

Improving Feed Efficiency at the Feedlot: Opportunities and Challenges

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Feed efficiency issue

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- Dr. Berger, NCBA Cattlemens College
- Excellent on why cattle less efficient
 - forage diet, more maintenance, lower intake, ruminants, not been a focus
- Illinois data with GrowSafe and variation
 - cattle not bigger, intakes about the same, gains were different, tremendous variation in profits
- Feed efficiency is important

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Feed efficiency issue

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- Feed efficiency definition
 - lb of gain per lb of feed DM
 - lb of feed DM per lb of gain
- Beef industry efficiency
 - minimize lb of feed per lb of productivity (gain)
 - lb of beef per cow? per cow exposed?
- Feedlot focus
 - commercial feedlots (run cattle hotel)
 - private feedlots (profit from cattle too)
- Feedlot nutrition consultants
 - Graded on feed efficiency
 - Should the grade be profitability?

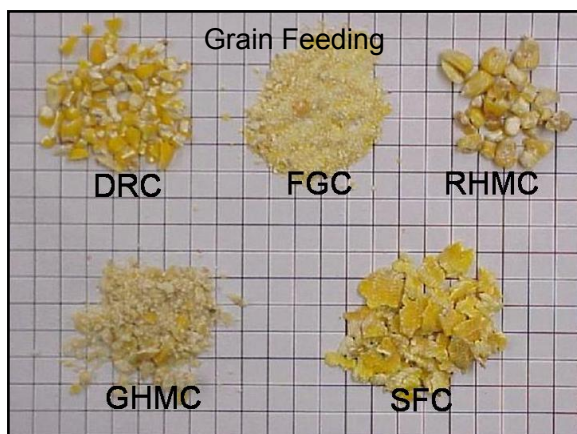
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Nutrition/Management Methods

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- Grain type/processing
- Roughage (forage type/amount)
- Byproducts (distillers, gluten, etc)
- Feed additives
 - Ionophores/Antimicrobials
 - Beta-agonists
- Implants
- Example where poorer efficiency increases profit

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Corn Processing-Diets without byproducts

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Owens et al. (1997)

| | DRC | HMC | SFC |
|-----------------------|-------------------|-------------------|-------------------|
| DMI, lb | 20.8 ^a | 19.2 ^b | 18.4 ^c |
| ADG, lb | 3.19 ^a | 3.01 ^b | 3.15 ^a |
| Feed / Gain | 6.57 ^a | 6.43 ^a | 5.87 ^b |
| Feed / Gain, % of DRC | -- | 102 | 112 |

Owens et al. (1997) summarized performance from 521 research trials which fed DRC, HMC, or SFC

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| Corn Processing-Diets without byproducts | | | |
|--|-------------------|-------------------|-------------------|
| | DRC | HMC | SFC |
| DMI, lb | 22.2 ^a | 21.8 ^a | 20.4 ^b |
| ADG, lb | 3.64 | 3.55 | 3.60 |
| Feed / Gain | 6.10 ^a | 6.10 ^a | 5.65 ^b |
| Feed / Gain, % of DRC | -- | 100 | 108 |

Cooper et al., 2002 J. Anim. Sci.
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| | Processing | | | | |
|-----|-------------------|--------------------|-------------------|-------------------|-------------------|
| | SFC | HMC | FGC | DRC | WC |
| DMI | 22.0 | 21.8 | 22.2 | 23.4 | 24.8 |
| ADG | 4.25 | 4.15 | 4.17 | 4.24 | 4.18 |
| F:G | 5.18 ^a | 5.26 ^{ab} | 5.32 ^b | 5.52 ^c | 5.92 ^d |

All diets contained 32% WCGF
Calves fed 170 days, initial wt. = 667 lb

Scott et al., 2003 J. Anim. Sci.
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| | Processing | | | | |
|------------------------|-------------------|--------------------|-------------------|-------------------|-------------------|
| | SFC | HMC | FGC | DRC | WC |
| DMI | 22.0 | 21.8 | 22.2 | 23.4 | 24.8 |
| ADG | 4.25 | 4.15 | 4.17 | 4.24 | 4.18 |
| F:G | 5.18 ^a | 5.26 ^{ab} | 5.32 ^b | 5.52 ^c | 5.92 ^d |
| Diet ^a | 6.2 | 4.7 | 3.6 | -- | -7.2 |
| Corn only ^a | 11.8 | 8.9 | 6.8 | -- | -13.7 |

^aExpressed as % above DRC, calculated for entire diet and corn only (52.5%)
All diets contained 32% WCGF
Calves fed 170 days, initial wt. = 667 lb

Scott et al., 2003 J. Anim. Sci.
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| | SFC | GHMC | RHMC | FGC | DRC |
|-----------|-------------------|-------------------|-------------------|-------------------|-------------------|
| | DMI | 21.3 ^a | 21.4 ^a | 21.6 ^a | 23.0 ^b |
| ADG | 4.33 | 4.24 | 4.21 | 4.35 | 4.23 |
| F:G | 4.91 ^a | 5.05 ^b | 5.13 ^b | 5.29 ^c | 5.49 ^d |
| Corn only | 17.6 | 13.4 | 10.9 | 6.1 | -- |

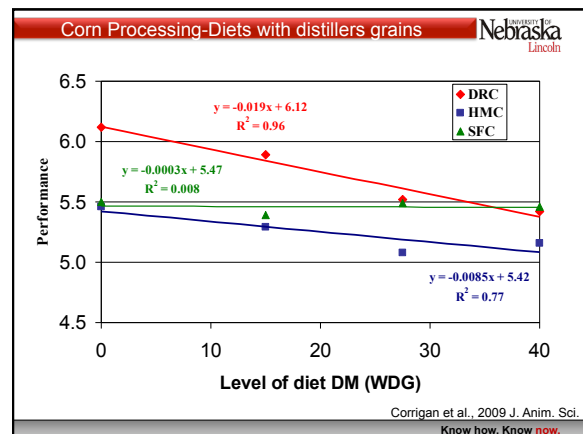
All diets contained 25% WCGF, 60% of respective corn
Calves fed 152 days, initial weight = 677 lb

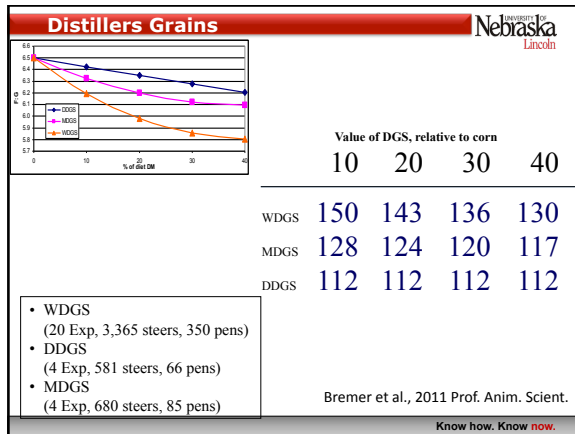
Macken et al., 2006 Prof. Anim. Scientist.
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| | WC | DRC | D/H | HMC | SFC | FGC |
|-------|-------------------|--------------------|--------------------|--------------------|-------------------|-------------------|
| DMI | 23.1 ^a | 22.6 ^a | 21.5 ^b | 21.0 ^{bc} | 20.4 ^c | 20.4 ^c |
| ADG | 3.85 ^a | 4.05 ^b | 3.91 ^{ab} | 3.89 ^{ab} | 3.59 ^c | 3.38 ^d |
| F:G | 6.07 ^a | 5.68 ^{bc} | 5.61 ^{bc} | 5.46 ^c | 5.76 ^b | 6.15 ^a |
| Corn: | -11.2 | -- | 2.0 | 6.3 | -2.3 | -13.5 |

All diets contained 30% WDGS; 61.4% corn
Calf-feds 168 days, initial weight = 700 lb

Vander Pol et al., 2008 Prof. Anim. Scientist.
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Distillers Grains

| | WDGS | MDGS | DDGS | SEM | P-value |
|--|-------------------|-------------------|-------------------|-------|---------|
| Performance¹ | | | | | |
| DMI, lb/d | 24.8 ^a | 26.4 ^b | 27.1 ^b | 0.07 | < 0.01 |
| ADG, lb | 4.11 | 4.17 | 4.05 | 0.3 | 0.30 |
| F:G | 6.06 | 6.33 | 6.67 | 0.002 | <0.01 |
| Carcass Characteristics² | | | | | |
| HCW, lb | 882 | 887 | 877 | 6 | 0.52 |
| Marbling Score | 610 | 599 | 602 | 9 | 0.69 |
| 12 th rib fat, in | 0.63 | 0.64 | 0.60 | 0.1 | 0.15 |
| LM area, in ² | 13.3 | 13.2 | 13.4 | 0.15 | 0.50 |

¹ DMI - Dry matter intake, ADG - Average daily gain, G:F - gain per lb of feed.
² HCW - Hot carcass wt., Marbling Score: 400 - slight, 500 - small, 600 - Modest, 700 - Moderate, 800 - Slightly Abundant.

Nuttelman et al., 2011 NE beef report

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Distillers grains

| | WDGS | MDGS | DDGS | CORN |
|--|-------------------|-------------------|-------------------|------|
| Performance¹ | | | | |
| DMI, lb/d | 24.8 ^a | 26.4 ^b | 27.1 ^b | 24.6 |
| ADG, lb | 4.11 | 4.17 | 4.05 | 3.58 |
| F:G | 6.06 | 6.33 | 6.67 | 6.85 |
| 30% inclusion: | (138) | (125) | (109) | |
| Carcass Characteristics² | | | | |
| HCW, lb | 882 | 887 | 877 | 831 |

¹ Means with different superscripts differ (P - value < 0.05).
² DMI - Dry matter intake, ADG - Average daily gain, G:F - gain per lb of feed.
³ HCW - Hot carcass wt., Marbling Score: 400 - slight, 500 - small, 600 - Modest, 700 - Moderate, 800 - Slightly Abundant.

Nuttelman et al., 2011 NE beef report

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WDGS-ROUGHAGE

| | Treatments | | | P-Value |
|--------------------|-------------------|---------------------|--------------------|---------|
| | NONE | ½ normal | Normal | Level |
| Level (%DM) | 0 | 3-6 | 6-12 | --- |
| DMI | 22.3 ^a | 24.6 ^b | 25.6 ^c | <0.01 |
| ADG | 4.33 ^a | 4.62 ^b | 4.77 ^c | <0.01 |
| G:F | 5.13 ^a | 5.32 ^b | 5.35 ^b | 0.03 |
| P/L, \$ | 0.00 ^a | 16.34 ^{ab} | 26.56 ^b | 0.02 |

Benton et al., 2007 Nebraska Beef Rep.

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Silage economics and performance

| Item | Treatment | | | | P-value | |
|---------------|-----------|-------|-------|-------|---------|------|
| | 15:40 | 30:40 | 45:40 | 55:40 | Lin | Quid |
| Final BW | 1426 | 1403 | 1375 | 1335 | <0.01 | 0.21 |
| DMI | 23.2 | 22.8 | 22.7 | 21.9 | 0.01 | 0.45 |
| ADG | 4.04 | 3.92 | 3.76 | 3.53 | <0.01 | 0.19 |
| F:G | 5.73 | 5.81 | 6.03 | 6.21 | <0.01 | 0.33 |
| | | -1.5% | -5.0% | -7.7% | | |
| Dress % | 63.3 | 62.6 | 61.2 | 61.1 | <0.01 | 0.54 |
| Marbling | 556 | 557 | 543 | 532 | 0.13 | 0.52 |
| Fat thickness | 0.55 | 0.53 | 0.52 | 0.43 | <0.01 | 0.09 |

Burken et al., 2013

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Implants and Finished Body Weight University of Nebraska Lincoln

Shrunk BW at 28%EBF in Steers

| Implant Strategy | Weight @ 28% EBF | Change |
|------------------|------------------|--------|
| None | 1143 | -- |
| Estradiol | 1166 | 23 |
| Rev-IS | 1180 | 37 |
| Rev-S | 1210 | 67 |
| Rev-S/Rev-S | 1240 | 97 |

13 trials, 9,052 steers Guiroy et al., 2002

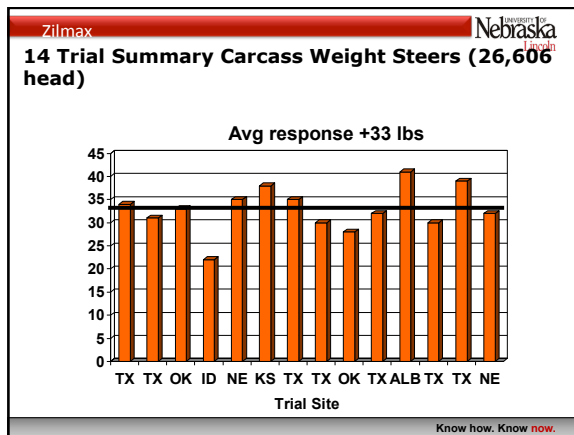
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Implants and Finished Body Weight University of Nebraska Lincoln

Shrunk BW at 28%EBF in Heifers

| Implant Strategy | Weight @ 28% EBF | Change |
|------------------|------------------|--------|
| None | 1086a | -- |
| Revalor-H | 1148b | 62 |
| Rev-IH/Rev-IH | 1155b | 69 |
| No/Rev-H | 1156b | 70 |
| Syn-H/Rev-H | 1170c | 84 |
| Rev-IH/Rev-H | 1170c | 84 |
| Rev-H/Rev-H | 1176d | 90 |

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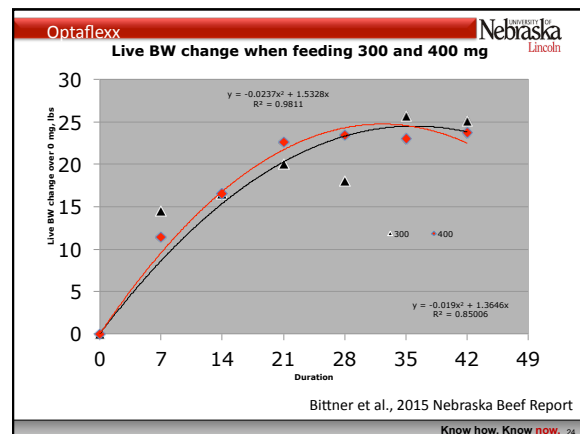
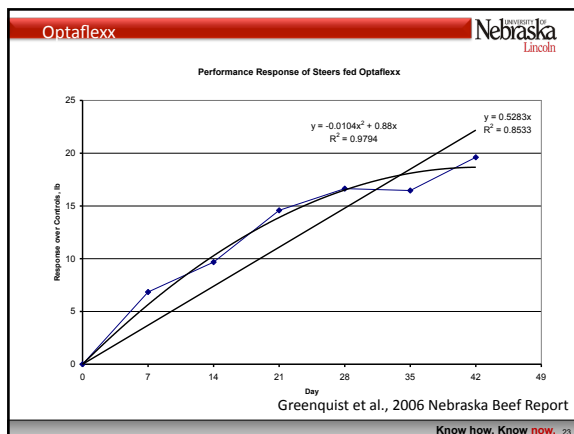


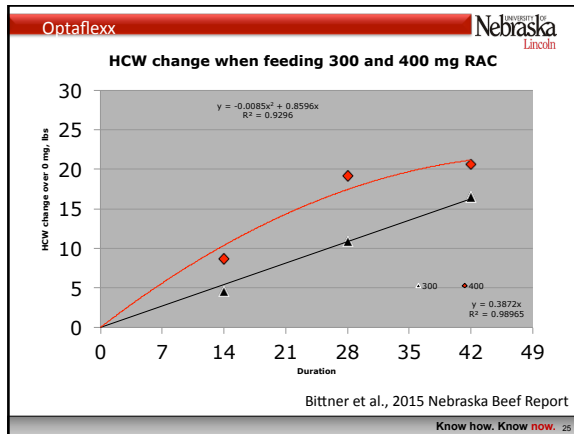
Zilmax University of Nebraska Lincoln

Zilmax and sorting

| Variable | -CON | +CON | 1-SORT | 4-WAY | F-test | -CON vs. +CON | 4-WAY vs. -CON |
|---------------------------------|------|------|--------|-------|--------|---------------|----------------|
| DOF | 154 | 154 | 157 | 159 | | | |
| HCW, lb | 914 | 947 | 954 | 957 | <.01 | <.01 | .02 |
| Change in HCW ³ , lb | - | 32.9 | 39.9 | 42.4 | - | - | - |
| HCW Std. Dev, lb | 63.9 | 63.8 | 55.9 | 39.6 | <.01 | .98 | <.01 |
| HCW Over 1000 lb, % | 10.5 | 18.6 | 23.3 | 14.3 | <.01 | <.01 | .13 |
| 12 th Rib Fat, in. | 0.63 | 0.60 | 0.60 | 0.59 | .12 | .05 | .84 |
| Marbling Score ⁴ | 515 | 494 | 491 | 487 | .02 | .03 | .45 |
| % Choice | 93.0 | 84.9 | 88.3 | 81.3 | .01 | .03 | .30 |

Hilscher et al., 2014 Nebraska Beef Report
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- ### Challenges
- Does BRD hurt efficiency?
 - Why don't we use carcass gain and efficiency rather than live?
 - Are we accurately weighing?
 - Measuring individual efficiency in pen fed situations is not accurate
 - Age/background of animal at feedlot entry

Effect of age on efficiency

Animal Performance

| Item | Calf-fed | Yearling | Diff. |
|------------------------|--------------------|--------------------|-------|
| Initial BW, lbs | 642 ^b | 526 ^c | -116 |
| FIWT, lbs ^a | 642 ^c | 957 ^b | 315 |
| Final BW, lbs | 1282 ^c | 1365 ^b | 83 |
| DMI, lbs/d | 21.36 ^c | 30.55 ^b | 9.19 |
| ADG, lbs | 3.81 ^c | 4.53 ^b | 0.72 |
| F:G | 5.63 ^c | 6.76 ^b | 1.13 |
| DOF | 168 ^b | 90 ^c | -78 |
| Total Feed, lbs | 3592 ^b | 2754 ^c | -838 |

^a Feedlot initial weight
^{b,c} Means within row with different superscripts differ $P < 0.05$

Effect of age on efficiency

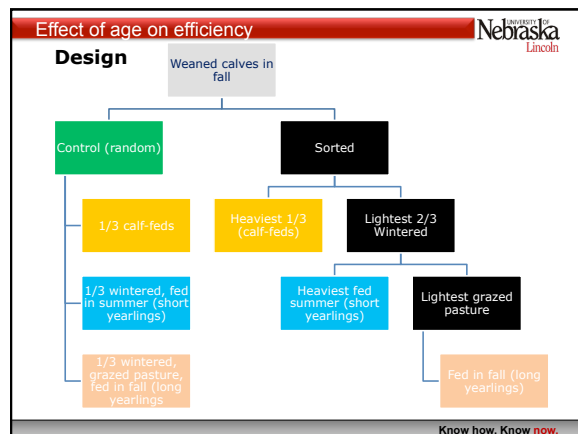
Carcass Characteristics

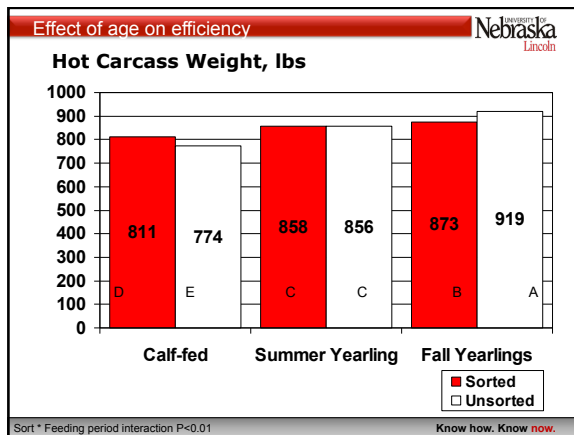
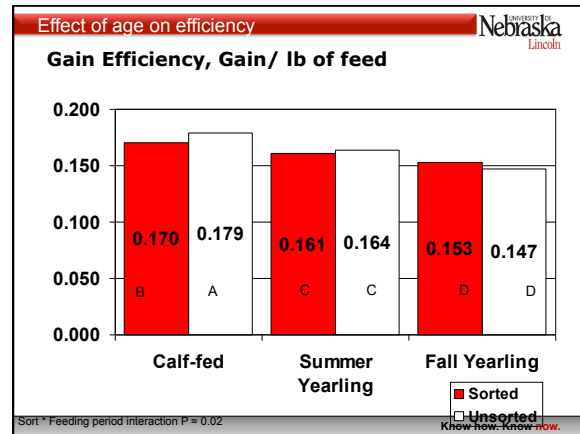
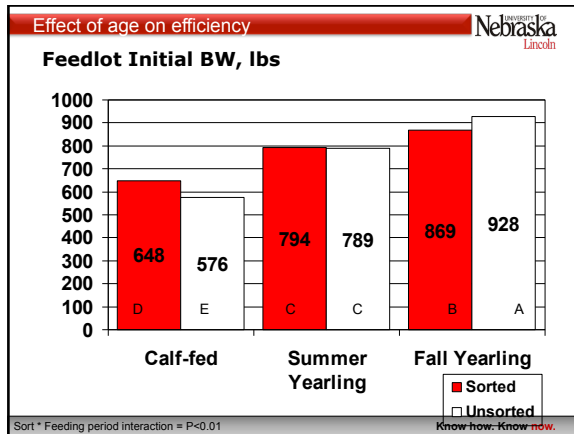
| Item | Calf-fed | Yearling | Diff. |
|-----------------------|-------------------|-------------------|-------|
| HCW, lbs | 808 ^c | 860 ^b | 52 |
| Marbling ^a | 510 | 525 | 15 |
| YG | 2.71 | 2.60 | -0.11 |
| FT, in. | 0.53 ^b | 0.47 ^c | 0.06 |
| Choice, % | 58.4 | 65.0 | 6.6 |

| | | | |
|-----------------|------------------|-------------------|------|
| %Yield Grade 4+ | 11.9 | 3.3 | -8.6 |
| % Overweight | 1.1 ^b | 11.3 ^c | 10.2 |

^a Marbling = 400 = Slight⁰, 500 = Small⁰ etc.
^{b,c} Means within row with different superscripts differ $P < 0.05$.

- ### Effect of age on efficiency
- # Summary
- Yearlings – 200 lb more gain
 - 77% as much feedlot diet
 - 58% as much feedlot diet (adjusted for gain)



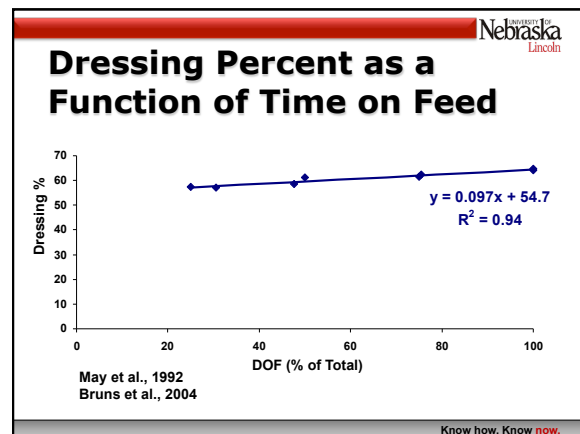


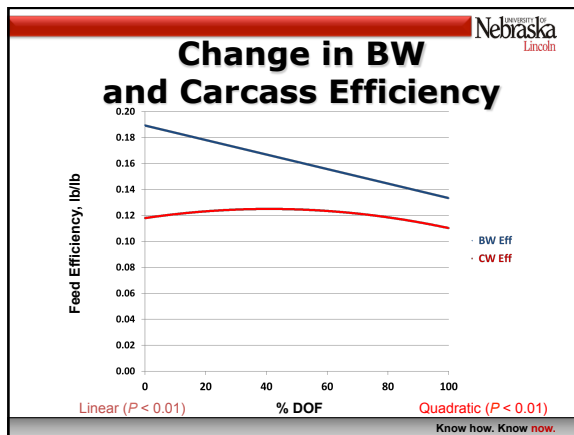
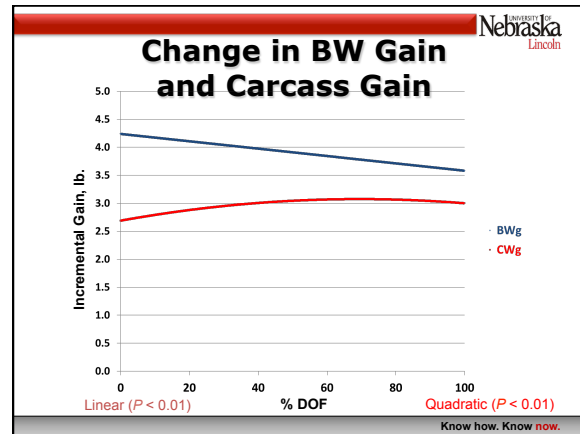
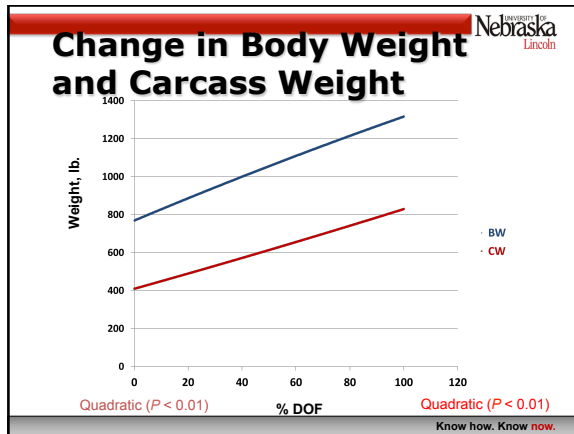
Marketing is Critical to Profit

- When to sell
 - Feed until the cost of additional gain is greater than the value of the gain.
 - Efficiency declines during the feeding period.
 - Market early during times of high feed costs and negative margins

Marketing is Critical to Profit

- Live vs. dressed marketing
 - Dressed marketing common in NE
 - Need to think on a carcass - basis
- Need to understand how carcass is changing over feeding period.





Example

- Buy Feeder Steer March, 2014
 - Feeder Price = \$170 / cwt
 - Ration Cost = \$185/ton (\$4.50/bu corn)
 - Yardage and Interest = \$0.45/head/d
 - Misc. = \$20/hd
 - October Live Cattle = \$130/cwt
- 769 lb steer in
- 1315 lb steer out
- Fed 140 days

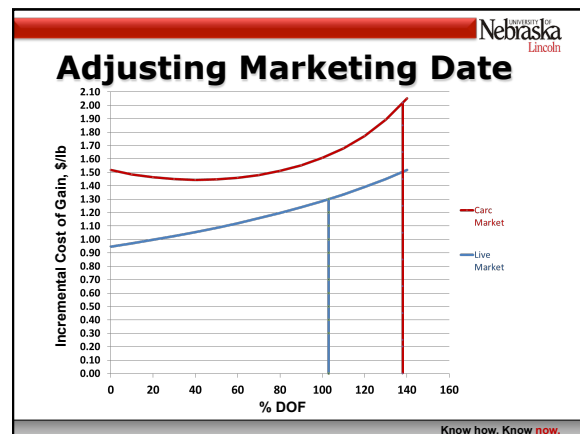
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Example

- Sell Fat Steer October 2014

| | |
|--------------------------|-----------|
| • Feeder cost = | \$1307 |
| • Feed Cost = | \$ 319 |
| • Yardage and Interest = | \$ 63 |
| • Misc. = | \$ 20 |
| • Total Costs | \$1709 |
| • Gross return | \$1710 |
| • Profit | \$ 1 |
| • COG | \$0.72/lb |

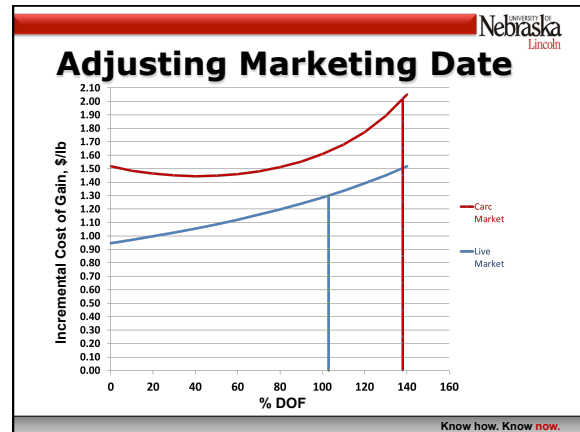
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Example

- Sell Fat Steer October 2014
 - Feeder cost = \$1307 (NOW: \$1600)
 - Feed Cost = \$ 319
 - Yardage and Interest = \$ 63
 - Misc. = \$ 20
 - Total Costs \$1709
 - Gross return **\$1934 (NOW: \$1973)**
 - Profit \$ 226 (NOW: (\$29))
 - COG \$0.72/lb

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Distributing Purchase Price Across Carcass Weight

- Purchase cost = \$1600 / head
- Carcass weight = 800 lbs
 - \$2 / lb
- Carcass weight = 1000 lbs
 - \$1.60 / lb
- \$0.40 reduction in breakeven
- We can't feed them big enough today (off the chart)
- Feed until overweight (if any), over fat (if any)

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Feed efficiency at the feedlot

- Feed efficiency has improved
 - mostly diet related and additives
 - implants
 - larger frames, feed longer for bigger carcass
 - starting with lighter, younger cattle (than past)
 - Are they less physiologically mature than before?
- Nutritionists and commercial yards prioritizing F:G, at expense of profit at times
- Only measuring at pen level (all mgmt)
- Feed costs are variable (currently decreasing)
- Too much capacity, need more cattle

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The screenshot shows the homepage of the UNL Beef website. The URL <http://beef.unl.edu> is visible in the browser address bar. The page features a navigation menu with 'HOME', 'CATTLE PRODUCTION', 'LEARNING MODULES APPS AND RESOURCES', 'REPORTS AND PROCEEDINGS', 'UNL BEEF NEWS INSIGHTS', and 'FINANCE & MARKET EXPERT'. A main content area includes an 'Upcoming Events' section with a list of events such as 'Nebraska Range Symposium' and 'Nebraska Beef Improvement Federation Meeting'. A sidebar on the left contains a survey announcement: 'The UNL Extension Beef Team is committed to providing relevant, research based information in a format that meets your needs. To help us achieve that end, we would appreciate your feedback on the Statewide Beef Survey by July 11. Your completion of this survey will help us identify your preferred method for receiving information and key issues you would like more research and information on. Completing the survey should take approximately 5-10 minutes. Thanks in advance for your time and input.' Below this is a link to 'Monitoring pasture condition? UNL Extension has an app for that!' and a small image of a cow. The footer of the page reads 'Know how. Know now.'