International meeting on Beef and Lamb carcase grading to underpin consumer satisfaction

Meat Livestock Australia and INRA
Paris, headquarter, 20-21 August 2015
Contact persons: JF Hocquette, D Pethick
AIMS

• to emphasise “quality for customer satisfaction” and measuring/evidencing “quality” as essential
• to encourage consumer focused sensory research for red meat with key collaborating international partners using common protocols
• facilitate where appropriate MSA like systems that focus on consumer satisfaction
• work towards a model for sharing sensory data using the MSA protocols that can be used for scientific and for commercial purposes
• explore models for funding future research collaboration
Participants

• Registrations were received from 80 people covering 17 countries (Australia, Brazil, Canada, China, Czech Republic, Denmark, France, Italy, Japan, Republic of Ireland, Poland, Portugal, South Africa, Spain, Thailand, United Kingdom, United States of America)

• Registrations were received from both scientists and industry people
Programme (Day 1)

• Meat Standards Australia cuts based beef grading – an overview of use in Australia: (J Thompson, MSA pathways, Australia)

• A vision for International work utilizing common sensory protocols with untrained consumers (R Polkinghorne, MSA pathways chair, Australia)

• Overview of outcomes from analysis of the combined European consumer data set (S Bonny, Murdoch University, Australia & JF Hocquette, INRA, France)

• Modeling and prediction versus statistics with reference to MSA (G Tarr, Newcastle University)

• An opportunity too good to miss – experience from the Australian Industry. P Trefort (Meat & Livestock Australia board member, Australia)

• UK retail perspective - The need to move beyond carcass classification (D Sinclair Waitrose, UK)

• French Industry perspective on beef and lamb eating quality grading (F Frette, FNICGV, French Meat Industry and Wholesalers Organisation)

• The Polish Industry perspective on beef quality grading (J Wierzbicki, Polish Beef Association, Poland)

• Global trading of beef using Meat Standards Australia – an Australian supplychain perspective of brand management underpinned by MSA (M Crowley, Meat & Livestock Australia, Australia)
Programme (Day 2)

The prospects for grading lamb cuts based on eating quality (D Pethick, Sheep CRC, Australia)

Objective carcase grading for yield and eating quality in Australia (G Gardner, Sheep CRC, Australia)

Eating quality grading - perspective from Ireland and an update on objective carcase grading in Europe (P Allen, TEAGASC, Ireland)

Eating quality grading - perspective from Japan – scientific and industry views. (T Nishimura, Japan)

The Meat Standards Australia beef eating quality index and the role of genetics (P McGilchrist, Australia)

Incorporating flavour research into carcase grading for eating quality (L Farmer, Nth Ireland)

International beef eating quality language (R Polkinghorne, MSA pathways, Australia and Jerzy Wierzbicki, Polish Beef Association, Poland)

2.30-3.30pm: New collaborations (20min each): China - Q Meng & H Luo (China Agricultural University); UK/Wales - N Scollan (Aberystwyth University, Wales) ; New European initiative(s) – K Duhem (French Livestock Institute, France)

General discussion, future directions (Facilitator: N Scollan, Aberystwyth University, Wales) and Summing up (D Pethick & JFs Hocquette)
What is MSA?

- A Meat and Livestock Australia initiative
- MSA is a product grading scheme focused on satisfying the consumer
- MSA uses a ‘PACCP’ approach to grading meat

Meat Standards Australia cuts based beef grading – an overview of use in Australia:
(J Thompson, MSA pathways, Australia)
<table>
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<td>Intercostal</td>
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<td>INTO</td>
<td>54</td>
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</table>
All models are wrong, but some are useful (George Box).

Reliable but invalid
Valid but less reliable
Unreliable but valid

Expert panels
Ideal consumers
Actual consumers

Research done so far in Europe
Research done in Australia and by Sarah Bonny in Europe

Modeling and prediction versus statistics with reference to MSA (G Tarr, Newcastle University)
The output

Boneless Beef

* YG* CUR

2.2 - 3.1kg
IW/VAC

Any Meat Works Co
Batch: 4487

PRODUCT OF AUSTRALIA

32301

4 PC

MSA 3 Grill @ 5 days, MSA 4 @ 14 days
MSA 3 Roast @ 5 days, MSA 4 @ 14 days
MSA 3 Stir fry @ 5 days, MSA 4 @ 21 days

PKD ON 17-APR-2009 17:26
BEST BEFORE 29-MAY-2009

21.8kg 48.1lb

NET WEIGHT

KEEP REFRIGERATED

EST. NO. 9999

Australia Inspected
Current usage of MSA
- total number of carcasses graded

Meat Standards Australia cuts based beef grading – an overview of use in Australia:
(J Thompson, MSA pathways, Australia)
Current usage of MSA

Meat Standards Australia cuts based beef grading – an overview of use in Australia:
(J Thompson, MSA pathways, Australia)
Current usage of MSA

MSA eligible cattle and sheep are processed at MSA licensed abattoirs.

Carcasses are graded by an MSA-accredited grader with an eating quality score assigned to each cut.

Cuts with the same eating quality are packed together. Eating quality outcomes specified on the carton label.

End users of product have confidence that consumers will be satisfied.

An opportunity too good to miss – experience from the Australian Industry. P Trefort (Meat & Livestock Australia board member, Australia)
The Consumer:

- Is not going to learn to cook
- Is not going to learn about cuts

To Succeed Beef Must Be:

- Simple to buy
- Pan ready and simple to cook
- Bullet Proof

*a contemporary consumer product*

A vision for International work utilizing common sensory protocols with untrained consumers (R Polkinghorne, MSA pathways chair, Australia)
The MQ4 score = Consumer Satisfaction

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<tr>
<td>Tenderness</td>
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<td>+</td>
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<td>Juiciness</td>
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<td>Like flavour</td>
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<td>+</td>
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<tr>
<td>Overall liking</td>
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MQ4 score

A vision for International work utilizing common sensory protocols with untrained consumers (R Polkinghorne, MSA pathways chair, Australia)
Consumer identified quality grades

A vision for International work utilizing common sensory protocols with untrained consumers (R Polkinghorne, MSA pathways chair, Australia)
TOWARDS THE MSA INDEX

MSA Index = A weighted MSA score for the carcase

All MQ4 scores weighted for their proportion of all 39 muscles

The Meat Standards Australia beef eating quality index and the role of genetics (P McGilchrist, Australia)
MSA Index

Average MSA index for 2014-15 was 57.61

Global trading of beef using Meat Standards Australia – an Australian supplychain perspective of brand management underpinned by MSA
(M Crowley, Meat & Livestock Australia, Australia)
Feedtype MSA Index distribution

The Meat Standards Australia beef eating quality index and the role of genetics (P McGilchrist, Australia)
Change is possible (grilled short loins)
Here is what happened for lambs

**Post MSA**

- MSA compliant loins $n=806$
- (2005)

**Pre MSA**

- Retail audit before MSA $n=907$
- (1997)

Prototype MSA for lambs
(presentation of G Gardner)

<table>
<thead>
<tr>
<th>Trait</th>
<th>Dorper</th>
<th>Maternal</th>
<th>Merino</th>
<th>Terminal</th>
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<tr>
<td>Hot Standard Carcase Weight (kg)</td>
<td>22</td>
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<tr>
<td>IMF %</td>
<td>5</td>
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<tr>
<td>Eye Muscle Area (cm²)</td>
<td>16</td>
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<td>GR tissue depth (mm)</td>
<td>12</td>
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**Loin Overall Liking**
- 76.0  
  5 star

**Topside Overall Liking**
- 51.0  
  3 star

Set these boxes and press to update type of graph

Overall Liking
Optimal discrimination function
Willingness to pay in other countries

WTP (as a ratio of 3 star)

Quality Grade

A vision for International work utilizing common sensory protocols with untrained consumers (R Polkinghorne, MSA pathways chair, Australia)
Global data is predominantly complementary

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<th>CATTLE</th>
<th>AUST</th>
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<th>RSA</th>
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<th>WALES</th>
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| SEX                  | Bull | Y   | Y     |       | Y    | Y    |      |      |       |        |        |
| Steer                | Y    | Y   | Y     | Y     | Y    | Y    | Y    | Y    | Y     |        |        |
| Heifer               | Y    | Y   |       |       |      |      |      |      |       | Y      |        |
| Cow                  | Y    |     |       |       |      |      |      |      |       | Y      | Y      |

| COOK Methods         | 8    | 4   | 2     | 3     | 4    | 2    | 2    | 2    | 2     | 3      | 1      |
| Doneness             | 1    | 1   | 1     | 1     | 1    | 1    | 2    | 1    | 1     | 1      | 2      |
| Thickness            | 1    | 1   | 1     | 2     | 1    | 1    | 1    | 1    | 1     | 2      | 2      |

A vision for International work utilizing common sensory protocols with untrained consumers (R Polkinghorne, MSA pathways chair, Australia)
Considerations

- Establish a common database structure within a cloud environment to facilitate local but compatible data collection
- Utilise MSA Consumer Testing Protocols to standardise consumer data
- Each country retains ownership and control of their own data and uses their own languages
- Data is approved for merging in a data co-operative – ontology used to standardise local terms and language as it is uploaded
- Record kept of data contributions of each party
- Data co-operative managed by an expert working group for research evaluation

International beef eating quality language
(R Polkinghorne, MSA pathways, Australia and Jerzy Wierzbicki, Polish Beef Association, Poland)
A vision for International work utilizing common sensory protocols with untrained consumers (R Polkinghorne, MSA pathways chair, Australia)
A collaborative work already exists in Europe

Overview of outcomes from analysis of the combined European consumer data set (S Bonny, Murdoch University, Australia & JF Hocquette, INRA, France)
PhD of Sarah Bonny

European conformation and fat scores have no relationship with eating quality

S. P. F. Bonny$^{1,7*}$, D. W. Pethick$^1$, I. Legrand$^2$, J. Wierzbicki$^3$, P. Allen$^4$, L. J. Farmer$^5$, R. J. Polkinghorne$^6$, J.-F. Hocquette$^{7,8}$ and G. E. Gardner$^1$

Ossification score is a better indicator of maturity related changes in eating quality than animal age

S. P. F. Bonny$^{1,7*}$, D. W. Pethick$^1$, I. Legrand$^2$, J. Wierzbicki$^3$, P. Allen$^4$, L. J. Farmer$^5$, R. J. Polkinghorne$^6$, J.-F. Hocquette$^{7,8}$ and G. E. Gardner$^1$

Biochemical measurements of beef are a good predictor of untrained consumer sensory scores across muscles

S. P. F. Bonny$^{1,4,5a}$, G. E. Gardner$^{1*}$, D. W. Pethick$^1$, I. Legrand$^2$, R. J. Polkinghorne$^3$ and J. F. Hocquette$^{4,5}$

The variation in the eating quality of beef from different sexes and breed classes cannot be completely explained by carcass measurements

S. P. F. Bonny$^{1,2*}$, J.-F. Hocquette$^{2,3}$, D. W. Pethick$^1$, L. J. Farmer$^4$, I. Legrand$^5$, J. Wierzbicki$^6$, P. Allen$^7$, R. J. Polkinghorne$^8$ and G. E. Gardner$^1$
Eating quality and carcass conformation

Overview of outcomes from analysis of the combined European consumer data set (S Bonny, Murdoch University, Australia & JF Hocquette, INRA, France)
Eating quality and carcass fatness

Overview of outcomes from analysis of the combined European consumer data set (S Bonny, Murdoch University, Australia & JF Hocquette, INRA, France)
A UK retail perspective
- the need to move beyond carcase classification

Duncan Sinclair, Agriculture Manager, Waitrose Ltd
duncan.sinclair@waitrose.co.uk
In France, consumption has changed

• Due to higher expenses for energy, insurance, housing, communication, ... French consumers:
  – In 2013, spent only 180 euros/year for meat (310 euros in 1990)
  – 35% will reduce their meat consumption (women, pensioners, low-income employees) within the next 2 years **but will be looking for pleasure**
  – Still have a good opinion on read meat, despite scandals

• => A need of quality rather than quantity

French Industry perspective on beef and lamb eating quality grading (F Frette, FNICGV, French Meat Industry and Wholesalers Organisation)
Meat distribution is changing

• Some butchers are becoming celebrities

Desnoyer/Le Bourdonnec, famous French butchers

French Industry perspective on beef and lamb eating quality grading (F Frette, FNICGV, French Meat Industry and Wholesalers Organisation)
Meat distribution is changing

• To be a carnivore becomes a way of life, as being a vegetarian

Want a good plan in your area?

Want to meet a real carnivore?

French Industry perspective on beef and lamb eating quality grading (F Frette, FNICGV, French Meat Industry and Wholesalers Organisation)
A new system for meat labelling in France

• In 2014, the French meat sector launched a new system for meat labelling in self-service section of supermarkets:

• new names for meat cuts with indication of their potential eating quality based on expert knowledge: ★, ★★ or ★★★

but there is no guaranty for consumers
Prediction of quality in France using the MSA system

- Considerable variability for each muscle
- But visible muscle hierarchy (Link = Striploin & rump)

(data obtained with 6 muscles from 18 Australian and 18 French cattle tested by 540 French consumers)

Eating Quality grading tools in Poland

- We have assessed that the MSA (Australian system) is more attractive for Polish beef sector than the USDA Grade system (US system) and has more potential to be developed.
- In 2009 we decided that we should endeavor to build a Polish model similar to MSA.

Polish model similar to MSA

<table>
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<th>Consumers</th>
<th>GRILL</th>
<th>ROASTING</th>
<th>STEWING</th>
<th>SUM</th>
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<td>5 220</td>
<td>660</td>
<td>600</td>
<td>6 480</td>
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<tr>
<td>French</td>
<td>600</td>
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<td>600</td>
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<tr>
<td>All consumers</td>
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<td>660</td>
<td>600</td>
<td>7 080</td>
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</table>

The Polish Industry perspective on beef quality grading (J Wierzbicki, Polish Beef Association, Poland)
The Polish model (similar to MSA)

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<th>Czas dojrzowania</th>
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<th>Antrykot</th>
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<th>Rostbef</th>
<th>Podgrzebieniowy</th>
<th>Łopatka bez kości</th>
<th>Mięśni nadgrzebieniowy</th>
<th>Krzyżowa ze skrzydłem</th>
<th>Krzyżowa ze skrzydłem</th>
<th>Zrazowa dolna</th>
<th>Krzyżowa ze skrzydłem</th>
<th>Skrzydło</th>
<th>Skrzydło</th>
<th>Zrazowa dolna</th>
<th>Ligawa</th>
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<th>Zrazowa górná</th>
<th>Zrazowa górná</th>
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Overall conclusions in Ireland

• Irish consumers seem to score beef in similar way to AUS consumers, but not identical and model may need optimising
• Model tested over wide range of factors
• Moderately large database - over 1100 samples, over 1600 consumers
• Fits reasonably well in most circumstances
• Some exceptions may be due to electrical inputs on line not accounted for
• MSA could be used by Irish industry

Eating quality grading - perspective from Ireland and an update on objective carcase grading in Europe (P Allen, TEAGASC, Ireland)
The MSA system also works in Japan

Japanese consumer categorisation of beef into quality grades, based on Meat Standards Australia methodology


A comparison of Japanese and Australian consumers’ sensory perception of beef

Incorporating flavour research into carcase grading for eating quality

Cause
- Age/maturity?
- Breed/genetics?
- Diet
- Marbling, IMF
- pHu
- pH/T decline
- Ageing
- Muscle
- Cooking method
- Contamination

Formation pathways
- Proteolysis
- Glycolysis
- ATP / IMP breakdown
- Pentose phosphate pathway
- Lipid oxidation
- Impact of pro-oxidants and antioxidants

Flavour precursors
- Amino acids
- $\text{H}_2\text{S}$
- Sugars
- Fatty acids
- Nucleotides
- Carotenoids

Flavour
ODOUR VOLATILES
TASTE (including UMAMI)
FLAVOUR RELEASE

Flavour perception
FLAVOUR as perceived by the consumer

Incorporating flavour research into carcase grading for eating quality (L Farmer, Nth Ireland)
International collaborations

- IRELAND
- FRANCE
- POLAND
- JAPAN
- SOUTH KOREA
- USA
- NEW-ZEALAND
- CHINA
- SOUTH AFRICA
- IRELAND
- NORTHERN IRELAND
- USA
- SPAIN
- PORTUGAL
- ITALY
- WALES

New interests
Future meat quality grading systems in UK

• Deliver needs of consumers

• Need to have stronger evidence of impact of our production/processing on consumer eating quality

N Scollan (Aberystwyth University, Wales)
Beef and lamb consumption are increasing in China

2006-2013 beef consumption *per capita*

2004-2014 lamb consumption *per capita*

Data from China Agriculture Yearbook, 2014

In 2014, China Agricultural University (CAU) and Murdoch University (MU) started a cooperation in MSA evaluation.
The First Symposium on the Applied Techniques and Industry Economics in Chinese Beef Cattle Production
International collaborations

Europe
(here UK, France)

Australia

China
General Discussion at the Paris Workshop

To encourage consumer focused sensory research for red meat with key collaborating international partners using common protocols

• MLA have a track record here and welcome further collaboration (– MLA and Australian scientists only need cost recovery – typically with appropriate R&D monies)
Work towards a model for sharing sensory data using the MSA protocols that can be used for scientific and for commercial purposes

- Data management (organised, standardised, administration)
- Could put it on a cloud with ‘rules’ etc = 3G
- Will this really help
- What will people do with the data
  - research likely simple
  - Australia MSA would like it as we maybe able to use the data to improve our model!!
Way forward

- Working group – need a chair
- Members – current collaborators + others. Ideally scientific and industry ?
- How big could it be and remain effective
- Need to develop this around our aims
- Include objective carcase measurement
- Perhaps 2 international meeting per year by via video/Skype/Tele conference – whatever
- Face to face workshop every 2-3 years (if agreed) around ‘another’ conference ....
Explore models for funding future research collaboration

- So far has been
  - An R&D grant in the home country and an R&D grant in Australia
    - Beef: France-Aus collaborating grant (France)
    - Lamb: China-Aus collaborating Centre
    - Beef: ACIAR grant (Sth Africa)

- AND since then (after the workshop)
  - European projects
EUROBEEF,
a European Network for knowledge exchange and innovation in the beef sector in Europe
Animal and carcass characteristics

Eating quality by untrained consumers

Creation of the Beef 3G model

Methods to combine diverse quantitative and qualitative quality criteria

Nutritional value and Traceability of beef from grass-based systems

Prediction of

Consumers’ expectations

Genetic selection in favour of eating quality

Acceptance of the model

Validation of the model

The Beef 3G eating quality model

The Beef generic quality model

Project submitted by JF Hocquette on September 1st

ERC Advanced Grant 2016
Global Guaranteed Grading of Beef

Beef 3G
The goal of the 3G system is to underpin existing labels and brands.
Meat from beef breed, a good piece of environment

In France

Beef breeds protect our grasslands so necessary to our environment.

Did you know it?

Source: French Meat Information Center
The summary of the workshop was published (in English)

http://www.viandesetproduitscarnes.fr/index.php?option=com_content&view=article&id=681:prediction-de-la-qualite-de-la-viande-de-ruminants&catid=97&Itemid=435&lang=fr