Towards a European beef quality model?

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Evolution of research in animal science towards sustainability

Sustainability is a priority for the European Roundtable for Beef Sustainability (ERBS)

Goods and services derived from livestock farming

Animal health
Heritage and cultural aspects
Animal welfare

Social concern

Environment

Negative effect

Positive effect

Food consumption
Production
International trade
Associated sectors


Environment

Inputs

Market

Jobs

Direct employment
Indirect employment
Work
Technology and automation
Worker health and safety

Greenhouse gases
Air quality
Soils and carbon storage
Water quality
Biodiversity of plants and of animals

Animal feed
Land use
Energy, phosphorous, water
The quality of beef

**Extrinsic qualities**
- Production
- Carbon footprint
- Welfare
- Health
- Origin

**Intrinsic qualities**
- Appearance
- Smell
- Colour
- Marbling
- Nutritional qualities

**Eating qualities**
- Cost
- Brand
- Label
- Packaging
- Marketing
Which is better?
And why?

Quality is just like love
1. It's natural. Everyone is in favour of it
2. Everyone likes it
3. Everyone does it
4. Everyone is expert
5. When it does not work, it's the fault of your partner

Beef Quality Grading System
Background

• Beef is not always meeting consumers' expectations

• No strong relationship is observed between eating quality of beef and its price as shown in France (Normand et al., 2014).

• A consumer-driven prediction model of beef eating quality has been developed in Australia
The Meat Standards Australia System

- Scores for
  - Tenderness
  - Juiciness
  - Flavour
  - Overall Liking

- Scores then weighted and combined into a single MQ4 value

\[
\text{Tenderness} \times 0.3 + \text{Juiciness} \times 0.1 + \text{Flavour} \times 0.3 + \text{Overall Liking} \times 0.3
\]
Consumers also class meat as:

- Unsatisfactory
- Good every day
- Better than every day
- Premium

Global quality score

MQ4

0

46

64

76

100
Prediction of beef quality in Australia: the Meat Standards Australia (MSA) system

- **Meat Colour**
- **Ossification**
- **Fat colour**
- **Marbling**
- **Temperature and pH**

**MSA2000model®**

- **Hang (AT/TC/TS/TX)**
- **Sex (M, F)**
- **Est. % Bos Indicus**
- **Hump Height cms**
- **Hot Std Carc Weight**
- **USDA Ossification**
- **Milk Fed Vealer Y/N**
- **USDA Marbling**
- **Days Aged (min 5)**
- **Quarter Point Ribfat**
- **Ultimate pH**

<table>
<thead>
<tr>
<th><strong>AUSMEAT Meat Col.</strong></th>
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<td>Saleyard? (Y, N)</td>
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<th><strong>Wght/App.Maturity</strong></th>
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Prediction of beef quality in Australia: the Meat Standards Australia (MSA) system

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MSA2000model®

Hang (AT/TC/TS/TX) | AT
Sex (M, F)         | m
Est. % Bos Indicus | 0
Hump Height cms    | 0
Hot Std Carc Weight| 200
USDA Ossification  | 100
Milk Fed Vealer Y/N| N
USDA Marbling      | 130
Days Aged (min 5)  | 5
Quarter Point Ribfat| 5
Ultimate pH        | 5.40

AUSMEAT Meat Col.
Saleyard? (Y, N)   | 2
Wght/App.Maturity  | 1.32
Prediction of sensory quality in France using the MSA system

- Considerable variability for each muscle
- But agrees visible muscle hierarchy

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

The Meat Standards Australia Index indicates beef carcass quality

A weighted eating quality score for the carcass

All MQ4 scores weighted for their proportion of all 39 muscles

= 57.62

McGilchrist et al., 2019. Animal, in press
How does it work in practice?

- Labelling
- Underpinning of 172 brands/labels in Australia and one in France uses some MSA principles
- Industry impact: $AUD679 millions
- Benefit/cost ratio: 12.5/1
- The system provides feedback to farmers to be more competitive
MSA is growing

- Dynamic growth: 40% of slaughter

- Increase in the average eating quality of beef
Is the MSA system relevant for the European beef chain?

**Australia**
- Mostly steers
- Mostly heifers
- 90% Beef breeds

**EU-28**
- 55% of Dairy origin
- Cows
- Young bulls
- Heifers
- Steers

Sources:
- http://www.abs.gov.au
- http://ec.europa.eu/eurostat
The European Beef Industry

France
- Cows: Young bulls
- Cows

Poland
- Cows: Young bulls
- Cows

EU-28
- 55% of Dairy origin
- Cows: Young bulls, Steers, Heifers

Ireland
- Steers
- Heifers

UK
- Steers
- Heifers

http://ec.europa.eu/eurostat/statistics-explained/index.php/Agricultural_production_animals
Prediction of quality in France using the MSA system

Beef Quality Prediction

Cattle
- Carcass (conformation, fatness)
- Sex
- Breed type
- Age
- Tenderstretch
- Ageing time

Consumers
- Age, Gender
- Income, Occupation
- Children and adults in the household
- Frequency of eating beef
- Importance of beef
- Preferred cooking doneness
Is the MSA system relevant for the European beef chain?

- 774 Carcasses
- X 7 samples
  - 6 experimental samples
- 19,492 Consumers

Countries:
- Poland
- France
- Australia
- Nth Ireland
- Ireland
All samples

All data
(80% being well classified)
All samples

- 12% Premium
- 24% Better than every day
- 38% Good every day
- 26% Unsatisfactory

All data (80% being well classified)

- 22% Premium
- 30% Better than every day
- 37% Good every day
- 7% Unsatisfactory

After removing Samples predicted as unsatisfactory

(80% being well classified)
European Carcass Classification

<table>
<thead>
<tr>
<th>But consumers do not eat carcasses</th>
<th>Fatness score</th>
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<tr>
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<td>P+</td>
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</table>
Eating quality and carcass conformation

No Difference on average (but difference for two muscles only)

Increasing global quality score (MQ4)

Lower conformation

Bonny et al., Animal (2016), 10:6, pp 996–1006
Eating quality and carcass fatness

Increasing global Eating Quality Score (MQ4)

No Difference across all 16 muscles

Increasing Fatness

Bonny et al., Animal (2016), 10:6, pp 996–1006
Beef from males has lower eating quality scores but this is not fully explained by MSA

Effect of hanging method on tenderness

Achilles tendon

Tenderstretch

Legrand et al., 2018. ICoMST
Experiment on Limousine cows: results

Legrand et al., 2018. ICoMST
## Demographics of consumers

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<thead>
<tr>
<th></th>
<th>France</th>
<th>Ireland</th>
<th>Northern Ireland</th>
<th>Poland</th>
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<td>Children in the household</td>
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<tr>
<td>Frequency of eating beef</td>
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<td>✔️</td>
<td>✔️</td>
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<tr>
<td>Importance of beef</td>
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<td>Preferred cooking doneness</td>
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<td>✔️</td>
<td>✔️</td>
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</tr>
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</table>

**Effect sizes similar to standard error**
Proportional willingness to pay

Australia
France
Northern Ireland
Poland

Bonny et al., Animal (2018), 11:8, pp 1399–1411
Future perspectives

• The International Meat Research 3G Foundation on beef eating quality has been established.

• The Specialized Section of the United Nations Economic Commission for Europe (UNECE) on Standardization of Meat will support it (2/7/2018).
How the Meat 3G foundation may work?

- **Public grants**
- **Meat 3G Foundation**
  - Data to improve the prototype
  - **Commercial activities**
    - Data
    - Financial contribution
    - Prediction of eating quality
- **Company X**
- **Scientific council**
  - R&D activities: a European prototype to predict beef eating quality

**Prediction of eating quality**

**Data**

**Company X**

**Financial contribution**

**R&D activities: a European prototype to predict beef eating quality**

**Data to improve the prototype**
Conclusion 1

A beef eating quality grading system, similar in design to the Australian MSA system, is highly applicable in Europe to both the beef industry and consumers, despite the need for some adjustments (for gender, etc).
Conclusion 2

The combination of indices related to sensory and nutritional quality, social and environmental considerations (carbon footprint, animal welfare, biodiversity of pasture, rural development, etc.) and economic efficiency (incomes of farmers and of others players along the supply chain, etc.) will provide objective assessment of the overall sustainability of beef (Meat Science 92 (2012) 197–209).
To know more

CHAPITRE 11

Critères de qualité recherchés : évolution des attentes des consommateurs et approche australienne de la qualité gustative

ISABELLE LÉGRAND, JEAN-FRANÇOIS HOCQUETTE

La chaîne de la viande bovine

Production, transformation, valorisation et consommation

(18 chapitres)

INRA
SCIENCE & IMPACT

Lavoisier
TEC & DOC