Differences in digestibility between beef cows receiving the same diet contribute to explain differences in feed efficiency

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Introduction

⇨ Feed efficiency (FE) is a major issue for Ruminant production

- Improvement of ruminant feed efficiency in particular with the use of local food especially grass and forages

FAO, 2013

⇨ Residual Feed Intake (RFI) : one indicator of the FE

- Difference between actual feed intake and expected feed intake according to metabolic requirements and production

- Independant of the production traits (BW, level of production)

Physiological basis for RFI

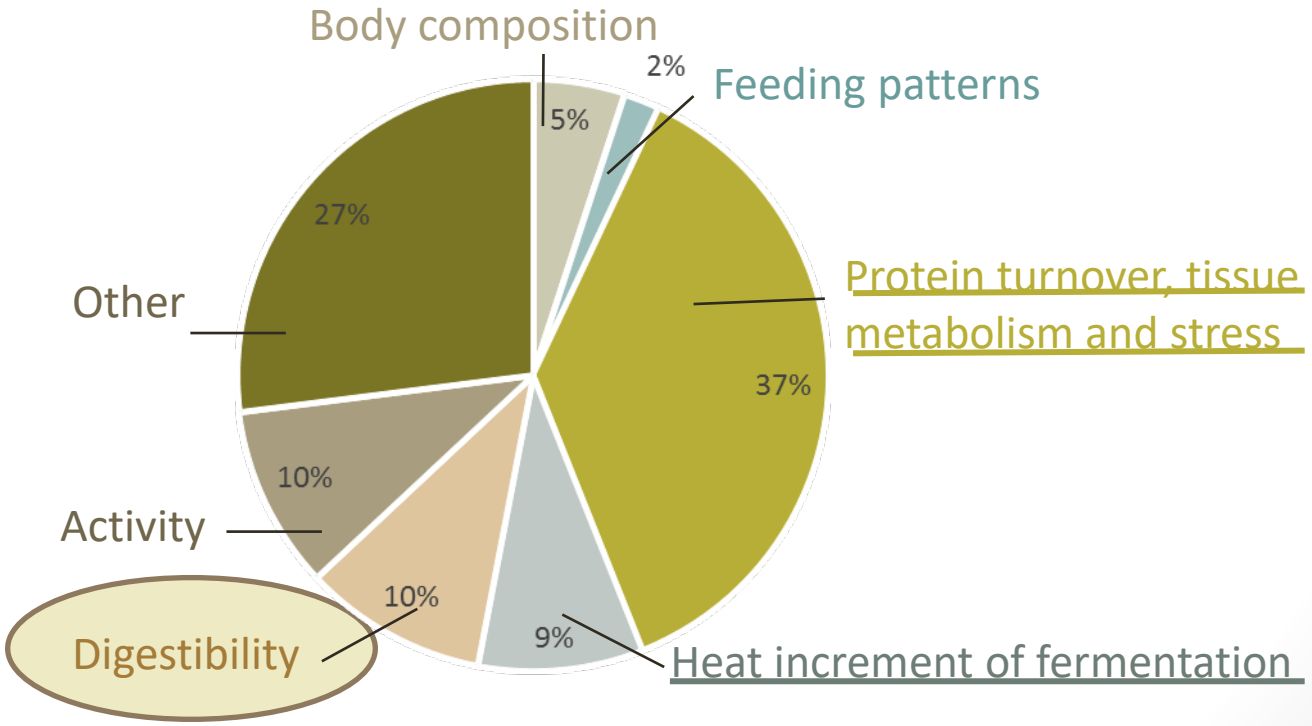
- Considerable individual animal variation in feed intake as well as in RFI

Russell et al., 2016

- Variability of FE between animals ≈ variability of FE between diets

From data of Mialon et al, 2014

- Contributions of biological mechanims to Δ RFI, Richardson & Herd, 2004

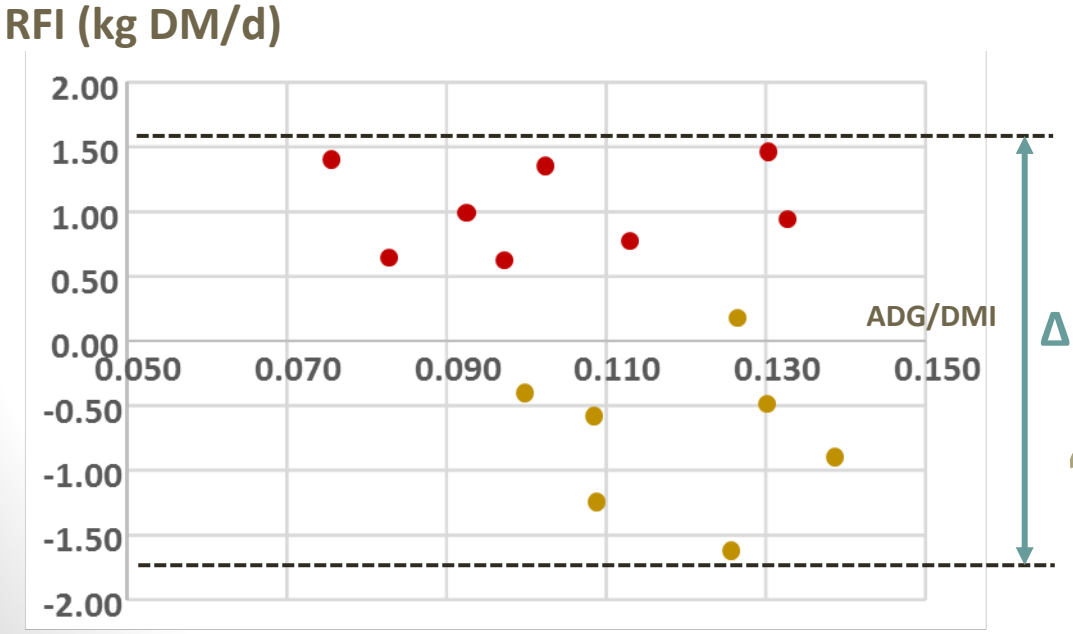


Aim of the study and experimental design

Determination of individual variability of digestive efficiency

- Measurement of the apparent digestibility of contrasted diets in two divergent RFI non-pregant non-lactating beef cows.

⇨ RFI ranking : 12 weeks on grass silage diet distributed *ad libitum* when cows were 21 months old

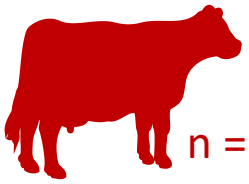


RFI + : 1.02 ± 0.34 kg DM/d
BW = 753 ± 75 kg
BCS = 2.97 ± 0.63

Δ = 3.09 kg DM/d

RFI - : -0.73 ± 0.59 kg DM/d
BW = 761 ± 79 kg
BCS = 2.69 ± 0.69

Experimental design



RFI + : 1.02 ± 0.34

RFI - : **-0.73** ± 0.59

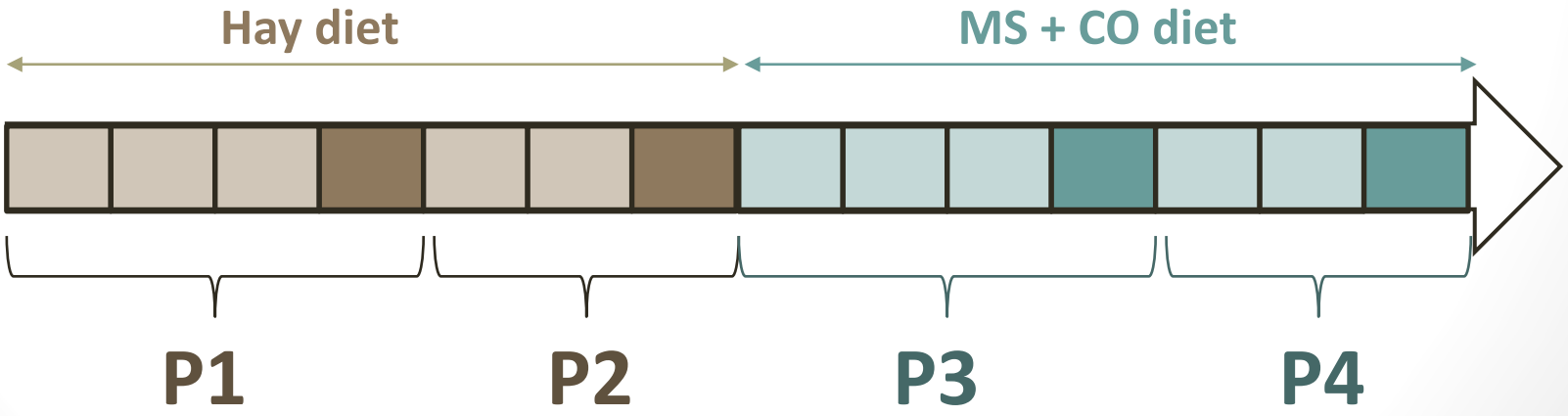
2 constrasted diets
ad libitum

100 % hay

67% maize silage
33% concentrate (MS+CO)

100 % hay

67% maize silage
33% concentrate



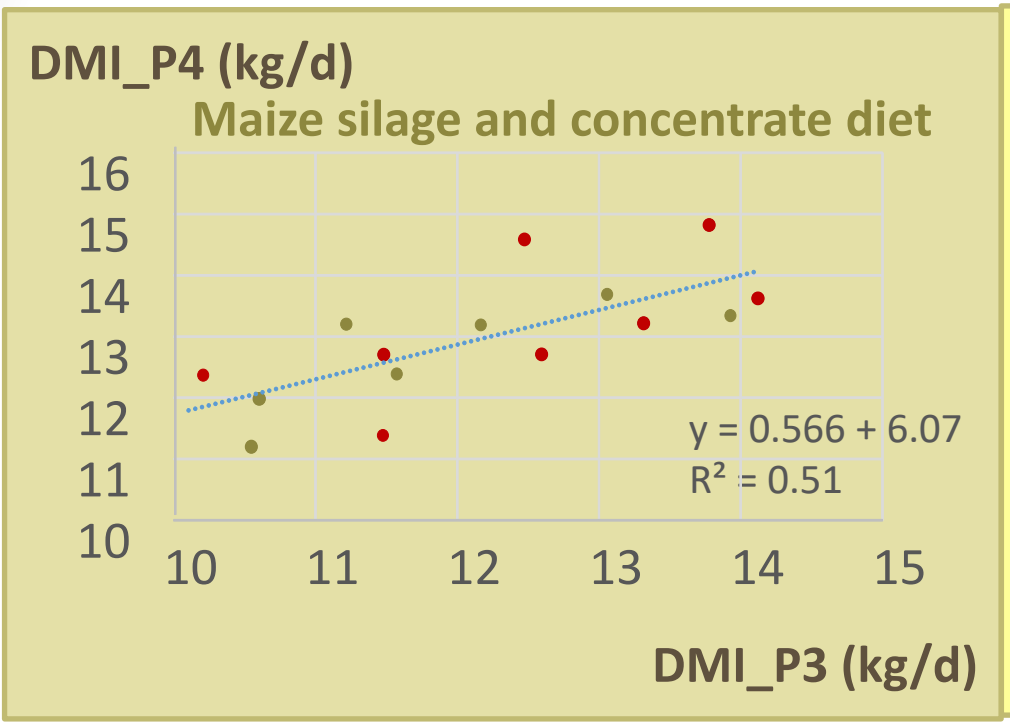
4 periods : 2-3 weeks of adaptation + 1 week of total faeces collection

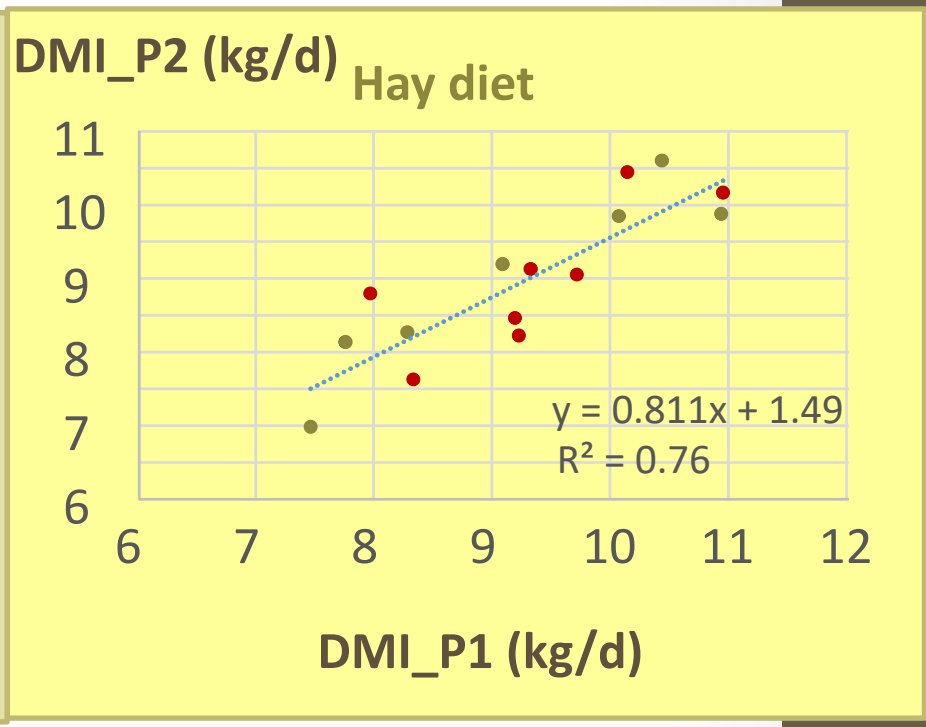
Measurements

- **Individual feed intake** : offers and refusals every day
- Weight of **total faeces collection** for each cows
- **Dry matter** (offers, refusals and faeces): oven at 60°C for 72 h
- **Organic matter** (offers, refusals and faeces): incineration of dried samples at 550°C for 6 h

DMI **OM digestibility (OMd)**

Relation of DMI within diets

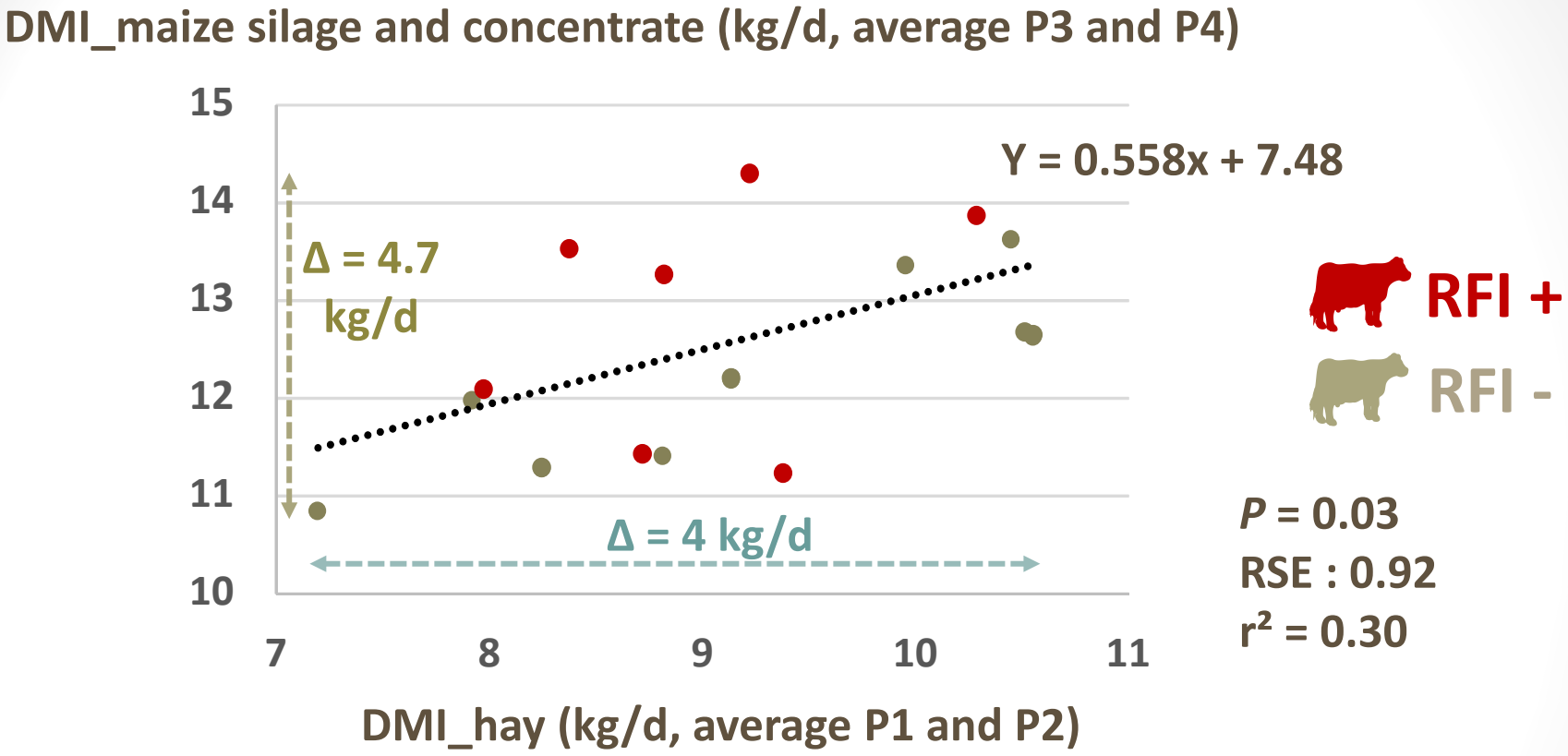




Similar results with OM digestibility

- **DMI and OM digestibility within diet are repeatable**

Results : Dry matter intake (DMI)

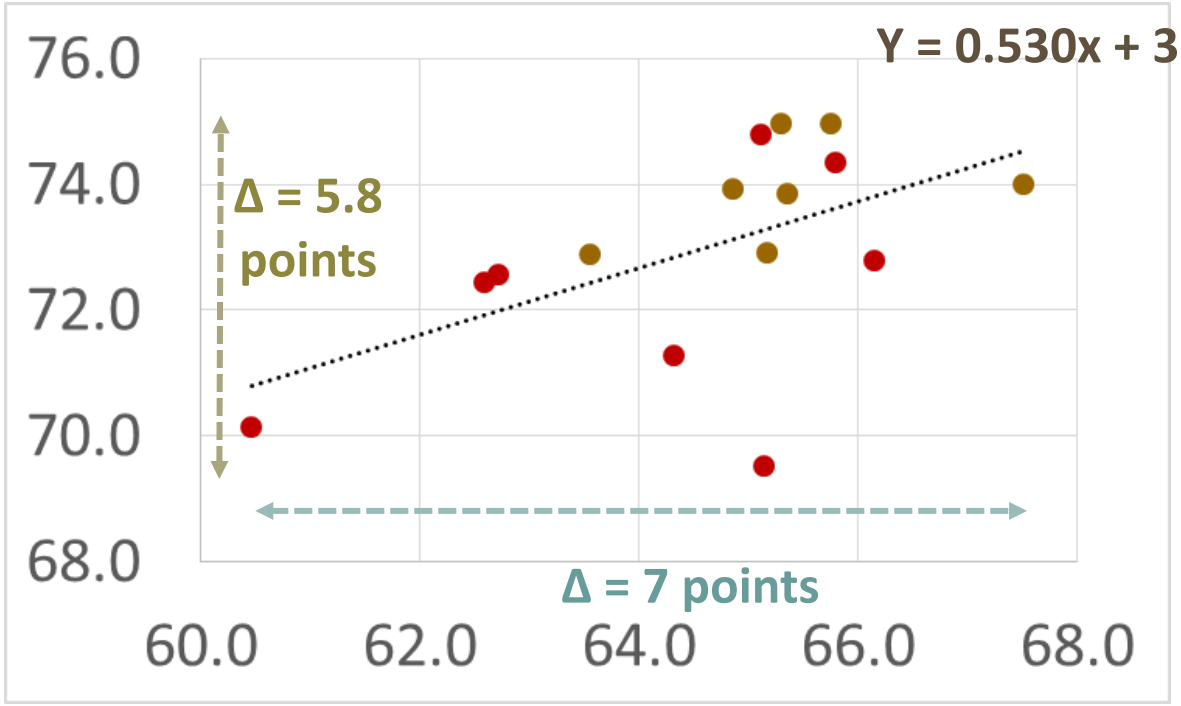


Δ = diff. between the largest and the smallest value

- **Variabilty is important among individuals**
- **Cows which eat the most hay are globally the ones which eat the most maize silage and concentrate**
- **No effect of RFI ranking on DMI (P=0.27), even when expressed per kg BW, $BW^{0.75}$**

Variability of apparent OM digestibility

Average OM digestibility of Maize silage and concentrate (%)



RFI +

RFI -

P = 0.03
RSE : 1.50
r^2 = 0.30

Average OM digestibility of hay (%)

- OMd ranged from 5.8 (MS+CO diet) to 7 points (hay diet)
- The cows' ranking is similar between diets
- OM digestibility is 1.02 > in low-RFI than in high-RFI cows *(P<0.01)*

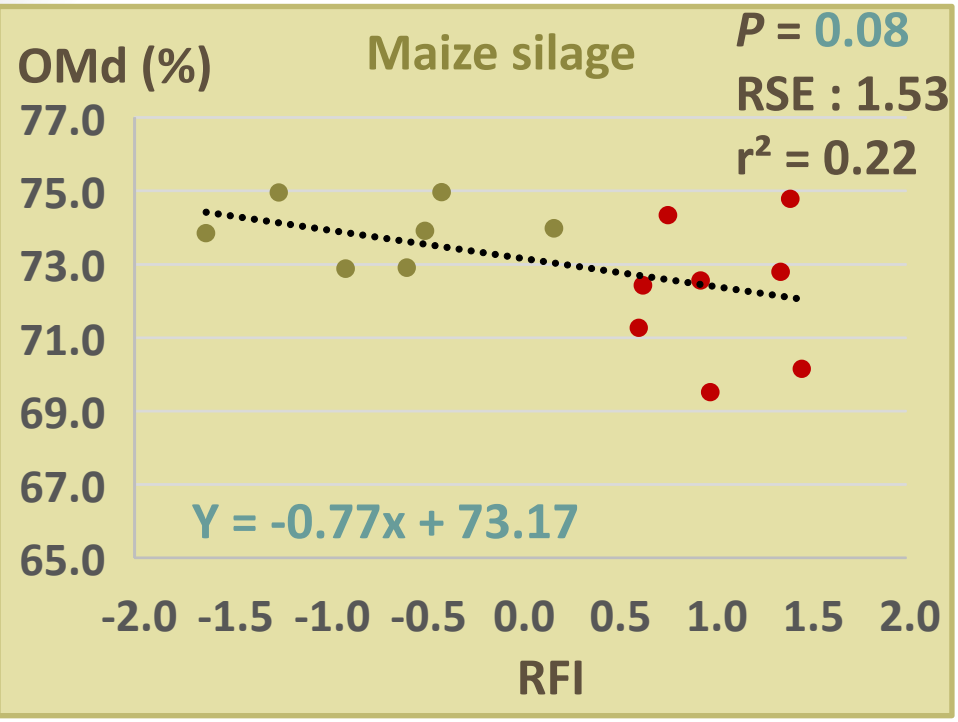
Conclusions of this experiment

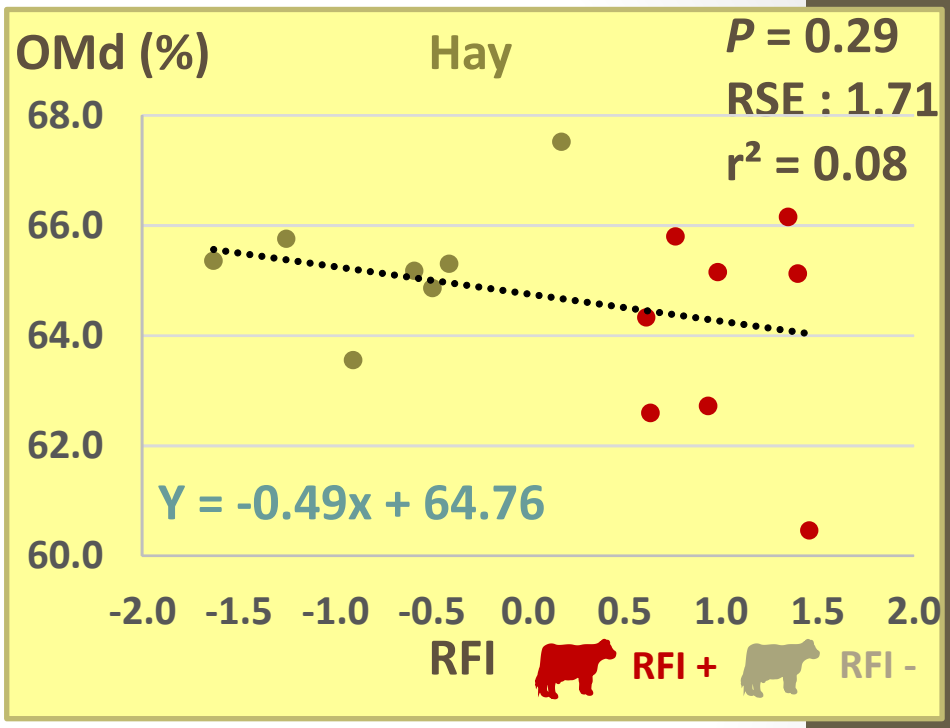
- **DMI and OMd vary among animals**

- **For a given diet, the ranking of cows according to DMI and OMd is repeatable**

- **Under our conditions, animals with higher feed efficiency exhibit higher digestive efficiency regardless the type of diet**

Relationships between OMD and RFI





- Low-RFI cows tended to have a greater digestive potential than high-RFI cows

- **But** RFI test and digestibility measurements were not performed in the same time

  preservation of FE according to physiological stage and diet?

Thank you for your attention

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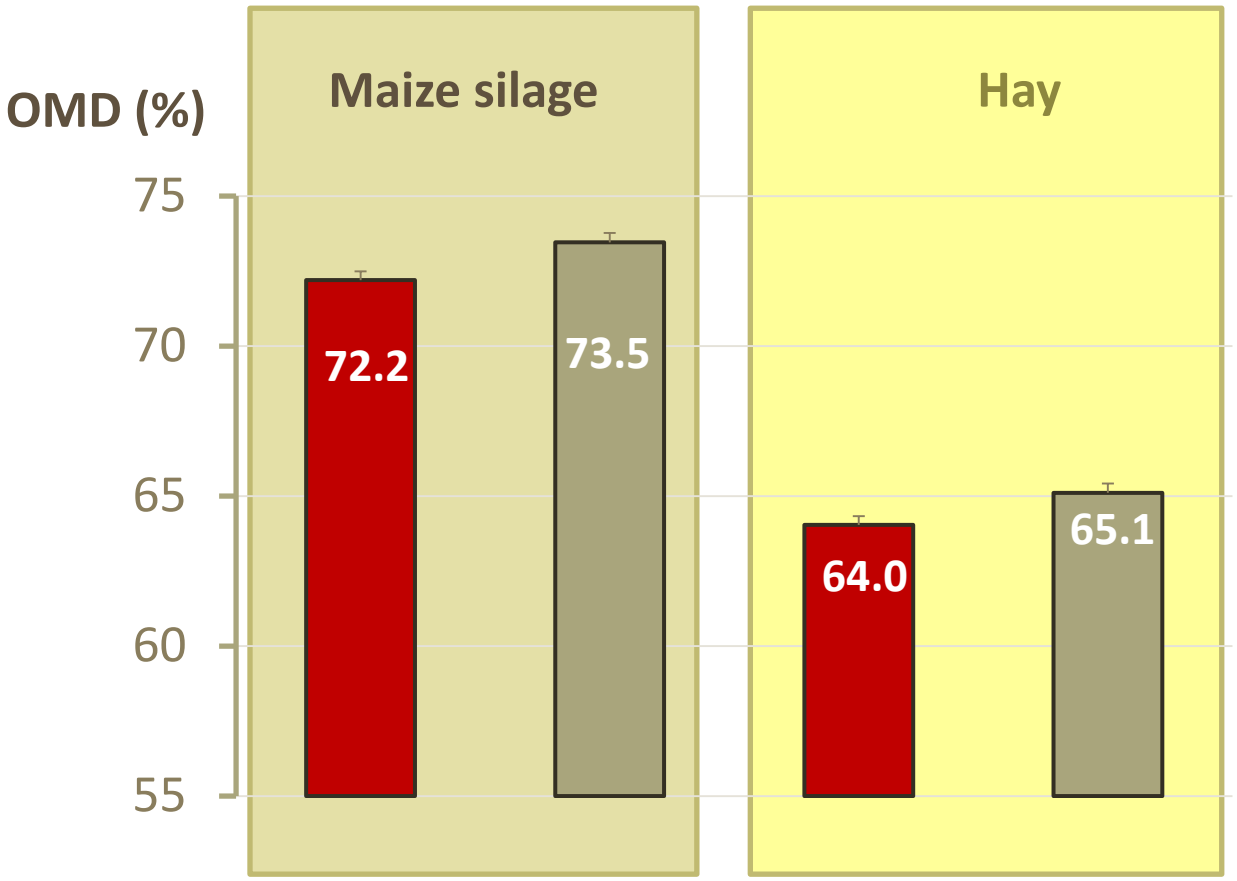
Apparent digestibility of OM



Diet: P<0.0001
RFI: P= 0.018
*RFI*Diet: P=NS*

- **OM digestibility is 1.02 fold higher in low-RFI than in high-RFI cows**