Effect of Hang, Cut, Cook, Doneness on Eating Quality of Beef

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DARD Project on Beef Eating Quality

- Collaboration
  - DARD Food scientists
  - NI Beef Industry
  - LMC
  - MLA

- 3 year programme of research
- BEQMS for NI industry
BEQ Experiments

- Muscle/cut
- Hang
- Doneness
- Cooking method
- Consumer country
- Ageing
- Dairy versus beef breeds
- Time in lairage and clipping

Expts 1+2

- Fasting (stress) and mixing
- Electrical stimulation
- Gender.
<table>
<thead>
<tr>
<th>Factors investigated - Expts 1 &amp; 2</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Hang</strong></td>
</tr>
<tr>
<td>Achilles, tenderstretch</td>
</tr>
<tr>
<td><strong>Cut</strong></td>
</tr>
<tr>
<td>Striploin, rump, knuckle, topside</td>
</tr>
<tr>
<td><strong>Country of consumer</strong></td>
</tr>
<tr>
<td>N Ireland, Australia</td>
</tr>
</tbody>
</table>
Experimental Protocol

- Meat Standards Australia (MSA) methods
- 24 animals
- Achilles and Tenderstretch
- More than 1400 consumers
- Grill panels
- Roast panels

Med & WD
Cooking Method

- Strict protocol for sampling, labelling, storage, etc.
- Cooked on Silesia clam grill or roasted in ovens to “medium” or “well-done” (defined by internal temperature)
Consumer taste panels

Please rate the beef sample you have just eaten, for each of the categories below, by placing a single vertical mark on the appropriate line scale.

<table>
<thead>
<tr>
<th>Tendermess</th>
<th>Not Tender</th>
<th></th>
<th></th>
<th>Very Tender</th>
</tr>
</thead>
<tbody>
<tr>
<td>Juiciness</td>
<td>Not Juicy</td>
<td></td>
<td></td>
<td>Very Juicy</td>
</tr>
<tr>
<td>Liking of Flavour</td>
<td>Dislike Extremely</td>
<td></td>
<td></td>
<td>Like Extremely</td>
</tr>
<tr>
<td>Overall Liking</td>
<td>Dislike Extremely</td>
<td></td>
<td></td>
<td>Like Extremely</td>
</tr>
</tbody>
</table>

Please mark one of the following boxes to rate the quality of the beef sample you have just eaten. Choose one only (you must make a choice).

- Unsatisfactory
- Satisfactory everyday quality
- Better than everyday quality
- Premium quality
Assessment of beef samples

- Tenderness, juiciness, flavour liking and overall liking, e.g.,
  0 Not tender
  100 Extremely tender

- Satisfaction
  - Unsatisfactory
  - Satisfactory everyday quality
  - Better than everyday quality
  - Premium

MQ4 score
Effect of Hanging Method - Achilles vs. Tenderstretch

- Tenderness
- Juiciness
- Flavour liking
- Overall liking

Consumer score

<table>
<thead>
<tr>
<th></th>
<th>AT</th>
<th>TS</th>
</tr>
</thead>
<tbody>
<tr>
<td>Tenderness</td>
<td>50</td>
<td>60</td>
</tr>
<tr>
<td>Juiciness</td>
<td>50</td>
<td>60</td>
</tr>
<tr>
<td>Flavour liking</td>
<td>50</td>
<td>60</td>
</tr>
<tr>
<td>Overall liking</td>
<td>50</td>
<td>60</td>
</tr>
</tbody>
</table>

Legend:
- AT
- TS
Effect of Hanging Method x Cut

- STR045_ANT AT
- STR045_ANT TS

- RMP231 AT
- RMP231 TS

Frequency of scores vs Tenderness score

Diagram showing the distribution of tenderness scores for different cuts and hanging methods.
Cut

- Most important factor influencing EQ
  - Striploin > Rump > Knuckle > Topside when grilled
- Differences highly significant (P<0.001)
- Position within same primal cut
  - Striploin - anterior, mid and posterior
    - Anterior scores up to 8 units higher than posterior when grilled
  - Rump - RMP 005, RMP 131, RMP 231
    - RMP 005 scores up to 5 units higher than the other two when roasted
Cut x Cook (GRL & RST)

**Tenderness**

<table>
<thead>
<tr>
<th></th>
<th>Knu</th>
<th>Rmp</th>
<th>Str A</th>
<th>Str P</th>
<th>Top</th>
</tr>
</thead>
<tbody>
<tr>
<td>GRL</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>RST</td>
<td></td>
<td></td>
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</table>

Mean score

**Juiciness**

<table>
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<tr>
<th></th>
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<tr>
<td>GRL</td>
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</tr>
<tr>
<td>RST</td>
<td></td>
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</tbody>
</table>

Mean score

Cooking method - significant effect on all traits except flavour liking.

Striploin - higher scores when grilled than roasted.

Rump and topside were better roasted.
Doneness

![Graph showing consumer scores for tenderness, juiciness, flavour, and overall liking for different levels of doneness: rare, medium rare, medium, medium well, and well done. The scores are compared between MED and WD.]
Consumer Nationality

Expt 2. Satisfaction. Effect of treatment x cut interaction

<table>
<thead>
<tr>
<th></th>
<th>AU/AU/ME</th>
<th>AU/NI/ME</th>
<th>NI/NI/ME</th>
<th>NI/NI/WD</th>
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</thead>
<tbody>
<tr>
<td>KNU066</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>RMP131</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>STR045-A</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>STR045-P</td>
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<td></td>
<td></td>
</tr>
<tr>
<td>TOP073</td>
<td></td>
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</tbody>
</table>
Results

Boundaries for Australian MSA model and NI consumers

**Australia**

<table>
<thead>
<tr>
<th>CMQ4</th>
<th>0</th>
<th>41</th>
<th>64</th>
<th>77</th>
<th>100</th>
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</thead>
<tbody>
<tr>
<td>Grade</td>
<td>2☆</td>
<td>3☆</td>
<td>4☆</td>
<td>5☆</td>
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</tbody>
</table>

**Northern Ireland**

<table>
<thead>
<tr>
<th>CMQ4</th>
<th>0</th>
<th>38</th>
<th>60</th>
<th>76</th>
<th>100</th>
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Conclusions

Interactions between varying factors must be taken into consideration when assessing quality.

Cut or muscle
Position within muscle
Hanging method
Cooking method
Doneness
Consumer country

Large effect

Small effect