Practical Challenges of Implementing Genomic Selection & Breeding of British Texel Sheep

John Yates

Will Sawday, Ann McLaren,

Sebastian Mucha, Joanne Conington

www.texel.co.uk

MY TALK

- ▶ The Texel Breed
- ▶ The opportunity of Genomic Selection
- ▶ Logistics
- ▶ Dealing with the scientists
- ▶ Knowledge transfer
- ▶ Where to next

TEXEL SHEEP

▶ 13M ewes are mated annually by 365,000 rams in the UK.

▶ 27% are Texel rams being used on 17,700 UK sheep flocks.

▶ Sire of 12.5% of national flock representing ~1.6M ewes

The Breeds Value To UK Industry –
Ref Abacus Bio report

- ▶ Impact of Texel breed in UK **£4.8M annually.**

- ▶ Predicted Impact **£23M annually.**

- ▶ Due to increasing market share and accelerating rates of genetic progress in economically important traits.

MY TALK

▶ The Texel Breed

▶ The opportunity of Genomic Selection

▶ Logistics

▶ Dealing with the scientists

▶ Knowledge Transfer

▶ Where to next

#addtexeladdvalue

NEW PROJECT - GEBV'S FOR MASTITIS AND FOOTROT RESISTANCE

SNP data - 17K LD Chip

50K HD Chip 700K HD Chip

New phenotypes -

hard to measure traits
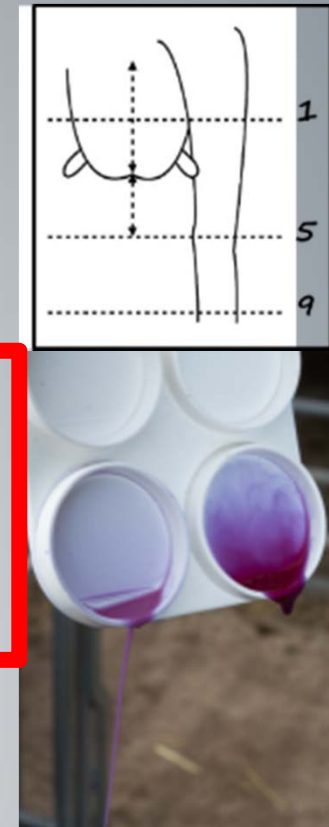
THE OPPORTUNITY OF GENOMIC SELECTION

Aim

▶ Improvements in commercially relevant traits – productivity and health

Opportunity

▶ 'Drive' the genetic improvement at a breed level

▶ Well-phenotyped, genetically linked cohort with high breed penetration

▶ GEBVs for non-phenotyped animals

▶ Source of revenue to support breed development

TEXEL
SHEEPSOCIETY

#addtexeladdvalue

THE OPPORTUNITY OF GENOMIC SELECTION

1. Obtaining grant funding, £650,000 invested

2. More accurate pedigree!

3. Traits expressed only in females, hard to measure traits (Maternal/Disease).

4. Reduction in generation interval (in sheep are modest).

5. Benefits from improvements in prediction accuracy.

6. Faster rates of genetic improvement - (~10-32%) increase in economic response to selection in terminal sire sheep
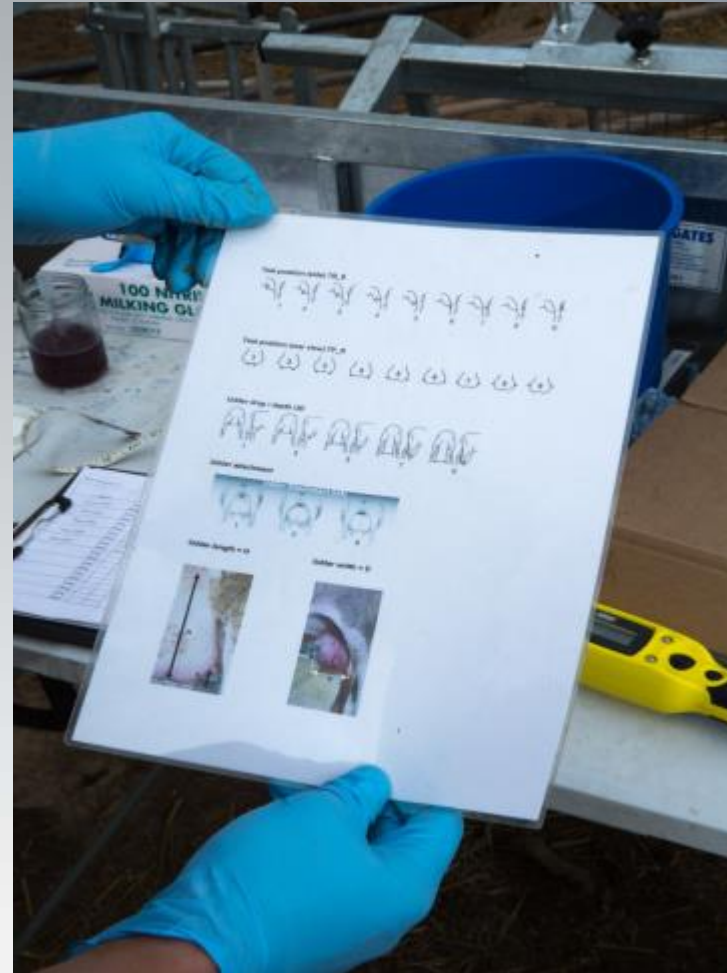
TEXEL
SHEEPSOCIETY

#addtexeladdvalue

MY TALK

▶ The Texel Breed

▶ The opportunity of Genomic Selection

▶ Logistics

▶ Dealing with the scientists

▶ Knowledge Transfer

▶ Where to next

Cluster of phenotype farms

TEXEL
SHEEPSOCIETY

ON-FARM PHENOTYPING – CLUSTER OF WELL-CONNECTED FLOCKS

MASTITIS PHENOTYPING N=3500 EWES

LOGISTICAL ISSUES

▶ Embracing science at farmer level – <u>driven by a breed society.</u>

▶ Complexity with hard to measure traits - new scoring systems.

▶ Dealing with 'problem disease" leads to enhanced awareness - solutions

▶ Risk/Reward. No immediate financial benefit- farmer or breed level

▶ Timing for phenotyping events -milk samples in meat sheep not simply collected, at peak milk yield, prior to weaning.

   ▶ All scored in the same week of lactation

▶ Replacement ewes adds to running costs £££ genotyping

▶ Data quality -animal identification -matching up to nationally collected animal performance database.

▶ Are results in time for selection decisions?

TEXEL
SHEEPSOCIETY

#addtexeladdvalue

MY TALK

▶ The Texel Breed

▶ The opportunity of genomic selection

▶ Logistics

▶ Dealing with the scientists

▶ Knowledge Transfer

▶ Where to next

SRUC

TEXEL
SHEEP SOCIETY

DEALING WITH SCIENTISTS

▶ Their priorities often can differ to sheep farmers.

▶ Under estimation of challenges that exist in UK sheep sector.

    ▶ Structure – socio economic influence.

    ▶ Number and size of breeds and flocks

    ▶ Ram usage decision making - lack of vertical integration: producer-processor-retailer-consumer

    ▶ Exploitation limited- Capability of technology uptake – (AI)

▶ Novel science can be challenging to communicate at the farmer level.

▶ Scientific audience to cater for too!

TEXEL
SHEEP SOCIETY

#addtexeladdvalue

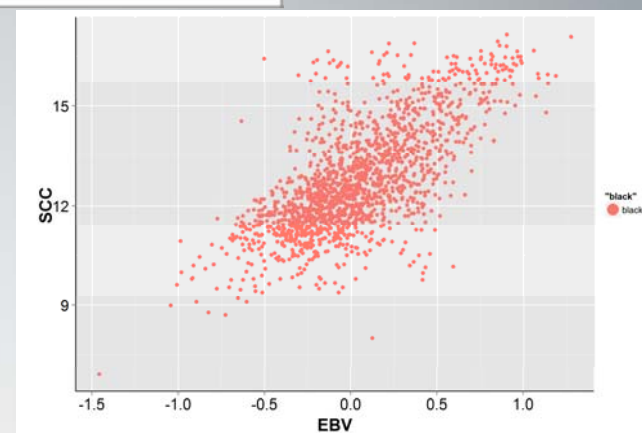# RESULTS SO FAR.

1088 700K HD genotypes and 2205 50K genotypes. By end of 2016 aim is for 4000 HD &50K genotypes. Programme for use of 17K LD started.
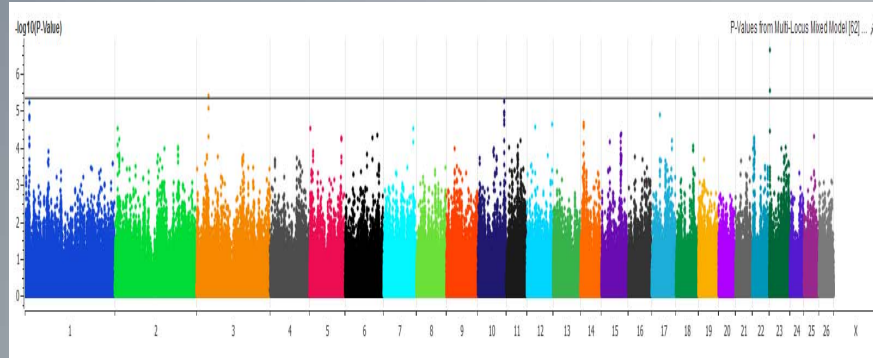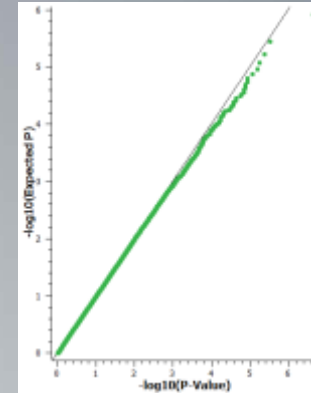
✓Good quality DNA
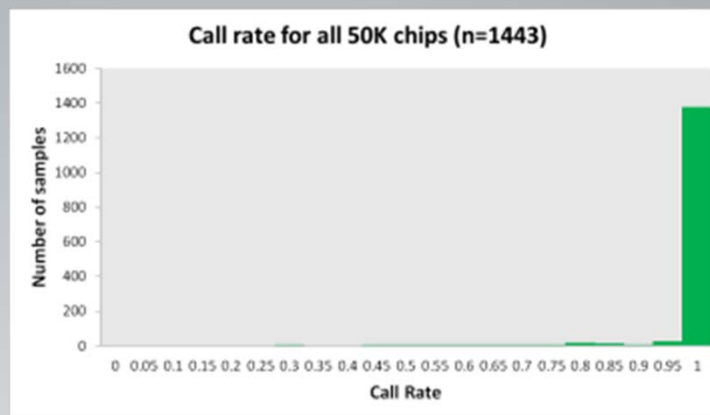
✓De-regressed EBVs for somatic cell count

#addtexeladdvalue

GENOME-WIDE ASSOCIATION MASTITIS AT MID LACTATION

n = 2995
genotypes
422,532
SNPs

➢De-regressed breeding values for SCC were used as the phenotype derived from 3,410 mid-lactation SCC records collected from 2,718 ewes, across 29 different flocks, scored over 2 years. There were 31,775 animals in the pedigree used for the breeding value estimation.

➢Initial results shown indicate that there are SNPs significant, at the chromosome level, on Chromosome 23. Still to investigate if these SNPs are located within known ovine genes. Results are a useful first step in assessing the association between SCC and the sheep genome."

TEXEL
SHEEPSOCIETY

#addtexeladdvalue

MY TALK

▶ The Texel Breed

▶ The opportunity of genomic selection

▶ Logistics

▶ Dealing with the scientists

▶ Knowledge Transfer

▶ Where to next

KNOWLEDGE TRANSFER

▶ Getting the message across will take time.

▶ Production of and understanding GEBVs is complicated and costly!

▶ New systems at the breed or industry level needed.

▶ Convincing farmers of direct benefits of genomics challenging – as has promoting value of conventional EBVs for past 30 years!

A Texel Sheep Society Publication

TEXEL
Genomics of disease resistance

National Agricultural Centre, Stoneleigh Park, Kenilworth, Warwickshire, CV8 2LG
Tel: 02476 696 629
Fax: 02476 696 472
Email: office@texel.co.uk

#addtexeladdvalue

www.texel.co.uk

TEXEL
SHEEP SOCIETY

#addtexeladdvalue

MY TALK

▶ The Texel Breed

▶ The opportunity of genomic selection

▶ Logistics

▶ Dealing with the scientists

▶ Knowledge Transfer

▶ Where to next

TEXEL
SHEEPSOCIETY

A WAY FORWARD

▶ International collaboration.

▶ Aim to create the largest Texel sheep reference population.

▶ Ensure a sustainable model of phenotyping & genotyping. Routine collection 17K LD genotype -all sires used 55,000 lamb annual crop.

▶ New projects, exploit data for carcase trait, meat quality - CT scanner and VIA to feedback slaughter lamb performance into breeding programme.

▶ The power of Imputation- allowing use of more affordable LD or Custom Chips.

TEXEL
SHEEPSOCIETY

#addtexeladdvalue
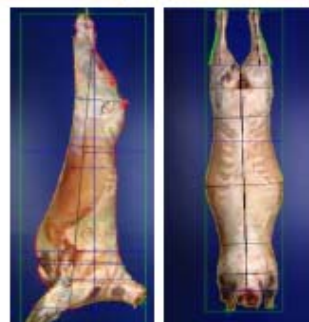
CHALLENGES THAT REMAIN

▶ Cost benefit / per value of animal remains an issue.

▶ Cost of genotyping still high! 17K LD ~£25 50K HD ~£50 per genotype...or custom LD?

▶ Future funding.

▶ Speed of adoption of genomic selection is in its infancy.

▶ Designing commercial model

  ▶ Affordably growing reference population – keeping it informative.

  ▶ Lack of accurate low cost collection of phenotypes at the breed level that are sire linked.

  ▶ Creating performance focused well connected nucleus farms to produce high volume quality data.

TEXEL
SHEEPSOCIETY

#addtexeladdvalue

ACKNOWLEDGEMENTS

#addtexeladdvalue