Impact of Ethanol on Animal Agriculture

John D. Lawrence
Iowa State University
11,568 MGY – 4,072 MBu
14,261 MGY – 5,034 MBu
36,198 MGY – 12,869 MBu
Higher Corn Prices Came at a Good Time

- Hogs: extended period of positive returns
- Feedlots Near record weekly prices and new record annual
- Cowherds: profitable since 1999 and contracting
- Dairies: rough 2006, but record prices in 2007
- Eggs: prices higher in early 2007 following 3+ years of lower price
- Turkeys: expanding after record prices in 2006
OMAHA CORN PRICES
Weekly

$ Per Bu.

$ 1.50
$ 2.00
$ 2.50
$ 3.00
$ 3.50
$ 4.00
$ 4.50

JAN  APR  JUL  OCT

2001-05
2006
2007

G-P-02
08/30/07

IOWA STATE UNIVERSITY
University Extension
Implication for Pork Producers

• **Cost of production impact**
  
  – **1997-2006**
  
  • Omaha corn = $2.09
  • Decature 48% SBM $188
  • ISM barrows and gilts live weight $42.18
  • ISU farrow to finish cost estimate $39.92

  – **12 bu/head, 270# live weight**
  
  • $1 higher corn = $4.44 = $44-45/cwt
  • $2 higher corn = $8.88 = $48-49/cwt
Impact on Feedlot Cattle Cost and Returns

<table>
<thead>
<tr>
<th>1997-2006</th>
<th>Price</th>
<th>BE Cost</th>
</tr>
</thead>
<tbody>
<tr>
<td>- Calf</td>
<td>$101.96</td>
<td>$71.69</td>
</tr>
<tr>
<td>- Yearling</td>
<td>$90.35</td>
<td>$72.00</td>
</tr>
<tr>
<td>- Fed</td>
<td>$74.18</td>
<td></td>
</tr>
</tbody>
</table>

- 60 Bushels and 1250# pay weight
  - $1 higher corn = $4.80/cwt, $8.50 on 7cwt
  - $2 higher corn = $9.60/cwt, $17 on 7cwt
Cost of Corn as Percent of Total Retail, Hide, and Offal Value

1991-2006
7.4% 7.1%

Jan-Jun 07
9.0% 9.6%
CARD 2

• Baseline results
  – Corn price = $3.16 per bushel
  – Ethanol price = $1.57* per gallon
  – Ethanol = 14.6 billion gallons
  – Corn acreage = 92.5 Million
  – Corn to ethanol = 31%
  – Feed use decline = 5%

* Includes $.51/gal blender’s credit
CARD 2

• Food price implications
• Likely at the low end of range
  – Only feed-livestock-meat, milk, and eggs impact, not displaced acres of others
  – Competitive markets for food, thus only animal impact
  – Food price increase = 1.1%
Observations

• Growth depends on demand
  – E10 is approximately 14 bgal

• Difficult for cellulosic ethanol in a market filled with corn ethanol

• Soybeans and biodiesel challenge in ethanol world

• Linkage to food through animals
Dry Milling-Distillers Grains + Solubles

CORN

GRIND, WET, COOK

FERMENTATION

YEAST, ENZYMES

STILL

ALCOHOL & CO₂

2.7-2.8 gal/bu

STILLAGE

DISTILLERS GRAINS

WDG, DDG

DISTILLERS SOLUBLES

WDGS

DDGS

17-18 #/bu
NW Iowa Price of Dry, Modified, and Wet Distillers Grains with Solubles Divided by the Price of Corn

10/6/06 to 6/6/07

- Wet
- Modified
- Dry
### Midwest DGS Inclusion Rates

**Percent of Diet**

<table>
<thead>
<tr>
<th>Enterprise</th>
<th>Range</th>
<th>Realistic Adoption</th>
</tr>
</thead>
<tbody>
<tr>
<td>Swine</td>
<td>0-20</td>
<td>10</td>
</tr>
<tr>
<td>Poultry</td>
<td>0-10</td>
<td>5</td>
</tr>
<tr>
<td>Feedlot</td>
<td>0-40</td>
<td>30</td>
</tr>
<tr>
<td>Dairy</td>
<td>0-30</td>
<td>15</td>
</tr>
</tbody>
</table>

Still need corn for beef and dairy cattle
Still need corn and SBM for poultry and hogs

- **For each 1 bushel process to DDGS you need 2 more bushels to feed**
**Example U.S. DGS demand by 2011-12**

- COF @ 30% of corn  
  - 13.2 mil. T.
- Dairy @ 25% of corn  
  - 8.3 mil. T.
- Hogs @ 10% of corn  
  - 3.0 mil. T.
- Poultry @ 7% of corn  
  - 1.4 mil. T.

**Total**  
25.9 mil. T.

**Potential production at 5.5 bil. bu. for ethanol**  
46.8 Mil. T.
## Performance and Carcass Traits by DDGS in Diet

<table>
<thead>
<tr>
<th></th>
<th>DDGS 0</th>
<th>DDGS 10</th>
<th>DDGS 20</th>
<th>DDGS 30</th>
</tr>
</thead>
<tbody>
<tr>
<td>ADG, lbs</td>
<td>1.90(^a)</td>
<td>1.89(^a)</td>
<td>1.82(^b)(^c)</td>
<td>1.78(^b)(^d)</td>
</tr>
<tr>
<td>Feed:Gain</td>
<td>2.78(^a)</td>
<td>2.78(^a)</td>
<td>2.78(^a)</td>
<td>2.94(^b)</td>
</tr>
<tr>
<td>Final BW</td>
<td>257.2(^a)</td>
<td>258.7(^a)</td>
<td>250.6(^b)</td>
<td>246.2(^b)</td>
</tr>
<tr>
<td>No. of days</td>
<td>103.5</td>
<td>103.5</td>
<td>103.5</td>
<td>103.5</td>
</tr>
<tr>
<td>Dressing, %</td>
<td>73.4(^c)</td>
<td>72.8(^c)</td>
<td>72.1(^d)</td>
<td>71.9(^d)</td>
</tr>
<tr>
<td>Lean, %</td>
<td>52.6</td>
<td>52.0</td>
<td>52.6</td>
<td>52.5</td>
</tr>
</tbody>
</table>

\(^a\),\(^b\) Means within row with unlike superscripts differ (\(P < 0.05\)).  
\(^c\),\(^d\) Means within row with unlike superscripts differ (\(P < 0.10\)).  

Revenue and Return per Head
Over Feed Cost by Treatment

<table>
<thead>
<tr>
<th>DDGS 0</th>
<th>DDGS 10</th>
<th>DDGS 20</th>
<th>DDGS 30</th>
</tr>
</thead>
<tbody>
<tr>
<td>Carcass wt</td>
<td>187.4</td>
<td>186.9</td>
<td>178.9</td>
</tr>
<tr>
<td>Revenue, $60 carcass</td>
<td>$112.47</td>
<td>$112.17</td>
<td>$107.34</td>
</tr>
</tbody>
</table>

Return Over Feed Cost Per Head

<table>
<thead>
<tr>
<th>$2/175</th>
<th>81.64</th>
<th>82.91</th>
<th>80.62</th>
<th>79.36</th>
</tr>
</thead>
<tbody>
<tr>
<td>$3/185</td>
<td>73.47</td>
<td>74.72</td>
<td>72.67</td>
<td>71.07</td>
</tr>
<tr>
<td>$4/195</td>
<td>65.30</td>
<td>66.52</td>
<td>64.72</td>
<td>62.77</td>
</tr>
</tbody>
</table>

60 Pound starting weight, same days on feed, no difference in percent lean. Dressing percent DDGS0=DDGS10 and DDGS20=DDGS30. DDGS priced at 85% of corn price.
Change in Return Over Feed Cost Compared to DDGS0

<table>
<thead>
<tr>
<th>Revenue</th>
<th>DDGS 10</th>
<th>DDGS 20</th>
<th>DDGS 30</th>
</tr>
</thead>
<tbody>
<tr>
<td>$2/175</td>
<td>1.27</td>
<td>-1.02</td>
<td>-2.28</td>
</tr>
<tr>
<td>$3/185</td>
<td>1.24</td>
<td>-0.80</td>
<td>-2.41</td>
</tr>
<tr>
<td>$4/195</td>
<td>1.22</td>
<td>-0.59</td>
<td>-2.53</td>
</tr>
</tbody>
</table>

DDGS priced at 85% of corn price
### Impact of DDGS Price Relative to Corn Price

Return Over Feed Cost Compared to DDGS0

<table>
<thead>
<tr>
<th></th>
<th>DDGS 10</th>
<th>DDGS 20</th>
<th>DDGS 30</th>
</tr>
</thead>
<tbody>
<tr>
<td>75%</td>
<td>1.53</td>
<td>-0.24</td>
<td>-1.54</td>
</tr>
<tr>
<td>85%</td>
<td>1.24</td>
<td>-0.80</td>
<td>-2.41</td>
</tr>
<tr>
<td>95%</td>
<td>0.95</td>
<td>-1.36</td>
<td>-3.28</td>
</tr>
</tbody>
</table>
DDGS Effects

• Appears to be little impact at 10% level, but lower feed cost
• Higher levels appear to have
  – Higher feed:gain at 30%
  – Lower gain
  – Lower dressing percentage
  – Lower revenue but not as large of a decrease in return over feed cost
Feedlot Cattle DGS

• Wet distillers grains and solubles
  – More valuable than DDGS
  – Higher feed value than corn to 40-50% of the ration
  – Storage and transportation challenge

• Substitutes for corn and protein
  – Still need vit & min supplement, but no added P
Feedlot Cattle DGS

- Inclusion rates
  - 20-40% of dry matter is common
  - 60% WDGS in research
  - Appears to be lower marbling and quality grade at levels over 40%
Feed Efficiency & ADG Response To WDG Inclusion Rate

\[ y = -0.0007x^2 + 0.043x + 3.6604 \]
\[ R^2 = 0.914 \]

\[ y = 0.0005x^2 - 0.0406x + 6.5271 \]
\[ R^2 = 0.8867 \]

Vander Pol et al., 2006 Nebraska Beef Rep. and 2005 Midwest ASAS
Feed Efficiency & ADG Response To DDG Inclusion Rate

Buckner et al., 2007 Nebraska Beef Rep.
Assume: 95% of corn price, $0.10/bushel increase corn price, costs covered, 153 days from Vander Pol et. al. (2006 Nebraska Research Report)
CHANGE IN BEEF COW NUMBERS
JANUARY 1, 1998 TO JANUARY 1, 2007
(1000 Head)

-105 3
-45 2
-120
-131
-124
-60
-160
-107
-111
-11
-131
-120
-47
-11
-35
-5
-1
0
-1
0
-3
0
-5
0
-60
-207
-60
-15
-30
-14
-27
-11
-3
-35
-15
-3
-107

Alaska  3
Hawaii -3
US Total  -991

Livestock Marketing Information Center
Data Source: USDA/NASS

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Feed Cost Economics

• Iowa Beef Cow Business Records report average winter feed cost per cow of $1.01 per day

• Corn stalks and DGS can be much less
  – Baled corn stalks, $17-25 per ton
  – Dried distillers grains, $70 per ton
  – Before for processing, feeding loss, or vit & min
    • Late gestation cost would be $.38-.51 per day
    • Early lactation cost would be $.57-.72 per day
  – Wet distillers grains is lower cost than DDGS
  – Supplement grazed corn stalks will also lower cost
Implications for Cowherds

- Higher feed costs
  - Competition for land
  - Demand for heavier feeders
  - Cheaper feeders, all else equal
  - Excess capacity in feedlots
- Liquidation in crop states
- Slow to no expansion in US
Converting Fiber to Ethanol

- 6/27/2007, POET produces cellulosic ethanol from corn cobs
- “… First, the fiber that comes from our fractionation process will provide 40 percent of our cellulosic feedstock from the corn kernels that we are already processing in our facility. “
Corn Basis to Chicago Cash for Cattle Feeding Regions

Monthly average of daily prices '06-'07 is Jan '06 - May '07

Iowa Elevators
OMAHA
SWNE
Dodge City
NECO
TX N of Canadian
TX Triangle

Iowa State University
University Extension
Corn Price Difference, Average Ethanol Bids Minus Elevator Bids, Northeast and Northwest Iowa

Northeast Iowa

Northwest Iowa

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University Extension
NOV 3, 2006 CORN BASIS
Basis Calculated from CBOT DEC futures Prices 342.3 cents per bushel

http://www.card.iastate.edu/ag_risk_tools/
AUG 3, 2007 CORN BASIS

Basis Calculated from CBOT SEP futures price 326.5 cents per bushel
Risk Implications

• Physical control

• Enough for ‘08, what about ‘09
  – Ethanol expansion continues
  – Other crops try to buy back acres

• Basis volatility
  – 20% more corn to harvest and store
  – Carry in the market
  – Location basis variability
Take-home points

• Much tighter feed energy supply than in past
• Increased supply of medium-protein DGS
• Soy meal: tighter supply & higher cost
• Differential economic impacts by species of livestock & poultry
• *High risk to livestock industry in short-crop years*
• Feed price volatility affected by govt. fuel mandates
• 2nd generation ethanol plants to tighten DGS, forage supplies (8-10 years out?)
Rural Communities Need Both Ethanol and Livestock

- **50 million gallon ethanol plant**
- **18.5 Million bushels of corn**
  - **35** People directly employed
  - **98** Indirect & induced jobs
  - **133** Total regional jobs

Source: Swenson & Eathington
Rural Communities Needs Both Ethanol and Livestock

- 18.5 million bu corn
- Direct jobs
  - Farrow-finish: 400
  - Or Wean-finish: 120
  - Or Beef feedlot: 140
- Indirect and induced jobs??
- Further processing employment??
Iowa Corn Processing Plants, 2002
71 Potential Iowa Plants
11 Just across IA Borders

Capacity: 142% of 2006 Crop
Take Home

The world in which you operate had fundamentally changed.

How have you changed your business???
Thank you!

Any Questions?

www.econ.iastate.edu/faculty/lawrence/