The Best Place to Feed Cattle: The Economics of Feeding Cattle in the Northern Plains[†]

Darrell R. Mark[‡]

Prior to the 1970s, Iowa ranked first in the number of cattle on feed (see slide 2). Since then, the commercial cattle feeding industry grew rapidly in Texas, Kansas, and Nebraska. Southern Plains (Texas and Kansas) cattle feeding in particular grew due to improved feeding performance resulting from more favorable weather and lower energy costs for steam flaking corn. These advantages were sufficient to offset transportation costs for relatively inexpensive corn imported from the Corn Belt. As corn prices reach sustained higher levels due to ethanol production in the Corn Belt and cattle feeders can utilize distillers grains as a value-added feed, the competitive advantage of Southern Plains feeders has, to some degree, been eroded. The extent to which a structural change occurs and cattle on feed numbers appreciably grow in the Northern Plains will depend on several factors, especially cost of gain and feeding performance.

A comparison of feedlot closeout data from Kansas State University's Focus on Feedlot Survey and Iowa, Minnesota, and South Dakota closeouts from Land O'Lakes confirms the historical performance advantages for the Southern Plains feedlots. Average daily gain averaged 0.25 lbs higher and feed conversion 1.2 lbs lower in the Kansas feedlots for the same weight placements from 1999-2006 (see slides 4 and 5). Interestingly, death loss at the Kansas feedlots was 1.2% higher than the Northern Plains feedlots, likely resulting from higher risk cattle placed in Kansas (see slide 6). Not surprising, though, is that corn price averaged $0.40/bu higher for the Kansas feedlots (see slide 7). The lower corn price and death loss in the Northern Plains feedlots resulted in a total cost of gain that averaged $5/cwt lower from 1999-2006 (see slide 8).

These cost of gain advantages in the Northern Plains may further grow as corn prices and energy prices increase. For the past twenty years, corn prices in the Southern Plains have been gaining on corn prices in the Northern Plains (see slide 15). As the rapidly growing ethanol industry has been using a greater proportion of the total U.S. corn production, availability of corn becomes an increasingly important issue, particularly in already deficit areas. Diversified corn farming and cattle feeding operations in the Northern Plains have an advantage in being able to secure corn for cattle feeding by producing corn themselves.

Higher corn price levels tend to change feeder cattle price spreads, which in turn reveals relative profitability differences among feedlots. Typically, the premium for lighter weight calves declines as corn price increases because they consume more corn to finish them. Because of historically small calf crops for the past several years, feeder cattle

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[†] Presented at Land O'Lakes/Quality Liquid Feeds Feedlot Seminar, February 19-21, 2008. Data are current through January 2008.
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prices have, until recently, remained relatively high. Similarly, the spread between calf prices (5-600 lb) and yearling prices (7-800 lb) has grown due to the tight calf supplies. However, that spread has grown more in Nebraska than in Kansas and Texas. In fact, the spread increased the most in Nebraska (closest to corn production) and increased the least in Texas (farthest from corn production) (see slide 26). The difference in Nebraska and Texas calf prices has increased (see slide 27), suggesting that Northern Plains cattle feeders could afford to pay more for light weight placements than Southern Plains feeders could (assuming cattle feeding is a margin business and feeder prices are bid up to their breakeven point). Similarly, Nebraska feeders have been able to pay more for yearling steers than Texas feeders (see slide 28).

That Northern Plains feeders have been paying increasingly more for feeder cattle than Southern Plains feeders suggests the economics of feeding cattle in the Northern Plains has changed. Likely the biggest economic change in Northern Plains cattle feeding has resulted from replacing corn in the ration with distillers grains. Distillers grains is usually priced less than corn (see slide 40) despite it being a higher energy feedstuff (see slide 41) that results in significant improvements in performance (see slide 42). University of Nebraska–Lincoln research has found that feeding wet distillers grains plus solubles (WDGS) at 30-40 percent of the ration (DM basis) can lead to about a 0.8 lb increase in average daily gain and approximately a 0.8 lb improvement in feed conversion. Most importantly, these performance responses to feeding WDGS translate to improvements in feeding profits after accounting for extra transportation and handling costs associated with this very wet, bulky feed. Marginal returns to feeding WDGS at 30-40 percent of the ration (DM basis) are as much as $30/head and grow larger as corn price increases (see slide 47). Economic optimum inclusion level of dried distillers grains plus solubles (DDGS) is lower (about 20 percent of the ration) and result in slightly smaller marginal returns (see slide 46). The economic impact of feeding distillers grains, particularly WDGS, is sensitive to the location of the feedlot relative to the ethanol plant. As distance from the ethanol plant increases, the optimal inclusion level decreases as do the marginal returns (see slide 48). As a result, cattle feedlots that are further from ethanol plants (particularly those in the Southern Plains) are at a disadvantage relative to cattle feedlots in close proximity to ethanol plants. Still, even WDGS can be transported well over 100 miles and still provide positive returns due to the significant performance response observed from feeding byproducts.

One of the challenges associated with feeding distillers grains is that nutrients, including phosphorous, are concentrated three-fold relative to corn. As a result, the phosphorous content of manure from cattle fed distillers grains is about three times greater as cattle fed non-byproduct rations. Distribution and application of this manure in accordance with restrictive phosphorous guidelines increases costs for cattle feeders. Kissinger et al. found, though, that these costs increase the least for small feedlots (see slide 52). Thus, smaller feedlots that are most prevalent in the Northern Plains may have an advantage in waste handling associated with feeding byproducts. Further, crop nutrient demands for phosphorous are higher relative to the manure phosphorous available in the Northern Plains states (see slide 54).

Early assumptions about spoilage and shelf life of distillers grains, particularly WDGS, suggested that only larger operations could effectively utilize WDGS. Depending upon time of year and ambient temperatures, WDGS may last only 1-3 weeks before spoiling. So, only operations that could feed truck loads of WDGS that quickly could take advantage feeding the byproduct. Further, the cattle feeders that could purchase more distillers grains during its seasonal price low in late summer (see slide 58) were at a distinct advantage. However, new research has found several methods work well to store WDGS, DDGS and other ethanol byproducts. As a result, smaller operations, including those without cattle on feed in the summer when distillers grains is cheapest, can take better advantage of feeding byproducts.

Market structure issues other than feeding ethanol byproducts may also contribute to shifting the feeding advantage back to the Northern Plains. The last three years have seen the smallest calf crop in history. As a result, availability of feeder cattle is tight nearly everywhere. However, given significantly higher feeding costs in Canada, imports of feeder cattle from Canada have been increasing. Feeders in Iowa, South Dakota, Minnesota, and Nebraska are in best position to take advantage of this available supply of feeder cattle. Further, it appears that over-capacity in the packing industry will lead to consolidation or plant closures. Given that cattle placements have been increasing in the Northern Plains and declining in the Southern Plains (see slide 63), it is likely that plant closures would occur in the south. Not surprising, then, one major beef packer announced plans in late January to close one of its plants in eastern Kansas.

The extent to which Northern Plains cattle feeders can maintain their new competitive advantage remains unclear. Southern Plains cattle feeders are seeking to gain the performance responses from feeding distillers grains by constructing ethanol plants in the south. Still, as the cattle feeding industry has to increasingly compete with the ethanol industry for corn, transportation logistics dictate that those closest to the corn will have an advantage.

The Best Place To Feed Cattle:

The Economics of Feeding Cattle in the Northern Plains

LOL-QLF Feedlot Seminar
February 19-21, 2008

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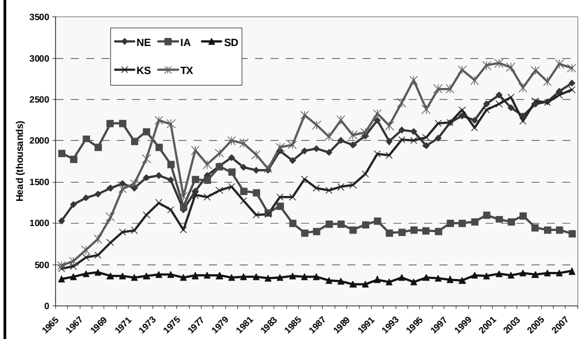
2

All Cattle on Feed, January 1



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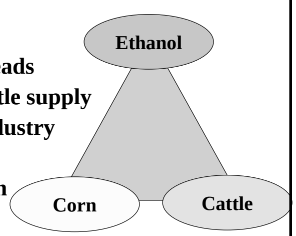
3

Can The North Do It Again?

The Issues

1. Cost of gain
2. Cattle performance
3. Feeder cattle price spreads
4. Closer to Canadian cattle supply
5. Location of packing industry
6. Waste handling
7. Challenges to expansion



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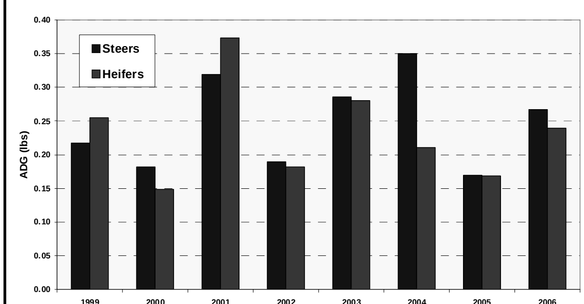
Difference in Average Daily Gain Between Kansas and IA/MN/SD Feedlots



Source: KSU Feedlot Survey & LOL

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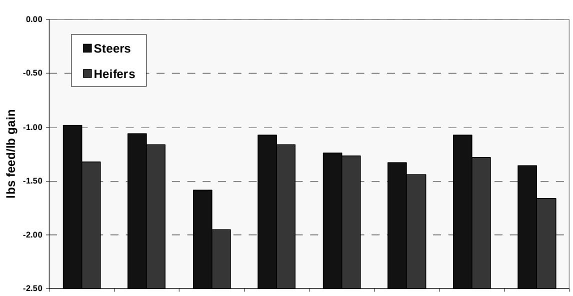
5

Difference in Feed Conversion Between Kansas and IA/MN/SD Feedlots



Source: KSU Feedlot Survey & LOL

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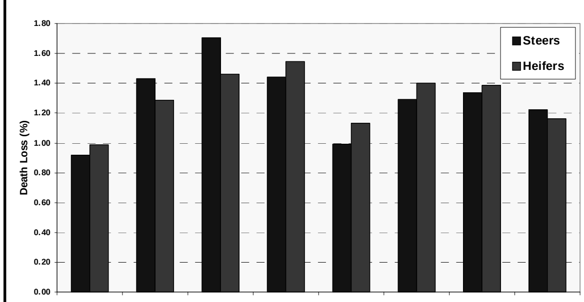
6

Difference in Death Loss Between Kansas and IA/MN/SD Feedlots



Source: KSU Feedlot Survey & LOL

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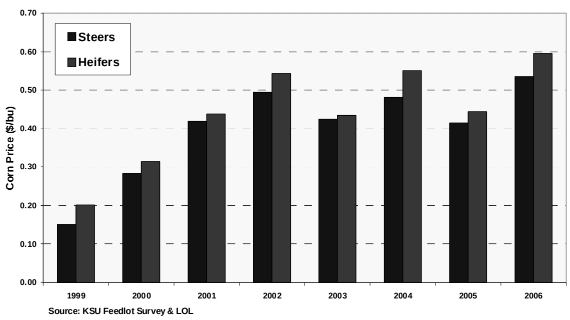
7

Difference in Corn Price Between Kansas and IA/MN/SD Feedlots



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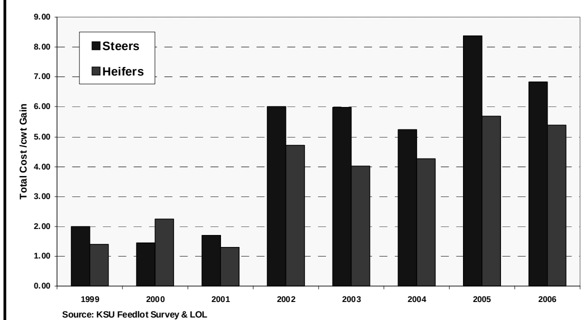
Difference in Total Cost of Gain Between Kansas and IA/MN/SD Feedlots



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Growth of the Ethanol Industry Has Fundamentally Changed The Cattle Business

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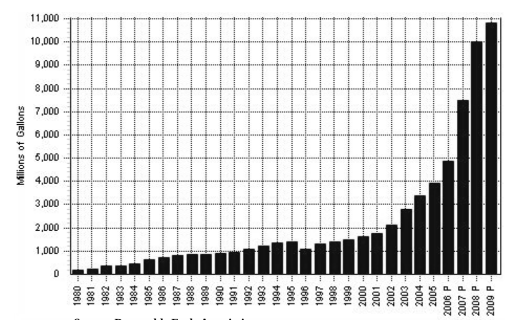
Fuel Ethanol Production in the U.S.



Source: Renewable Fuels Association

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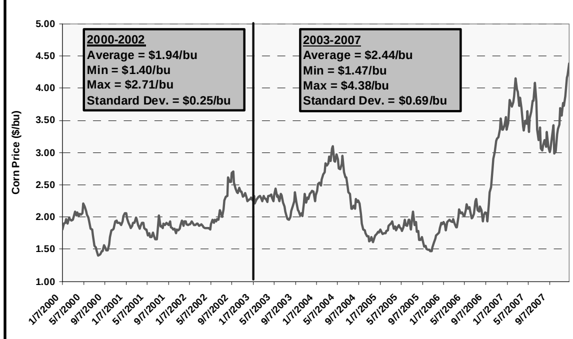
Corn Prices More Variable
Omaha Nebraska Corn Price, 2000-2007



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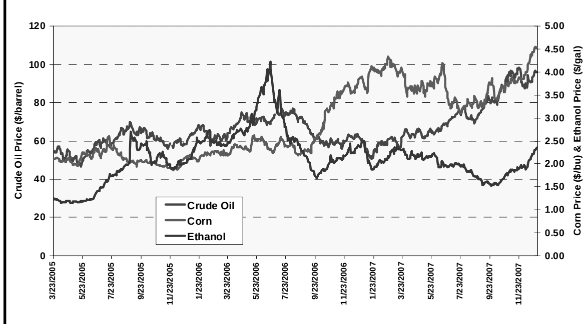
CBOT Corn, CBOT Ethanol, & NYMEX Crude Oil Futures



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Basis Is More Variable

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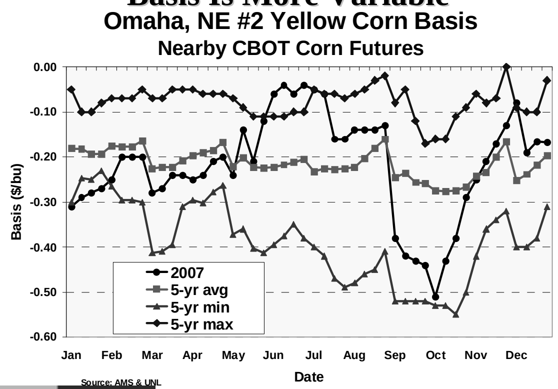

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Cattle Feeders Have To Become Grain Originators

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- Cash price risk is higher
- Availability of corn *at any price* may become an issue
- Focus on cash contracting
  - ✓Crop insurance
  - ✓New Generation Contracts

Who Has The Advantage?

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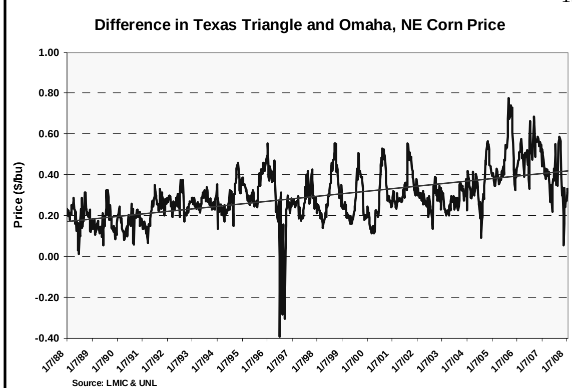

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Corn Basis to Chicago Cash for Cattle Feeding Regions

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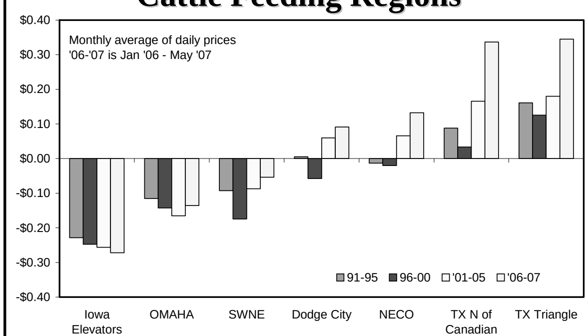

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Price Level & Variability Changes Things For Cattle Feeders

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- Decreases price can pay for feeder cattle
  - ✓Varies according to weight
- Changes desired placement weight
- Changes fed cattle marketing weight
- Changes where cattle are fed

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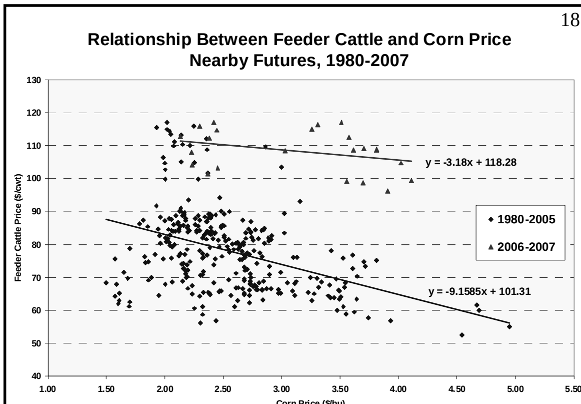

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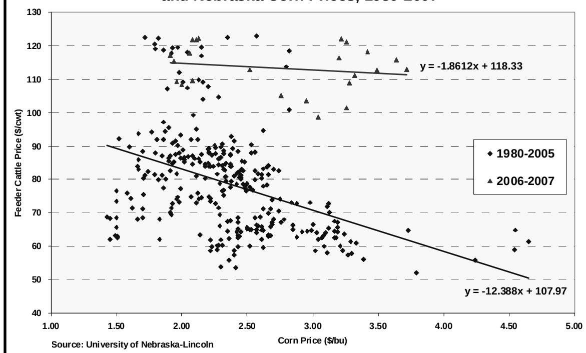
Relationship Between Nebraska Feeder Cattle (700-800 lb.) and Nebraska Corn Prices, 1980-2007



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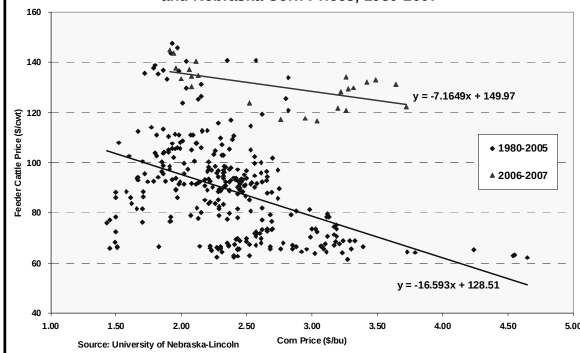
Relationship Between Nebraska Feeder Cattle (500-600 lb.) and Nebraska Corn Prices, 1980-2007



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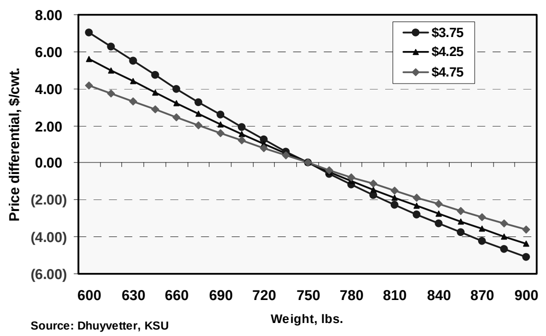
Impact of Corn Price on Feeder Cattle Price-Weight Relationship



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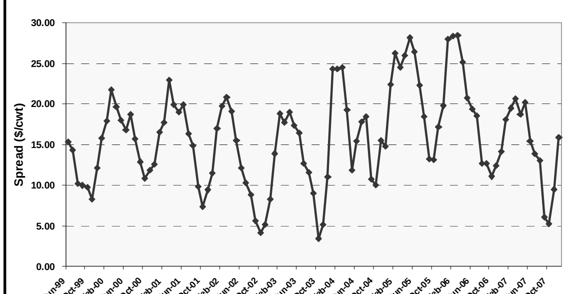
Spread Between Nebraska 5-600 lb Steer and 7-800 lb Steer Price



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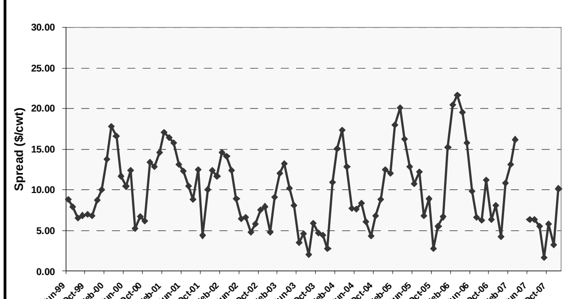
Spread Between Texas 5-600 lb Steer and 7-800 lb Steer Price



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Calves Have Been Discounted More in the Southern Plains

Year	Nebraska Steers 5-600 & 7-800 Spread	Kansas Steers 5-600 & 7-800 Spread	Texas Steers 5-600 & 7-800 Spread
1999	11.43	8.74	7.53
2000	11.50	9.03	7.70
2001	12.00	10.12	8.54
2002	13.66	11.37	10.14
2003	15.04	12.76	11.54
2004	16.21	13.56	12.22
2005	17.43	13.56	12.73
2006	18.36	14.42	13.25
2007	18.35	14.62	12.57
Change	**6.92**	**5.88**	**5.04**

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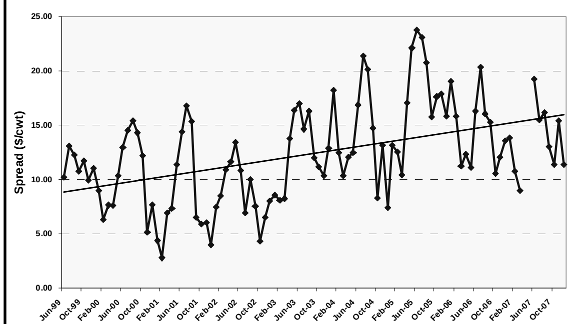
Spread Between NE and TX Steer Price, 5-600 lb



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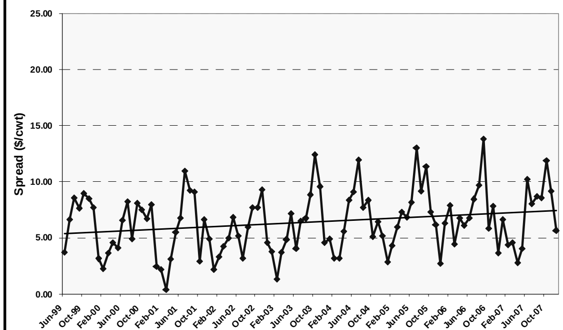
Spread Between NE and TX Steer Price, 7-800 lb



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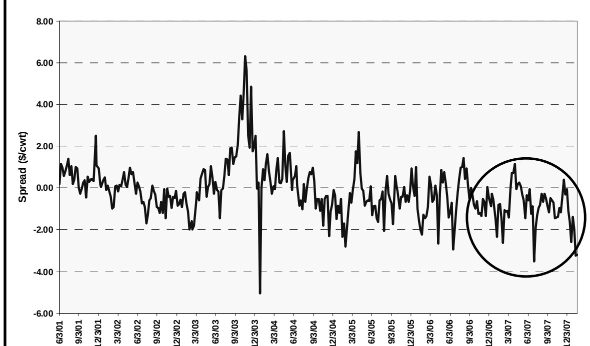
Spread Between Texas and Nebraska Fed Steer Price



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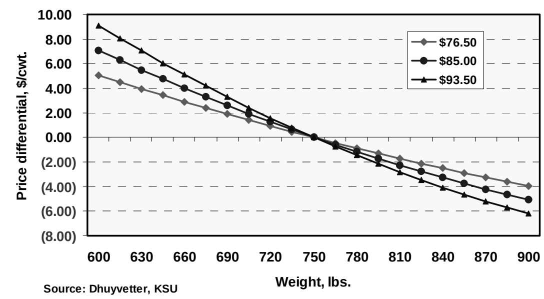
Impact of Fed Cattle Price on Feeder Cattle Price-Weight Relationship



Source: Dhuyvetter, KSU

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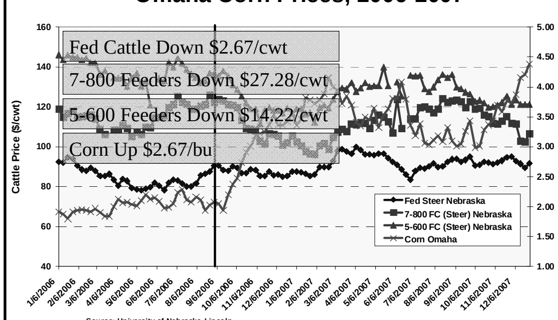
What Happened From 9/1/06 to 1/18/08?

Nebraska Fed Steer, Feeder Steer, & Omaha Corn Prices, 2006-2007



Source: University of Nebraska-Lincoln

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Historical Models Would Have Suggested…

- ➢ **Over a $37/cwt drop in 5-600 lb. feeders**
  - ✓ **Compared to $14.22/cwt actual drop**
- ➢ **Over a $16/cwt drop in 7-800 lb. feeders**
  - ✓ **Compared to $27.28/cwt actual drop**

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What Happened From 9/1/06 To 7/20/07?

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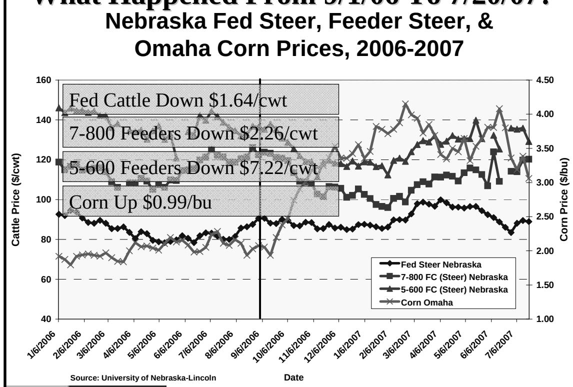

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Historical Models Would Have Suggested…

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- Nearly a $12/cwt drop in 5-600 lb. feeders
  - ✓Compared to $7.22/cwt actual drop
- Nearly a $8/cwt drop in 7-800 lb. feeders
  - ✓Compared to $2.26/cwt actual drop

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Why Haven’t Feeder Prices Dropped As Much As Expected?

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- Tight feeder supplies & available bunk space
- Good demand
- Old models don’t reflect co-product feeding

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Feedlot Economics Have Changed With The Feeding Of Ethanol Co-Products

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Economic Issues Associated With Feeding Ethanol Co-Products

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1. Co-products may be less expensive than corn, but availability is sometimes an issue
2. Performance improvements from feeding co-products at 30-40% dietary inclusion hedges against corn price increases
3. Feeding wet co-products leads to:
   - ✓ Increased trucking cost to feedyard
   - ✓ Increased feeding/handling cost within feedyard
   - ✓ Fewer days on feed (less yardage/interest cost)

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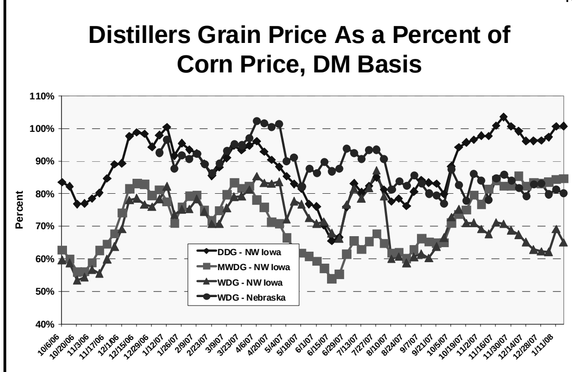

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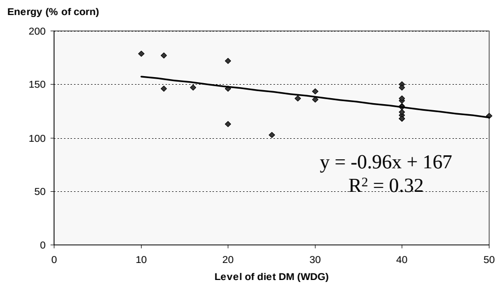
Energy Content of WDGS Compared To Corn



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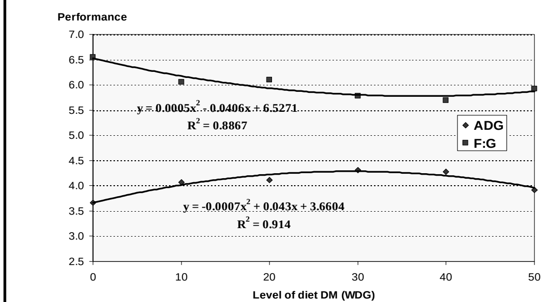
Feed Efficiency & ADG Response To WDG Inclusion Rate



Source: Vander Pol et al., 2006 Nebraska Beef Rep. and 2005 Midwest ASAS

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Cattle CODE
*C*oproduct *O*ptimizer *D*ecision *E*valuator

- **Cattle feeding budget that calculates a marginal return to feeding various ethanol co-products with user-defined prices & performance**
  - ✓ **WDGS, DDGS, WCGF, Dakota Bran**
- **Available at http://beef.unl.edu**

Source: Buckner, Erickson, Klopfenstein, Mark, Bremer

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Cattle Feeding Budget Model With WDGS & DDGS

Inputs

- **Dietary ingredients (DM, inclusion, price)**
- **Cattle performance (DMI, feed conversion)**
- **Trucking distance, size, cost**
- **Yardage, processing/health, interest rate**

Outputs

- **ADG & DOF**
- **Total Costs**
  - ✓ **Yardage**
  - ✓ **Ration**
  - ✓ **Feeding expense**
  - ✓ **Co-product hauling**
- **Net Return**
- **Return to co-product feeding**

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Example

➢ **Feeder cattle in-weight**	**750 lbs**
➢ **Fed cattle out-weight**	**1300 lbs**
➢ **Days on feed**	**153 days**
➢ **DMI**	**24 lbs**
➢ **Feed:Gain**	**6.5 lbs/lb**
➢ **Yardage cost**	**$0.35/hd/day**
➢ **Trucking**	**$3.00/loaded mile**
➢ **Corn price**	**$4.00/bu**
➢ **WDGS/DDGS price**	**95% of corn price**

(DM basis)

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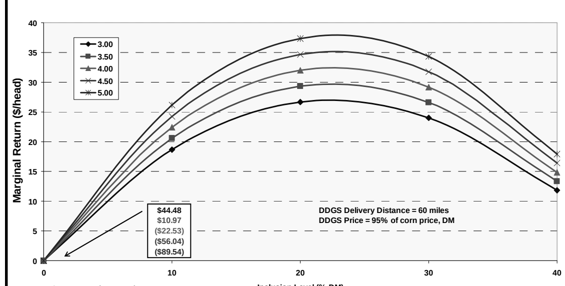
Marginal Returns To Feeding DDGS At Varying Corn Prices, By Inclusion Level



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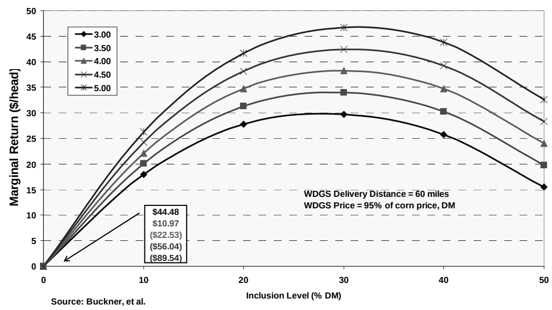
Marginal Returns To Feeding WDGS At Varying Corn Prices, By Inclusion Level



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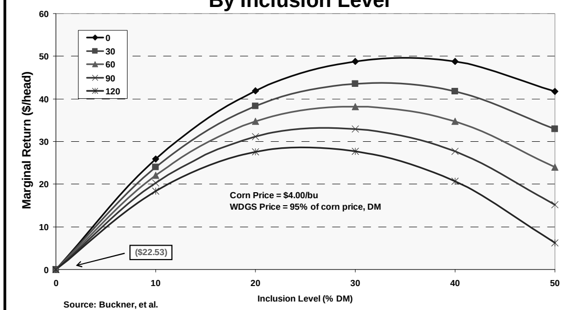
Marginal Returns To Feeding WDGS At Varying Shipping Distance for WDGS, By Inclusion Level



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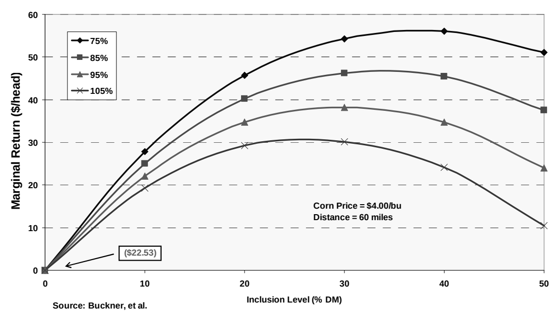
Marginal Returns To Feeding WDGS At Varying WDGS Prices, By Inclusion Level



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Another Feeding Challenge…

- **Phosphorous content of manure increases for cattle fed WDGS**
  - ✓**WDGS concentrates phosphorous three-fold compared to corn**
- **Managing phosphorous in manure is a distribution & logistics issue**
  - ✓**Need more acres to distribute manure**

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Land Requirements, 4 yr P basis (acres)

	2500	10,000	25,000
0 byp 0.30 P	1,320	5,300	13,200
20 byp 0.40 P	1,900	7,600	19,000
40 byp 0.50 P	2,500	10,000	25,000

Assumes: 50% of land area accessible
185 bu corn, corn-soybean rotation, ~35 P (80 P_2O_5)

Kissinger et al., 2006

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Costs and Net Value, C-SB rotation 4-Yr P Basis, ($/hd)

	2500	10,000	25,000
COSTS			
0 byp 0.30 P	3.00	2.10	3.00
20 byp 0.40 P	3.50	2.70	4.30
40 byp 0.50 P	3.90	3.30	5.75
NET VALUE			
0 byp 0.30 P	2.50	3.50	2.50
20 byp 0.40 P	4.30	5.10	3.50
40 byp 0.50 P	6.10	6.80	4.30

Kissinger et al., 2006

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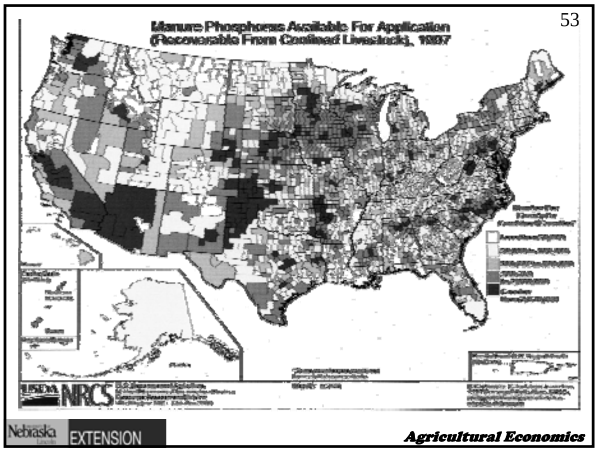
53
Manure Phosphorus Available For Application (Recoverable From Confined Livestock), 1997
USDA NRCS
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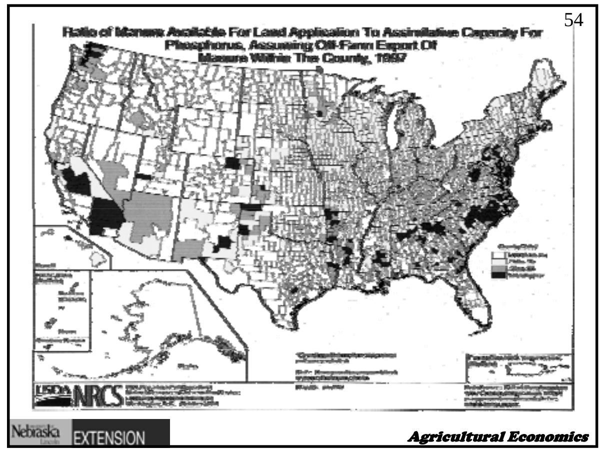
54
Ratio of Manure Available For Land Application To Assimilative Capacity For Phosphorus, Assuming Off-Farm Export Of Manure Within The County, 1997
USDA NRCS
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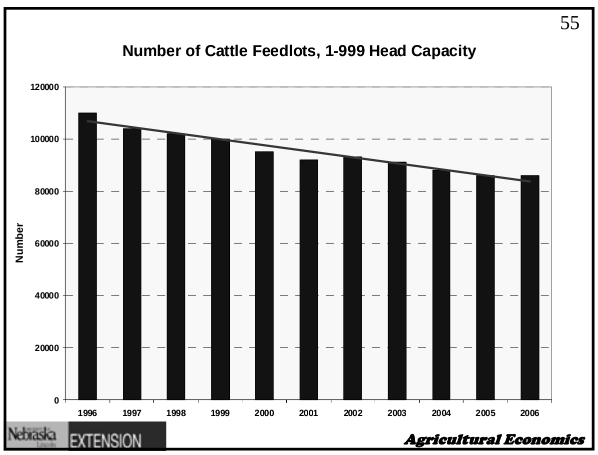
55
Number of Cattle Feedlots, 1-999 Head Capacity
Number
0
20000
40000
60000
80000
100000
120000
1996
1997
1998
1999
2000
2001
2002
2003
2004
2005
2006
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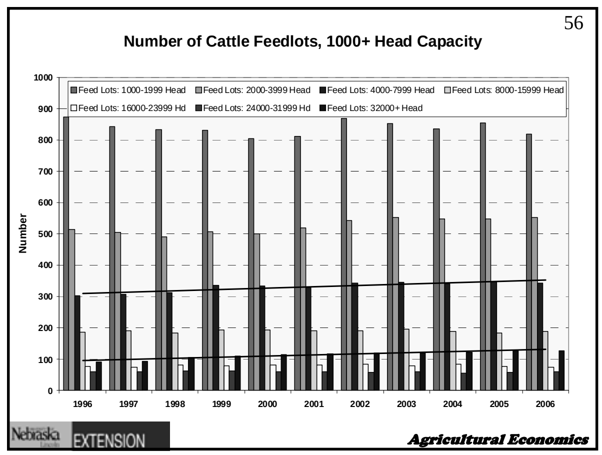
56
Number of Cattle Feedlots, 1000+ Head Capacity
Feed Lots: 1000-1999 Head
Feed Lots: 2000-3999 Head
Feed Lots: 4000-7999 Head
Feed Lots: 8000-15999 Head
Feed Lots: 16000-23999 Hd
Feed Lots: 24000-31999 Hd
Feed Lots: 32000+ Head
Number
0
100
200
300
400
500
600
700
800
900
1000
1996
1997
1998
1999
2000
2001
2002
2003
2004
2005
2006
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57
Smaller Feeders Can Store Byproducts To Maintain Competitiveness
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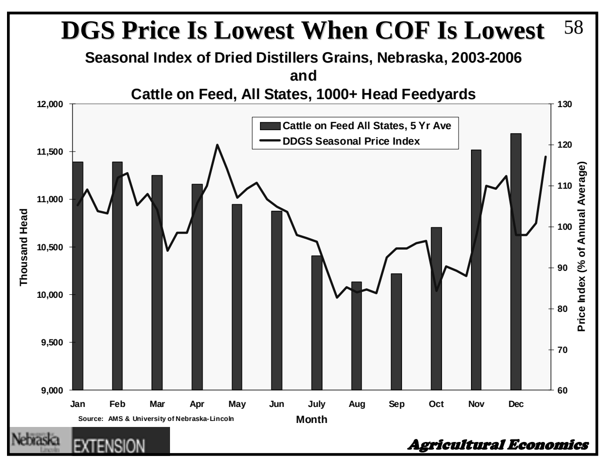
58
DGS Price Is Lowest When COF Is Lowest
Seasonal Index of Dried Distillers Grains, Nebraska, 2003-2006
and
Cattle on Feed, All States, 1000+ Head Feedyards
Cattle on Feed All States, 5 Yr Ave
DDGS Seasonal Price Index
Thousand Head
9,000
9,500
10,000
10,500
11,000
11,500
12,000
Price Index (% of Annual Average)
60
70
80
90
100
110
120
130
Jan
Feb
Mar
Apr
May
Jun
July
Aug
Sep
Oct
Nov
Dec
Month
Source: AMS & University of Nebraska-Lincoln
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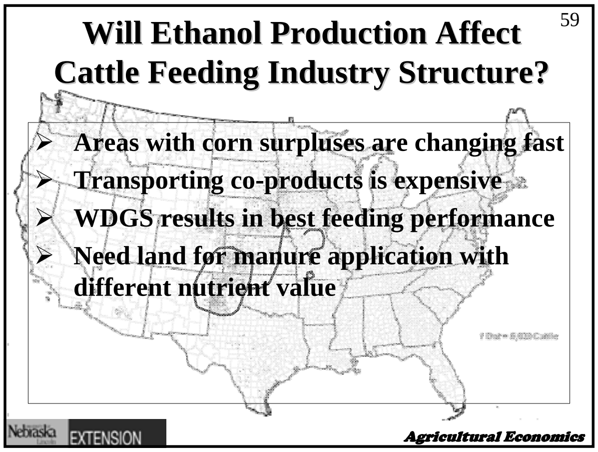
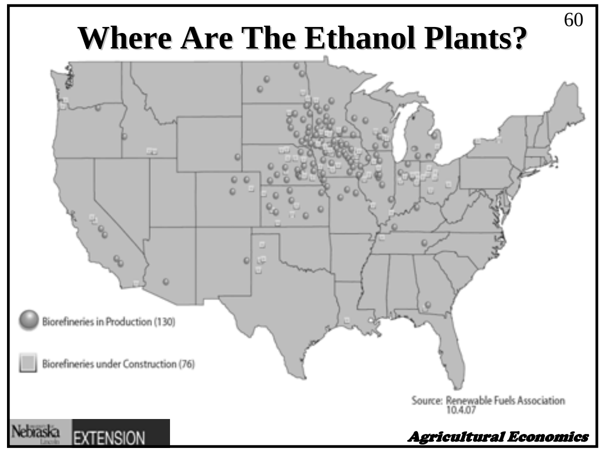
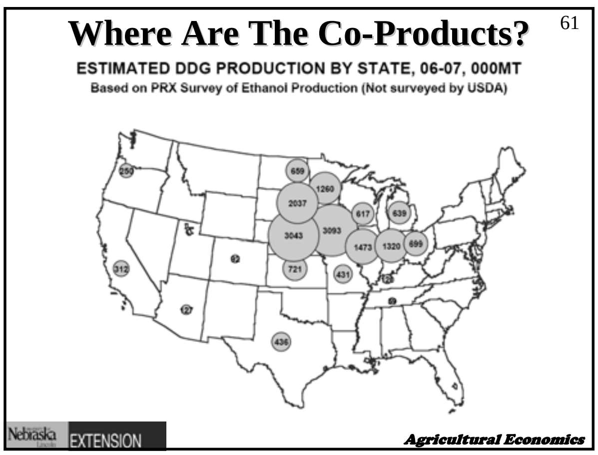
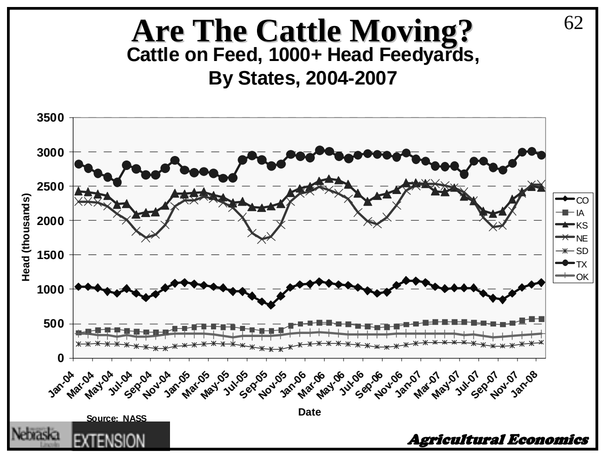
"The Best Place to Feed Cattle: The Economics of Feeding Cattle in the Northern Plains"

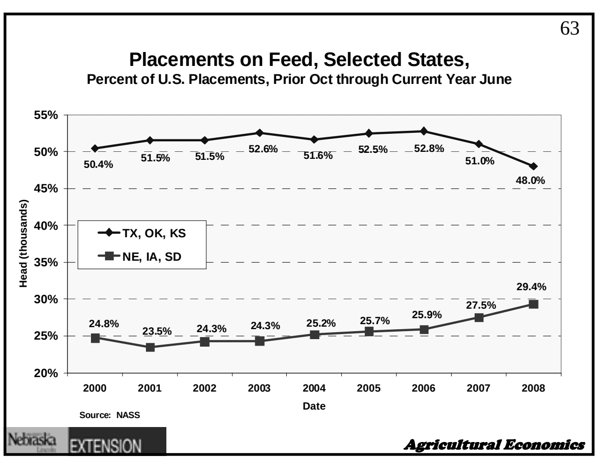
Dr. Darrell R. Mark

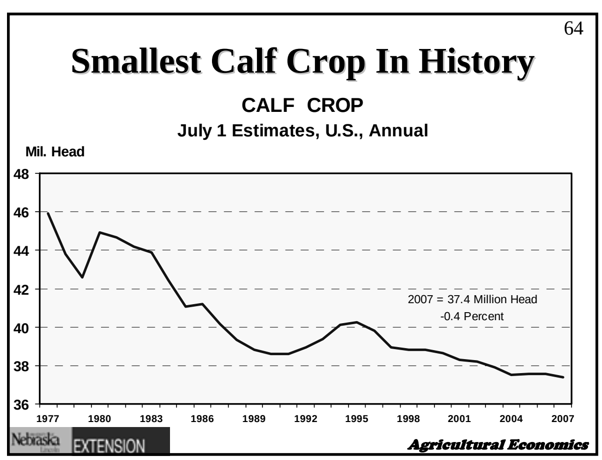












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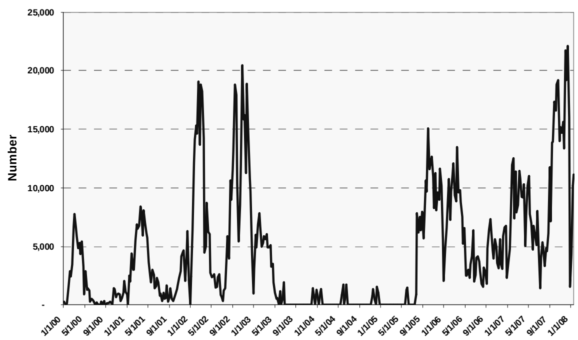
Canadian Feeder Cattle Imports



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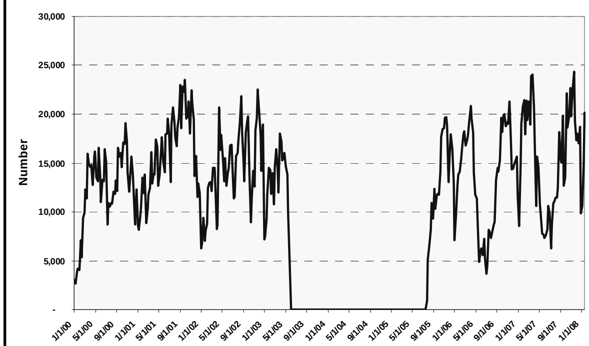
Canadian Fed Cattle Imports



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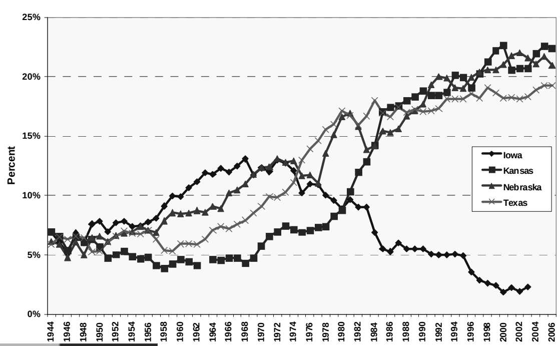
Will Slaughter Relocate Back To North?

Commercial Cattle Slaughter As A Percent Of U.S. Total



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For More Information

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