



Sheep Health and Welfare Group Conference 2018

Breeding more resilient sheep

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Breeding resilience



Principles

- Measurement
- Heritability
- Challenge
- Selection

Examples

- Texel Sheep Society
 - Mastitis
 - Footrot
- Signet / AHDB / PRLB
 - Longevity
 - Worm resistance

Future

- Genomics
- New traits
 - BCS

Why is resilience important?



Resilient animals are those that are able to withstand or recover quickly from difficult conditions

Important for lots of things we are interested in including:

- Lameness
- Fly strike
- Worm resistance
- Longevity
- Mastitis

All of high economic and welfare importance and have been shown to have some genetic basis for variation

They can be difficult traits for breeders



- Hard to measure
- Low heritabilities
- May need to expect a slow down or check in production while sheep are under 'challenge'

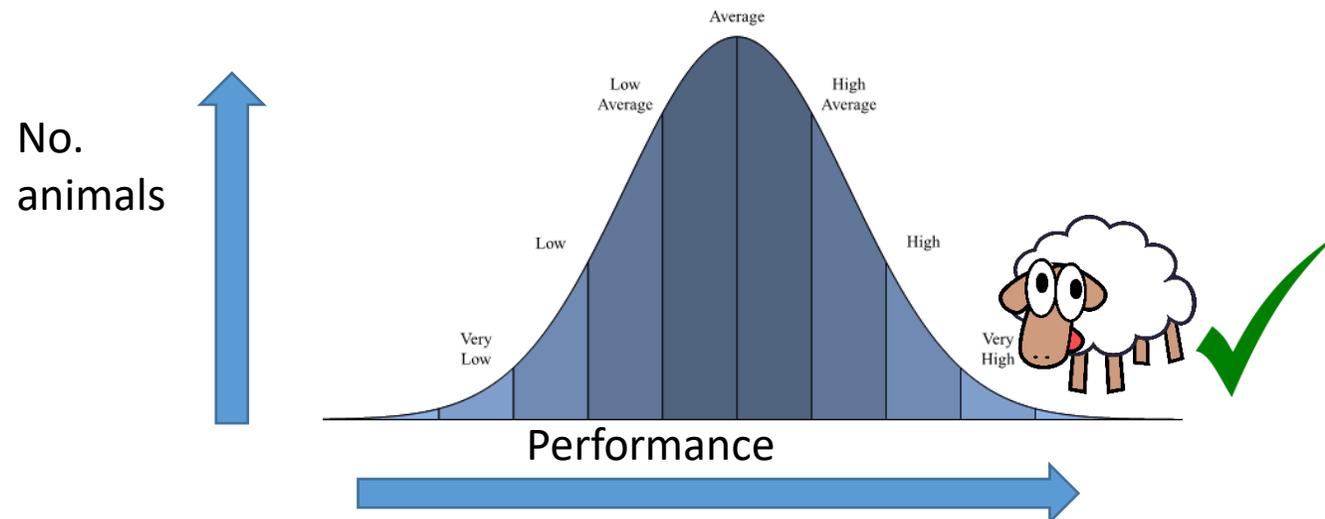
Breeders equation



$$\text{Genetic gain/year} = \frac{\text{heritability} \times \text{selection differential}}{\text{generation interval}}$$

Heritability estimates the degree of variation in a phenotypic trait in a population that **is** due to genetic variation between individuals in that population.

Helps if you can increase selection differential and decrease generation interval



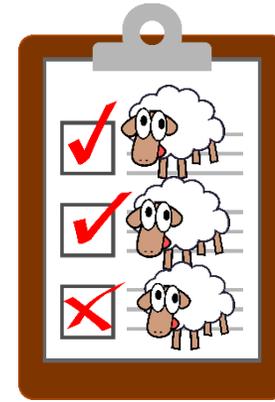
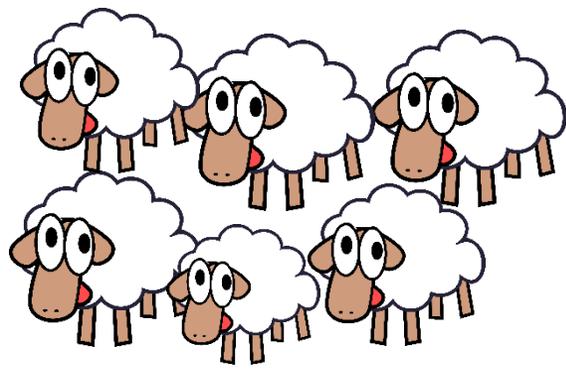
The importance of challenge

- It is easier to identify more resilient sheep on some farms than it is on others
- The best way to find animals that thrive in less than optimal conditions is to rear and record them in those conditions





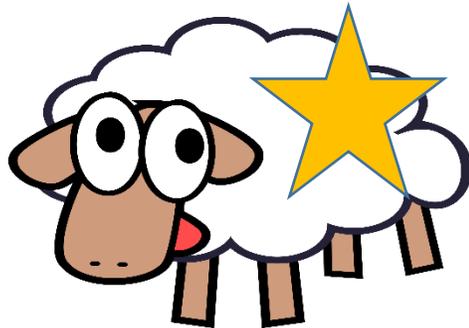
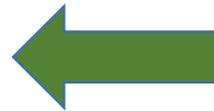
Challenge



Record



Analyse



Select

Texel Sheep Society disease resilience data collection



- Phenotype farm network
- Hard-to-measure maternal traits
 - Footrot
 - Mastitis
- Texel and Texel cross ewes make up about 12% of the maternal flock



Hard-to-measure data collection



Milk samples



CMT score for each udder half

All feet scored for level of infection



Foot scores



Data recording

Data to date

- Four years of hard-to-measure data collection
- Over 7000 footrot scores
- Mastitis score from more than 4000 ewes

Footrot heritability 0.18

Mastitis heritability 0.09

Longevity

For commercial farmers it needs to be 'productive' longevity
Signet / AHDB Beef and Lamb funded work to see if an EBV
for longevity could be established from existing data.

- Around 10,000 Lleyn ewes recorded annually
- Using information already collected i.e. birth year, age at first lambing, total litter size born, number of lambing events
- Heritability for Lleyn of 0.05
- Published Estimated Breeding Values (EBVs)

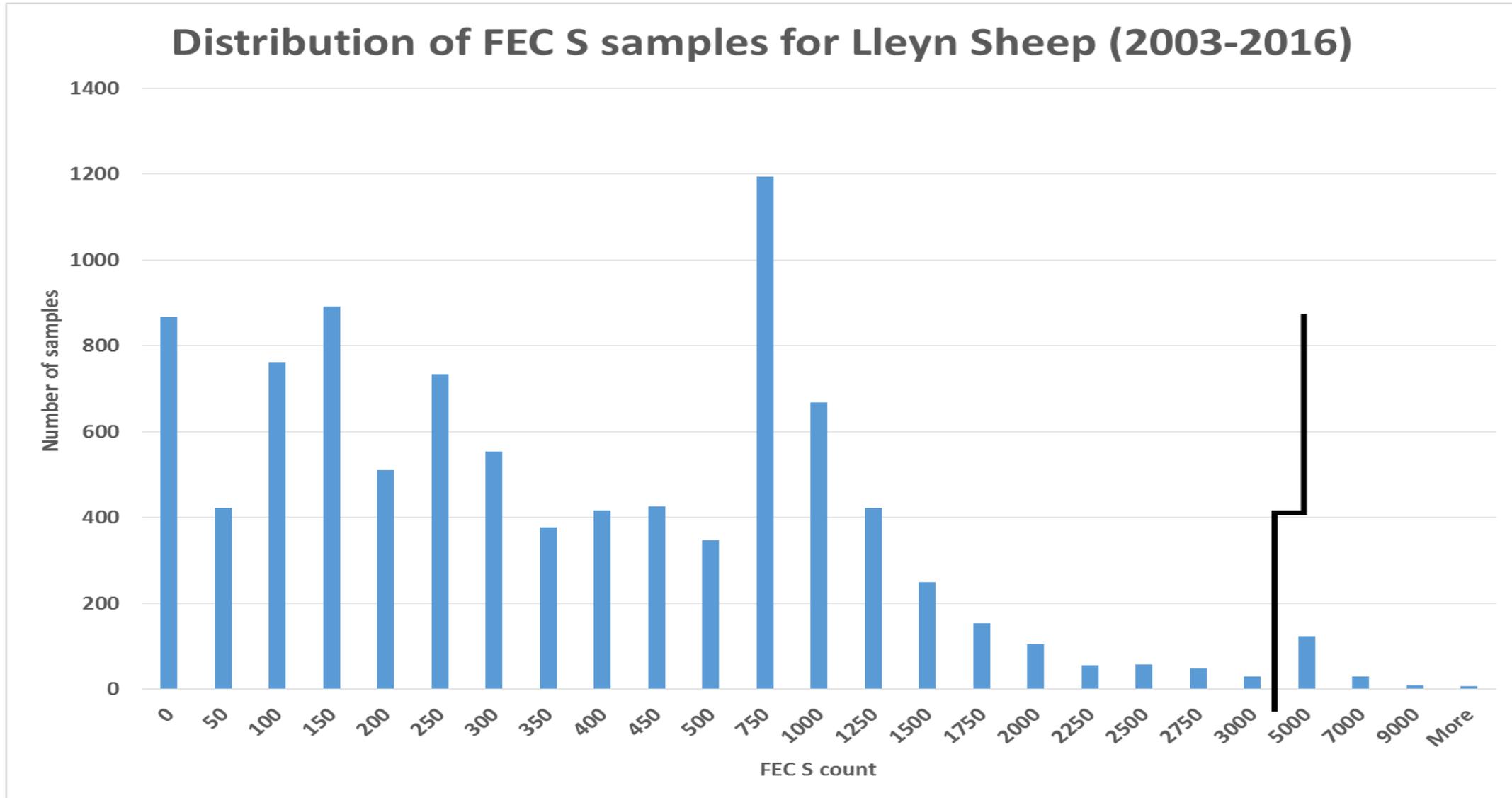
Worm resistance

- Wormer resistance costs UK sheep industry £84m a year
- Breeders have a role to play in slowing down resistance by breeding sheep more resistant to worms
- Another hard-to-measure trait
- Standard way is by the collection of individual Faecal Egg Counts for Strongyles (FEC S) and Nematodirus (FEC N)
- To get meaningful FEC results lambs have to be under a significant worm challenge

Data collection



Variation



A new phenotype – Saliva IgA



- Research at Glasgow University had shown that parasite specific Immunoglobulin A (IgA) in saliva could provide a new worm resistance phenotype.
- IgA is thought to control adult worm length by targeting immune cells to the worms, preventing them from feeding. Shorter worms produce fewer eggs.
- We can't directly measure the amount of IgA in the intestine mucosa but it can be detected in saliva
- The test looks for the IgA specific to the worm species *Teladorsagia circumcincta* – the most parasitic of the Strongyles
- Potential advantages – easier to take, don't need such a high worm burden, cheaper, higher heritability?

Performance Recorded Lleyn Breeders



- Taken over 12,000 FEC and Saliva IgA samples since 2014
- New published EBV for Saliva IgA
- Updated heritabilities

Strongyles (FEC S) = 0.07

Nematodirus (FEC N) = 0.21

Saliva IgA = 0.11

We should learn more from our project
with Harper Adams



Will genomics help?

- The biggest gains from genomics are seen in these sort of hard to measure, often maternal, traits
- The phenotyped Texel ewes have DNA samples taken at the same time
- As we move towards genomics the collection of phenotypes from a well recorded population will be essential
- Higher accuracy of EBVs earlier in life



Final thoughts



- They can be difficult traits for breeders but lots of potential welfare and economic benefits
- Genomics should help but collecting phenotypes will still be essential
- Could BCS be important?
- Lots of good work already being done but it will need support to continue and expand
- Buy from breeders who demand at least as much from their sheep as you do – preferably more

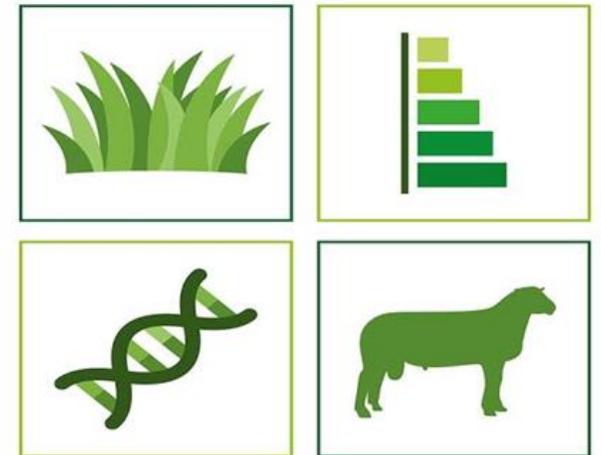
Thanks

Signet

Signet Breeding Services

AHDB

BEEF & LAMB



PERFORMANCE
RECORDED
LLEYN BREEDERS



Harper Adams
University



University
of Glasgow