

# The Benefits of Genomics

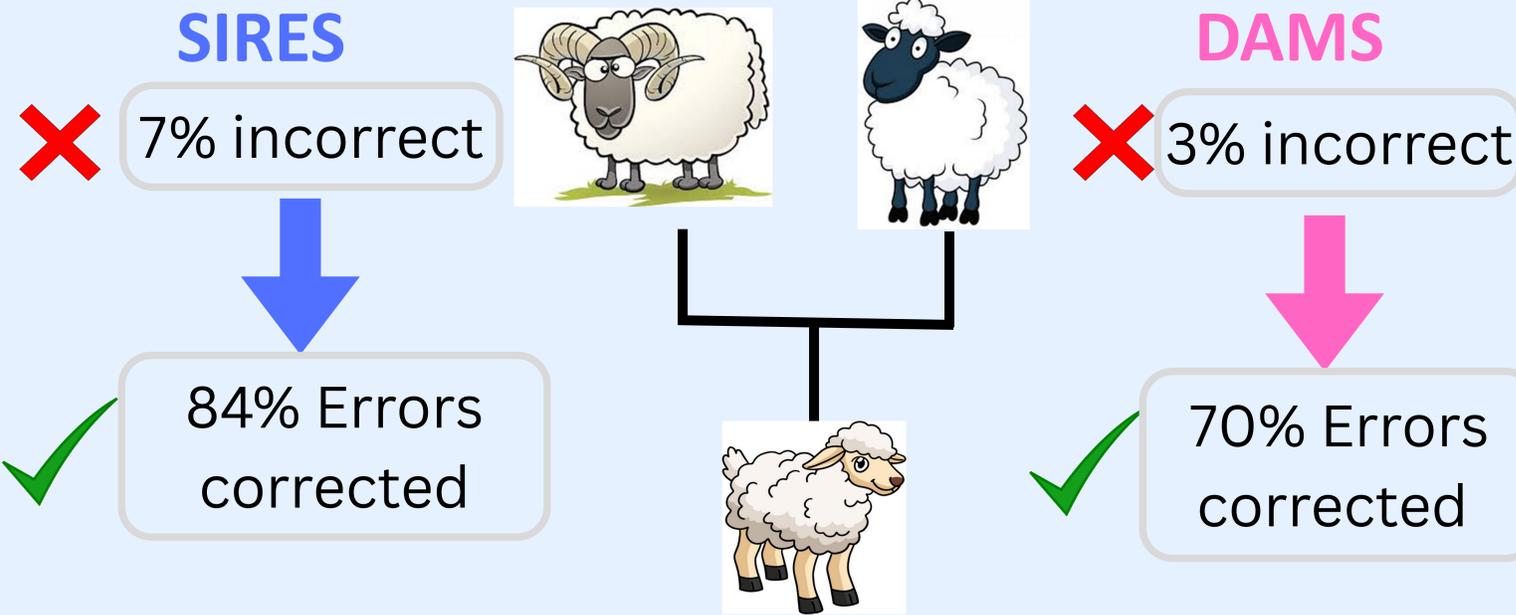


By Aisling O'Mahony, Sheep Ireland

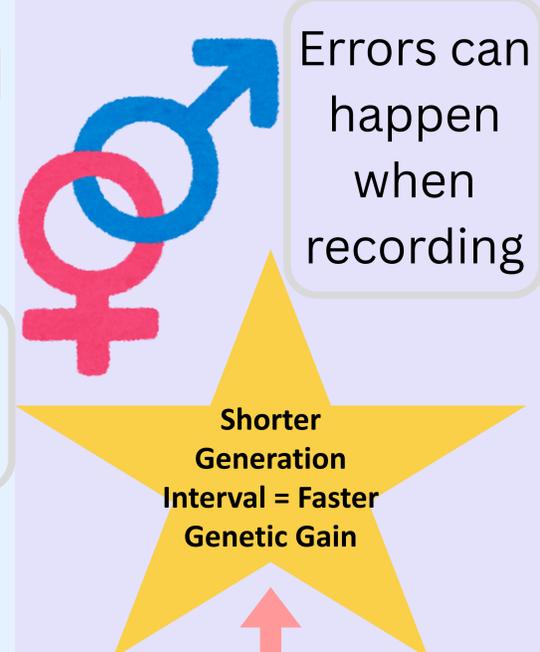


Genomics is the study of DNA to identify more profitable genetics

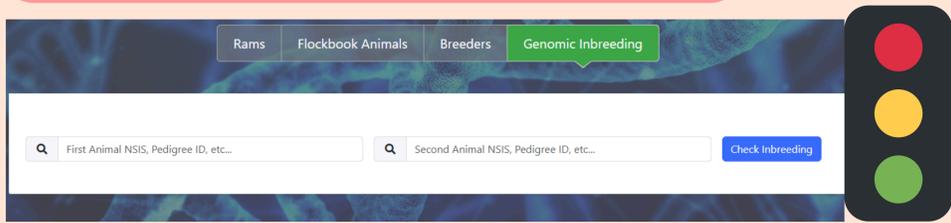
## Parentage Assignment



## Gender Determination



## Inbreeding Coefficient



The GRM allows you to check the level of inbreeding between genotyped rams!  
 Over 3100 hits since its launch!

## Increased Eurostar Accuracies

REPLACEMENT: €0.77 Top 17% <b>Acc 88%</b> ★★★★★	TERMINAL: €1.74 Top 16% <b>Acc 91%</b> ★★★★★
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Genomics increases acc% by at least **20%**

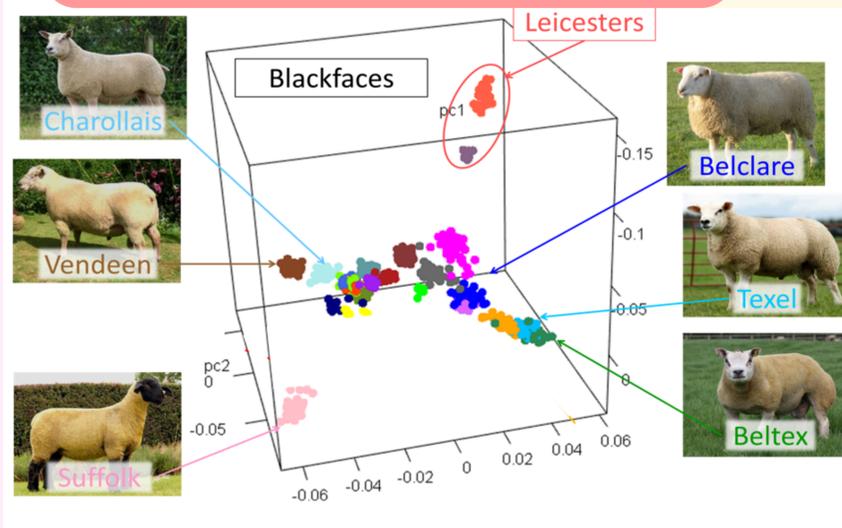
## Disease Resistance

The prevalence of Scrapie type 1

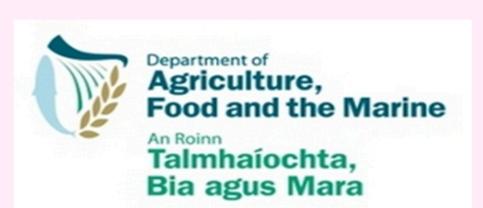
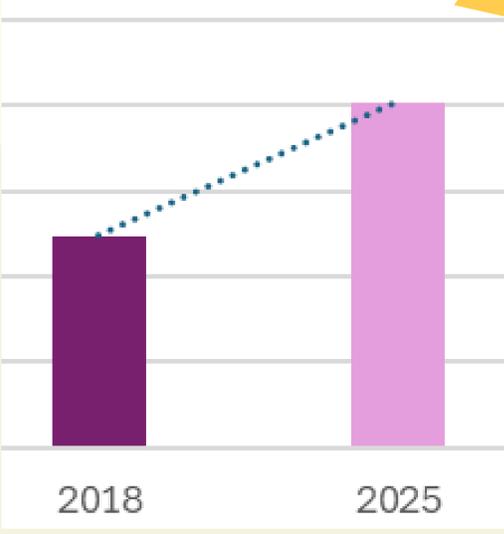
+31% in pedigree lowland population

Over 155k genotypes used in weekly evaluations!

## Breed Determination



One of the largest sheep genomic databases in the world



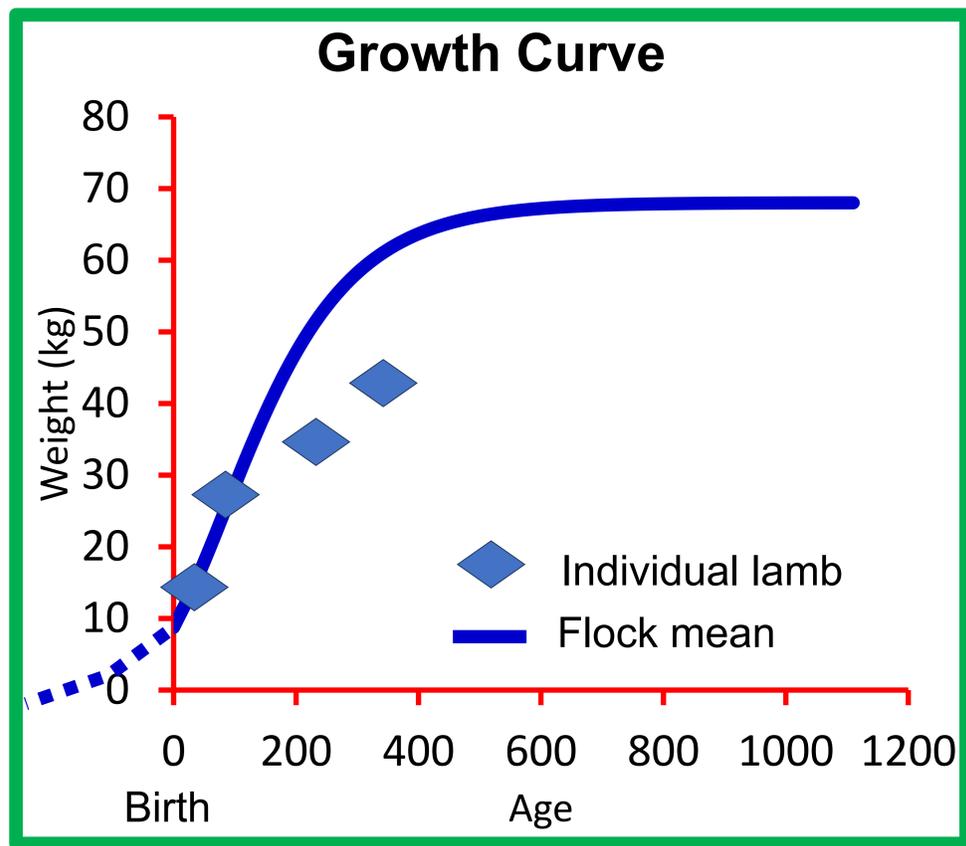
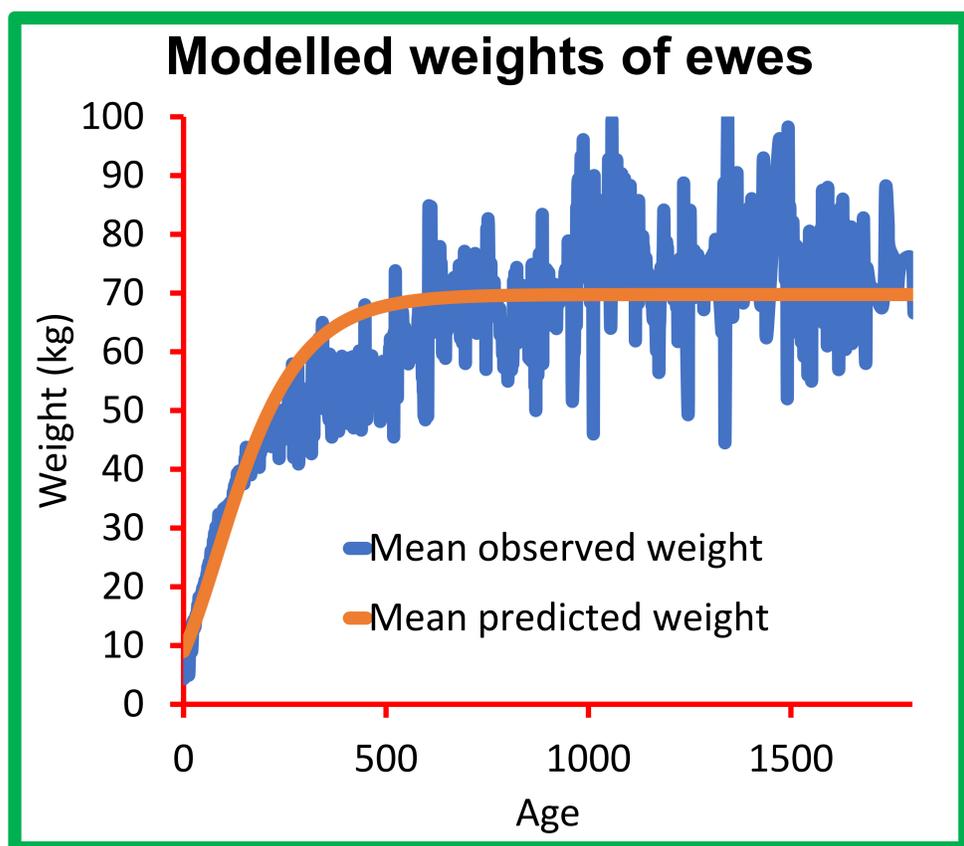
# Genetics of Sheep Growth Curves

## Numan Sharif

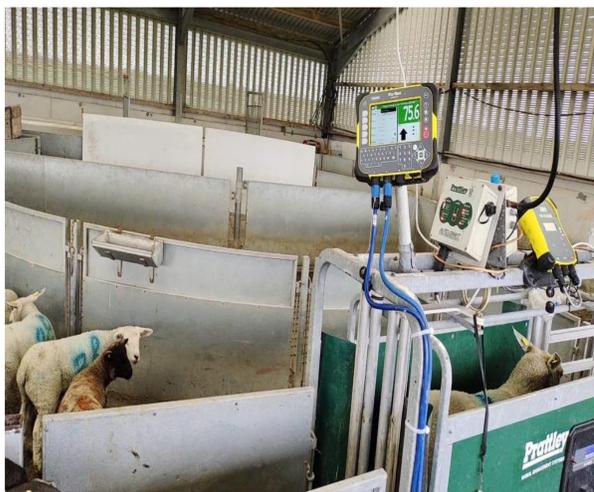


### Objective

To understand lamb growth from birth to maturity and to see if growth parameters are under genetic control



### Steps involved



Weight recording



Estimating genetic components



Including growth curve parameters in genetic indexes



### Key messages

- Mature weight (37%) and maturing rate (25%) are under genetic control
- Future research will focus on applying these growth curves to individual animals



# Sheep Ireland Central Progeny Test (CPT) – Kevin Mulhall

## What is the CPT?

- Established in 2009
- Large scale independent data, collected by trained SI Technicians
- Ram and Trait Comparison
- Only one of its kind in the Northern Hemisphere
- Currently funding 2,250 commercial ewes across 10 flocks
- 3,853 lambs born in 2025

## Evolution of CPT

- Early years - Reliance on SSM to assign parentage
- Now - All CPT lambs genotyped to assign parentage
  - Use of genomic technologies removes labour burden and allows for more data collection
  - Almost 25k genotypes to date

## CPT Ram Usage

- In 2025, 34 SI selected rams used – Natural and AI
- Since Establishment – 400 different sires used
- Rams are used for 2 seasons
- Aim to performance record >75 lambs per ram
- A proportion of females are retained from each ram
- Ram Selection:
  - 5-Star Replacement Index
  - Have no common bloodlines within the CPT
  - Breeds selected are representative of the national flock



## Using CPT Data : 5-Stars Outperform 1-Stars

### Replacement

- 0.21 more lambs born
- 3.4% less lamb mortality
- 4% better mothering ability

### Terminal

- 6% less lambing difficulty
- 2.1 kg heavier lambs at weaning
- 17 days quicker to slaughter

### Why is the CPT Important?

- Independent Commercial Data
- Accelerate Genetic Linkage
- Validation of Indexes
- Research, Development and Implementation of new Traits e.g., Lamb Vigour, Mothering, etc.
- Crucial to compare an across-breed dataset

# Breeding for a low-emissions flock



## Objective

To develop and incorporate the carbon sub index into the Irish sheep breeding program

### 1. Estimation of greenhouse gas (GHG)

- Greenhouse gases estimated using the sheep life cycle assessment (LCA)
- Onfarm activities & production of inputs
- Enteric methane from the PACs



### 2. Deriving the carbon value and the carbon economic value

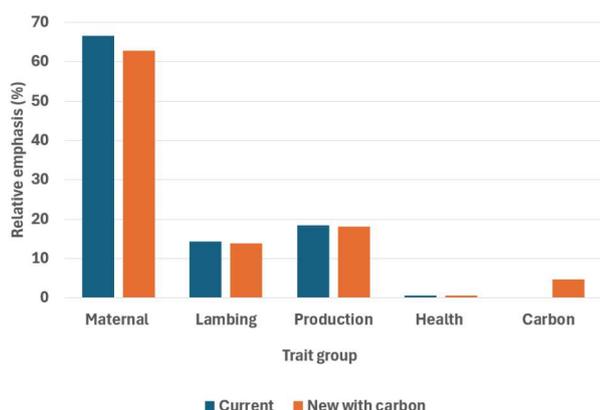
- Change in GHG emissions in response to unit change of a particular trait
- Economic value of €80/t carbon dioxide (CO<sub>2</sub>)-equivalent



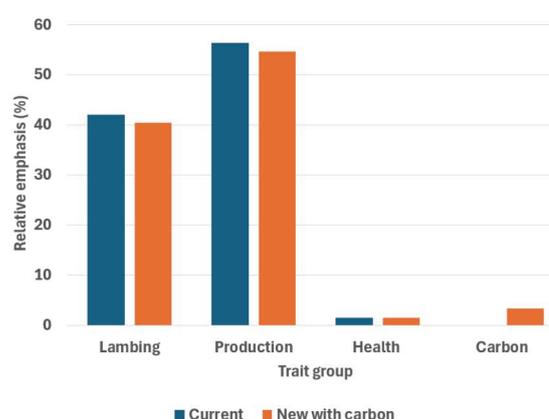
## RESULTS

- The carbon sub-index constitutes a greater proportion in maternal index
- The incorporation of carbon result in redistribution of emphasis across all trait categories with no negative effect.

Maternal Index



Terminal Index



## Key message

It is possible to breed for reduced GHG emissions without negatively impacting the economics of production





Eamon Wall  
Sheep Ireland



# OviFlock

Hill Sheep Flockbooks

## Building the Future of Irish Hill Sheep Breeding

Foundation  
for EuroStars  
/ EBVs for hill  
sheep

Enable  
structured  
genetic  
improvement

Support  
scrapie  
resistance

Prevent  
breed  
dilution

Reduce  
inbreeding



### What OviFlock Is Doing

- ✓ Establishing **6 flockbook databases**
- ✓ **DNA sampling** purebred hill ewes (target: 400+ flocks)
- ✓ Developing an easy-to-use **smartphone data app**
- ✓ **Genotyping priority dams** for full ram parentage verification
- ✓ Collecting important traits (Mature weights, mouth scores, etc.)
- ✓ Linking hill sheep info to **mart sales ring displays**



**Project  
Progress  
To  
Date**



**78 purebred hill  
flocks visited**



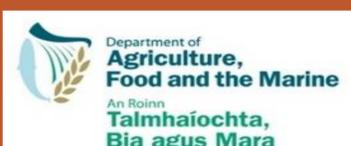
**5,700 DNA samples  
collected**



**On track for 125  
flock visits in year  
one**

**Sign Up or Learn More**

Register via **Sheep Ireland** (OviFlock link on homepage) Email: [query@sheep.ie](mailto:query@sheep.ie) Phone: **023 882 0451**



# Inbreeding trends in sheep

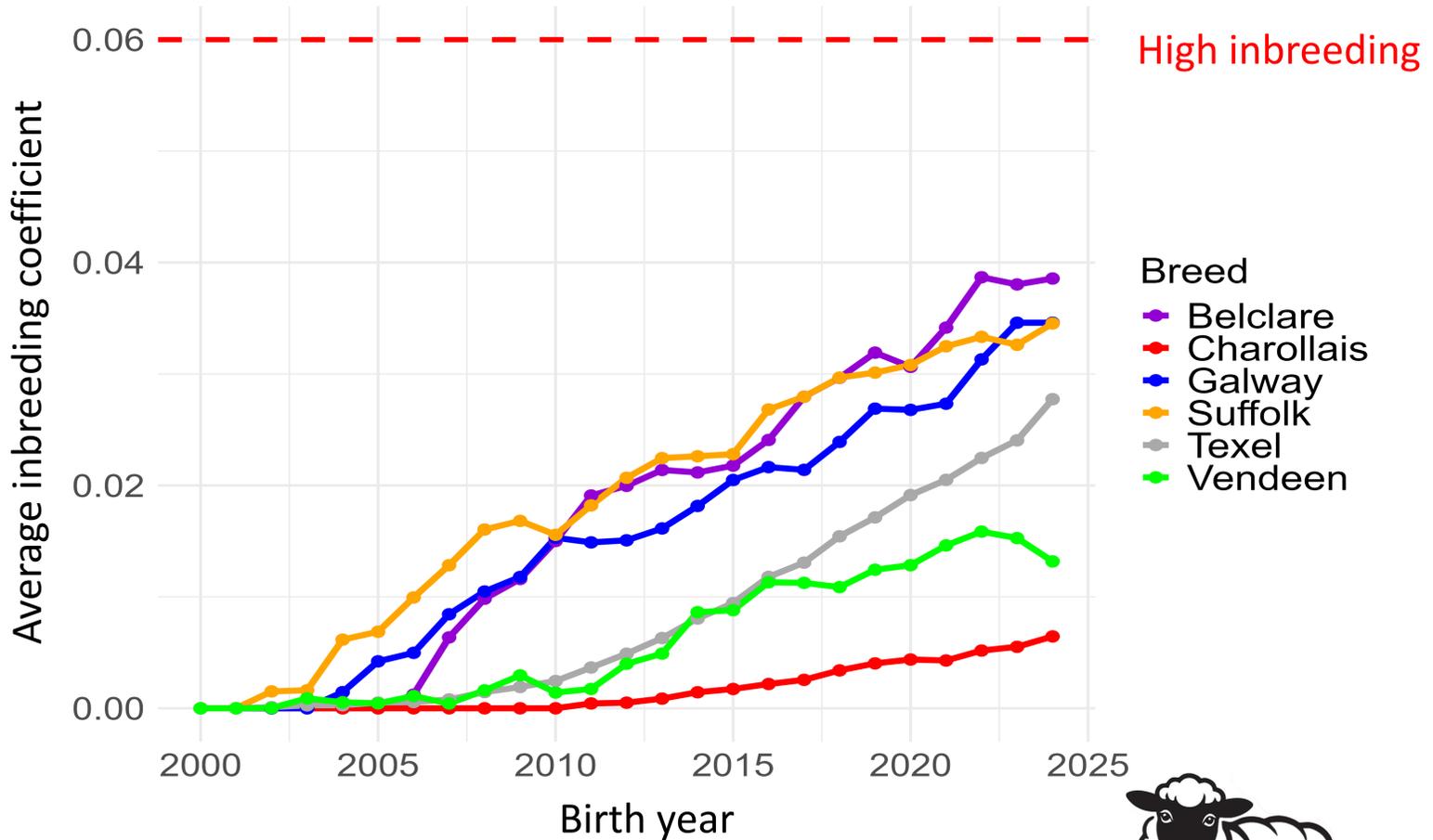


Mujibur.Rahman  
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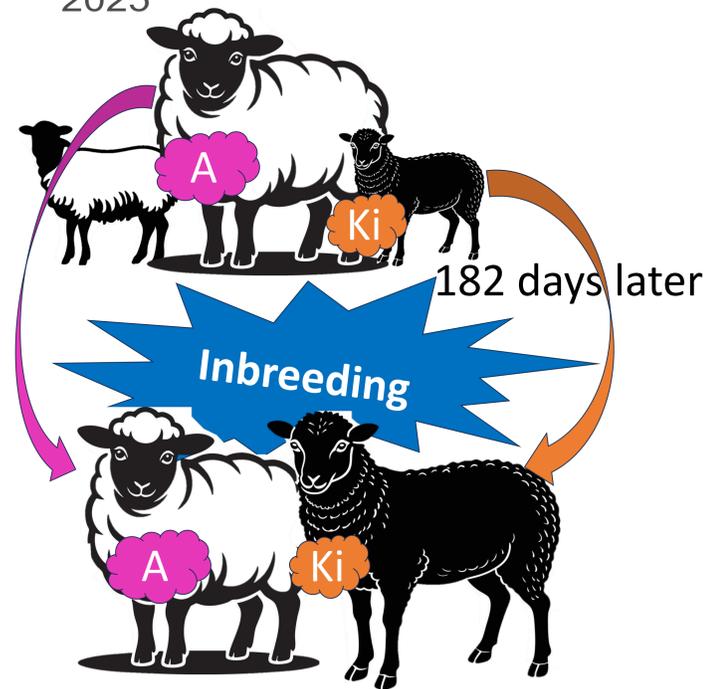
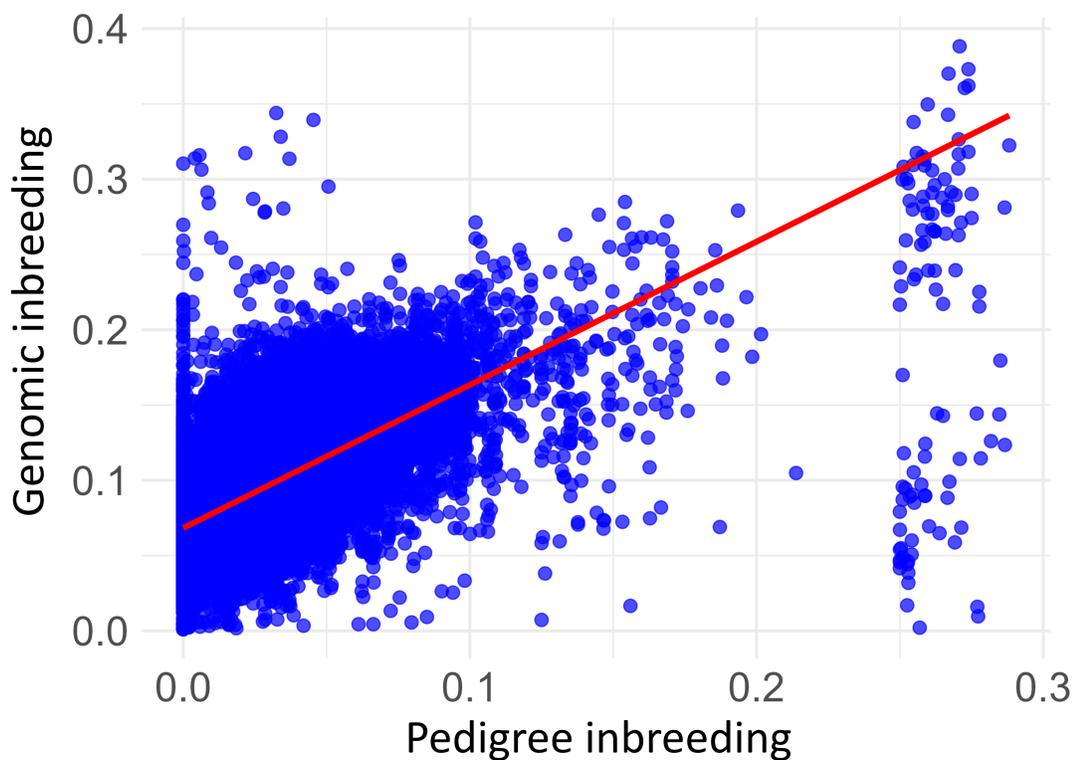
## Objective

1. Compare genomic and pedigree-based inbreeding estimates
2. Look at how inbreeding levels affect key performance traits

### Pedigree inbreeding trends



### Pedigree vs. genomic inbreeding



### Inbreeding effect

Inbreeding:

- ↑ increases lambing difficulty by 0.61%,
- ↓ reduces weaning weight by -0.16%

## Key messages

- Across all breeds - on average low level of inbreeding
- Animals with high levels of inbreeding show reduced performance

# Multi-country survey on awareness of genetic tools for methane mitigation in sheep

## Objective:

This survey aimed to establish a multi-country baseline of stakeholder's knowledge, perceptions, and willingness to adopt genetic tools for methane mitigation in sheep production



n = 88



n = 116



n = 9



n = 141

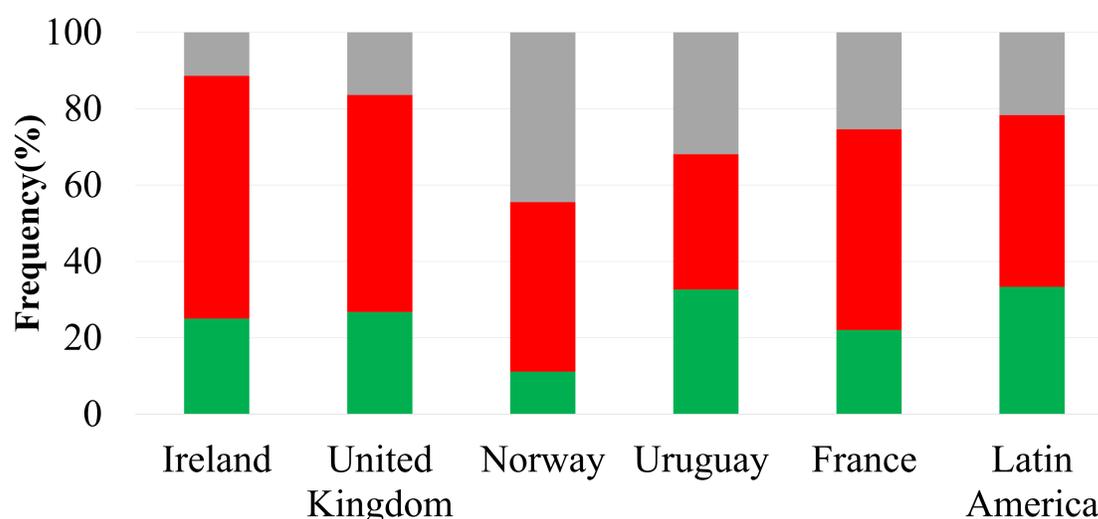


n = 59

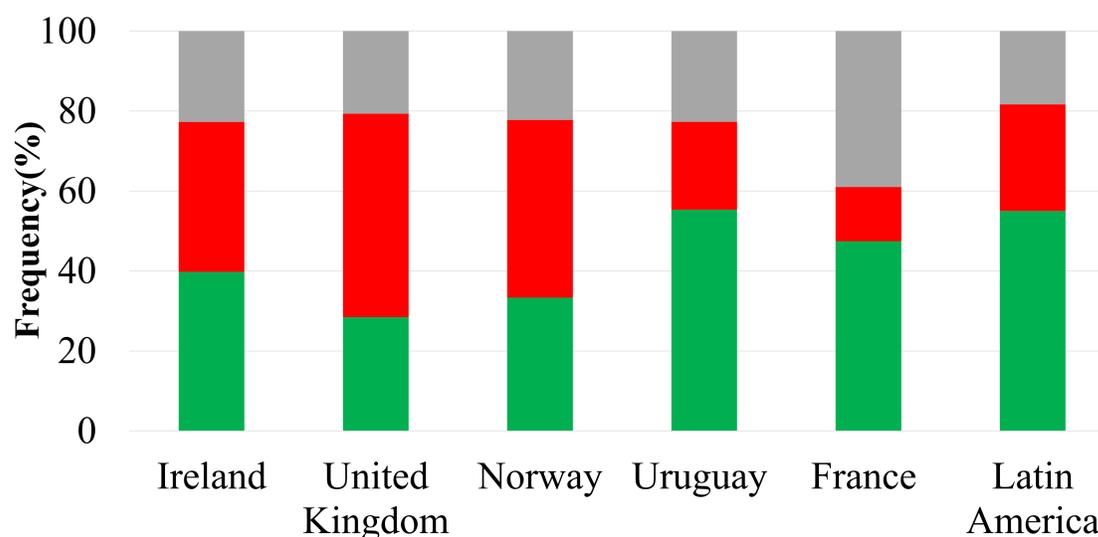


n = 60

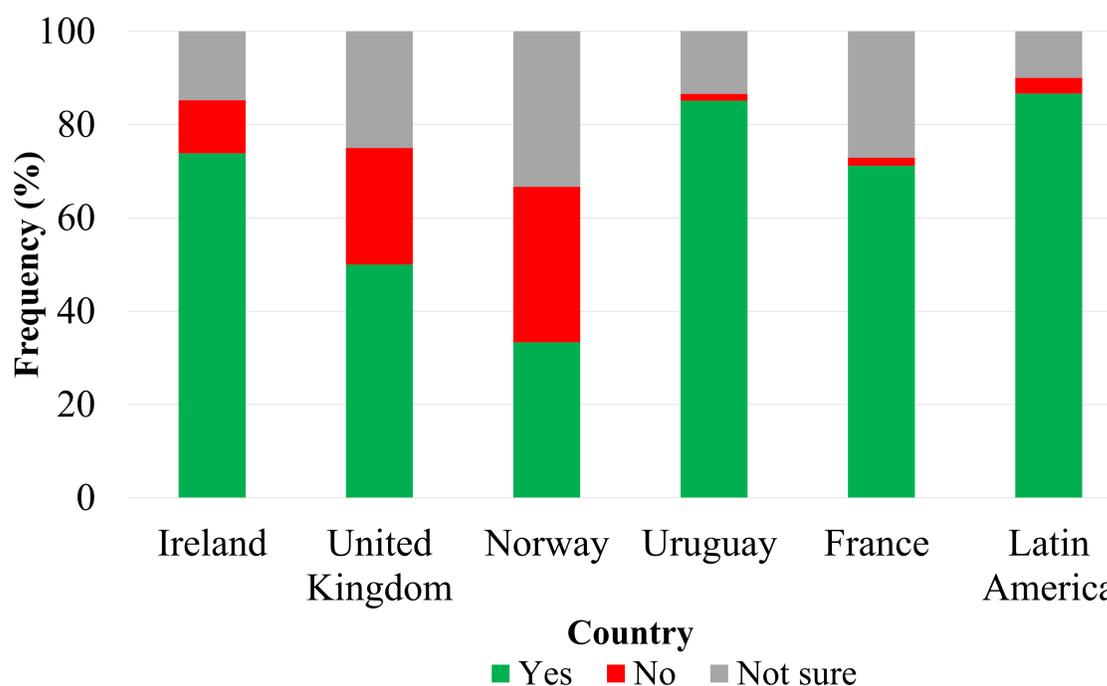
**Do you think sheep emit significant amounts of methane?**



**Do you think methane emissions from sheep need to be reduced?**



**Would you be willing to support genetic tools to reduce emissions?**



The survey highlights broad international openness to genetic solutions for climate-smart sheep breeding

# Breeding Efficient, Low-Methane Sheep



Dermot Kelly

## Objective

Can we identify animals that are more methane efficient, without compromising performance?



Kg BW/kg DMI/kg carcass



## Key messages

We can identify sheep that produce less methane while delivering superior performance, improving farm profitability in a sustainable manner

# INZAC II: How Elite Genetics Can Boost Your Flock Performance



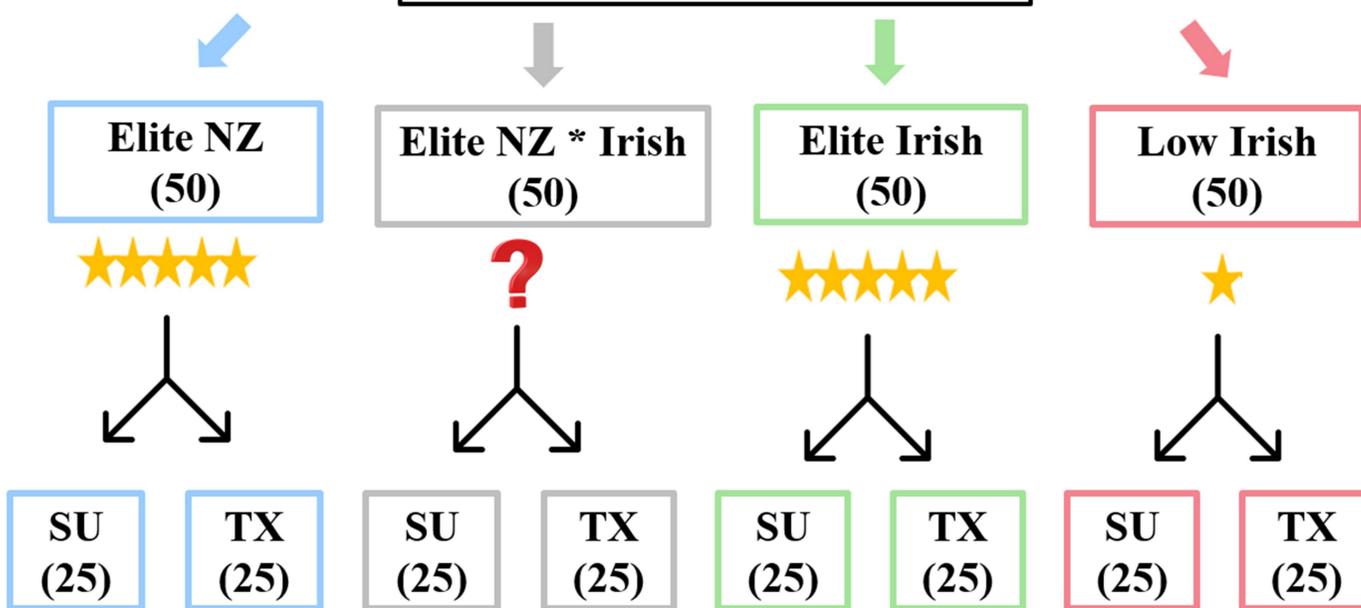
## What were we trying to find out?

To assess how ewe genetic merit impacts:

- Ewe reproduction
- Ewe lambing
- Lamb performance
- Ewe efficiency



## The INZAC flock (200 ewes)



## Measurements

Breeding

Scanning

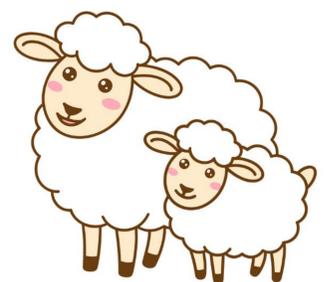
Lambing

Lamb growth

## What we found

Elite genetic merit ewes have:

- ✓ Greater pregnancy scan rate and number lambs weaned
- ✓ Fewer barren ewes
- ✓ Less lambing difficulty
- ✓ Lambs 4kg heavier at weaning
- ✓ Lambs finishing for slaughter 10 days earlier
- ✓ Ewes weaned > 70% of their mating live-weight



## Key Takeaway

Investing in elite genetics results in more productive ewes and faster growing lambs

# Breeding for Survival

## Genetic and non-genetic factors associated with ewe culling

A. Mahony



Aoife Mahony, Teagasc  
aoife.mahony@teagasc.ie

### Objective:

- Identify factors associated with voluntary and involuntary culling
- Estimate the heritability of ewe culling



### Early removal of ewes from the flock through voluntary culling;

- ⬆ Increases female replacement costs
- ⬇ Reduces flock productivity
- ⬇ Reduces output per ewe
- ⬇ Decreases flock sustainability



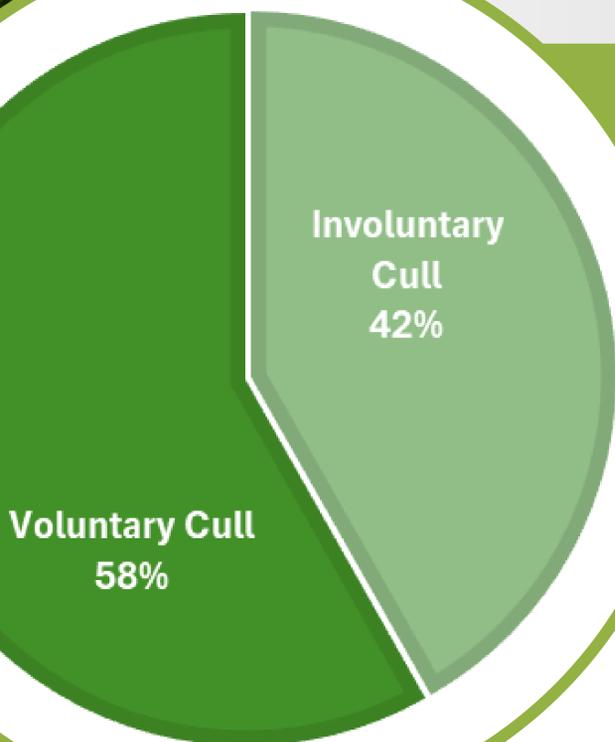
- Understand reasons for culling on farm
- Reduce incidences of voluntary culling on farm

### NEXT STEPS:

- Gather more data, link to national database
- Stars for ewe-survival trait ★★★★★



N = 1256 records



### Involuntary Culling:

Unplanned removal of an ewe from the flock due to unforeseen circumstances  
Age - Udder Health - Condition - EBV - Performance

### Voluntary Culling:

Planned removal of an ewe from the flock based on management decisions  
Death - Disease - Mastitis

### KEY MESSAGE:

Understanding longevity will support the development of a **new ewe-survival trait** that strengthens the profitability and sustainability of Irish sheep production

# Predicting growth & benchmarking flocks

Adam Dunne



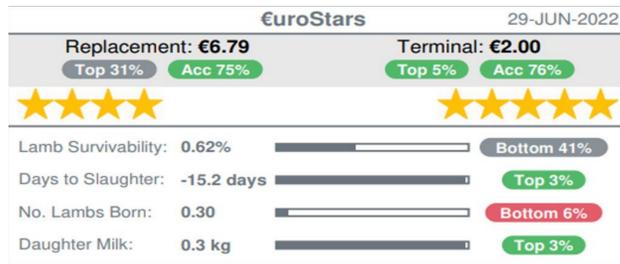
## Objectives

- 1) Benchmarking flock growth performance
- 2) Predict future lamb growth

### 1) Putting flocks on the scales: Evaluating management performance

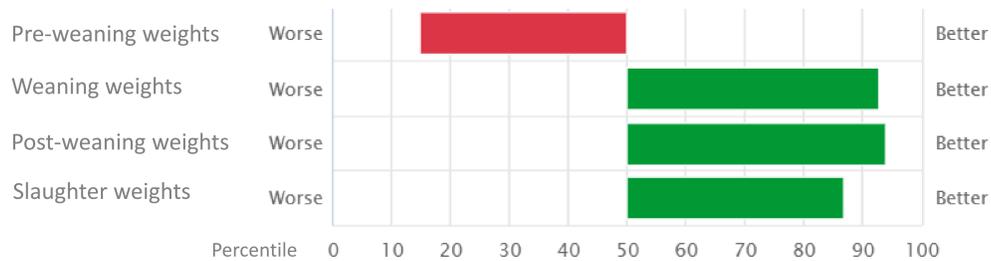


Eurostar indexes used to compare animals

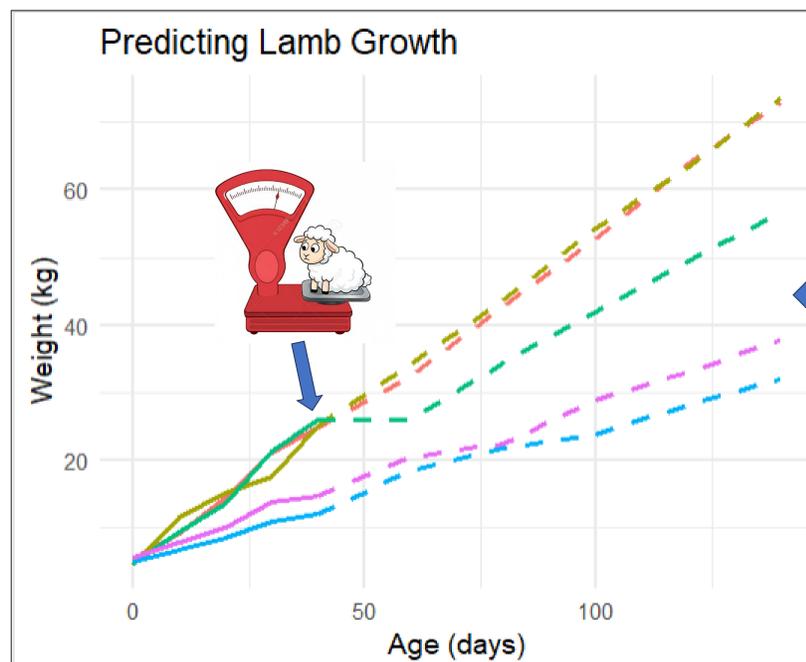


But flock management practises also governs lamb performance

**Flock Profile Tool:** Enable farmers to assess their flock growth performance after accounting for genetics



### 2) Predicting future lamb weights



**Projected weight**  
Prediction based on:  
Litter size, sex, dam parity,  
genetics and flock management

Accuracy improves as more weights are recorded

**Result:** Manage lambs based on projected weights

## Key messages

- Flock-level profiles can be used to benchmark flocks independent of genetics
- Predictive models forecasting liveweight enable proactive management decisions



# Breeding Climate-Smart Sheep

shalini.abeykoon@teagasc.ie

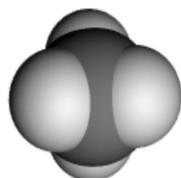
## Objective

Should we combine Irish with international sheep genetic data?

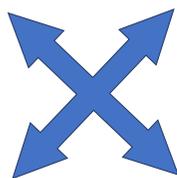
## Linked Traits



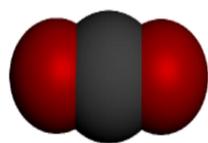
Feed Intake  
( $< 500$  records)



Methane (GHG)  
( $> 10,000$  records)



Body Weight  
( $> 50,000$  records)



Carbon Dioxide (GHG)  
( $> 10,000$  records)

### PROBLEM

Selecting for animals with low methane emissions  $\rightarrow$  animals with low body weight.

### FIX

Create a methane trait that corrects methane emissions for body weight.

### END GOAL

Have a methane trait that does NOT penalise fast growing animals

## Case Study

Combining Irish and New Zealand Sheep Data



Better methane predictions



## Key messages

1. Methane is heritable – we can breed to lower emissions
2. Create a methane metric that doesn't penalise fast-growing animals
3. Potential to incorporate the methane metric into a combined dataset of Irish and international sheep



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Bia agus Mara  
Department of Agriculture  
Food and the Marine

**W**  
WALSH SCHOLARS  
PROGRAMME

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AGRICULTURE AND FOOD DEVELOPMENT AUTHORITY

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BRIDGING SCIENCE & BUSINESS

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