

International meeting on Beef and Lamb carcasse 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 carcass grading for yield and eating quality in Australia (G Gardner, Sheep CRC, Australia)

Eating quality grading - perspective from Ireland and an update on objective carcass 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 carcass 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

Description	Format	Name	Input	?
Estimated % Bos In	Weight	EPBI	0	
Animal Sex	Y/N	Sex	m	
Hormone Growth P	Y/N	HGP	y	
MilkFe	Y/N	MFV	n	
Sal	Y/N	SIYrd	n	
Rinse/Flush	Y/N	Rin	n	
Hot Std Carcase Weight	Weight in Kg	HSCW	300	
HangMethod	AT/TS/IL/TC/XX	Hang	at	
Hump Height	mm	Hump	20	
Ossification USDA	USDA measure	220	140	
Marbling USDA	USDA measure	umb	300	
RibFat	mm	RbFt	10	
Ultimate pH	Metered pH	UpH	5.5	
Loin Temp at Grade	Metered Temp C	Utmp	10	
Days of Ageing from Kill	Days Aged	Age	21	

Inputs

Cooking method

Cuts

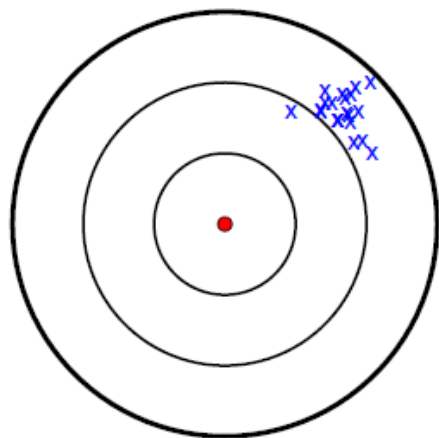
Grade

Muscle	GRL	RST	SFR	TSL	YAK	SSB	SCT	CRN
	66	75	71	76				
	79	73						
062	75	74	76	72	68	64		
062	73							
B045	63	63	63	63	64			
TA045	59	59	61	58	60	53		
STP045	57	58	60	57	58	52		
ogster blade	OYS036	64	61	67	68			
blade	BLD084		42	47				
blade	BLD096	54	58	60	60	62	48	60
chucktender	CTR085		49	51	56		59	
rump	RMP131	53	61	59	63	58	51	56
rump	RMP231	56	63	62	62	66		
rump	RMP005	59	63	66	67	69		
rump	RMP032			64	66			
rump	RMP087		53	57	58		56	
knuckle	KNU066	47	60	55	58	57	48	
knuckle	KNU098			55	59		57	
knuckle	KNU099	38	48	45	52	48	53	
knuckle	KNU100			61	64	62	56	
outside flat	OUT005	44	44	47	56	57	45	59
outside flat				58	65		60	52
eye ro		52	50	51	53		52	50
to		52	54	57			51	
to		53	58	58			59	
to		44	44	54	54	46	53	
o			46	51			62	
ch		54	59	65	57		69	
chuck		53	56	56	60	56	67	
chuck	CHK081			58	62	58	72	
chuck	CHK082			50	54			
thin-flank	TFL051			60			60	
thin-flank	TFL052			68	61		65	
thin-flank	TFL064			63	59		62	
rib-blade	RIB041			49				
brisket	BRI056			41	54	50	56	36
brisket	BRI057			39	46	46	61	
shin	FQshin						61	
shin	HQshin						64	
intercostal	INT037			54				

58.62655552

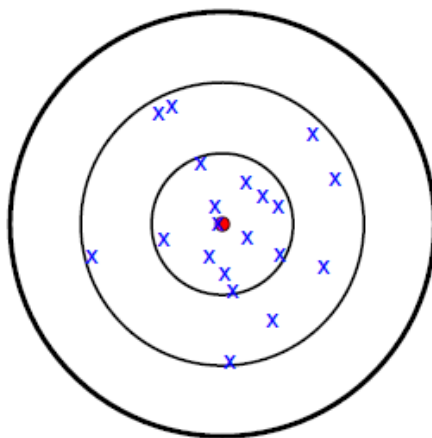
All models are wrong, but some are useful (George Box).

Reliable but invalid



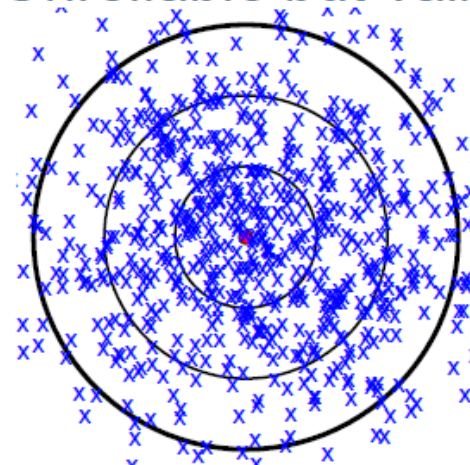
Expert panels

Valid but less reliable



Ideal consumers

Unreliable but valid



Actual consumers

Research done
so far in
Europe

Research done in
Australia and by
Sarah Bonny in
Europe

The output

BONELESS BEEF
* YG* CUR
2.2 - 3.1kg
IW/VAC

ANY MEAT WORKS Co
Batch: 4487

32301
4 PC
PRODUCT OF AUSTRALIA



(01)99327111031762(3101)000262(15)220417(21)41457354

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

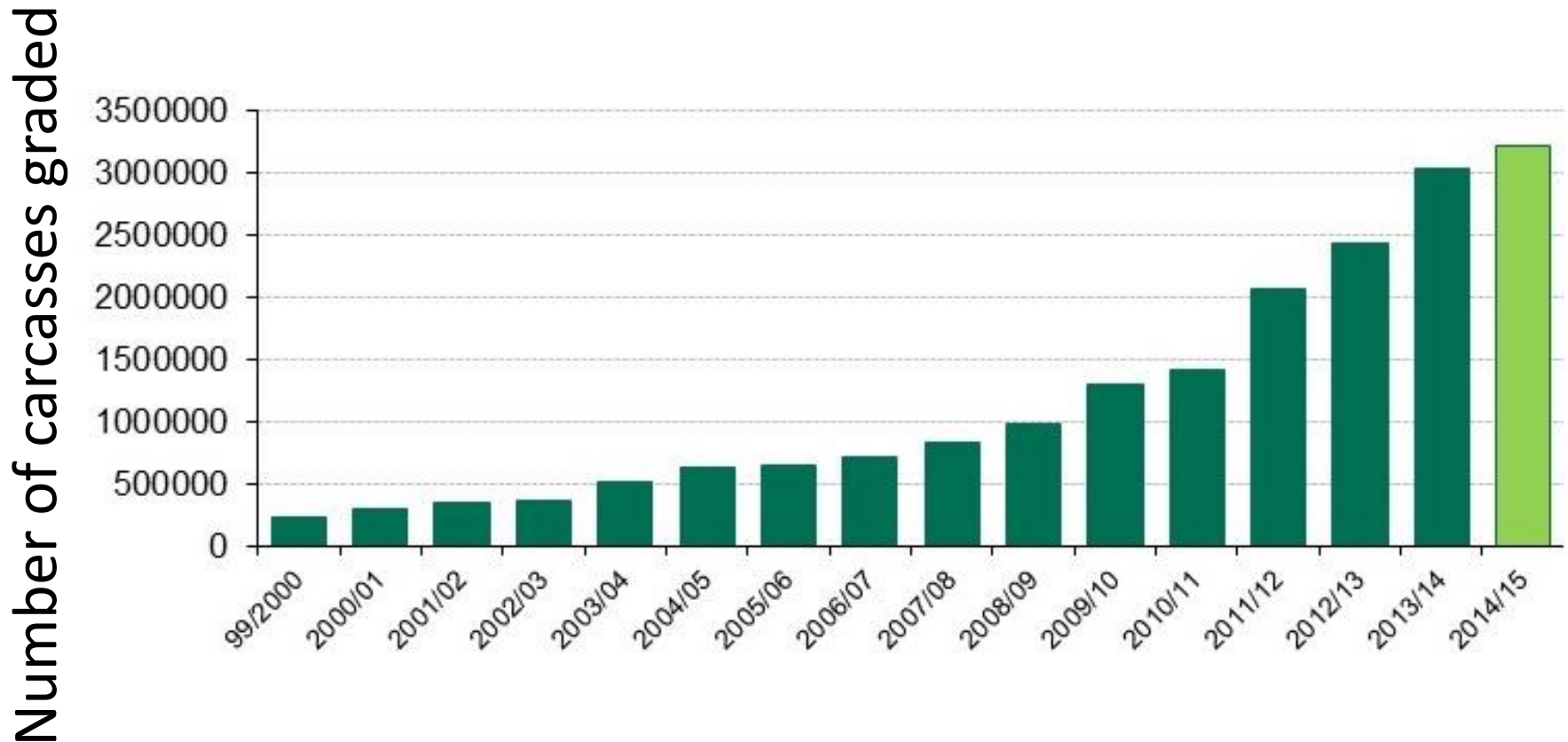
KEEP REFRIGERATED

EST. NO.9999



Current usage of MSA

- total number of carcasses graded



Current usage of MSA



Producers

ca. 41,000

Processors

52

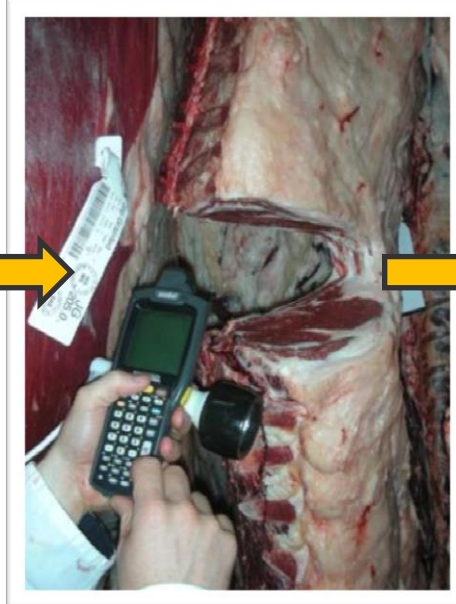
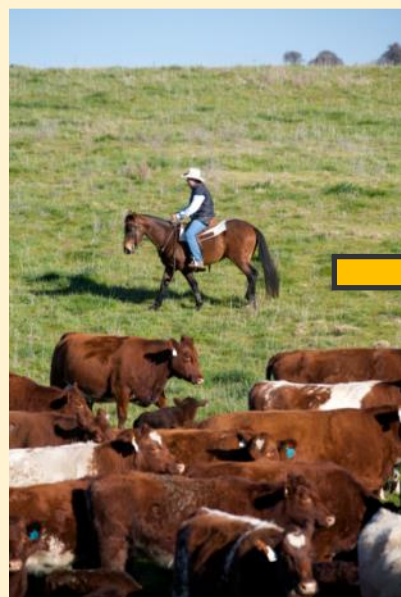
End user
outlets

2759

Brands

131

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

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

The MQ4 score = Consumer Satisfaction

Tenderness 0.3

+

Juiciness 0.1

+

Like flavour 0.3

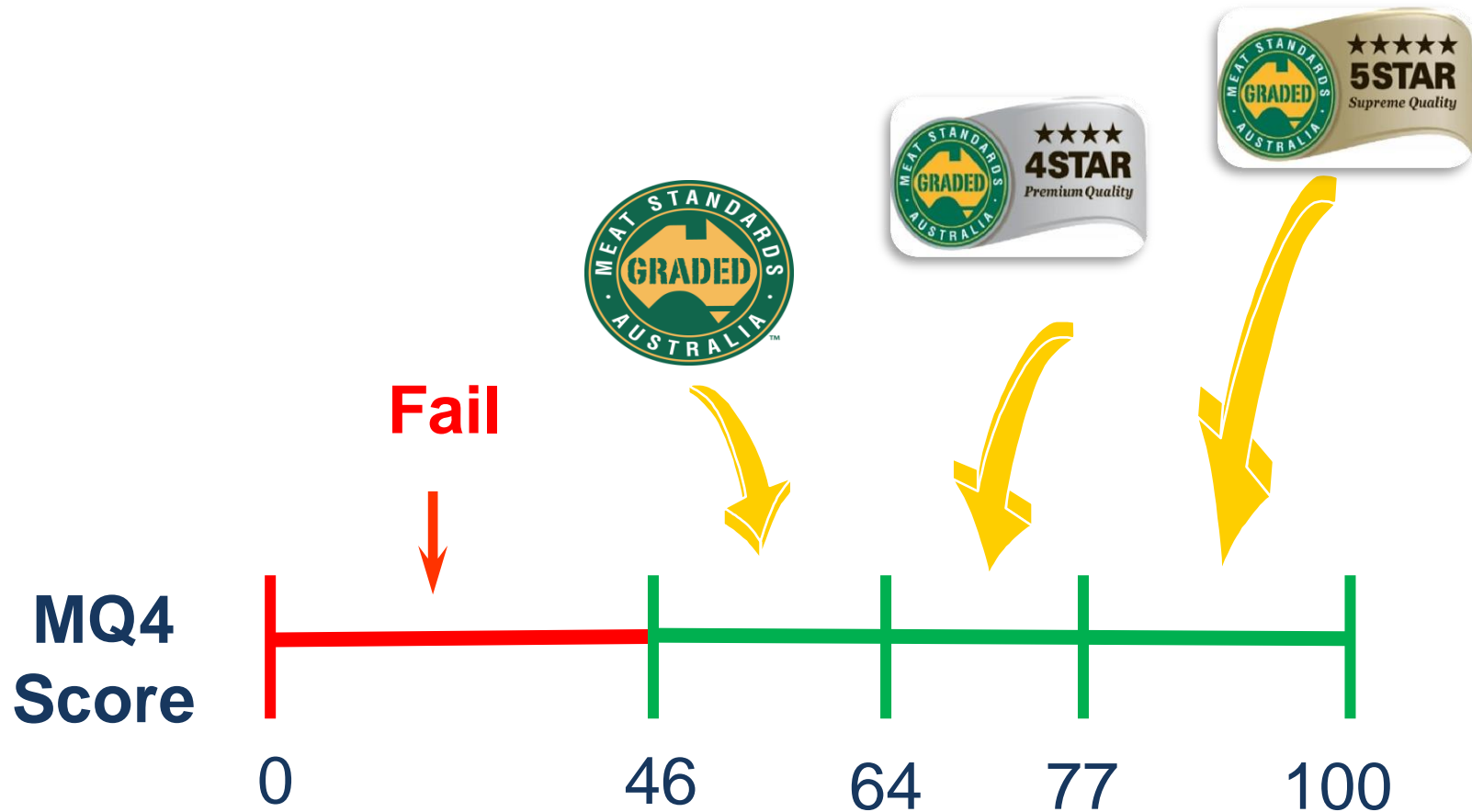
+

Overall liking 0.3



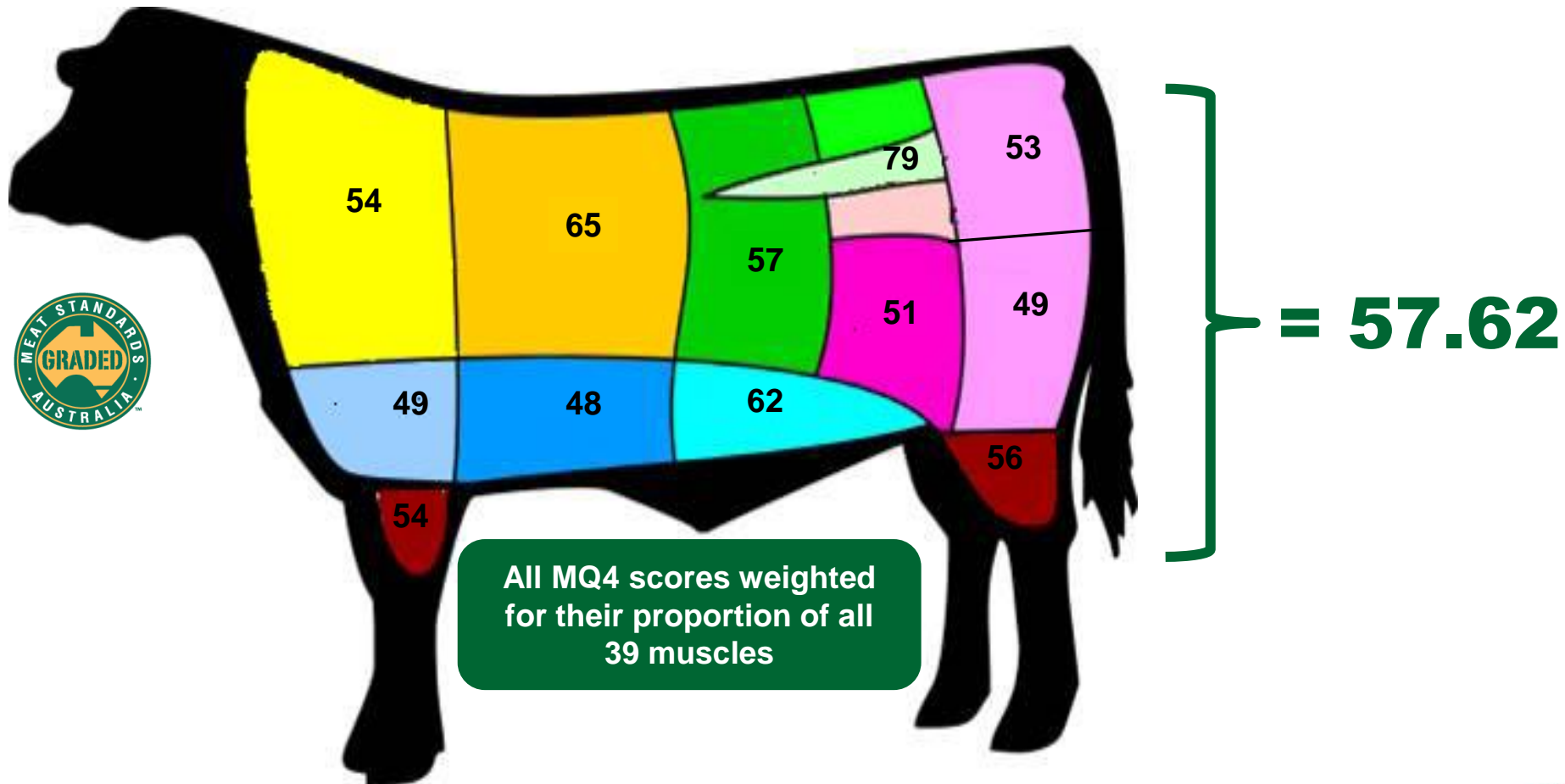
MQ4 score

Consumer identified quality grades



TOWARDS THE MSA INDEX

MSA Index = A weighted MSA score for the carcase



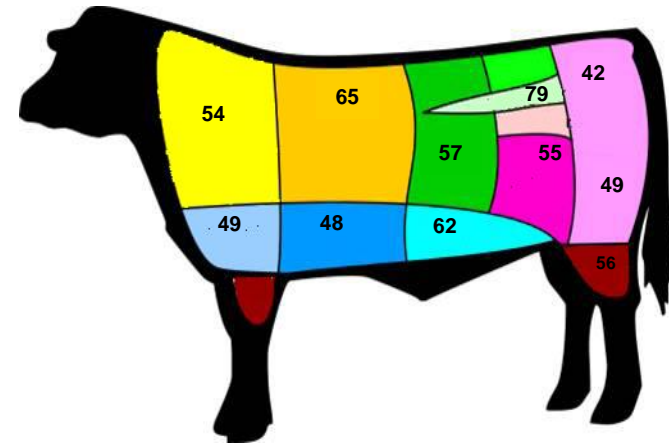
All MQ4 scores weighted
for their proportion of all
39 muscles

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

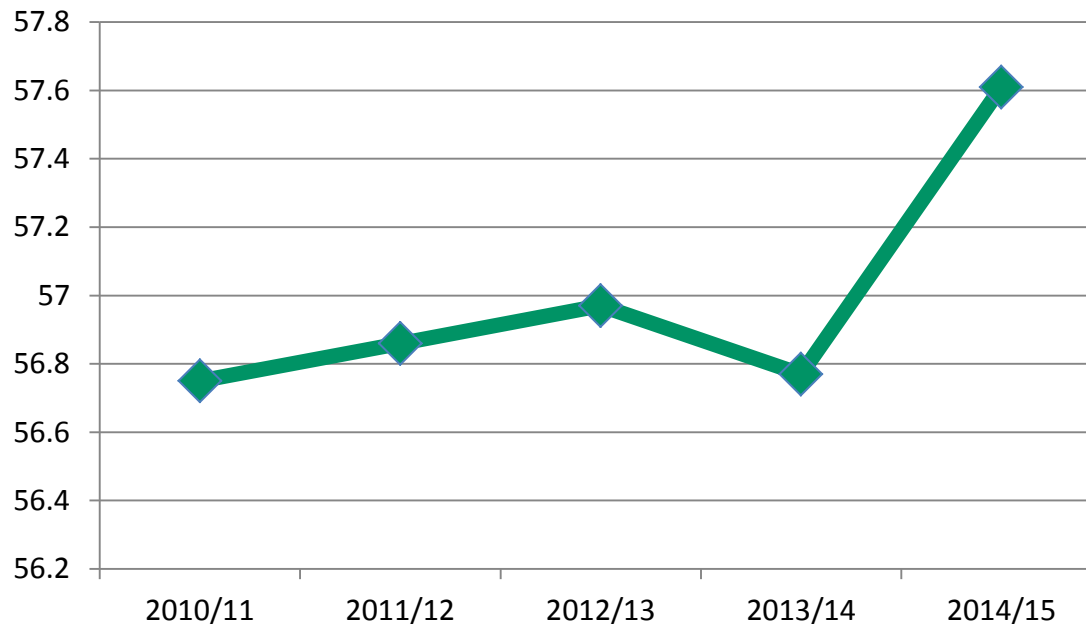


MSA Index

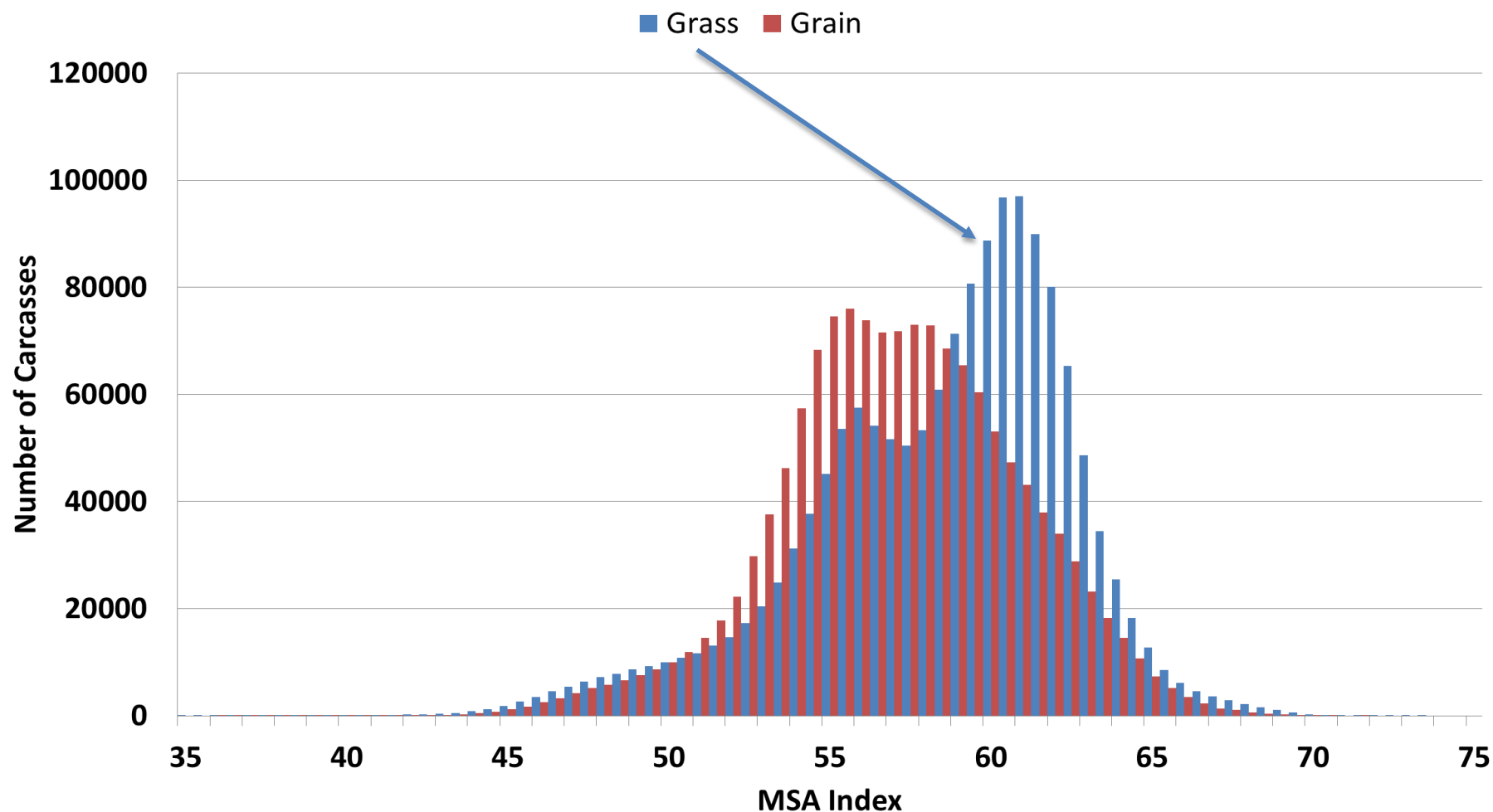
Average MSA index for 2014-15 was 57.61



MSA Index over time



Feedtype MSA Index distribution



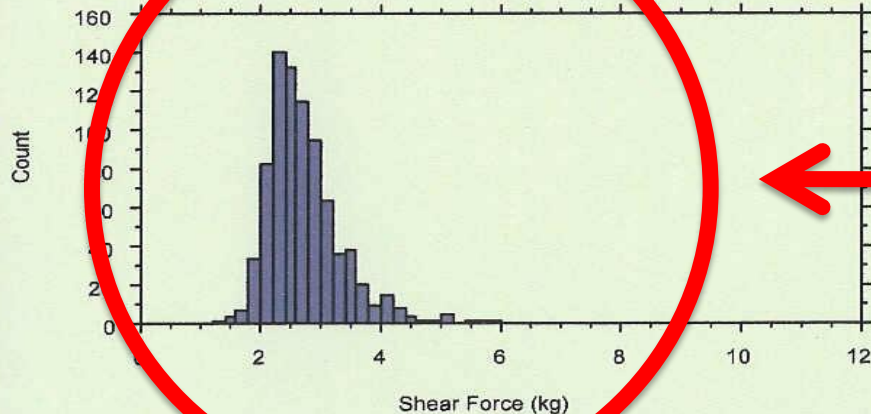
The Meat Standards Australia beef eating quality index and the role of genetics (P McGilchrist, Australia)

Change is possible (grilled short loins)

Here is what happened for lambs

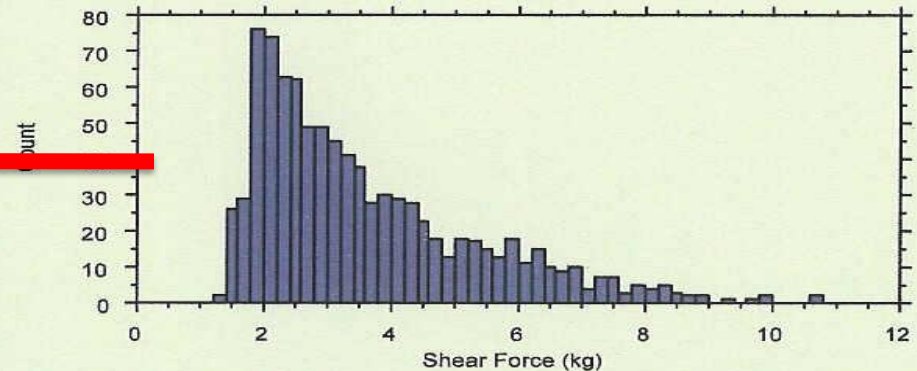
Post MSA

MSA compliant loins $n=806$
(2005)



Pre MSA

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



Pethick, Banks, Hales, Ross (2006) Int J Sheep & Wool Sci 54, 66-73

Prototype MSA for lambs

(presentation of G Gardner)

Dorper
Maternal
Merino
Terminal

Terminal

Loin Overall Liking

76.0 5 star

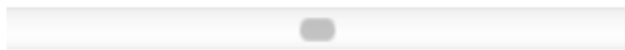
Topside Overall Liking

51.0 3 star



22

Hot Standard Carcase Weight (kg)



5

IMF %



16

Eye Muscle Area (cm²)



12

GR tissue depth (mm)

Set these boxes and press to update type of graph

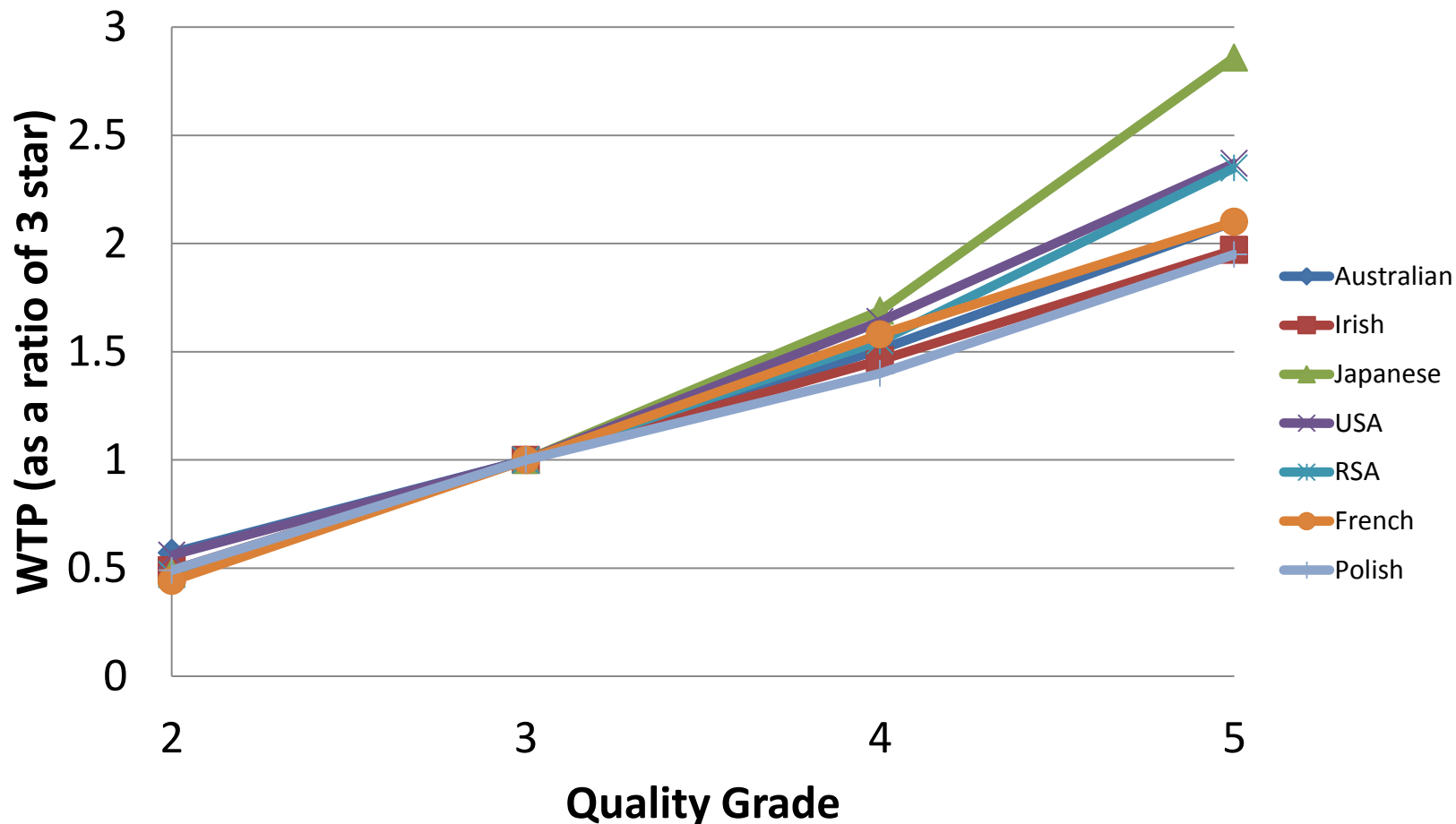
HCWT
IMF
CFMA
HGRFAT
SF5

Overall Liking
Optimal discrimination function

Loin
Topside

Press
this
Button

Willingness to pay in other countries



Global data is predominantly complementary

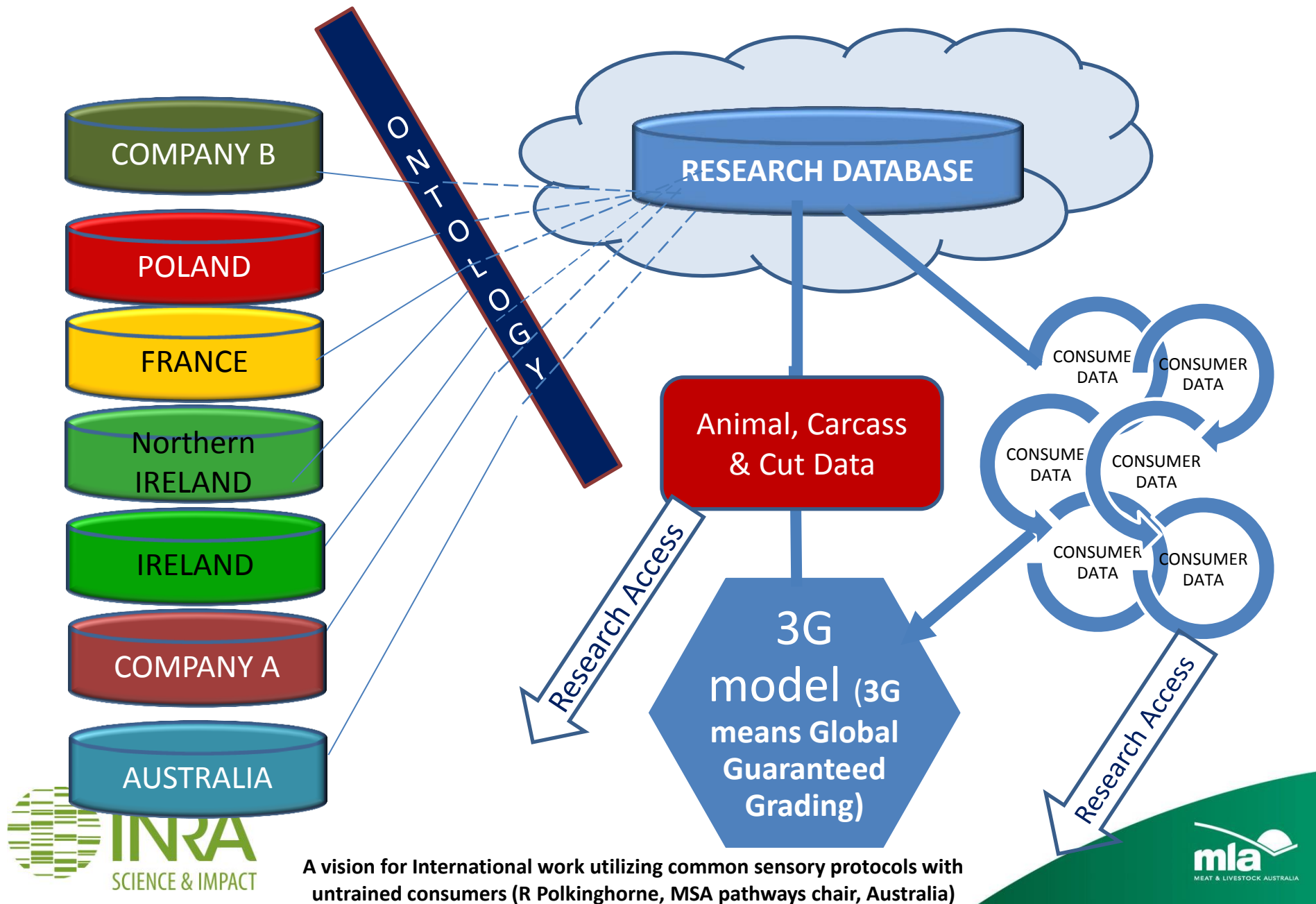
		AUST	NZ	KOREA	JAPAN	USA	RSA	NI	IRE	WALES	POLAND	FRANCE
CATTLE	British	Y	Y	Y	Y	Y	Y	Y	Y	Y		
	Euro	y						y	y		Y	Y
	Bos Indicus	Y										
	Bonsmara	y					Y					
	Nguni						Y					
	Wagyu	Y			Y	Y						
	Hanwoo			Y								
	Dairy										Y	Y
	Crossbred	Y	Y			Y					Y	
SEX	Bull	y	Y								Y	y
	Steer	Y	Y	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

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

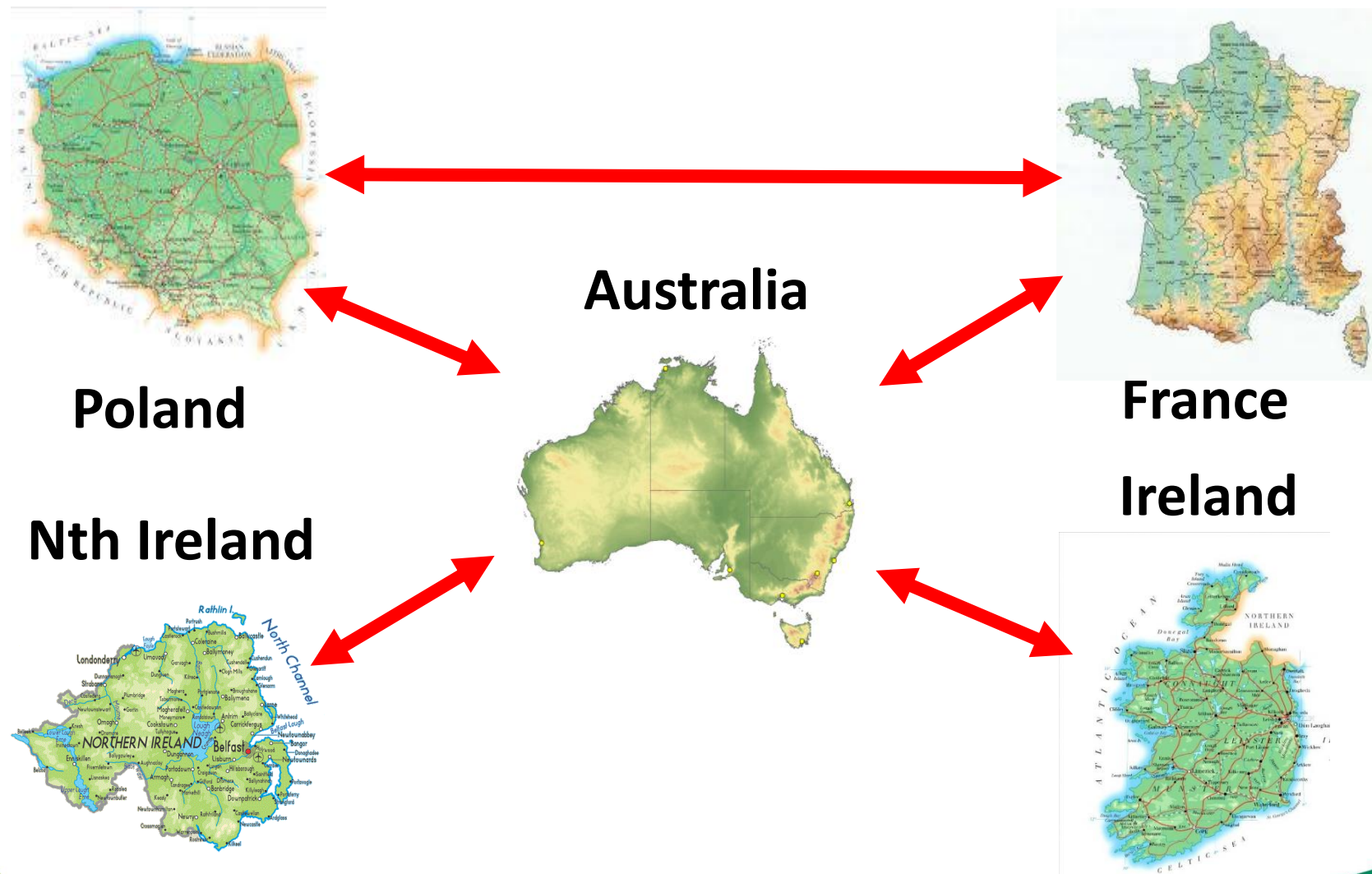
**International beef eating quality language
(R Polkinghorne, MSA pathways, Australia
and Jerzy Wierzbicki, Polish Beef
Association, Poland)**

BROAD CONCEPT FOR A GLOBAL DATA COOPERATIVE



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



PhD of Sarah Bonny

European conformation and fat scores have no relationship with eating quality

S. P. F. Bonny^{1,7†}, D. W. Pethick¹, I. Legrand², J. Wierzbicki³, P. Allen⁴, L. J. Farmer⁵, R. J. Polkinghorne⁶, J.-F. Hocquette^{7,8} and G. E. Gardner¹

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

S. P. F. Bonny^{1,7†}, D. W. Pethick¹, I. Legrand², J. Wierzbicki³, P. Allen⁴, L. J. Farmer⁵, R. J. Polkinghorne⁶, J.-F. Hocquette^{7,8} and G. E. Gardner¹

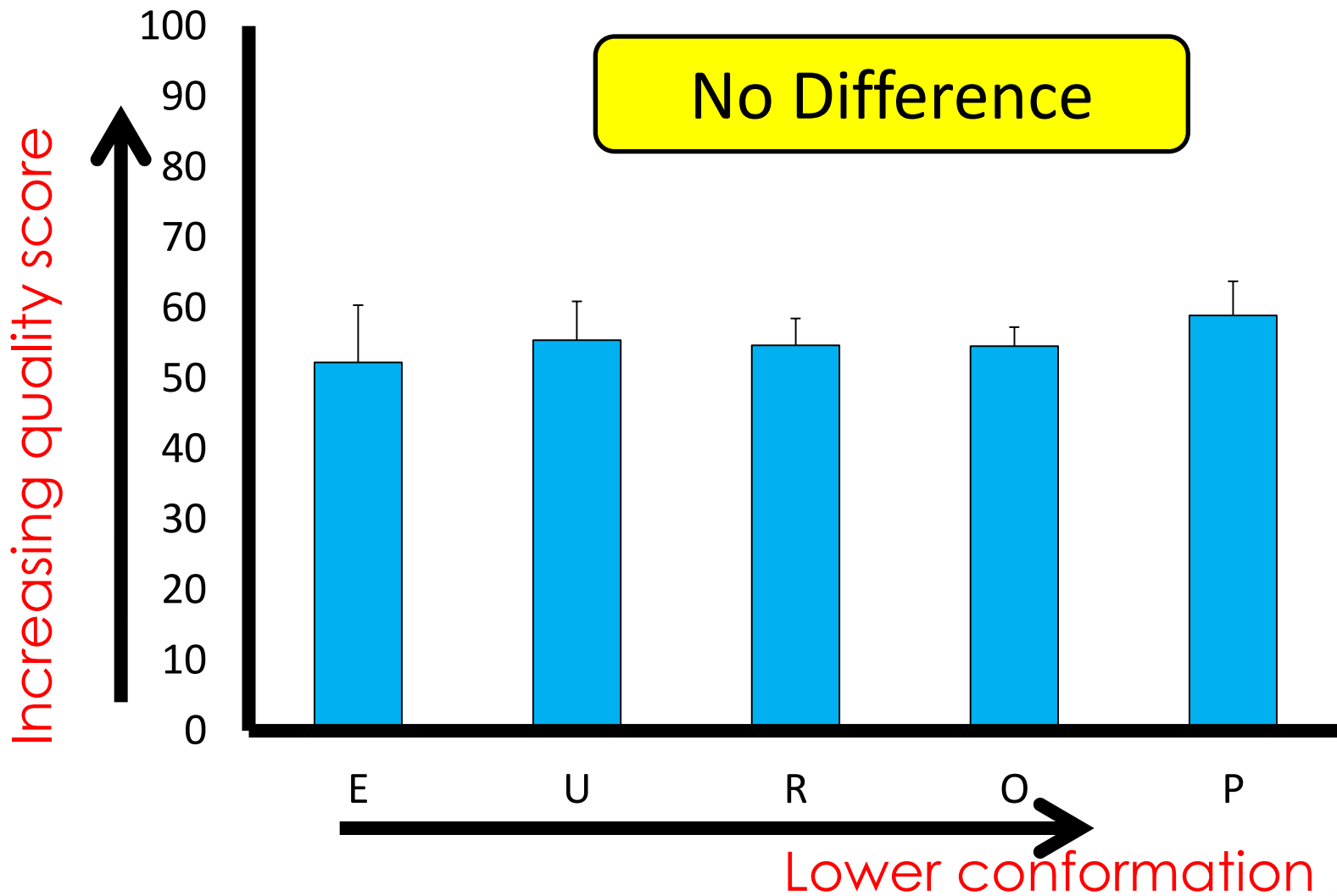
Biochemical measurements of beef are a good predictor of untrained consumer sensory scores across muscles

S. P. F. Bonny^{1,4,5a}, G. E. Gardner^{1†}, D. W. Pethick¹, I. Legrand², R. J. Polkinghorne³ and J. F. Hocquette^{4,5}

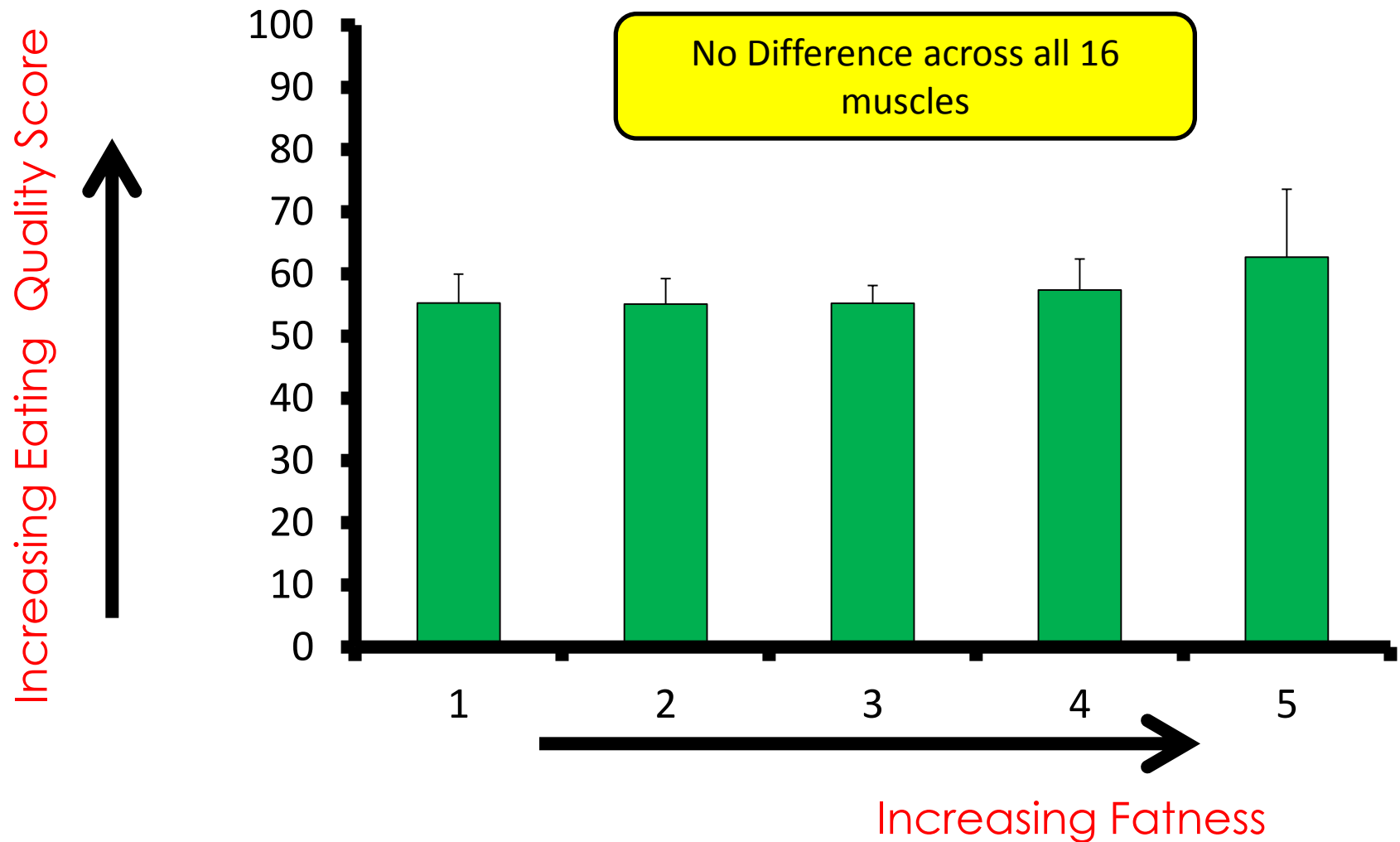
The variation in the eating quality of beef from different sexes and breed classes cannot be completely explained by carcass measurements

S. P. F. Bonny^{1,2†}, J.-F. Hocquette^{2,3}, D. W. Pethick¹, L. J. Farmer⁴, I. Legrand⁵, J. Wierzbicki⁶, P. Allen⁷, R. J. Polkinghorne⁸ and G. E. Gardner¹

Eating quality and carcass conformation



Eating quality and carcass fatness





A UK retail perspective - the need to move beyond carcass 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 red meat, despite scandals
- => **A need of quality rather than quantity**

Meat distribution is changing

- Some butchers are becoming celebrities



Desnoyer/Le Bourdonnec,
famous French butchers

Meat distribution is changing

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



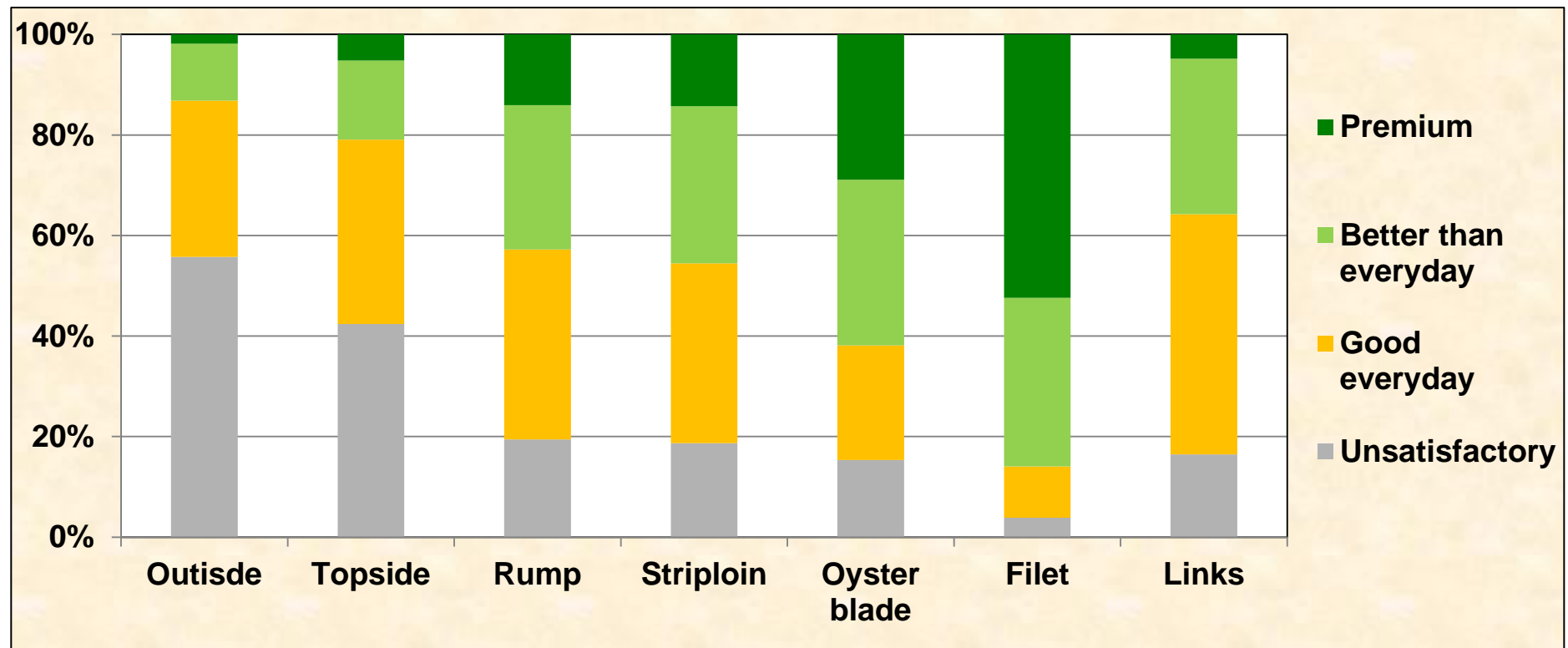
A new system for meat labelling in France

- 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



Consumers	GRILL	ROASTING	STEWING	SUM
Polish	5 220	660	600	6 480
French	600			600
All consumers	5 820	660	600	7 080

The Polish model (similar to MSA)

DANE Z OCENY				Czas dojrzewania		Metoda obróbki			KRAJ	
						Grill	Pieczen	Duszenie	BYDŁO	KONSUMENT
Rasa		Płeć	J			75	78			
System żywienia		Weik				79	80		FRA	FRA
Masa tuszy	420	Skostnienie	140	35		75	76		IRE	IRE
Podwieszanie	TX	Marmurk owatość	650			70	69	62	IT	IT
pHu	5,5	Okrywa tł. Na Rostbefie	8			67	68	62	NI	NI
Kolor Mięsa		Czas dojrzewania	21			66	64	65	POL	POL
						53	56	56	ROM	ROM
									SP	SP
						67	69		UK	UK
						71	72			
						65	67			
						54	56			
						63	59	60		
						57	58	56		
						54	52	52		
						53	54			
						60	54			
								68		
						54	52	51		
						61		68		
						60	57	64		

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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

The MSA system also works in Japan

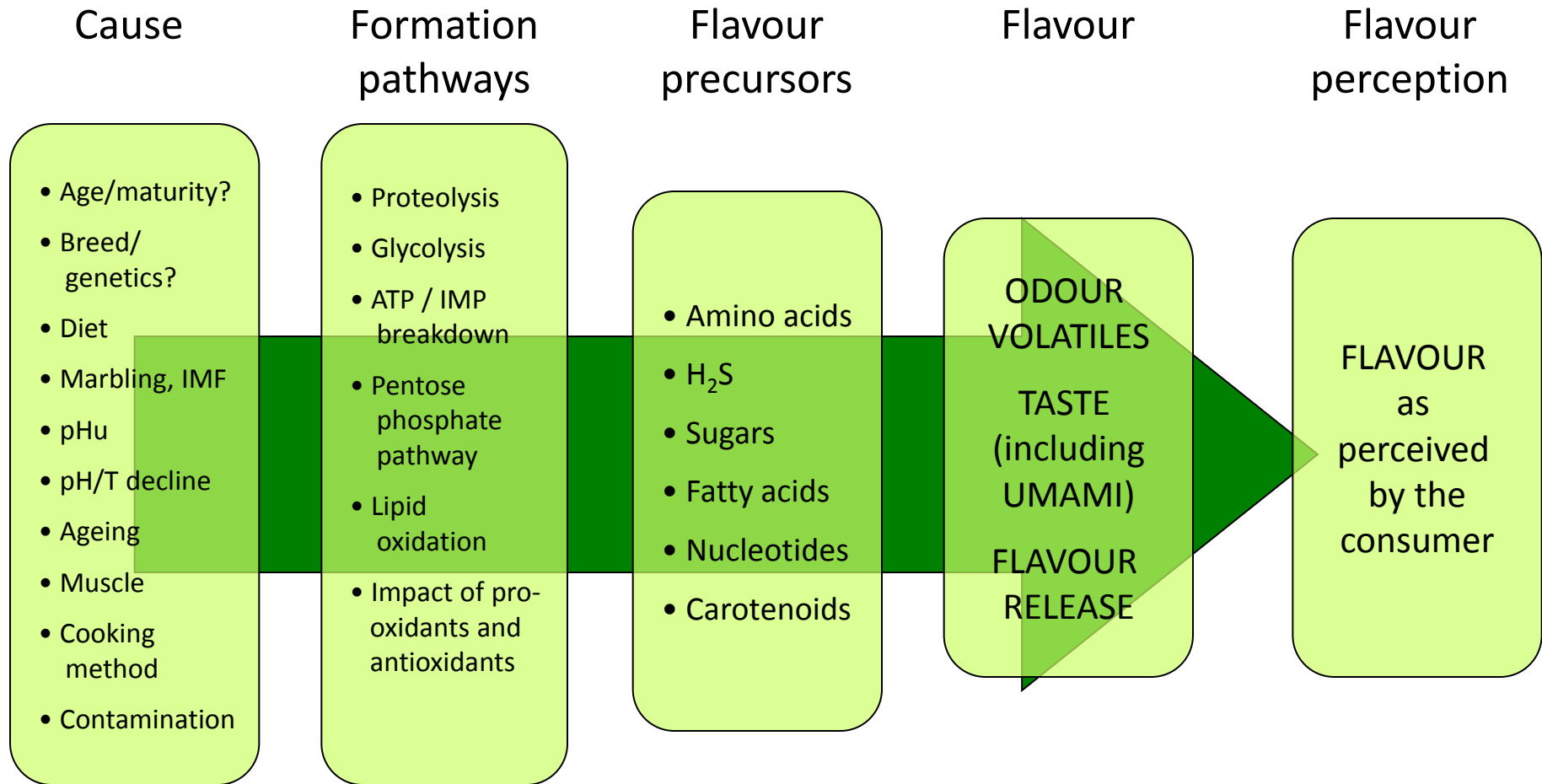
Japanese consumer categorisation of beef into quality grades, based on Meat Standards Australia methodology

Rod J. POLKINGHORNE, Takanori NISHIMURA, Kate E. NEATH and Ray WATSON (2011) *Animal Science Journal*, 82: 325-333.

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

Rod J. POLKINGHORNE, Takanori NISHIMURA, Kate E. NEATH and Ray WATSON (2014) *Animal Science Journal*, 85: 69-74.

Incorporating flavour research into carcass grading for eating quality



International collaborations

The diagram illustrates Australia's international collaborations in the meat and livestock sector. At the center is a yellow box labeled **AUSTRALIA**. Surrounding it are various countries and regions, each in a colored box, with arrows indicating the direction of collaboration. Red arrows represent 'New interests', while black arrows represent established collaborations. Sheep icons are placed near sheep-related countries (Spain, Portugal, Italy, Wales, China, USA, New Zealand), and cow icons are placed near cow-related countries (France, Poland, Japan, South Korea, South Africa, Ireland, Northern Ireland, USA, New Zealand).

New interests (Red arrows):

- AUSTRALIA to SPAIN, PORTUGAL, ITALY, and WALES (sheep icon).
- AUSTRALIA to SOUTH AFRICA (cow icon).
- AUSTRALIA to IRELAND and NORTHERN IRELAND (cow icon).
- AUSTRALIA to FRANCE (cow icon).
- AUSTRALIA to JAPAN (cow icon).
- AUSTRALIA to SOUTH KOREA (cow icon).
- AUSTRALIA to CHINA (sheep icon).
- AUSTRALIA to USA (sheep icon).
- AUSTRALIA to NEW ZEALAND (cow icon).

Established collaborations (Black arrows):

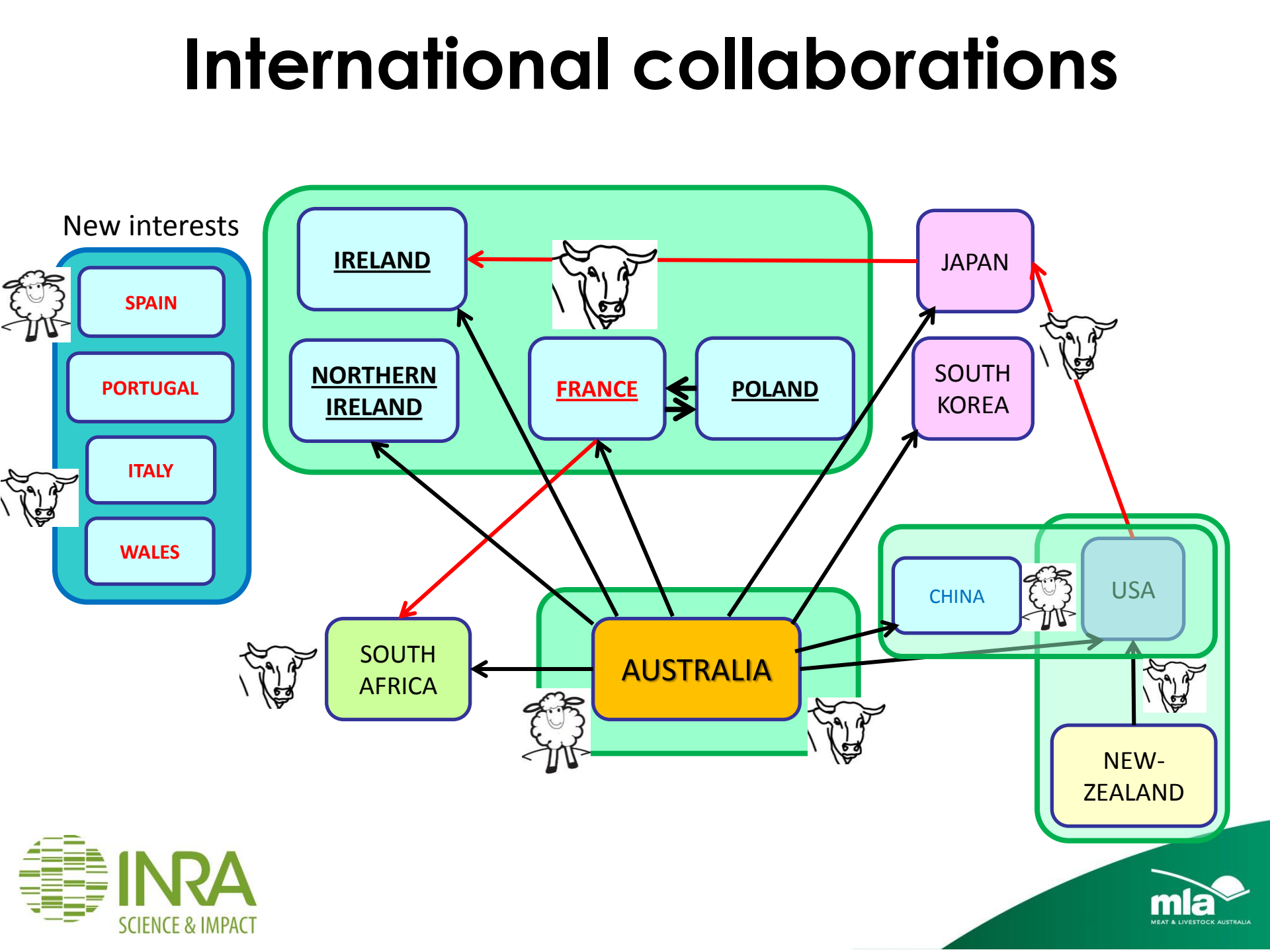
- AUSTRALIA to SOUTH AFRICA (cow icon).
- AUSTRALIA to IRELAND and NORTHERN IRELAND (cow icon).
- AUSTRALIA to FRANCE (cow icon).
- AUSTRALIA to POLAND (cow icon).
- AUSTRALIA to JAPAN (cow icon).
- AUSTRALIA to SOUTH KOREA (cow icon).
- AUSTRALIA to CHINA (sheep icon).
- AUSTRALIA to USA (sheep icon).
- AUSTRALIA to NEW ZEALAND (cow icon).

Other countries/regions:

- IRELAND and NORTHERN IRELAND are grouped together in a light blue box.
- FRANCE and POLAND are grouped together in a light blue box.
- JAPAN and SOUTH KOREA are grouped together in a light purple box.
- CHINA and USA are grouped together in a light green box.
- NEW ZEALAND is in a light yellow box.

Logos:

- INRA** SCIENCE & IMPACT (bottom left).
- mla** MEAT & LIVESTOCK AUSTRALIA (bottom right).



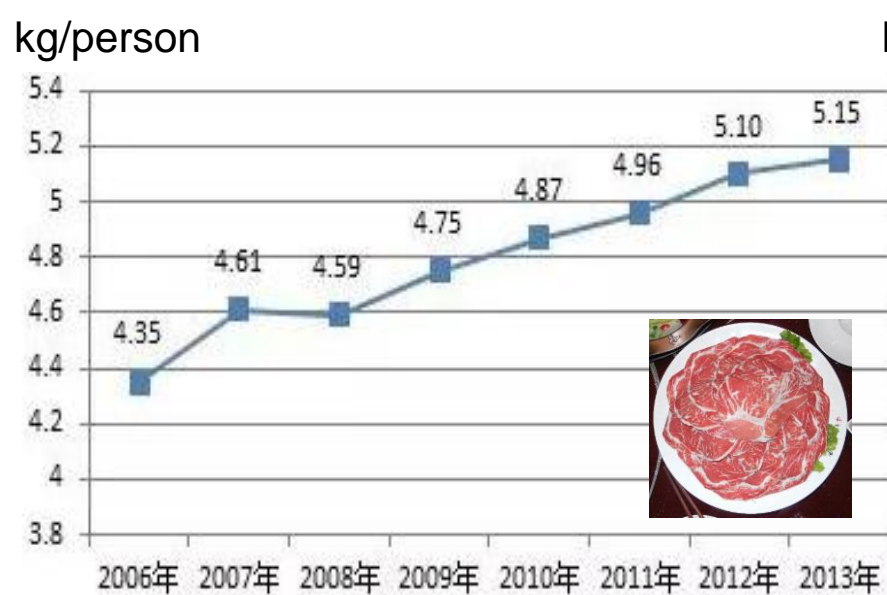
Future meat quality grading systems in UK

- Deliver needs of consumers
- Need to have stronger evidence of impact of our production/processing on consumer eating quality

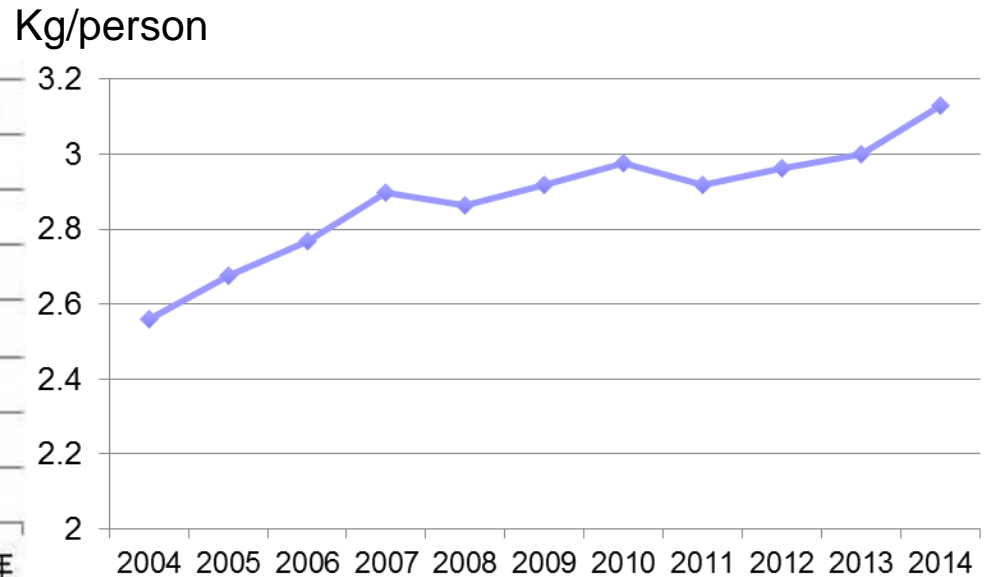
N Scollan (Aberystwyth
University, Wales)

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

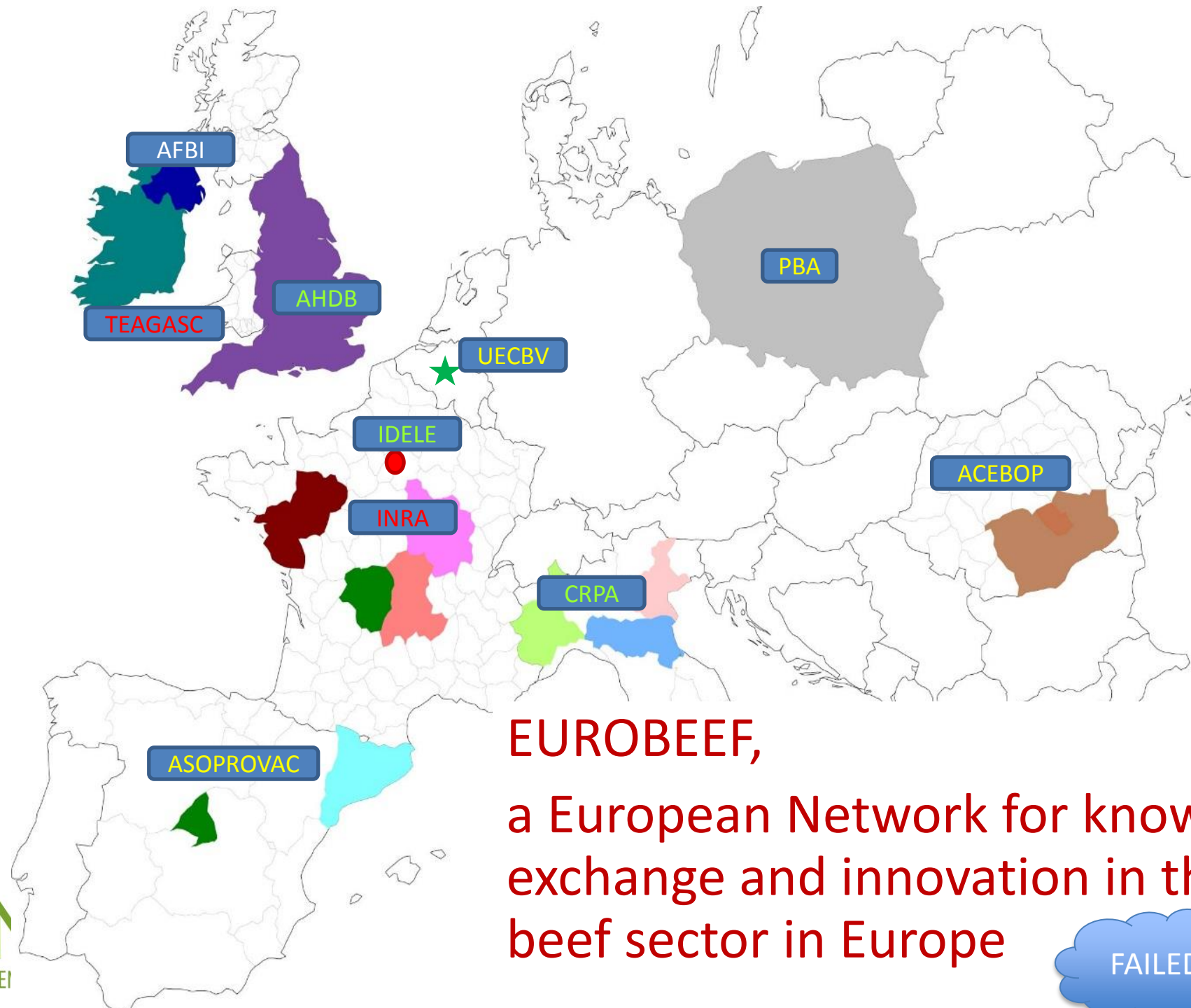
- Data management (organised, standardised, administration)
- Could put it on a cloud with 'rules' etc = **3G**
- Will this really help
- What will people do with the data
 - research likely simple
 - Australia MSA would like it as we maybe able to use the data to improve our model !!

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 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 know
exchange and innovation in the
beef sector in Europe



European Research Council

Project submitted by JF Hocquette on September 1st

ERC Advanced Grant 2016

Global Guaranteed Grading of Beef

Beef 3G

The Beef 3G eating quality model

Creation of the Beef 3G model

Animal and carcass characteristics

Eating quality by untrained consumers

Validation of the model

Genetic selection in favour of eating quality

Acceptance of the model

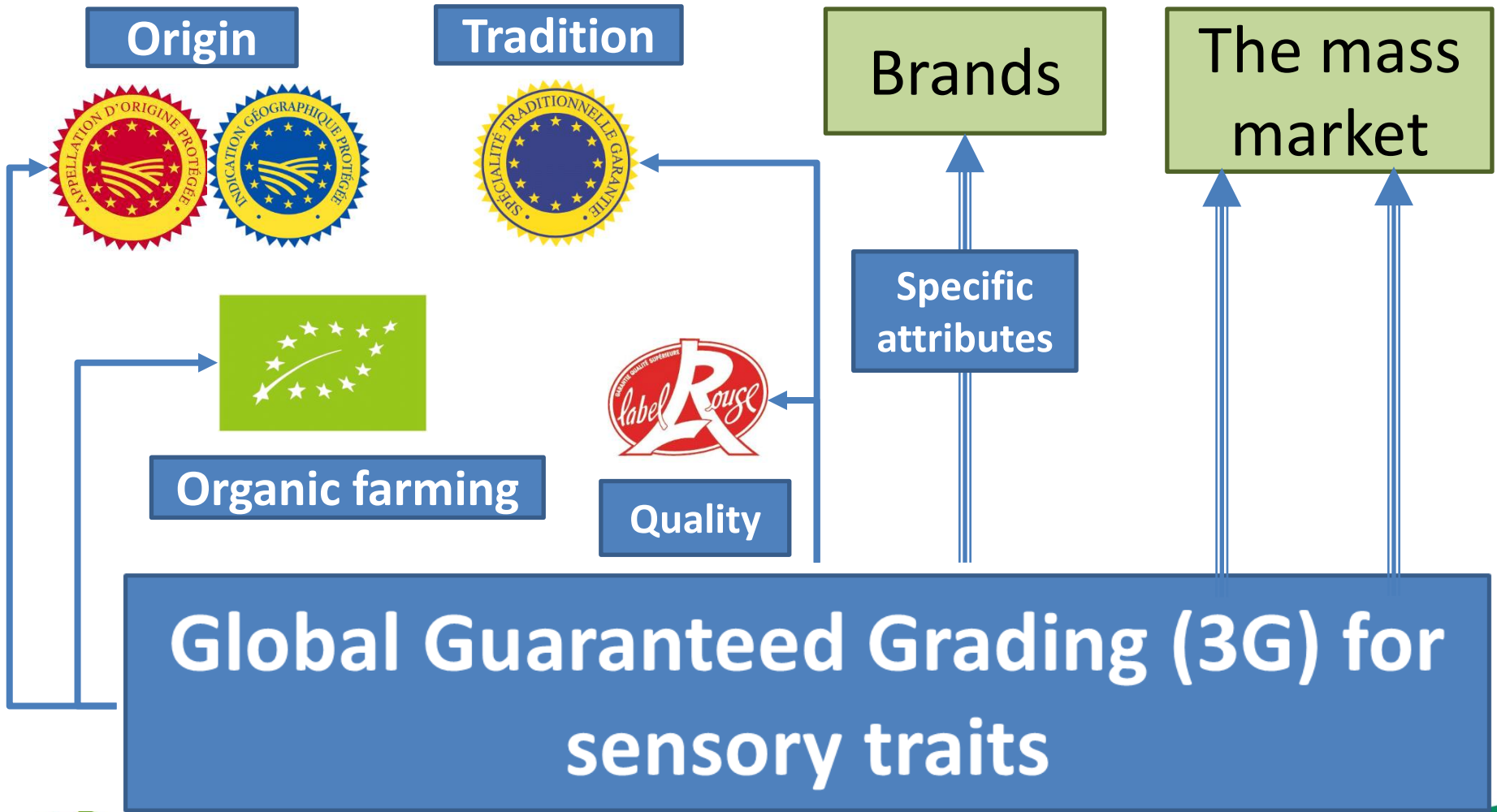
Prediction of
- Nutritional value and
- Traceability of beef
from grass-based systems

Consumers' expectations

Methods to combine diverse quantitative and qualitative quality criteria

The Beef generic quality model

The goal of the 3G system is to underpin existing labels and brands





Meat from beef breed, a good piece of environment

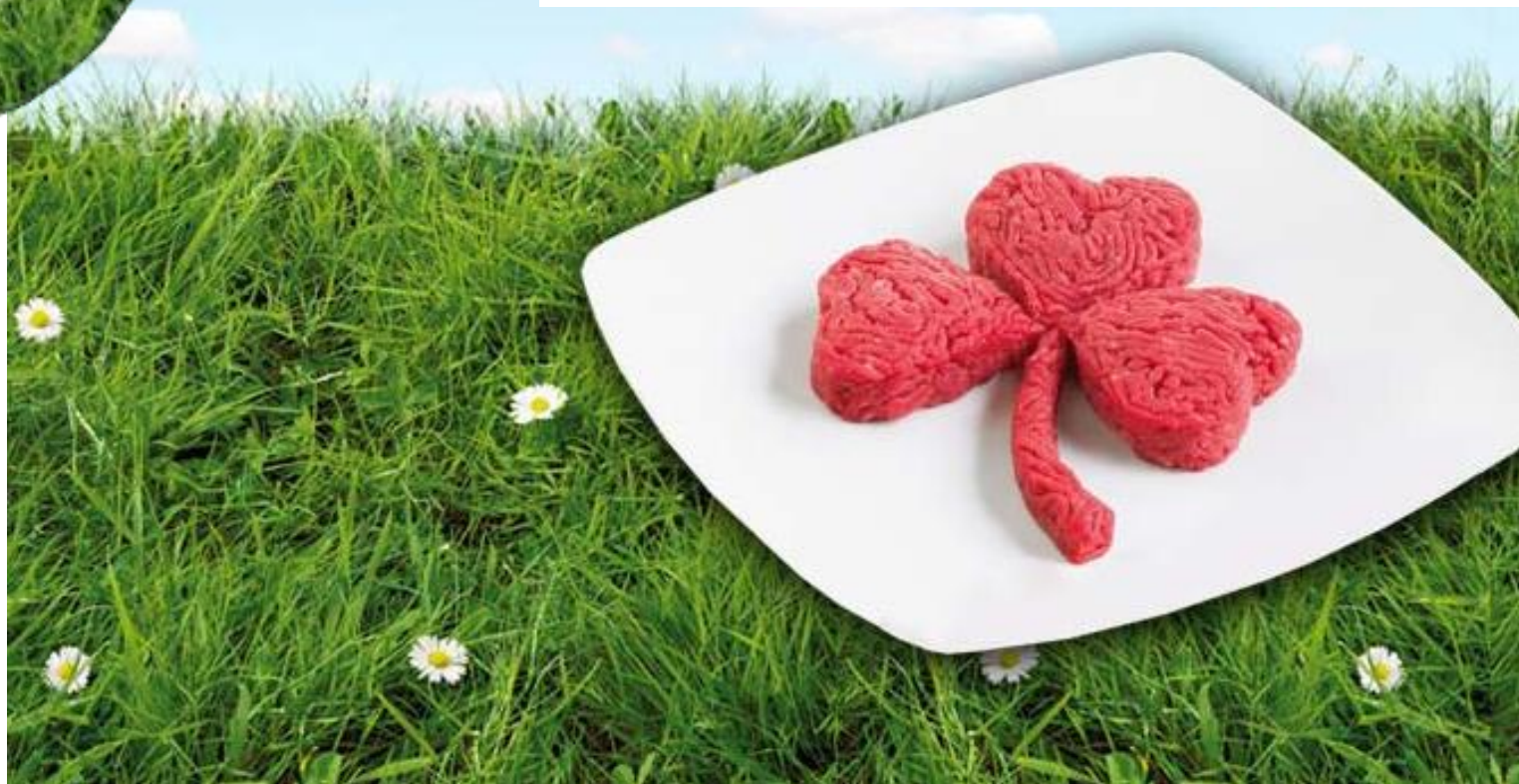
In France

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



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Prédiction de la qualité de la viande de ruminants

Compte-rendu du congrès international d'Août 2015 à Paris sur la prédiction de la qualité de la viande de ruminants pour mieux satisfaire les consommateurs

Mots-clés : Qualité, Viande, Bovins, Ovins

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Abstract: Beef and Lamb carcass grading to underpin consumer satisfaction

Meat & Livestock Australia and Meat Standards Australia and INRA have organized an International meeting on Beef and Lamb carcass grading to underpin consumer satisfaction. The 2 day meeting consisted of 19 presentations centred on the theme that modern beef and lamb products must meet the expectations of consumers who purchase red meat to cook it as a meal solution. The focus was based around the Meat Standards Australia (MSA) grading platform which is designed as a sensory or eating quality grading system for underpinning a cooked meal performance that is matched to the occasion and requires no specialist knowledge by the consumer. This workshop unanimously supported the need for evidence based systems to underpin eating quality for lamb and beef in order to keep consumers purchasing products that are higher in price than the white meat competitors. 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) creating a dynamic workshop atmosphere. In order to drive and focus the recommendations which were discussed at the end of the workshop, it was agreed to establish a working group of current collaborating countries that would be open with respect to new partners.