



Meta-analysis of beef sensory quality

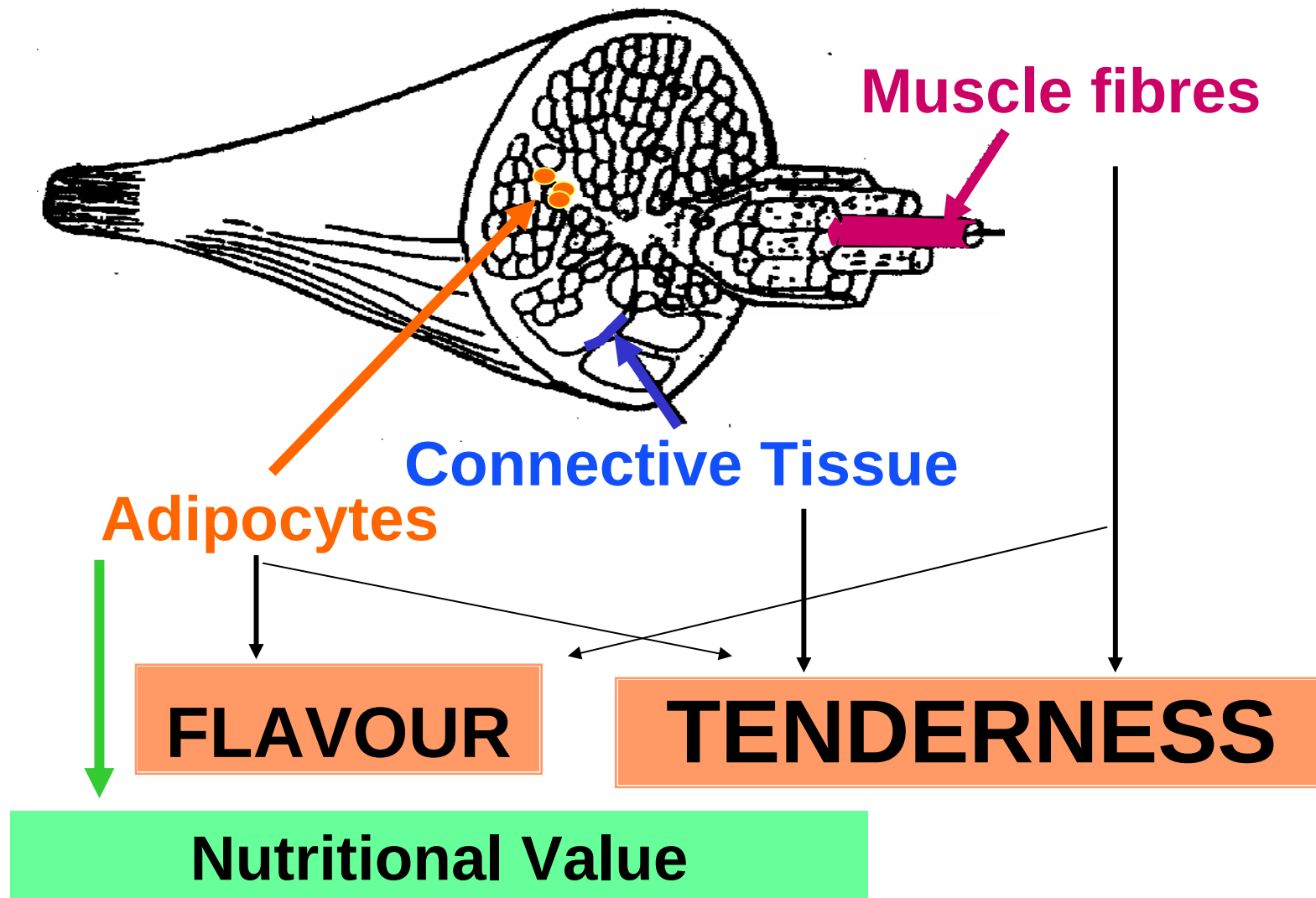
P. MEURICE, J.P. BRUN, C. JURIE, B. PICARD, G.R. NUTE,
J.F. HOCQUETTE

INRA, Unité de Recherche sur les Herbivores, France

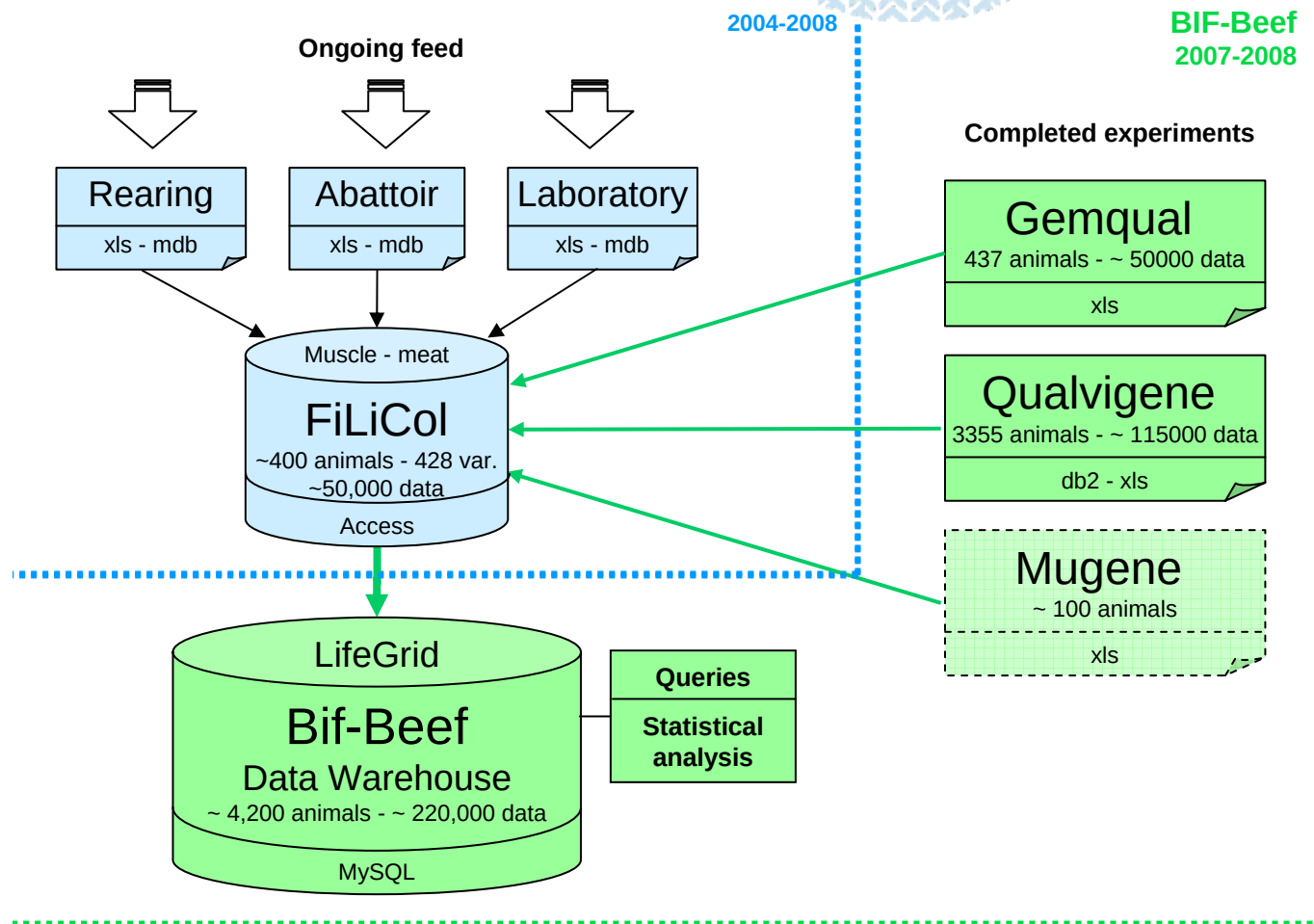
59th EAAP 2008 Congress, August 24th-27th 2008, VILNIUS, LITHUANIA.
Abstract number 3444, Session 21



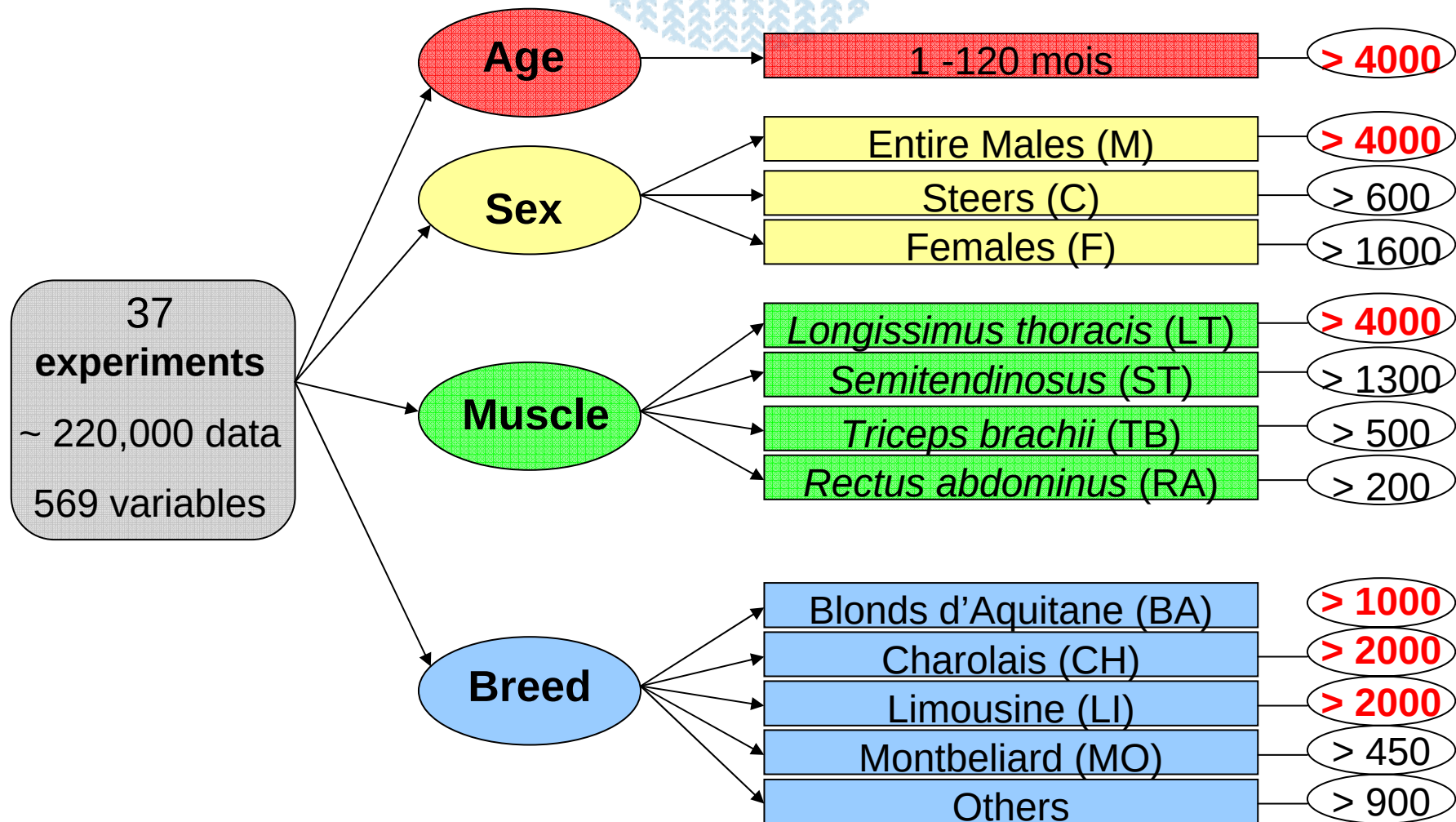
Muscle characteristics and beef quality



Data Warehouse, Integrative Biology and Beef Meat



The Whole Data Base



Extracting data : Query definition

Tools bar

Table frame

Selection of

- experiments
- variables
- animals

Data selection - Mozilla Firefox

http://localhost/BIF-Beef/index.php?page=form&id=113

INRA BIF-Beef

Query : Gemqual

Structure

Not displayed	Rows	Columns	Data
Data code Experiment Lot Slaughter age (years) Measurment age (days) Measurment age (months) Sex Site Metabolit Manager Database Data type Unit Description+Biblio Data Data type (abbrev.)	Country Breed Animals Slaughter age (months)	Data (abbrev.)	☐ number of animals ☐ number of measurements ☒ mean ☐ min ☐ max ☐ standard deviation

Selection of experiments

☐ Data Bases
☐ Experiments
☐ Lots

Selection of measurements

☒ Sensory data

Not selected :
Tendreté initiale J14
Tendreté globale J14
Résidu J14
Jutosité J14
Flaveur J14
Flaveur anormale J14
Flaveur typique J2

Selected :
tendreté J10 UK+ajustement Espagne
tendreté J10 Espagne+ajustement UK
flaveur J10 UK+ajustement Espagne
flaveur J10 Espagne+ajustement UK

☐ Laboratory data
☐ Farming and slaughter data

☒ Sites

Not selected :
FOIE
PLASMA
OS
TISSU ADIPEUX INTERMUSCULAIRE
TISSU ADIPEUX PERIRENAL

Selected :

☐ Metabolit
☐ Manager

Selection of animals

☐ Sex
☐ Age
☐ Breeds

Extracting data: Result

Result : Gemqual - Mozilla Firefox

Eichier Édition Affichage Historique Marque-pages Outils ?

http://localhost/BIF-Beef/index.php?page=res&irid=113

INRA BIF-Beef

Gemqual

Country	Breed	Animals	Slaughter age (months)	Pesées	Pco_E	Pds_Ab	LT	EPC	JS	CS_LD-LT	COX_LD-LT	LDH_LD-LT	ICDH_LD-LT	PROT_FR_LD-LT	H_Garrot	L_Pelvis	L_C
Danemark	Holstein	DK1758701384	15	444.25	293	531.3	132	25.5	84	5.9	12.02	978	1.28	165.39	127.33	45	
Danemark	Holstein	DK1780101636	15	466.5	329	621.9	135	25.5	87	6.89	12.15	997.3	1.91	182.19	135	46.67	12
Danemark	Holstein	DK1780101638	15	399.5	283	515.4	133	24	86	6.14	14.01	873.9	1.57	173.33	134	42.67	12
Danemark	Holstein	DK4317101068	15	491	342	607.6	137	27	87	8.09	15.05	967.1	2.16	165.96	132.67	46	
Danemark	Holstein	DK4448003757	15	487	360	663.5	142.5	27	89.5	5.4	5.95	854.5	0.949	183.31	141.67	48.33	12
Danemark	Holstein	DK4448003759	15	407	289	504.6	134	25	87	9.43	14.33	846	1.96	222.36	137	46	13
Danemark	Holstein	DK4615901344	15	424.75	308	582.1	131	25.5	85	6.62	16.13	1085.7	1.82	193.63	132	45.33	
Danemark	Holstein	DK4707800906	15	446.5	309	555.7	137	26	87.5	6.8	12.31	952.6	1.34	199	139.33	49	12
Danemark	Holstein	DK5011501525	14	471.5	321	585.6	131	25.5	82	7.58	13.38	1030	1.35	216.95	130	46.33	12
Danemark	Holstein	DK5011501535	15	446.5	315	589.1	130	26.5	84	6.71	16.29	864.2	0.827	213.19	136.67	46	
Danemark	Holstein	DK5011501536	15	498.5	339	658.8	140	27	85	6.99	19.61	1037.3	1.1	220.2	135.33	49	
Danemark	Holstein	DK5011501537	15	485.5	313	609.1	130	26	84	6.75	12.66	984	0.671	209.94	127.33	48.33	12
Danemark	Holstein	DK5011501538	15	475	347	628.3	139	29	87	8.14	20.84	867.8	1.07	212.12	132.67	45	13
Danemark	Holstein	DK5011501539	15	469.25	331	633.4	136	26	85	6.81	15.21	994.9	1.14	207.15	130	45.67	
Danemark	Holstein	DK5011501540	15	402	282	527.1	126	25	83	5.42	10.33	901.7	0.71	204.34	127.67	45.33	12
Danemark	Holstein	DK5011501542	15	511	334	624.6	136	26.5	88	7.25	10.37	1011.9	1.42	174.56	132.67	47.33	12
Danemark	Holstein	DK5011501545	15	450.75	317	595.1	136	26.5	84	7.21	11.41	1034.9	1.45	188.7	131	45	12
Danemark	Holstein	DK5123201849	14	440.25	301	566.1	134	25.5	88.5	4.01	14.37	909	1.74	190.31	129.67	47.67	
Danemark	Holstein	DK5123201851	14	468	299	586.4	137	25.5	83	4.24	13.34	854.5	1.38	200.94	127	48	13
Danemark	Holstein	DK5123302521	15	483	350	646.6	137	27	86	6.04	12.69	948.9	1.2	204.91	135	49.67	13
Danemark	Holstein	DK5123302523	14	512	358	664.1	140	27.5	86.5	6.11	7.29	1074.8	1.08	191.77	133	47.33	13
Danemark	Holstein	DK5123302524	14	479.25	345	624.8	134	27.5	86	8.52	20.34	1008.2	1.11	191.41	135	46.33	13
Danemark	Holstein	DK5179400880	15	432	310	604.4	138	27	85	7.24	11.34	1044.5	1.27	181.61	132.33	47	13
Danemark	Holstein	DK5179400921	14	395	267	498	128	26	84	5.91	9.33	1094.2	1.12	207.79	129	45	13
Danemark	Holstein	DK5179400922	14	503	349	649.1	140	27	89.5	6.98	10.95	1070	1.43	198.89	139	49.67	
Danemark	Holstein	DK5264401555	14	461.25	340	624.0	137	26.5	88	6.98	14.56	1042.4	1.02	211.87	132.67	46	12

Data analysis

Data
management

Parameters

R : statistical analysis - Mozilla Firefox

Fichier Édition Affichage Historique Marque-pages Outils ?

http://localhost/BIF-Beef/R/

Result : Gemqual R : statistical analysis

Data : Gemqual

Country
Breed
Animals
Slaughter.age.months.
Pesces
L
P
Pee_E
CIS_ML_CUJ02
CIS_ML_CUJ10
CIS_ML_CRJ10
Jutosite fusion(JUTJ10_UK,JUTJ10_ES)

PCA

variables

☒ TENJ10_UK
☒ FLAJ10_UK
☒ Jutosite
☒ LDH
☒ ICDH
☒ TL_WFA

center -

color Breed

axe 1 1

axe 2 2

matrix correlation matrix

loadings ☐ yes ☒ no

scores ☐ yes ☒ no

Go

ANOVA

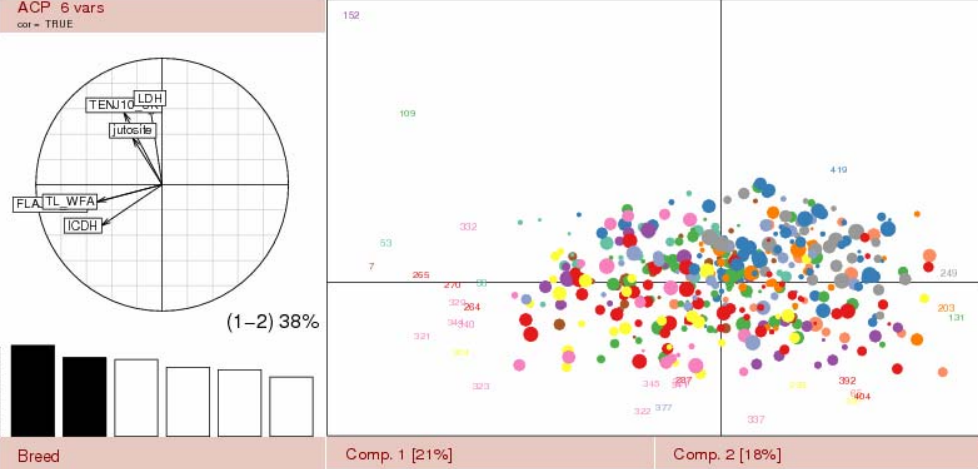
Correlation

Plot

Linear Regression

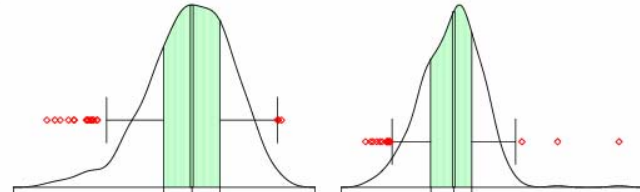
R output Gemqual

ACP 6 vars
col = TRUE



(1-2) 38%

Breed

Loading required package: ade4
[1] TRUE
matrice : correlation

```
options(echo = FALSE)
attach(Gemqual, warn.conflicts = FALSE)
fusion<-function(a,b) {
  isna=is.na(a)
  ab<-b
  ab[!isna]<-a[!isna]
  return(ab)
}
```

R Code



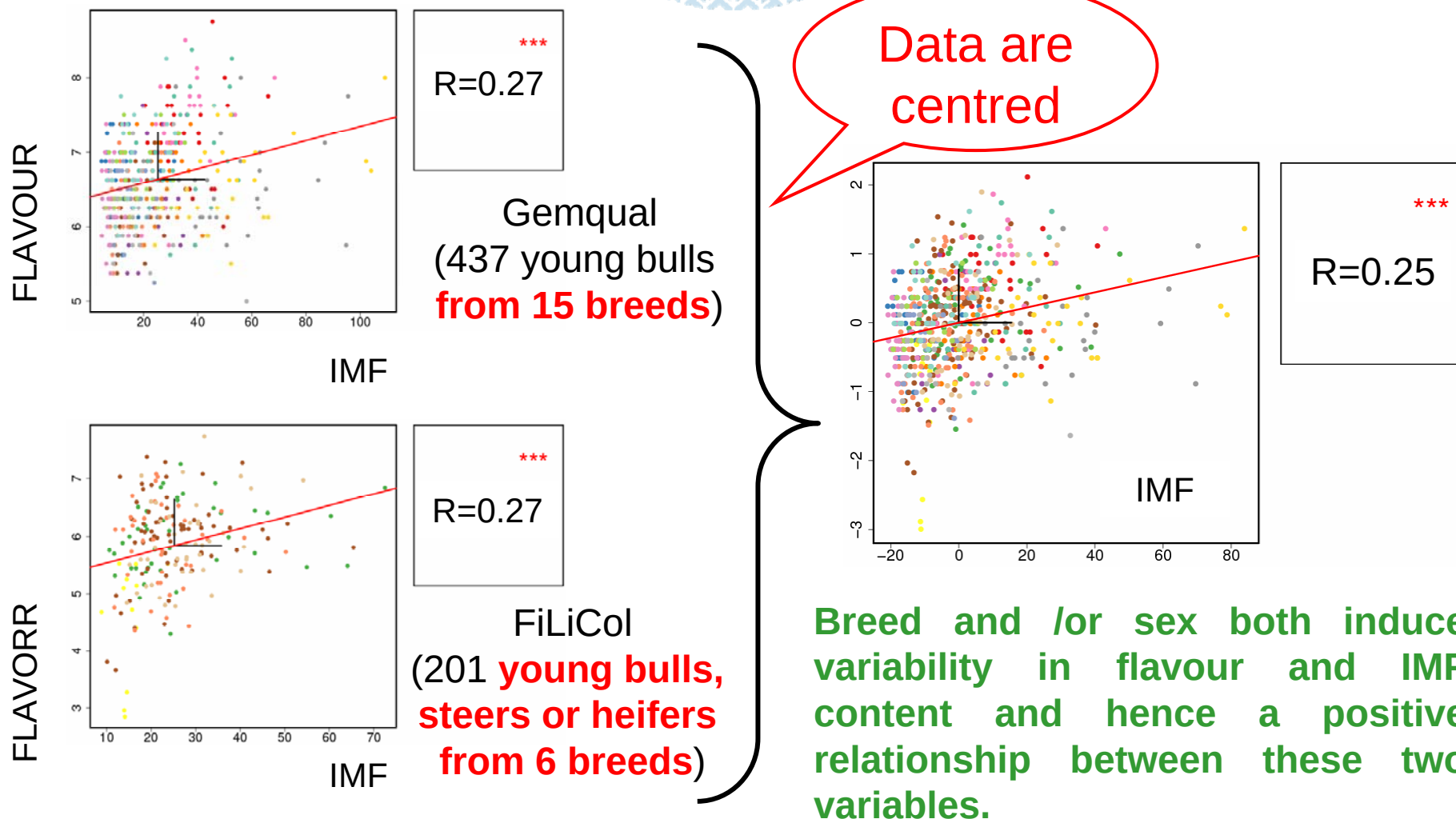
Difficulties associated with the fusion of pre-existing smaller databases

Example : shear forces

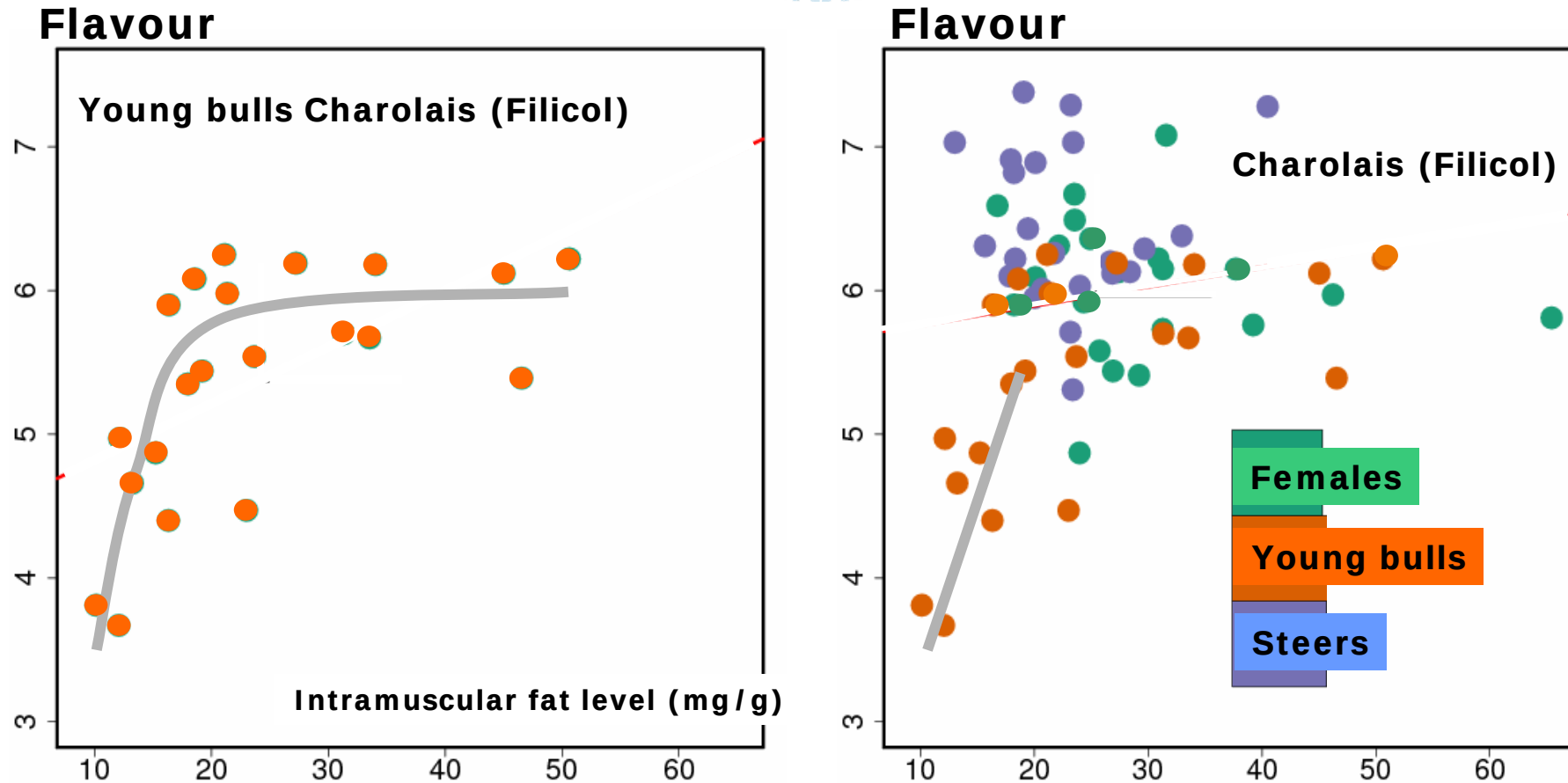
variable	measurement	cooking	ageing	base
WBJ14	WB : Maximum load	Grilled to 55°C internal temp.	14 days	QUALVIGENE
WBJ14nrj	WB : Energy	Grilled to 55°C internal temp.	14 days	QUALVIGENE
WBJ02	WB : Maximum load on cooked meat 48h	80°C waterbath to 78°C internal temp.	2 days	GEMQUAL
WBJ10	WB : Maximum load on cooked meat 10d	80°C waterbath to 78°C internal temp.	10 days	GEMQUAL
cisJ14	Shear force	raw	14 days	FILICOL
cisJ10	Shear force : maximum load on raw meat 10d	raw	10 days	GEMQUAL



An example of application: relationships between flavour and intramuscular fat content (IMF)



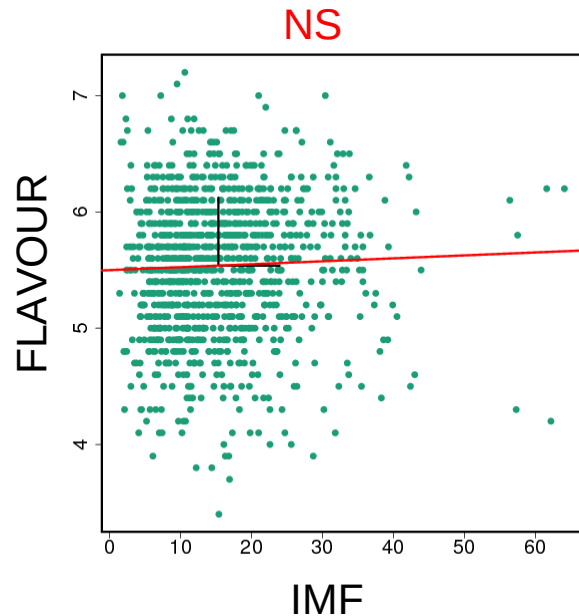
Relationships between flavour and intramuscular fat content (IMF) within the Charolais breed



The positive relationship between flavour and IMF appears mainly for young bulls

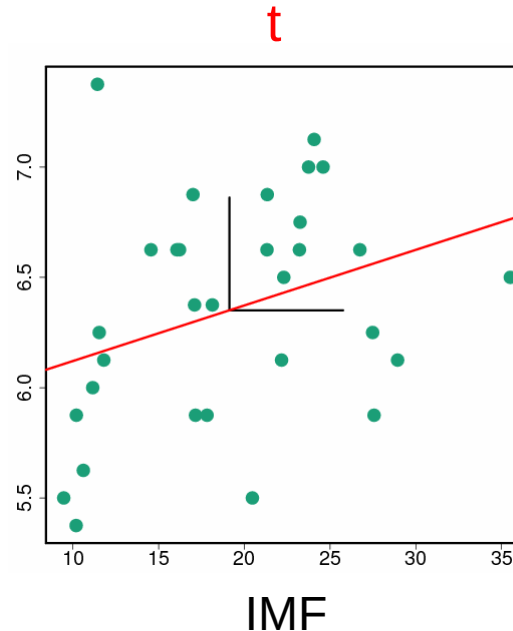
Relationships between flavour and intramuscular fat content (IMF) in Charolais young bulls

Qualvigene :
 $R = 0.04$



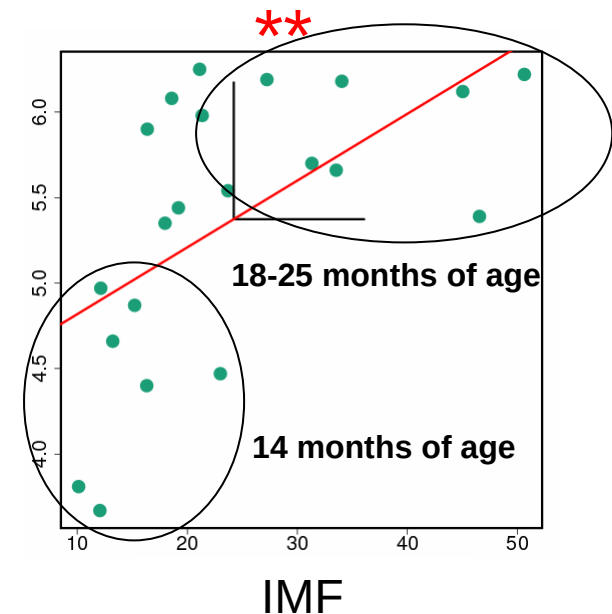
1111 Charolais young bulls of the same age (14-17 months)

Gemqual :
 $R = 0.33$



31 Charolais young bulls of the same age (14-17 months)

FiLiCol :
 $R = 0.58$

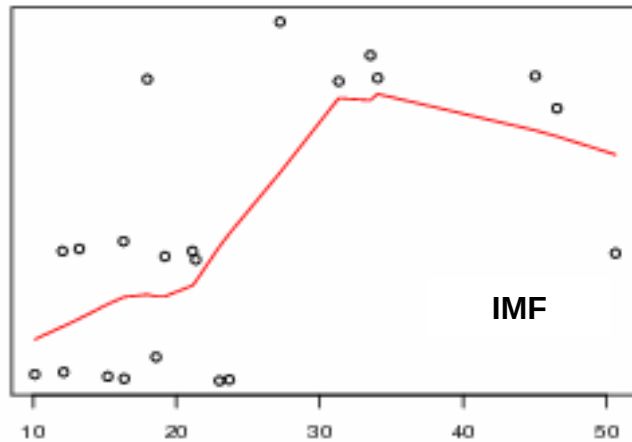


21 Charolais young bulls of **various ages** (14-25 months)

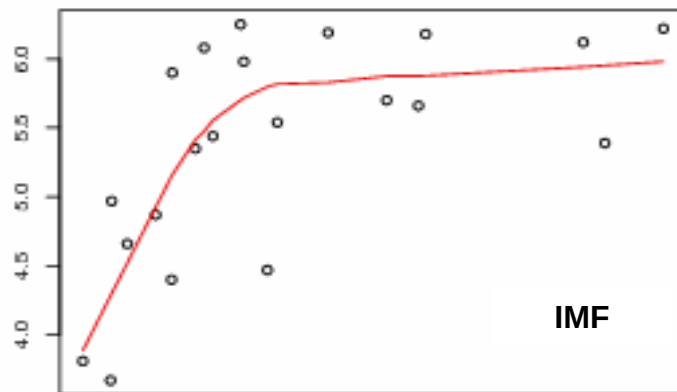
Age induces variability in flavour and IMF and hence a positive relationship between these two variables

Relationships between flavour and intramuscular fat content (IMF) in Charolais young bulls

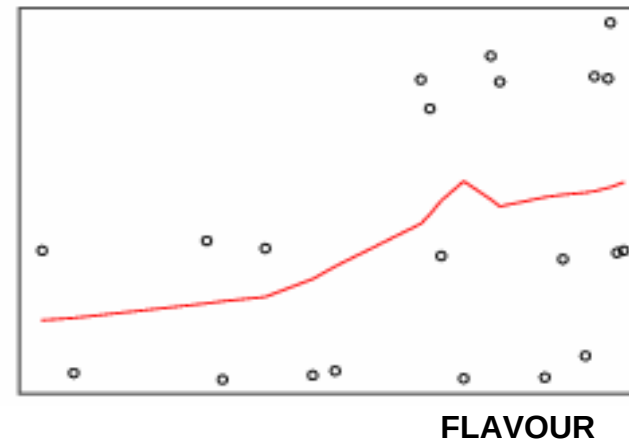
AGE



FLAVOUR



AGE



Age does induce increase in both flavour and intramuscular fat level

Conclusions

There is no relationship between intramuscular fat level and flavour of beef in homogeneous populations of beef cattle.

However, age, breed or sex induce variability in flavour and intramuscular fat level.

Therefore, flavour may be related to intramuscular fat content in heterogeneous populations of cattle (which vary for breed or age).



Future of the project

Next steps :

- To analyse other types of relationships
- To merge the database with others
- To open the database to new partners
- To identify laws between variables from the literature
- To setup experiments to complete the database and underline new laws
- To set up a repository of measures: a restricted number of variables the definition of which would be accepted in Europe or in the world

