Guaranteed eating quality and better livestock systems are key issues

Jean-François HOCQUETTE, INRAE, France

The problem to solve

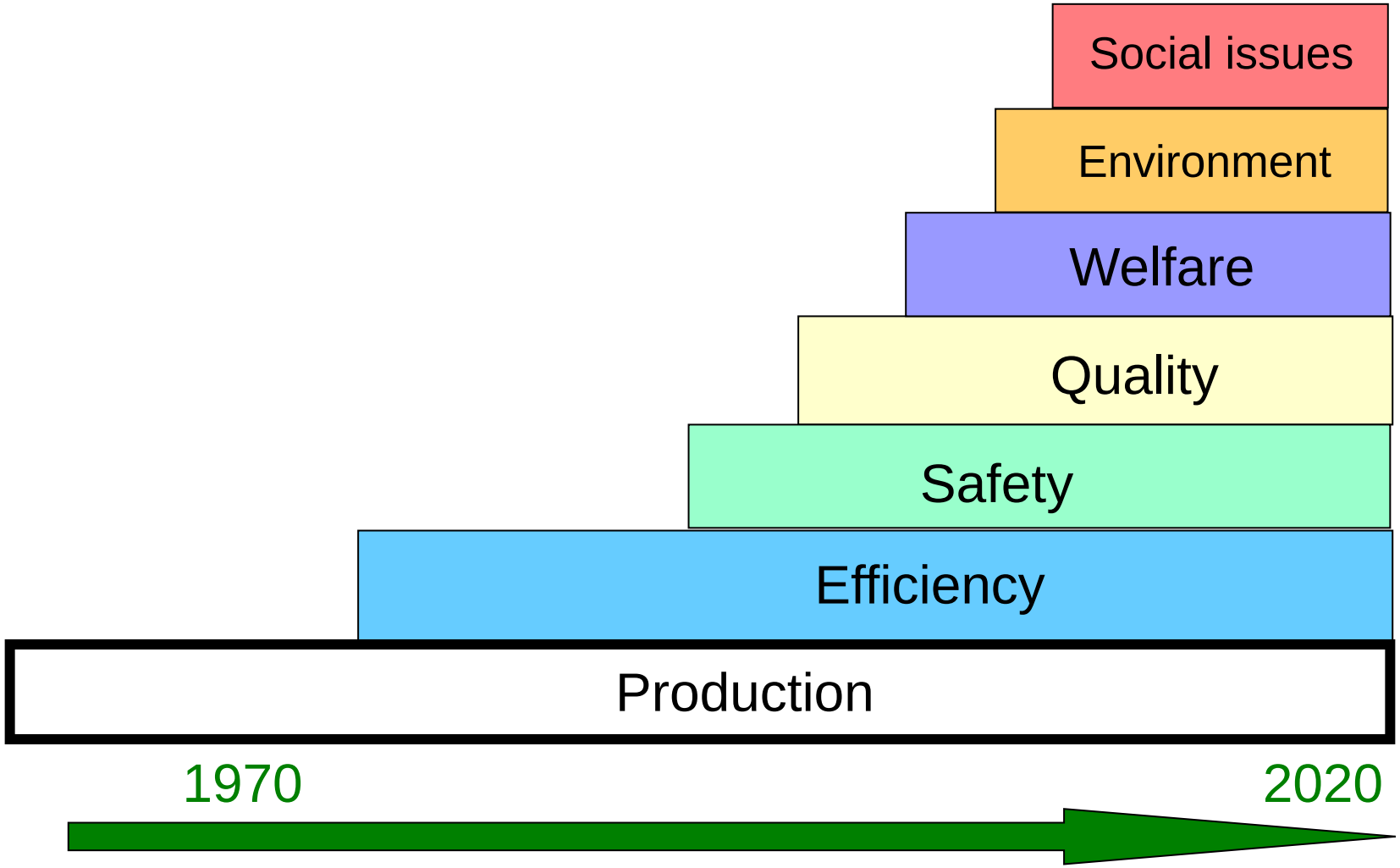
Nowadays, the livestock and meat sectors are facing new and important challenges:

- **increasing production of animal products** (to satisfy the needs of the increasing human population)
- coupled with **a lower footprint to protect the environment**;
- and addressing societal needs in terms of **animal welfare and product quality** for the consumer

Scollan, Greenwood, Newbold, Yanez Ruiz, Shingfield, Wallace, Hocquette, Animal Production Science, 2011, 51, 1–5.

L'élevage pour l'agroécologie et une alimentation durable (2021). Editions France Agricole https://www.editions-france-agricole.fr/site/gfaed/AGRO__gfaed.4464.42722__/fr/boutique/produit.html

Evolution of research in animal science towards sustainability



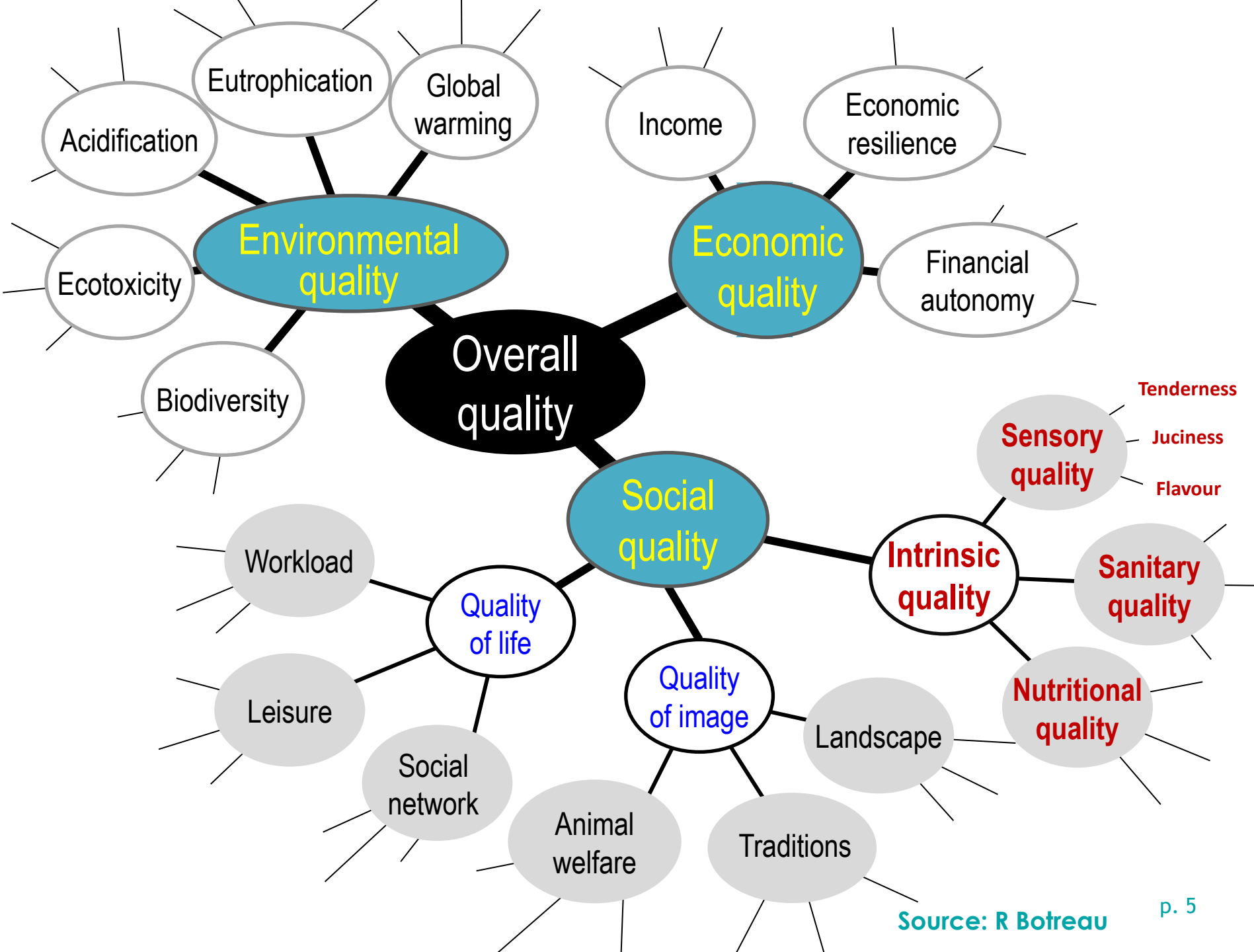
Adapted from M Doreau. Animal Production Science, 2011, 51, 19–29

The definition of quality

***Intrinsic* quality refers to the characteristics of the product** itself and includes sensory traits (e.g. tenderness, flavor, juiciness, overall liking), safety, healthiness, convenience, etc.

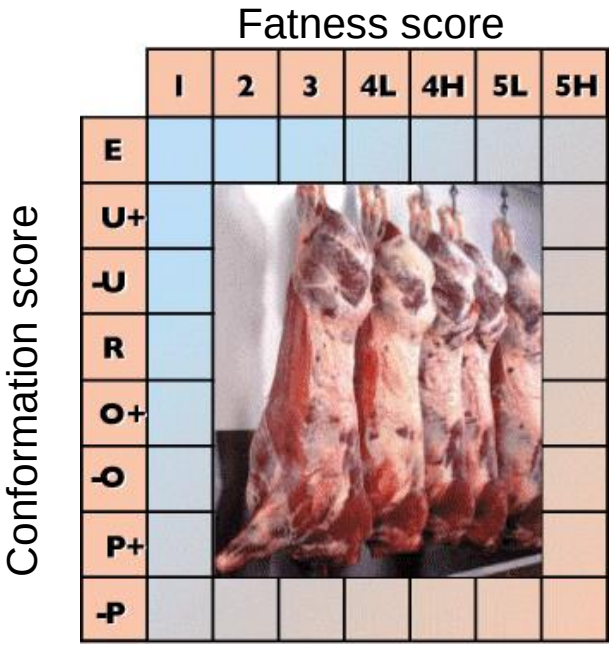
***Extrinsic* quality refers to traits which are associated with the product**, namely (i) production system characteristics (from the animal to the processing stages including for example animal welfare and carbon footprint), and (ii) marketing variables (including price, brand name, distribution, origin, packaging, labelling, and traceability)

Reviewed by Luning, Marcelis & Jongen, 2002; Grunert, Bredahl, & Brunso, 2004.



Source: R Botreau

Consumers want to buy guaranteed meal results!



Unfortunately, beef price in Europe depends on carcass weight, conformation and fatness, NOT on beef quality

But consumers do not eat carcasses

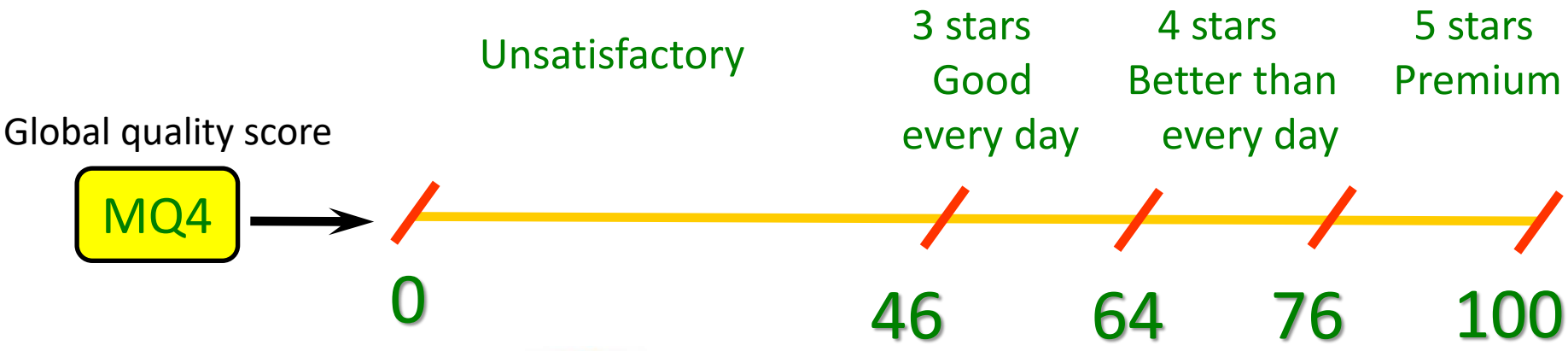
The 3G system inspired by the MSA system

Untrained consumers score beef for 4 criteria

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

Global quality score

MQ4



INTERNATIONAL MEAT RESEARCH 3G FOUNDATION

UNITED NATIONS ECONOMIC COMMISSION FOR EUROPE

Prediction of beef eating quality from animal and carcass traits

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

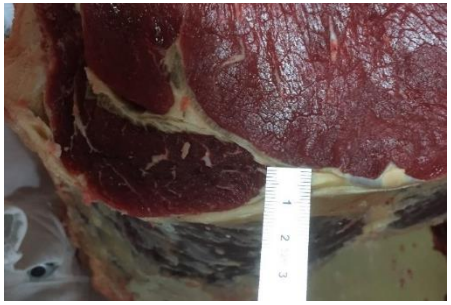
Kg

Ossification

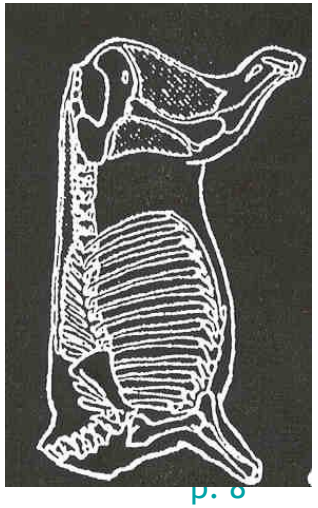
Temperature and pH

Marbling

Fat thickness

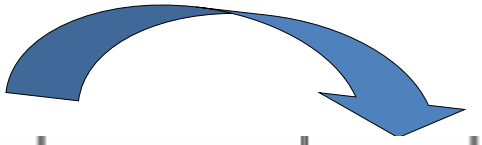


Hanging



Meat and fat colour

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

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	

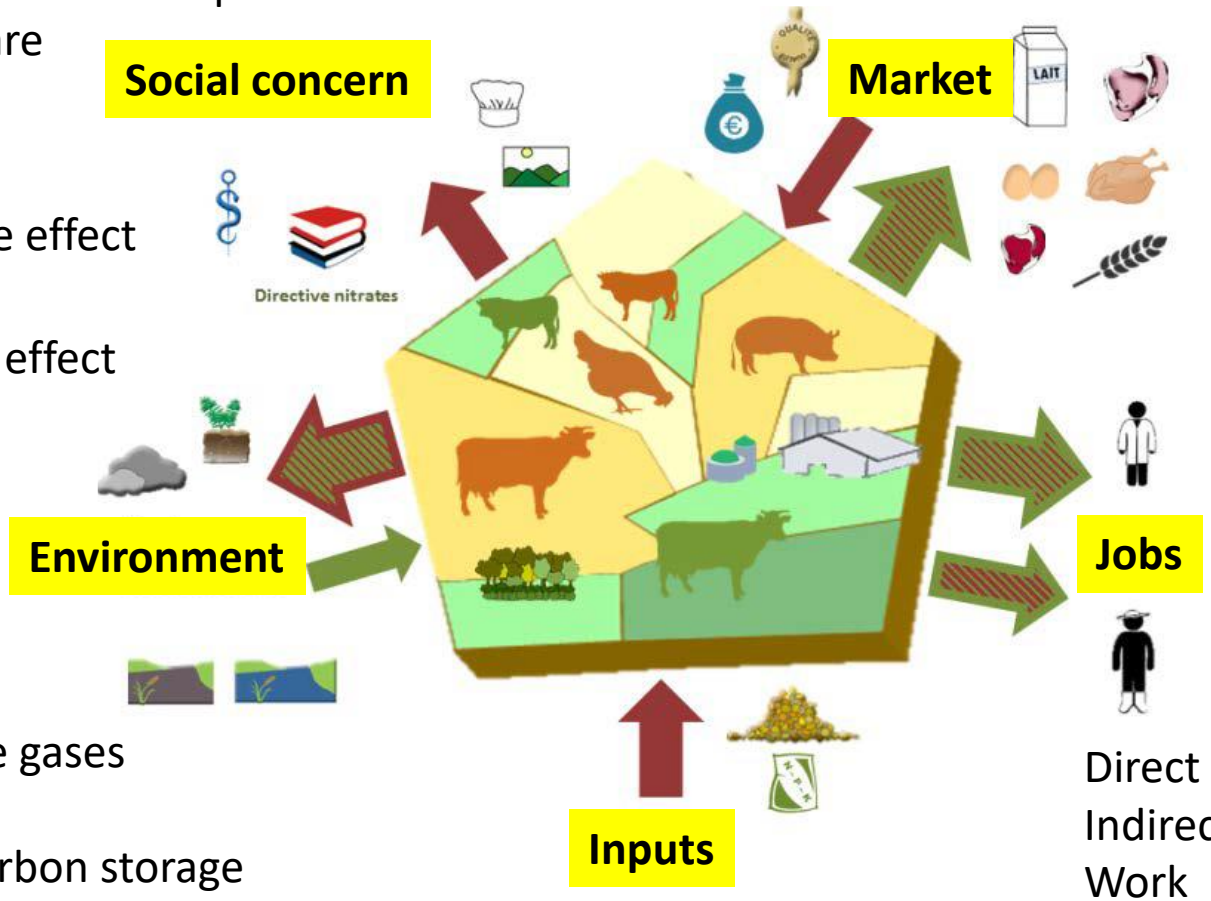
Goods and services derived from livestock farming

Animal health
Heritage and cultural aspects
Animal welfare

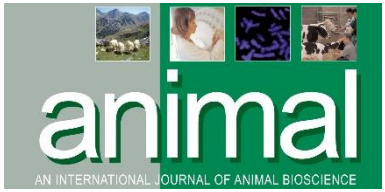
Food consumption
Production
International trade
Associated sectors

Negative effect

Positive effect



Dumont B. (ed.), Dupraz P. (ed.),. ROLE, IMPACTS AND SERVICES PROVIDED BY EUROPEAN LIVESTOCK PRODUCTION. Collective scientific assessment. INRA (France). Animal. 2018

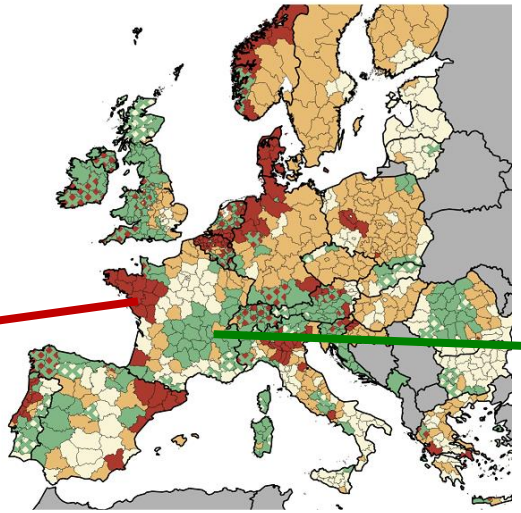


Greenhouse gases
Air quality
Soils and carbon storage
Water quality
Biodiversity of plants and of animals

Animal feed
Land use
Energy, phosphorous, water

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

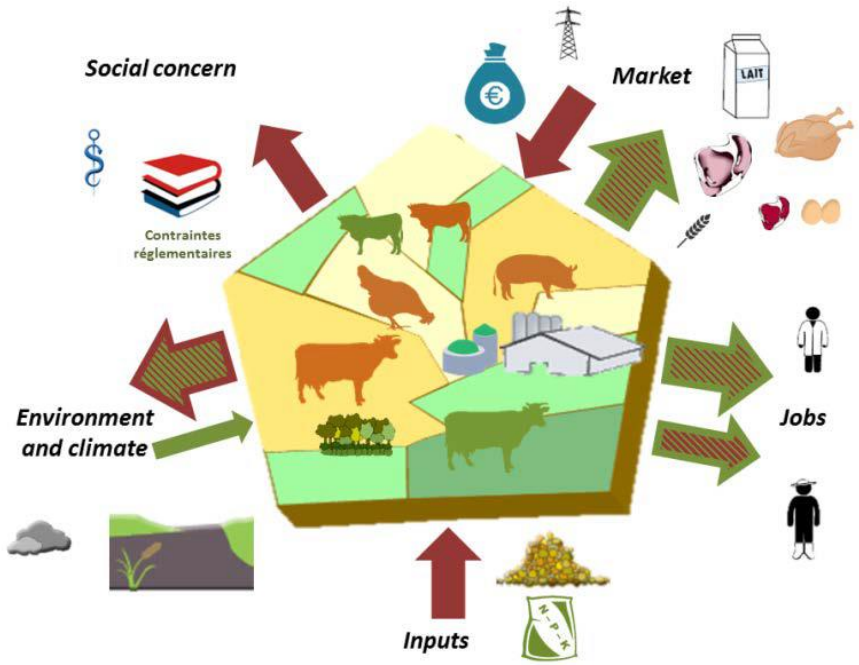
Goods and services from livestock in France

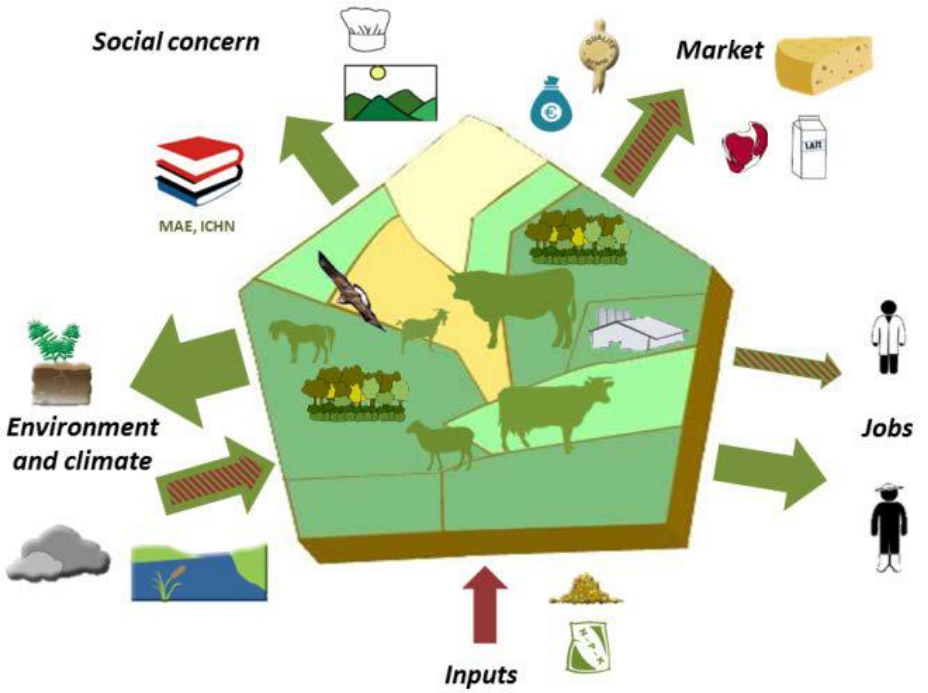


Dumont B. (ed.), Dupraz P. (ed.),. ROLE, IMPACTS AND SERVICES PROVIDED BY EUROPEAN LIVESTOCK PRODUCTION. Collective scientific assessment. INRA (France). .

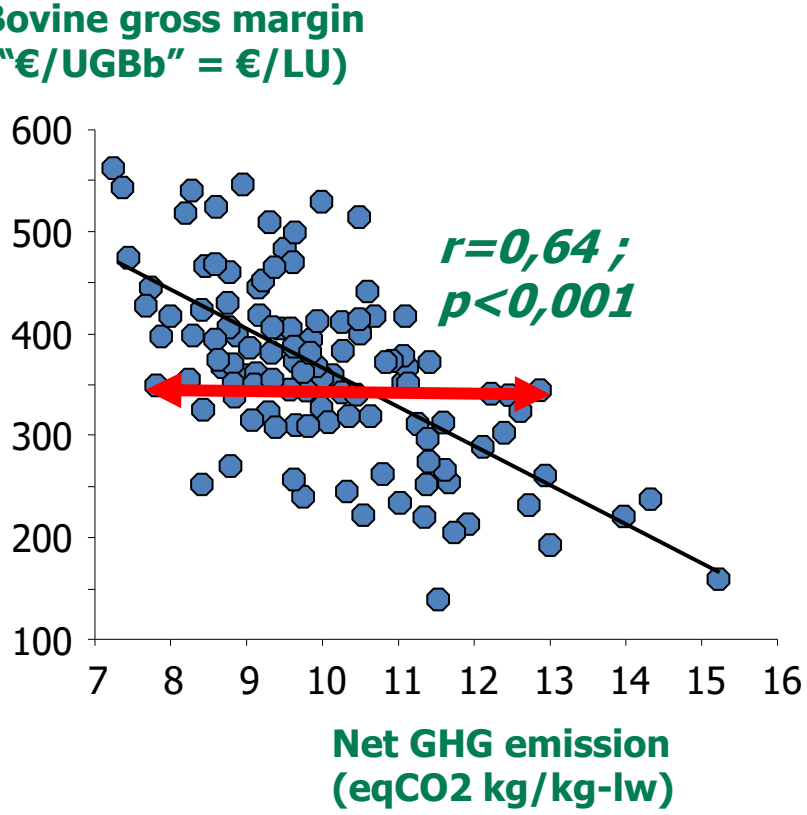
Low-grassland areas with high animal densities

Grassland-dominant areas
(the world area of Pasture and Fodder Crops represent 26% of the world land area and 70% of the world agricultural area)





Win–win strategies between environmental value and economic efficiency



59 farms in the Charolais area from 2010 to 2011.

High variability :

- **from 7 to 15 for GHG emissions**
- **from 150 to 550 for gross margin**

Win-win relationships:

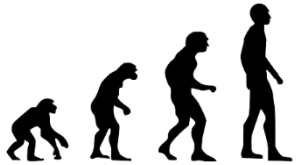
Farms

- the most efficient on an economic basis

- are also the most efficient in terms of GHG emissions

Veysset et al., 2014. Ecosystems & Environment 188, 180–191.

Regenerative agriculture and agroecology



A diverse diet with plant and animal products

Crops for humans and grass for animals

Farm animals

Soils enriched with manure from animals

Conclusions

The drivers of meat consumption are more and more numerous and complex

Consistent eating quality, price, societal issues (welfare, environment, etc) & transparency are key issues for consumer **trust**

Some meat alternatives (especially cultured meat) are over-simplified solutions

Prediction of eating quality is improving and it will be part of the solution because eating is a pleasure

Regenerative agriculture & agroecology are key solutions

Reducing food waste and having more balanced diets are also key solutions