Combining sustainable farming with high-quality and authentic chicken and cattle products

From "One Quality" research to farm practice and policy.

29th October 2026
Brussels, Belgium

INTAQT One Quality

Is farm multiperformance achievable?

Eléa Caumette, INRAE

intaqt one quality

ONE QUALITY 1Q

01. One quality - from intrinsic to extrinsic quality



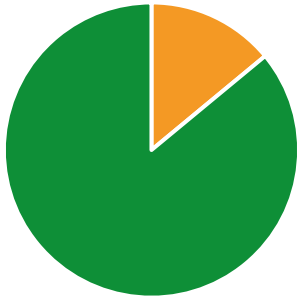
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Feed-food competition

02. Context

6 billion tonnes dry matter per year

Non human-edible feeds

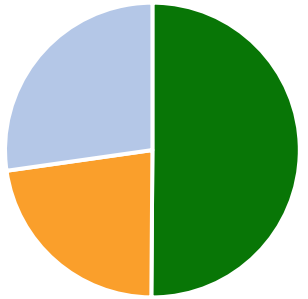


Human-edible feeds

Grains: Cereals, Leguminous, Soja

Half of the agricultural area

Arable land



Permanent grasslands

Feed-food competition

Livestock intensification: good or bad for **feed-food competition**?

Protein feed conversion ratio (FCR) = $\frac{\text{Feed}}{\text{Animal products}}$

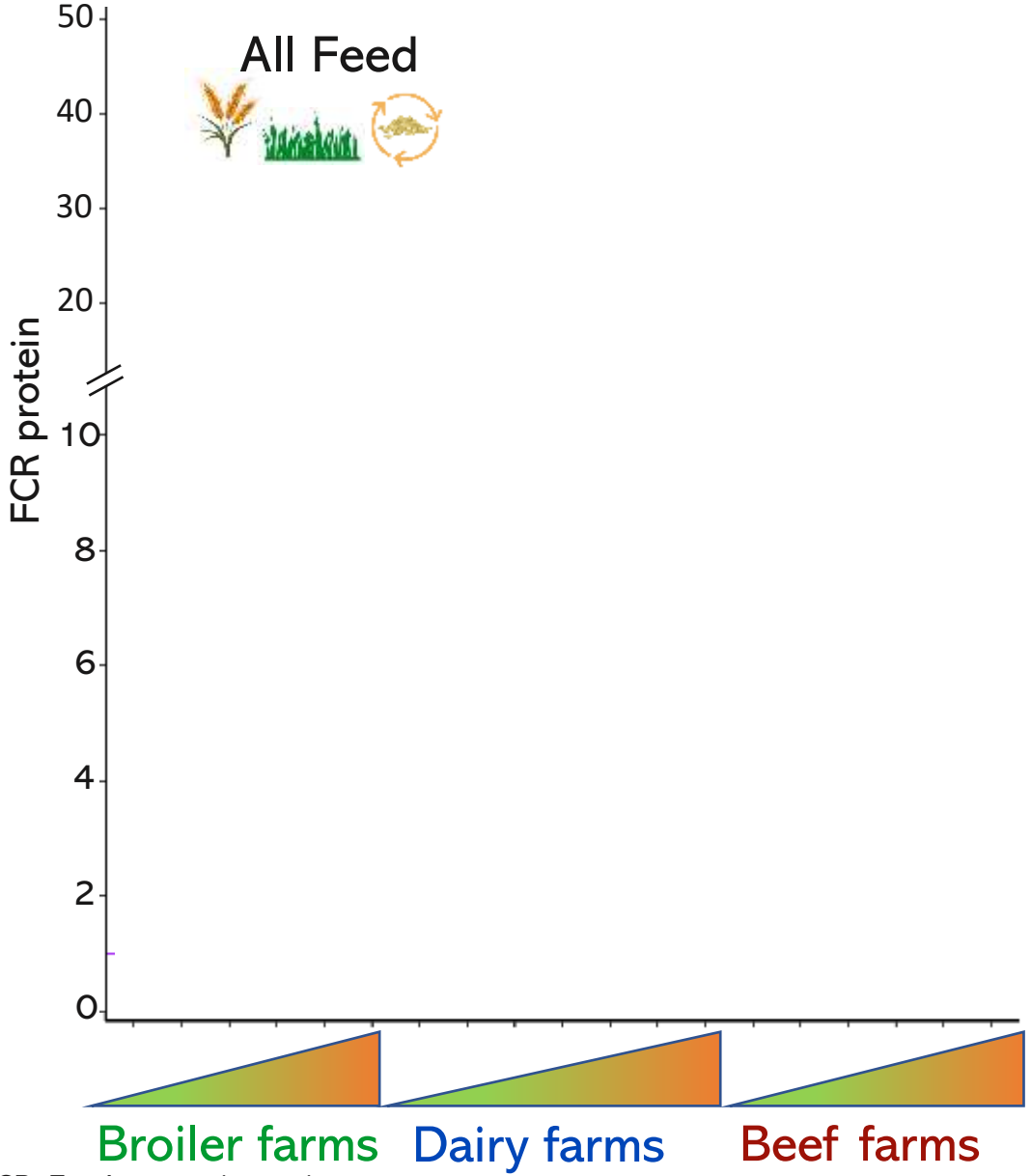
All feed or **only human-edible** feed considered

Mottet et al., 2017

FAOSTAT, 2023

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02. Feed efficiency



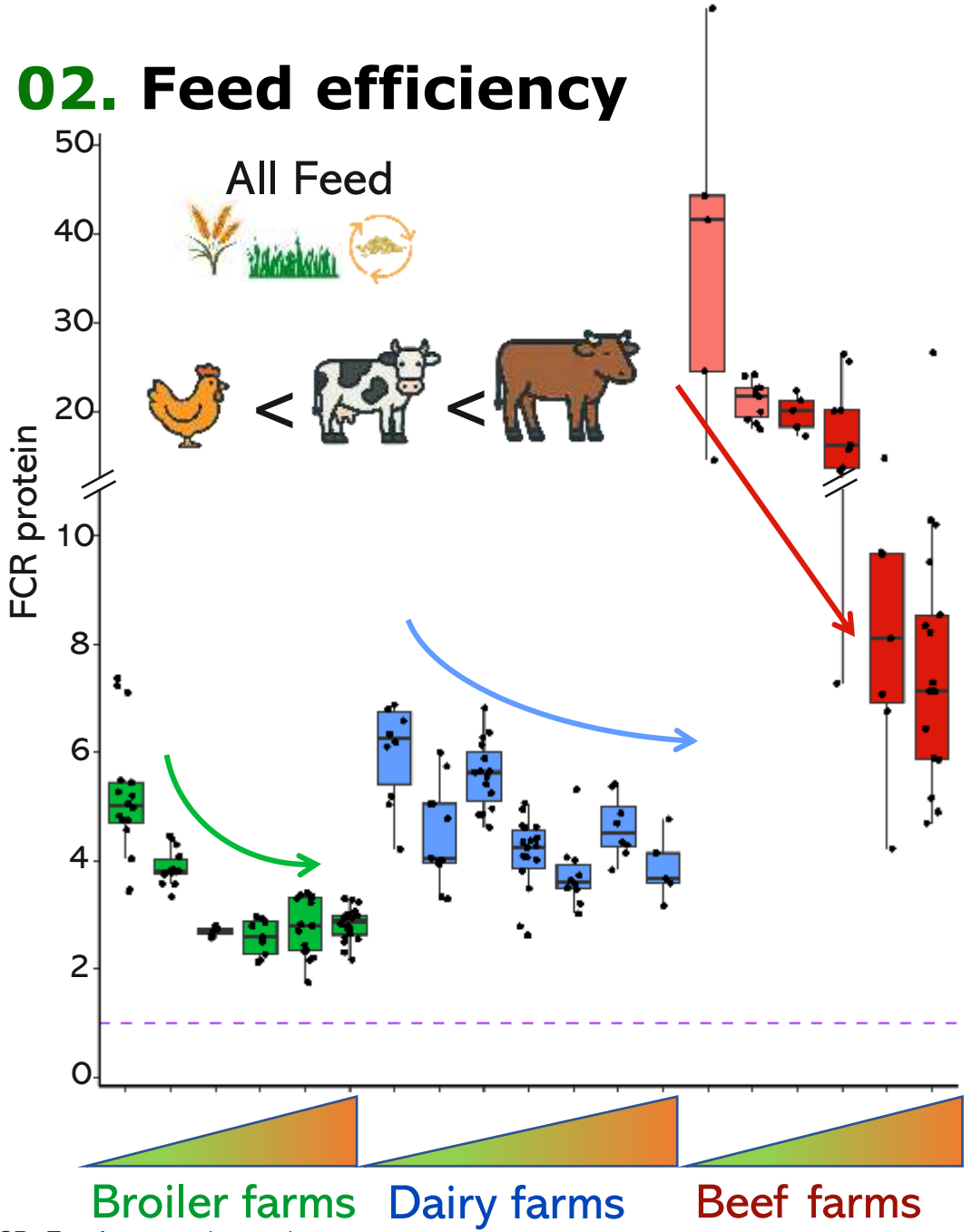
Productions

- Broiler farms
- Dairy farms
- Beef suckler farms
- Beef fattening farms

Intensification inputs levels

FCR: Feed conversion ratio
(kg feed protein/kg produced protein)

02. Feed efficiency



FCR: Feed conversion ratio
(kg feed protein/kg produced protein)

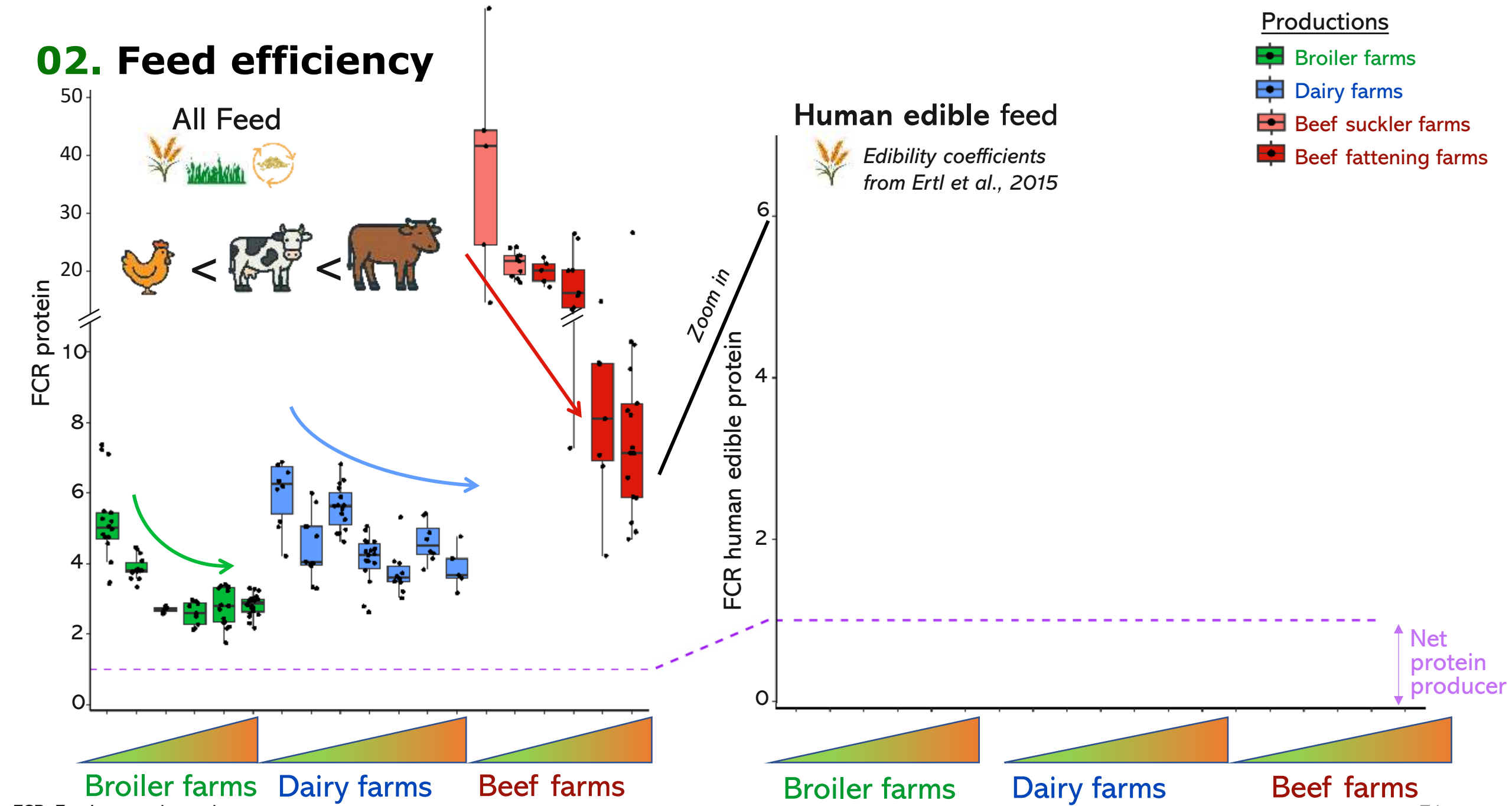
Human edible feed

Edibility coefficients from Ertl et al., 2015

Productions

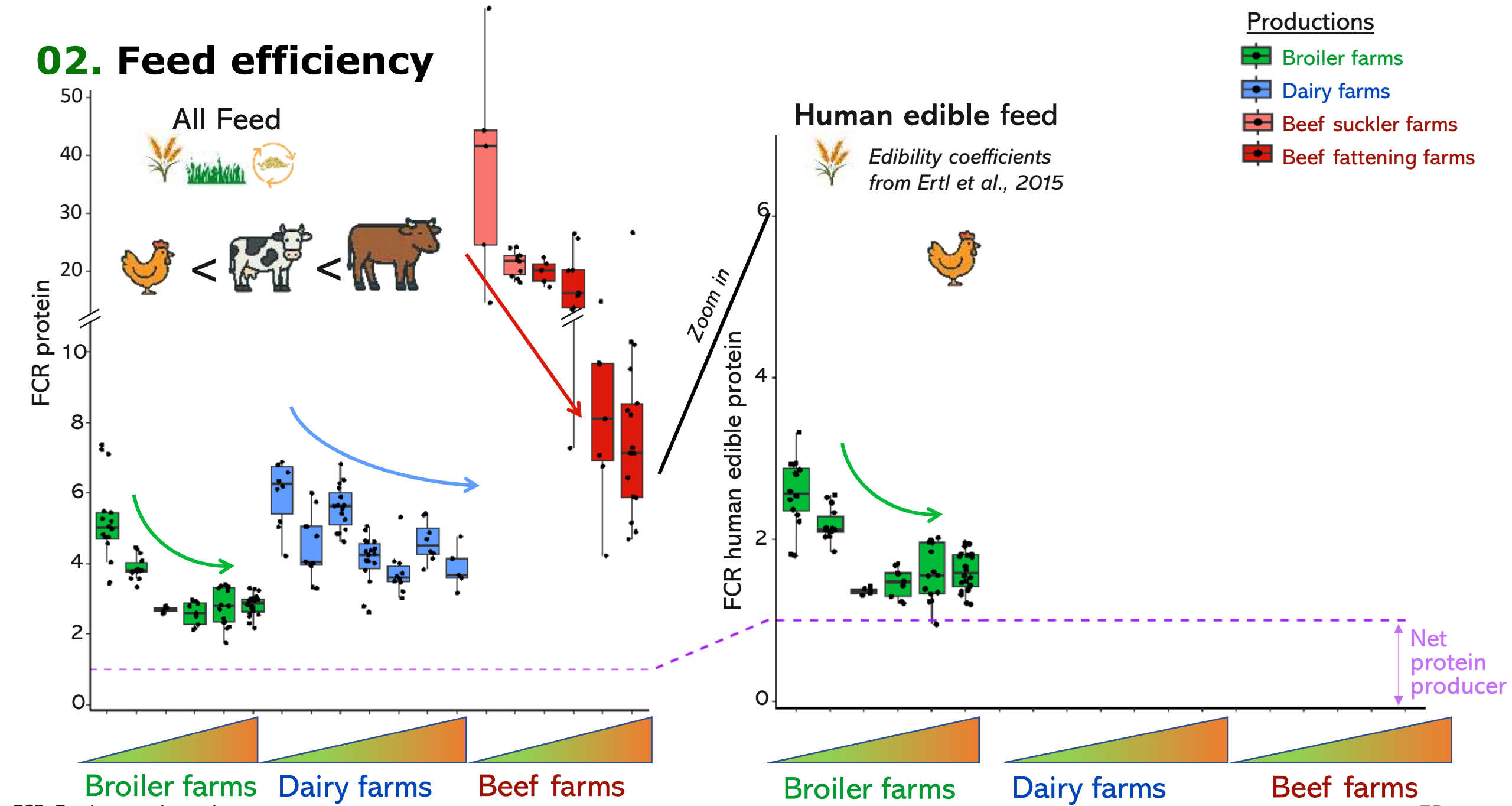
- Broiler farms
- Dairy farms
- Beef suckler farms
- Beef fattening farms

02. Feed efficiency



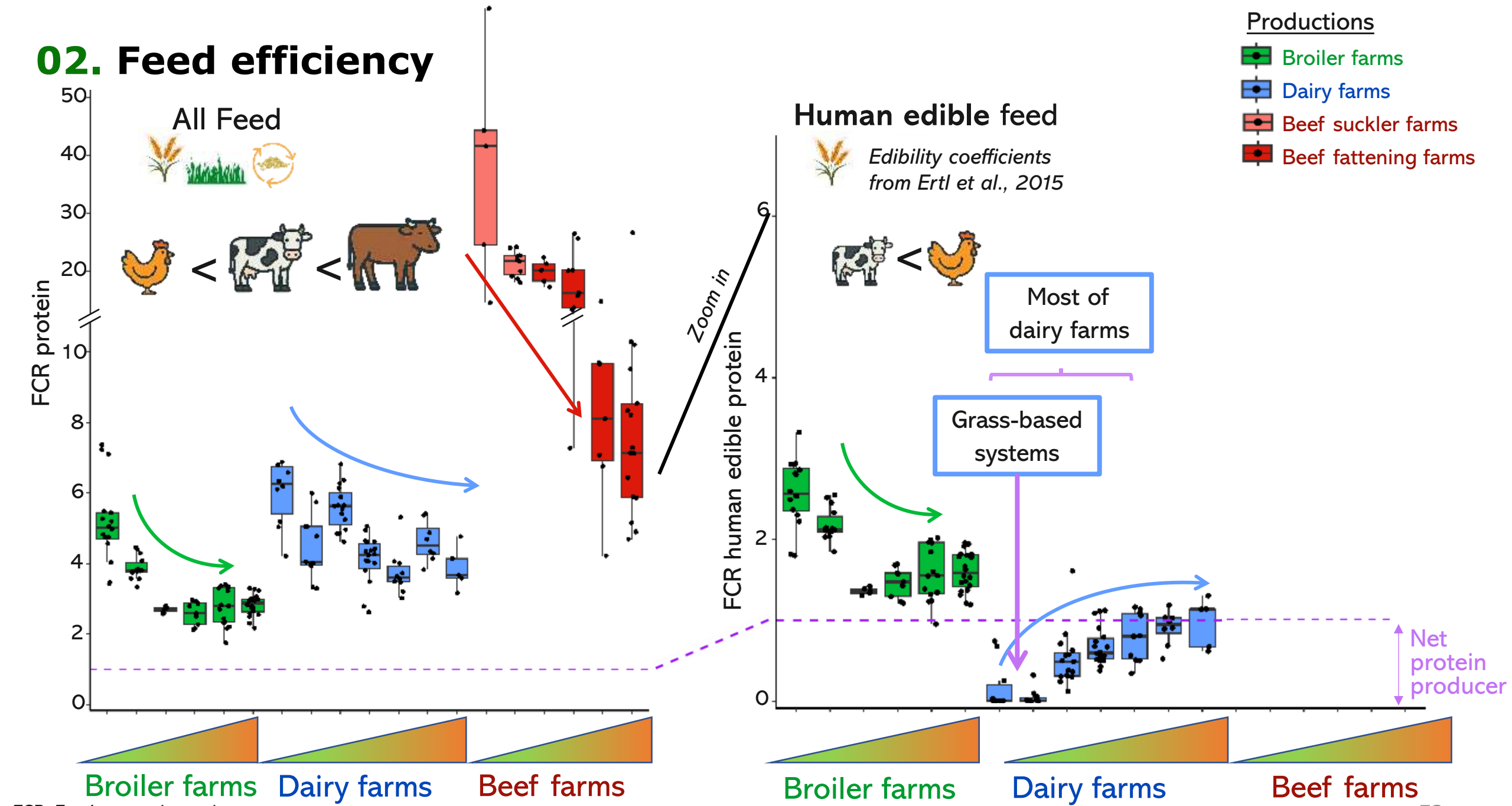
FCR: Feed conversion ratio
(kg feed protein/kg produced protein)

02. Feed efficiency



FCR: Feed conversion ratio
(kg feed protein/kg produced protein)

02. Feed efficiency

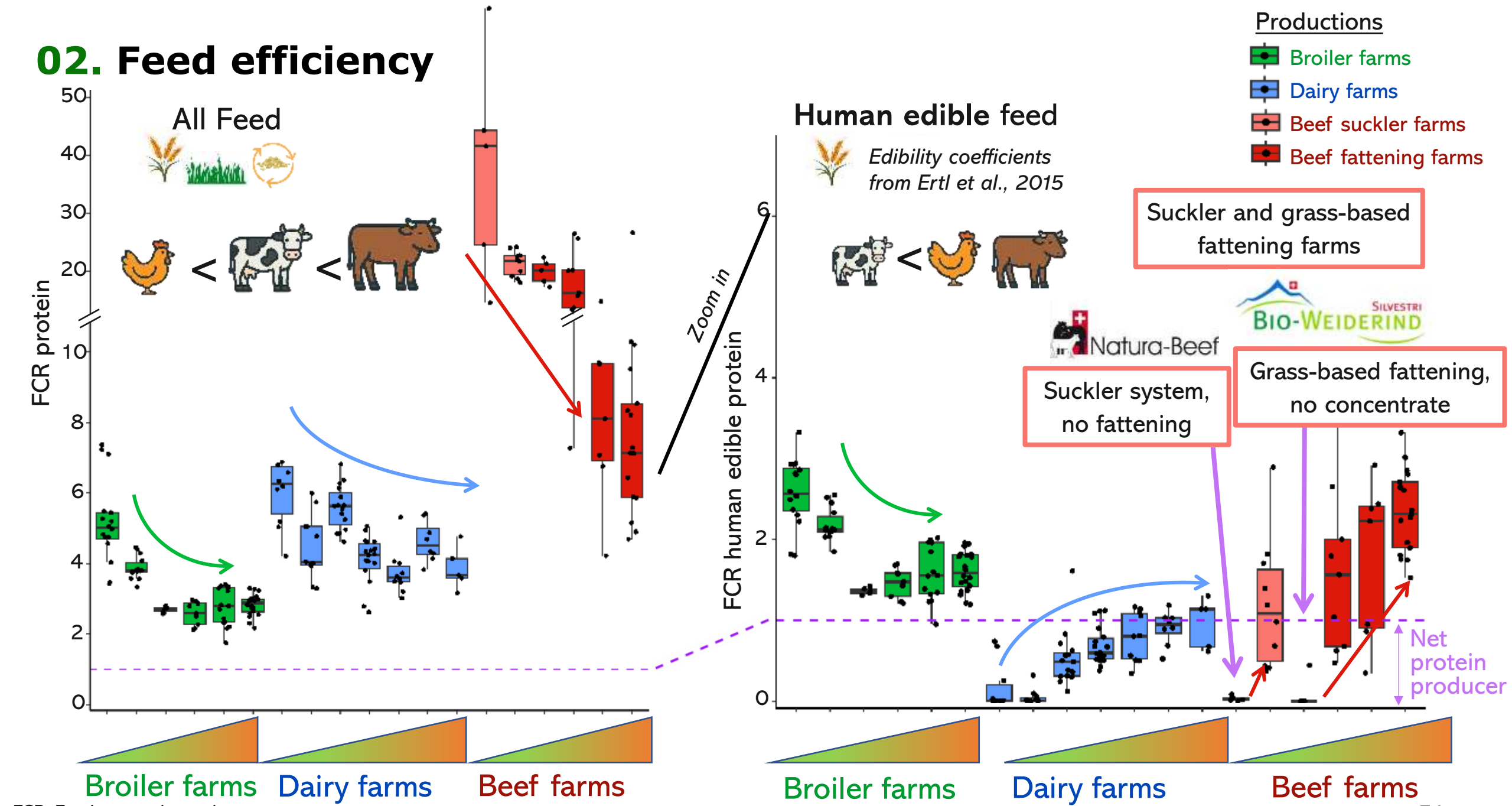


Productions

- Broiler farms
- Dairy farms
- Beef suckler farms
- Beef fattening farms

FCR: Feed conversion ratio
(kg feed protein/kg produced protein)

02. Feed efficiency



FCR: Feed conversion ratio (kg feed protein/kg produced protein)

02. Conclusions

Intensification in…





Productivity ↑ ↑ ↑

Efficiency
(all feed and land) ↑ ↑ ↑

Feed-food competition
(human-edible feed
and arable land) ↓ ↑ ↑

Yes but until a certain point



Livestock intensification —*limits*→ **Feed-food competition**

Livestock intensification —*worsens*→ **Feed-food competition**



Grass-based systems can be **net protein producers**



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Multiperformance?



Broilers

03. Summary

Outdoor — Intensification level — Indoor



Laying males & Dual-purpose



Slow-growing



Medium-growing



'Fast-medium' growing



Fast-growing Standard

Fast-growing Heavy

EXTRINSIC QUALITY

Productivity

Environmental impacts/kg product

Feed-food competition

Animal welfare

INTRINSIC QUALITY

Sensory quality

Technological quality

Nutritional quality

Health quality

Outdoor — Intensification level — Indoor

03. Summary











	Laying males & Dual-purpose	Slow-growing	Medium-growing	'Fast-medium' growing	Fast-growing Standard	Fast-growing Heavy
EXTRINSIC QUALITY						
Productivity	- -	- -	-	+	+	+ +
Environmental impacts/kg product	+ +	+	+	-	-	+
Feed-food competition	- -	- -	-	+	+	+
Animal welfare						
INTRINSIC QUALITY						
Sensory quality						
Technological quality						
Nutritional quality						
Health quality						

Outdoor — Intensification level — Indoor

03. Summary











	Laying males & Dual-purpose	Slow-growing	Medium-growing	'Fast-medium' growing	Fast-growing Standard	Fast-growing Heavy
EXTRINSIC QUALITY						
Productivity	- -	- -	-	+	+	+ +
Environmental impacts/kg product	+ +	+	+	-	-	+
Feed-food competition	- -	- -	-	+	+	+
Animal welfare	+ +	+ +	+	+/-	-	- -
INTRINSIC QUALITY						
Sensory quality						
Technological quality						
Nutritional quality						
Health quality						

03. Summary

Outdoor — Intensification level — Indoor











	Laying males & Dual-purpose	Slow-growing	Medium-growing	'Fast-medium' growing	Fast-growing Standard	Fast-growing Heavy
EXTRINSIC QUALITY						
Productivity	- -	- -	-	+	+	+ +
Environmental impacts/kg product	+ +	+	+	-	-	+
Feed-food competition	- -	- -	-	+	+	+
Animal welfare	+ +	+ +	+	+/-	-	- -
INTRINSIC QUALITY						
Sensory quality	High variability between systems but, **higher overall sensory score for intermediate systems** ←		+	+		
Technological quality						
Nutritional quality						
Health quality						

Outdoor — **Intensification level** — Indoor

03. Summary











	Laying males & Dual-purpose	Slow-growing	Medium-growing	'Fast-medium' growing	Fast-growing Standard	Fast-growing Heavy
EXTRINSIC QUALITY						
Productivity	- -	- -	-	+	+	+ +
Environmental impacts/kg product	+ +	+	+	-	-	+
Feed-food competition	- -	- -	-	+	+	+
Animal welfare	+ +	+ +	+	+/-	-	- -
INTRINSIC QUALITY	High variability between systems but, **higher overall sensory score for intermediate systems**					
Sensory quality		+	+			
Technological quality		+	+	-	-	
Nutritional quality				-	-	
Health quality				-	-	

↑ water losses during processing, ↑ breast muscle abnormalities
↓ protein content, ↑ fat content, ↓ less iron, ↓ beneficial bioactive compounds (e.g., anserine and carnosine), ↓ amino acid availability

Faster growth rates

Outdoor — **Intensification level** — Indoor

03. Summary











	Laying males & Dual-purpose	Slow-growing	Medium-growing	'Fast-medium' growing	Fast-growing Standard	Fast-growing Heavy
EXTRINSIC QUALITY						
Productivity	- -	- -	-	+	+	+ +
Environmental impacts/kg product	+ +	+	+	-	-	+
Feed-food competition	- -	- -	-	+	+	+
Animal welfare	+ +	+ +	+	+/-	-	- -
INTRINSIC QUALITY						
Sensory quality			+	+		
Technological quality			+	+	-	-
Nutritional quality					-	-
Health quality					-	-

No one best system

03. Broilers: ECC a sustainable alternative?



vs.



What was estimated in the literature:

Costs and implications of the European Chicken Commitment in the EU — AVEC

+ 24% GHG emissions/kg meat
+ 38% production costs/kg meat
+ 48% space requirement for same bird numbers

Impact of the European Chicken Commitment (ECC) broiler production system on economics, the environment and food safety — WAGENINGEN UNIVERSITY & RESEARCH

+ 6% GHG emissions/kg liveweight
+ 20% production costs/kg liveweight
+ 9% land use/kg liveweight

What we found:

No significant difference for:

- Feed efficiency
- Productivity
- Environmental impacts

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03. Broilers: ECC a sustainable alternative?



vs.



What was estimated in the literature:

Costs and implications of the European Chicken Commitment in the EU

AVEC

+ 24% GHG emissions/kg me
+ 38% production cost
+ 48% space re

Modelling studies using study cases

…icken
…broiler production
sys…omics, the environment and
food…

WAGENINGEN
UNIVERSITY & RESEARCH

+ 6% GHG emissions/kg liveweight
+ 20% production costs/kg liveweight
+ 9% land use/kg liveweight

What we found:

No significant difference for:

- Feed efficiency
- Productivity
- Environmental impacts

Farm data

- Variability within systems
- Some ECC farms and standard farms may have similar performances

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Multiperformance?



Cattle

04. Summary



Intensification in…

EXTRINSIC QUALITY	
Productivity	↑
Environmental impacts/kg product	↓*
Regulating ecosystem services	—
Feed-food competition	↓*
Animal welfare	↓
INTRINSIC QUALITY	
Sensory quality	—
Nutritional quality	↓
Technological quality	↓
Health quality	↓

*Yes but until a certain point

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04. Summary

Intensification in…







EXTRINSIC QUALITY	Productivity	↑	↑	↑
	Environmental impacts/kg product	↓*	(↓)	↓
	Regulating ecosystem services	—	↓	↓
	Feed-food competition	↓*	↑	↑
	Animal welfare	↓	—	—
INTRINSIC QUALITY	Sensory quality	—		
	Nutritional quality	↓		
	Technological quality	↓		
	Health quality	↓		

*Yes but until a certain point

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04. Summary

Intensification in…







EXTRINSIC QUALITY	Productivity	↑	↑
	Environmental impacts/kg product	↓*	(↓)
	Regulating ecosystem services	—	↓
	Feed-food competition	↓*	↑
	Animal welfare	↓	—/↓
INTRINSIC QUALITY	Sensory quality	—	
	Nutritional quality	↓	
	Technological quality	↓	
	Health quality	↓	

*Yes but until a certain point

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04. Summary

Intensification in…







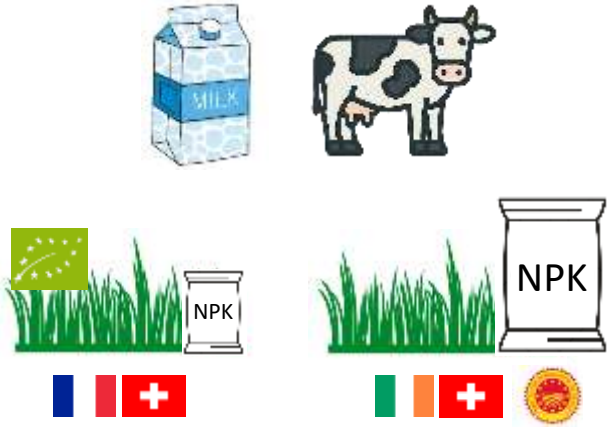
EXTRINSIC QUALITY	**Productivity**	↑	↑
	Environmental impacts/kg product	↓*	(↓)
	Regulating ecosystem services	–	↓
	Feed-food competition	↓*	↑
	Animal welfare	↓	– / ↓
INTRINSIC QUALITY	**Sensory quality**	–	–
	Nutritional quality	↓	↓
	Technological quality	↓	–
	Health quality	↓	–

*Yes but until a certain point

→ Pasture effect
(lower omega6/omega3 ratio)

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04. What pasture-based systems can provide





Low productivity
BUT
Provision of ecosystem services
And **Net production of protein**!

→ **Contribution to food security**

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Overall conclusions

05. Take-home messages

In broilers:



- Antagonisms between productivity/efficiency *vs.* animal welfare and intrinsic quality
- Intermediate systems *(fast-medium growing genotypes)* are a potential compromise according to our data











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05. Take-home messages

In broilers:



- Antagonisms between productivity/efficiency *vs.* animal welfare and intrinsic quality
- Intermediate systems *(fast-medium growing genotypes)* are a potential compromise according to our data

In cattle:



- Antagonisms: productivity *vs.* feed-food competition, nutritional quality, …
- **Pasture-based systems**:
  → Produce less but contribute to **food security** by being **net protein producers**













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05. Take-home messages

In broilers:



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In cattle:



- Antagonisms: productivity *vs.* feed-food competition, nutritional quality, …
- **Pasture-based systems**:
  → Produce less but contribute to **food security** by being **net protein producers**



- **Large variability within systems:**
  Opportunities to improve milk and meat quality within systems → to be explored











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05. Take-home messages

In broilers:



- Antagonisms between productivity/efficiency *vs.* animal welfare and intrinsic quality
- Intermediate systems *(fast-medium growing genotypes)* are a potential compromise according to our data

In cattle:



- Antagonisms: productivity *vs.* feed-food competition, nutritional quality, …
- **Pasture-based systems**:
  → Produce less but contribute to **food security** by being **net protein producers**



- **Large variability within systems:**
  Opportunities to improve milk and meat quality within systems → to be explored

- Whatever the system, these livestock products remain valuable sources of nutrients and **safe products**













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From "One Quality" research to farm practice and policy.

29th October 2026

Brussels, Belgium

From results to practice: practice abstracts and tools for farmers and advisors

intaqt one quality

Rennie C. Eppenstein, FiBL

ONE QUALITY 1Q

From results to practice

- Incorporation of **stakeholder interests** into the design of the project (multi-actor approach)
- Innovating together with **agricultural practitioners** and building farmer-led research networks (living labs)
- Making scientific results accessible for **everyone**: Our web app and dissemination materials

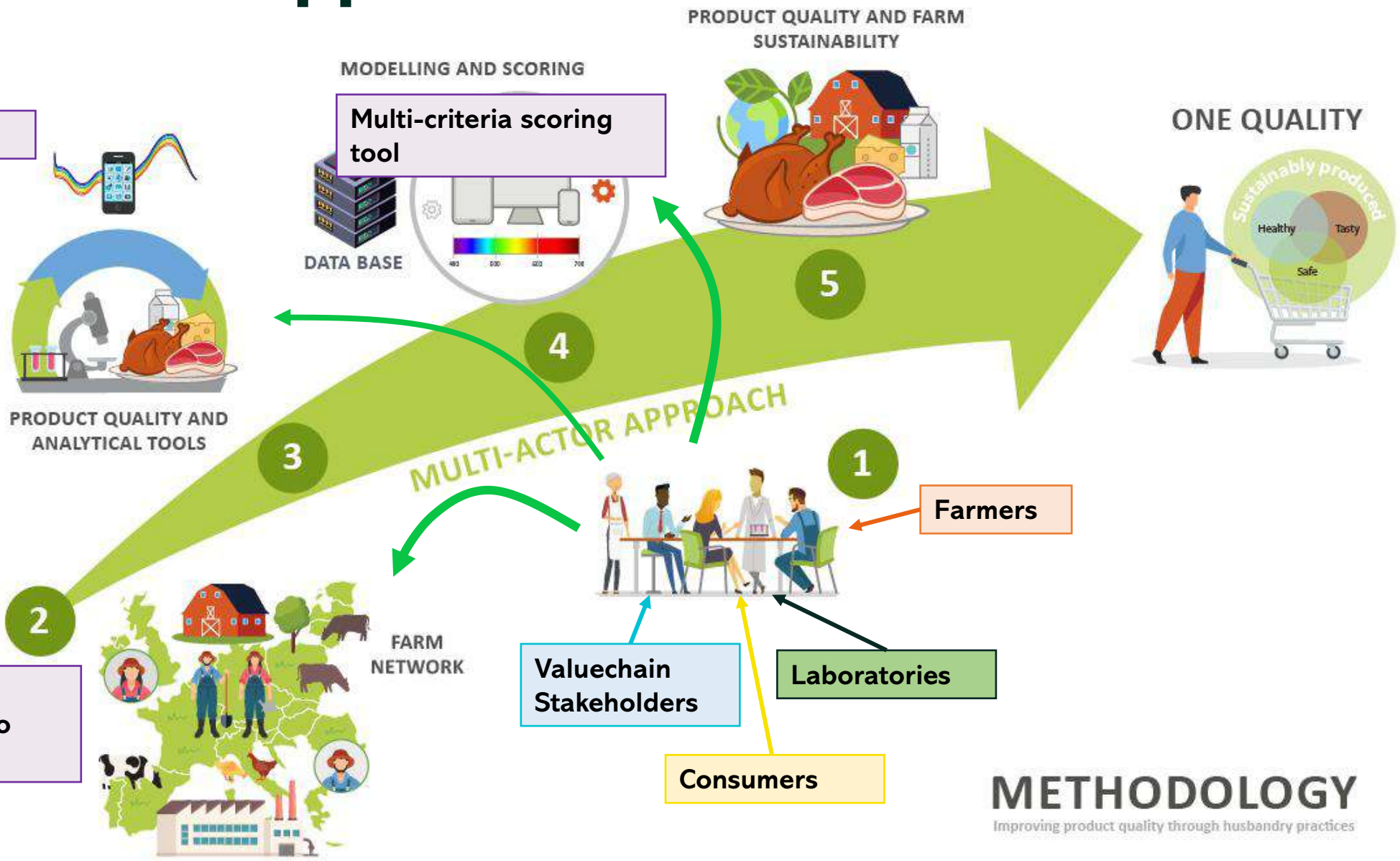
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01. Multi-actor approach

Analyses

Multi-criteria scoring tool

Farming systems & Innovative practices to test



METHODOLOGY

Improving product quality through husbandry practices

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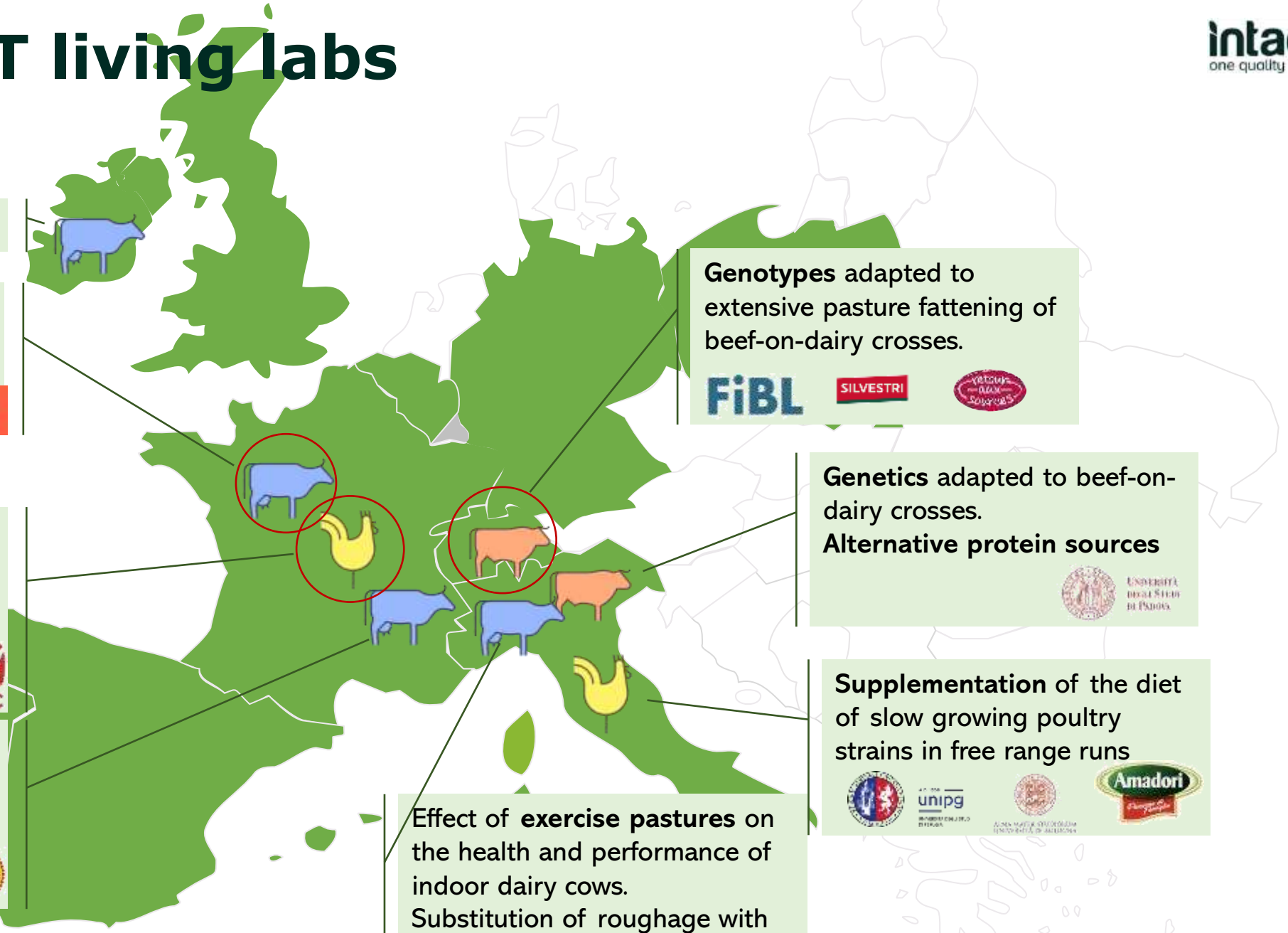
02. INTAQT living labs

Multi-species **swards**

Improve intrinsic and extrinsic qualities of milk due to a **maximization of pasture**

On-farm broiler hatching: What impact on health, welfare, performance and meat quality of the standard chicken?

Impact of **increasing pasture** intake on fat content of « Fourme de Montbrison » PDO cheese



Genotypes adapted to extensive pasture fattening of beef-on-dairy crosses.

Genetics adapted to beef-on-dairy crosses.
Alternative protein sources

Supplementation of the diet of slow growing poultry strains in free range runs

Effect of **exercise pastures** on the health and performance of indoor dairy cows.
Substitution of roughage with **Sorghum**

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02. Maximization of pasture

Improving milk quality through grazing and spring-calving dairy systems



Innovation

Spring calving

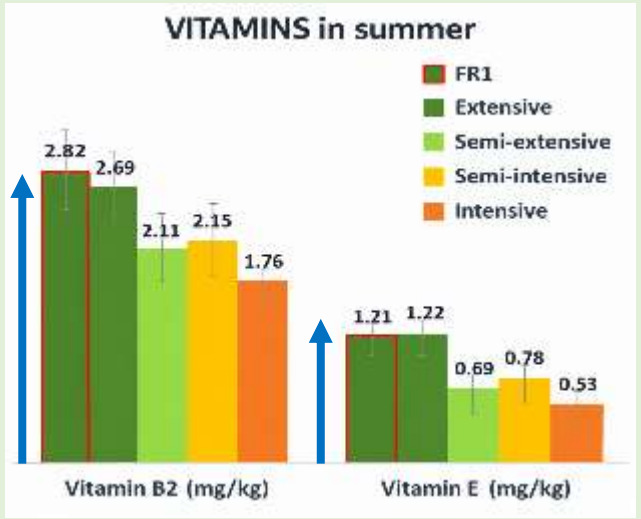
Strict breeding

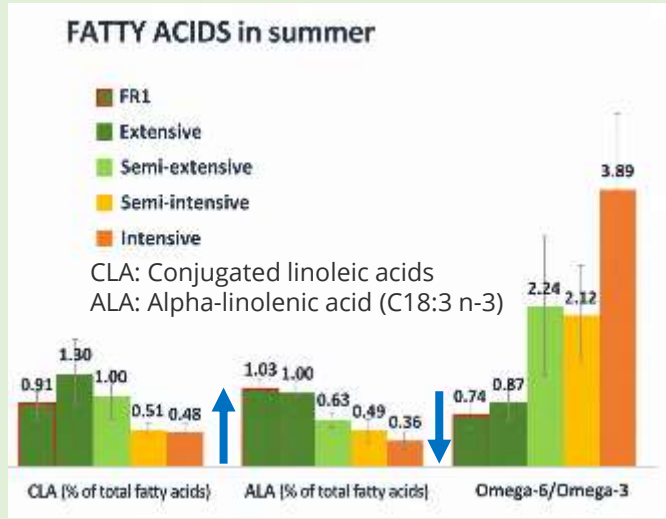
Adapted breeds

Forage management



Results





- ✓ Improved Vitamins and fatty acids.
- ✓ Satisfactory technological characteristics.

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02. On-farm hatching

What impact has on-farm hatching on the health, welfare, performance and meat quality of the standard broilers?

System

- Fast growing
- Higher animal welfare



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Innovation









Improved

✓ Health
(footpad dermatitis, mortality)

✓ Performance
(slaughter age, ADG, FCR, Perf. Ind., weight coeff.)

✓ Animal welfare
(end of rearing)

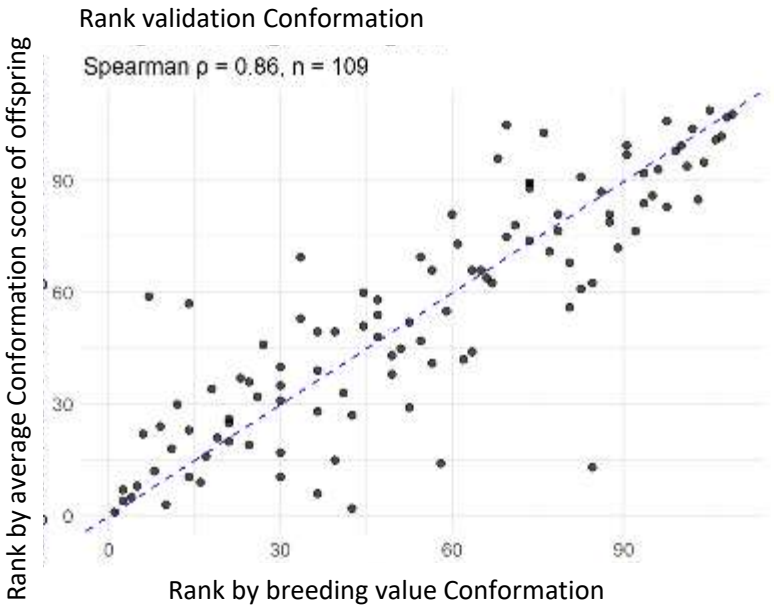
✓ Meat quality
(cooking loss, techn. yield, - texture)

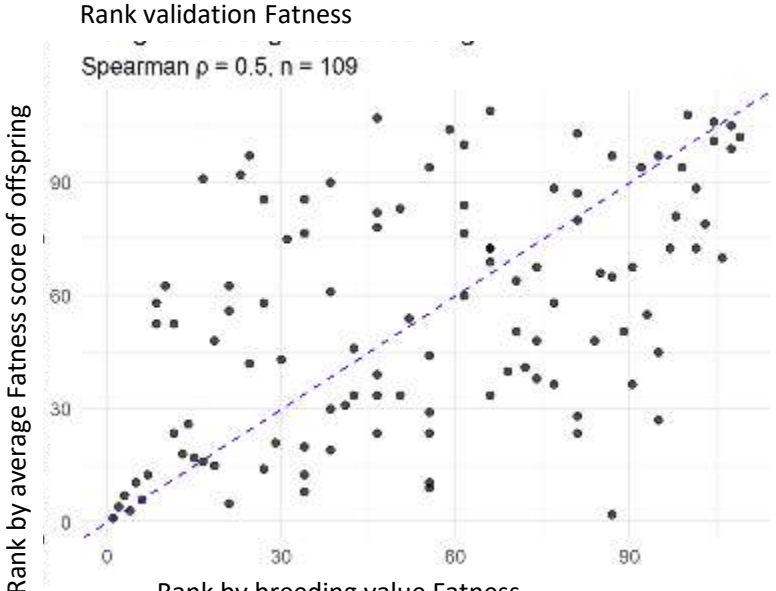
02. Genotypes adapted to pasture fattening of beef-on-dairy

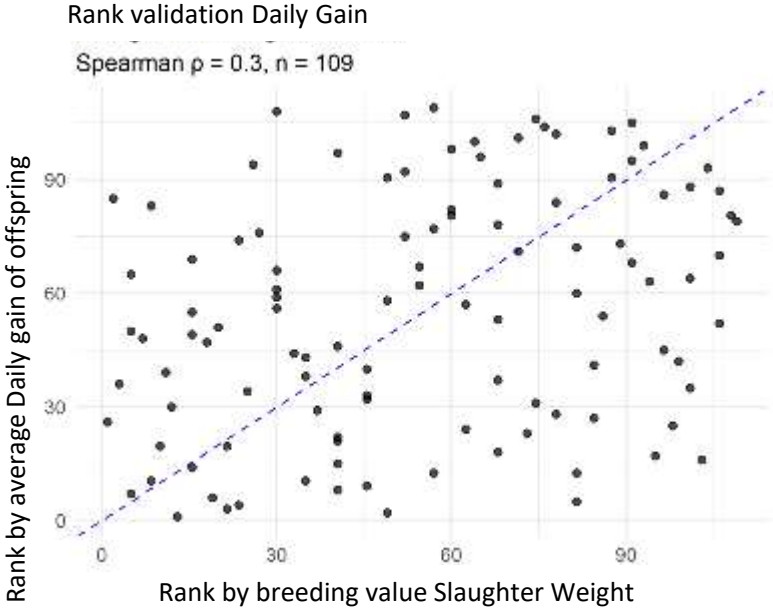
Slaughter data of 60.000 pasture fattened animals; partly beef-on-dairy crosses.

→ Validation of ***breeding values*** *in extensive fattening systems.*





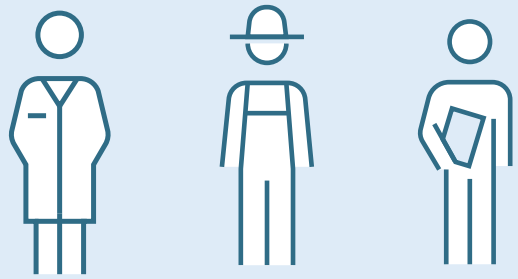




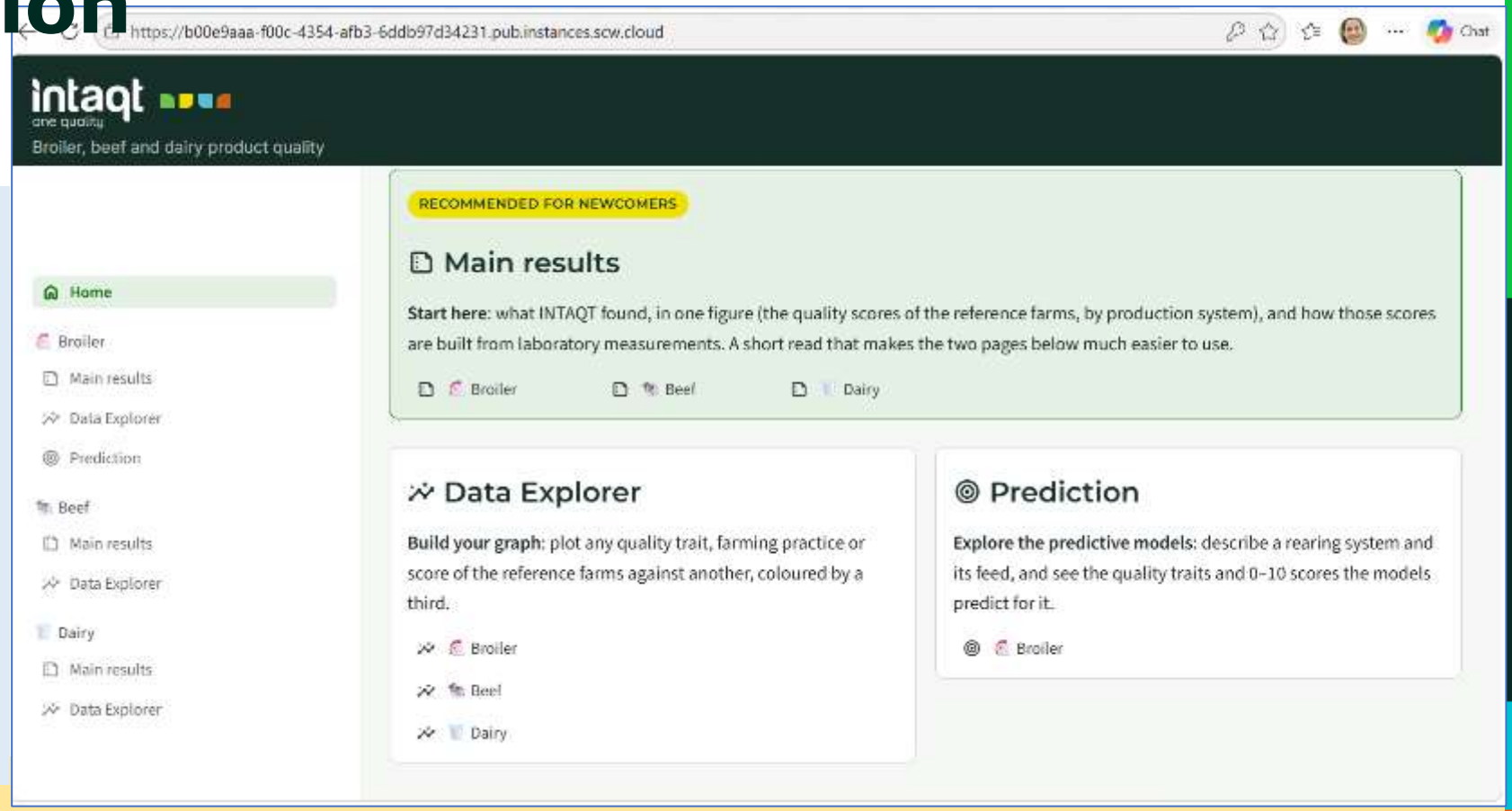
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03. Web application

For who?



→ *Everyone interested in understanding how product quality **varies** across farming systems and how farming practices **influence** product quality.*



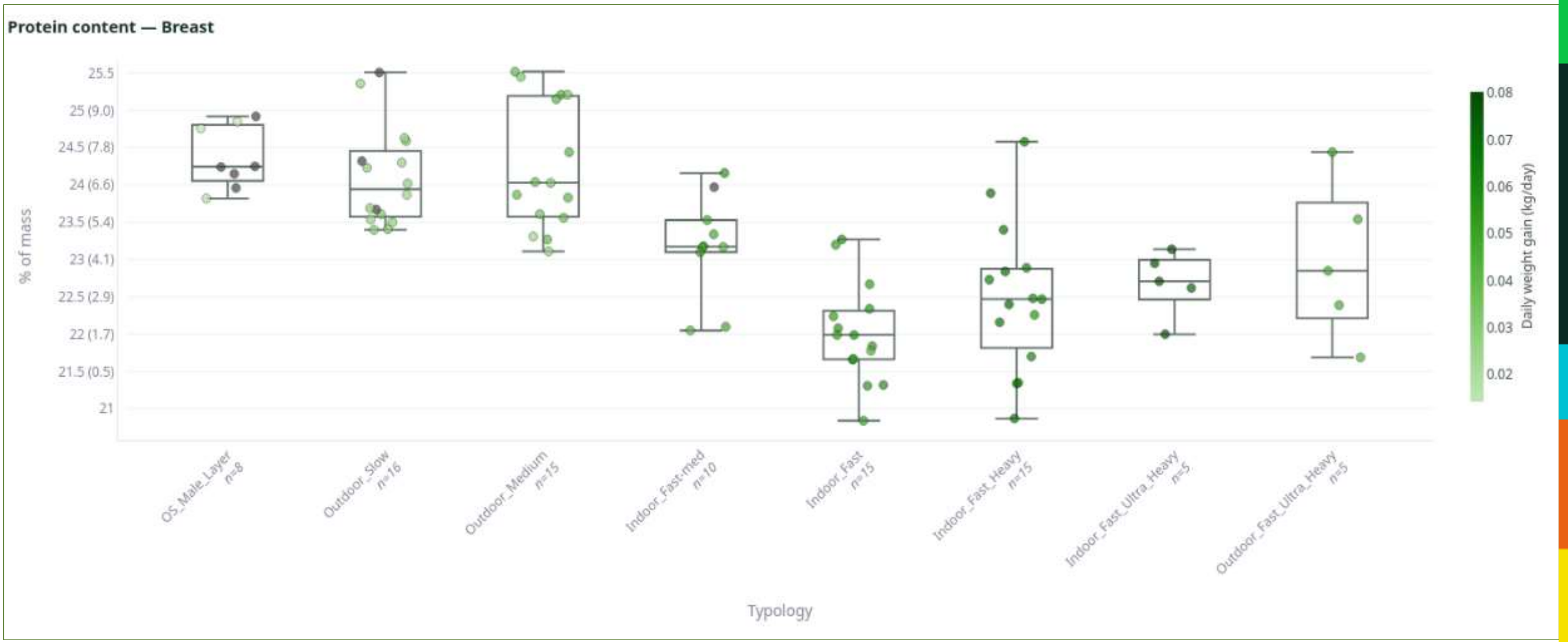
✓ **Open-source tool !**

Developed in Python using open-source libraries

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03. Visualize

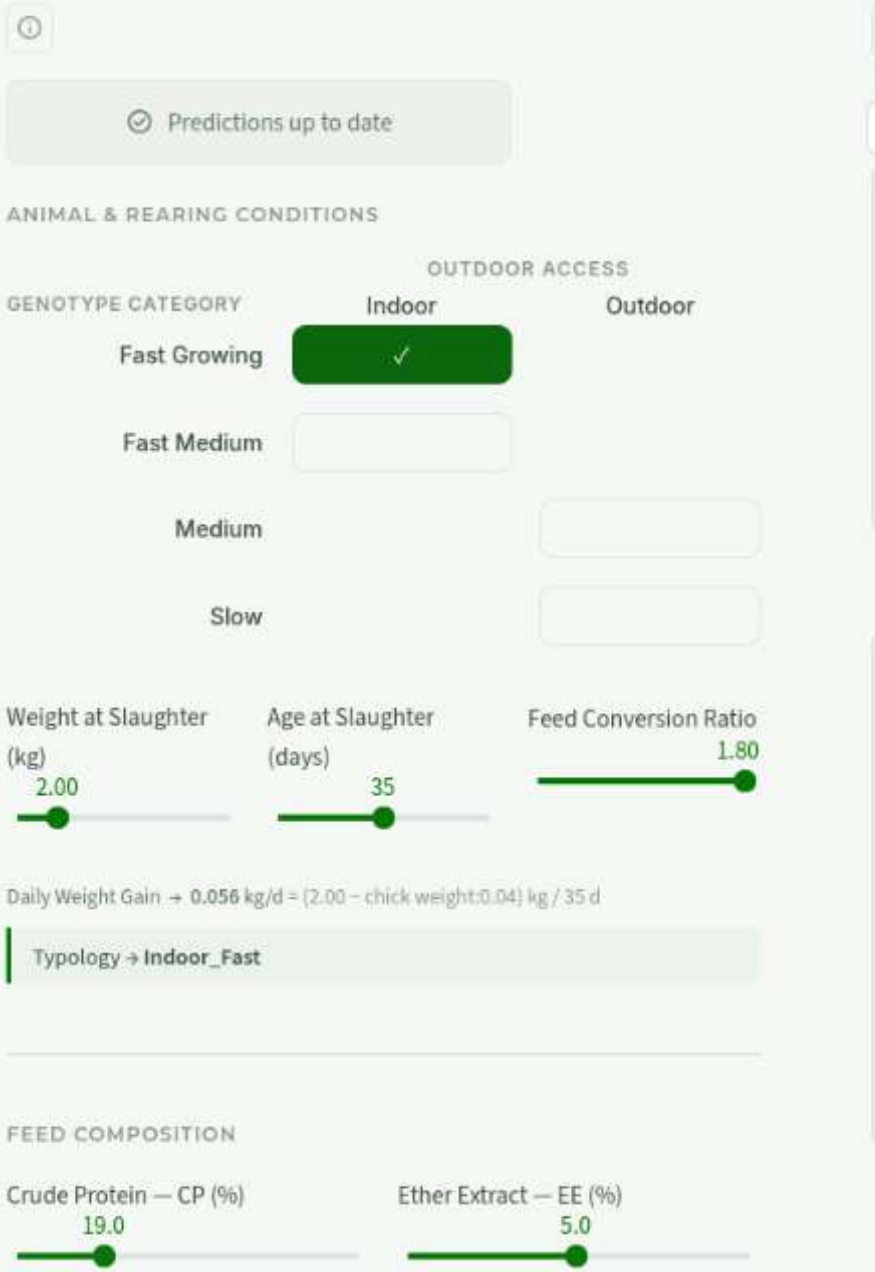
- Explore data
- Create graphs
- Visualize farming practices, quality traits and scores data

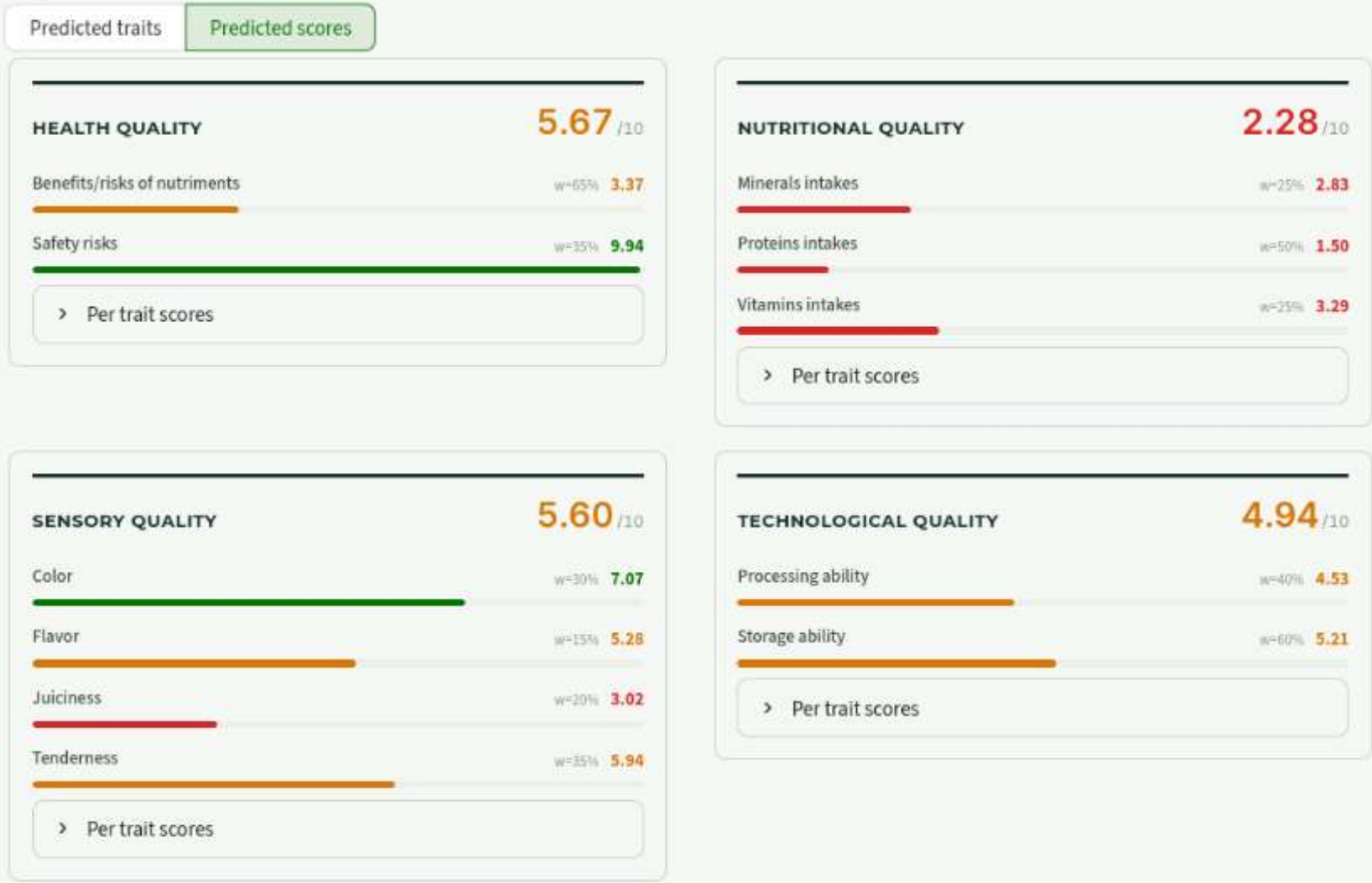


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03. Predict

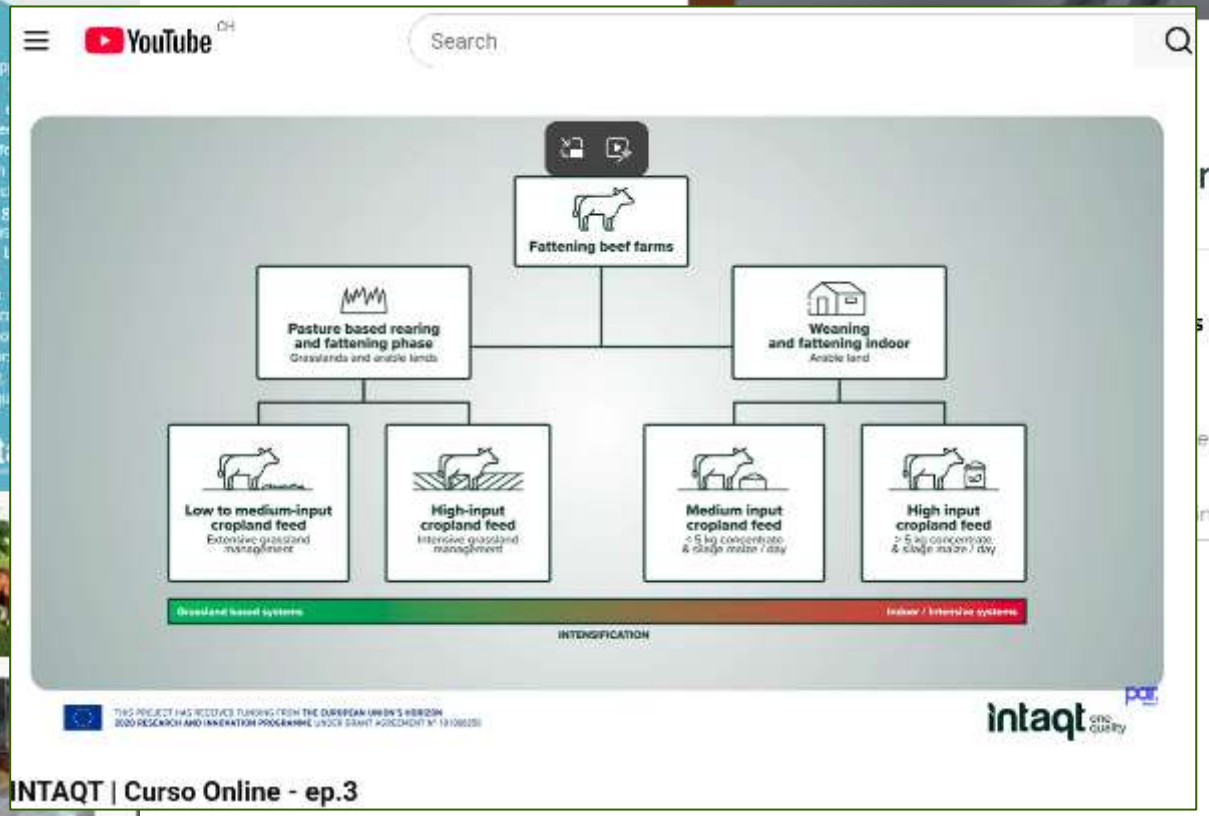
- Chose a set of farming practices
- Predict quality traits, values and scores through pretrained random forest models

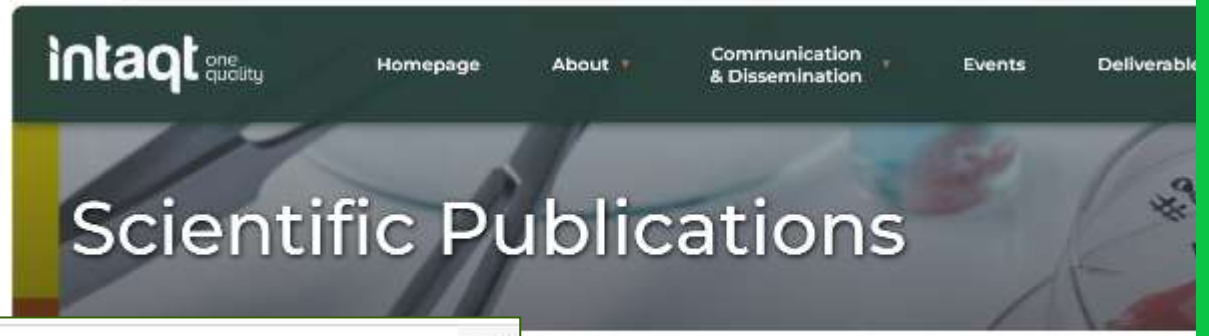




03. Dissemination







ntific Publications

s and authenticate poultry, beef and dairy products

eration of Animal Science

n, E. Sturaro, F. Klevenhusen, S. De Smet, M. Petracci, C.L. De Marchi,

intaqt
one quality

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Thank you for your attention

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