Sheep Research Update

Ann McLaren

SRUC Research

SRUC/SAC Consulting - Future Livestock Farming – 2019

Sheep Research

- Range of areas of being investigated
  - Health & Welfare
    - Genetics
    - Behaviour
    - Management – Targeted Selective Treatment
  - Meat quality
  - Computer Tomography (CT)
    - New traits
  - Feed efficiency
  - Breeds and systems comparison
  - Other links with technology

Sheep Research

- Range of areas of being investigated
  - Health & Welfare
    - Genetics
    - Behaviour
    - Management – **Targeted Selective Treatment**
  - Meat quality
  - Computer Tomography (CT)
    - New traits
  - Feed efficiency
  - **Breeds and systems comparison**
  - **Other links with technology**

Afternoon talk

John Holland's talk

Disease traits – Scottish Blackface

Antonio.Pacheco@sruc.ac.uk

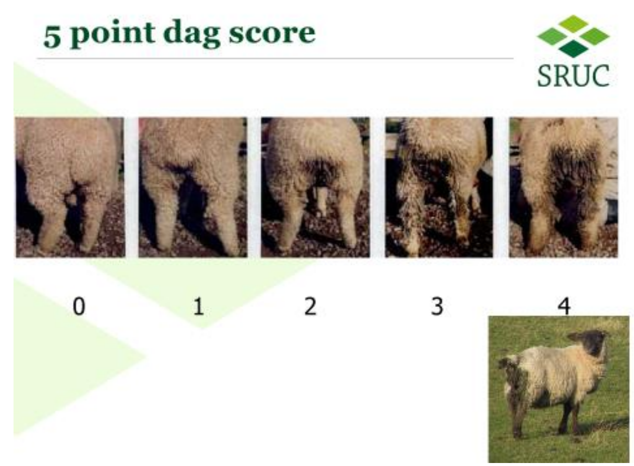
- Castlelaw flock (from 2011 -)
- Objectives
  - Estimate genetic parameters of disease traits
    - Faecal Egg Counts (FEC), DAG scores
  - Assess relationship with productivity (e.g. live weight)
  - Assess relationship between disease traits and immune function
  - Develop a faecal resistant line – reduced FEC and improved productivity

Traits	
FEC_S	FEC Strongyles
FEC_N	FEC Nematodirus
FEC_C	FEC Coccidia
LWT	Live weight
DAG	Faecal soiling (Dag) score

Disease traits – Scottish Blackface

- Heritabilities
  - FEC, DAG and LWT
- Immunological traits
  - All heritable
  - Range of 0.14 to 0.77
- Faecal line of sheep proving successful in reducing FEC whilst maintaining/improving productivity

Trait	h^2	s.e.
FEC_S	0.15	0.03
FEC_N	0.17	0.03
FEC_C	0.09	0.02
DAG	0.09	0.03
LWT	0.33	0.04



Disease traits – Scottish Blackface

- Selection for reduced FEC is working
- Genetic correlations between different parasites are favourable
  - meaning that genetic selection for low FECs is possible, and will not affect productivity.
- Genetic correlation between DAG and live weight is antagonistic.
  - DAG score being an indicator of previous infection, we can work with this correlation in order to reduce the impact of infections on productivity.

Behavioural signatures of parasitism

Alex.Morris@sruc.ac.uk

- Aims
  - to investigate whether changes in grazing behaviour can be an indicator of parasite infection (*Teladorsagia circumcincta)*.

- Trial set-up (9 weeks)

Group	Treatment
Parasitised	all lambs infected with parasitic nematode, n=20
Partial Parasitised	a proportion of lambs were infected with nematodes, n=20
Control	all lambs remain parasite free, n=20

Behavioural signatures of parasitism

- Lamb behaviour
  - Monitored continuously using proximity loggers and activity monitors.
  - Frequency and duration of social contacts between lambs recorded.
  - Activity levels of each lamb measured.

- Analysis
  - Data collection just finishing.
  - Data will be analysed to identify if any changes in behaviour and/or activity can be linked to level of parasite infection.

Additional behaviour work

Marie.Haskell@sruc.ac.uk

- Pen enrichment (e.g. mirrors, extra food, extra space, hay bales etc.) – Positive effects
- Emotional contagion - *the phenomenon of having one person's emotions and related behaviours directly trigger similar emotions and behaviours in other people*
- Stress levels measured using heart rate monitors
- Relevance to sheep – housing, handling ease & welfare

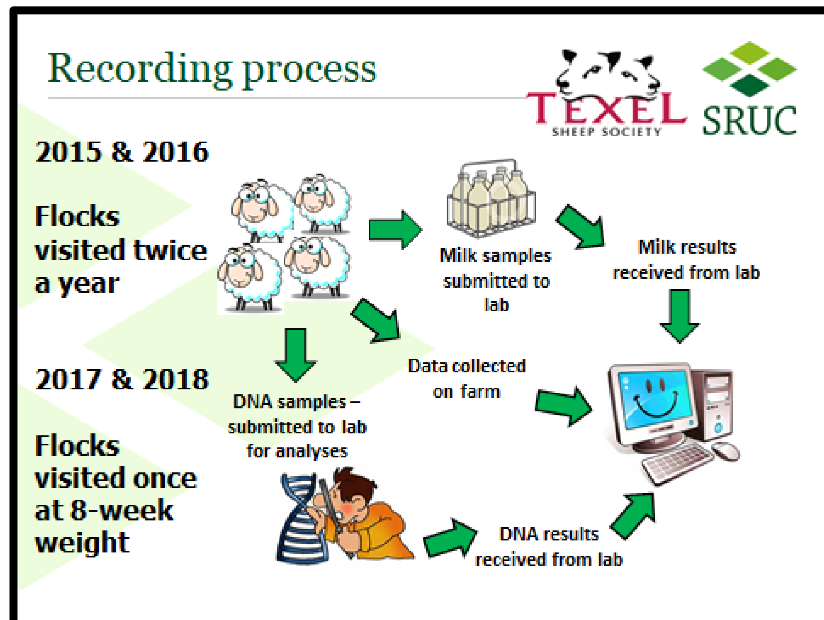
Mastitis & Footrot

Smarter
SMAll RuminanTs breeding for Efficiency and Resilience

SRUC

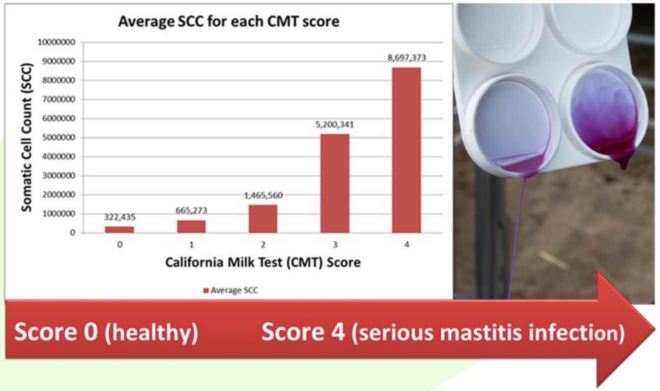
Ann.McLaren@sruc.ac.uk

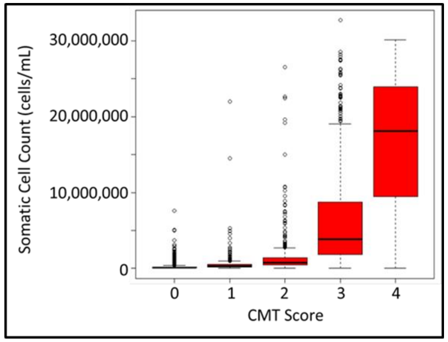
- Texel society member flocks
- Aims – identify suitable phenotypes for mastitis
  - – collect genotype information
  - – genomic EBVs for mastitis and footrot
- Data collected on farm
  - Udder & Teat measurements
  - California Mastitis Test
  - Foot scores
  - DNA samples



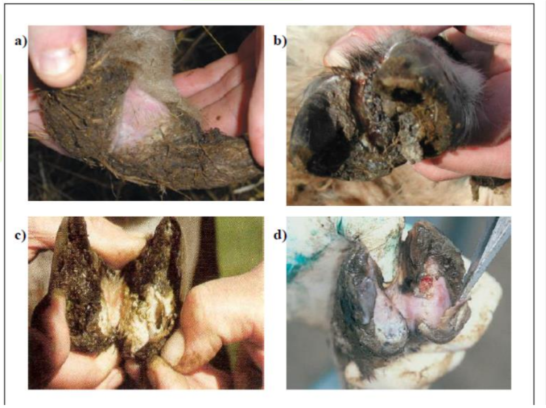
Mastitis & Footrot Phenotypes

- California Mastitis Test ($h^2 = 0.10$)
  - Good predictor of Somatic Cell Count ☺

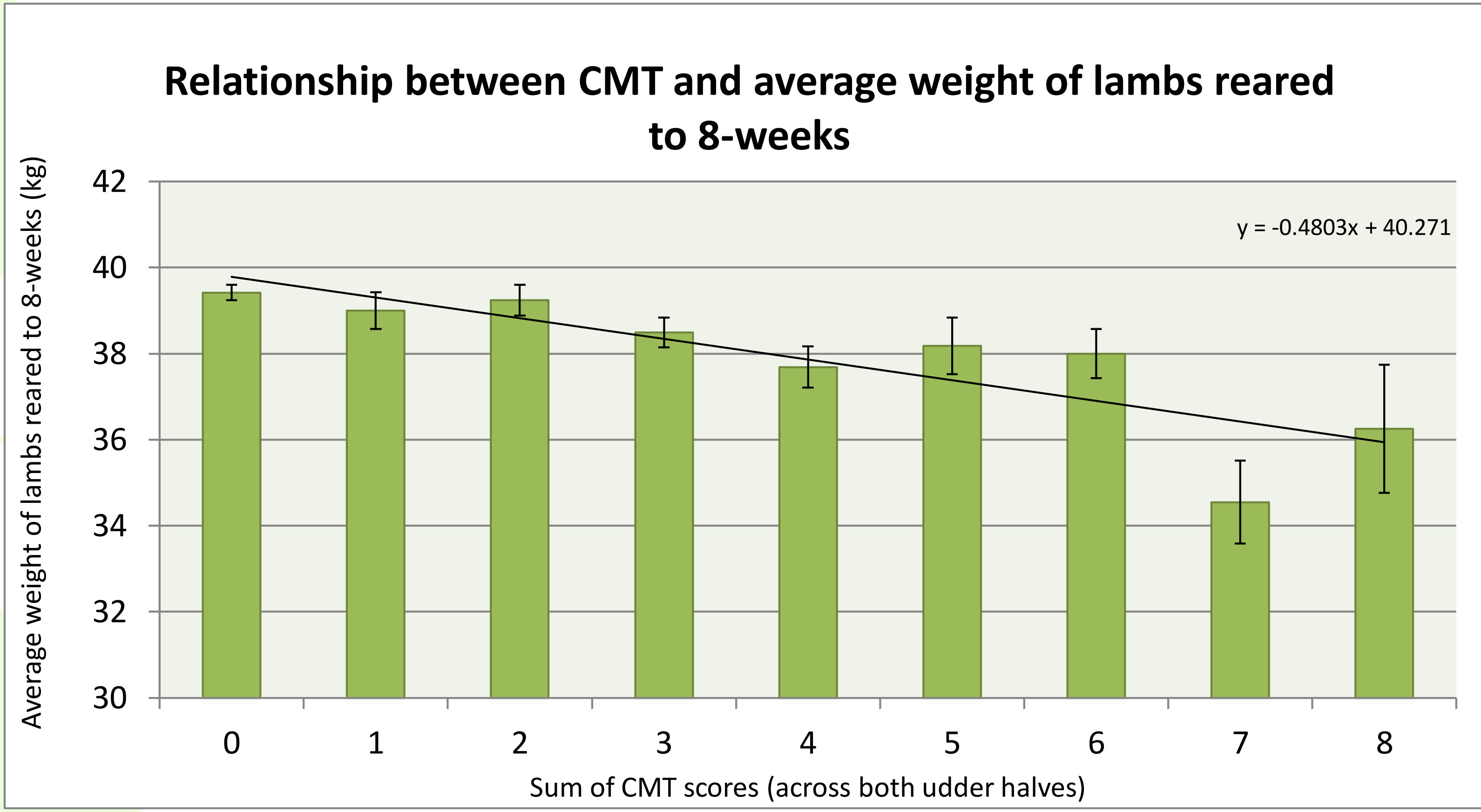




- Foot Scores ($h^2 = 0.18$)



CMT and lamb live weights



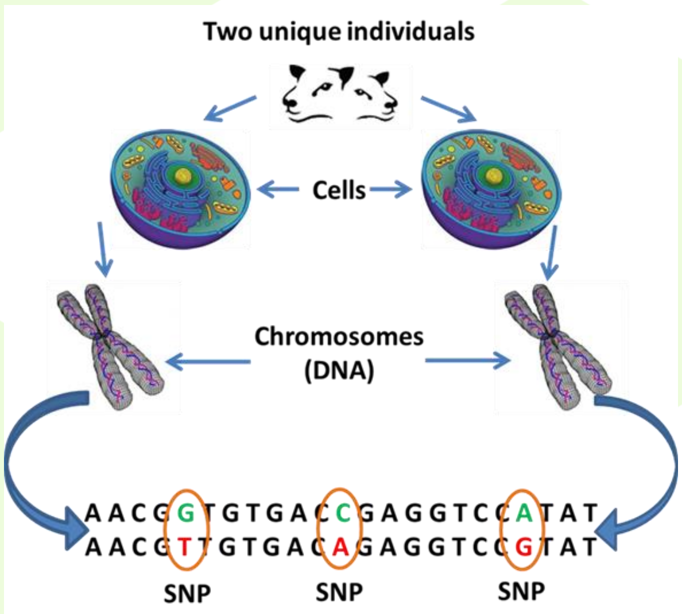
Difference between a ewe scored 0 and scored 8:

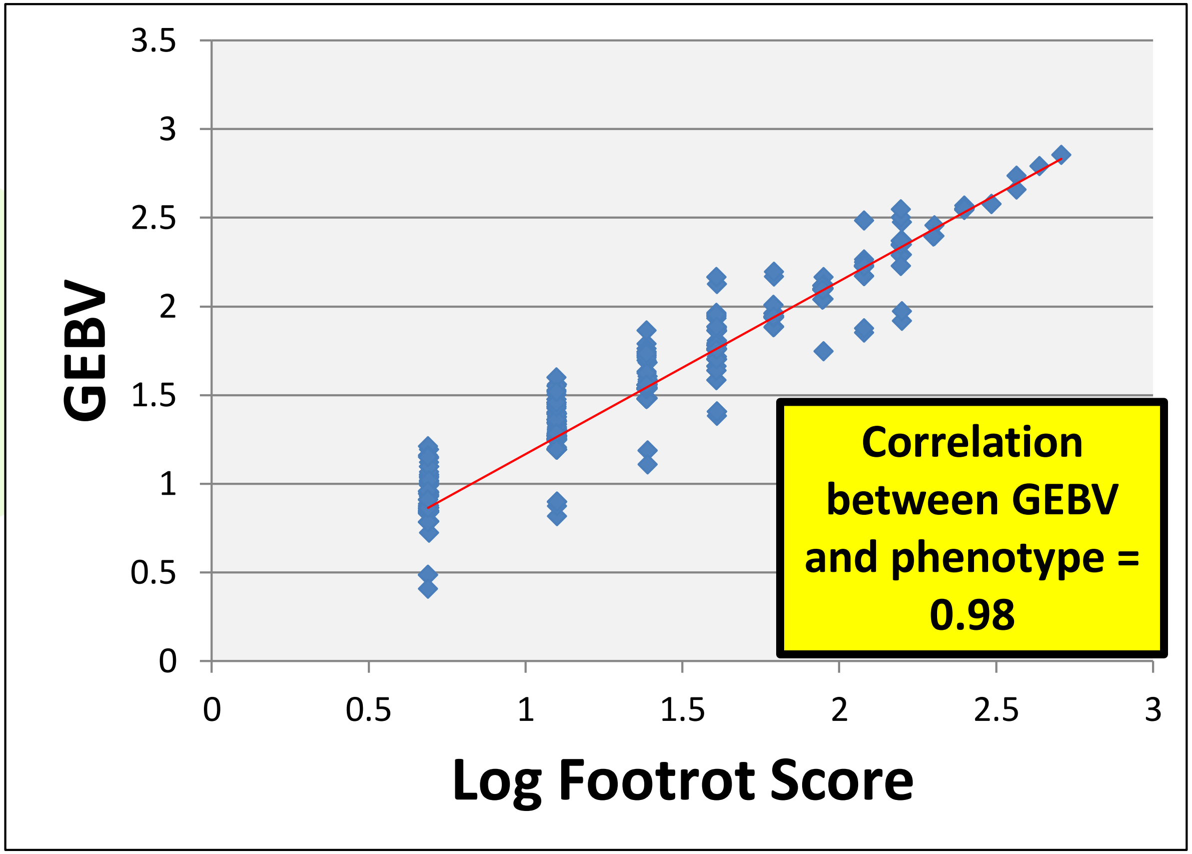
- 3.84 kg average lamb live weight reared
- £6.30 a lamb (based on a current live weight price of £1.64 per kilo)

Genomic breeding values (GEBVs)

Karolina.Kaseja@sruc.ac.uk

- GEBVs produced for both mastitis and footrot

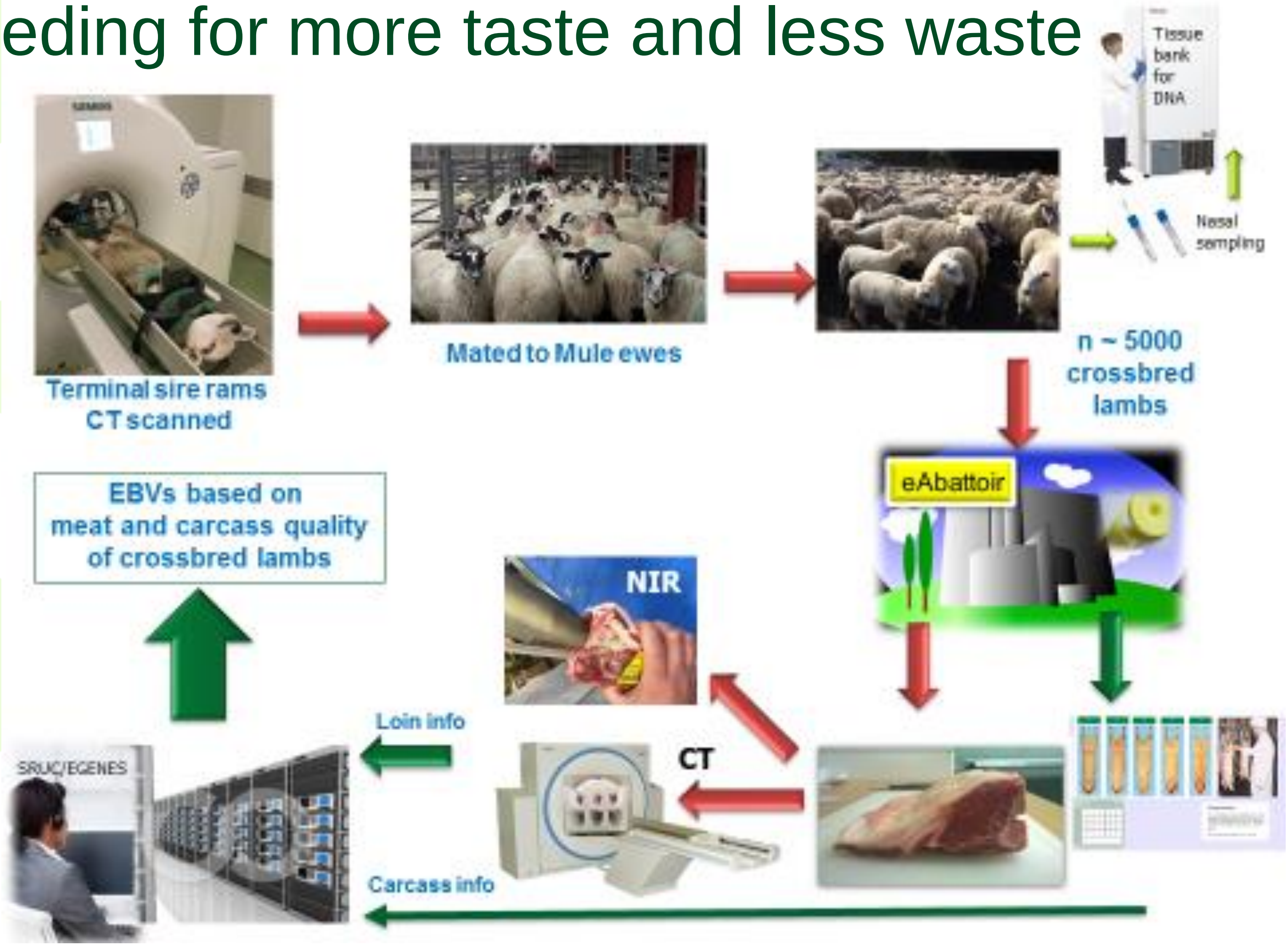




Taste –vs- Waste (2014-2019)

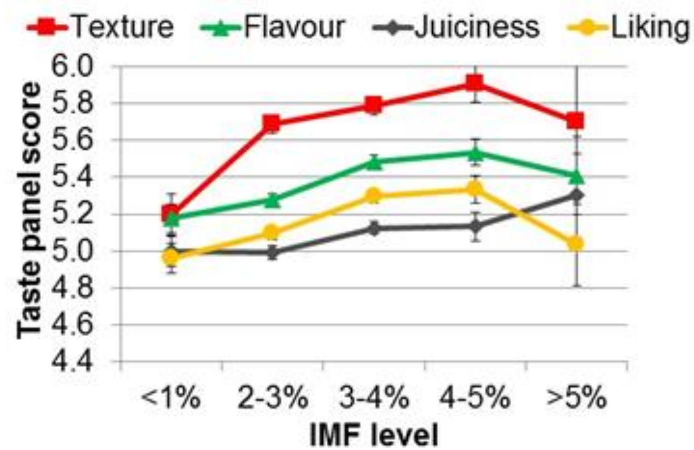
Nicola.Lambe@sruc.ac.uk

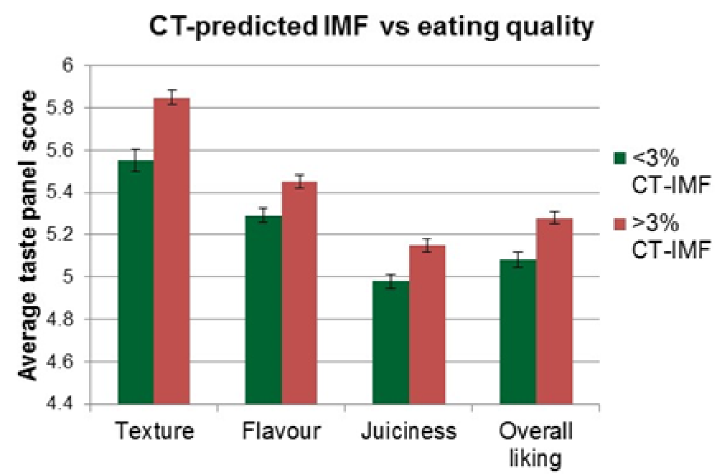
- Breeding for more taste and less waste



Taste –vs- Waste: Key Findings

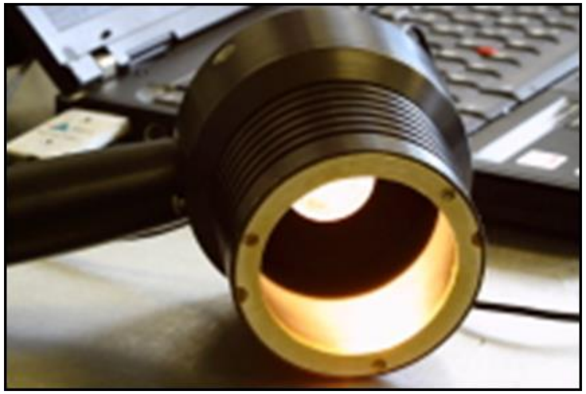
- Lamb intramuscular fat (IMF) linked to eating quality
- NIR and CT of lamb loin cuts can predict IMF with mod-high accuracy
- IMF predictors heritable in crossbred lambs:
  - NIR-IMF = 29%; CT-IMF = 21%



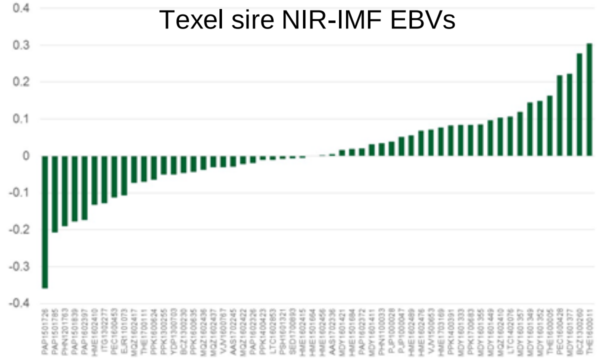


Taste –vs- Waste: Key Findings

- NIR predicted IMF as preferred option:
  - more practical to implement in abattoir
  - independent of FAT class
  - strong correlations with various IMF lab tests
  - high genetic correlation with lab-extracted IMF (0.9)



- Scope within breeding programmes to:
  - maintain IMF for improved eating quality
  - increase lean, decrease total fat, to improve carcass quality and reduce waste in commercial slaughter lambs



“VIA Project” (2017-2020)

Nicola.Lambe@sruc.ac.uk

- Carcass trait phenotype feedback for genomic selection in sheep

- Outputs target improved meat production and animal health
- Novel phenotype collection
  - Carcass merit (VIA scanned) ~3400 lambs from ~80 sires
  - Animal health
    - Health data for MHS traits ~3400 lambs from ~80 sires
    - Mastitis and footrot ~ 2000 ewes

VIA Project – Progress to date

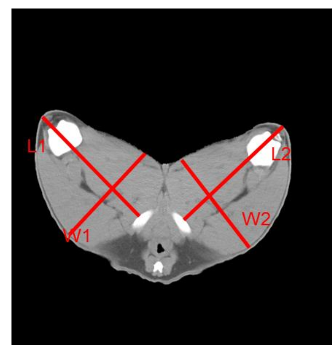
SRUC

- New VIA traits validated against CT scanning
  - Weights of fat, lean meat and bone in:
    - Total Carcass
    - Shoulder Primal Cut
    - Saddle Primal Cut
    - Hind-Leg Primal Cut

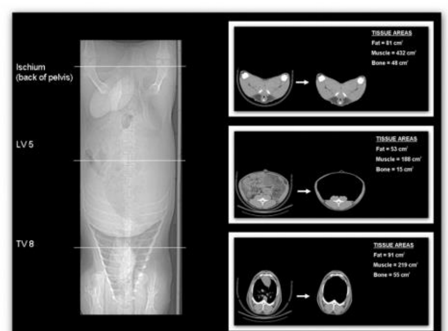
- Preliminary EBVs for growth carcass traits have been produced
- Genotypes collected

CT scanning

- CT scanning - detailed carcass trait measurements without slaughter
- CT lean, CT fat, CT muscularity – since late 90s

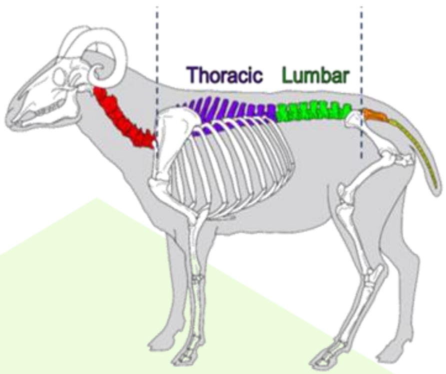


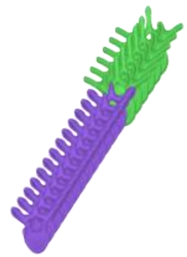
Very accurate prediction of muscle, fat depots, bone etc.



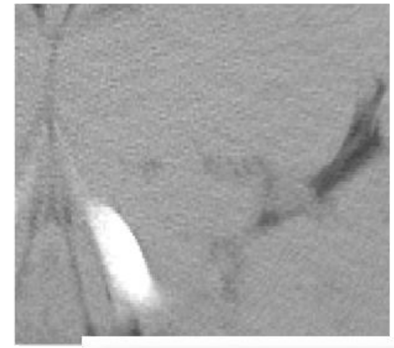
M: $R^2 = 0.98$
F: $R^2 = 0.99$
B: $R^2 = 0.89$

Research proven new CT traits

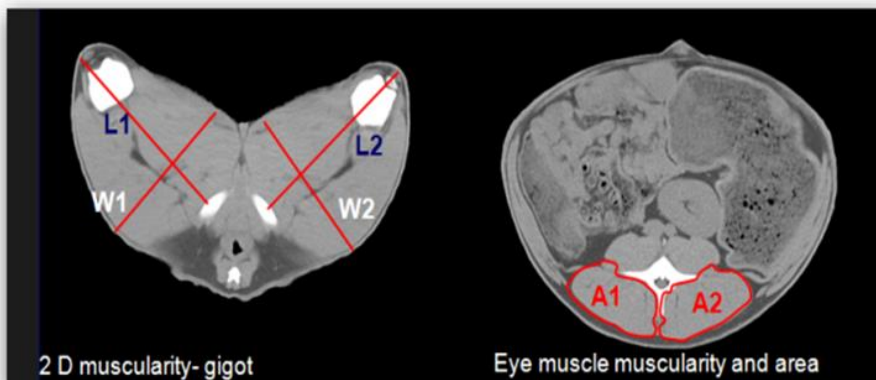




Spine traits



Meat quality (IMF)

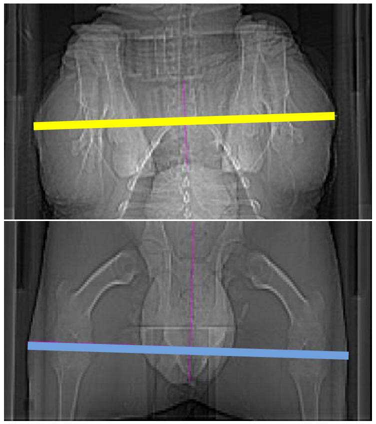


Loin muscularity

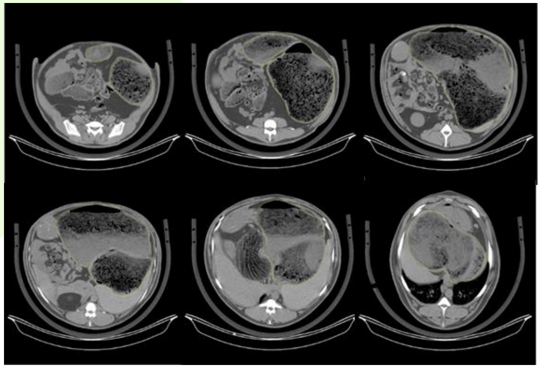
Developing novel CT traits

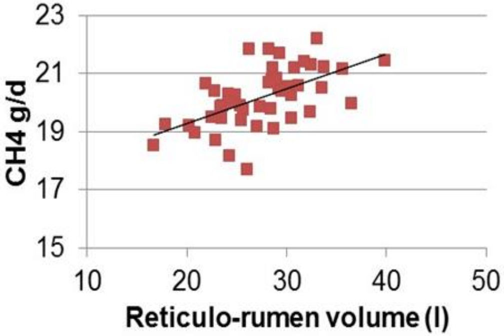
SRUC

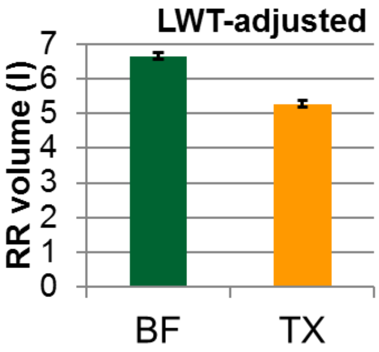
- Lambing ease predictors
  - Shoulder width
  - Hip width
  - Pelvic dimensions / angle
  - in sires??



- Methane predictors
  - Reticulo-rumen volume…. under genetic control?







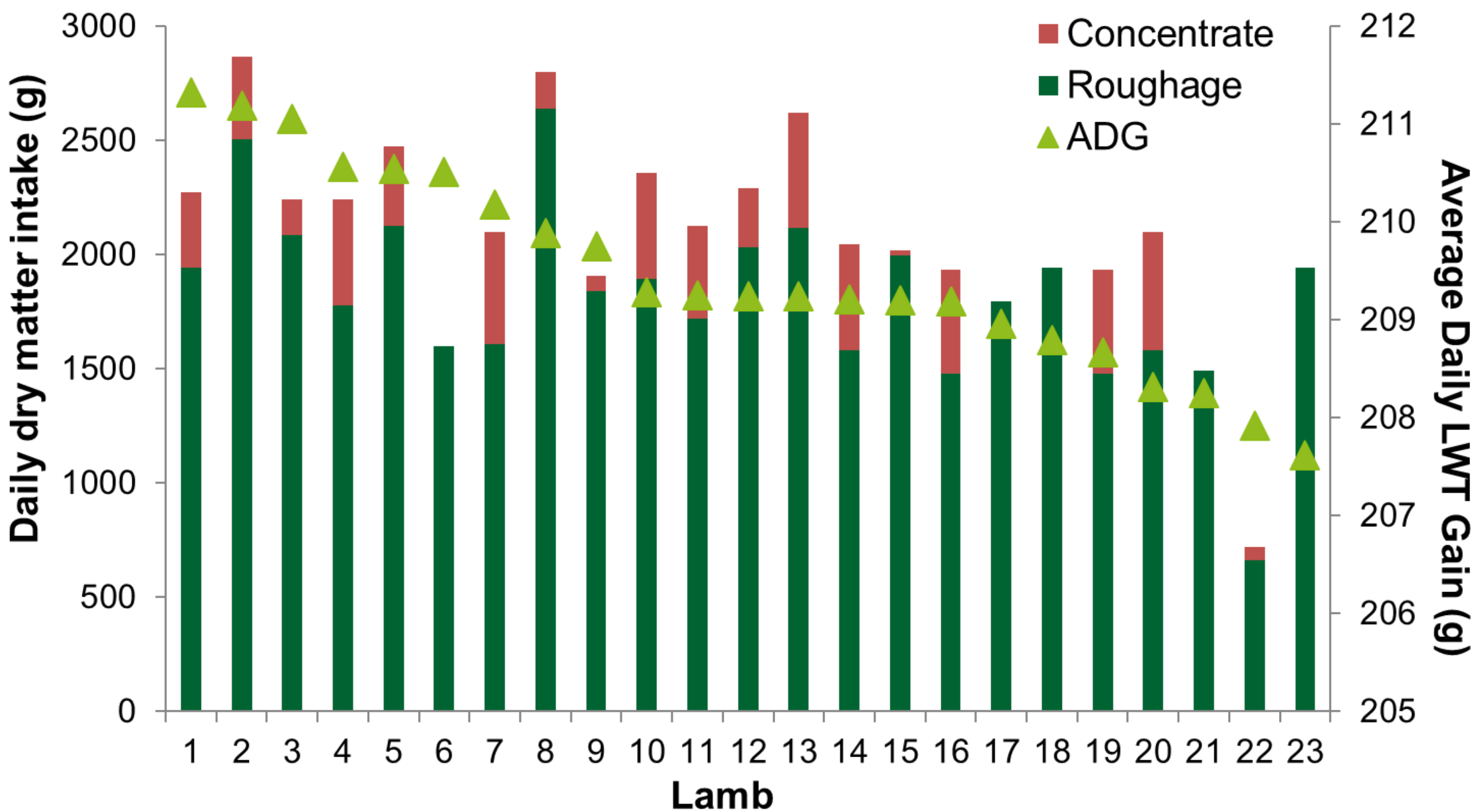
Feed intake recording

SRUC

First results – Blackface finishers

Harriet.Wishart@sruc.ac.uk

- Roughage and concentrate intake varies between animals.



Grass to Gas (2019-2022)

Nicola.Lambe@sruc.ac.uk

- Strategies to mitigate GHG emissions from pasture-based sheep systems

Objectives:

- Validate predictors of **feed intake** and **feed efficiency**
- Determine the relationships between:
  - indoor vs outdoor (grazing) FE
  - indoors vs outdoors **methane production**
  - FE vs methane production – indoors and outdoors
- Investigate genetic and genomic (animal and microbiome) strategies to reduce methane emissions in pasture-based sheep systems
- Quantify economic and environmental benefits of more feed-efficient, and lower GHG-emitting sheep
- Deliver applied, sustainable solutions to reduce methane emissions from sheep

European Projects

SRUC

- iSAGE
  - Georgios.Banos@sruc.ac.uk & Joanne.Conington@sruc.ac.uk
- SMARTER
  - Joanne.Conington@sruc.ac.uk & Sebastian.Mucha@sruc.ac.uk
- SusSheP
  - Claire.Morgan-Davies@sruc.ac.uk & Nicola.Lambe@sruc.ac.uk
- SheepNet
  - Claire.Morgan-Davies@sruc.ac.uk & Cathy.Dwyer@sruc.ac.uk

Acknowledgements

- Commercial farmers involved in data collection
- All SRUC technical and farm staff involved in data collection