The Relationship Between Carcass Quality and Value

Rob Maddock, NDSU Beef Systems Center
Definitions – Carcass Quality

- The presence or absence of “outs”
  - Excess fat, heavy and light carcasses, hardbones, no roll, dark cutters, blood splashed
- The presence or absence of “ins”
  - Age and source, natural, organic, certified programs, breed programs
- USDA Yield Grade – an estimation of yield of closely-trimmed cuts
- USDA Quality Grade – an estimation of eating quality
Perspective – Long Term Consumption Trends

![Graph showing consumption trends for Beef, Pork, Chicken, and Turkey from 1980 to 2009.](image-url)
Perspective - Selling protein to consumers

- **Beef Protein**
  - $1.00/lb live cattle
  - ÷ 0.63 (dressing percent)
  - $1.59 beef carcass
  - ÷ 0.62 (boning yield)
  - $2.56 boneless beef
  - ÷ 0.20 (percent protein)
  - $12.80/lb beef protein

- **Soy Protein**
  - $13.00/bushel soybeans
  - ÷ 60 lbs (test weight)
  - $0.17 per lb soybeans
  - ÷ 0.39 (percent protein)
  - $0.43/lb soy protein
The origin of beef value!
The origin of beef value

- Live animal to carcass (called dressing percentage or “yield”)
  - Carcass and offal

- Then the carcass will receive a USDA Quality and Yield Grade or be sorted as an “in” or “out” carcass

- Cuts are fabricated from carcasses, vacuum packaged, and sold as boxed beef (cut yield)

- Trimmings are collected in bulk

- Fat and bone are also collected and sold
Carcass Quality and Value – Defects and “Outs”
### 2005 Beef Quality Audit – “Outs”

<table>
<thead>
<tr>
<th>Defect</th>
<th>Percentage</th>
</tr>
</thead>
<tbody>
<tr>
<td>YG 4 &amp; 5 (excess fat)*</td>
<td>14.1%</td>
</tr>
<tr>
<td>Carcass weight*</td>
<td>5.5%</td>
</tr>
<tr>
<td>C-E maturity*</td>
<td>1.5%</td>
</tr>
<tr>
<td>&gt; 30 months*</td>
<td>0.8%</td>
</tr>
<tr>
<td>Standard &amp; lower*</td>
<td>5.4%</td>
</tr>
<tr>
<td>Dark cutters</td>
<td>1.9%</td>
</tr>
<tr>
<td>Blood splash</td>
<td>0.6%</td>
</tr>
<tr>
<td>Yellow fat</td>
<td>0.3%</td>
</tr>
<tr>
<td>Callous</td>
<td>0.1%</td>
</tr>
<tr>
<td>*Management failure</td>
<td></td>
</tr>
</tbody>
</table>

#### No defects: 77.5%
Cash Market vs. Hanging Price vs. “The Grid”

- Cash Market
- Hanging Price – Price of carcass
  - Removes dressing percentage risk from packer
- The Grid – Negotiated carcass price based on quality and yield grade and presence of absence of “outs”

“We are all selling on a grid now”
“Outs” - Carcass Weights

- Average US Discounts for weight
  - 4-500 lb HCW - $37/cwt
  - 5-549, 550-599 lb HCW - $23, -$1.22
  - 9-949, 950-999 lb HCW - $0.18, -$0.20
  - 1000+ lb HCW - $20

- WHY - Lights?
  - $125/hd to kill, cut, package, and store a beef
  - A 450 lb carcass will yield about 260 pounds of meat, a 800 lb carcass about 520
  - $125/260 lbs = $0.48/lb processing
  - $125/520 lbs = $0.24/lb processing
“Outs” – Carcass Weight

Why – Heavies #1
- Plants were built when carcasses weighed 650 pounds
- Things break

Why – Heavies #2
- 700 lb carcass = 12.2 inch REA, 12.5 pound ribeye roll
- 950 lb carcass = 15.0 inch REA, 17.0 pound ribeye roll
A note on carcass weights

- Carcass weights have generally increased for both steers and heifers over the past 20 years.
- Last week the average steer carcass weighed 879 lbs, the average heifer carcass 785 lbs.
- Last year the values were 852 and 769.
“Outs” C-E Maturity (Hardbones)

- Average discount is -$31/cwt
- Why?
  - Generally from old cattle
  - Not eligible to be graded, Select, Choice, or Prime (can’t sell in normal channels)
  - Meat from older cattle is less palatable
“Outs” – Cattle over 30 months of age

- Average discount is -$15/cwt
- Why?
  - BSE!
    - Cattle over 30 months must be tracked and processed differently
  - Potential for grade reduction
  - These cattle can generally be graded Choice, and Prime, but are usually not eligible for Select (Selects go Standard)
- Limited Export Market Potential
“Outs” – Dark Cutting Carcasses

- Average discount is -$37/cwt
- What is dark cutting?
  - Intermediate to long term stress causes muscles to lose energy (glycogen)
  - A lack of glycogen at slaughter causes the pH of the meat to be higher than normal (normal is 5.6, dark cutters are generally 5.9 or higher)
  - The meat ranges from “muddy” to dark
“Outs” – Dark Cutting Carcasses

- Why discounted?
  - Consumers want bright red beef at retail – cannot simply be put into the supply chain
  - Beef from dark cutting carcasses is tougher and has more off-flavors than normal beef
  - Generally not even cut at the plant, goes out as sides of beef at a steep discount

- Some plants, at certain times of the year will have up to 5% dark cutters (average is less than 1%)
“Outs” – Blood Splashed Lean

- Average discount -$30/cwt
- What is blood splashed lean?
  - Extremely high short term stress causes blood vessels in the muscle to burst.
  - Residual blood causes a spotted appearance.
- Why discounted?
  - Can’t be sold at retail
  - Not eligible for premium programs
Carcass Quality and Value “Ins”

- Age and Source verified
  - Worth from $4-20/hd depending upon time of year
- “Natural”
  - Worth approximately $100/hd (may not be profitable at this)
- Certified programs (CAB)
  - From $2-20/hd
- Organic
  - $400-600/hd (this is also close to the breakeven)
# Carcass Quality and Value – Quality and Yield Grading

## Relationship between Marbling, Maturity, and Carcass Quality Grade

<table>
<thead>
<tr>
<th>Degrees of Marbling</th>
<th>Maturity&lt;sup&gt;2&lt;/sup&gt;</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>A&lt;sup&gt;1&lt;/sup&gt;</td>
</tr>
<tr>
<td>Abundant</td>
<td>Prime</td>
</tr>
<tr>
<td>Moderately Abundant</td>
<td></td>
</tr>
<tr>
<td>Slightly Abundant</td>
<td></td>
</tr>
<tr>
<td>Moderate</td>
<td>Choice</td>
</tr>
<tr>
<td>Modest</td>
<td></td>
</tr>
<tr>
<td>Small</td>
<td>Select</td>
</tr>
<tr>
<td>Slight</td>
<td></td>
</tr>
<tr>
<td>Traces</td>
<td>Standard</td>
</tr>
<tr>
<td>Practically Devoid</td>
<td></td>
</tr>
</tbody>
</table>

<sup>1</sup> Assumes that firmness of lean is completely developed with the degree of marbling and that the carcass is not a “dark cutter.”

<sup>2</sup> Maturity increases from the left to right (A through E).

<sup>3</sup> The A maturity portion of the figure is the only portion applicable to bullock carcasses.
Grading versus Inspection
Grading versus Inspection

- Inspection is mandatory and paid for by tax dollars

- Grading is voluntary, and a “for-fee” service provided by the Agricultural Marketing Service of USDA.
Purpose of Grading
USDA Grading

- USDA Yield Grades
  - Prediction of Cutability (Red meat yield)
- USDA Quality Grade
  - Prediction of Palatability (Eating quality)

QG and YG are uncoupled
Historic Quality Grades


- % Prime
- % Choice
- % Select
Last weeks quality grading by area

<table>
<thead>
<tr>
<th>Grade</th>
<th>Nebraska</th>
<th>Kansas</th>
<th>Texas</th>
</tr>
</thead>
<tbody>
<tr>
<td>Prime</td>
<td>5.29</td>
<td>1.90</td>
<td>0.62</td>
</tr>
<tr>
<td>Choice</td>
<td>70.99</td>
<td>66.04</td>
<td>52.14</td>
</tr>
<tr>
<td>Select</td>
<td>19.17</td>
<td>29.16</td>
<td>41.79</td>
</tr>
<tr>
<td>Other</td>
<td>4.54</td>
<td>2.90</td>
<td>4.18</td>
</tr>
</tbody>
</table>
Choice/Select Spread

- Last week was $1.81/cwt
Historic Yield Grades

![Chart showing yield grades from 2000 to 2010]

- % YG 1
- % YG 2
- % YG 3
- % YG 4
- % YG 5

The chart displays the yield grades from 2000 to 2010, with a focus on the series for each grade over the years.
USDA Yield Grades

- Predict Carcass Cutability
- Uses four factors
  - Hot Carcass Weight
  - Adjusted Fat Thickness
  - Ribeye Area (12th-13th Rib)
  - % KPH (Kidney, Pelvic and Heart) Fat
- The five USDA YG’s are 1, 2, 3, 4, 5
USDA Yield Grades

Yield Grade 1
Yield Grade 5
Yield Grade 4
Yield Grade 3
Yield Grade 2

Yield Grade 1
Yield Grade 2
Yield Grade 3

Yield Grade 4
Yield Grade 5
Determining USDA Yield Grades (Carcass)

1. Determine Preliminary Yield Grade
   - 2.0 + 0.25 YG for every 0.1” of fat
   - Or, (fat inches + .4) + 2.0

2. Determine Required Ribeye Area (REA)
   - 600 lb hot carcass weight = 11.0 sq. inch
   - 700 lb = 12.2; 800 lb = 13.4; 900 lb = 14.6

3. Measure Ribeye Area
   - Subtract actual REA from required REA and divide by 3
   - 12.2 (required) – 13.1 (actual) = -0.9 ÷ 3 = -0.3

4. KPH; Base = 3.5%
   - +/- 0.1 YG for every 0.5% deviation from base
   - 2.5 % KPH has a -0.2 adjustment to the PYG
Yield Grades
USDA Quality Grades

- Predict eating quality
- Eight distinct QG’s
  - Grades of youthful carcasses (< 42 months)
    - Prime
    - Choice
    - Select (Cattle over 30 months not eligible)
    - Standard (No Roll)
  - Grades of Mature Carcasses (> 42 months, hardbones)
    - Commercial
    - Utility
    - Cutter/Canner
USDA Quality Grades

Based on two factors

- Physiological Maturity
  - Skeletal Ossification
  - Lean Color
- Marbling (Intramuscular Fat)
  - Amount
  - Distribution
Carcass Maturity

- Physiological versus Chronological
  - Skeletal ossification, lean color
- Broken into differing maturity classification
  - A, B, C, D, E
- A and B are considered “young”
- C, D, and E considered “old”
Skeletal Maturity

- Evaluated by looking at “buttons” on the tips of thoracic vertebrae
- As cattle age, cartilage becomes bone
Marbling

- Intramuscular fat
- Determined in the ribeye (12th rib)
- Broken into classifications
  - Abundant, Moderately Abundant, Slightly Abundant, Moderate, Modest, Small, Slight, Traces, Practically Devoid, Devoid
Marbling

Moderately Abundant  Slightly Abundant  Moderate

Modest  Small  Slight
Determining Final Quality Grade

<table>
<thead>
<tr>
<th>Marbling</th>
<th>A</th>
<th>B</th>
<th>C</th>
<th>D</th>
<th>E</th>
</tr>
</thead>
<tbody>
<tr>
<td>Abundant</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Mod. Abund.</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Sl. Abund.</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Moderate</td>
<td></td>
<td></td>
<td>Prim.</td>
<td>Commercial</td>
<td></td>
</tr>
<tr>
<td>Modest</td>
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<td></td>
<td>Choice</td>
<td></td>
<td></td>
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</tr>
<tr>
<td>Pract. Dev.</td>
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</tbody>
</table>
Yield Grading and Value

- Value does not equal the discounts or premiums!
  - Premiums are hard to come by (tight margins)
  - Discounts also take into consideration slower processing times required to trim fat
Yield Grading and Value

Average Premiums and Discounts, USDA reported grid prices

- YG 1: +$3.83/cwt
- YG 2.0 - 2.4: +$2.13/cwt
- YG 2.5 - 2.9: +$1.99/cwt
- YG 3.0 - 3.9: $0.00/cwt
- YG 4.0 - 4.9: -$12.30/cwt
- YG 5.0 +: -$21/cwt (often ungraded)
Quality Grading and Value

- Average premiums and discounts, HCW
  - USDA Prime: +$15.55/cwt
  - USDA Top Choice (CAB): +$2.84/cwt
  - USDA Select: -$4.21/cwt
  - USDA Standard (no roll): -$17.62/cwt
To sum up carcass value to a packer!

- Carcass value comes from the “base” value of the animal or carcass
- Adjusting for dressing percentage
- Accounting for “outs” and “ins”
- Then adding or subtracting processing costs, drop credits, and meat value
- Importance of “high quality” cattle and carcasses
Conversion from Animal to Carcass (1280 lb steer)

- Conversion of cattle to carcass
  - Head, feet, hide, internal organs are removed
- About 62.5% of the live animal becomes a carcass
  - \(1280 \times 62.5\% = 800\) lb hot carcass weight
- Value of live animal at $105/cwt = 1280 \times $82 = $1344
- Assume a Low Choice, YG 3 carcass
Cost of Processing – Live to Carcass

- Slaughter Costs
  - Fixed Costs estimated $50/hd

- Slaughter Credits
  - Offal and Hide $12.76/cwt (Live wt basis)
    - This is over 1/3 more than last year at this time, and over twice the value 2 years ago

- 1280 lb Steer then has the following:
  - $50 slaughter cost
  - 1280 lbs x $12.76/cwt = $163 credit

- Net gain from slaughter = $113 (no cattle costs included)
Cost of Processing – Carcass to Cuts

- Fabrication Costs
  - Costs estimate at $17/hd
- Fabrication Credits
  - Fat $23.77
  - Bone $5.42
- 800 lb Carcass YG 3 Low Ch
  - $17 cost
  - +$23.77 fat credit
  - +$5.42 bone credit
- Net gain from processing $12.00
Recovering the Cost of Cattle (YG 3, Choice Example)

- 1280 lb Steer at $105/cwt
  - Cattle Cost = $1344

- Carcass Cutout Value (Choice, YG 3)
  - Boxed Beef Value = 800 lb carcass x $158.05/cwt
    - boxed beef equivalent = $1264

- Profit/Loss
  - Meat value minus cost of cattle: $1264 - $1344 = $ -80
  - Processing Credit: $12.00 (includes fat and bone credit)
  - Slaughter credit: +$113.00
  - Net of: $45/hd

- Not profit, this is return to assets and doesn’t account for other expenses such as marketing, management, depreciation, interests, etc…
Recovering the Cost of Cattle (YG 1, Choice Example)

- 1280 lb Steer at $105/cwt
  - Cattle Cost = $1344

- Carcass Cutout Value (Choice, YG 1)
  - Boxed Beef Value = 800 lb carcass x $161.43/cwt
    boxed beef equivalent = $1264

- Profit/Loss
  - Meat value minus cost of cattle: $1291 - $1344 = $ -53
  - Processing Credit: $12.00 (includes fat and bone credit)
  - Slaughter credit: +$113.00
  - Net of: $72/hd
Recovering the Cost of Cattle (YG 3, Select Example)

- 1280 lb Steer at $105/cwt
  - Cattle Cost = $1344

- Carcass Cutout Value (Select, YG 3)
  - Boxed Beef Value = 800 lb carcass x $154.24/cwt
    boxed beef equivalent = $1234

- Profit/Loss
  - Meat value minus cost of cattle:$1234 - $1344 = $ -110
  - Processing Credit: $12.00 (includes fat and bone credit)
  - Slaughter credit: +$113.00
  - Net of: $15/hd
Recovering the Cost of Cattle (YG 3, Prime! Example)

- 1280 lb Steer at $105/cwt
  - Cattle Cost = $1344

- Carcass Cutout Value (Prime, YG 3)
  - Boxed Beef Value = 800 lb carcass x $170.42/cwt
  - boxed beef equivalent = $1234

- Profit/Loss
  - Meat value minus cost of cattle: $1363 - $1344 = $ +19
  - Processing Credit: $12.00 (includes fat and bone credit)
  - Slaughter credit: +$113.00
  - Net of: $144/hd
Recovering the Cost of Cattle

“Out cattle” (Standard)

- 1280 lb Steer at $105/cwt
  - Cattle Cost = $1344

- Carcass Cutout Value (Standard, YG 3)
  - Boxed Beef Value = 800 lb carcass x $140.56/cwt
    - boxed beef equivalent = $1124

- Profit/Loss
  - Meat value minus cost of cattle:$1124 - $1344 = $ -220
  - Processing Credit: $12.00 (includes fat and bone credit)
  - Slaughter credit: +$113.00
  - Net of: $-95/hd
Recovering the Cost of Cattle “Out cattle” (Dark Cutter)

- 1280 lb Steer at $105/cwt
  - Cattle Cost = $1344
- Carcass Cutout Value (Standard, YG 3)
  - Boxed Beef Value = 800 lb carcass x $121.00/cwt
    - boxed beef equivalent = $968
- Profit/Loss
  - Meat value minus cost of cattle:$968 - $1344 = $ -376
  - Processing Credit: $12.00 (includes fat and bone credit)
  - Slaughter credit: +$113.00
  - Net of: $-251/hd
Recovering the Cost of Cattle – Impact of Dressing Percentage

- 1280 lb Steer at $105/cwt
  - Cattle Cost = $1344
  - Assume a poor dressing percentage (59%)

- Carcass Cutout Value (Standard, YG 3)
  - Boxed Beef Value = 755 lb carcass x $158.05.00/cwt
    boxed beef equivalent = $1193

- Profit/Loss
  - Meat value minus cost of cattle:$1193 - $1344 = $ -151
  - Processing Credit: $12.00 (includes fat and bone credit)
  - Slaughter credit: +$113.00
  - Net of: $-26/hd
Summary

- Packers should be generally profitable at current high live cattle and meat prices
- Grading percentages have changed only slightly in the past decade, but there are large regional differences
- Knowing the quality of your cattle can be very profitable by selling high quality cattle
- “Outs” can wreck the value of cattle
- Dressing percentage (yield) can dramatically affect value as well