Modelling for the prediction of beef sensory quality

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CONTEXT

Beef Sensory Quality

- **Great** and **uncontrolled variability**
- consumer's **dissatisfaction**

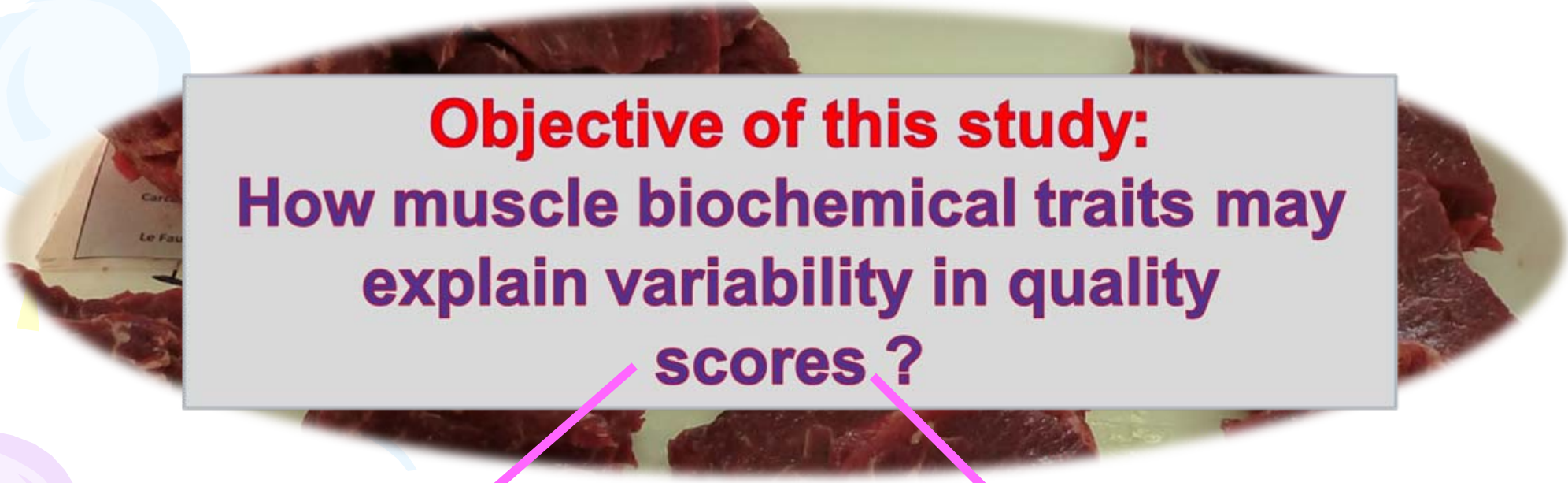
In Europe, there is still no reliable tool to predict beef quality to deliver consistent quality beef to consumer.

Beef Quality depends on differences in muscle characteristics (muscle fibre types, collagen content, lipid content, etc.).

These differences are attributed to different factors:

genetics, muscle type, breed and sex, etc.

aims to advance beef safety and quality across Europe



Objective of this study:
How muscle biochemical traits may explain variability in quality scores ?

1. Trained consumers

2. Untrained consumers

Part 1 of this study:

we have compiled all biochemical data of the muscle tissue from a great number of experiments in a database called **BIF-Beef**

(Integrated and Functional Biology of Beef)

➔ The objective here is to perform meta-analyses in order to relate muscle biochemical data to meat quality.

1. Trained consumers

Part 2 of this study:

We recorded sensory analysis according to the guidelines of **the Meat Standards Australia (MSA)** to relate MSA quality scores to muscle biochemical data system

Legrand et al., 2012, Animal, In Press

2. Untrained consumers

Part 1
of this study

Parte 1 of this study:

Data warehouse BIF-Beef

Breeding

Slaughterhouse

Laboratory

Animal – Carcass – Muscle – Meat

BIF-Beef

43 experiments - **5197** animals

621 variables

330 153 measurements

Request

Statistical Analysis

New data are continuously added

Research Programs

FiLiCol

Qualvigène

Gemqual

Mugène

Ghent

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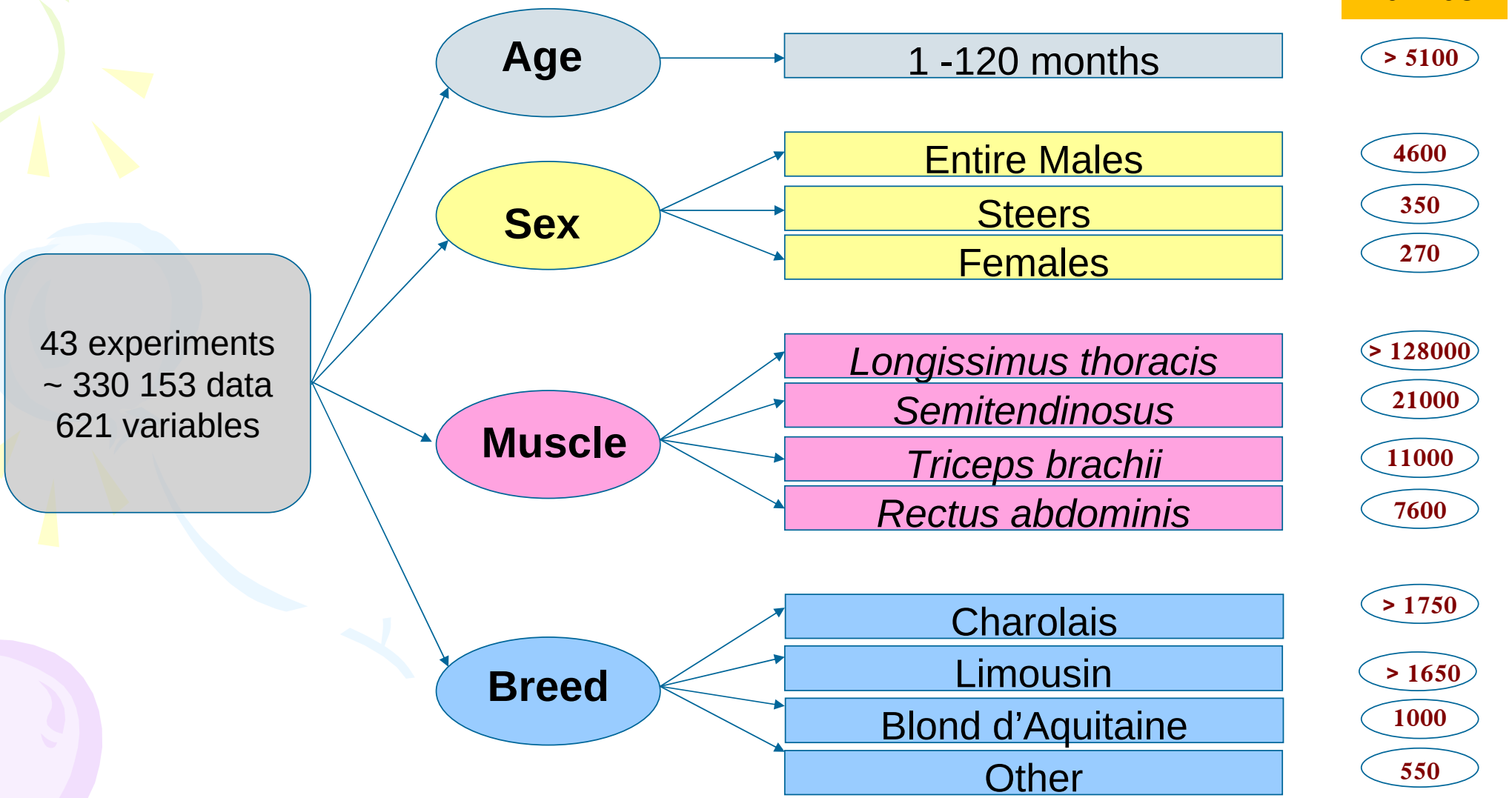
The Whole Data base: BIF-Beef



The **BIF-Beef** data warehouse aims to **associate** the available phenotype data relating to muscle characteristics and beef quality

After an extracting of the selected data

Meta-analysis was realized

Aim of the first part of this work

Explain and predict variability in beef quality by muscle biochemical traits

Materials & methods

4037 striploin
(M. longissimus thoracis)
samples from young bulls of similar age (15 months)

with a specific focus

21 Charolais young bulls
which differed in age from
15 to 26 months

Trained panellists

Relationship between IMF and Flavour (trained panellist consumers)

Results

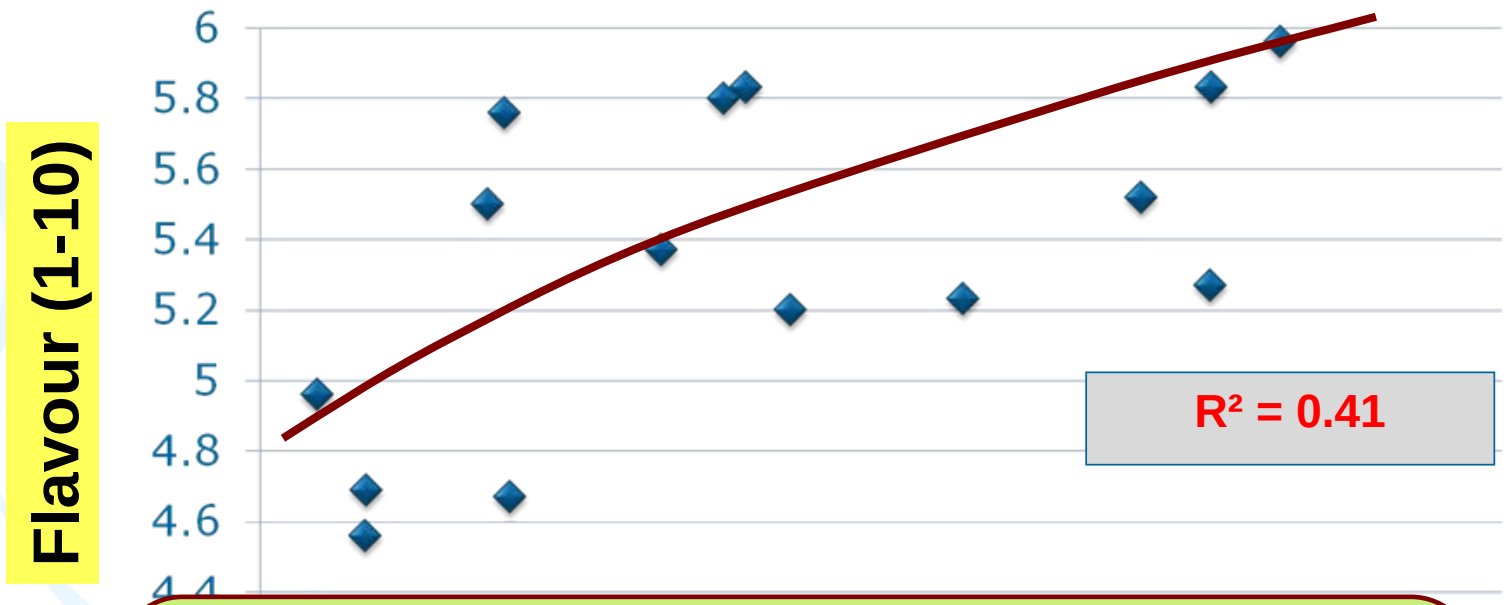
❖ On average, with 4037 striploin samples from mainly young bulls of similar age (15 months of age), the partial correlation between flavour and intramuscular fat level was low but significant (0.11***).

❖ Thus, less than 2% of the variation in flavour could be explained by differences in intramuscular fat level with this homogenous population of young bulls.

Hocquette et al., 2011
Animal Production Science, 2011, 51, 975–981

Results of the specific analysis

With 21 Charolais young bulls which differ in age (from 15 to 26 months)



In that particular case, we can explain up to 41% of the variation in flavour by differences in intramuscular fat content.
Indeed, changes in age induce larger variation in intramuscular fat level and then large differences in flavour.

Part 2
of this study

Part 2 of this study:
We did sensory analysis according to MSA guidelines

Australia has developed the Meat Standards Australia (MSA) since 1996.
MSA is a product grading scheme to predict beef quality by **untrained** consumers.

Score are allocated for each individual "muscle x cooking method" combination using various information on the corresponding animals and meats.

In a precedent study, we demonstrated that it would be possible to manage a grading system in Europe similar to the MSA system

Legrand et al., 2012

Unsatisfactory | Good every day | Better than everyday | Premium

Materials & methods

108 cuts from 6 different muscles

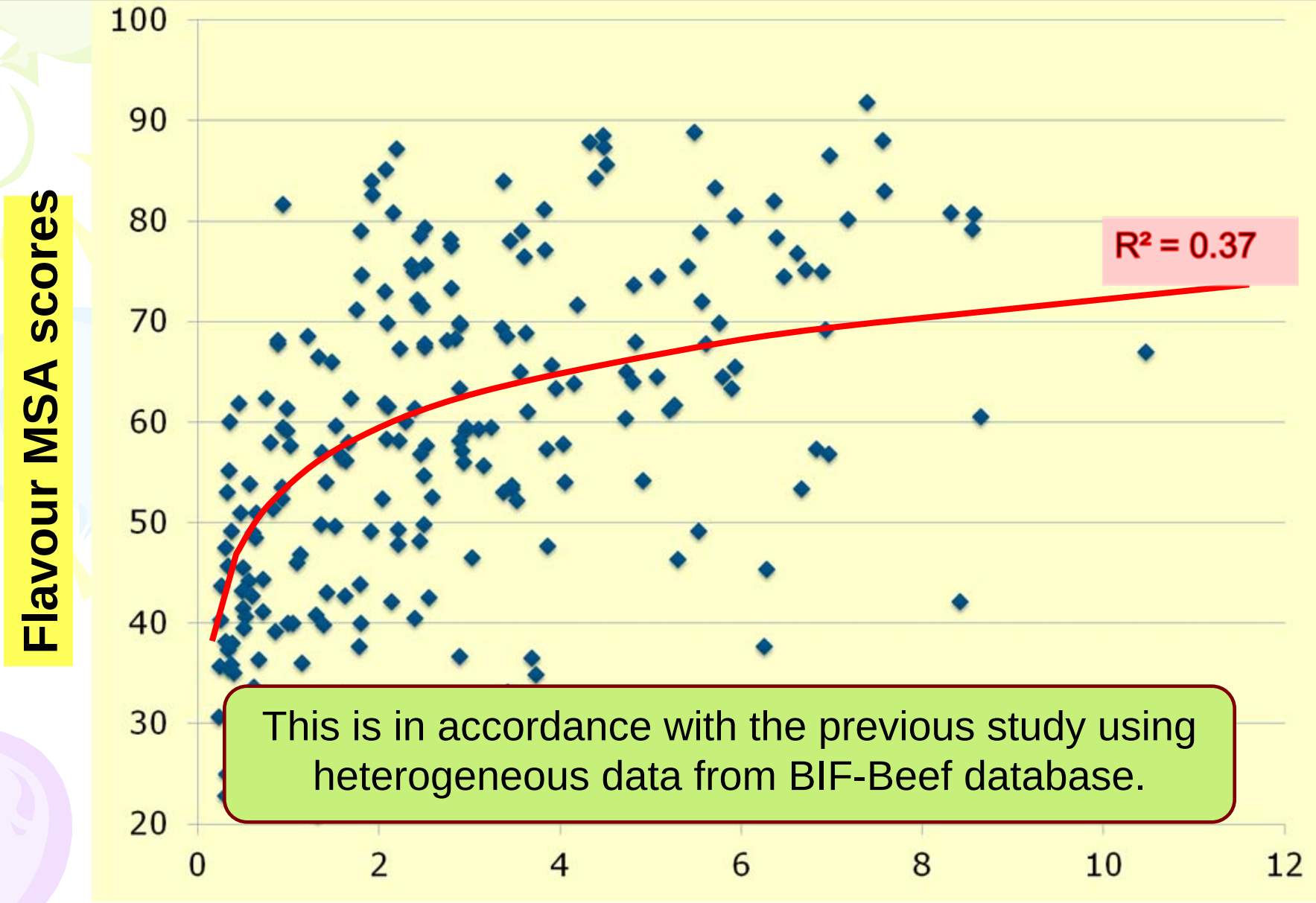
[Outside (M. biceps femoris) Topside (M. semimembranosus) Striploin (M. longissimus thoracis), Rump (M. gluteus medius) Oyster blade (M. infraspinatus) Tenderloin (M. psoas major)]

sampled from 18 animals of different ages, breeds and sexes

(3 young bulls +15 cows)

Untrained panellists

Relationship between IMF and Flavour MSA scores (untrained consumers)



Relationship between MSA scores and biochemical muscle data

Other significant correlations: R^2 ($P<0.05$)

Soluble / total collagen (Solubility indicator)

- with MSA tenderness score: $R^2 = 0.33$
- with MSA overliking score: $R^2 = 0.29$
- with MSA palatability score: $R^2 = 0.30$

Palatability score

=

(0.3 Tenderness + 0.3 Flavour + 0.1 Juiciness + 0.3 overliking)

CONCLUSIONS

This is among the first studies which related biochemical parameters of the muscle tissue to quality scores determined by untrained consumers

With untrained consumers, this study confirmed the importance of intramuscular fat level for beef flavour and of collagen solubility for tenderness, which is in accordance with observations with trained panelists

It is possible to develop a predictive model of beef quality from muscle and biochemical traits (this study) combined with muscle structure and genomic biomarkers (not presented)

Thank you for your attention

CONSEIL RÉGIONAL AUVERGNE