



Association between feed efficiency and methane emissions, performance and health in Merino sheep

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Initial questions

What type of sheep are we looking for?

Why is important to know the association between efficiency, emissions, performance, health?



“The sculpture is already complete within the marble block, before I start my work.

It is already there, I just have to chisel away the superfluous material”.

Michelangelo Buonarroti

INIA

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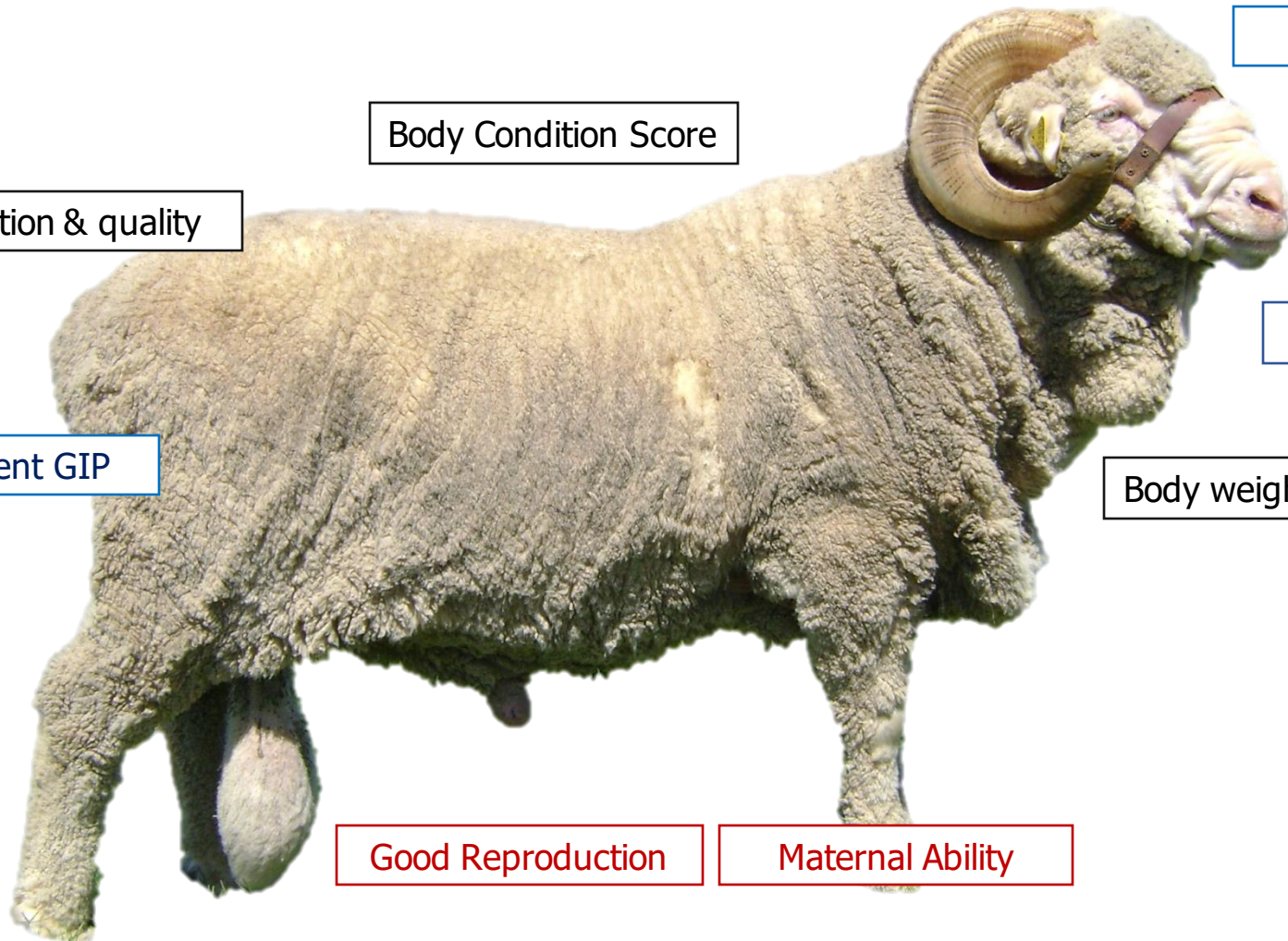


We have the sheep of the future, but we must chisel it more!

The Stone Ram
(La Paloma, Durazno – Uruguay)



Chiseling the sheep of the future



Easy care

Body Condition Score

Less CH₄

Wool: production & quality

More efficient

Resistant / Resilient GIP

Body weight & growth

Good Reproduction

Maternal Ability

No foot rot





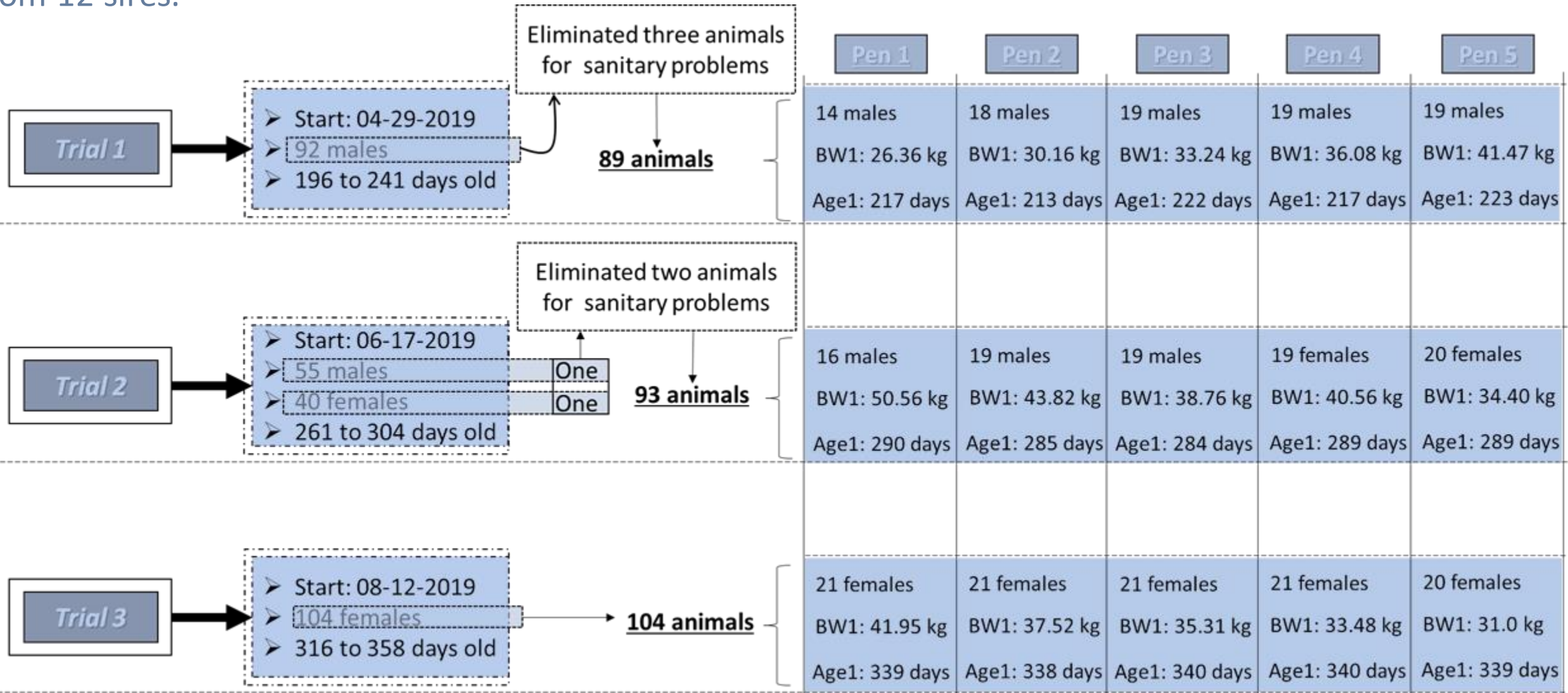
**Material
&
Methods**

Material & Methods

278 Merino lambs (males and females).

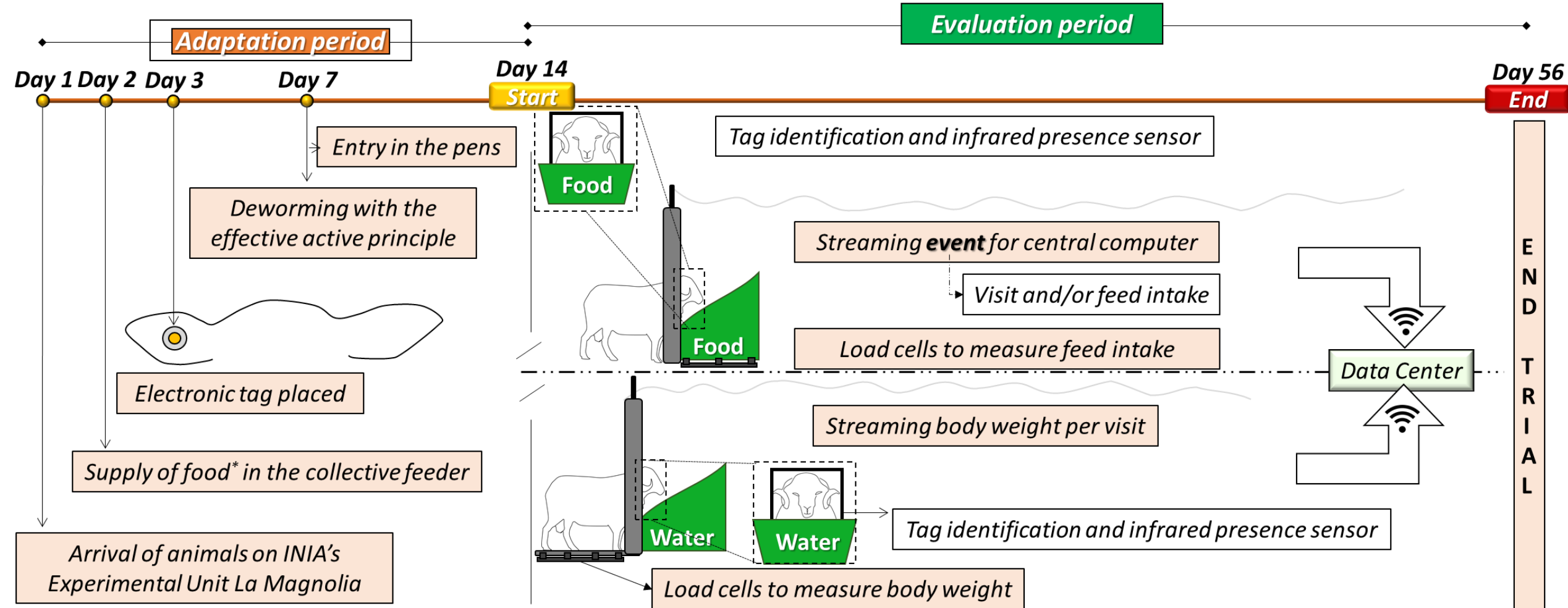
One-year old.

From 12 sires.



Material & Methods

Lucerne haylage : DM 53.8%; crude protein 21.8%; NDF 36.0%; ADF 29.3%; EE 2.4%; (Festín®)



Material & Methods

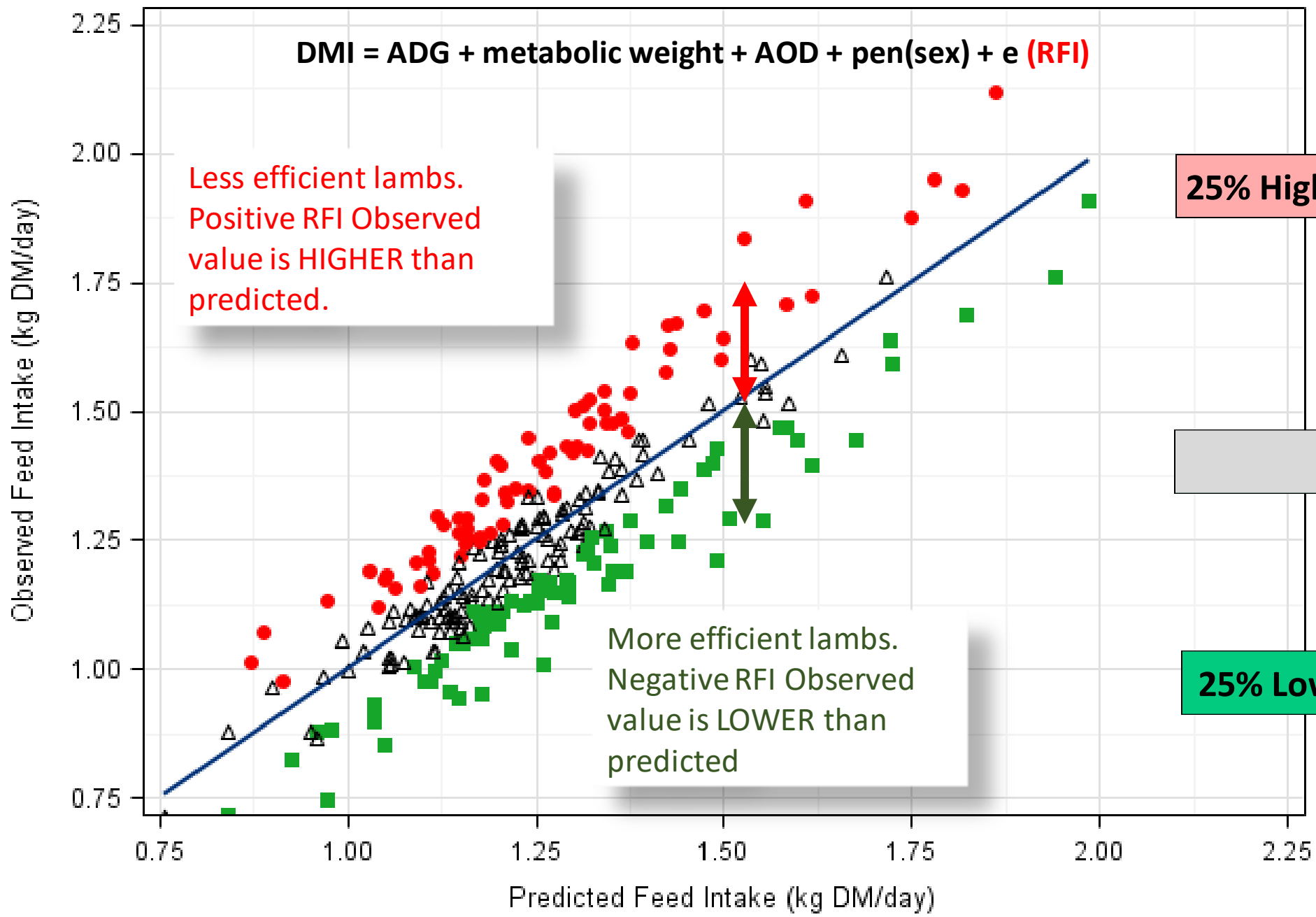


EAGLE 2



RFI Groups

$$\text{DMI} = \text{ADG} + \text{metabolic weight} + \text{AOD} + \text{pen}(\text{sex}) + e \text{ (RFI)}$$



Less efficient lambs.
Positive RFI Observed value is HIGHER than predicted.

More efficient lambs.
Negative RFI Observed value is LOWER than predicted

25% Highest + RFI **Less efficient**

n=70
RFI=0.148 kgDM/day

Medium

25% Lowest - RFI **More efficient**

n=71
RFI=-0.135 kgDM/day

RFI Group ● 25% Low Eff. △ Medium ■ 25% High Eff. — Regression

Material & Methods

Trait Groups



Intake: Feed intake per day (DMI), Residual Feed Intake (RFI),
Number of visits to the feeder (N°V), Number of daily meals (N°M)



Emission: CH4 emission, yield, intensity (g/d, g/kgDM, g/kgBW), CO2 emission, O2 consumption



Growth: Yearling Body Weight (BWt), Fat Depth (FD), Rib Eye Area (REA)



Wool production and quality: Clean Fleece Weight (CFW), Fiber Diameter (FD), Staple Length (SL)
Wool Production Potential (WPP=CFW/BWt x 100)

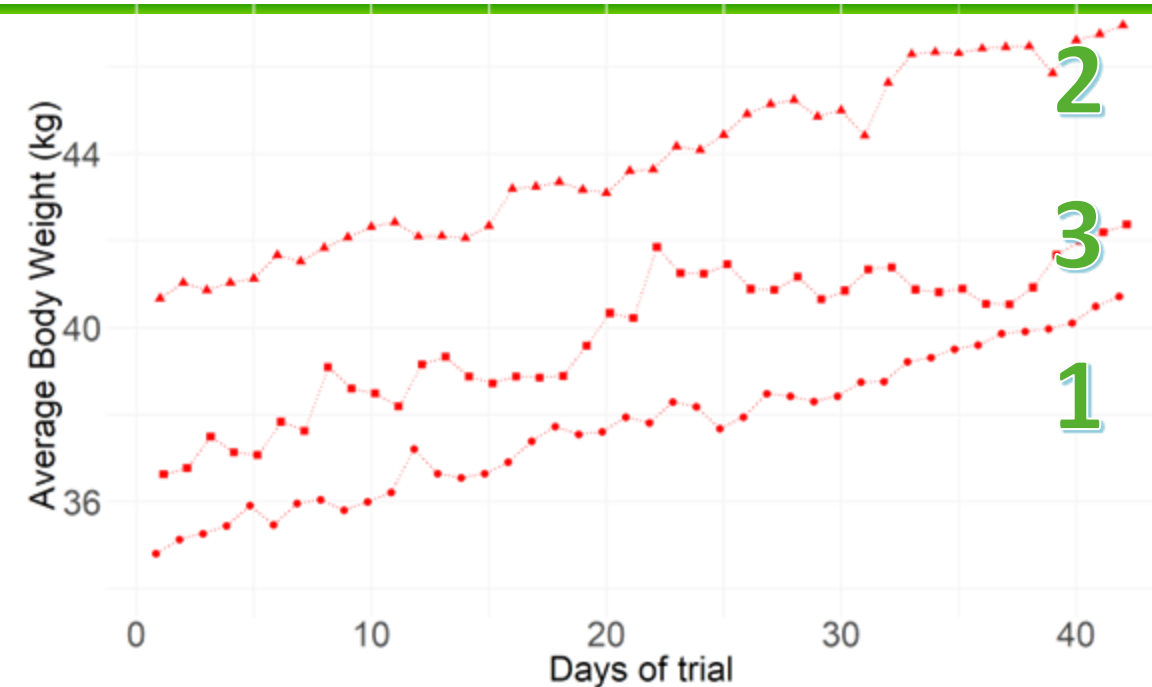


Health (parasite resistance/resilience): FAMACHA© and FEC post weaning

$$y = \text{RFI group} + \text{dam age} + \text{birth type} + \text{contemporary group} + \text{trial-pen-sex} + \text{age} + e$$



**Results
&
Discussion**



Less efficient animals ate more, and visit more times the feeder



Intake

Trait	Unit	Less efficient	More efficient	p
RFI	kgDM/day	0.148	-0.135	<0.0001
DMI	kgDM/day	1.449	1.158	<0.0001
N° of visits	n	125	96	<0.0001
N° of meals	n	72	55	<0.0001



Emission

Trait	Unit	Less efficient	More efficient	p
CH ₄ emission	g/d	24.3	22.7	<0.05
CH ₄ yield	g/kgDM	15.5	17.8	<0.0001
CH ₄ intensity	g/kgBW	0.55	0.52	<0.05
CO ₂ emission	g/d	1029	959	<0.01
O ₂ consumption	g/d	941	894	<0.05

Less efficient animals had a higher CH₄ and CO₂ emissions, methane yield (g/kgDM) and O₂ consumption, while lower methane intensity (g/kgBW).



Wool

Trait	Unit	Less efficient	More efficient	p
Clean Fleece Weight	kg	3.27	3.14	<0.05
Wool Prod. Pot.	%	6.85	6.46	<0.05

No significant effect of RFI on **Fiber Diameter** and **Staple Length**.



Growth

No significant effect on Yearling Body Weight, Fat Depth and Rib Eye Area.



Health

No significant effect on health traits: FAMACHA© and FEC post weaning.



Decreasing feed intake without negative consequences on animal performance and health, by improving RFI, provides an opportunity to increase profitability of grazing sheep systems (and with less emissions).



These favorable results must be balanced with a potential reduction on **fleece weight** or **WPP** in a fine-wool production system.

RESEARCH



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Thank you for your attention



