Texel Society research and breed development

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Texel Sheep Society

South East Texel Group
27th January 2021

British Texel Sheep Society

- Formed in 1974
- Largest registry of pedigree Texels in the world
- > 2,300 members
- Birth notify 55,000 lambs
- 20,000 females and 1,500 males registered annually
- The Society and 19 regional clubs market ~12,000 breeding rams through 35 sales throughout the UK
- A founder shareholder of Basco Data Ltd in 2004
- Launched new iTexel database in 2019
- Aligned with in-house genetic improvement services
- Supports the Society's research and development

Texel sheep in the marketplace

- Leading UK terminal sire breed

27 %

12 %

Texel Society R&D

- Overcome technological barriers to support breeders and increase genetic gain of Texel breed

- Extremely successful integrating science and technology into its people business over decades...

- Breed Development Strategy
  - Strategic direction to benefit breed, breeders and industry

- Two industry-leading commercial research projects
  - Disease resilience | Carcase quality | Meat quality

- Two multi-country research projects
  - Disease resilience | Feed efficiency

- Genomics central to research and breed development

Breed development vision

Through leadership and collaboration, increase the financial, animal health and welfare, and environmental benefits of Texel sheep to breeders, commercial farmers, industry and the public

Diversity of research activity

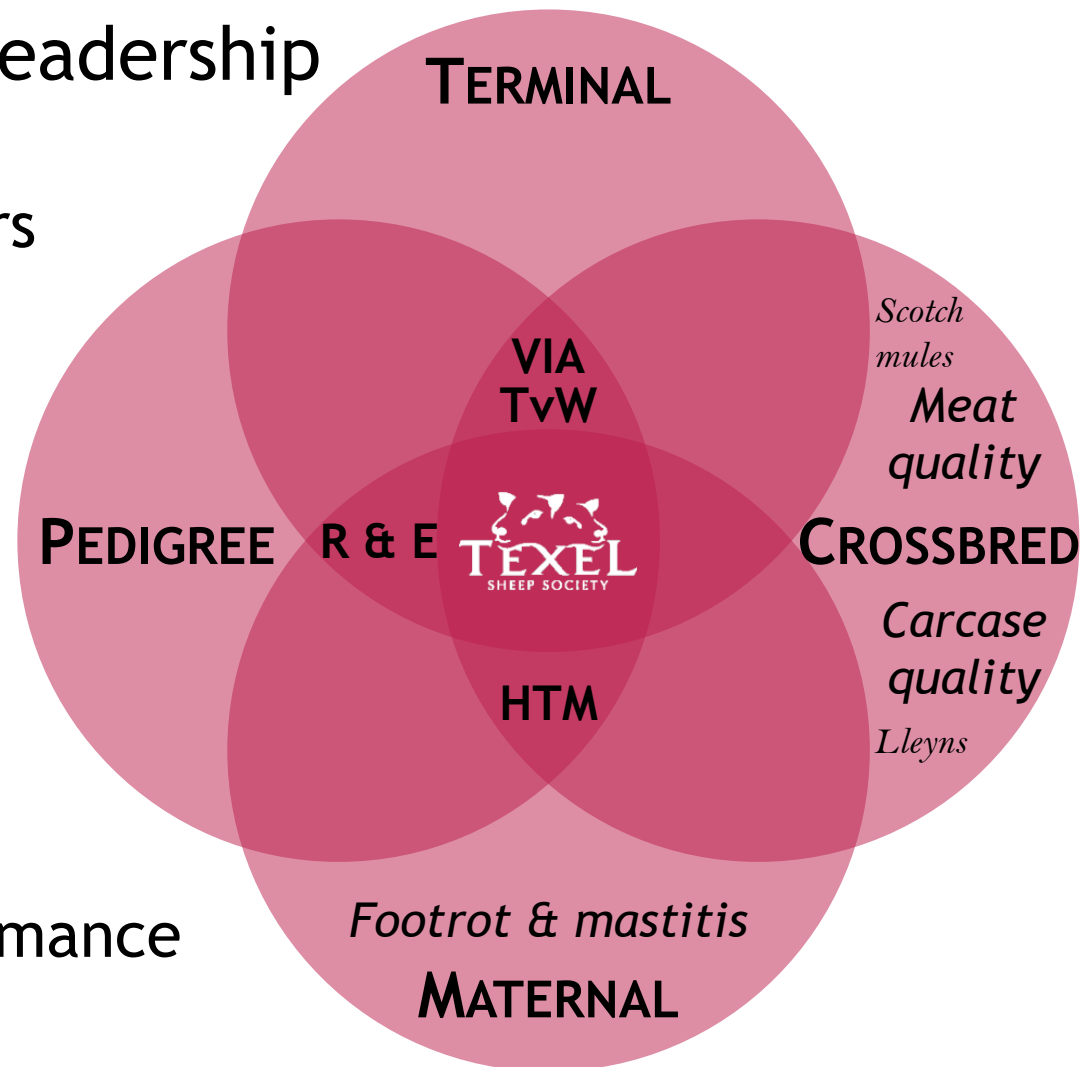Collaboration and leadership

People benefits

Animal benefits

Diversity of research activity

- Collaboration and leadership
  - Breeders
  - Commercial farmers
  - Academics
  - Industry
- People benefits
  - Management
  - Profitability
- Animal benefits
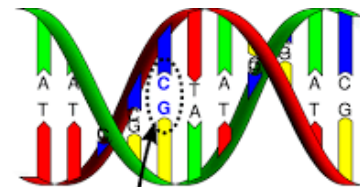 - Welfare
  - Commercial performance

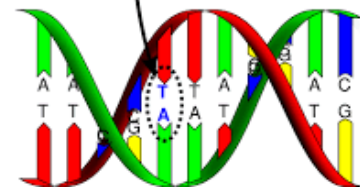# *Genomics and 'Hard-to-measure' traits*

What is genomics?

- Study of an animal's entire set of DNA

- Every individual has a unique DNA signature

- DNA influences performance

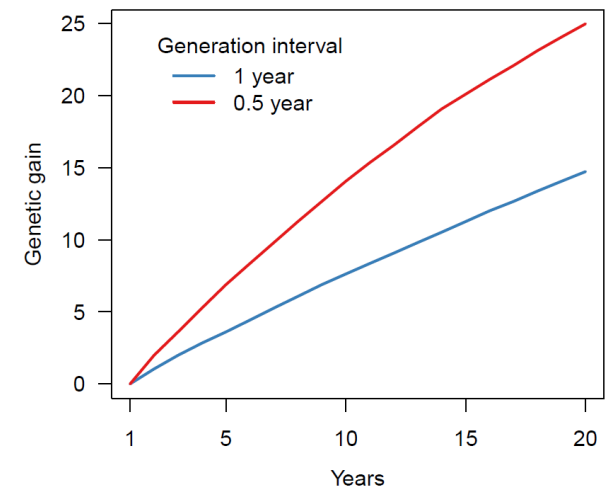- …so if we know the DNA, we can predict performance?…



Fast growing lambs

Very lean lambs

Genomic selection

- Use thousands of markers throughout the genome

- Understanding the genetic potential can unlock the maximum value

- Improved response to selection
  - Accuracy of data (more is better)
  - Diversity of data (more is better)
  - Time (generation interval)
  - Selection intensity

Benefits of using genomics

- Determine an animal's value from birth

- Increased accuracy of selection

- Increased selection intensity

- Increase rate of genetic gain

Parent generation

Offspring generation
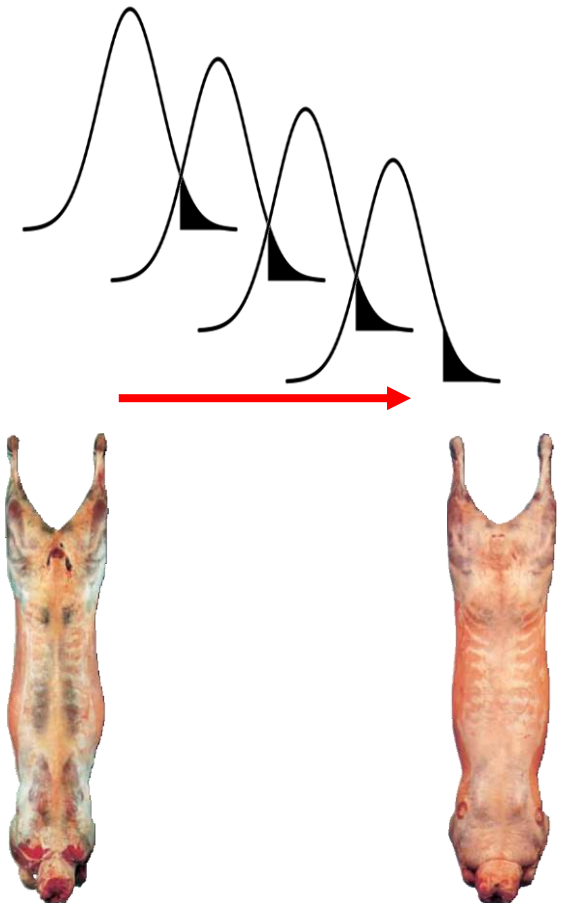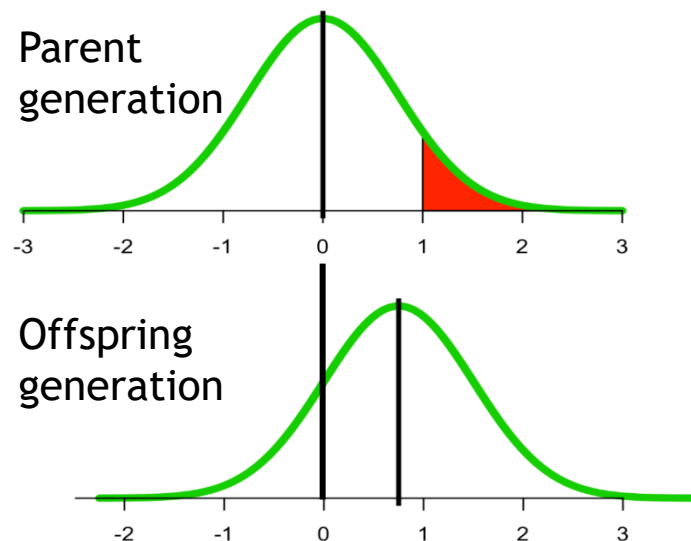
Sounds great, why don't we start?

- First we need data (lots of it), and some ££

REFERENCE POPULATION

Measurements:
e.g. disease scores

+

Thousands of
genetic markers

Relationship between
measurements and
genetic markers

*Prediction
equations*

*Genetic
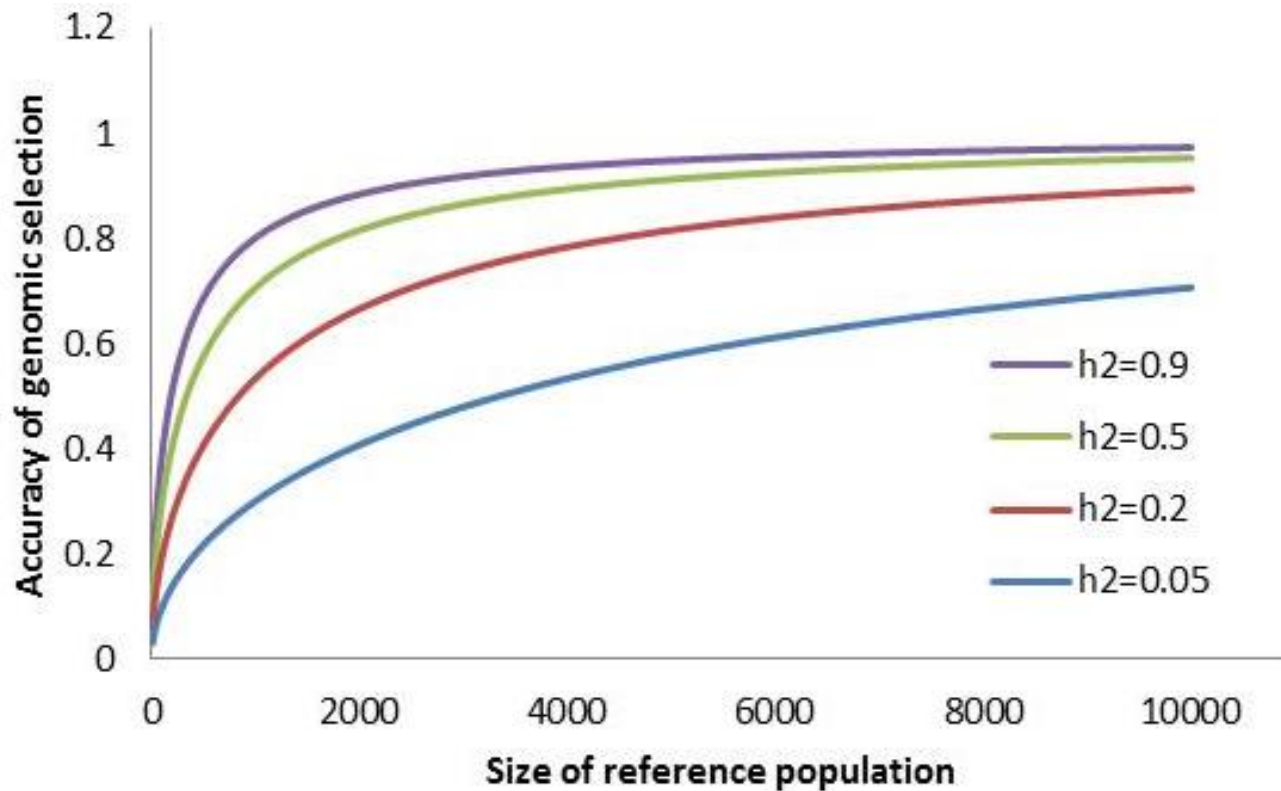relationships*

Thousands of
genetic markers

+

*Prediction
equations*

Genomic
predictions

MAIN POPULATION

Reference population

- How big does the reference population need to be?

Neil Clelland, SRUC

Building our reference population

- DNA sampling and genotyping all rams registered

- Policy now in its sixth year
  - No cost to member
  - Cross-section of animals
  - No extra phenotype (trait) data

- DNA sampling and genotyping all CT scanned ram lambs
  - No cost to member
  - ~250-300 animals per year
  - Extra CT phenotypes

- Collection of hard-to-measure trait data

Novel Phenotype Farm Network

- 25 fully-recorded pedigree flocks
- Individual flocks with links
- Representative of the wider breed
- Disease resilience data collection
- Develop genomic reference population
  - Genotyped and phenotyped animals
    - *Footrot (nine measures)*
    - *Mastitis (four measures)*

Health traits: Footrot & mastitis

- Data collection developed and optimised
  - Reduce burden on staff and breeders
  - Refined phenotyping relevant for commercial exploitation
- Handheld Psion computing / bespoke software
- Maintains data collection to support genetic and genomic evaluations
- Created a novel reference population ~ 4,500 genotyped and phenotyped pedigree animals

Disease resilience data to date

- Footrot heritabililty: 0.18 | Mastitis heritability: 0.09
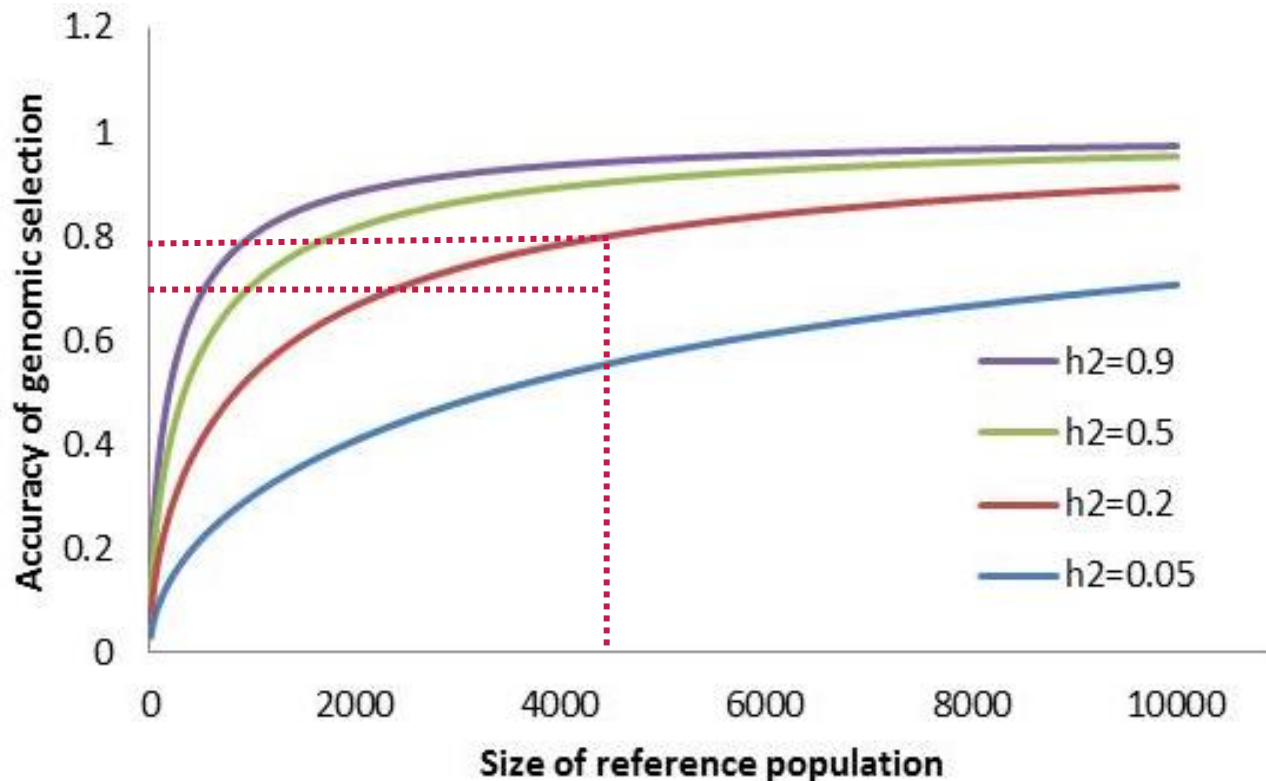
Research GEBV development

- Produced for 50,000+ pedigree animals
  - TSS texelplus service delivery
- Individual Phenotype Farm feedback
- Within and between flock comparisons and rankings
- Benchmarks calculated to structure the data
  - Breeding value thresholds
  - Identify top and bottom 1%, 5%, 10% animals

Between-flock comparisons
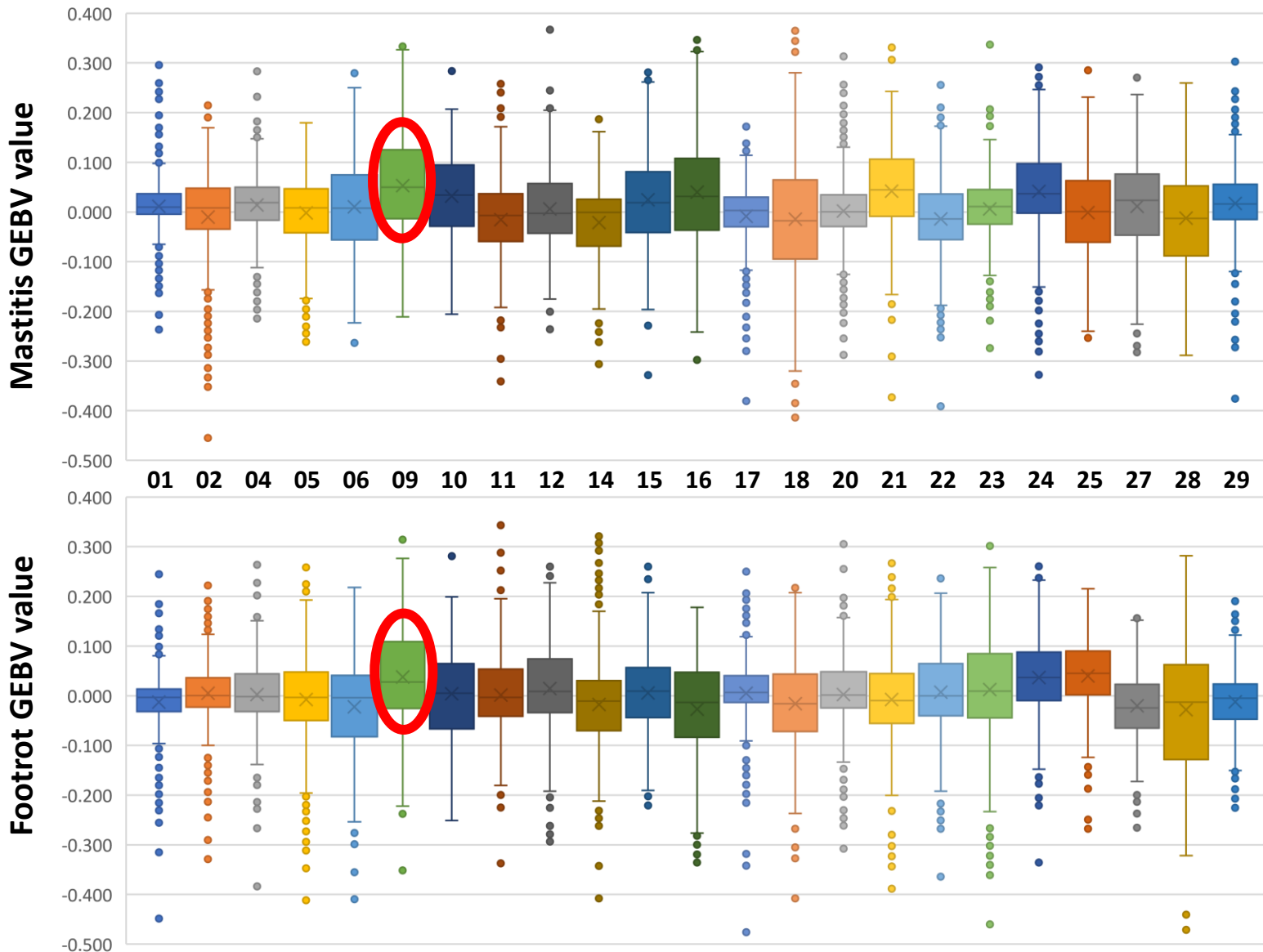
Within-flock comparison

- Footrot vs Mastitis
  - Whole flock analysis
  - Top 10% animals
  - Bottom 10% animals

Bottom 10%

Top 10%

#addtexeladdvalue
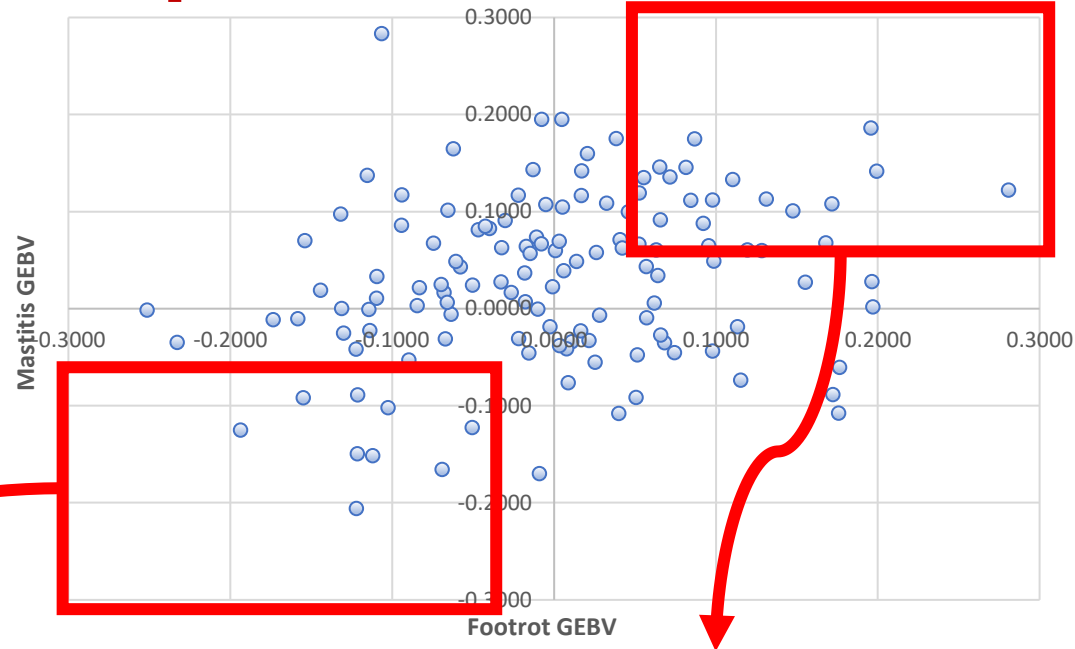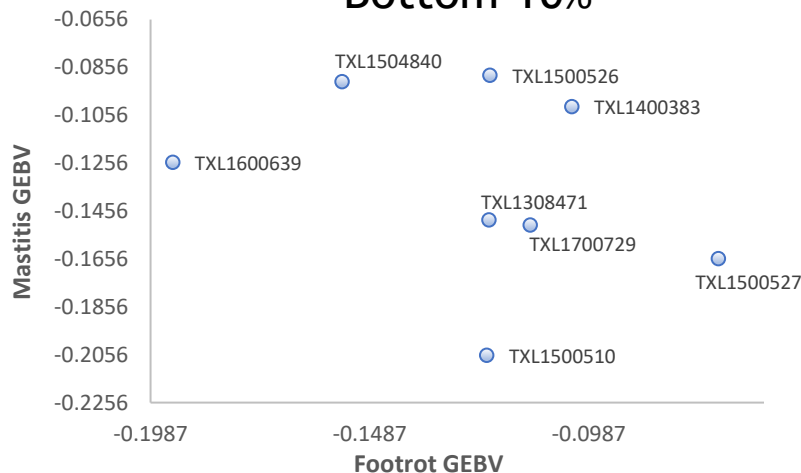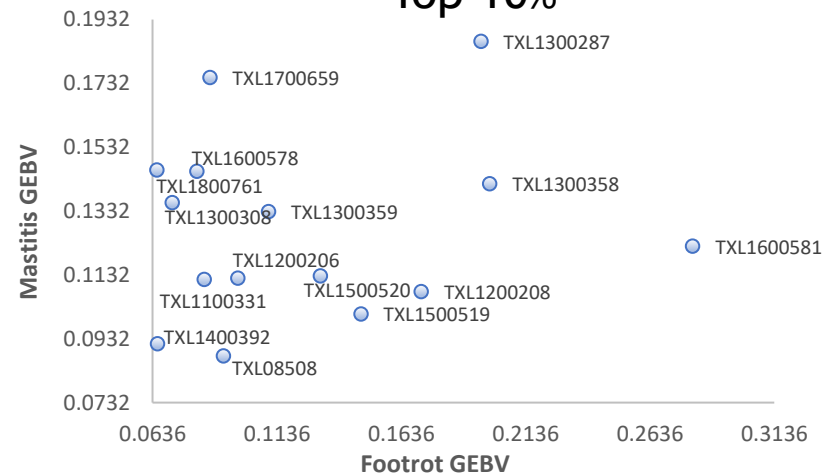
Meat and carcass quality

Meat and carcass quality

- Two major commercial research projects
  - Taste vs Waste
  - Video Image Analysis (VIA)

- Address Breed Development Strategy
  - Developing commercially relevant traits
  - Enhance the breed's reputation for consistency and quality
  - Collaborations with
    - Industry
    - Academia
    - Commercial sheep flocks

- Initial steps to try and influence a consumer-driven, integrated value chain for red meat

Taste vs Waste

Aim to identify sheep that lay down less fat and deliver a tastier product

- Worked with four commercial Scotch mule flocks

- Provide performance recorded Texel rams

- Single-sire mating groups and AI

- Lambs born and reared to commercial specifications

- Live animal data capture
  - Growth rates
  - Muscle and fat depth

- Post-mortem data capture
  - Meat and carcass quality

Video Image Analysis (VIA)

Ultimate aim to turn the conventional breeding pyramid upside down by using commercial data to drive selection in pedigree flocks

- Working with commercial Lleyn flocks

- Single-sire mating groups and AI

- Lambs born and reared to commercial specifications

- Novel carcass grade data collection

- Derive new carcass traits (e.g. saleable meat yield)

Connecting breeders and farmers

- Sire distribution
  - Commercial partner flocks (●)
  - Live sires
    - Pedigree phenotype farms (●)
    - Other breeders (●)

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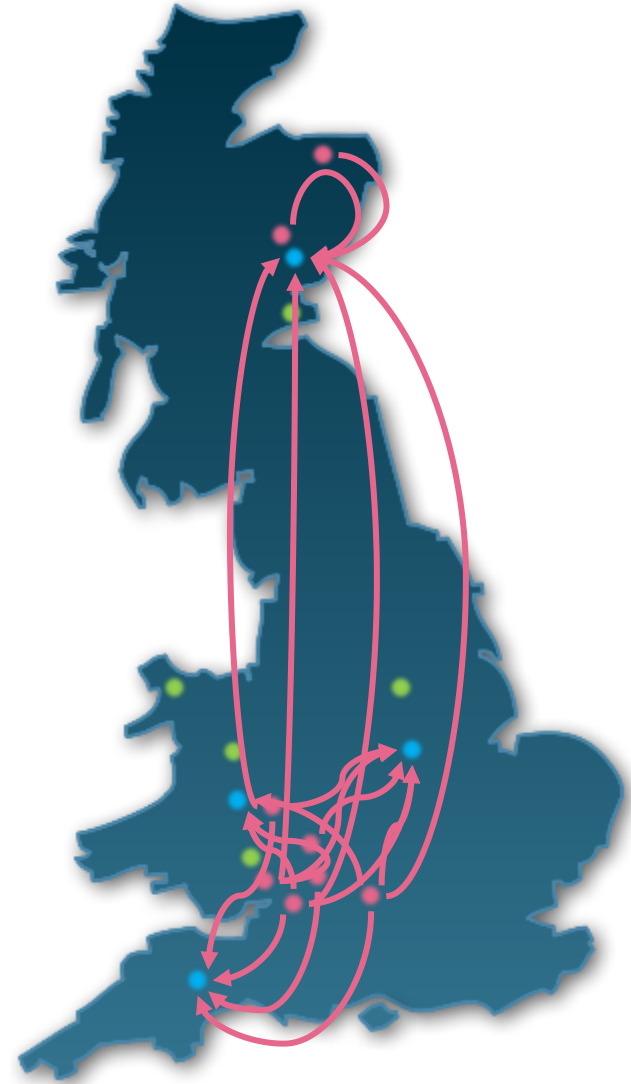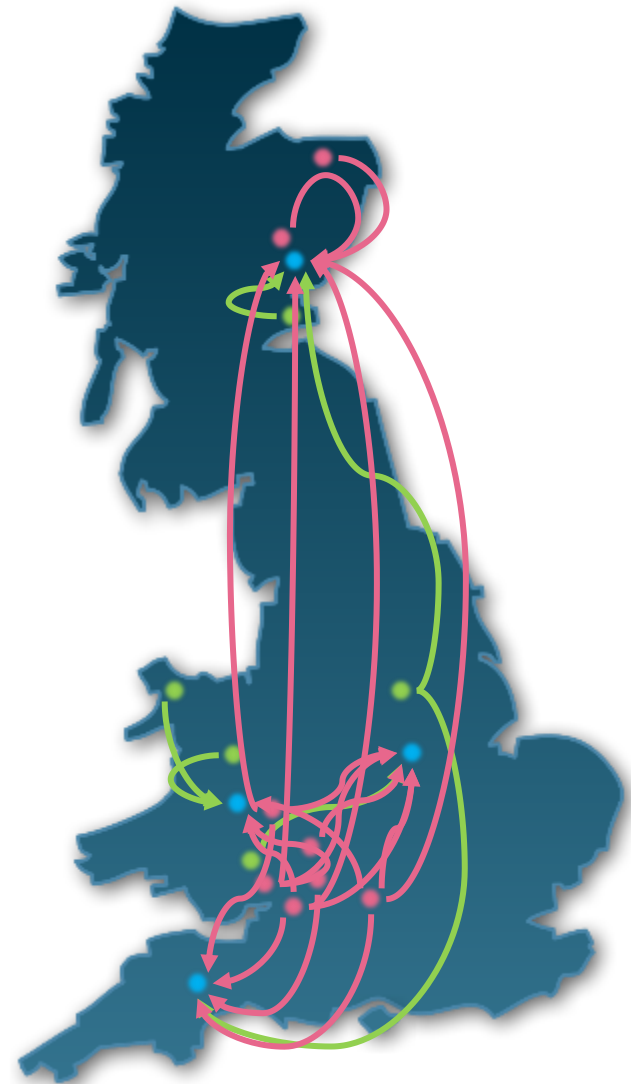 - Commercial partner flocks (●)
  - Live sires
    - Pedigree phenotype farms (●)
    - Other breeders (●)

Connecting breeders and farmers

- Sire distribution
  - Commercial partner flocks (●)
  - Live sires
    - Pedigree phenotype farms (●)
    - Other breeders (●)
  - Five additional AI sires

    - PHN1201763

    - PJP1000028

    - PJP1000047

    - PPK1400423

    - THE1600011
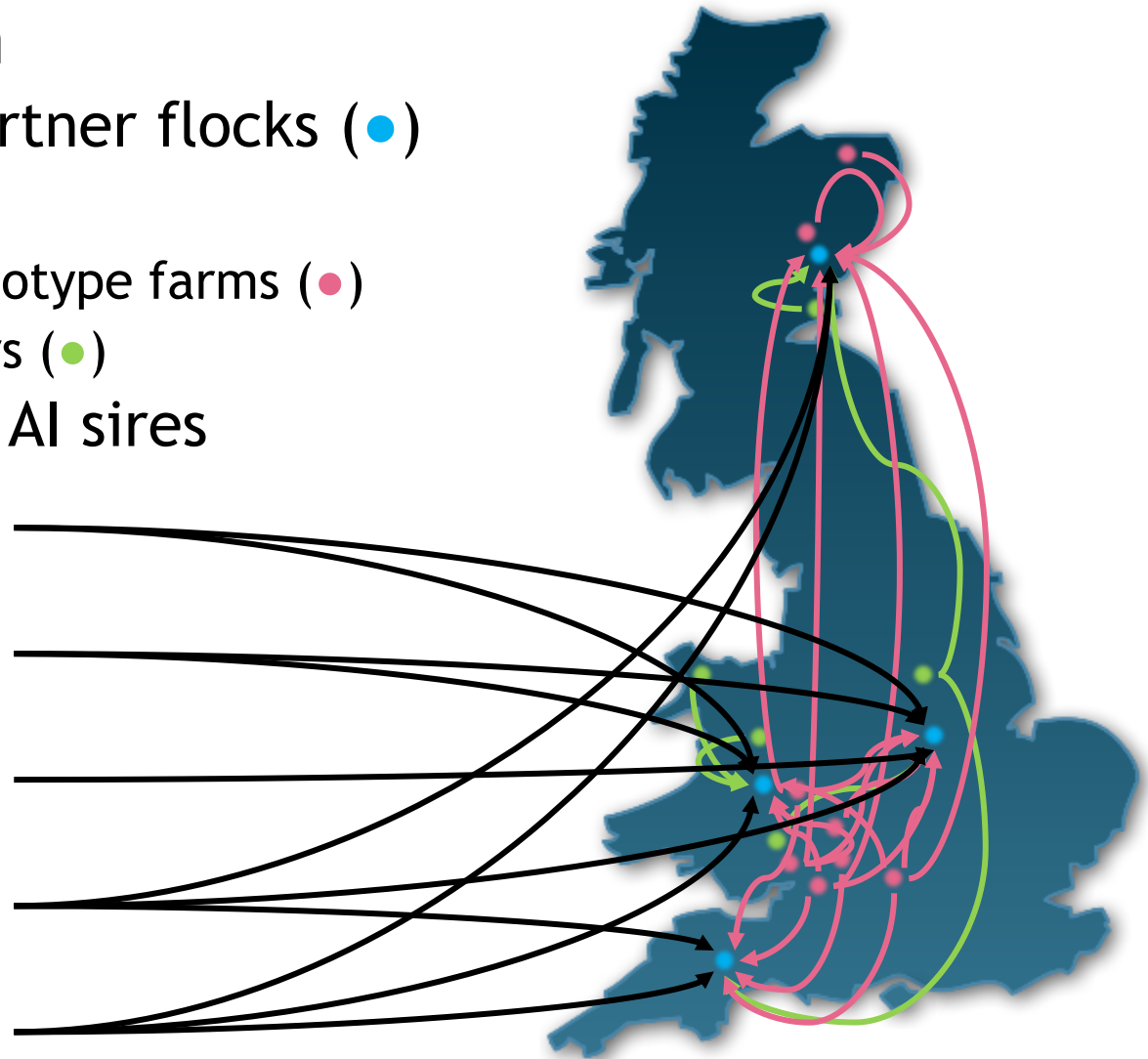
Texel-cross lamb performance

- TvW
  - ~2,700 lambs by 58 sires finished over two seasons
  - 83.7% in spec

- VIA
  - >3,000 lambs by 80 sires finished over two seasons
  - 86.0% in spec

- Compares well to industry averages of ~60% in spec

TvW	1	2	3L	3H	4L	4H	5
E		0.1	0.5	0.6	0.2	0.2	
U		1.9	14.7	5.4	1.0		
R	0.5	13.4	47.1	9.3	0.5		
O	0.6	1.9	2.3				
P		0.1					

VIA	1	2	3L	3H	4L	4H	5
E		0.5	0.5	1.0			
U		4.0	16.0	11.0	1.0	1.0	
R		19.0	34.0	8.0			
O		3.0	1.0				
P							

#addtexeladdvalue

Post-mortem analyses

- TvW
  - All loins NIR and CT scanned
    - IMF
    - Shear force
  - Subset of samples sent to a taste panel
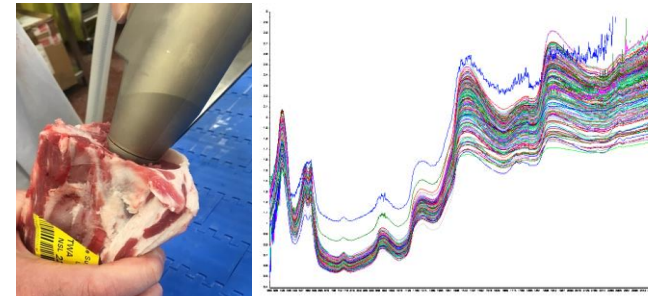
- VIA
  - VIA scanner installed in the abattoir
  - Calibrated to CT scanner
  - Able to estimate
    - Fat
    - Muscle
    - Bone

Project outcomes

- TvW
  - CT better predictor of IMF
  - CT and NIR have low predictive value of shear force
  - Consistent taste scores across a range of samples
  - NIR currently difficult to integrate at line speed

- VIA
  - High prediction equation accuracies
    - Validated on a separate sub-section of data
    - Muscle and total primal weights: 88-99%
    - Fat weights: 74-80%
    - Bone weights: 65-73%

Project outcomes

- VIA
  - Heritabilities of crossbred carcass traits
    - Fixed carcass weight

	Whole carcass
Muscle weight	0.27
Fat weight	0.22
Bone weight	0.47

- More data required
  - Commercial progeny test
  - Two commercial producers producing lambs of known sire
  - Finished lambs VIA scanned and data collected

Texel in the supply chain

27 %

12 %

Texel in the supply chain

Performance recording

27 %

Hard-to-measure maternal traits

12 %

Texel in the supply chain

Performance recording

27 %

Meat and carcass quality

Hard-to-measure maternal traits

12 %

#addtexeladdvalue

Research and genomics in numbers

- **1** terminal sire breed

- **2** maternal breeds

- **10** commercial partner flocks

- **25** pedigree phenotyping farms

- **>100** natural service and AI rams

- **2,500+** commercial ewes

- **13,500** animals genotyped

- **£3,000,000+** invested in R & D

- **£23,000,000** / yr: est. benefit to industry

- **~1,000,000,000** SNPs genotyped

Resilience and efficiency

Resilience and efficiency

SMARTER

SMAll RuminanTs breeding for Efficiency and Resilience

- Four-years, 26 partners
- Aims to develop strategies to improve R&E traits
- TSS contributing to feed efficiency and health and welfare resilience

This project has received funding from the EU's Horizon 2020 Research and Innovation programme under Grant Agreement No. 772787

GrassToGas

- Aims to find ways of feeding and breeding sheep to reduce their impact on the environment
- Project will measure feed efficiency of Texel-cross lambs
- Lambs bred from pedigree Texel sires
- Investigate the effects of sire on feed efficiency

Resilience and efficiency

- Four sires provided to SRUC, mated with Scotch mules

- Lambs born this February

- ~250 lambs reared to ~3 months old
  - Split into two groups
    - Indoor-reared feed-intake and growth recorded
    - Outdoor-reared, growth recorded

- Repeat in 2022…

GrassToGas

iTexel

- Record Lambs
  - Add and BN / register 2021-born lambs
- Flock Admin
  - BN / register animals
  - Mark as Sold / Dead
- Cheaper (and easier) than contacting the office
- Enter Sales
  - Online sales entry
  - Cataloguing service for regional / Club sales
    - 39 Club sales catalogued in 2020
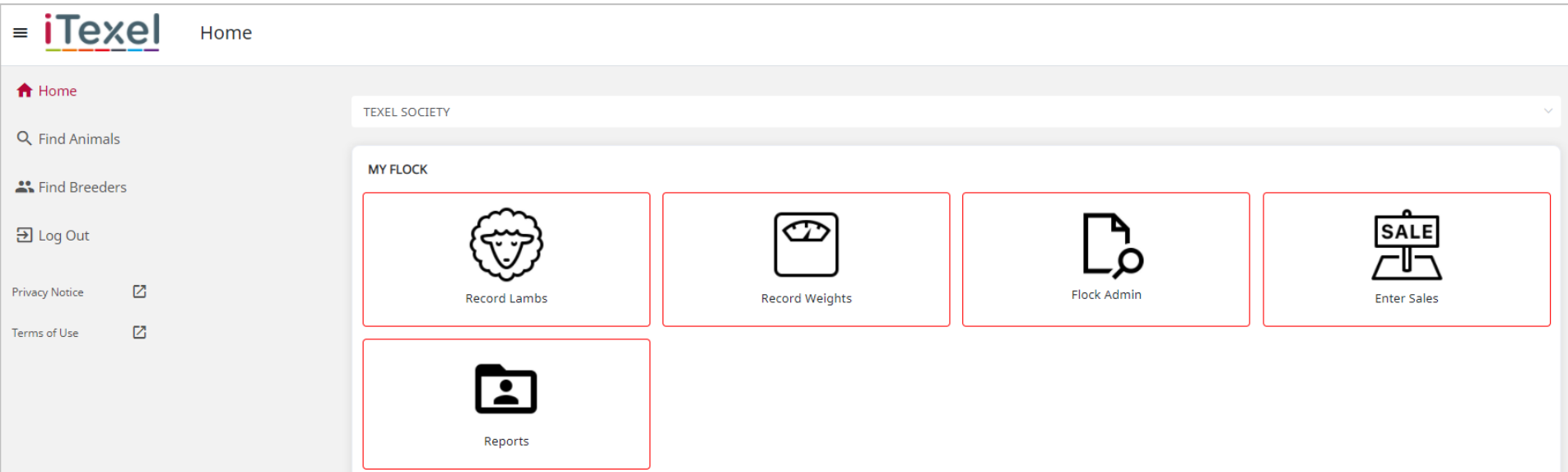- More developments in the pipeline

iTexel

- **Resources available online**
  - Flock Admin
  - Birth notifications
  - Cataloguing

- **Coming soon...**
  - '*How to*' videos

Take home messages

- We **provide**
  - support to our membership
  - industry leadership

- We **collaborate**
  - with researchers and industry
    - when we are able, can afford, and have the opportunity to do so

- We **continue to modernise**
  - the administration of the organisation
  - **iTexel** is core to this
    - as are other software

Acknowledgements

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NSA

Scotch Mule Association

SRUC CT unit

BORDER SOFTWARE

GENES

DEFAID LLEYN SHEEP

TORCH FARM VETS

FARMGENE artificial breeding services

AB EUROPE

Thanks for listening

- Any questions?…