Beef Quality and Marketing
Part 1

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Outline

• What is beef quality
• Hawaii Meat Science Research
  – Carcass Characteristics
  – Tenderness
• Building Capital in the Marianas
How is Quality Measured?

- Haugh units
- Shear force
- Colonies/ml
- CFU
  - e.coli, salmonella
- Beef
- Pork
- Dairy
- Broiler
- Eggs
How is beef quality measured?
National Beef Quality Audit

• Given criteria of Flavor, Juiciness and Tenderness, What is primary determinant of eating satisfaction among beef consumers?
  
  FLAVOR
  JUICINESS
  TENDERNESS
National Beef Quality Audit

• Given criteria - flavor, juiciness, tenderness, consumers want tender beef.

• TENDERNESS !!

• Shear force and Consumer satisfaction
  – Research by Miller, et al. (2001), strip loin steak
    – 4.3 kg = 86%
    – 4.0 kg = 94%
    – 3.4 kg = 99%
USDA Beef Quality Grading

- USDA Grades
  - Prime, Choice, Select, Standard
- Determining Factors
  - Marbling
  - Physiological Age (relates to bone ossification)
Sacral Vertebra

Yearling

30-month
Thorasic Vertebra

Yearling

Cull

30-month
Marbling Cards, Quality Grade

<table>
<thead>
<tr>
<th>Degrees of Marbling</th>
<th>Maturity²</th>
<th></th>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>A³</td>
<td>B</td>
<td>C</td>
<td>D</td>
<td>E</td>
</tr>
<tr>
<td>Slightly Abundant</td>
<td>PRIME</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Moderate</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Choice</td>
<td></td>
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<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Slight</td>
<td>SELECT</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Traces</td>
<td>STANDARD</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Practically Devoid</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

¹Assumes that firmness of lean is comparably developed with the degrees of marbling and that the carcass is not a “dark cutter.”

²Maturity increases from left to right (A through E).

³The A maturity portion of the Figure is the only portion applicable to bullock carcasses.
USDA Beef Quality Grading

Does an increased level of marbling in a steak, result in improved beef tenderness?

YES

NO
USDA Beef Quality Grading

• Quality grade is a poor predictor of tenderness!
  – (Wheeler, et.al., 1994, Wulf et. al, 1997)

• National Beef Quality Audit 2005 …
  – Recommends adoption/implementaton of instrument grading due to inconsistencies in current USDA grading system.
How is beef tenderness measured?

- WBSF
  - Warner-Bratzler Shear Force

- SSF
  - Slice Shear Force
    (U.S. Meat Animal Research Center, Meat Quality Protocols)
Hawaii Forage-finish Carcass Characteristics Study

• Goal: Find out the quality of carcasses produced on the Big Island.

• 1996-1998 (HNM)

• n = 386 carcasses evaluated from 22 ranches.

• Refer to publication
### Carcass Traits of Forage-Finished Beef in Hawaii

<table>
<thead>
<tr>
<th>Trait</th>
<th>Mean±SD</th>
<th>Range</th>
</tr>
</thead>
<tbody>
<tr>
<td>Carcass wt, lbs. (n=386)</td>
<td>620.9 ±75.1</td>
<td>477 - 871</td>
</tr>
<tr>
<td>Ribeye area, in² (n=311)</td>
<td>11.5 ±1.5</td>
<td>6.5 - 16.8</td>
</tr>
<tr>
<td>Backfat, in. (n=374)</td>
<td>0.27 ±0.14</td>
<td>0.05 - 1.2</td>
</tr>
<tr>
<td>Marbling score (n=384)</td>
<td>Slight 80</td>
<td>Tr – SIAb</td>
</tr>
<tr>
<td>Maturity (n=386)</td>
<td>A 80</td>
<td></td>
</tr>
<tr>
<td>Quality Grade Eq. (n=381)</td>
<td>Mid-Select</td>
<td></td>
</tr>
</tbody>
</table>
Sex classification and Age

**Sex class distribution**

- Heifers: 42
- Steers: 58

**Age distribution**

- Below 24 month: 15.9%
- 24-30 month: 74.0%
- Over 30 month: 10.1%
Quality grade distribution

Frequency, %

- Standard: 12.6%
- Select: 50.4%
- Choice: 29.7%
- Choice+: 6.0%
- Above choice+: 1.3%
Finding …

• We can produce high Select to low Choice beef on pasture based on USDA Quality Grading criteria.

• Big BUT … what about tenderness?
Hawaii Forage-finish Beef Tenderness Study

• Goal: Determine the tenderness of forage-finished beef in the marketplace (Hawaii Island).

• 2004-2006
• Rib samples from 191 carcasses from 45 different ranches.
• CTAHR Beef Initiative Program
• Refer to publication
Findings …

What about tenderness?

• Using shear force value of 4.3 kg as the cut-off value, we would achieve ??% consumer satisfaction?
Tenderness Distribution of Grass-Finished Beef in Hawaii, n = 187

Research by Miller et al. in 2001, found that 86% of consumers surveyed were satisfied with their steak eating experience, when tenderness or shear force values were ≤ 4.3 kilograms.

Average Shear Force = 5.21 kg
Research by Miller et al. in 2001, found that 86% of consumers surveyed were satisfied with their steak eating experience, when tenderness or shear force values were ≤ 4.3 kilograms.

Only 26.2% of the grass-finished beef samples met this criteria.

Average Shear Force = 5.21 kg
Profile of animals < 4.3

• n = 49 (26.2%)
• SEX
  Steers 21, Heifers 14, n.d. 14
• AGE
  <30 mo 22, >30 16, n.d. 11
    < 30 mo: steers 11, heifers 6, n.d. 5
  <36 mo 31, >36 7, n.d. 11
    < 36 mo: Steers 14, heifers 11, n.d. 6
Tenderness …

By Sex
• Heifers  (n = 84)
  – 5.33 kg
• Steers  (n = 69)
  – 5.06 kg

By Age
• 12-mo  (n = 10)
  – 4.49 kg
• 24-mo  (n = 52)
  – 4.75 kg
• 36-mo  (n = 28)
  – 5.02 kg
• 48-mo  (n = 24)
  – 5.64 kg
• 60-mo  (n = 28)
  – 5.93 kg
Tenderness by Age

Shear Force (kg)

Age by Teeth (months)

Teeth Chart
By Breed

- **Angus** *(n = 111)*
  - 5.14 kg
- **Hereford** *(n = 22)*
  - 6.18 kg
- **B. taurus X** *(n = 11)*
  - 4.86 kg
- **Other** *(n = 36)*
  - 4.93 kg
Building Capital in the Marianas

- Beef productivity data
- Beef quality
- Carcass data
- Tenderness data

- Need information to develop pricing structure and market segments
Items to consider …

• Documentation and Verification
  – Better record keeping by ranchers
    • Breeds, animal age, location
  – Better record keeping by processors
    • Sex, teeth age, carcass data
  – Development of Rancher Agreements
  – Rancher Incentives $$$, data based T-Dist
Questions and Discussion