GREENANIMO
Green future through research

Relationships between lamb feed efficiency, rumen volume and carcass quality measured by CT scanning

N. R. Lambe, A. McLaren
K. McLean, J. Gordon
J. Conington

REPUBLIC OF BULGARIA
Ministry of Education and Science
National Programme “European Scientific Networks”

SRUC

GrassToGas

GREENANIMO
Green future through research

GrassToGas

SRUC

Background

- Pressure to reduce GHG emissions from livestock production
  - improve system and individual animal efficiencies
  - ruminants - reduce enteric methane emissions
- Relationships with existing production traits / breeding goals
  - between feed efficiency and body composition/ carcass quality
  - mixed evidence in the literature for sheep
  - some evidence cattle selected for feed efficiency → reduce fatness, later maturing[1]
  - requires further investigation → sustainable strategies to improve efficiency and reduce methane emissions from sheep systems

REPUBLIC OF BULGARIA
Ministry of Education and Science
National Programme "European Scientific Networks"

[1] *e.g. Robinson and Oddy, 2004; Crowley et al., 2011*

Aims

To determine relationships amongst:

- feed efficiency
- body composition
- carcass quality
- rumen volume

in a cross-bred lamb population, typical of UK slaughter lambs

Methods

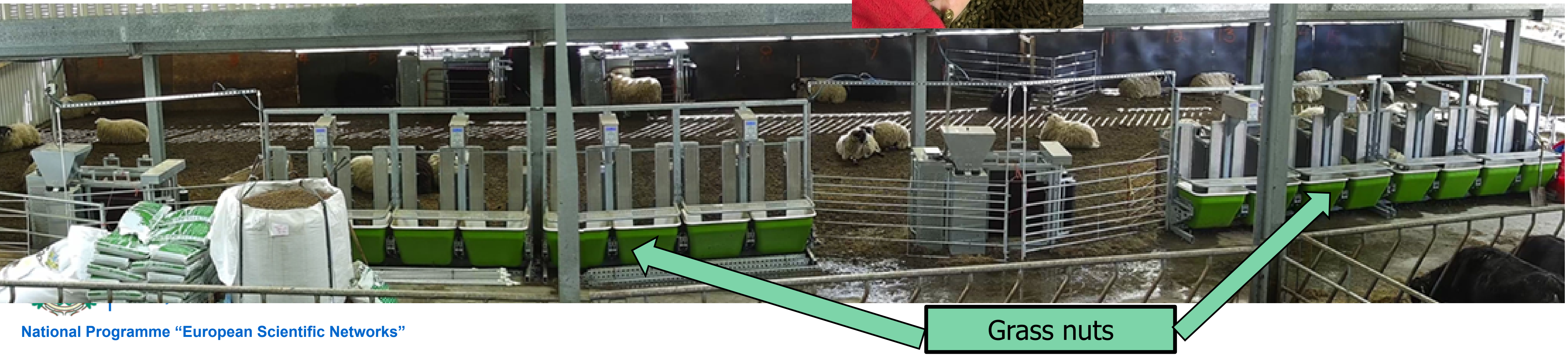
- Texel x Scotch Mule finishing lambs (n = 236)
  - sired by 10 Texel rams (EBV range)
  - recorded through feed intake recording equipment
- Growth and feed quality measured
- CT scanned at start & end of feeding trial
  - body composition
  - CT rumen volume, as a methane predictor
  - additional carcass traits

REPUBLIC OF BULGARIA
Ministry of Education and Science
National Programme “European Scientific Networks”

GREENANIMO
Green future through research

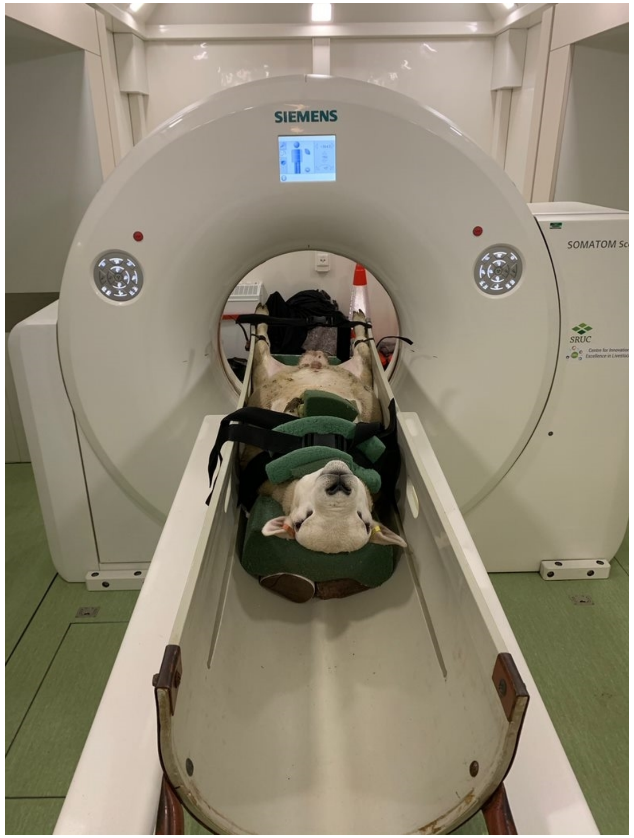
Feed intake recording @ SRUC Kirkton

- ~120 Texel x Mule lambs per year
- 1 pen, 16 feed bins
- forage-based diet (grass nuts only)
- 2 weeks training, 6 weeks test

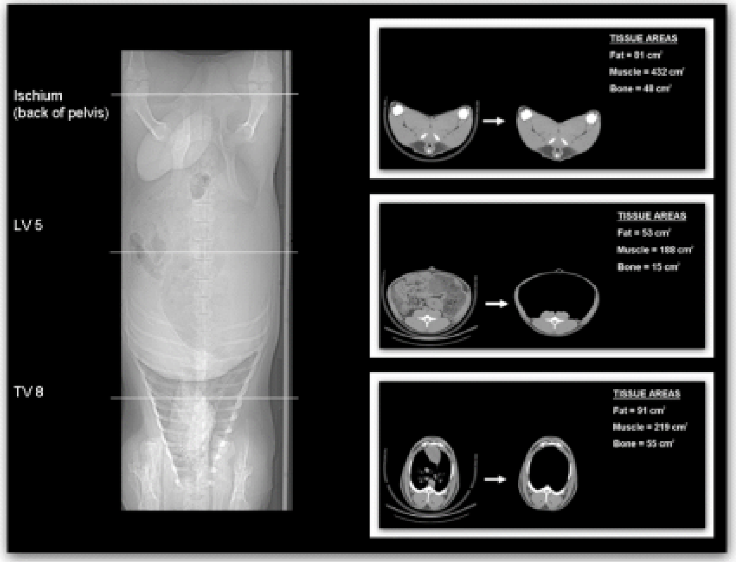


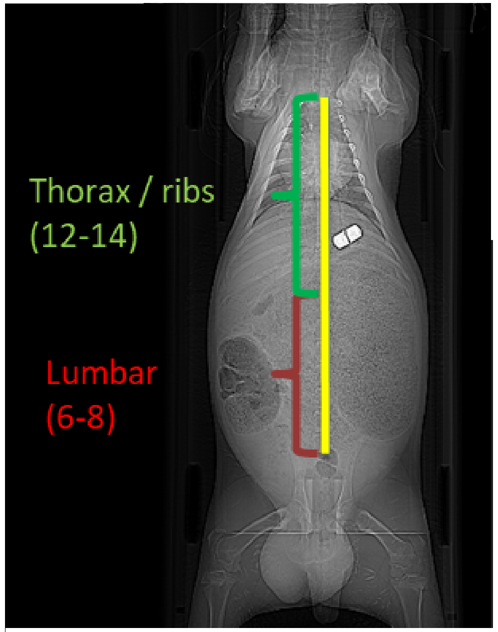
CT scanning

Detailed in-vivo carcass trait measurements

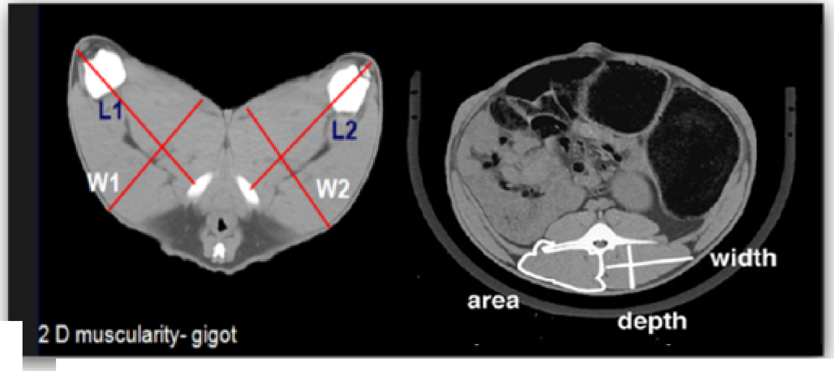


Weights of total carcass lean and fat

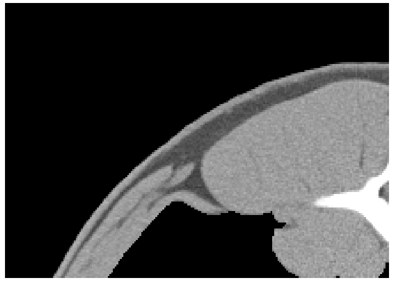




Vertebrae counts & lengths



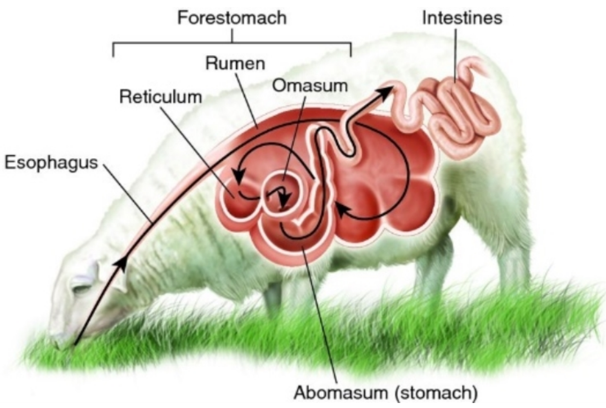
Gigot & loin muscularity



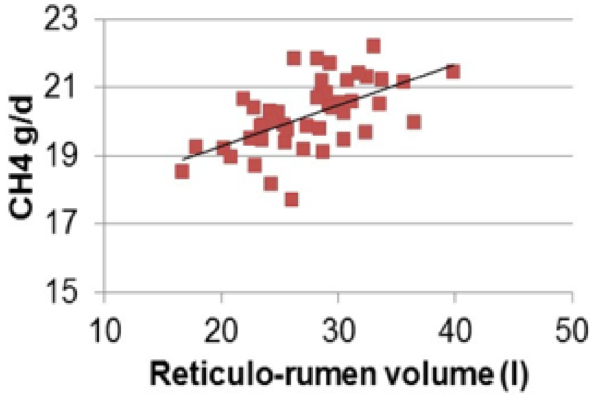
Meat quality (IMF)

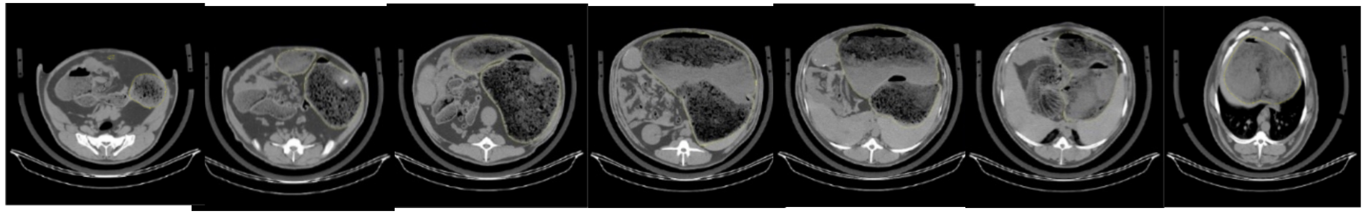
Reticulo-rumen volume by CT

- Volume of reticulum + rumen measured by CT
- Can be measured from routine CT scan images
- Previously correlated to methane emissions
- Larger rumen = higher CH_4 emissions



australiansheepenterprise.weebly.com





Scottish Government
Riaghaltas na h-Alba
gov.scot

Statistical analyses

Residual values calculated for each trait:

- Average daily dry matter intake = MMWT + ADG + sex + litter size = RFI
- CT trait (post-trial) = LWT + sex + year + litter size + age of dam

Correlations between residuals

MMWT = mid-test metabolic live weight
ADG = average daily live weight gain
RFI = residual feed intake
LWT = live weight

REPUBLIC OF BULGARIA
Ministry of Education and Science
National Programme "European Scientific Networks"

GREENANIMO
Green future through research

GrassToGas

Results

Correlations with **residual feed intake**

- reduced RFI favourably associated with increased muscling

Carcass lean wt	**-0.21**
Eye muscle area	**-0.18**
Eye muscle depth	**-0.16**
Eye muscle width	-0.07
Gigot muscularity	-0.08
Carcass fat weight	-0.07
IMF	-0.01
Spine length – lumbar	0.03
Vertebrae count – lumbar	0.07
Spine length – thoracic	-0.03
Vertebrae count – thoracic	-0.05
Spine length – lum + thor	0.00
Vertebrae count – lum + thor	0.04
Reticulo-rumen volume	0.10

bold = sig diff from zero

REPUBLIC OF BULGARIA
Ministry of Education and Science
National Programme "European Scientific Networks"

Results

Correlations with
reticulo-rumen volume

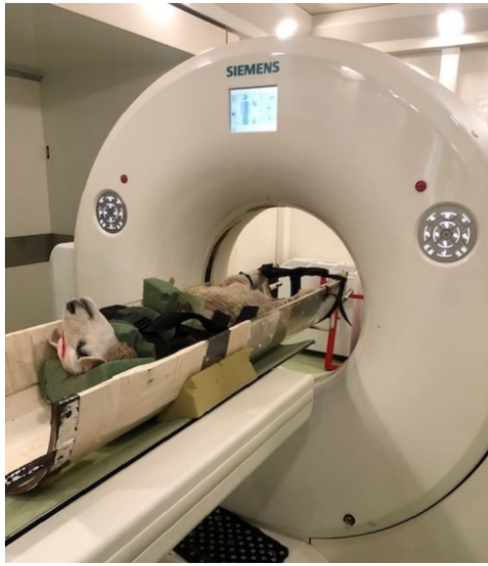
Lower RR volume:

(previously associated with lower methane emissions)

- increased carcass muscling
- increased fatness
- higher thoracic vert count

Carcass lean wt	**-0.34**
Eye muscle area	**-0.26**
Eye muscle depth	**-0.20**
Eye muscle width	**-0.14**
Gigot muscularity	-0.08
Carcass fat weight	**-0.23**
IMF	**-0.16**
Spine length – lumbar	0.00
Vertebrae count – lumbar	-0.03
Spine length – thoracic	0.03
Vertebrae count – thoracic	**-0.17**
Spine length – lum + thor	0.03
Vertebrae count – lum + thor	**-0.13**
Residual feed intake	0.10

bold = sig diff from zero



REPUBLIC OF BULGARIA
Ministry of Education and Science
National Programme “European Scientific Networks”

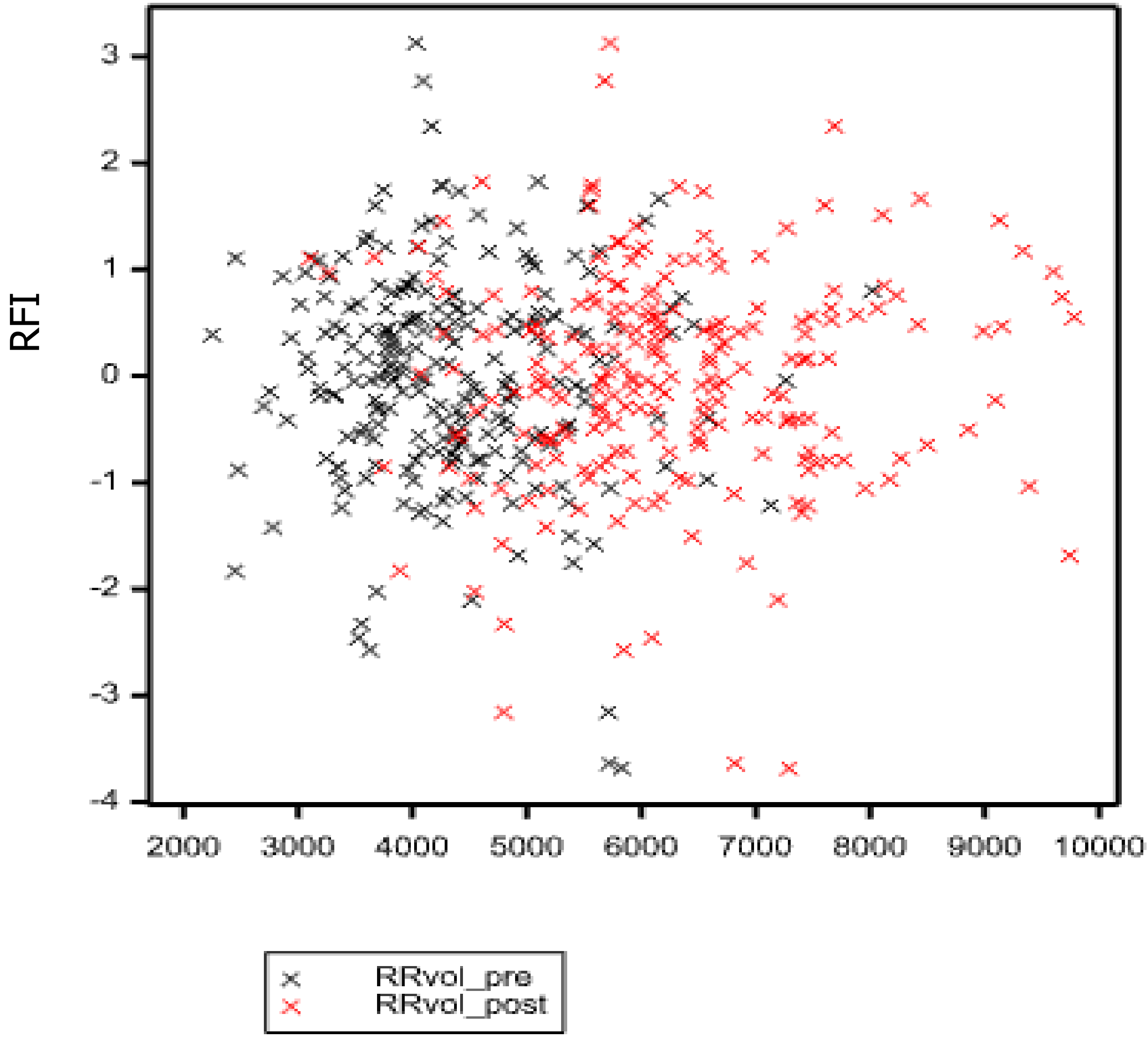
GREENANIMO
Green future through research

GrassToGas

Results

Correlations with
reticulo-rumen volume

NO sig. association with RFI



More in talk in session 96

REPUBLIC OF BULGARIA
Ministry of Education and Science
National Programme "European Scientific Networks"

GREENANIMO
Green future through research

Conclusions

- Some phenotypic win-wins:
  - more feed efficient <-> greater muscling
  - lower reticulo-rumen volume (proxy for lower CH_4) <-> greater muscling
- Other carcass traits (fat, spine traits):
  - not correlated with feed efficiency
  - low / no correlations with RR volume
- Include body composition in RFI calculations for sheep

  → RFI independent of composition as well as growth
- Larger data sets being collected to allow genetic analyses

  → most appropriate way to optimise production and environmental breeding goals

REPUBLIC OF BULGARIA
Ministry of Education and Science
National Programme "European Scientific Networks"

GREENANIMO
Green future through research

THANK YOU!

GREENANIMO
Green future through research

GrassToGas

FACCE ERA-GAS

ERA-NET SUSAN

ICT-AGRI era-net

TEXEL SHEEP SOCIETY

REPUBLIC OF BULGARIA
Ministry of Education and Science

National Programme "European Scientific Networks"