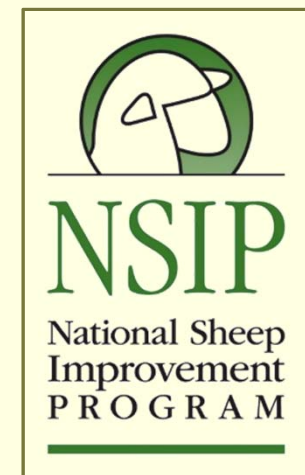


Does quantitative genetics work?

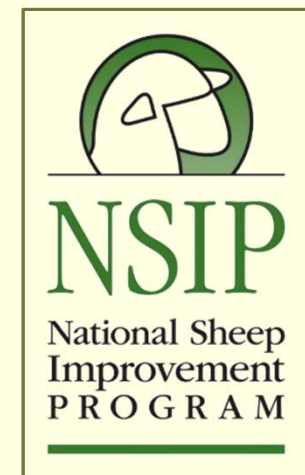
Ron Lewis, Department of Animal Science,
University of Nebraska-Lincoln

NSIP Regional Meeting
10th Annual Center of the Nation NSIP Sale
Clay County Fairgrounds, Spencer, IA
July 23, 2016



My talk

- Some principles
 - Breeding values
 - Selection index
- Is it economic?
- Where are we?
 - Genetic gains
- Summing up



Genetic evaluation

- Genetic evaluation is about parsing

$$P = G + E$$



Genotype (EBV)

- WWT: 4.32 kg
- PWWT: 8.66 kg
- PFAT: -2.76 mm
- PEMD: 2.00 mm

Breeding values

- Breeding value (BV)
 - The value of the genes that a parent transfers to its offspring for a given trait
- Seldom known and therefore must be estimated (EBV)
- Estimate becomes more accurate when a trait is
 - More heritable
 - More persistently measured
 - Particularly if on closer relatives

Selection index

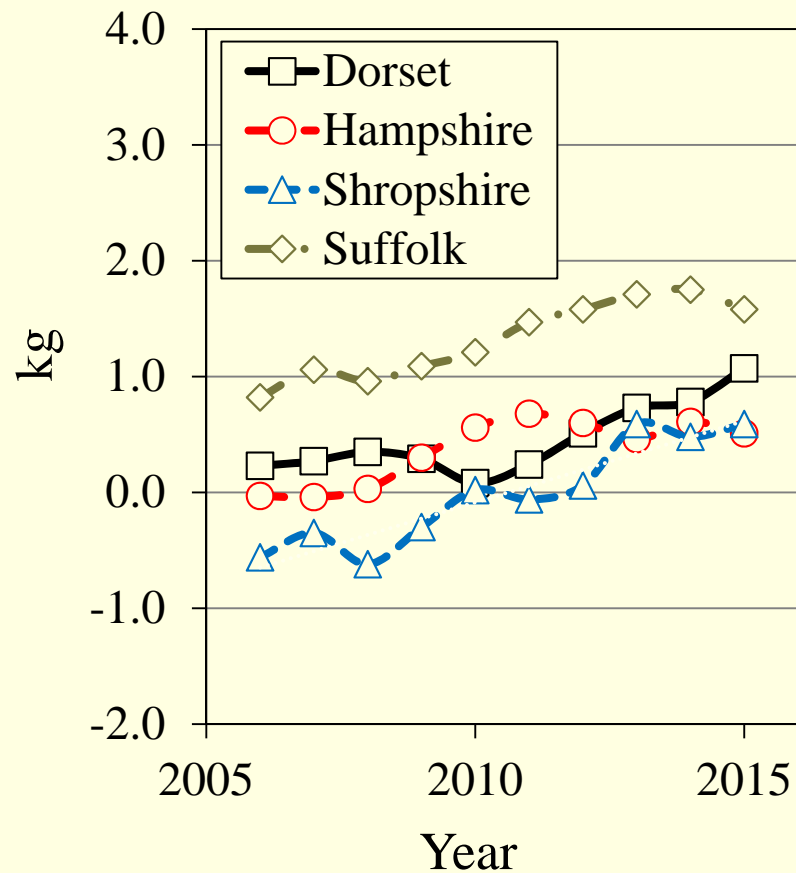
- Breeders seldom wish to select for one trait in isolation
 - Profit usually depends on several traits
 - Optimising profit therefore depends on placing the right emphasis on each trait to be improved
- A selection index predicts genetic merit for a combination of several traits
 - Key to their design is deciding on which traits to improve

Where are we?

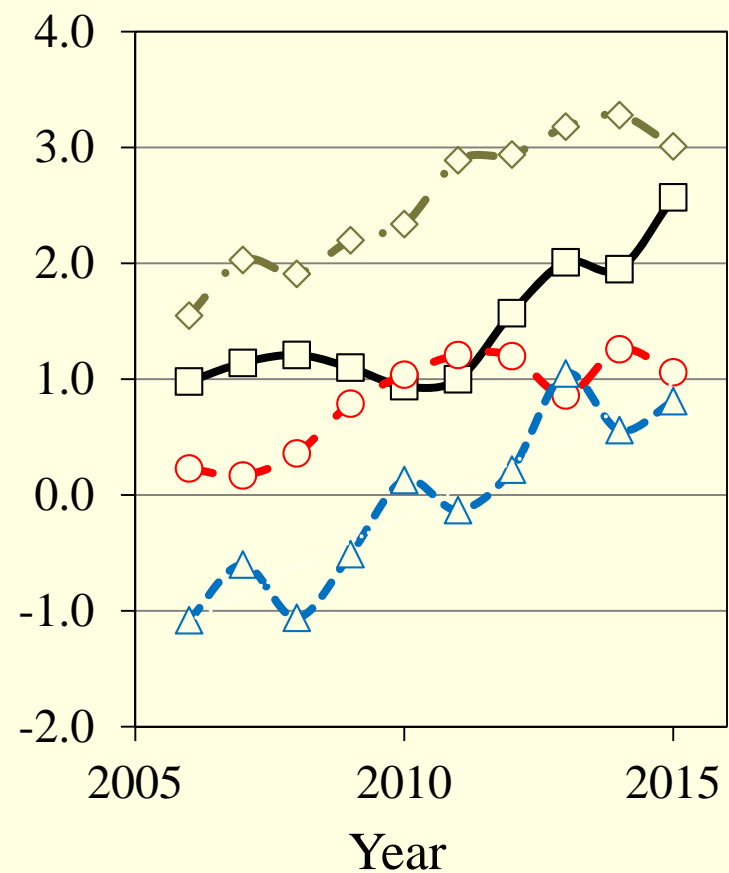


Trends in weight EBV

Weaning wt. EBV

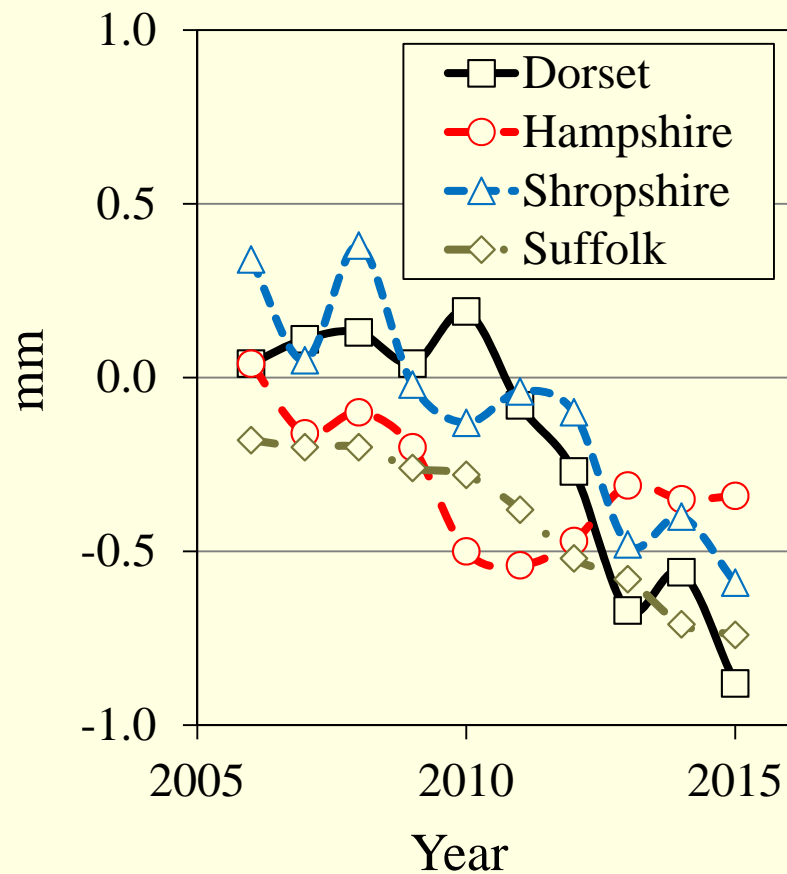


Post-weaning wt. EBV

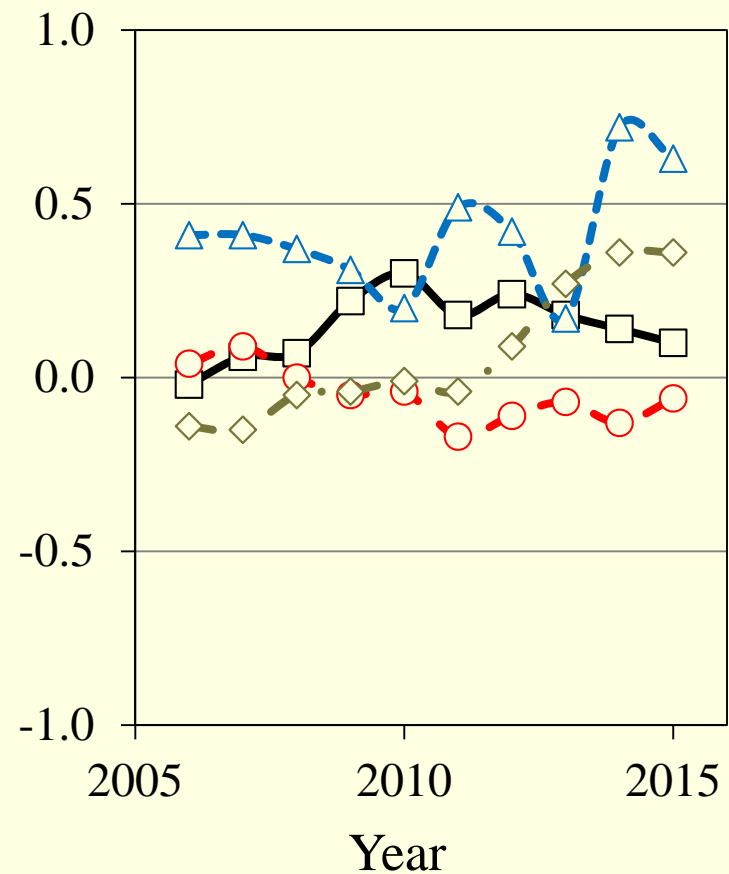


Trends in ultrasound EBV

Fat depth EBV



Muscle depth EBV

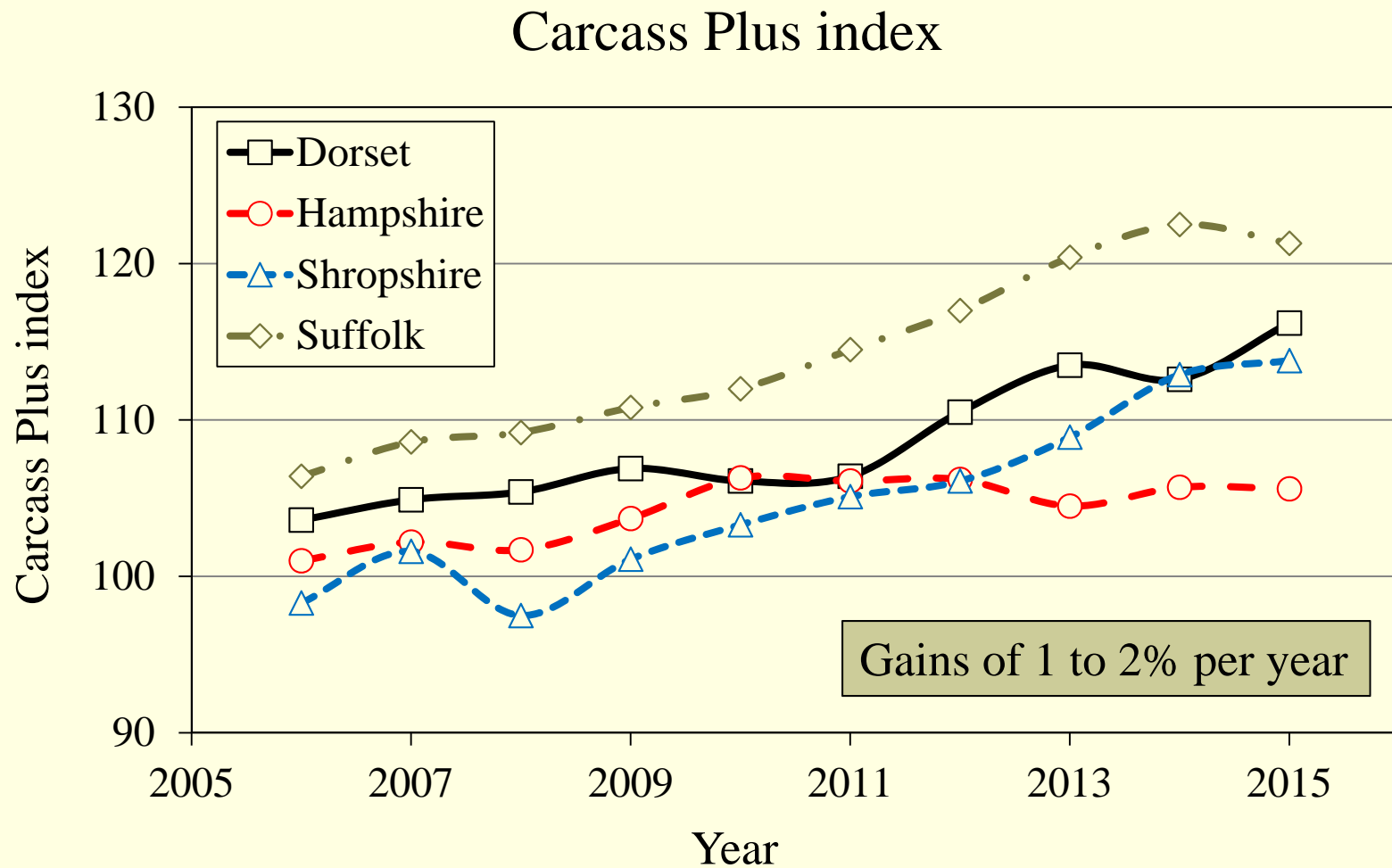


Carcass Plus Index

- Developed to improve carcass value in Australian sheep industry
- Provides a good assessment of carcass value in U.S. terminal sires

Criteria (EBV)	Index Weight	Relative emphasis
Weaning weight (kg)	2.33	30%
Post-weaning weight (kg)	3.50	35%
Fat depth (mm)	-4.07	5%
Muscle depth (mm)	11.40	30%

Trends in Carcass Plus index



Elite sires report

- Top sires ranked on Carcass Plus Index score

NSIP National Sheep Improvement PROGRAM		Elite Report - Suffolk										- Sires with 2015 - 2016 Offspring		
		Carcass+										June 2016		
ID	Prg:Flks	BWt	WWt	MWWt	PWWt	PFat	PEMD	NLW	NLB	PSC	SRC\$	Carc.+	Sire	Dam
Flock	Inbrd.Coef	kg	kg	kg	kg	mm	mm	%	%	cm				
690007-2014-002968 <i>Bunker Hill Farms</i>	35 : 1 6%	0.01 83%	4.32 80%	0.52 50.0	8.66 79%	-2.76 74%	2.00 77%	-5.6 42%	-2.3 37%	0.0 0%	116.0 55%	174.4 75%	6900242010000152 6900072013002825	
690007-2015-003043 <i>Bunker Hill Farms</i>	4 : 1 4%	0.62 73%	4.75 72%	0.04 40.0	7.26 74%	-3.71 70%	1.51 75%	2.8 31%	4.4 27%	0.0 0%	118.4 47%	168.8 70%	6900072013002868 6900072011002511	
690035-2015-005352 <i>Mint Gold Ranch-Suffolk</i>	18 : 2 14%	1.24 77%	7.06 76%	0.25 42.0	9.97 77%	-4.11 73%	0.02 78%	-1.8 35%	-0.6 31%	0.0 0%	116.6 51%	168.3 74%	6900352014004111 6900352014004139	
690007-2014-002896 <i>Bunker Hill Farms</i>	15 : 1 8%	0.28 81%	4.77 80%	0.17 54.0	8.89 82%	-2.87 81%	1.22 85%	-5.8 45%	0.5 39%	0.0 0%	113.1 57%	167.7 81%	6900242010000152 6900072012002667	

Is it economic?



United Kingdom example

■ United Kingdom

- Lean growth index
- Developed by Scottish Agricultural College
 - Began 1989



In 9 years, 1 kg increase in lean weight in 20 kg carcass (+ 5%)

■ Selection goal

- Increase lean carcass weight (+3)
- Little change in carcass fat weight (-1)

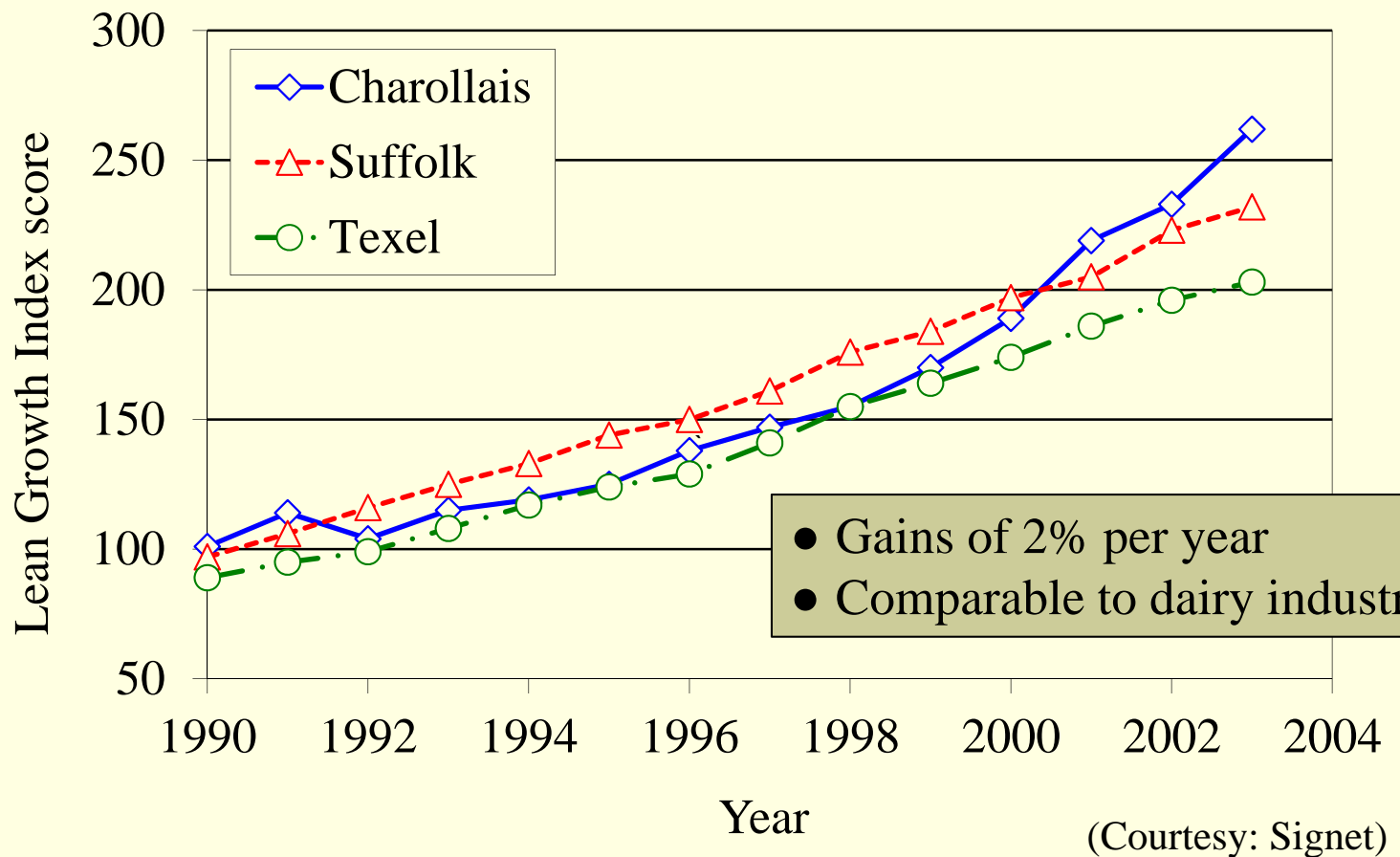
■ Selection criteria

- Live weight (+)
- Muscle depth (+)
- Fat depth (-)

(Simm and Dingwall, 1989; Lewis et al., 2002; Simm et al., 2002)

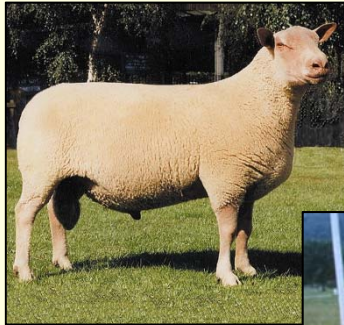
United Kingdom example

■ Gains in industry schemes



United Kingdom example

Terminal sire breeds



Crossbred ewe breeds



United Kingdom example

- Effects on marketable output
 - Comparison of crossbred lambs sired by high *versus* low index terminal sires
 - 6,400 lambs sired by 90 rams
 - Rams differed by 200 index points
 - Benefits
 - 0.56 kg heavier cold carcass weight
 - 0.47 kg more saleable meat yield (1000 carcasses)
 - £353 (US\$ 463) extra retail value per high index ram over its lifetime

(Lewis et al., 2006., Márquez et al., 2012;
Márquez et al., 2013a,b; Márquez et al., 2015)

United Kingdom example

■ Effects on marketable output

- Comparison of crossbred lambs sired by high index sires versus low index terminal sires

- 6,400 lambs sired by 90 high index sires
- Rams differed by 10% in index

■ Benefits

■ 10% increase in carcass weight

■ 10% more saleable meat yield (1000 carcasses)

■ £353 (US\$ 463) extra retail value per high index ram over its lifetime

**£15 million annually for UK sheep industry
(US\$ 19.7 million annually)**

(Lewis et al., 2006., Márquez et al., 2012;
Márquez et al., 2013a,b; Márquez et al., 2015)

Summing up

- Where are we?
 - Within NSIP recorded flocks, persistent genetic gains in production traits and index scores have been achieved
- Is it economic?
 - With implementation at an industry-wide level, there is clear opportunity for substantial economic returns
- Does quantitative genetics work?
 - Without any doubt
 - With growing adoption of this technology *via* NSIP, our industry has a bright future

Thank you

Questions?

