Towards a European beef quality model ?

Jean-François Hocquette [1],

In collaboration with Sarah Bonny [1,2], Isabelle Legrand[3] , Rod Polkinghorne[4], Linda Farmer [5], Paul Allen [6], Jerzy Wierzbicki [7], Graham Gardner [2], David Pethick [2]

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Evolution of research in animal science towards sustainability

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

Social concerns

Environment

Welfare

Safety

Quality

Efficiency

Production

1970   2020
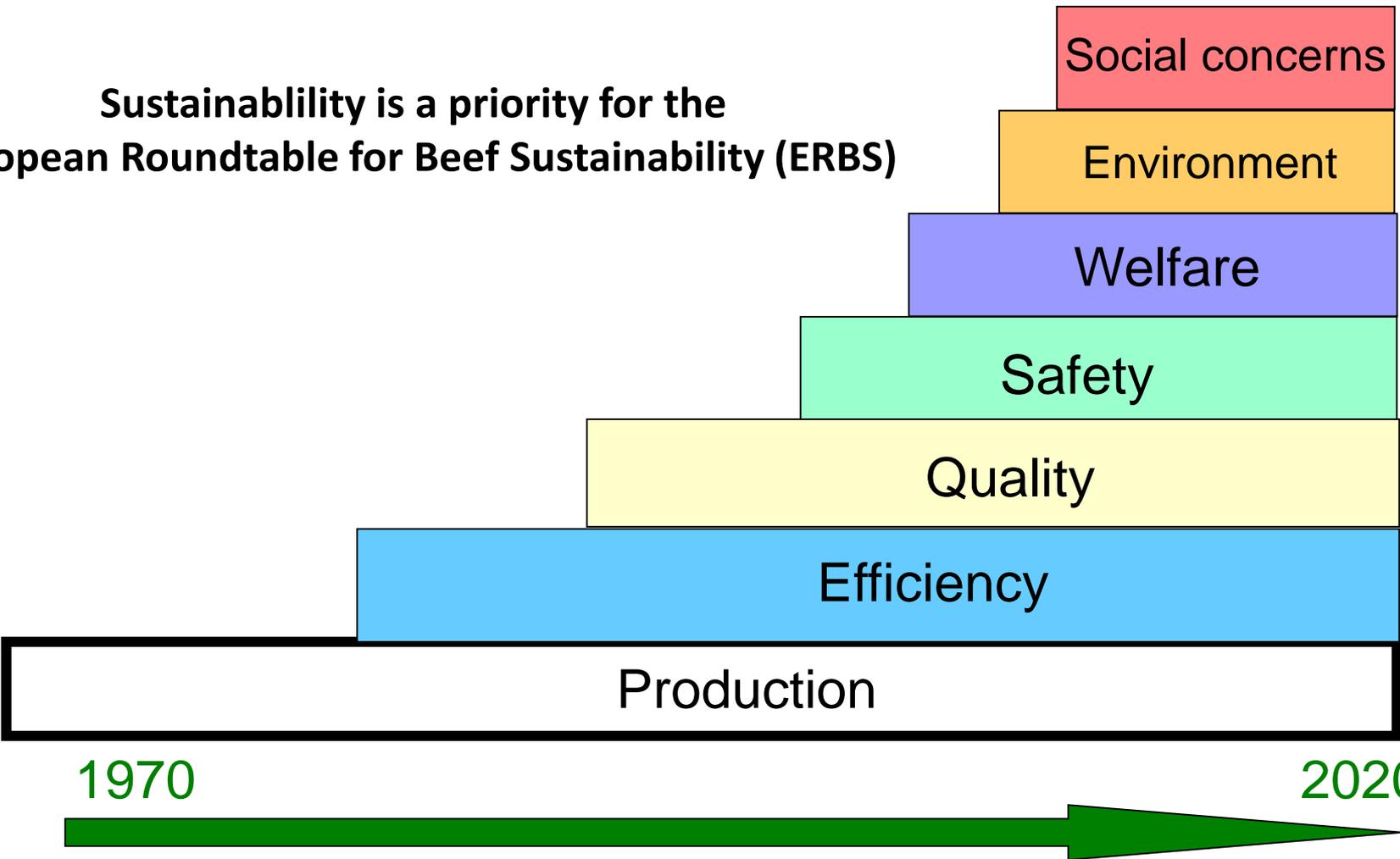
Goods and services derived from livestock farming

Animal health
Heritage and cultural aspects
Animal welfare

Social concern

Negative effect

Positive effect

Market

Food consumption
Production
International trade
Associated sectors

Environment

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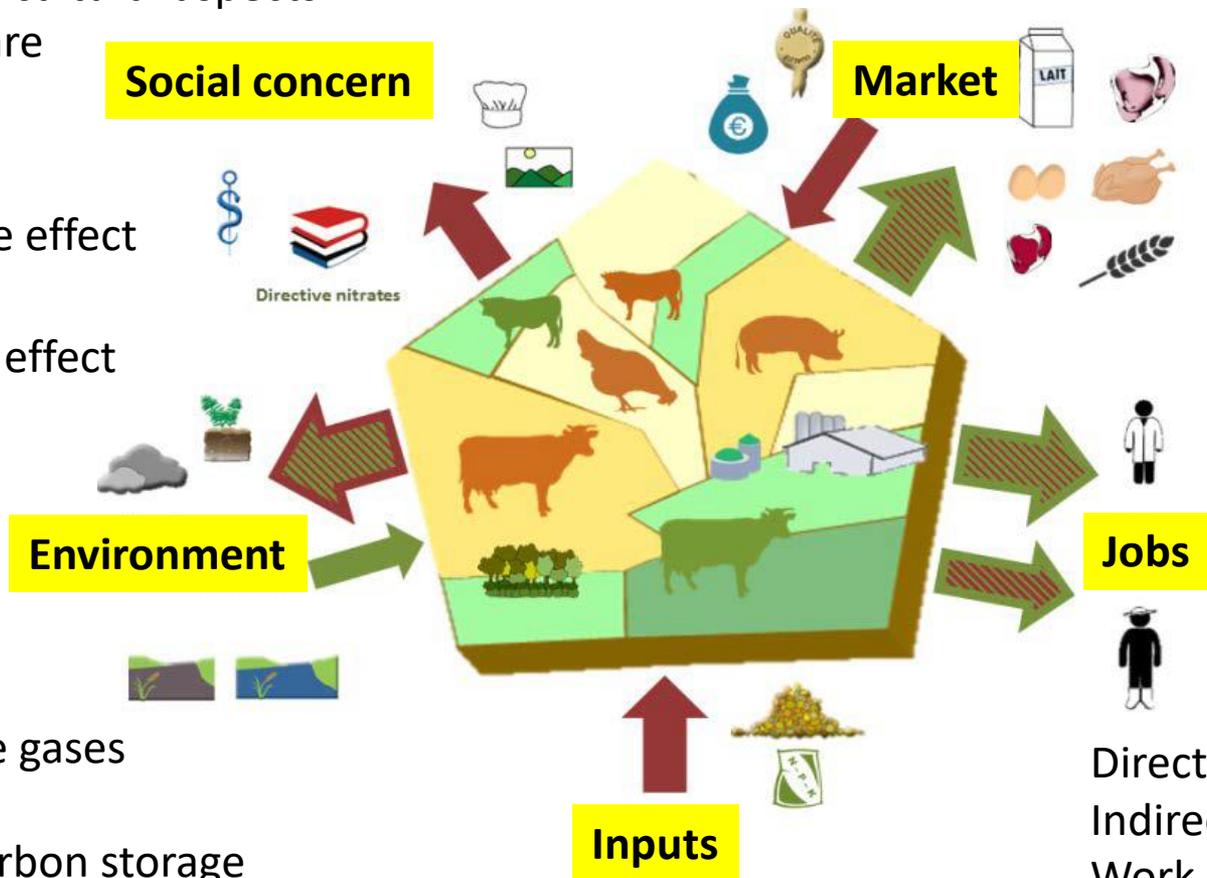
Greenhouse gases
Air quality
Soils and carbon storage
Water quality
Biodiversity of plants and of animals

Inputs

Animal feed
Land use
Energy, phosphorous, water

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

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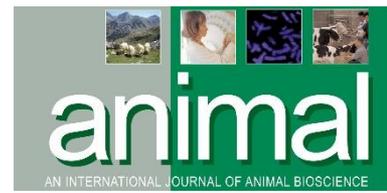
The quality of beef

Extrinsic qualities

- Production
- Carbon footprint
- Welfare
- Health
- Origin

- Cost
- Brand
- Label
- Packaging
- Marketing

Intrinsic qualities

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

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   0 ————————————— 100
  - Juiciness   0 ————————————— 100
  - Flavour   0 ————————————— 100
  - Overall Liking   0 ————————————— 100
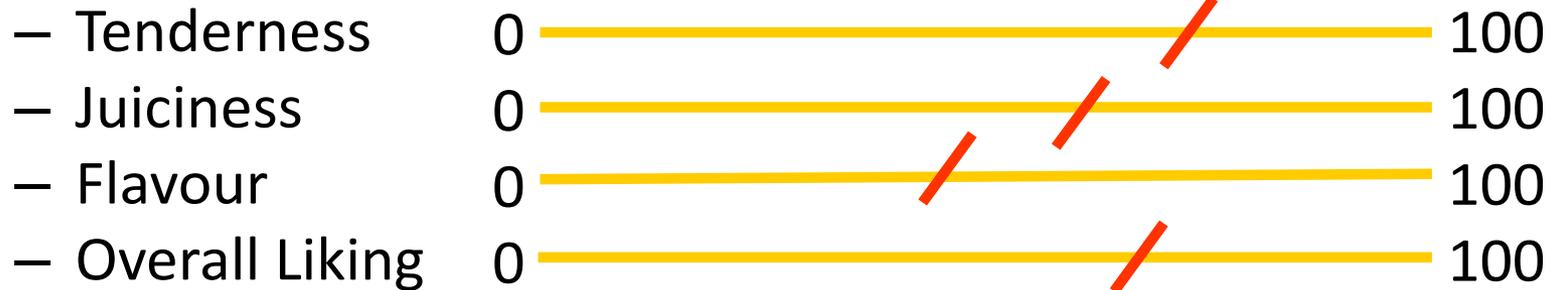
- Scores then weighted and combined into a single MQ4 value

Tenderness   x   0.3
+
Juiciness   x   0.1
+
Flavour   x   0.3
+
Overall Liking   x   0.3

Global quality score

MQ4

The Meat Standards Australia System

Consumers also class meat as:

Global quality score

MQ4 →

| Unsatisfactory | Good every day | Better than every day | Premium |

0   46   64   76   100
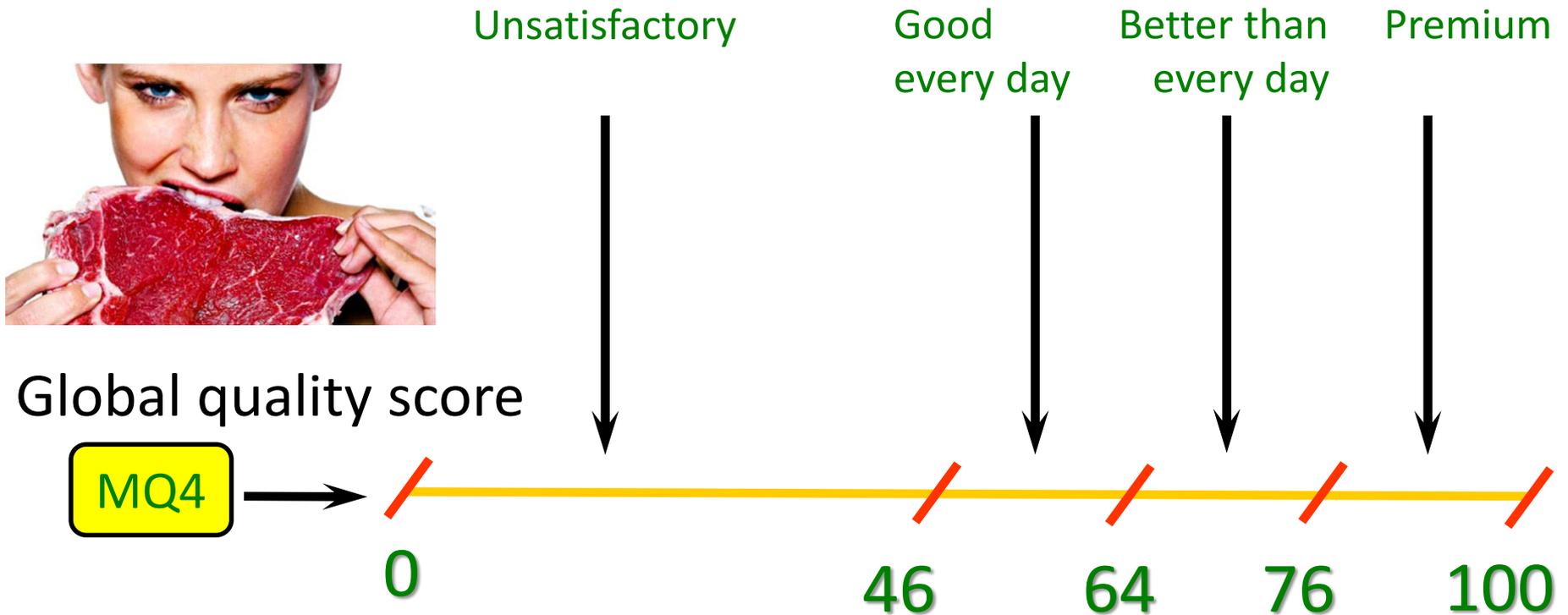
Prediction of beef quality in Australia:
the Meat Standards Australia (MSA) system

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.	2
Saleyard? (Y, N)	n

Wght/App.Maturity	1.32

Meat Colour

Ossification

Fat colour

Marbling

Temperature and pH

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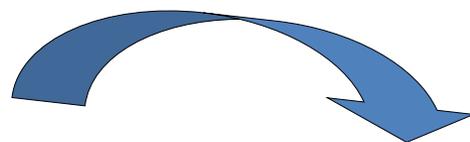
Prediction

MSA2000model®

Hang (AT/TC/TS/TX)	AT
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Wght/App.Maturity	1.32

Cut Description	Muscle Reference	Days Aged	Grilled Steak	Roast Beef	Stir Fry	Thin Slice	Cass-erole	Corned Beef
Tenderloin	TDR062		5	4	5			
Cube Roll	CUB045		3	3	3	4		
Striploin	STR045		3	3	3	3		
Oyster Blade	OYS036		4	3	4	4		
Bolar Blade	BLD096		3	3	3	3	3	
Chuck Tender	CTR085			3	3	3	3	
Rump	RMP131		3	3	3	3		
Point End Rump	RMP231		3	3	3	4		
Knuckle	KNU099		x	3	3	3	3	
Outside Flat	OUT005			x	x	3	3	3
Eye Round	EYE075		x	3	3	3	3	x
Topside	TOP073		x	3	x	3	3	
Chuck	CHK078			3	3	3	3	
Thin Flank	TFL051				3		3	
Rib Blade	RIB041				3			
Brisket	BRI056				x	3	3	x
Shin	FQshin						3	

Prediction of sensory quality in France using the MSA system

- Considerable variability for each muscle
- But agrees visible muscle hierarchy
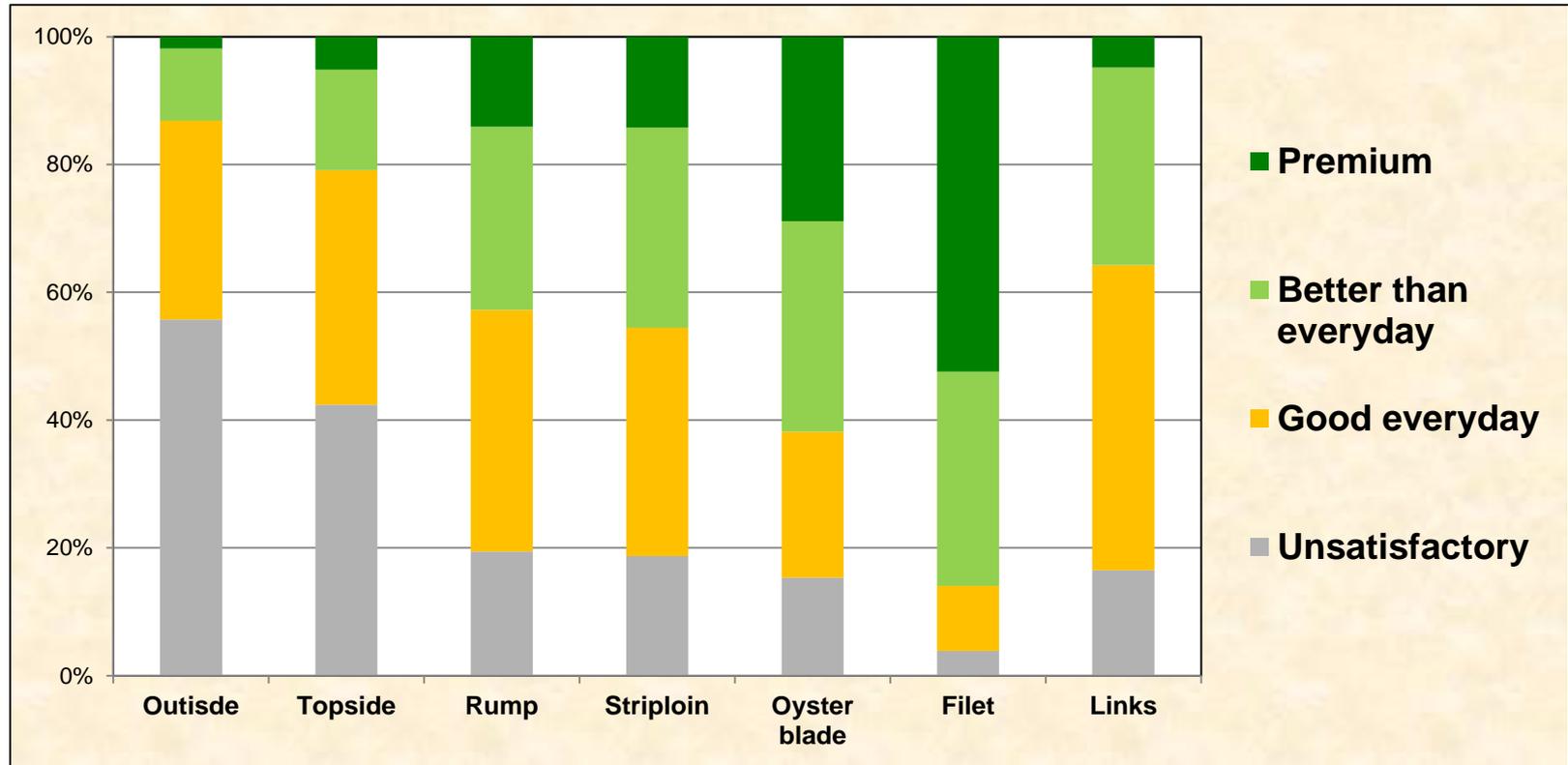
(data obtained with 6 muscles from 18 Australian and 18 French cattle tested by 540 French consumers)

The Meat Standards Australia Index indicates beef carcass quality

A weighted eating quality score for the carcass

= 57.62

**All MQ4 scores weighted for their proportion of all 39 muscles**
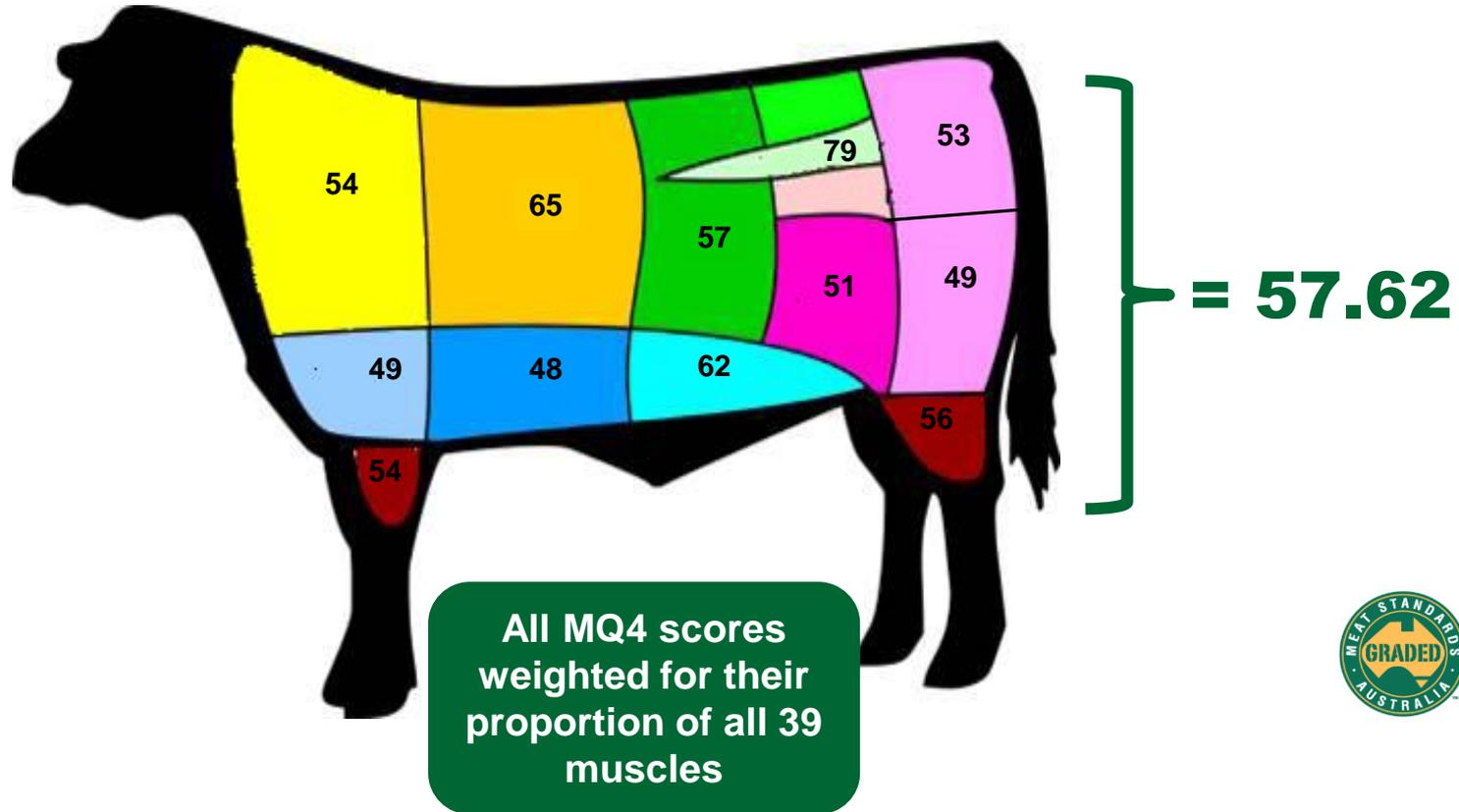
How does it work in practice?

- 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

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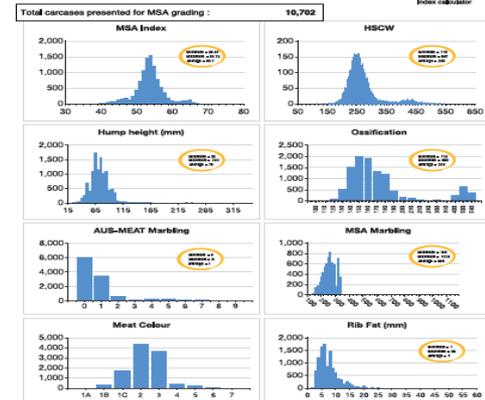
MSA is growing

- Dynamic growth: 40% of slaughter
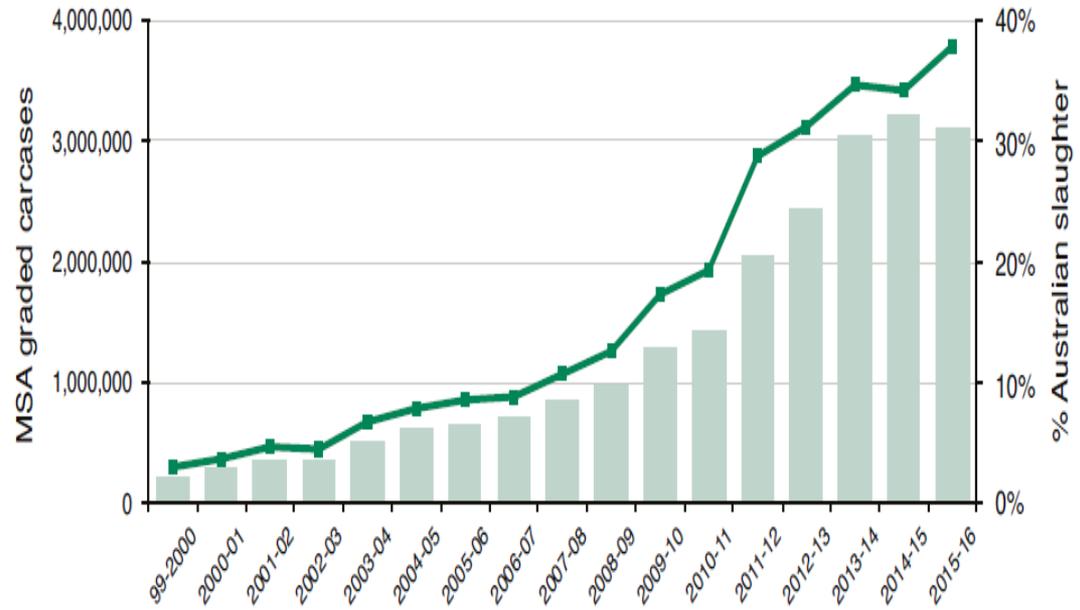
- Increase in the average eating quality of beef
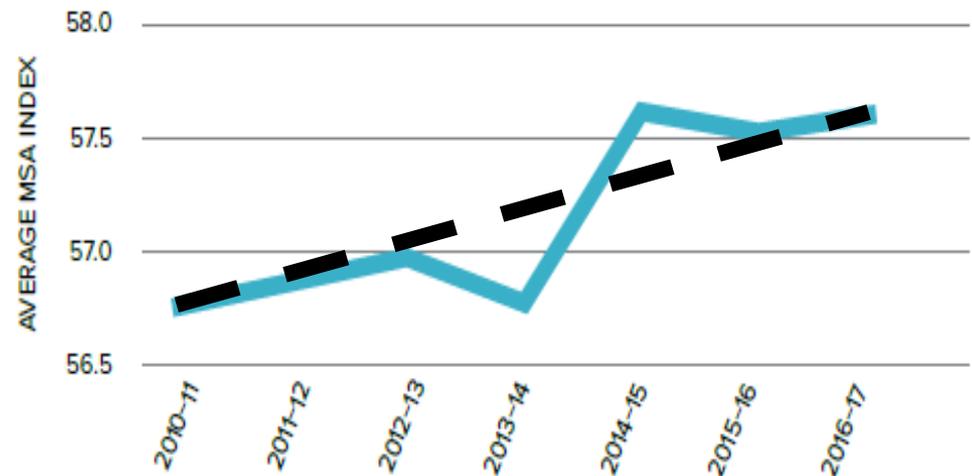
# Is the MSA system relevant for the European beef chain ?

Australia

EU-28

Australia pie chart:
- Mostly steers (green)
- Mostly Heifers (orange)
- 90% Beef breeds

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

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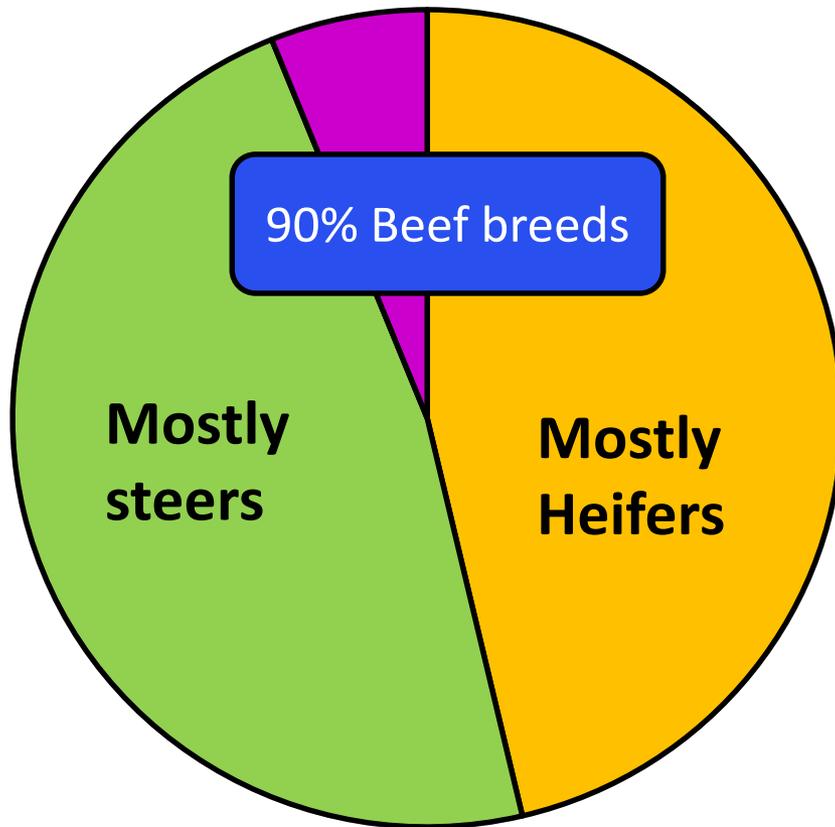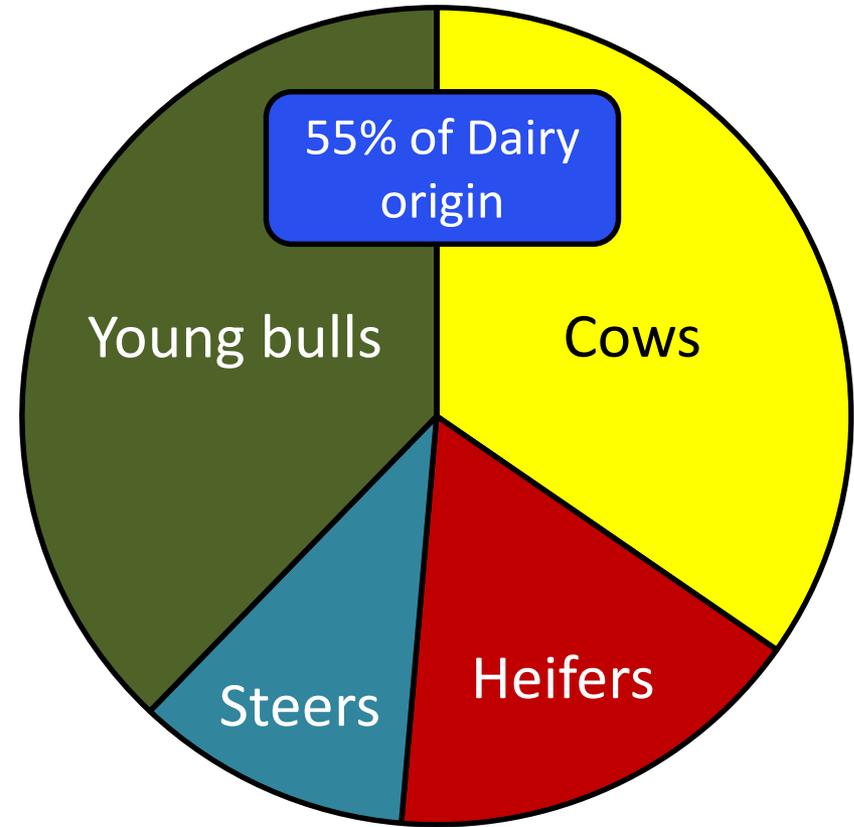
The European Beef Industry

France

Young bulls

Cows

EU-28

55% of Dairy origin

Young bulls

Cows

Steers

Heifers

Ireland

Steers

Heifers

Poland

Young bulls

Cows

UK

Steers

Heifers

16
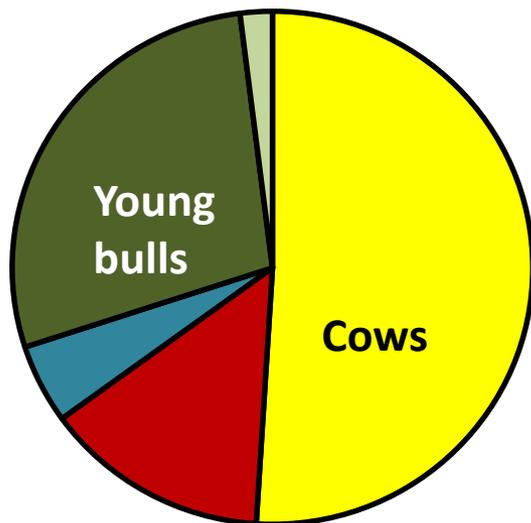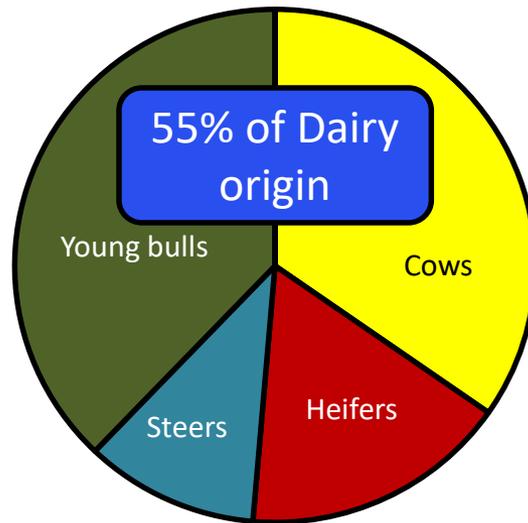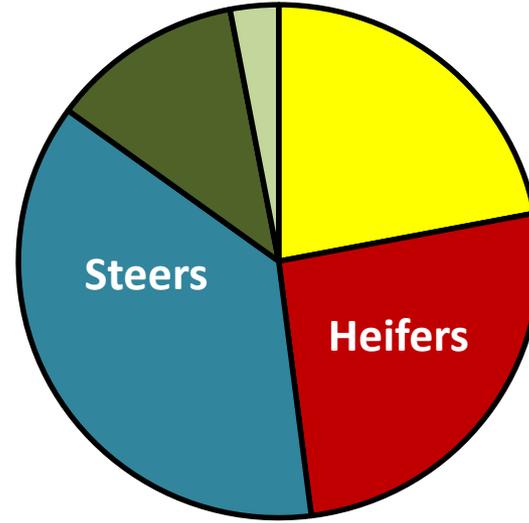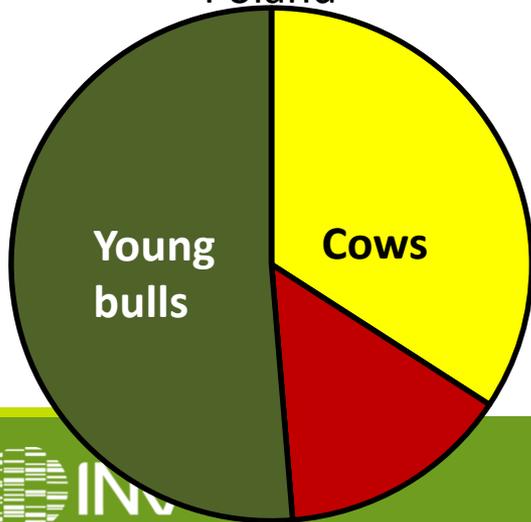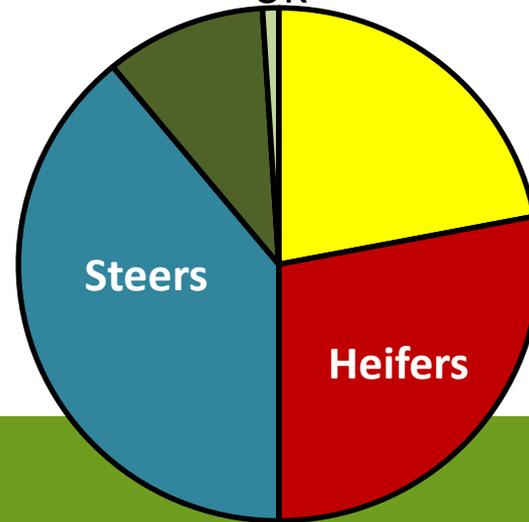
Prediction of quality in France using the MSA system

Real MQ4 cull cows
Predicted MQ4 cull cows

Outside, Topside, Rump, Striploin, Oyster blade, Fillet

Real MQ4 young bulls
Predicted MQ4 young bulls

Outside, Topside, Rump, Striploin, Oyster blade, Fillet

Legrand et al., (2013). 7:3, pp 524–529
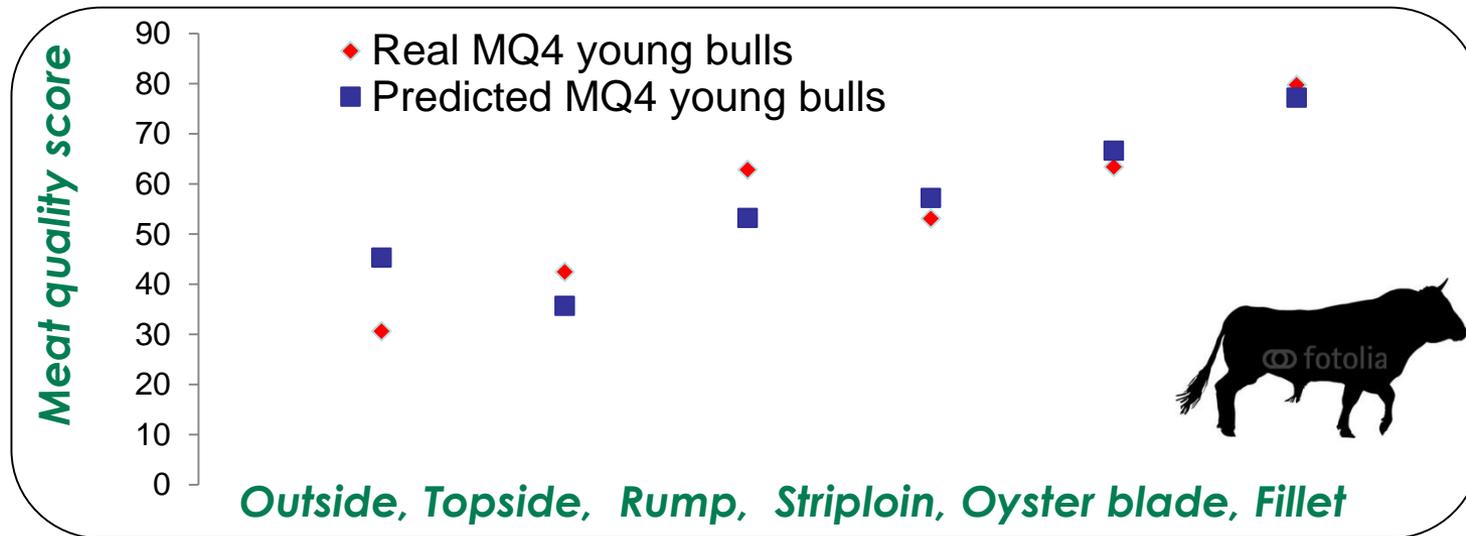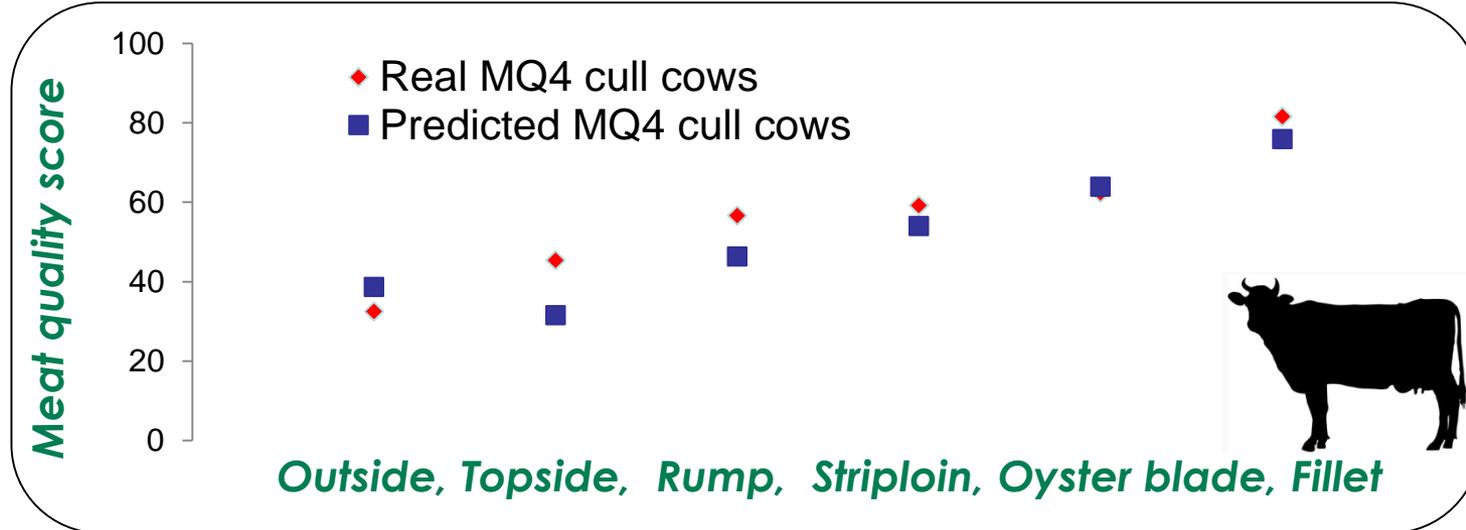
Beef Quality Prediction

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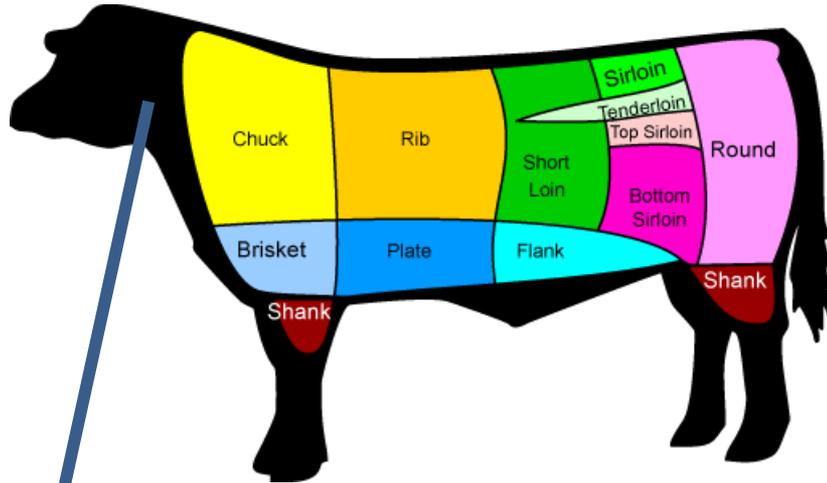
Carcass (conformation, fatness)
Sex
Breed type
Age
Tenderstretch
Ageing time

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**

Poland

France

Australia
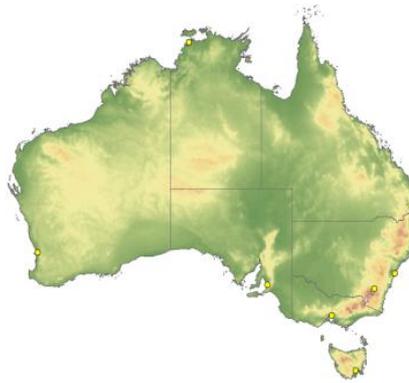
Nth Ireland

Ireland
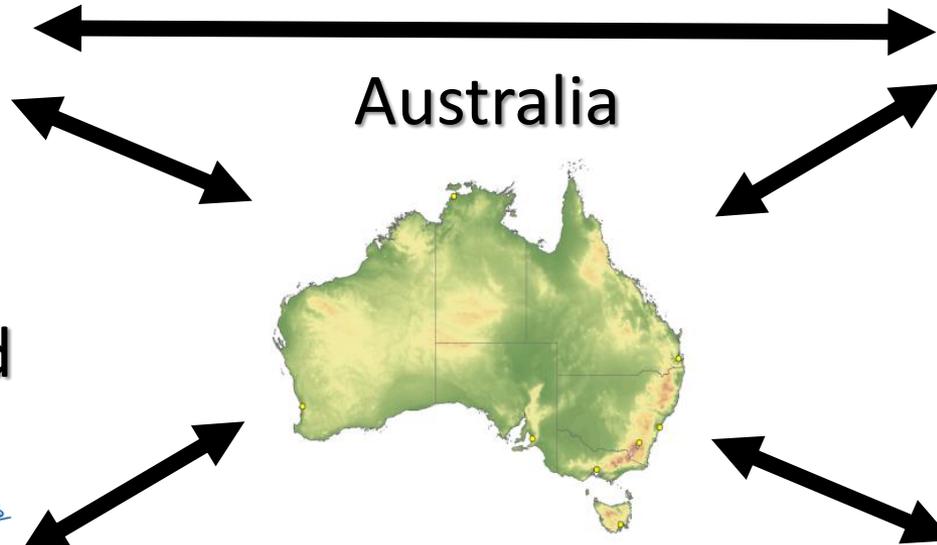
All samples
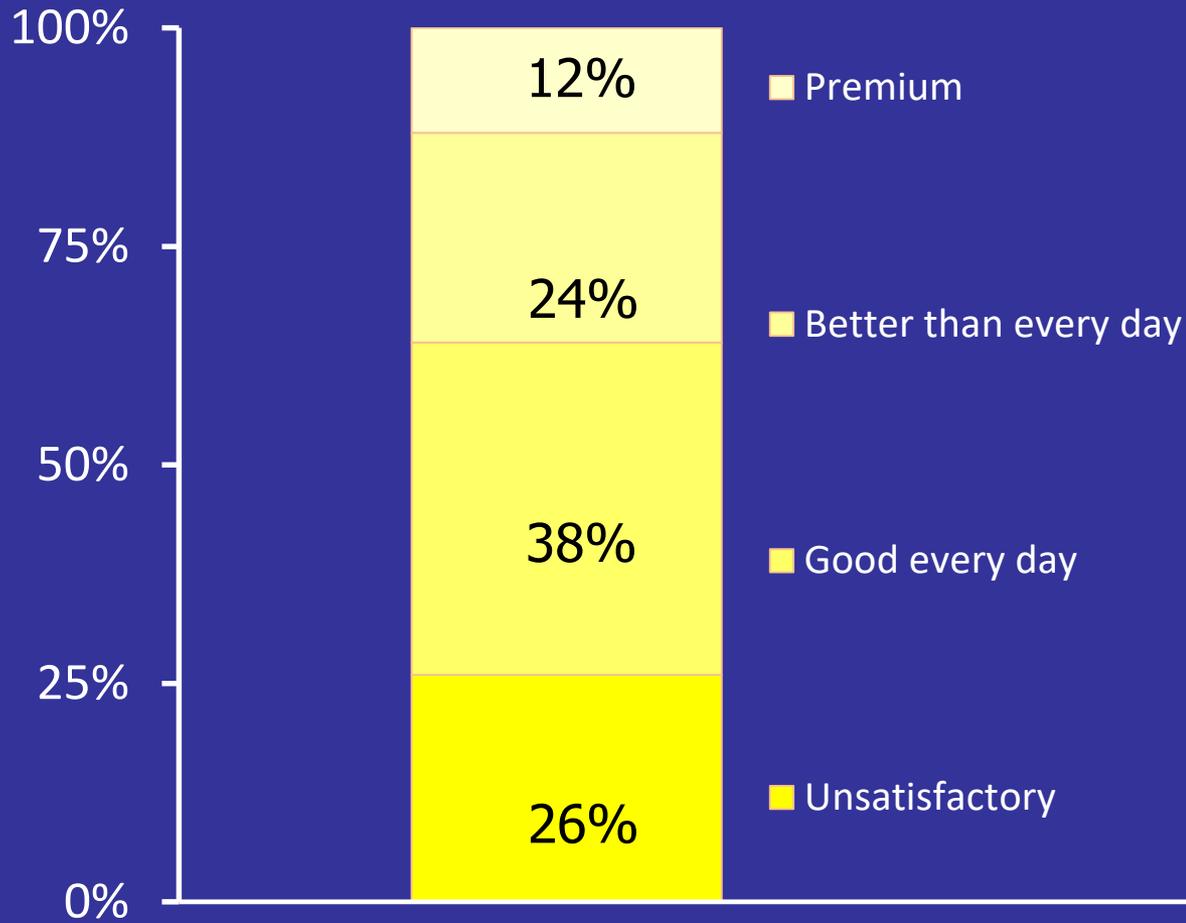
All samples
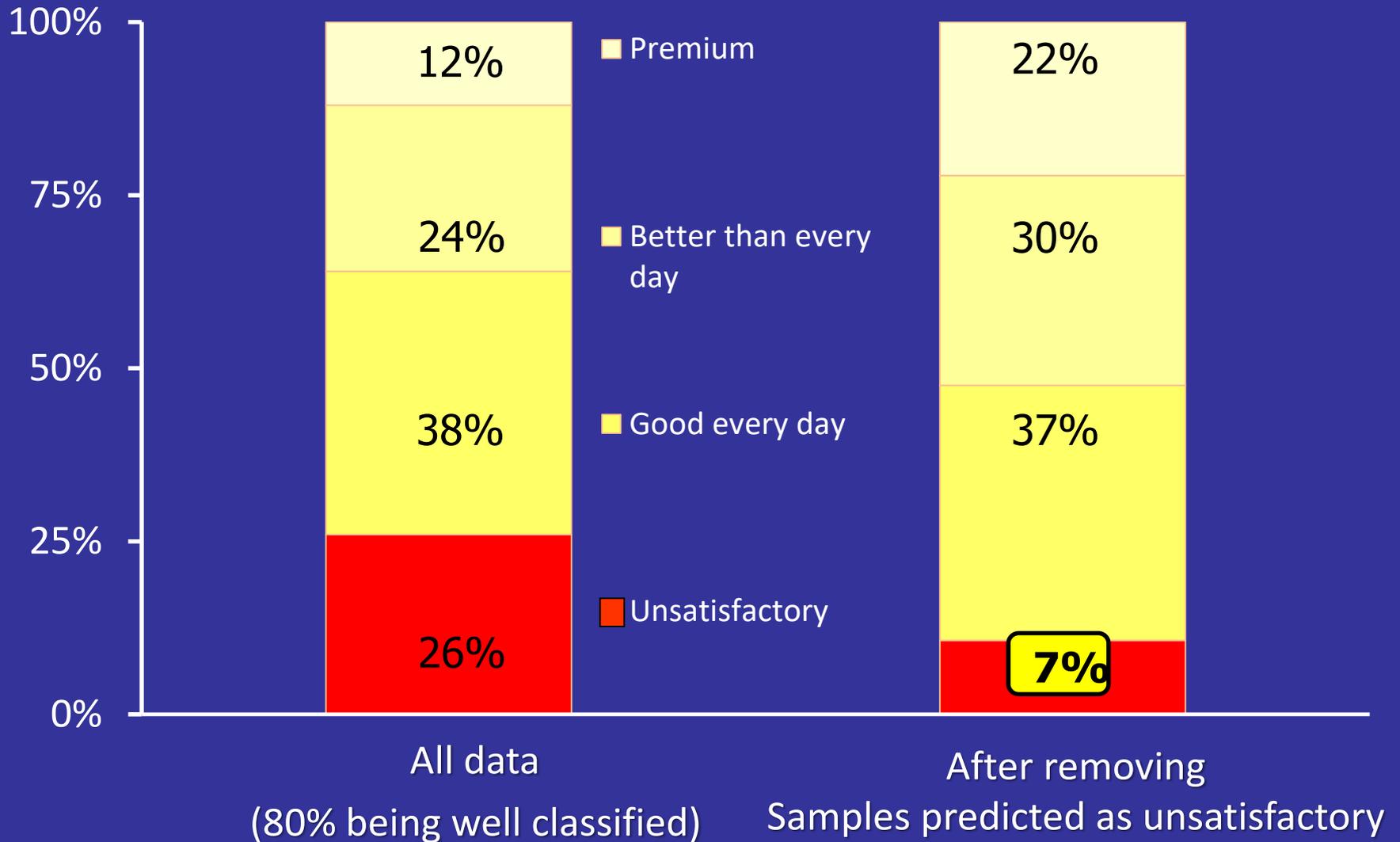
European Carcass Classification

Fatness score

	1	2	3	4L	4H	5L	5H
E							
U+							
U							
R							
O+							
O							
P+							
P							

Conformation score

But consumers do not eat carcasses

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Eating quality and carcass conformation
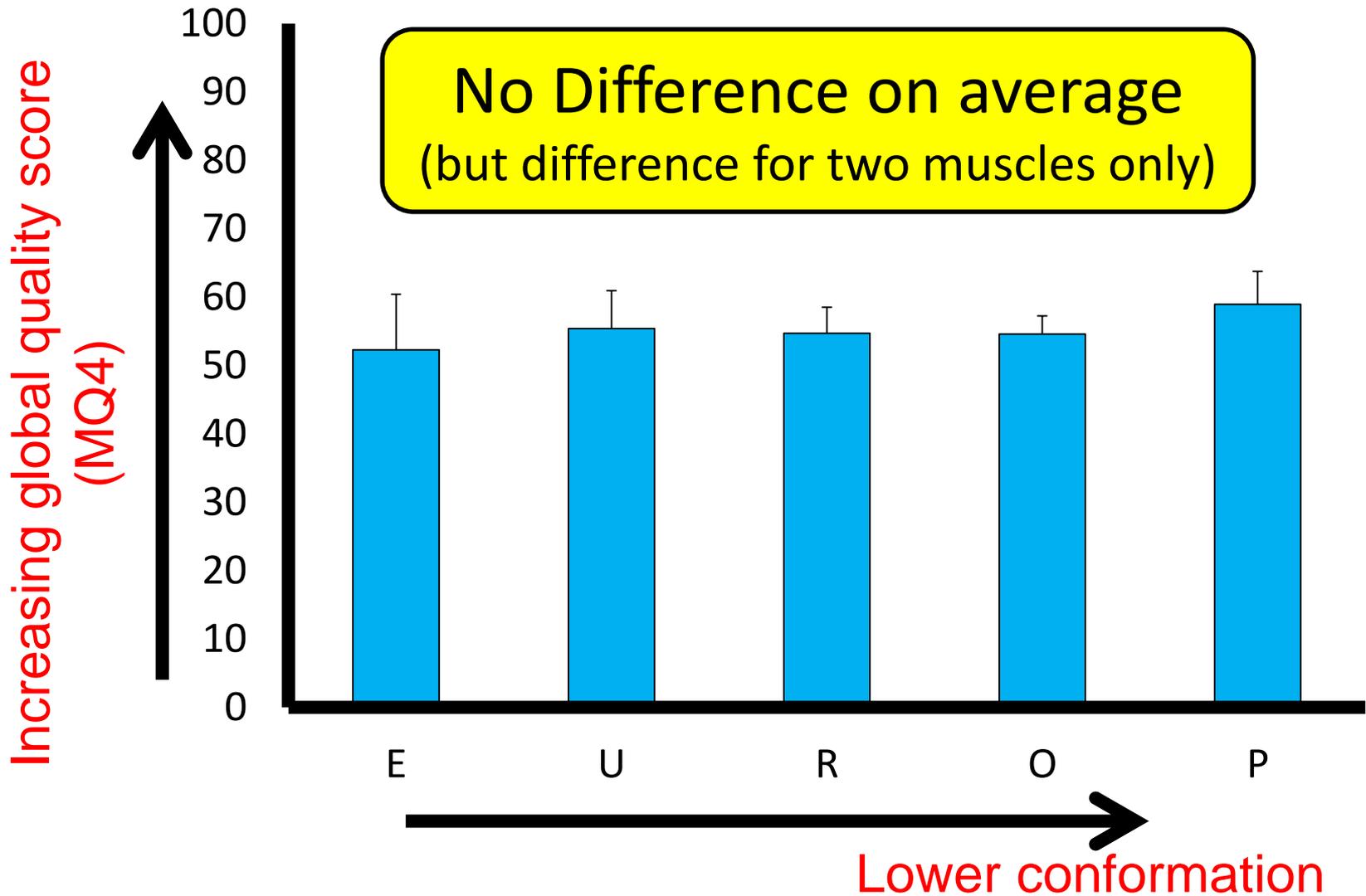
Eating quality and carcass fatness

No Difference across all 16 muscles

Increasing global Eating Quality Score (MQ4)

lean

fat

Increasing Fatness

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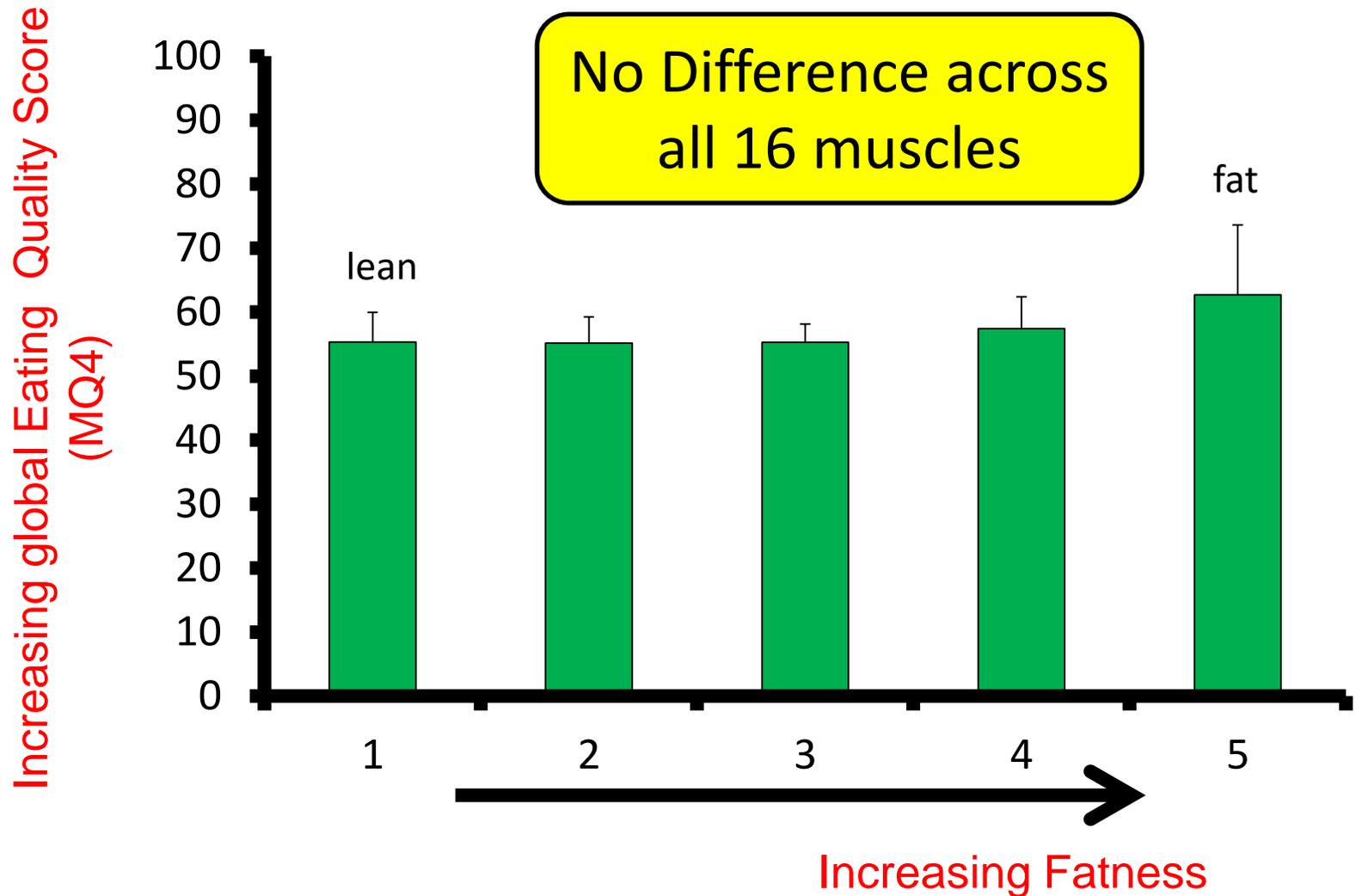
Beef from males has lower eating quality scores but this is not fully explained by MSA
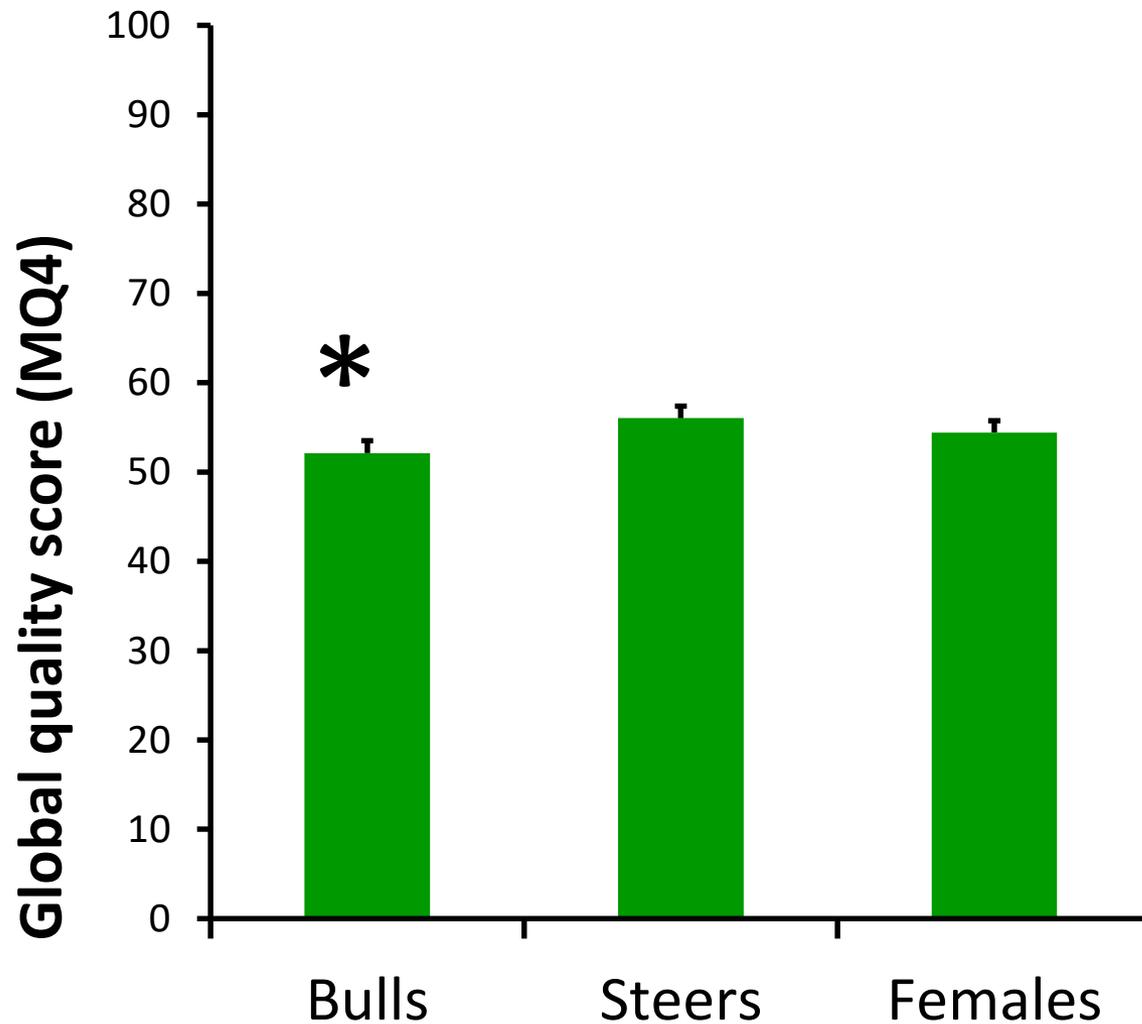
Effect of hanging method on tenderness

Achilles tendon
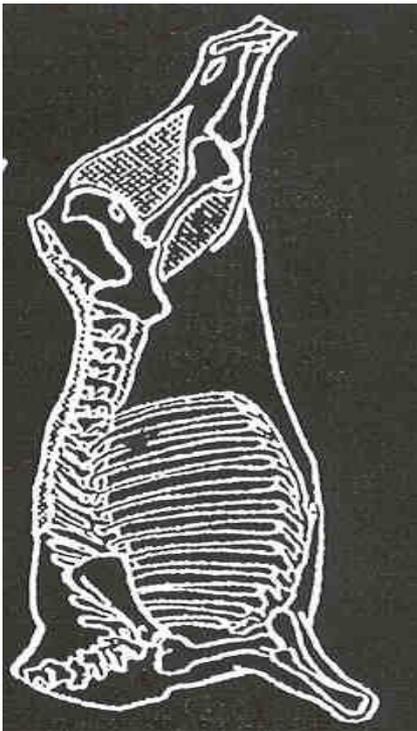
Tenderstretch
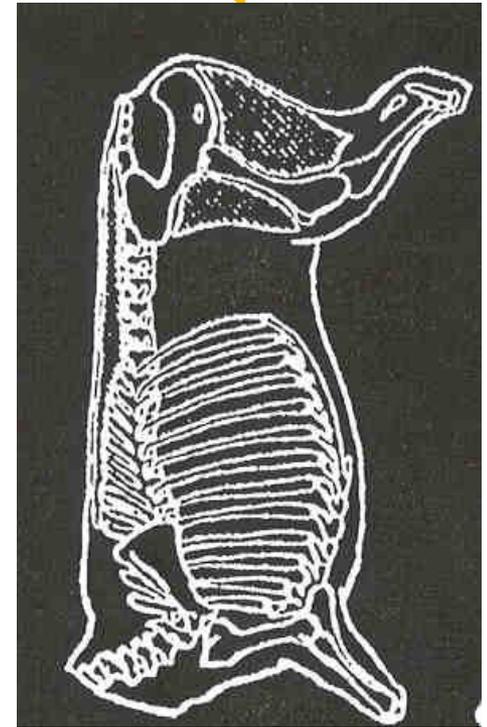
Experiment on Limousine cows: results
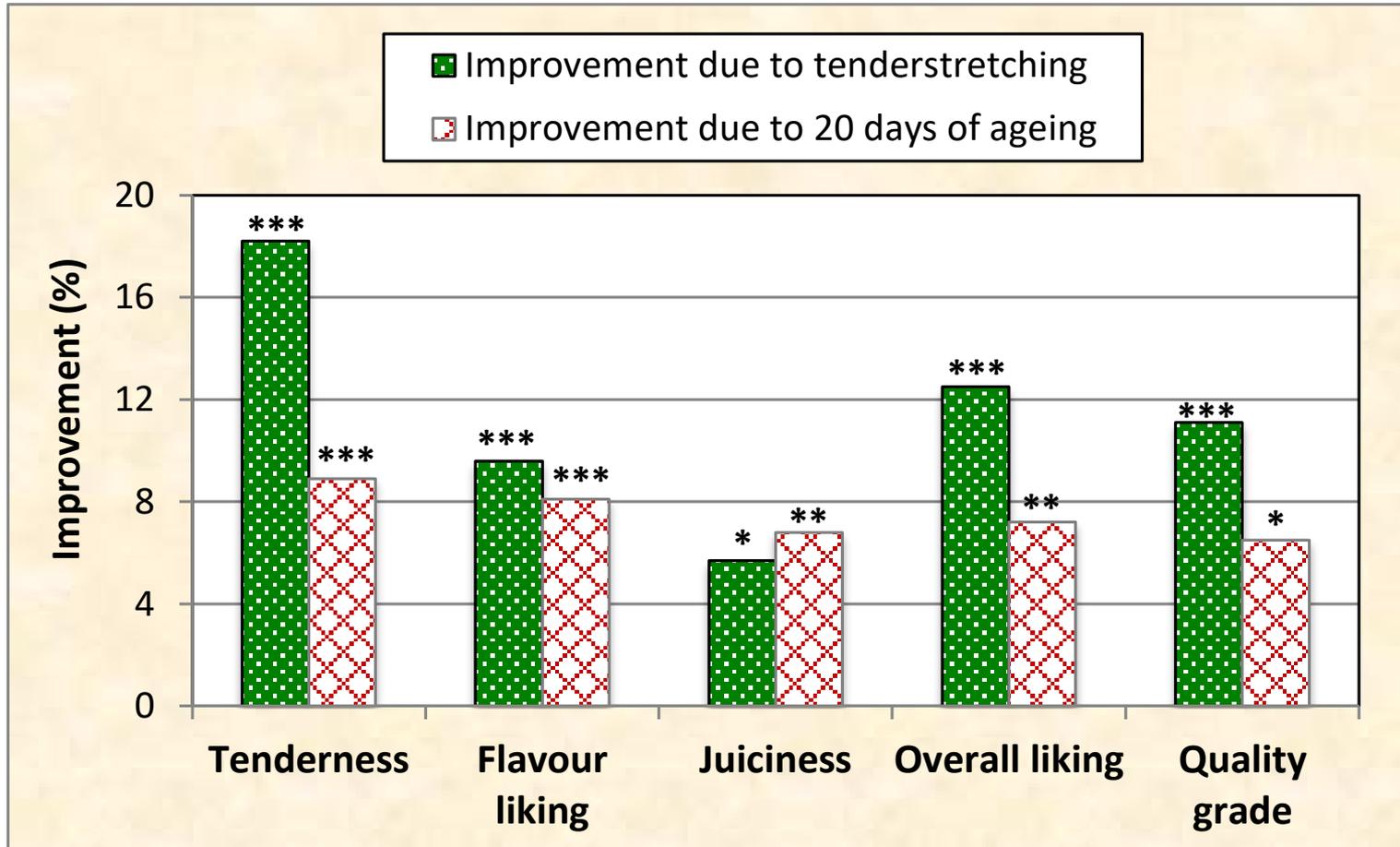
Demographics of consumers

	France	Ireland	Northern Ireland	Poland
Age	✓	✓	✓	✓
Gender	✓	✓	✓	✓
Income		✓	✓	
Occupation	✓			✓
Children in the household				✓
Adults in the household	✓	✓	✓	✓
Frequency of eating beef				
Importance of beef	✓	✓	✓	✓
Preferred cooking doneness		✓	✓	✓

Effect sizes similar to standard error

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Proportional willingness to pay
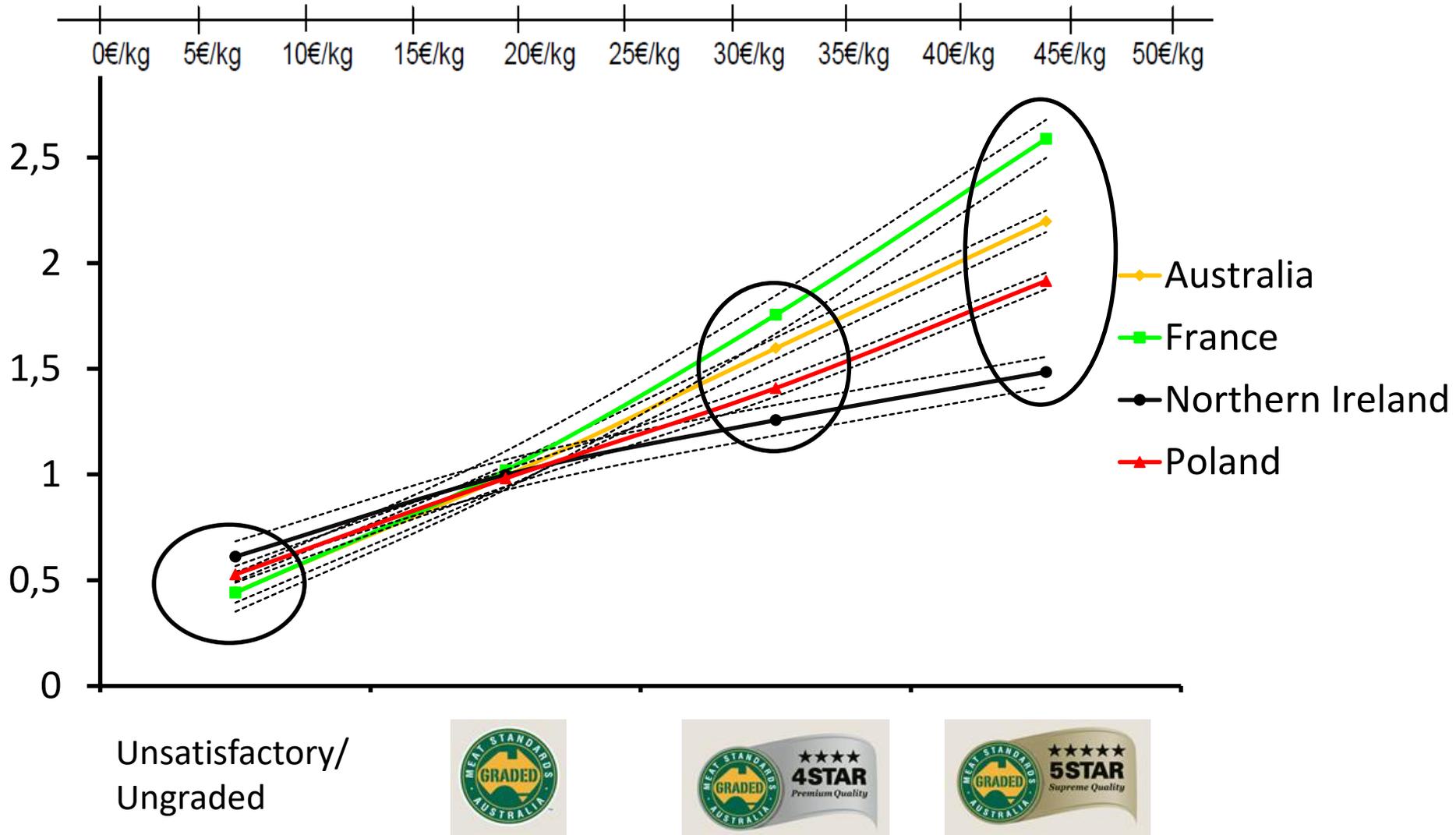
Future perspectives

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

La revue scientifique
Viandes & Produits Carnés
Référence de l'article : VPC-2018-34-1-2
Date de publication : 19 janvier 2018
www.viandesetproduitscarnes.fr

International research on beef and lamb eating quality

- 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

Scientific council

Data to improve the prototype

Commercial activities

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

Data

Financial contribution

Prediction of eating quality

Company X

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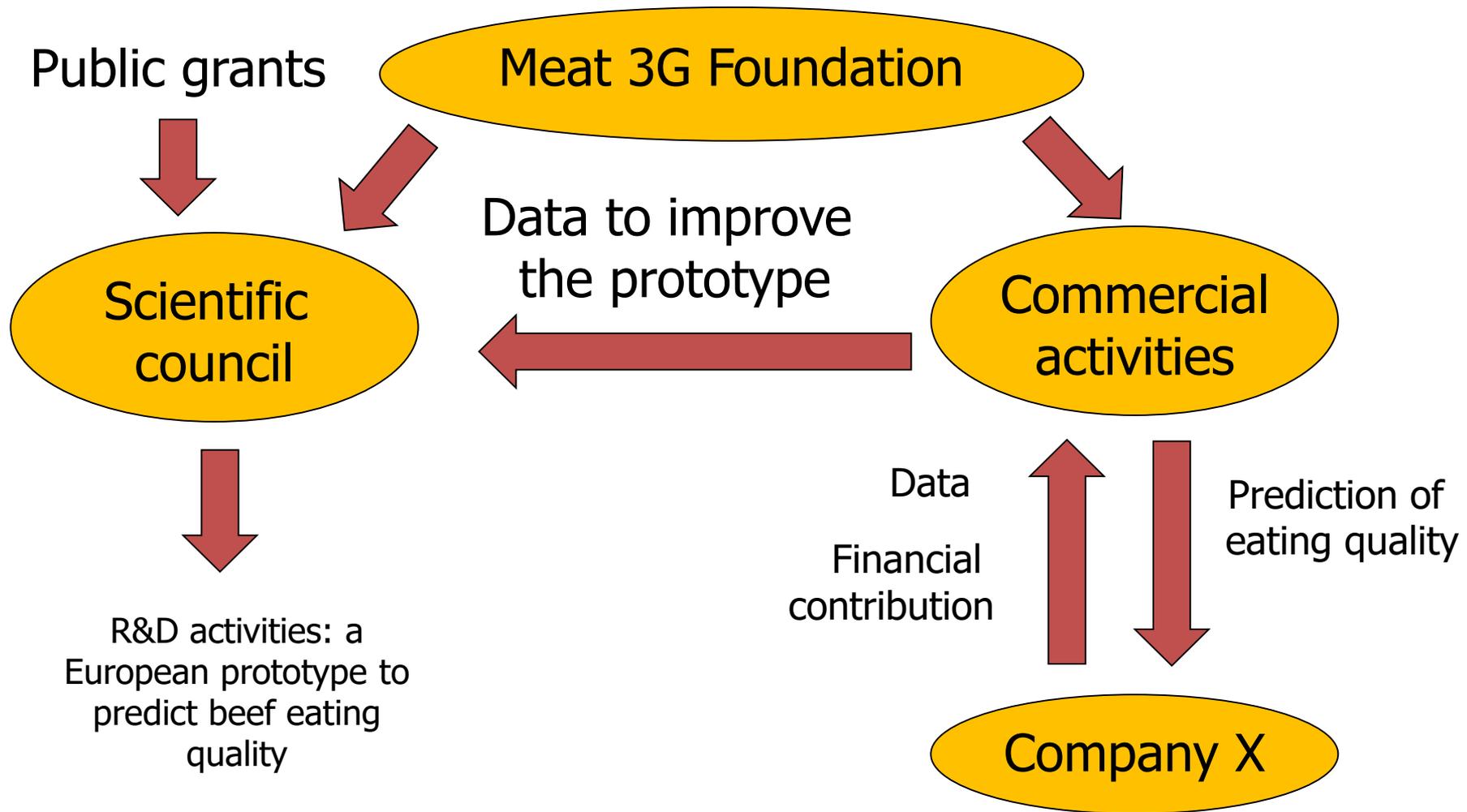
Conclusion 1

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)

Jean-François Hocquette [a,b,*], Lynn Van Wezemael [c], Sghaier Chriki [a,b,d], Isabelle Legrand [e], Wim Verbeke [c], Linda Farmer [f], Nigel D. Scollan [g], Rod Polkinghorne [h], Rune Rødbotten [i], Paul Allen [j], David W. Pethick [k]

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).

Jean-François Hocquette [a,*], Raphaëlle Botreau [a], Brigitte Picard [a], Alain Jacquet [b], David W. Pethick [c], Nigel D. Scollan [d]

To know more

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

ISABELLE LEGRAND, JEAN-FRANÇOIS HOCQUETTE

SCIENCES & TECHNIQUES
AGROALIMENTAIRES

La chaîne de la
viande bovine

Production, transformation,
valorisation et consommation

(18 chapitres)

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