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

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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.
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#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
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
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ON-FARM PHENOTYPING – CLUSTER OF WELL-CONNECTED FLOCKS
MASTITIS PHENOTYPING N=3500 EWES
LOGISTICAL ISSUES

- Embracing science at farmer level – driven by a breed society.
- 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?
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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!
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
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.”
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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!
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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.
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.
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