The use of carcass traits collected in the abattoir using video image analysis to improve beef yield

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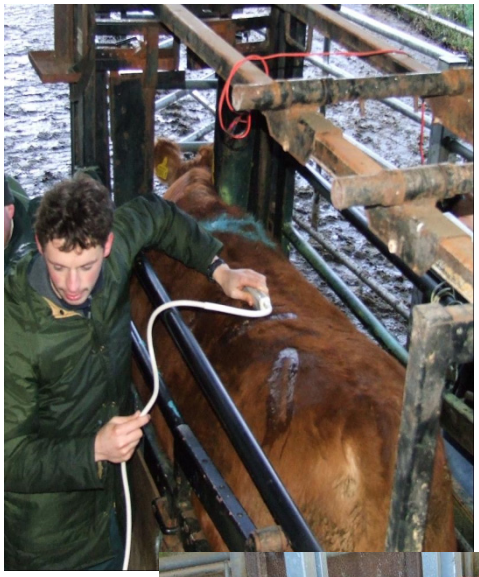
Leading the way in Agriculture and Rural Research, Education and Consulting

Overview

- Current Genetic evaluations
- UK beef genetic evaluation developments
  - EUROP carcase trait evaluations
  - Genomic evaluations for VIA carcase traits

Current carcase trait evaluations

- Traditional BLUP EBVs for proxy traits
- Limousin Pedigree sector (~20,000/year)
  - 400 day weight (~5,000/year; 25%)
  - Ultrasound fat and muscle depth (~1,500/year; 7.5%)



In the age of the genotype……

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PHENOTYPE IS KING!

Why are we interested in abattoir records?

Answer: the quantity of extra information available

e.g. Limousin

- ~ **1,500** animals / year ultrasonically scanned
- In 2011 abattoir records on **~93,000** animals Limousin/Limousin cross
- Of these **~20,000** had Limousin sire recorded
- The addition of this extra information should increase the accuracy (reliability) of genetic evaluations

Valuing carcases

- Commercial farmers paid using EUROP grid
- Paid per kg deadweight
- + penalty/premium based on
  - Conformation class
  - Fat class

- VIA provides carcass component traits
  - Multiplied by retail value

Limousin Cross steers

Carcase weight = 279kg Conformation = P- Fat = 3+	Carcase weight = 370kg Conformation = O- Fat = 2+	Carcase weight = 314kg Conformation = R= Fat = 1=	Carcase weight = 306kg Conformation = R= Fat = 3=	Carcase weight = 497kg Conformation = E= Fat = 2+

Utilising data from multiple sources

UK eartag
Carcase traits
Dates of birth & slaughter, sex, breed

British Cattle Movement Service

UK eartag
Dates of birth & death, sex, breed, pedigree (sire and dam), full movement information

UK eartag
Dates of birth, sex, breed, pedigree (sire and dam)

Carcase trait EBVs

Combined data – June 2014

- 3.5m carcase records
  - 6 processors, multiple sites
- 89 % carcase records matched to BCMS (3.1 million animal records)
- 23% had sire recorded in BCMS (~0.71 million animal records)
  - 28% for 2012+ born animals

Breeds

- **Dairy genetics** are a **major** component of beef carcases
  - Holstein Friesian the most common dam breed of the slaughter generation (accounting for 46%)

Ten most common dam breed types

	Breed code	Progeny Count	%		Breed code	Progeny Count	%
1	Holstein Friesian	1,078,469	45.7	6	Belgian Blue	90,459	3.8
2	Limousin	341,457	14.5	7	Charolais	85,118	3.6
3	Aberdeen Angus	225,330	9.6	8	Blonde d'Aquitaine	31,778	1.4
4	Simmental	175,326	7.4	9	Shorthorn	29,526	1.3
5	Hereford	117,247	5.0	10	Saler	26,363	1.1

VIA genomic breeding values

- 4 year project (2012-2015)
- Limousin genomic breeding values for abattoir VIA carcase traits
  - Available 2015
- First UK genomic breeding values

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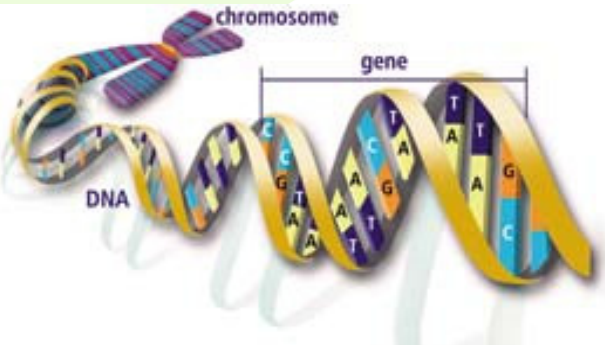
LIMOUSIN

abp Food Group



Technology Strategy Board
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Video Image Analysis (VIA)

- VBS2000
  - E+V
- Calibrated images (2D and 3D)
- Carcase weight and sex
- Mechanically grades the carcase
  - EUROP conformation and fat classes
  - 7 primal cut yields

Heritability of carcass cuts

Forequarter

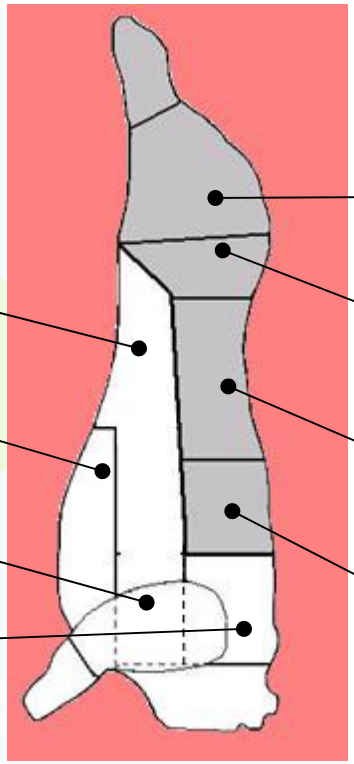
Ribs & Flank : 0.03

Brisket : 0.25

Shoulder : 0.79

Chuck : 0.83

[0.15 ≤ s.e. ≤ 0.24]



Hindquarter

Round : 0.86

Sirloin : 0.67

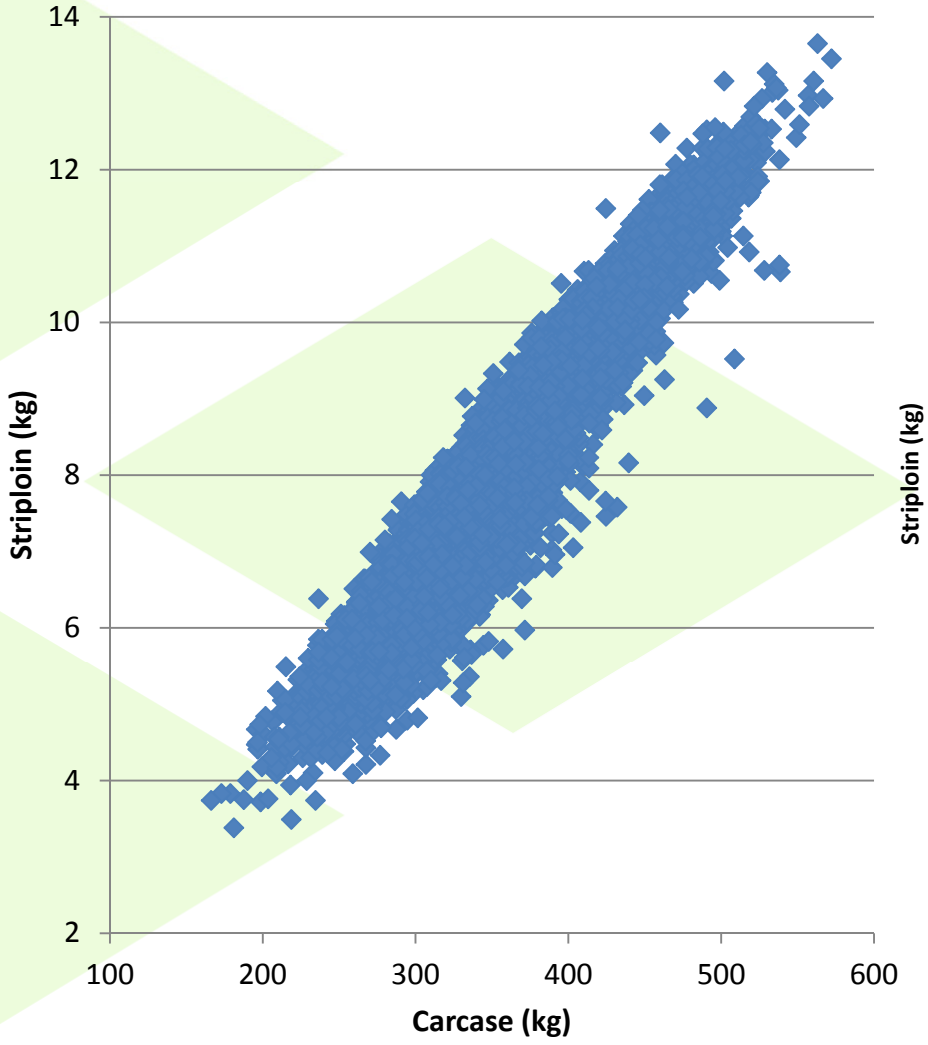
Strip-Loin : 0.49

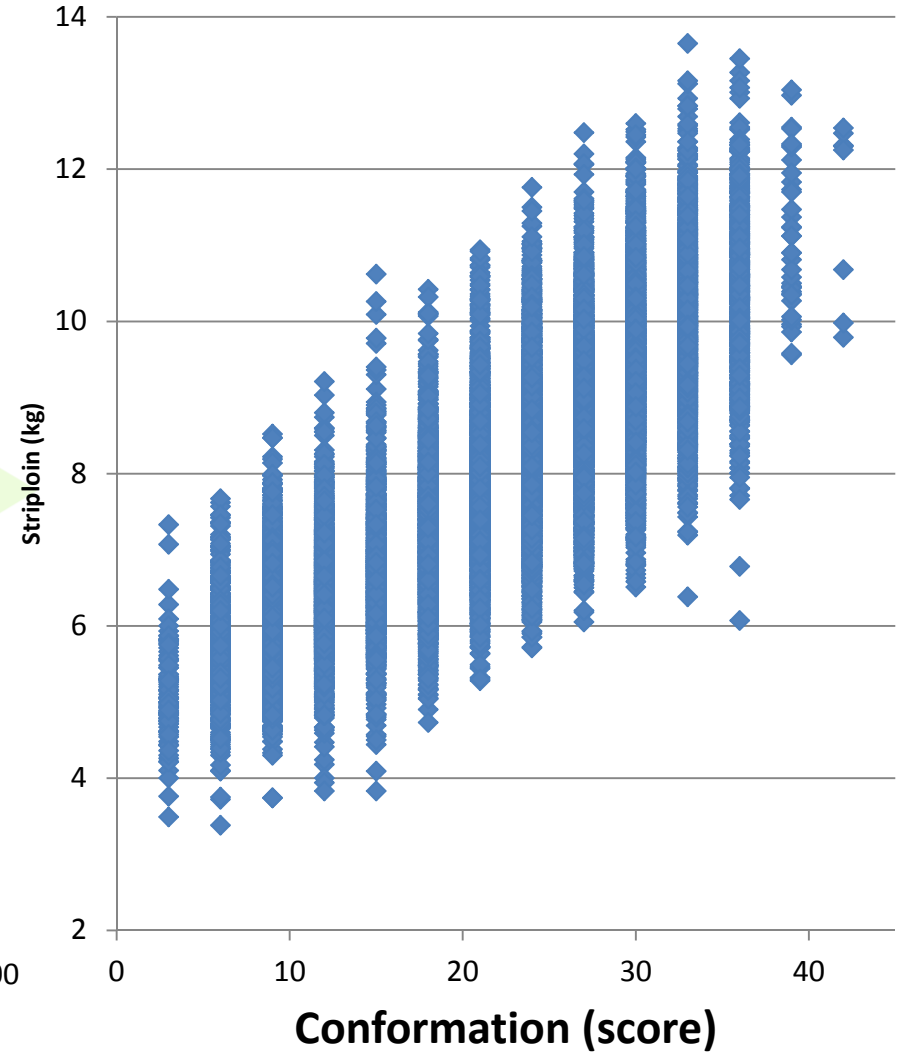
Rib-Roast : 0.14

[0.16 ≤ s.e. ≤ 0.23]

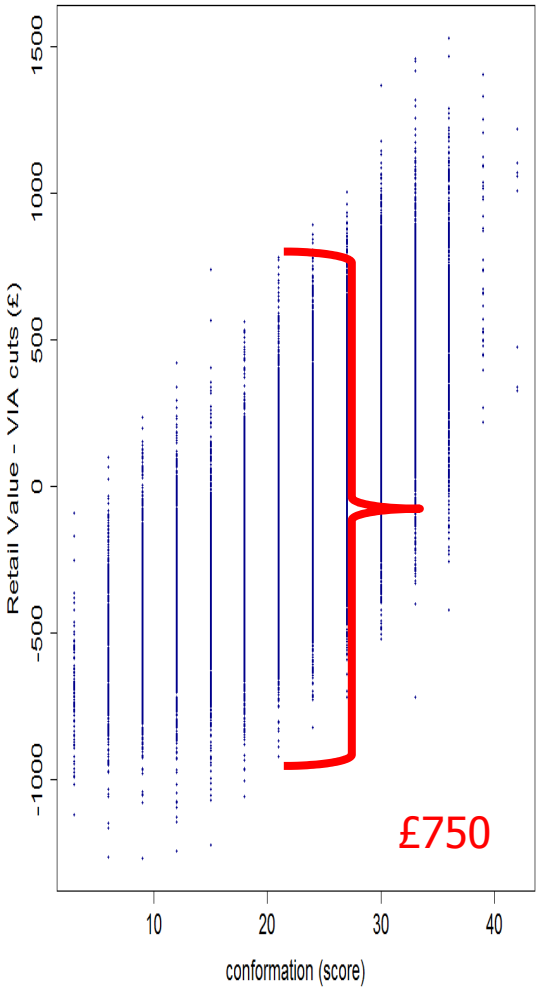
Pabiou et al. J. Anim. Sci. (2009)

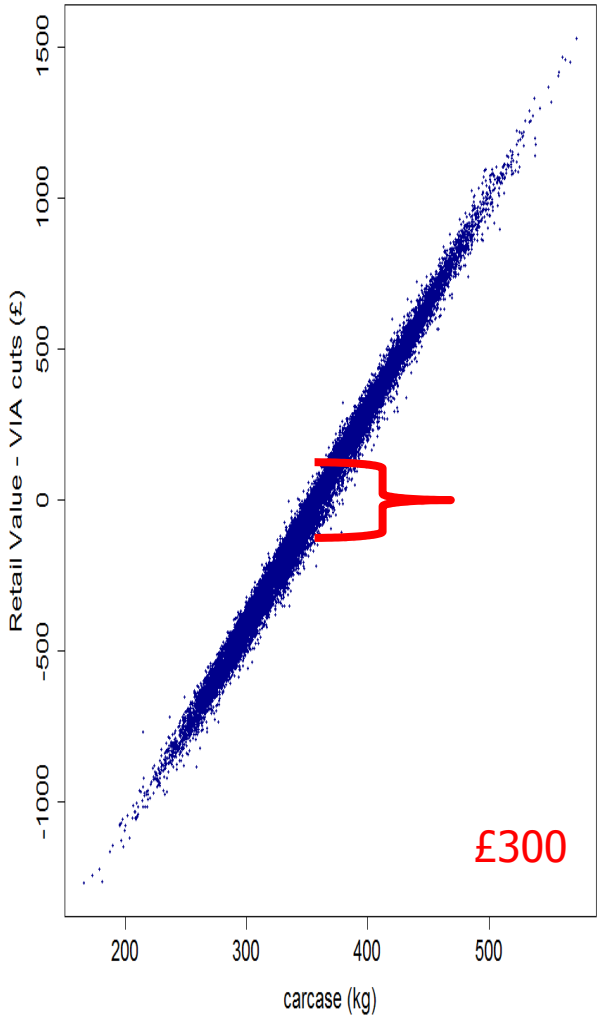
Striploin - steers

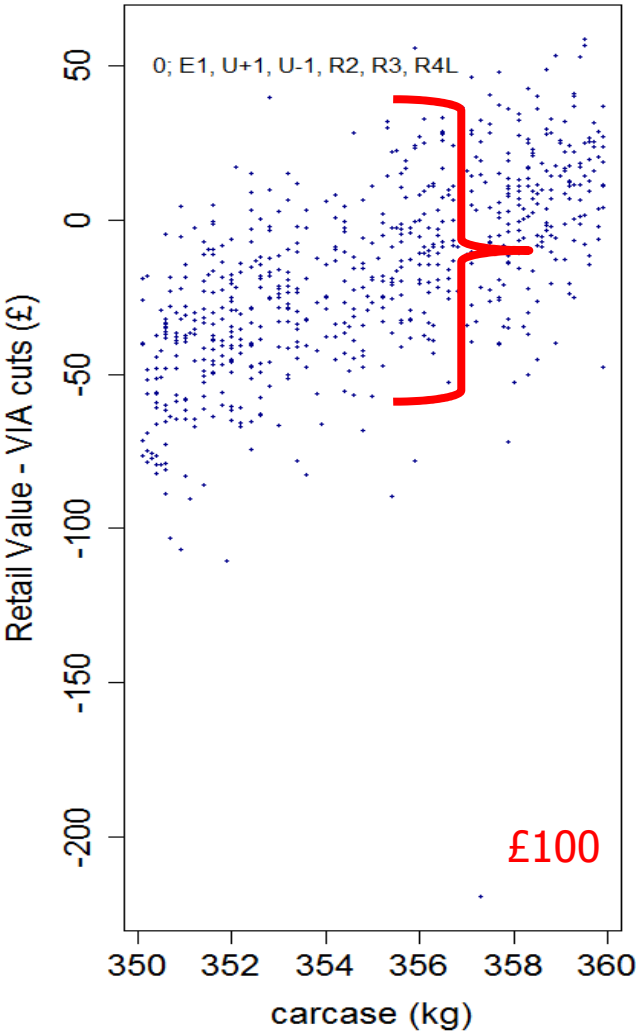




Opportunities to better differentiate carcases







Genetic Parameters

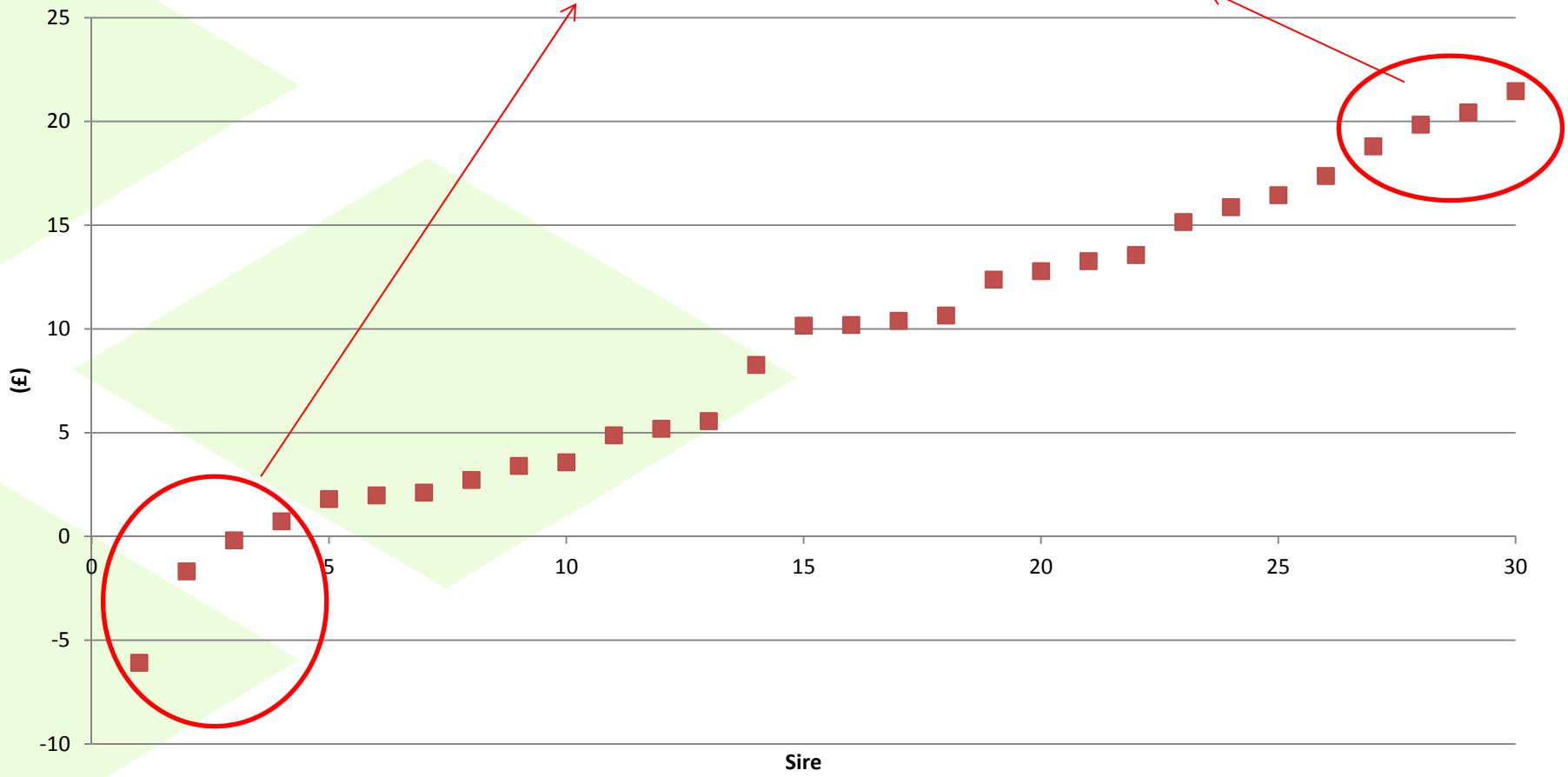
- 81,785 VIA records, 1 site
- Basic Data Edits
  - Heifers and steers aged 450 to 900 days
  - Kill dates with large amount of missing data
  - outliers
- 30,530 record remained
  - 63% steers, 37% heifers
  - 72% cross bred, 28% purebred
  - Breed types 22% Limousin, 19% Continental beef, 42% dairy, 8% native beef and 9% other
- 5 generation pedigree
  - 98,505
  - 31% of VIA animals had sire recorded

genetic parameters

	Phenotypic variance	h^2
Carcase weight	43.48 (1.15)	0.25 (0.04)
Conformation	15.63 (0.35)	0.50 (0.04)
Fat	43.48 (1.15)	0.25 (0.04)
Fillet	0.03 (0.001)	0.19 (0.05)
Striploin	0.11 (0.002)	0.37 (0.05)
Topside	0.35 (0.01)	0.29 (0.04)
Rump	0.16 (0.003)	0.29 (0.05)
Silverside	0.48 (0.01)	0.28 (0.05)
Knuckle	0.15 (0.003)	0.33 (0.05)
Flank	2.57 (0.06)	0.28 (0.05)

30 Limousin sires EBVs

£447 vs £910 (£463 difference in raw retail value)



Building the Limousin reference population

- Aiming for 2,000 Limousin's
  - VIA phenotype (accuracy of preliminary VIA EBVs)
  - medium density (50k) chip type
  - Project genotypes
    - Currently 662 genotypes
    - ~300 sampled
  - 716 HD Limousin
- 48 Limousin Sequences

Implications

- Massive benefit to the industry
  - Large numbers of records – thousands not hundreds
  - Traits of importance £
  - Stronger links in the supply chain
  - Increase efficiency ~ greenhouse gas emissions
  - Selection for dairy-beef
  - First EBVs of their kind in the UK
    - Genetic improvement
    - Stimulate the industry

Conclusions

- Developments Industry focused
- Large scale with big data sets
- Carcase traits and genomics
  - projects that are the first of their kind in the UK
- Provides a solid platform to expand and address further areas for improvement
  - Feed efficiency
  - Female fertility traits

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