



# Ultrasonography as a method to determine body composition in cattle

Christophe STAUB – INRA Val de Loire – UE1297 PAO – Nouzilly – France

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# INTRODUCTION

- ❖ Estimation of body composition in live cattle is difficult
- ❖ Body condition score
- ❖ Adipose cell number and diameter (Robelin, 1981)
- ❖ Ultrasonography (for review see Schröder and Staufenbiel, 2006)
- ❖ Three-dimensional camera (Fisher et al., 2015 ; Spoliansky et al., 2016)

# INTRODUCTION

- ❖ Estimation of body composition in live cattle is very useful
- ❖ Good knowledge of body condition in a herd
- ❖ Optimization of nutrition program
- ❖ Optimization of reproduction management
- ❖ Better production and longevity of animals in herd
- ❖ Best rentability of animals at slaughter

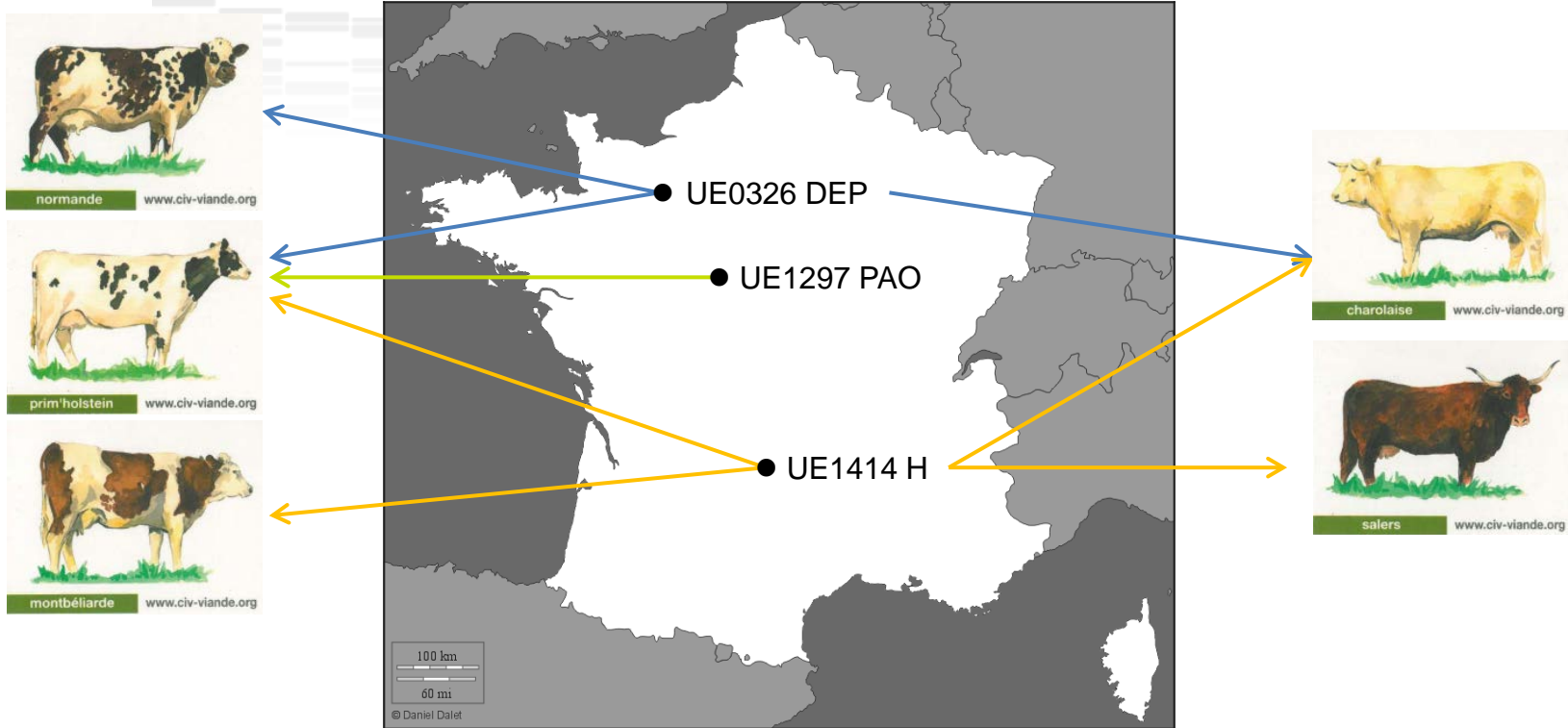
# AIMS

- ❖ **Validate a reference methodological framework to measure body fatness using ultrasonography**
- ❖ **Compare the results obtained at 4 anatomical sites and their relevance to the Body Condition Score**
- ❖ **Take advantage of the genetic wealth of INRA herds to generate reference data for 5 breeds**

# EXPERIMENTAL DESIGN

- ❖ 160 cows measured twice
- ❖ 5 different breeds : Normande, Holstein, Montbéliarde, Charolaise and Salers
- ❖ 4 anatomical sites : buttock, lumbar, back and rib
- ❖ 14688 ultrasound measures : skin, fat and muscles thickness
- ❖ 2 different ultrasound devices : Prosound (Aloka) and MyLab 30 Gold Vet (Esaote Pie Medical)
- ❖ Weight and BCS were measured at each ultrasound session

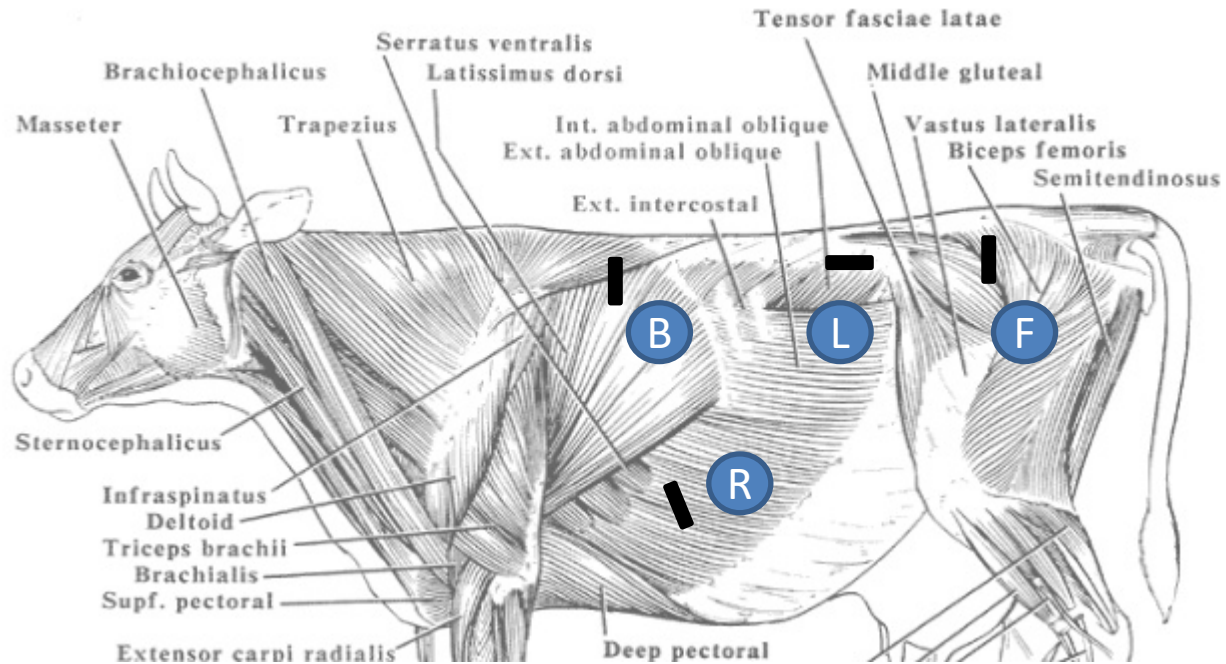
# EXPERIMENTAL SITES



# METHODOLOGY

Site	Anatomical landmark	Ultrasonic landmark	Fréquence (MHz)
<b>F buttock</b>	half way between the tip of the hip and the tip of the ischium	below the biceps femoris, to the intersection between the gluteus	5
<b>L lumbar</b>	at the level of the 4th lumbar vertebra between the 2nd and 3rd transverse processes	at the recess of the fourth lumbar vertebra	5
<b>B back</b>	in the back, in the range between the 12th and the 13th ribs	at the minimum thickness of the loin (longissimus dorsi)	3.5
<b>R rib</b>	in the range between the 12th and the 13th ribs, at the end of the 13th rib	at the end of the 13th rib, identifying the intercostal muscles and the peristaltic movements of the intestine	5

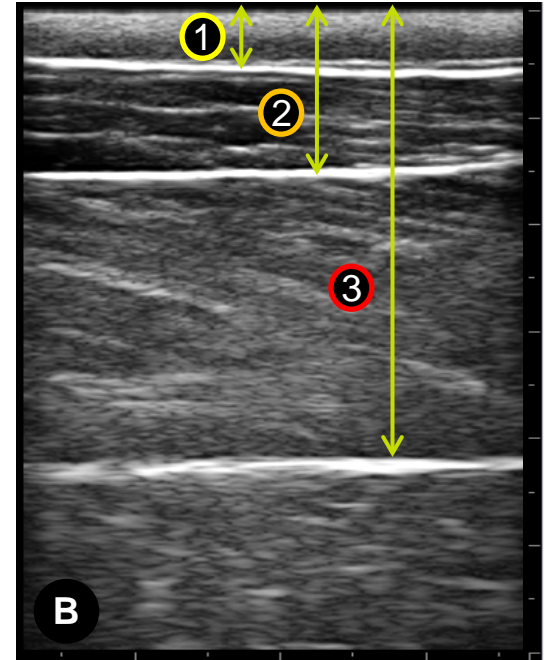
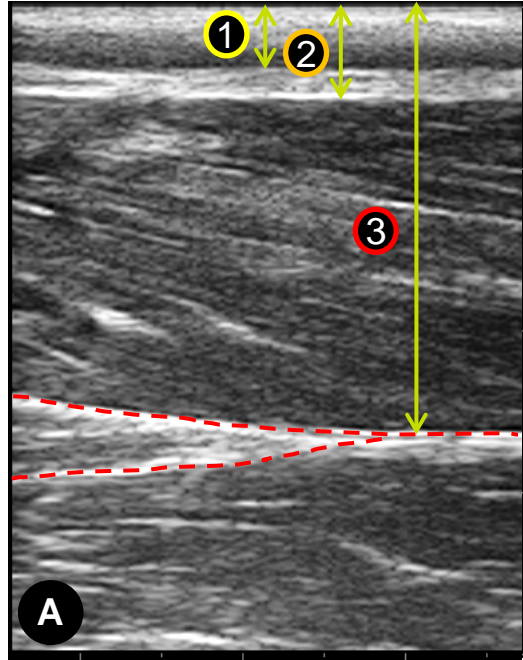
# METHODOLOGY





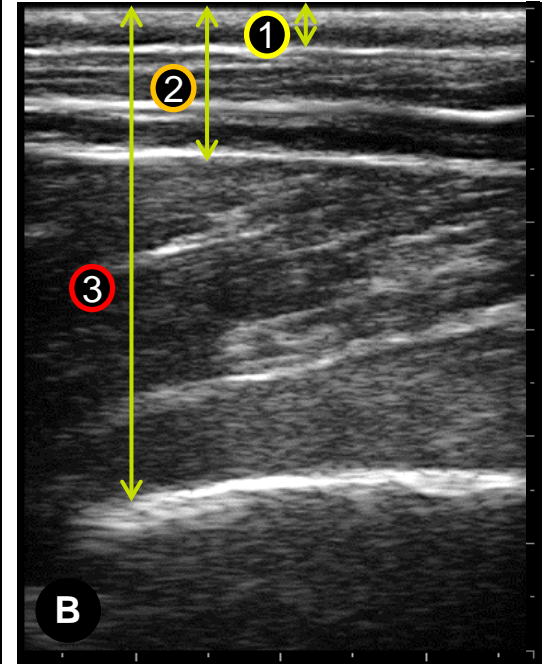
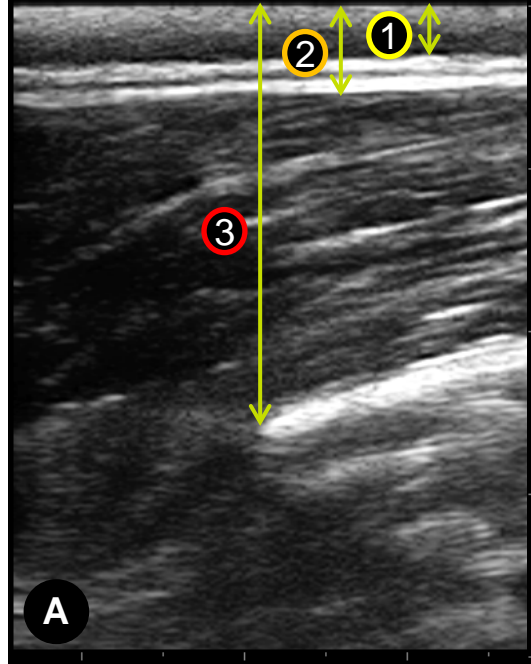
# ULTRASONOGRAPHY

## The F site at the buttock



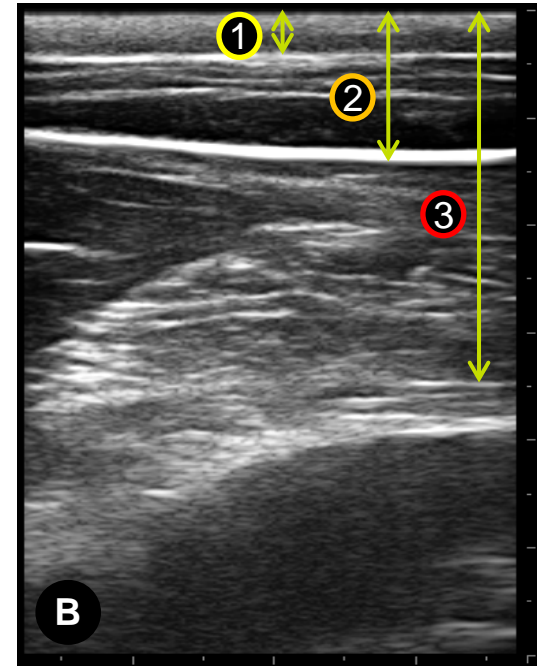
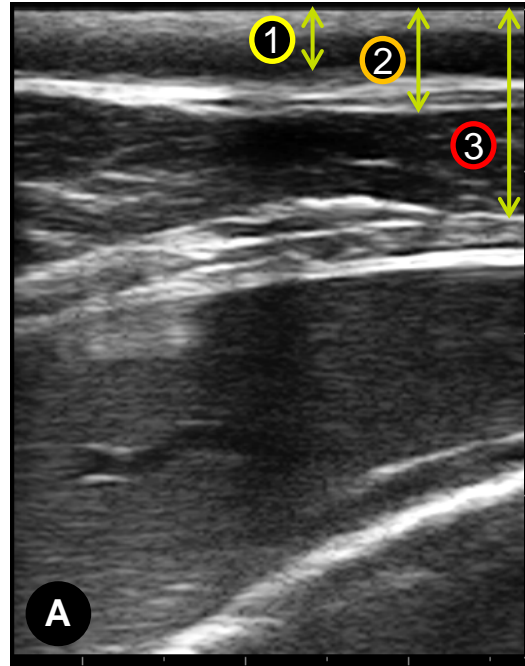
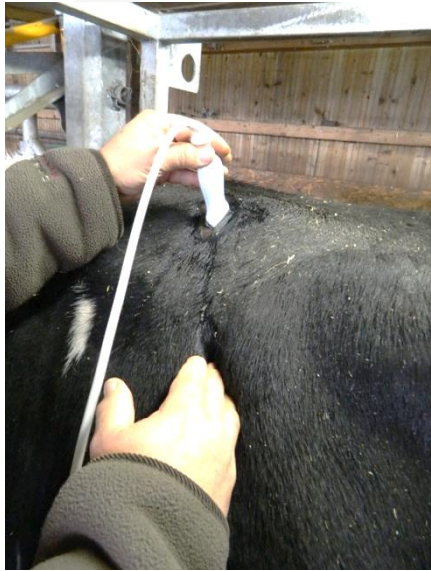
# ULTRASONOGRAPHY

## The L site at the lumbar L4



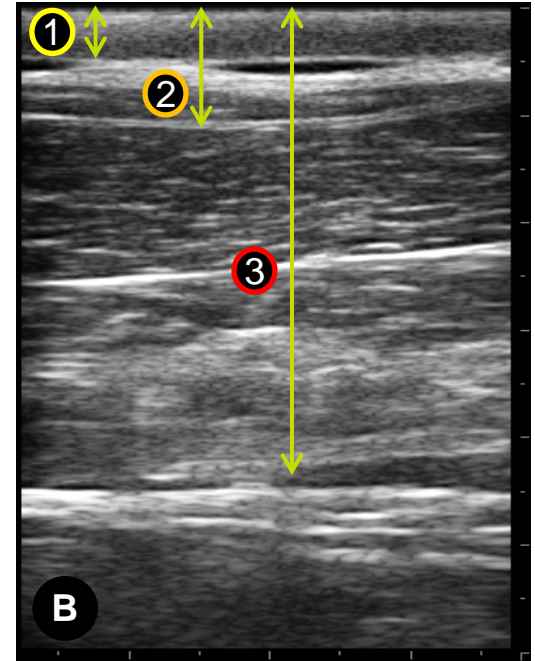
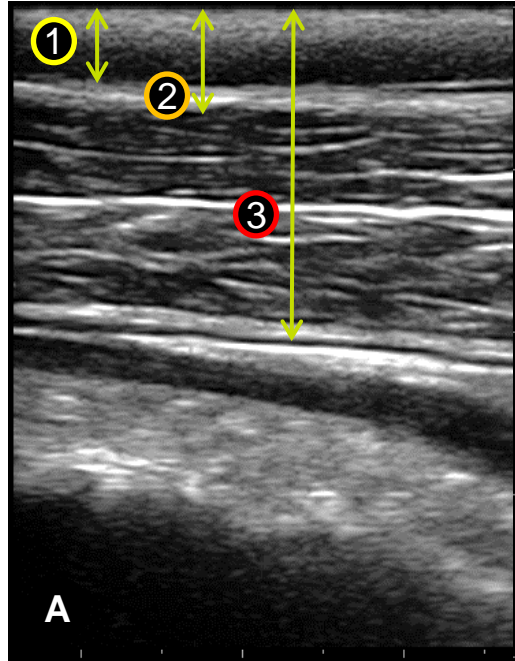
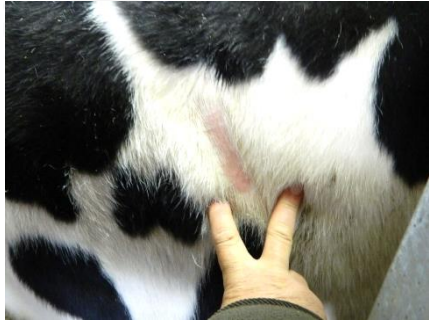
# ULTRASONOGRAPHY

## The B site at the back D12-13



# ULTRASONOGRAPHY

The R site at the end of the 13<sup>th</sup> rib



# VALIDATION OF THE METHOD

	Repeatability (variation in %)	Reproducibility (variation in %)	Variation between experimenters (%)
FS	4.11	3.13	6.57
FSA	1.53	4.22	6.64
FSAM	0.41	3.04	4.74
LS	3.55	3.45	3.31
LSA	1.71	4.02	5.43
LSAM	0.65	3.72	3.39
BS	3.58	6.24	5.56
BSA	2.49	10.60	4.69
BSAM	1.43	6.34	5.86
RS	2.64	7.29	4.06
RSA	2.80	3.89	5.81
RSAM	0.54	10.57	5.22

**F** : buttock

**L** : lumbar

**B** : back

**R** : rib

**S** : skin

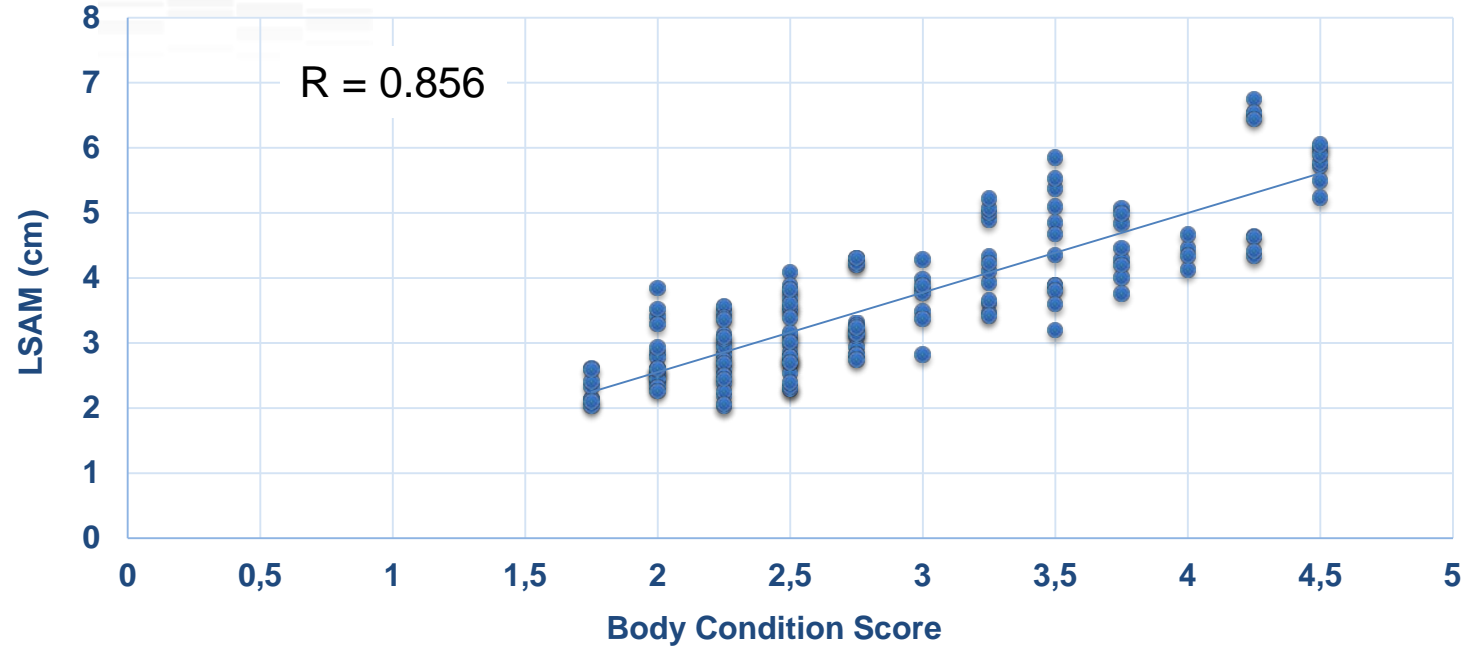
**A** : adipose tissue

**M** : muscles



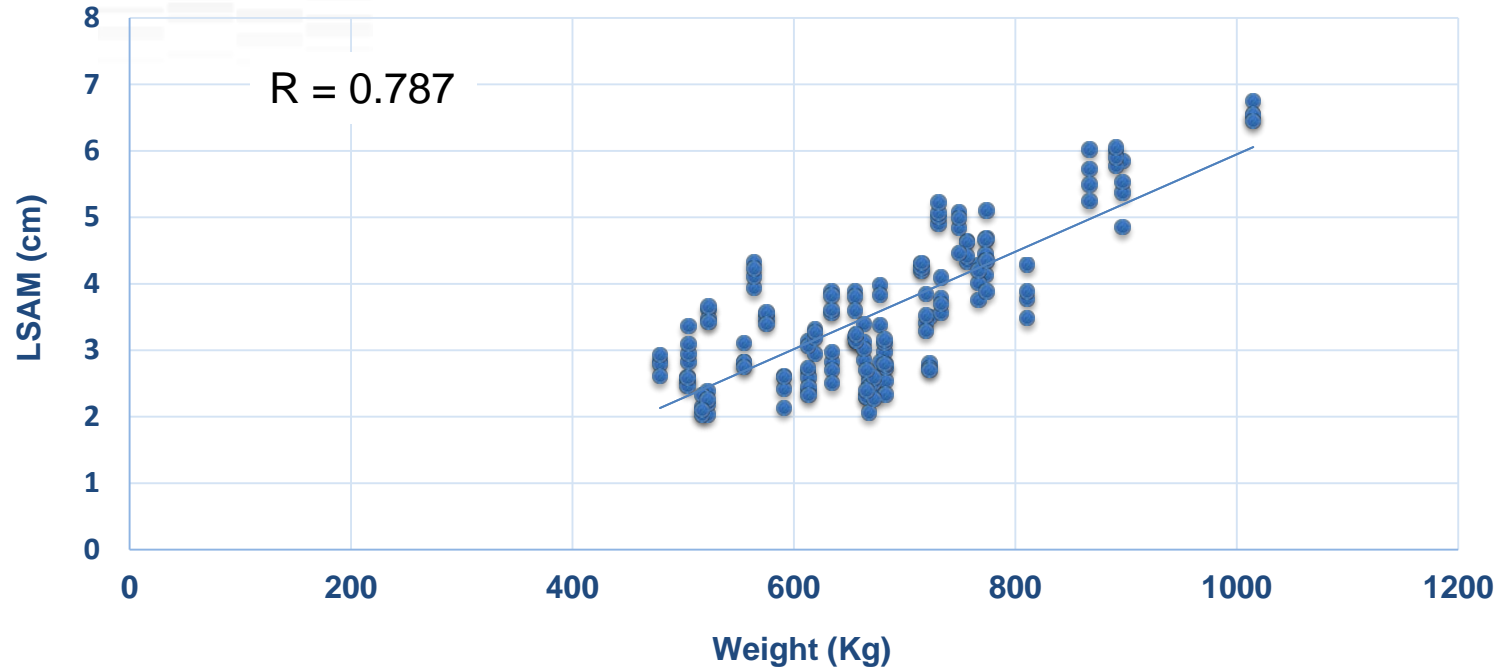
# RESULTS

## Fat and muscle at the lumbar site of Normande cows



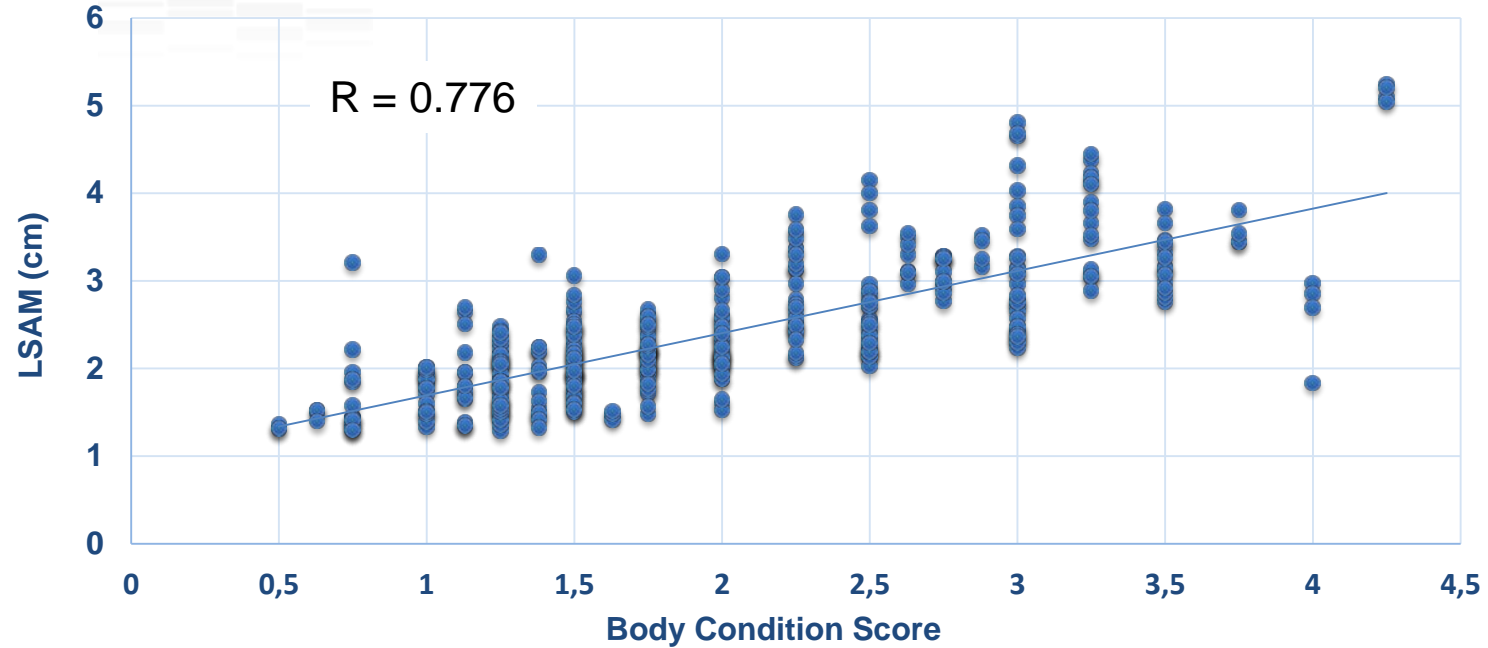
# RESULTS

## Fat and muscle at the lumbar site of Normande cows



# RESULTS

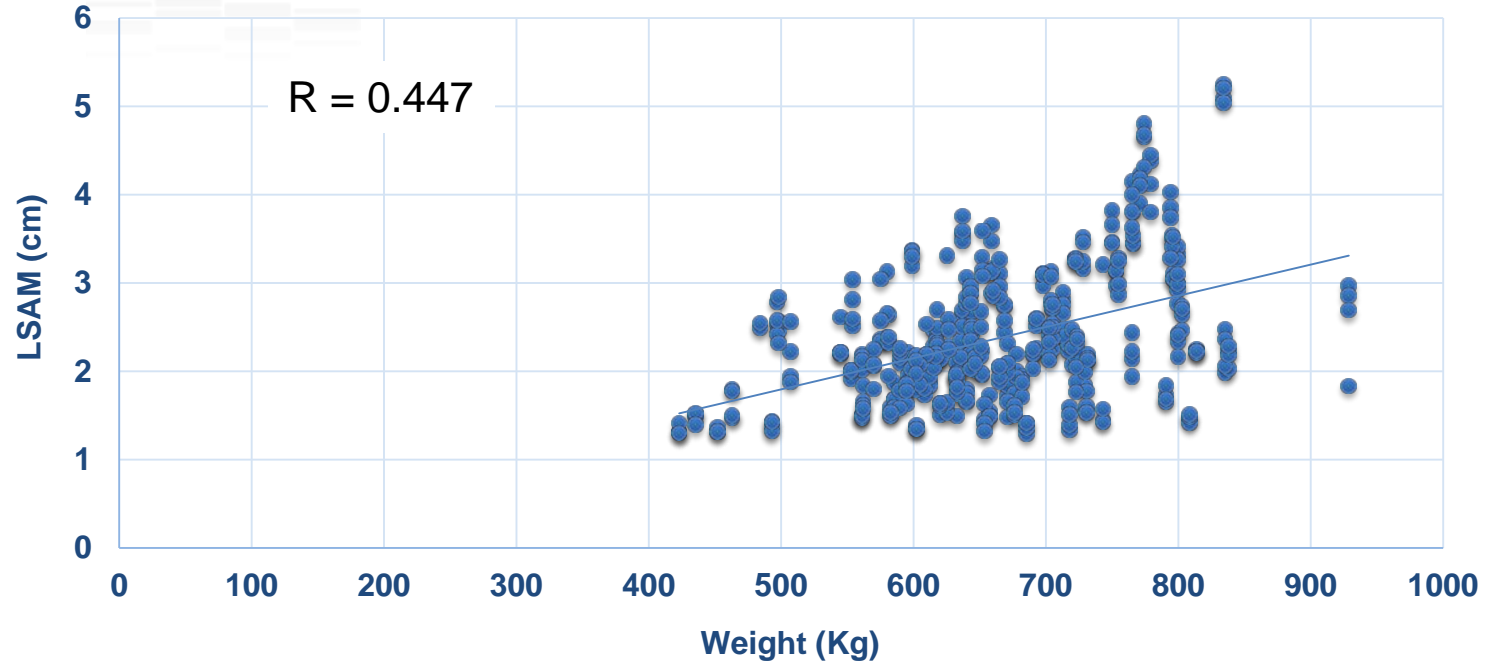
## Fat and muscle at the lumbar site of Holstein cows





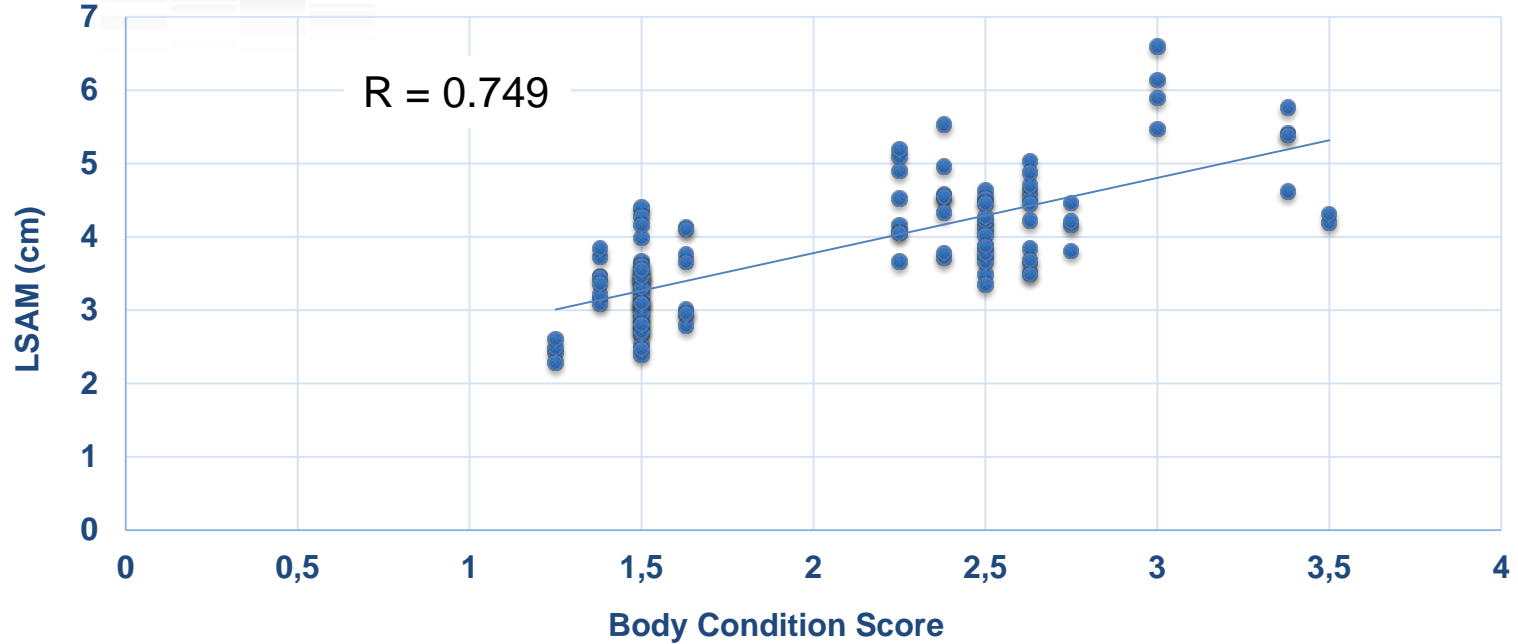
# RESULTS

## Fat and muscle at the lumbar site of Holstein cows



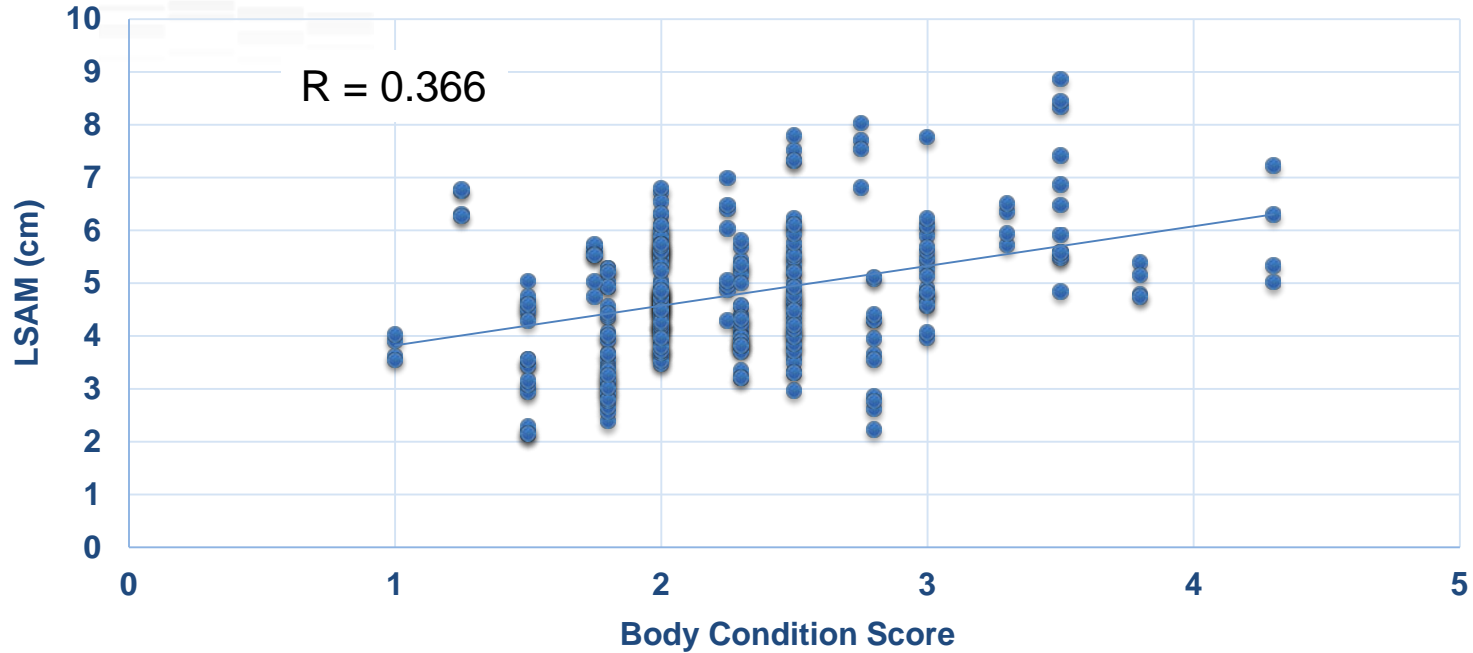
# RESULTS

## Fat and muscle at the lumbar site of Montbeliarde cows



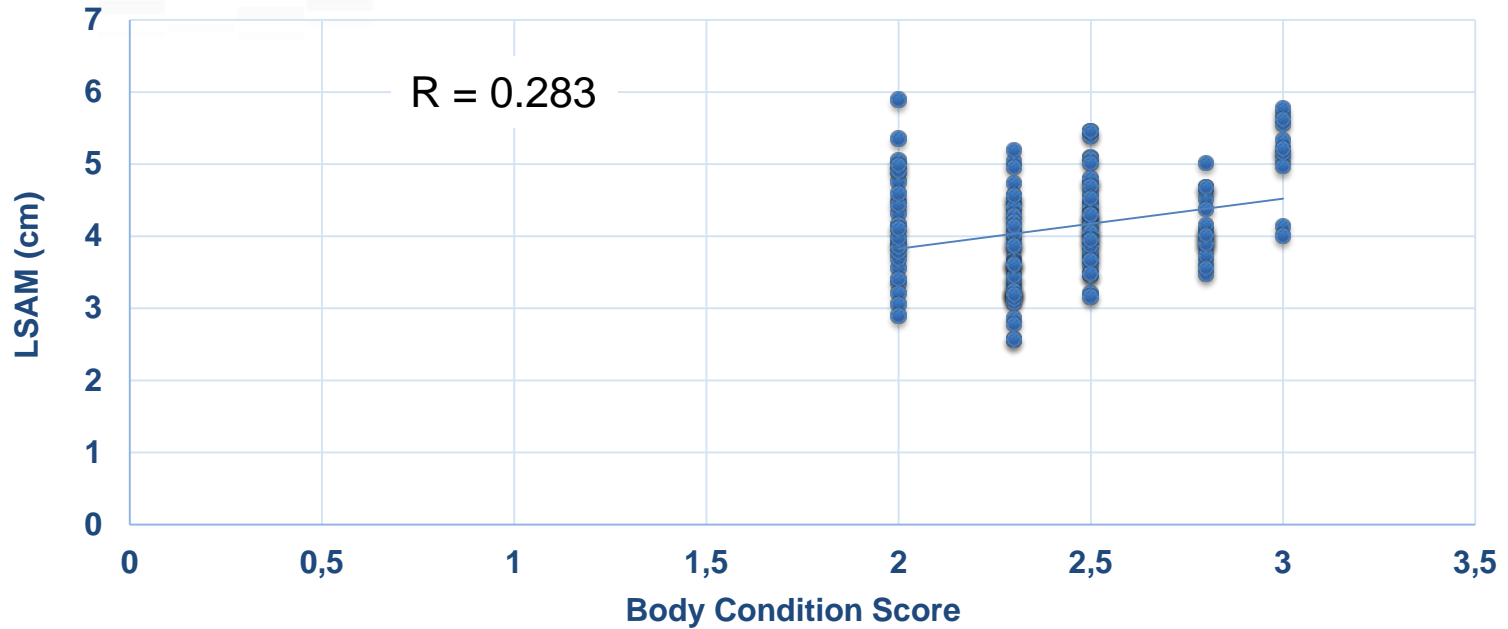
# RESULTS

## Fat and muscle at the lumbar of Charolaise cows



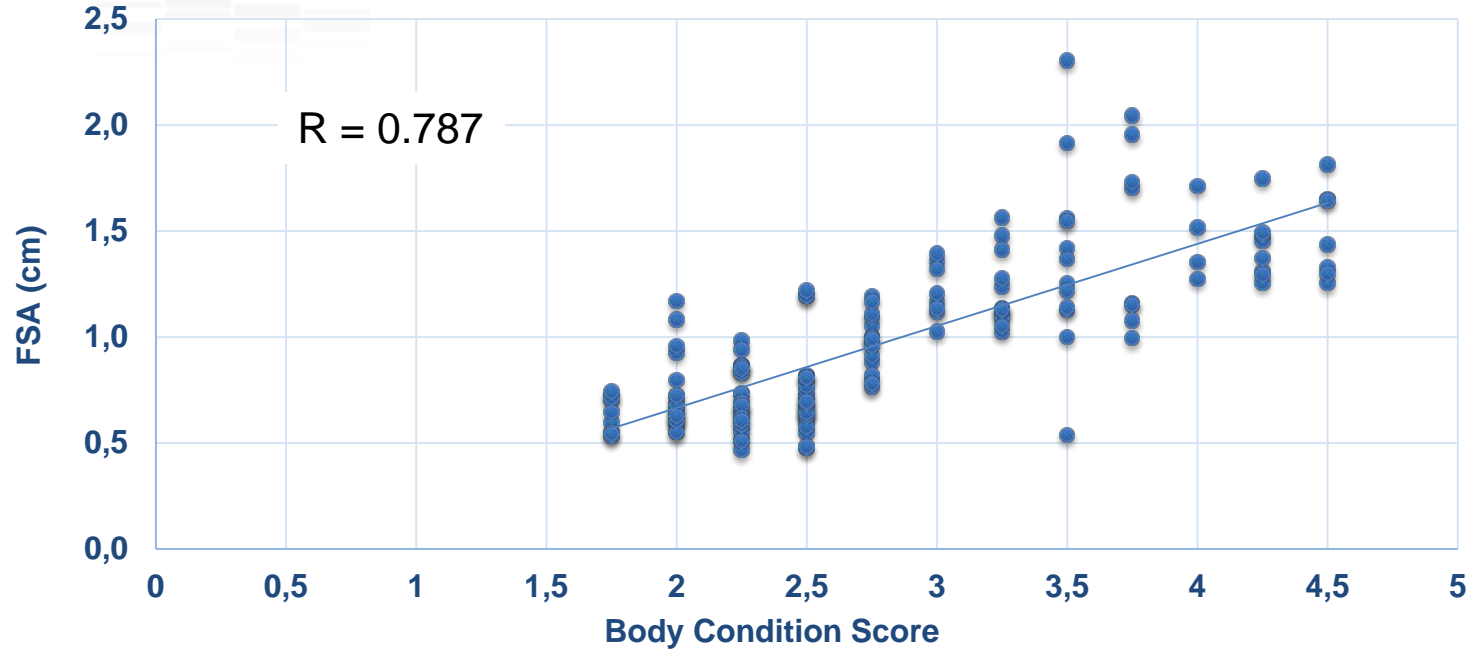
# RESULTS

## Fat and muscle at the lumbar site of Salers cows



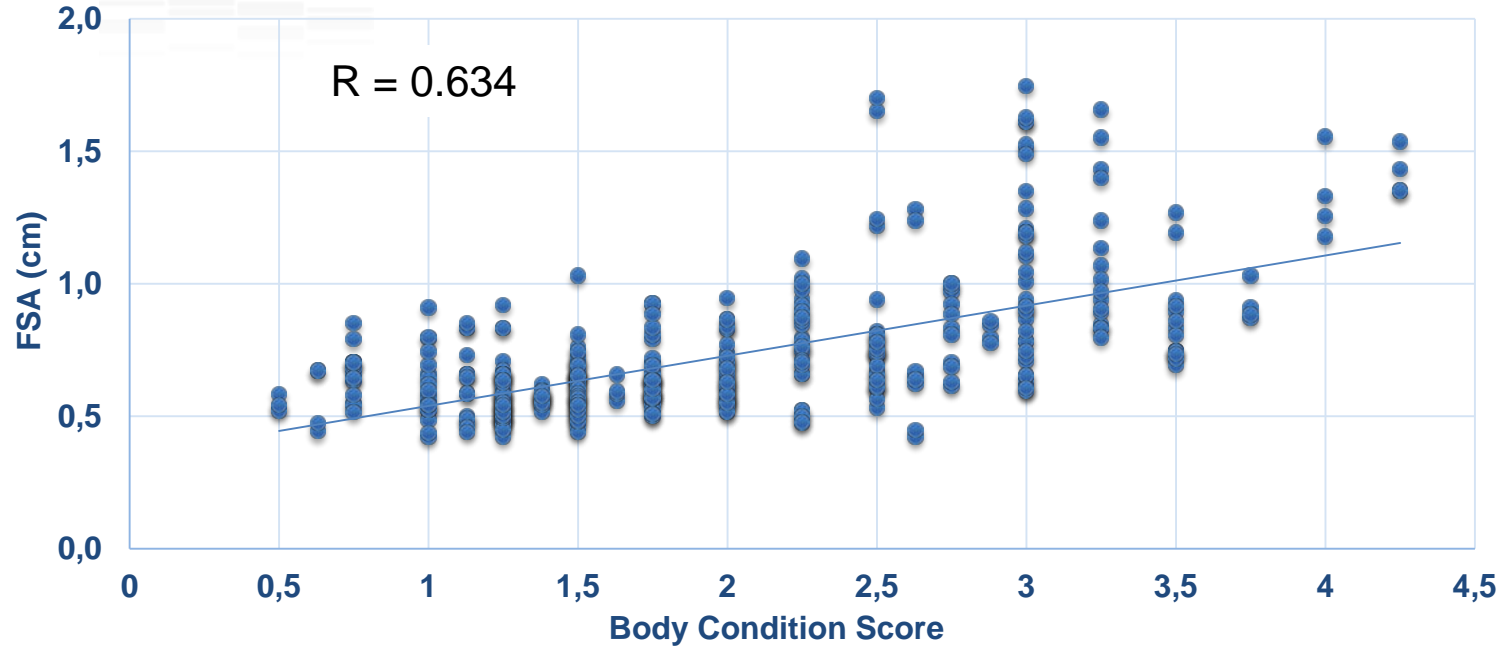
# RESULTS

## Fat at the buttock of Normande cows



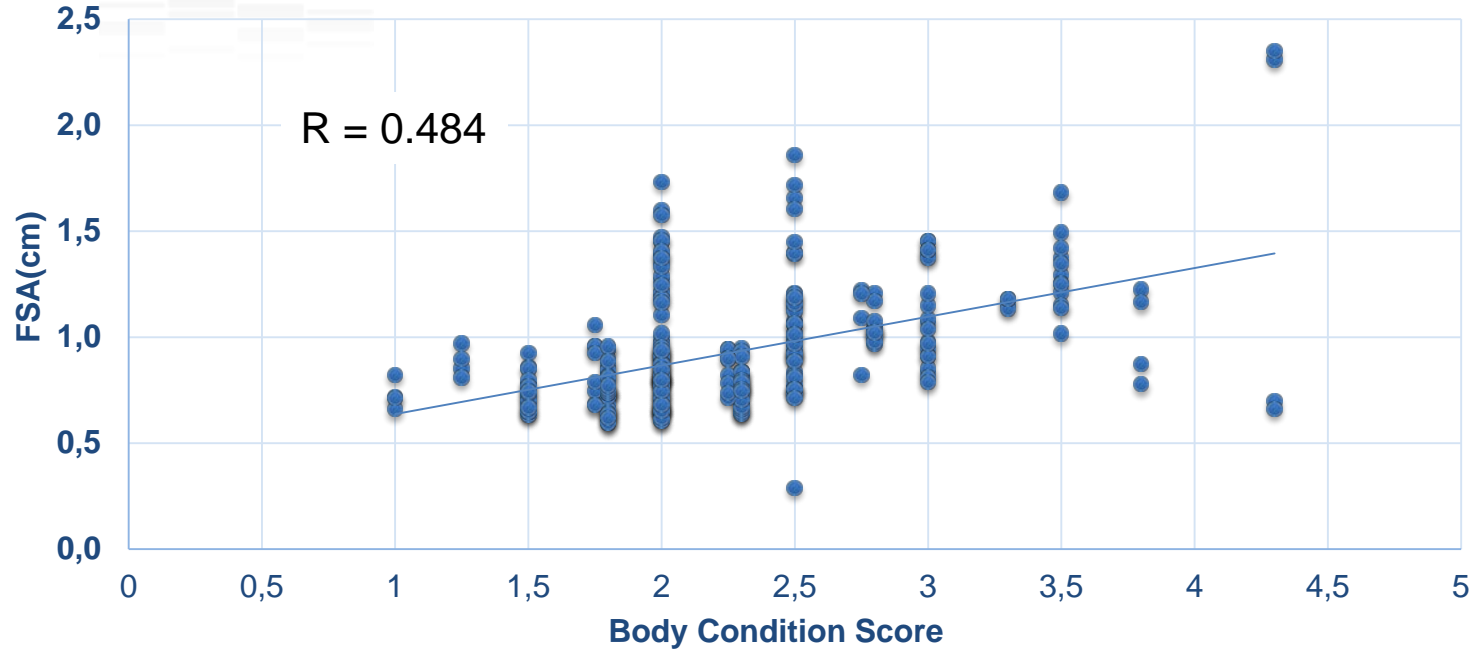
# RESULTS

## Fat at the buttock of Holstein cows

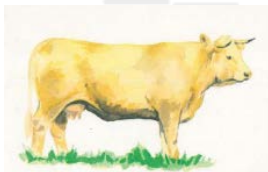


# RESULTS

## Fat at the buttock of Charolaise cows



# RESULTS



gto.ebnaiiv-vio.www  
oeielocarlo



salers  
www.civ-viande.org



montbeliarde  
www.civ-viande.org



normande  
www.civ-viande.org



prim'holstein  
www.civ-viande.org

	CHAROLAISE N=318 BCS from 1 to 4.25		SALERS N=159 <b>BCS from 2 to 3</b>		MONTBELIARDE N=130 BCS from 1.25 to 3.5		NORMANDE N=153 BCS from 1.75 to 4.5		HOLSTEIN N=460 BCS from 0.5 to 4.25	
	BCS	WEIGHT	BCS	WEIGHT	BCS	WEIGHT	BCS	WEIGHT	BCS	WEIGHT
FSA	0.48427	0.45411	0.47931	0.04137	0.44662	0.28013	<b>0.78750</b>	0.51485	0.63373	0.37075
FSAM	0.25288	0.36256	0.44049	0.46138	<b>0.73220</b>	0.63857	<b>0.73447</b>	0.47599	0.65943	0.37726
LSA	0.43565	0.42319	0.45668	0.17980	0.54084	0.34313	<b>0.76497</b>	0.54424	0.65273	0.34558
<b>LSAM</b>	0.36647	0.44287	0.28303	0.37743	<b>0.74901</b>	0.60798	<b>0.85637</b>	<b>0.78742</b>	<b>0.77556</b>	0.44703
BSA	0.40610	0.48808	0.29015	0.07486	0.44237	0.19984	0.66485	0.47642	0.49365	0.25438
BSAM	0.38195	0.28755	0.32921	0.23983	0.62024	0.55396	<b>0.73293</b>	0.54433	0.57727	0.35708
RSA	0.38108	0.34267	0.23753	0.14122	0.39515	0.14367	0.69266	0.41528	0.55108	0.35144
RSAM	0.36758	0.34723	0.27815	0.06165	0.32100	0.26251	<b>0.78103</b>	0.57741	0.59279	0.44643



# CONCLUSIONS

- ❖ **Reproducibility is lower at the back and at the rib sites because of the lack of precise landmark in those sites**
- ❖ **No relationship was found between ultrasound indicators and BCS in beef cows**
- ❖ **Measures of fat and muscle by ultrasonography at the lumbar is a very promising indicator in dairy cows**
- ❖ **Measures at the buttock can be used as a complement in dairy cows**
- ❖ **Ultrasonography is an easy and non-invasive way to determine body composition in dairy cows**

# THANK YOU !

- ❖ **UE1297 PAO : E. Briant, C. Mouazé, A. Touchard, N. Müller**
- ❖ **UE1414 H : D. Egal**
- ❖ **UE0326 DEP : D. Dozias, J. Moreau, E. Cobo, Y. Carbonnier, S. Leurent-Colette, G. Kohn**
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- ❖ **UMR1313 GABI : G. Renand**