EXTERNAL AND GENETIC FACTORS INFLUENCING FERTILITY IN LATXA DAIRY SHEEP

Lyon, August 2023

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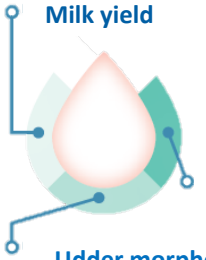
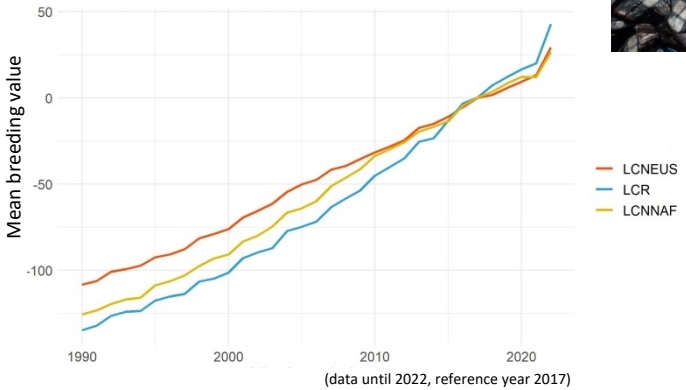
EUSKO JAURLARITZA GOBIERNO VASCO

Latxa breeding program



Genetic evolution of standarized milk yield

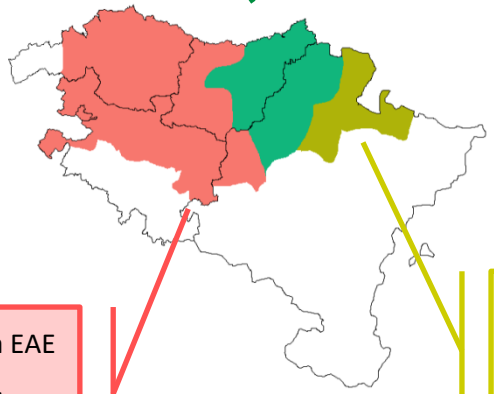


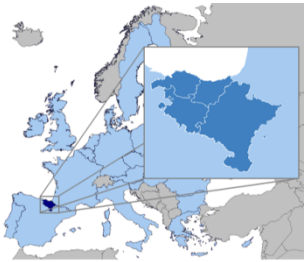
(data until 2022, reference year 2017)

Latxa Cara Rubia

182.000 ewes

4.000 herds





Latxa Cara Negra EAE

92.000 ewes

3.800 herds

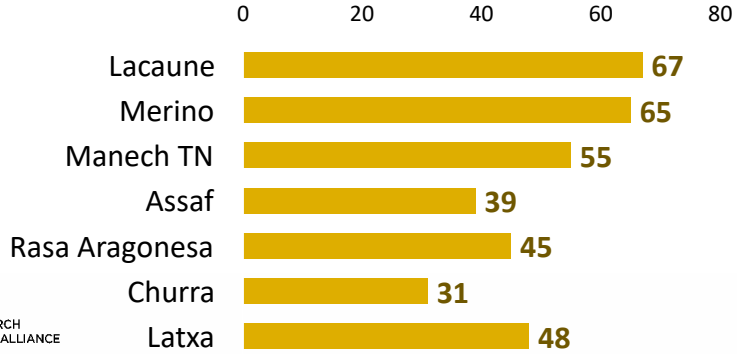
Latxa Cara Negra NAF

62,000 ewes

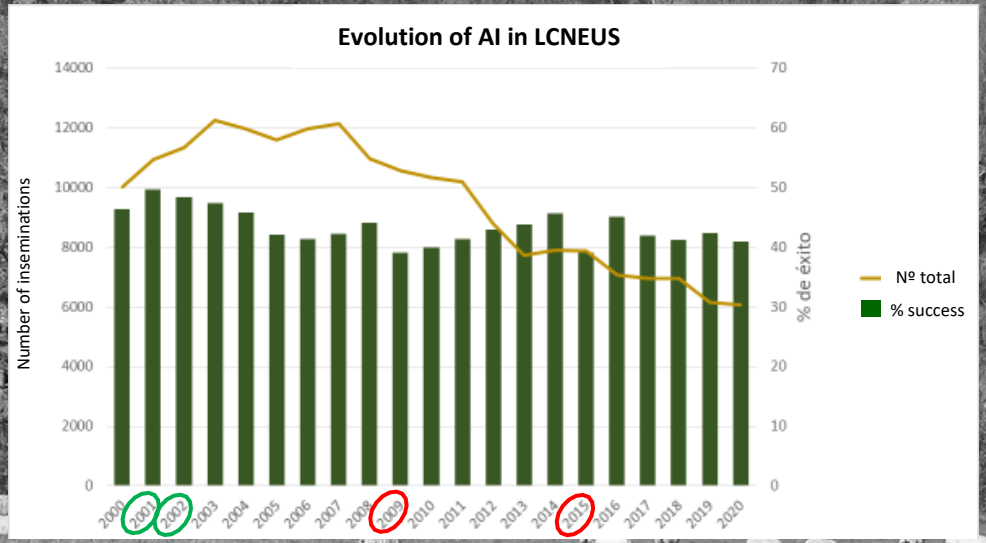
418 herds

Artificial insemination

- **Key tool** of the breeding program: make use of high genetic value rams to inseminate ewes **once per year**
- Pregnancy rate at AI is **largely variable**
  - Non genetic factors
  - Genetic factors (female and male)
- **Ovine AI fertility**: 30 – 70 % success



Artificial insemination



→ Identify the environmental factors that affect the AI success

→ Quantify its additive genetic component separately in males and females

Included data

	Phenotypic data		Pedigree data
	Number	Percentage	Number
Ewes	63480		90508
AI records	135351		
Success	63761	48	
Failure	71590	52	
AI rams	853		5499
Herds	104		

Methodology

- Identify environmental variables: **Multiple logistic regression**
  - Logistic probabilities
- Estimate the genetic components: **Threshold model**
  - Repeatibility → $\mathbf{R} = (\sigma_u^2 + \sigma_p^2)/\sigma_T^2$
  - Heritability → $\mathbf{h}^2 = \sigma_u^2/\sigma_T^2$

Non genetic factors

Non genetic factors

Type previous lambing | Interval previous Lambing - AI | Age first lambing | Herd

$$IA = TPL + PPL + ILAI + ANL + AFL + MY + H + Y + ewe + ram + e$$

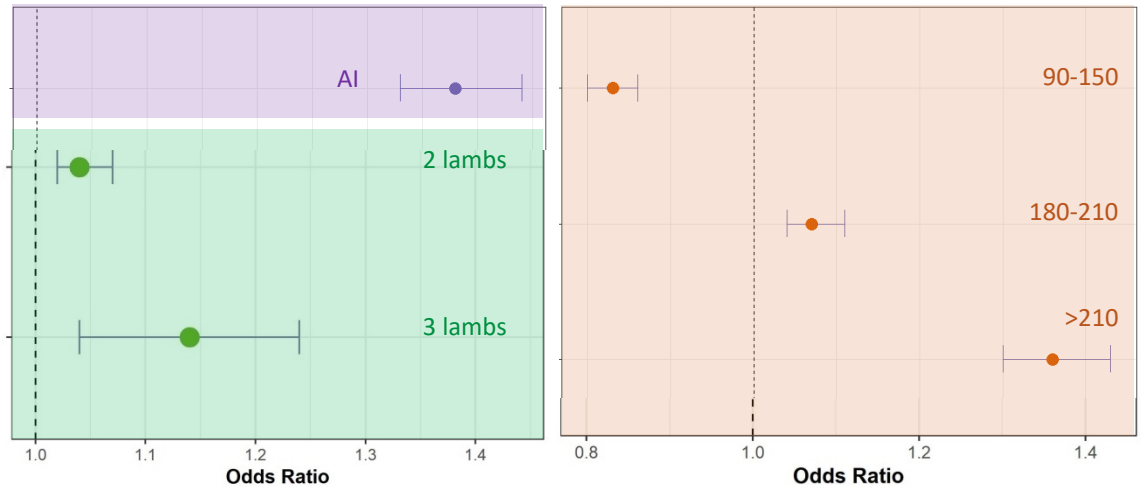
Prolificacy previous lambing | Age – number of lambing | Milk yield | Year

Non genetic factors

IA = TPL + PPL + ILAI + ANL + AFL + MY + H + Y + ewe + ram + e

Type previous lambing

Prolificacy previous lambing



Interval previous lambing - AI

→ **Previous lambing** by AI presented 38 % more odds of become pregnant by AI

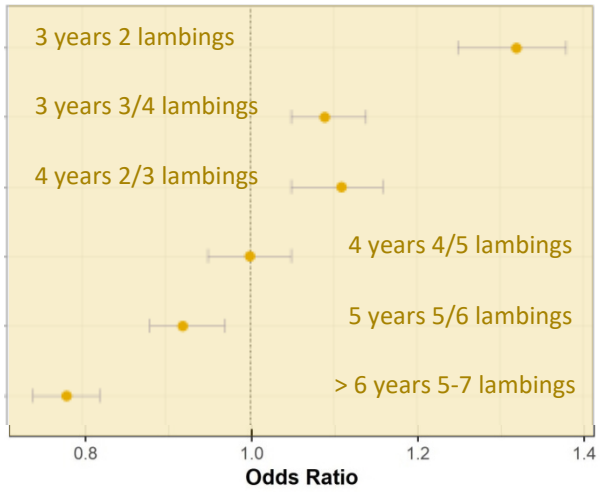
→ High **prolificacy** in previous lambing increase 4 % and 14 % odds of AI success

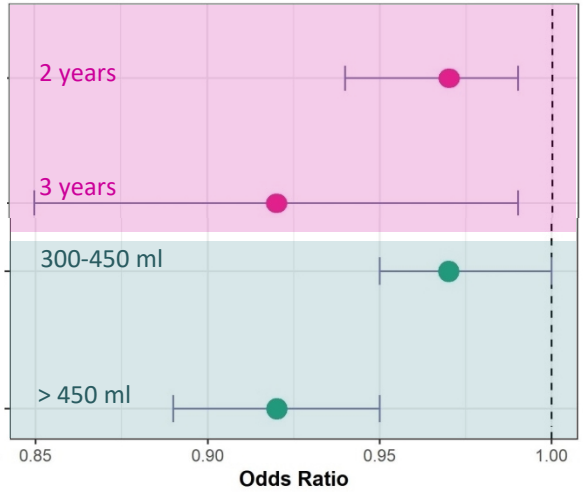
→ Larger **lambing – AI interval** was 7 % and 36 % greater odds

Non genetic factors

IA = TPL + PPL + ILAI + ANL + AFL + MY + H + Y + ewe + ram + e

Age - Number of lambing





Age - first lambing

Milk yield

→ **Younger ewes** with **less lambings** have better insemination results (↑32 % - ↓28 %)

→ Older at **first lambing** reduce odds (8 and 3 %)

→ Higher **milk productions** decreae AI success (3 and 8 %)

Estimate of genetic parameters

Estimate of genetic parameters

Variance components		Mean	PSD
Genetic additive ♀	σ^2_{uf}	0.113	0.096
Genetic additive ♂	σ^2_{um}	0.014	0.012
Permanent environmental ♀	σ^2_{wf}	0.143	0.119
Permanent environmental ♂	σ^2_{wm}	0.018	0.008
Residual	σ^2_{r}	1.0000	
Total	σ^2_{T}	1.289	0.012

Estimate of genetic parameters

Parameter		Mean	PSD
Repeatibility			
Female	$R_h = (\sigma^2_{uh} + \sigma^2_{ph})/\sigma^2_T$	0.199	0.007
Male	$R_m = (\sigma^2_{um} + \sigma^2_{pm})/\sigma^2_T$	0.025	0.002
Heritability			
Female	$h^2_h = \sigma^2_{uh}/\sigma^2_T$	**0.090**	0.007
Male	$h^2_m = \sigma^2_{um}/\sigma^2_T$	**0.014**	0.006

Conclusions

There are extensive and diverse **external factors**

The **additive component** is **low**

Genetic variability susceptible of **selection** under breeding scheme

Eskerrik Asko!

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CONCLUSIONES

Year of AI