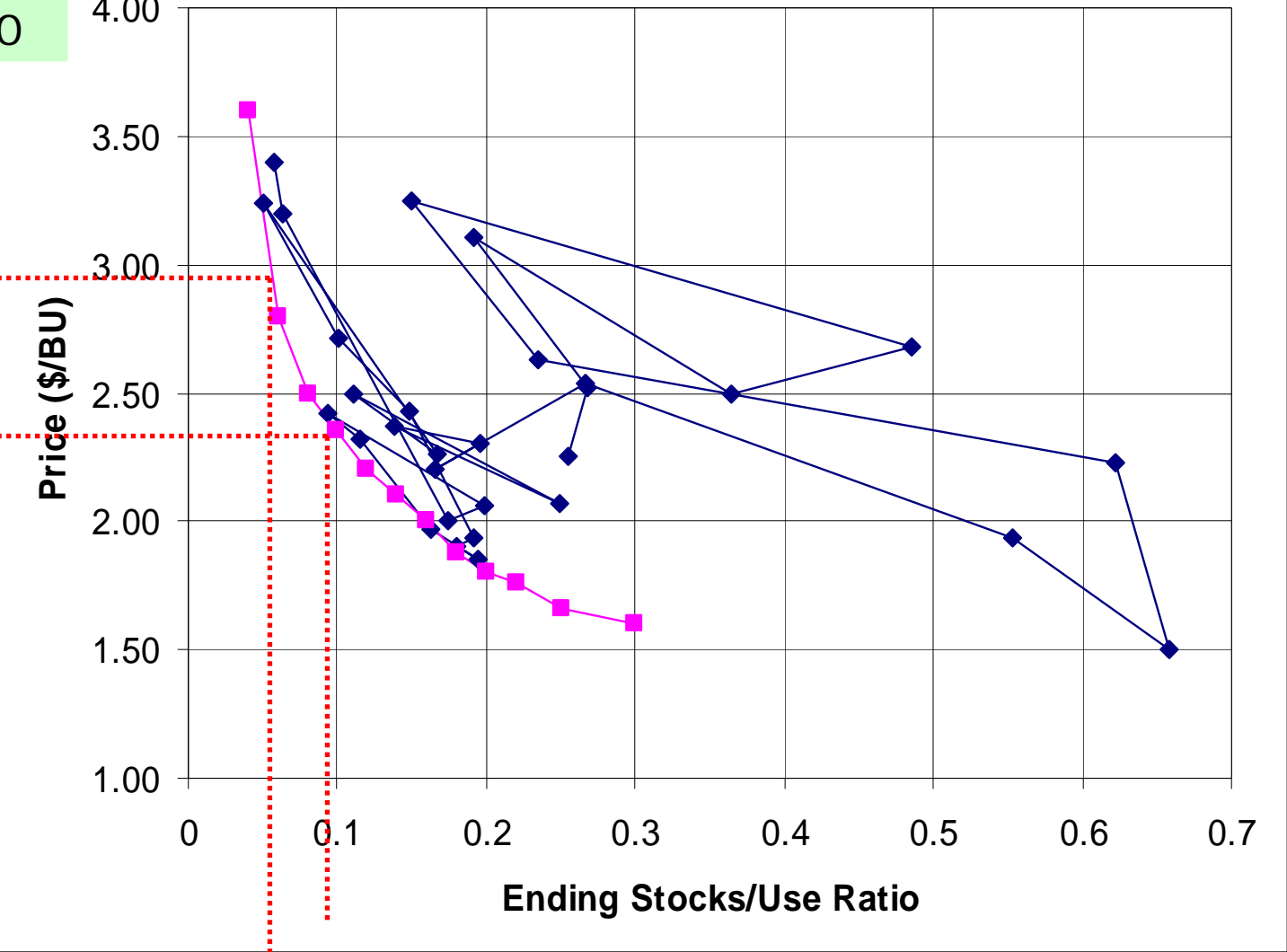


# U.S. Corn Price vs Ending Stocks/Use Ratio 1978 - 2007

EndStocks/Use  
.10 to .05 =  
\$2.30 to \$3.00

Ratio: .05  
Price: \$3

Ratio: .10  
Price: \$2.30





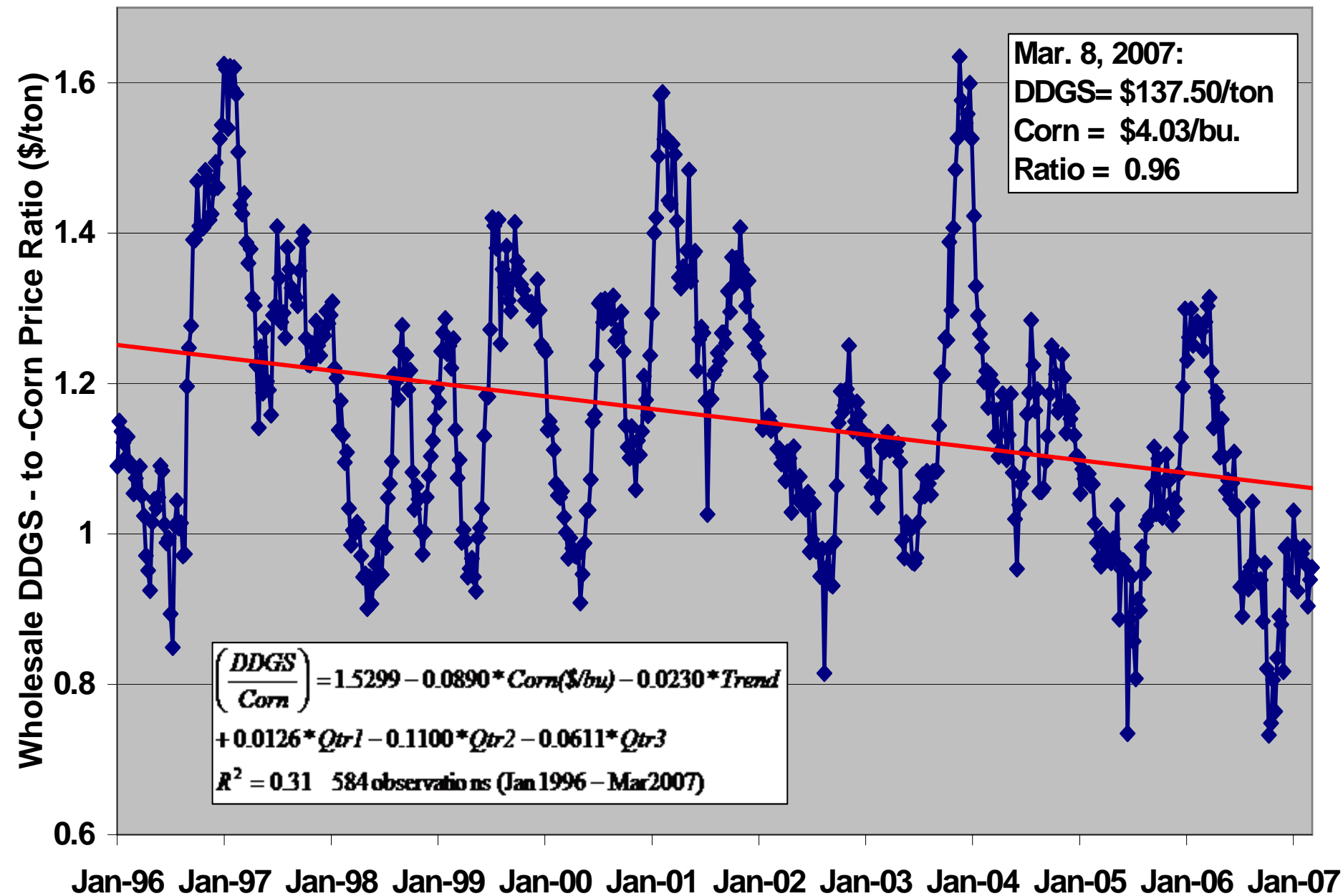
# Distillers Grains w/ Solubles (DGS) Issues:

- Can by-products offset corn prices?
- What are implications of DGS use?

# Distillers Grains w/ Solubles (DGS) Issues:

- As DGS market matures:
  - Which producers will have DGS access?
    - species, operation size, geography...
  - What type of purchasing arrangement?
    - spot, contract, ...
  - Will feed market even exist?
    - may replace natural gas in ethanol plants
    - reprocess for more ethanol
    - industrial products (fiberboard, ...)

## Chicago Wholesale DDGS - to - Corn Ratio (\$/ton)



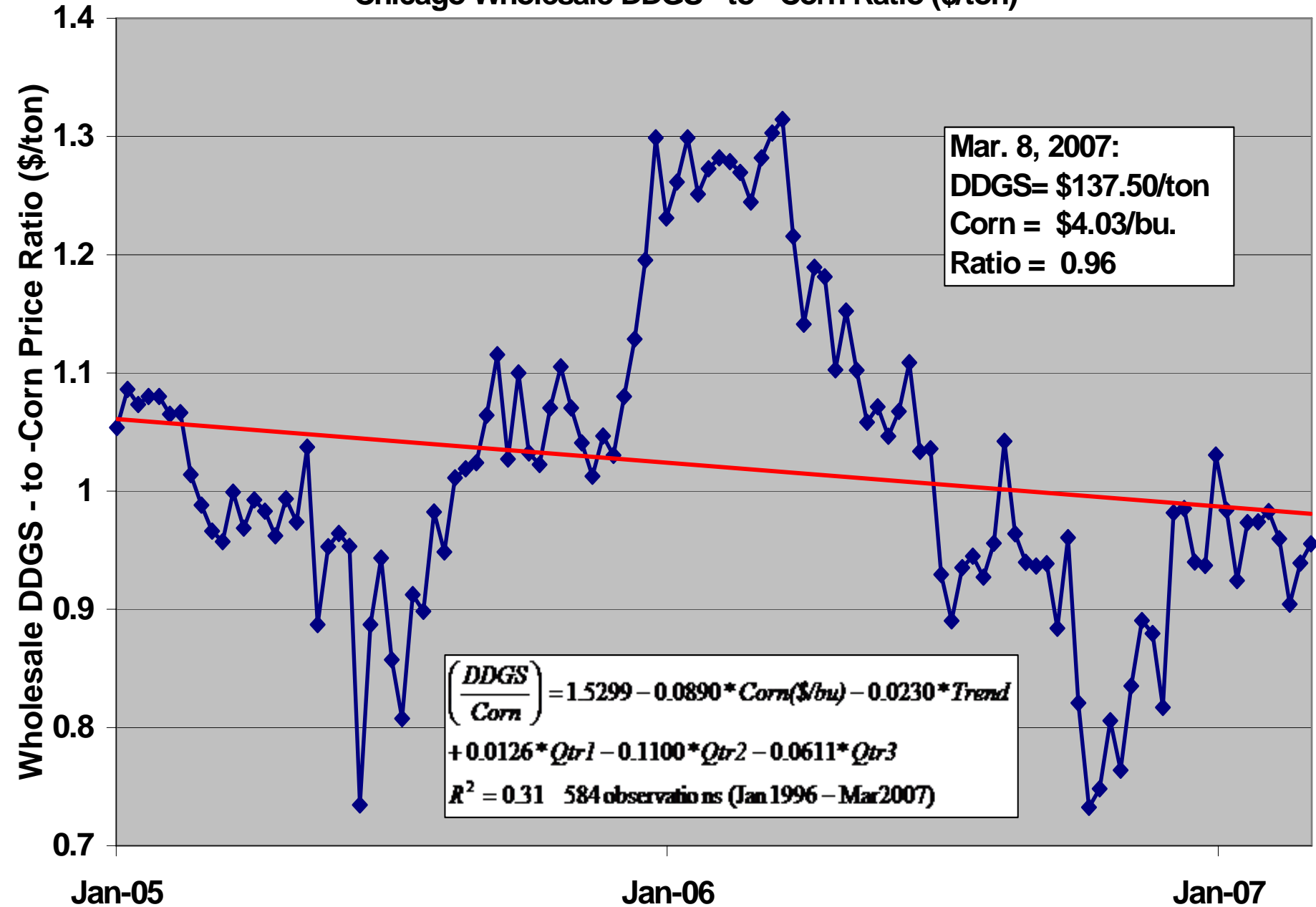
**Mar. 8, 2007:**  
**DDGS= \$137.50/ton**  
**Corn = \$4.03/bu.**  
**Ratio = 0.96**

$$\left(\frac{DDGS}{Corn}\right) = 1.5299 - 0.0890 * Corn(\$bu) - 0.0230 * Trend$$

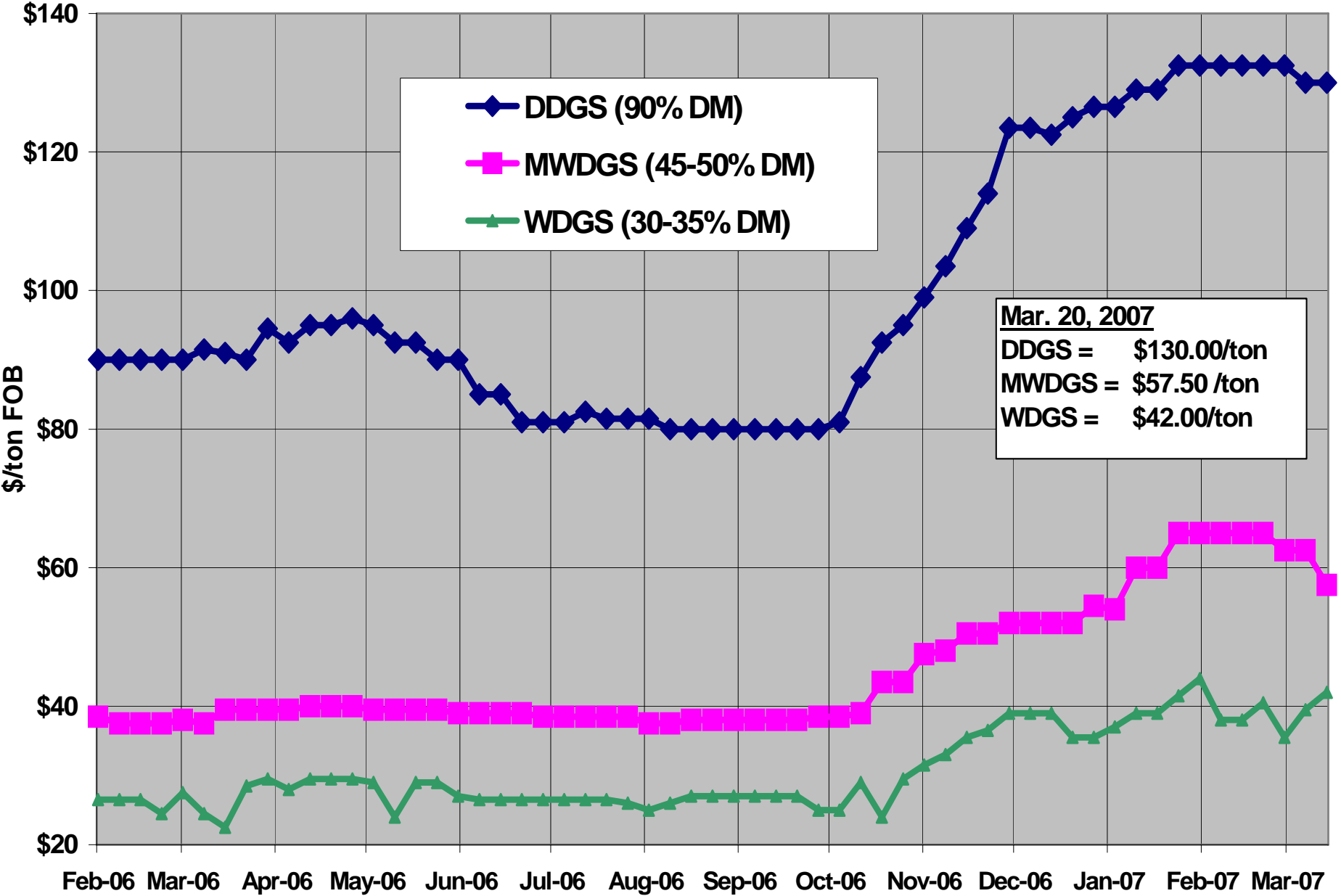
$$+ 0.0126 * Qtr1 - 0.1100 * Qtr2 - 0.0611 * Qtr3$$

$R^2 = 0.31$  584 observations (Jan 1996 - Mar 2007)

# Chicago Wholesale DDGS - to - Corn Ratio (\$/ton)

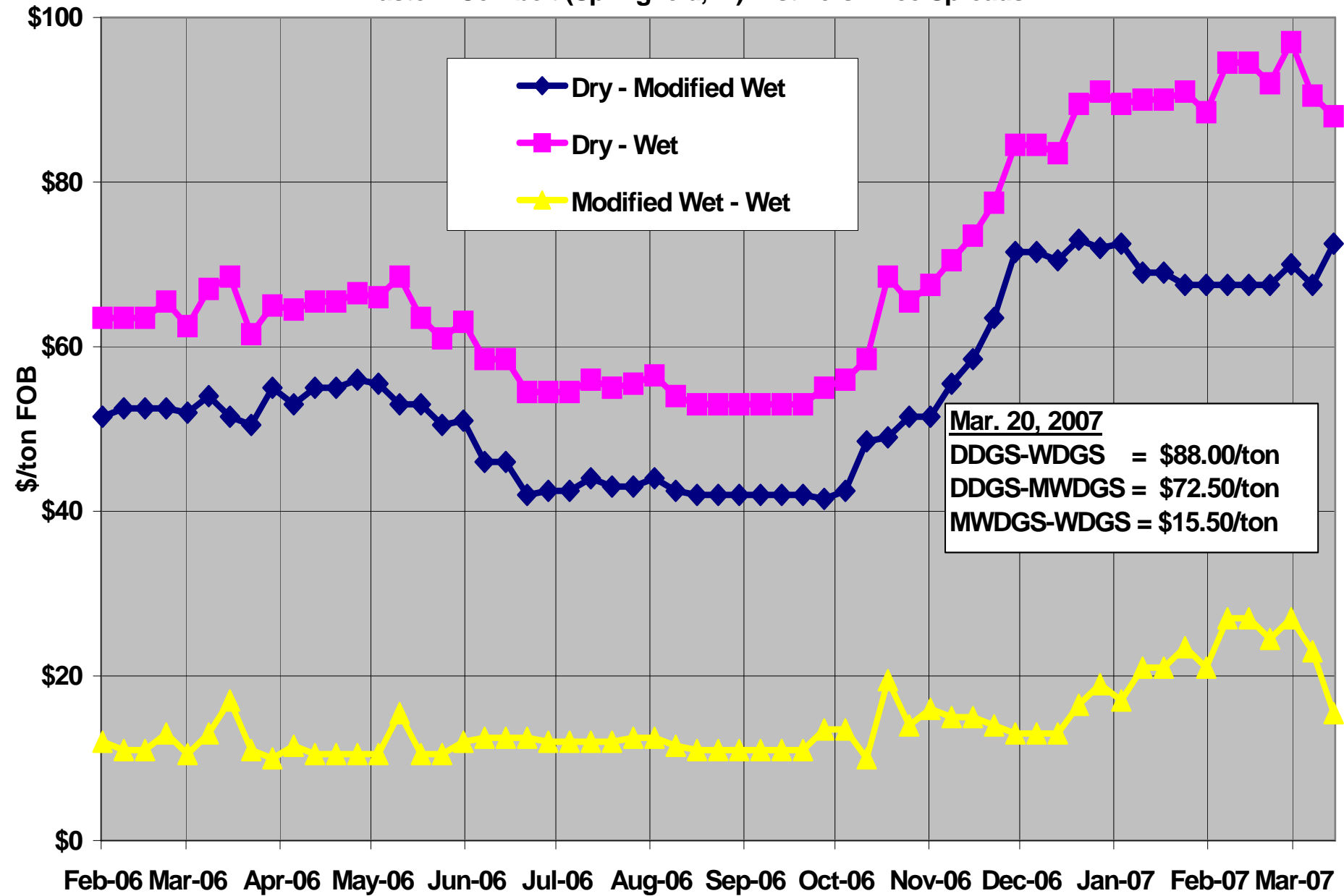


# Eastern Cornbelt (Springfield, IL) Distillers Prices



**Mar. 20, 2007**  
DDGS = \$130.00/ton  
MWDGS = \$57.50 /ton  
WDGS = \$42.00/ton

## Eastern Cornbelt (Springfield, IL) Distillers Price Spreads



Source: Livestock Marketing Information Center and USDA-AMS; Last updated 3/23/2007

# DDGS Feeding: Swine Finishing

- For a feed cost analysis, adopt competing rations:

	0% DDGS	10% DDGS	20% DDGS
Corn (dry)	73.15%	64.30%	55.45%
DDGS	0.00%	10.00%	20.00%
Soybean Meal 49	24.10%	23.10%	22.10%
DiCal Phosphate	1.20%	0.90%	0.60%
Limestone	0.70%	0.85%	1.00%
Salt	0.30%	0.30%	0.30%
Lysine	0.15%	0.15%	0.15%
Vit/min premix	0.40%	0.40%	0.40%
TOTAL	100.00%	100.00%	100.00%

# Feed Cost Savings: 60lb-260lb Hogs

Cost Savings (\$/head) Relative to 0% DDGS Inclusion

DDGS (\$/ton)	DDGS Inclusion	Corn (\$/bu.)								
		\$ 2.00	\$ 2.50	\$ 3.00	\$ 3.50	\$ 4.00	\$ 4.50	\$ 5.00		
\$0	10%	\$ 3.33	\$ 3.93	\$ 4.52	\$ 5.12	\$ 5.71	\$ 6.31	\$ 6.90		
\$0	20%	\$ 6.66	\$ 7.85	\$ 9.04	\$ 10.23	\$ 11.42	\$ 12.61	\$ 13.80		
\$ 100	10%	\$ (0.22)	\$ 0.37	\$ 0.97	\$ 1.56	\$ 2.16	\$ 2.75	\$ 3.35		
\$ 100	20%	\$ (0.45)	\$ 0.74	\$ 1.93	\$ 3.12	\$ 4.31	\$ 5.50	\$ 6.69		
\$ 125	10%	\$ (1.11)	\$ (0.52)	\$ 0.08	\$ 0.67	\$ 1.27	\$ 1.86	\$ 2.46		
\$ 125	20%	\$ (2.23)	\$ (1.04)	\$ 0.15	\$ 1.34	\$ 2.53	\$ 3.72	\$ 4.91		
\$ 150	10%	\$ (2.00)	\$ (1.41)	\$ (0.81)	\$ (0.22)	\$ 0.38	\$ 0.97	\$ 1.57		
\$ 150	20%	\$ (4.00)	\$ (2.81)	\$ (1.62)	\$ (0.44)	\$ 0.75	\$ 1.94	\$ 3.13		

Assumptions: SBM=\$200/ton, 3.2 F/G ratio, all prices are "delivered prices," and including DDGS results in no changes in carcass composition, days on feed, total feed intake, or changes in manure handling costs.



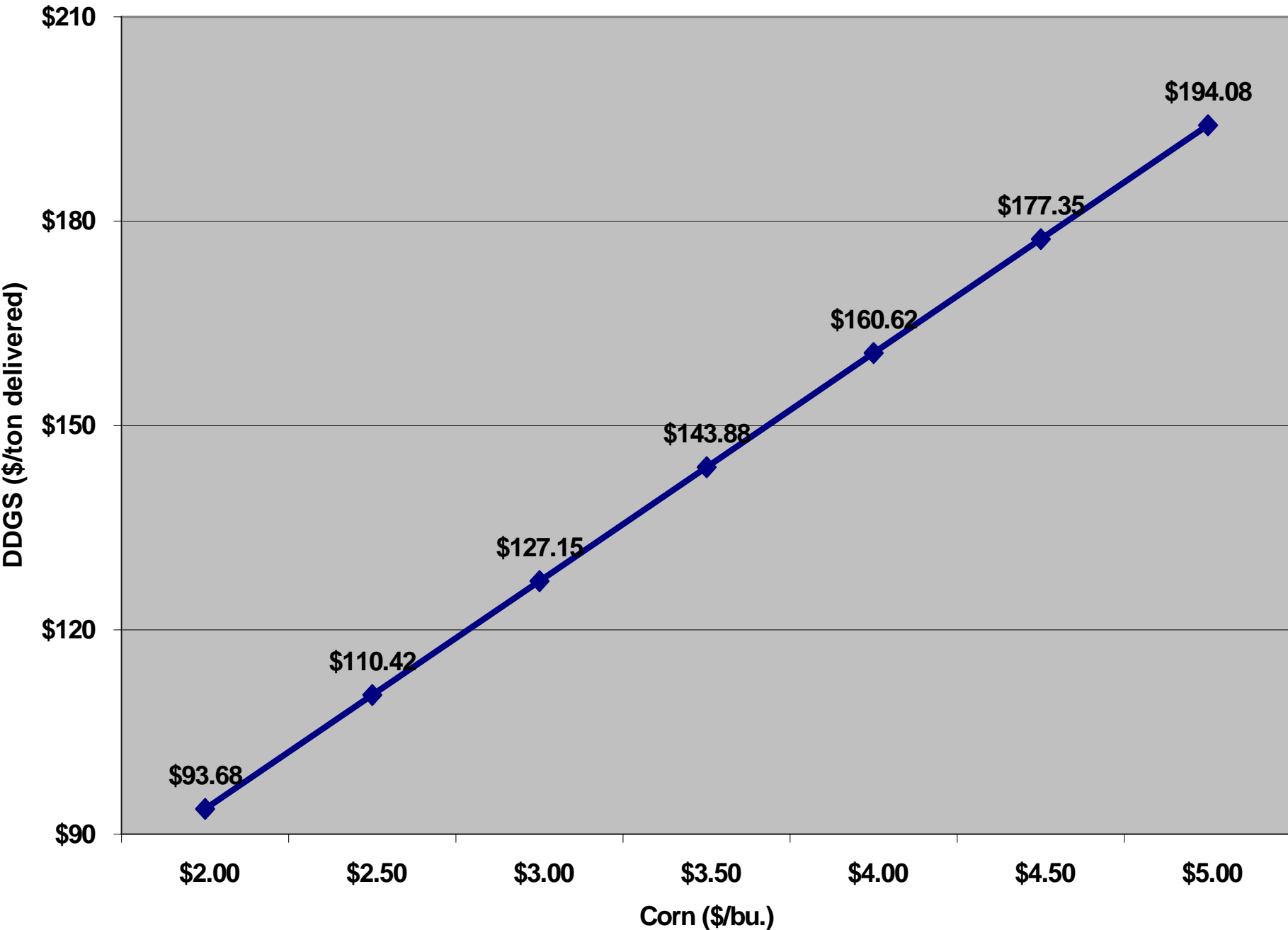
# Feed Cost Savings: 60lb-260lb Hogs

Cost Savings (\$/head) Relative to 0% DDGS Inclusion

DDGS (\$/ton)	DDGS Inclusion	Corn (\$/bu.)								
		\$ 2.00	\$ 2.50	\$ 3.00	\$ 3.50	\$ 4.00	\$ 4.50	\$ 5.00		
\$0	10%	\$ 3.33	\$ 3.93	\$ 4.52	\$ 5.12	\$ 5.71	\$ 6.31	\$ 6.90		
\$0	20%	\$ 6.66	\$ 7.85	\$ 9.04	\$ 10.23	\$ 11.42	\$ 12.61	\$ 13.80		
\$ 100	10%	\$ (0.22)	\$ 0.37	\$ 0.97	\$ 1.56	\$ 2.16	\$ 2.75	\$ 3.35		
\$ 100	20%	\$ (0.45)	\$ 0.74	\$ 1.93	\$ 3.12	\$ 4.31	\$ 5.50	\$ 6.69		
\$ 125	10%	\$ (1.11)	\$ (0.52)	\$ 0.08	\$ 0.67	\$ 1.27	\$ 1.86	\$ 2.46		
\$ 125	20%	\$ (2.23)	\$ (1.04)	\$ 0.15	\$ 1.34	\$ 2.53	\$ 3.72	\$ 4.91		
\$ 150	10%	\$ (2.00)	\$ (1.41)	\$ (0.81)	\$ (0.22)	\$ 0.38	\$ 0.97	\$ 1.57		
\$ 150	20%	\$ (4.00)	\$ (2.81)	\$ (1.62)	\$ (0.44)	\$ 0.75	\$ 1.94	\$ 3.13		

Assumptions: SBM=\$200/ton, 3.2 F/G ratio, all prices are "delivered prices," and including DDGS results in no changes in carcass composition, days on feed, total feed intake, or changes in manure handling costs.

**DDGS Prices Equating Swine Finishing Feed Costs/Ton of 0% & 10% DDGS Inclusion Rates**



# Static Output Price Increase:

## Return to “Old Margins” of 60-260 Feeders

\$/live cwt Increase Needed: 10% DDGS = 0% DDGS with \$2.50 corn

DDGS (\$/ton)	DDGS Inclusion	Corn (\$/bu.)					
		\$ 3.00	\$ 3.50	\$ 4.00	\$ 4.50	\$ 5.00	
\$0.00	10%	\$ 0.15	\$ 1.82	\$ 3.48	\$ 5.14	\$ 6.80	
\$0.00	20%	\$ (1.59)	\$ (0.15)	\$ 1.28	\$ 2.72	\$ 4.15	
\$ 100	10%	\$ 1.52	\$ 3.18	\$ 4.85	\$ 6.51	\$ 8.17	
\$ 100	20%	\$ 1.15	\$ 2.58	\$ 4.02	\$ 5.45	\$ 6.88	
\$ 125	10%	\$ 1.86	\$ 3.52	\$ 5.19	\$ 6.85	\$ 8.51	
\$ 125	20%	\$ 1.83	\$ 3.27	\$ 4.70	\$ 6.13	\$ 7.57	
\$ 150	10%	NA	NA	\$ 5.53	\$ 7.19	\$ 8.85	
\$ 150	20%	NA	NA	\$ 5.38	\$ 6.82	\$ 8.25	

Assumptions: SBM=\$200/ton, 3.2 F/G ratio, all prices are “delivered prices,” and including DDGS results in no changes in carcass composition, days on feed, total feed intake, or changes in manure handling costs. Also assumes no change in other inputs (e.g., feeder pig price).

# Lean Hog Futures (as of 3/23/07)

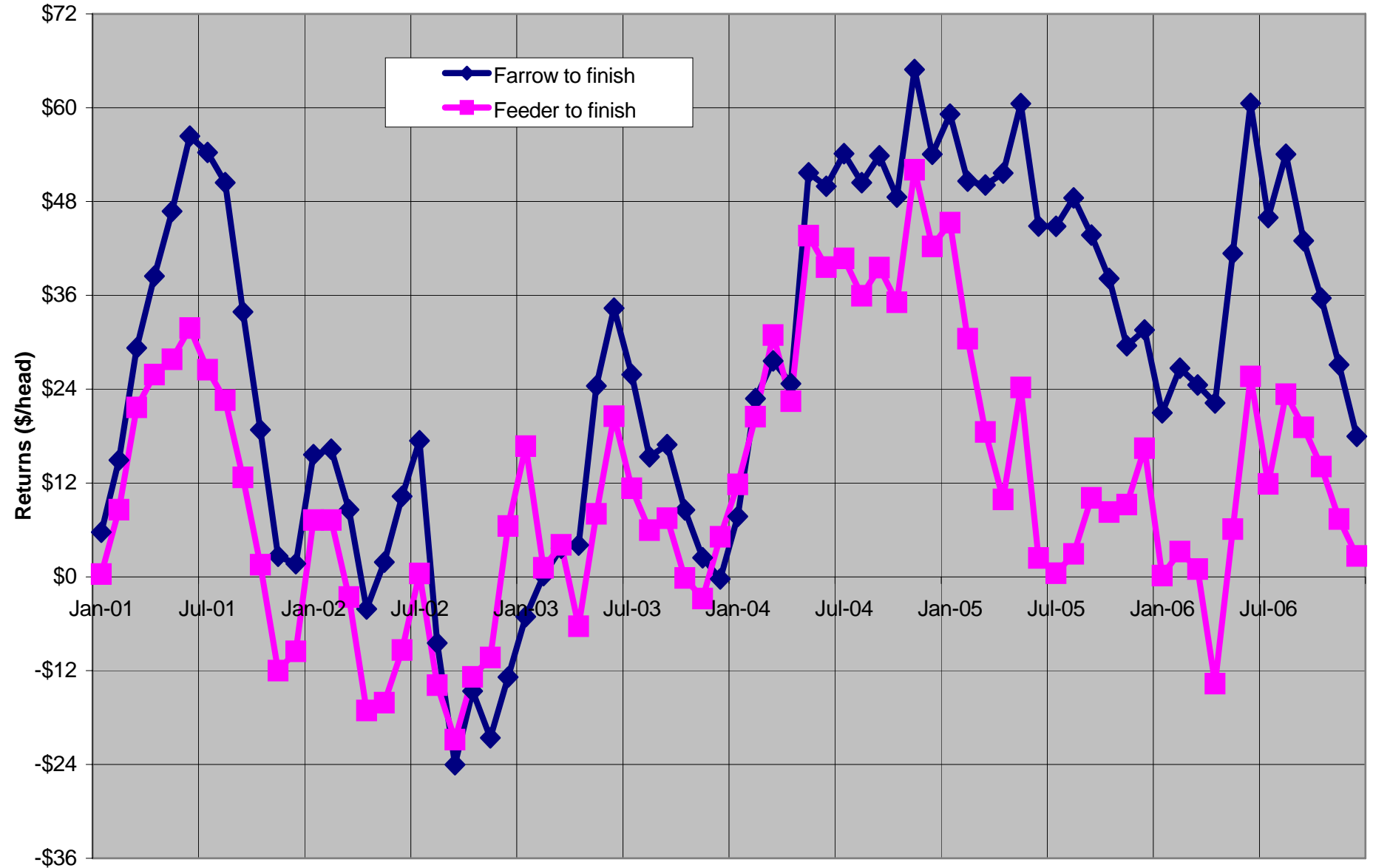
		LH	Cash Eq.
Apr-07	\$	63.58	\$ 47.05
May-07	\$	73.28	\$ 54.23
Jun-07	\$	73.78	\$ 54.60
Dec-07	\$	66.53	\$ 49.23
Apr-08	\$	71.30	\$ 52.76

# ISU: Pork Market Profitability

Iowa State Univ. Monthly Returns Series Assumptions:

	Feeder (50 lbs) -to- Finish (270 lbs)	Weanling (10 lbs) -to- Finish (270 lbs)
	20 weeks	26 weeks
DOF:		
Corn (bu):	9.3	10.2
SMB (lbs):	84	118
DDGS (lbs):	32.5	32.5
Vit/Min (\$/head):	\$ 6.19	\$ 9.38
Non-Feed Variable Costs (\$/head):	\$ 16.18	\$ 19.66
Fixed Costs (\$/head):	\$ 6.82	\$ 8.45

# Historical Returns to Swine Finishing: Using Revised, Jan. 07' Assumptions



# Projected Pork Market Profitability: (50 lbs to 270 lbs)

Placement Date	Feeder (50 lbs) -to- Finish (270 lbs)					
	April 1, 2007		July 1, 2007		October 1, 2007	
Sales Date	August 19, 2007		November 18, 2007		February 18, 2008	
Corn (\$/bu. w/ \$0.35 basis)	\$	3.75	\$	3.75	\$	3.75
SBM (\$/ton)	\$	225.00	\$	230.00	\$	235.00
DDGS (\$/ton)	\$	130.00	\$	130.00	\$	130.00
Vit/Min & NonFeed Variable Costs (\$/head)	\$	22.37	\$	22.37	\$	22.37
Fixed Costs (\$/head)	\$	6.82	\$	6.82	\$	6.82
Total "Non Animal Purchase" Costs (\$/head)	\$	75.63	\$	75.84	\$	76.05
Expected Sales Price (\$/cwt w/ \$2/cwt basis)	\$	53.82	\$	48.47	\$	50.32
Feeder Price: \$0/head margin	\$	69.69	\$	55.03	\$	59.82
01'-06' ISU Avg Margin (\$/head)	\$	27.12	\$	27.12	\$	27.12
Feeder Price: ISU 5 yr avg margin	\$	42.57	\$	27.91	\$	32.70
"Shut Down" Feeder Price	\$	76.51	\$	61.85	\$	66.64

# Projected Pork Market Profitability: (50 lbs to 270 lbs)

Placement Date	Feeder (50 lbs) -to- Finish (270 lbs)					
	April 1, 2007		July 1, 2007		October 1, 2007	
Sales Date	August 19, 2007		November 18, 2007		February 18, 2008	
Corn (\$/bu. w/ \$0.35 basis)	\$	3.75	\$	3.75	\$	3.75
SBM (\$/ton)	\$	225.00	\$	230.00	\$	235.00
DDGS (\$/ton)	\$	130.00	\$	130.00	\$	130.00
Vit/Min & NonFeed Variable Costs (\$/head)	\$	22.37	\$	22.37	\$	22.37
Fixed Costs (\$/head)	\$	6.82	\$	6.82	\$	6.82
Total "Non Animal Purchase" Costs (\$/head)	\$	75.63	\$	75.84	\$	76.05
Expected Sales Price (\$/cwt w/ \$2/cwt basis)	\$	53.82	\$	48.47	\$	50.32
Feeder Price: \$0/head margin	\$	69.69	\$	55.03	\$	59.82
01'-06' ISU Avg Margin (\$/head)	\$	27.12	\$	27.12	\$	27.12
Feeder Price: ISU 5 yr avg margin	\$	42.57	\$	27.91	\$	32.70
"Shut Down" Feeder Price	\$	76.51	\$	61.85	\$	66.64



# Projected Pork Market Profitability: (50 lbs to 270 lbs)

Placement Date	Feeder (50 lbs) -to- Finish (270 lbs)					
	April 1, 2007		July 1, 2007		October 1, 2007	
Sales Date	August 19, 2007		November 18, 2007		February 18, 2008	
Corn (\$/bu. w/ \$0.35 basis)	\$	3.75	\$	3.75	\$	3.75
SBM (\$/ton)	\$	225.00	\$	230.00	\$	235.00
DDGS (\$/ton)	\$	130.00	\$	130.00	\$	130.00
Vit/Min & NonFeed Variable Costs (\$/head)	\$	22.37	\$	22.37	\$	22.37
Fixed Costs (\$/head)	\$	6.82	\$	6.82	\$	6.82
Total "Non Animal Purchase" Costs (\$/head)	\$	75.63	\$	75.84	\$	76.05
Expected Sales Price (\$/cwt w/ \$2/cwt basis)	\$	53.82	\$	48.47	\$	50.32
Feeder Price: \$0/head margin	\$	69.69	\$	55.03	\$	59.82
01'-06' ISU Avg Margin (\$/head)	\$	27.12	\$	27.12	\$	27.12
Feeder Price: ISU 5 yr avg margin	\$	42.57	\$	27.91	\$	32.70
"Shut Down" Feeder Price	\$	76.51	\$	61.85	\$	66.64

Expect to produce 26.6 million metric tons of co-product feeds in producing 10 billion gallons of ethanol. Which U.S. livestock will consume it?

## Co-Product Usage Possibilities for U.S. Animal Species

(Based on Geoff Cooper, NCGA, Distillers Grains Quarterly, 1st 2006)

	Grain-Consuming Animal Units (Millions)	Max. Rate of Inclusion In Diet	1,000 metric Tons by % Market Penetration		
			50%	75%	100%
Dairy	10.2	20%	1,887	2,831	3,774
Beef	24.8	40%	9,176	13,764	18,352
Pork	23.8	20%	4,348	6,521	8,695
Poultry	31.1	10%	2,877	4,315	5,754
Total			18,288	27,431	36,575

50%

24%

# Relative Meat Impacts:

- Beef vs Pork vs Poultry
  - Higher feed costs:
    - Short-run: lower margins
    - Long-run: production cut, normal margins return
- Domestic vs. International Meat
  - Grass-Fed Beef
    - Can South American beef adjust better than:
      - U.S. Beef ???
      - U.S. Pork/Poultry ???
  - What if U.S. becomes corn importer?
  - What if DGS are removed as feed alternatives?

Glynn Tonsor  
Dept. of Agricultural Economics  
Michigan State University

Email: [gtonsor@msu.edu](mailto:gtonsor@msu.edu)

Webpage: <http://www.msu.edu/user/gtonsor/>

# Projected Pork Market Profitability: (10 lbs to 270 lbs)

Placement Date Sales Date	Weanling (10 lbs) -to- Finish (270 lbs)					
	April 1, 2007		July 1, 2007		October 1, 2007	
	September 30, 2007		December 30, 2007		March 31, 2008	
Corn (\$/bu. w/ \$0.35 basis)	\$	3.75	\$	3.75	\$	3.75
SBM (\$/ton)	\$	225.00	\$	235.00	\$	235.00
DDGS (\$/ton)	\$	130.00	\$	130.00	\$	130.00
Vit/Min & NonFeed Variable Costs (\$/head)	\$	29.04	\$	29.04	\$	29.04
Fixed Costs (\$/head)	\$	8.45	\$	8.45	\$	8.45
Total "Non Animal Purchase" Costs (\$/head)	\$	91.13	\$	91.72	\$	91.72
Expected Sales Price (\$/cwt w/ \$2/cwt basis)	\$	48.84	\$	48.10	\$	51.06
Weanling Price: \$0/head margin	\$	40.74	\$	38.15	\$	46.14
01'-06' ISU Avg Margin (\$/head)	\$	11.68	\$	11.68	\$	11.68
Weanling Price: ISU 5 yr avg margin	\$	29.06	\$	26.47	\$	34.46
"Shut Down" Weanling Price	\$	49.19	\$	46.60	\$	54.59

# Projected Pork Market Profitability: (10 lbs to 270 lbs)

Placement Date Sales Date	Weanling (10 lbs) -to- Finish (270 lbs)					
	April 1, 2007		July 1, 2007		October 1, 2007	
	September 30, 2007		December 30, 2007		March 31, 2008	
Corn (\$/bu. w/ \$0.35 basis)	\$	3.75	\$	3.75	\$	3.75
SBM (\$/ton)	\$	225.00	\$	235.00	\$	235.00
DDGS (\$/ton)	\$	130.00	\$	130.00	\$	130.00
Vit/Min & NonFeed Variable Costs (\$/head)	\$	29.04	\$	29.04	\$	29.04
Fixed Costs (\$/head)	\$	8.45	\$	8.45	\$	8.45
Total "Non Animal Purchase" Costs (\$/head)	\$	91.13	\$	91.72	\$	91.72
Expected Sales Price (\$/cwt w/ \$2/cwt basis)	\$	48.84	\$	48.10	\$	51.06
Weanling Price: \$0/head margin	\$	40.74	\$	38.15	\$	46.14
01'-06' ISU Avg Margin (\$/head)	\$	11.68	\$	11.68	\$	11.68
Weanling Price: ISU 5 yr avg margin	\$	29.06	\$	26.47	\$	34.46
"Shut Down" Weanling Price	\$	49.19	\$	46.60	\$	54.59

# Projected Pork Market Profitability: (10 lbs to 270 lbs)

Placement Date Sales Date	Weanling (10 lbs) -to- Finish (270 lbs)					
	April 1, 2007 September 30, 2007		July 1, 2007 December 30, 2007		October 1, 2007 March 31, 2008	
Corn (\$/bu. w/ \$0.35 basis)	\$	3.75	\$	3.75	\$	3.75
SBM (\$/ton)	\$	225.00	\$	235.00	\$	235.00
DDGS (\$/ton)	\$	130.00	\$	130.00	\$	130.00
Vit/Min & NonFeed Variable Costs (\$/head)	\$	29.04	\$	29.04	\$	29.04
Fixed Costs (\$/head)	\$	8.45	\$	8.45	\$	8.45
Total "Non Animal Purchase" Costs (\$/head)	\$	91.13	\$	91.72	\$	91.72
Expected Sales Price (\$/cwt w/ \$2/cwt basis)	\$	48.84	\$	48.10	\$	51.06
Weanling Price: \$0/head margin	\$	40.74	\$	38.15	\$	46.14
01'-06' ISU Avg Margin (\$/head)	\$	11.68	\$	11.68	\$	11.68
Weanling Price: ISU 5 yr avg margin	\$	29.06	\$	26.47	\$	34.46
"Shut Down" Weanling Price	\$	49.19	\$	46.60	\$	54.59