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IRISH CATTLE BREEDING FEDERATION

Improving Carcass and Meat Eating Quality through Genetics; Some experiences from Ireland.

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Department of
**Agriculture,
Food and the Marine**
An Roinn
**Talmhaíochta,
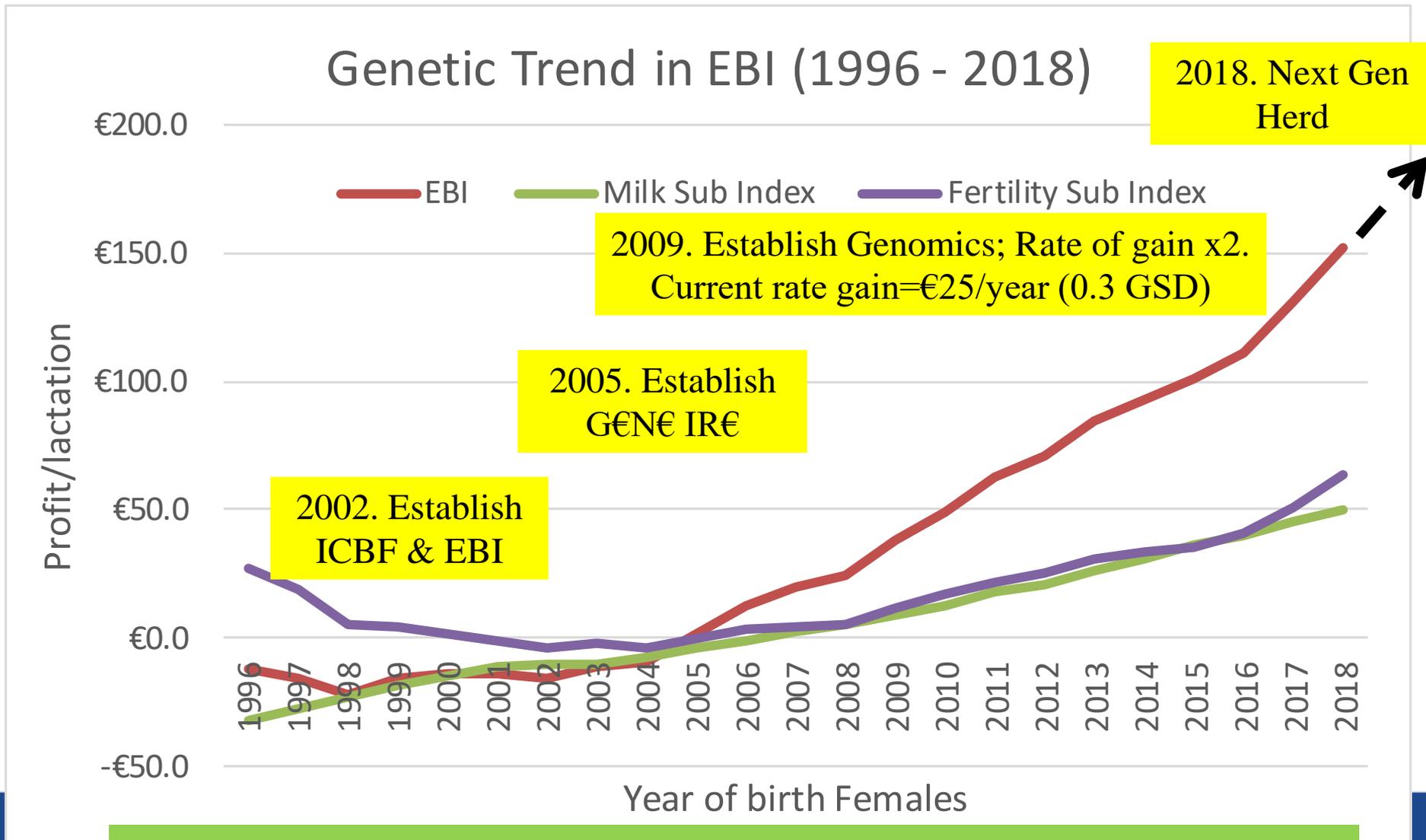Bia agus Mara**

Overview of Talk.

- Genetic works!
- Beef cattle breeding – challenges and opportunities.
- Irish approach to beef cattle breeding.
- Carcass trait evaluations + future plans.
- Meat eating quality + future plans.
- Collaboration in data sharing.
- Discussion.

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Genetics Works – Humans.

- Confirmation of parentage
- Me and my then 3 month old son Tim
  – Both enjoy a snooze after a long day.
  – Note the similar arch in necks.
- It's in our DNA!

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Genetics Works – Dairy Cattle.

Genetic Trend in EBI (1996 - 2018)

2018. Next Gen Herd

Legend:
- EBI
- Milk Sub Index
- Fertility Sub Index

2009. Establish Genomics; Rate of gain x2. Current rate gain=€25/year (0.3 GSD)

2005. Establish G€N€ IR€

2002. Establish ICBF & EBI

Y-axis: Profit/lactation (€200.0, €150.0, €100.0, €50.0, €0.0, -€50.0)

X-axis: Year of birth Females (1996, 1997, 1998, 1999, 2000, 2001, 2002, 2003, 2004, 2005, 2006, 2007, 2008, 2009, 2010, 2011, 2012, 2013, 2014, 2015, 2016, 2017, 2018)

Cumulative gain worth €683m across industry => 10:1 RoI

Validation; Teagasc Next Gen Herd.

Trait	Elite Herd	National Ave
EBI (€)	154	51
Replacement rate (%)	17%	27%
Fat + Protein (kgs).	475	445
Milk returns (€)	220,594	204,301
Replacement Costs (€)	29,079	46,072
Net profit (€)	92,305	68,023

- Teagasc Dairy Farm Systems Model.
  - 110 cows, 40 hectares, grass based & base milk price of €29.5 cpl.
- EBI predicted €206 additional profit/lactation. Actual outcome was €220 ! (i.e., €92k – €68k per 110 cows)

What about beef cattle?

- A lot more challenges with genetic gain in beef cattle systems?

Beef Cattle; Challenges.

- Multi-breeds, including cross-breeds.
- Genetic improvement generally "within breed". Past focus on terminal traits.
- Low AI usage (linkages + impact on genetic gain).
- Generally small breeding herd size.
- Poor data recording, especially for carcass & maternal traits under commercial conditions.
- Separating direct and maternal effects.
- Lower profits => not the same commercial investment.

Beef Breeding; Opportunities.

- New ways to collect data=> image data (beef carcass) & sensor data (e.g., fertility, health/disease, intake, vigor etc).....

- New technologies => genomics.

- Collaboration in data sharing.
    - At a national level – Ireland, US=>BIF (tomorrow morning sessions), MLA (Australia....
    - At an international level – ICAR, Interbeef, Breedplan, IGS, AAA, alliances/consortia.

Irish Beef Cattle Herd.

- 1m beef & 1.5m dairy cows.
  - 50k beef farmers @ 20 cows.
- 500k tonnes beef/year.
  - 55% suckler beef & 45% dairy beef.
  - Steers & heifers.
  - 80% exported.
  - Seasonal system (370kg @ 28 mths). Grass-fed!
- Cross-bred beef cow herd. Main breeds LM=> AA=> CH=> HE=> SI.
  - Major growth in AA in last 5 yrs
- 25% beef calves are AI bred.

Irish Cattle Breeding.

- Co-ordinated by ICBF.
  - Established in 2000 as a co-op of 30 cattle breeding orgs.
  - Operating budget of ~€7m/year. 50% "industry good" (govt & tag) & 50% "service income" (industry & herdplus)
  - Staff of 70 servicing 100k dairy & beef farmers.

- Focused on genetic gain; data, evaluations & breeding programs *(profit from science)*.

- Independent genetic evals => Trust.

- World-leading (research => implementation)
  - ~1.2m beef animals genotyped & growing @300k/year.

- ICBF database now corner-stone of industry.

Beef performance evaluations in a multi-layered and mainly crossbred population

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Department of Agriculture, Food and the Marine
An Roinn Talmhaíochta, Bia agus Mara

Department of Agriculture database

Calf registration, animal movements; 2.3 m calves per year (1.4m dairy & 900k beef)

ICBF Beef Database

Feed intake, live-weights, linear classification, carcass, meat eating quality; 400 animals/year

Progeny test

60k commercial Beef & 18k Dairy Farms

Sire ancestry, calving scores, live-weights, calf quality scores, docility, fertility; 1.5m

Live-weights and sale prices /year; 1,8m/year

50 Cattle Auctions

Pedigree beef herds 14 herd societies

Ancestry, live-weights, linear scores, fertility; 30k calves/yr

Carcass data; 1.6 m/year

40 Abattoirs

Genotyping companies

Genotypes; 350k/yr

500k/year

Inseminations; 400k/year

Beef Genomics Scheme; farmer recorded data.

6 AI Companies

The Breeding Goal in Beef.

- The ideal suckler cow must;
  – Calve each year.
  – Calve herself.
  – Have enough milk to rear her calve.
  – Be not too big *(from a cost of feed perspective).*
  – Have a good calf at foot (in terms of weight and quality), for sale or taking through to slaughter.
- She needs to produce more output from less input => a balanced cow.

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A balanced cow!

An Irish 5-Star cow.

One of David's best cows. This nine-year-old SI X cow has a Replacement Index of €169 (5 star, top 1%). She calved for the first time at 24 months, has had eight calves with an average calving interval of 364 days and she weaned the heaviest calf of David's 2015 calf crop. She is sired by the old Simmental AI bull Hurtig (HRG).

Producing these sorts of progeny.

Approach to Genetic Gain.

- Profit from science approach (with Teagasc).
- Evaluations have evolved with available data;
  - 2002   Within breed pedigree only.
  - 2005   Multibreed & cross-bred *(calving & carcass)*
  - 2008   Profit indexes (overall)
  - 2012   Profit indexes (rep and terminal).
  - 2015   Integrating genomics.
- Genomic evaluations for 40m+ animals.
- Incentive programs focused on data quality.

€uro-Star Indexes.

Star Rating (within Limousin breed)	Economic Indexes	€uro value	Index reliability	Star Rating (across all beef breeds)
★ ★ ★ ☆ ☆	Replacement (per daughter lactation)	€80	47% (Average)	★ ★ ★ ★ ☆
★ ★ ★ ★ ★	Terminal	€152	49% (Average)	★ ★ ★ ★ ★

- Profit Index, e.g., €80 more per calving.
  - Multi-breed evaluations.
- Star system; 5 star versus 1 star.
  - Across all breeds. Also within breed.
- Very high level of farmer understanding => *Beef Data Genomics Program.*

Replacement Index

Cow Traits (71%)		Calf Traits (29%)	
Maternal Calving Difficulty (6%)	Age @ 1st Calving (6%)	Calving Difficulty (7%)	Gestation (2%)
Calving Interval (9%)	Survival (8%)	Mortality (1%)	Docility (1%)
Milk (18%)	Cow Liveweight (14%)	Feed Intake (4%)	Carcass Weight (10%)
Cow Docility (4%)	Cull Cow Weight (7%)	Carcass Conformation (3%)	Carcass Fat (1%)

Goal traits, predicted from a total of ~30 goal and index traits.

* Goal traits, predicted from a total of ~30 goal and index traits.

Records in Genetic Evaluations.

Trait	old	new	Extra	% Extra
calving difficulty	13,417,747	14,151,764	734,017	5.2%
gestation	4,262,712	4,636,262	373,550	8.1%
mortality	18,372,695	19,275,401	902,706	4.7%
birth weight	244,722	253,588	8,866	3.5%
weaning weight	1,147,401	1,164,267	16,866	1.4%
yearling weight	1,255,434	1,291,924	36,490	2.8%
Linear scores	241,114	241,637	523	0.2%
weanling docility	1,658,493	1,704,922	46,429	2.7%
weanling price	1,117,318	1,144,126	26,808	2.3%
yearling price	1,081,150	1,108,389	27,239	2.5%
Tully feed intake	5,774	5,926	152	2.6%
carcass weight	7,311,277	7,539,510	228,233	3.0%
carcass conformation	7,311,277	7,539,510	228,233	3.0%
carcass fat	7,311,277	7,539,510	228,233	3.0%
age 1st calving	2,394,807	2,452,297	57,490	2.3%
calving interval	4,647,900	4,828,595	180,695	3.7%
maternal wean wt	984,932	996,339	11,407	1.1%
cow milk score	2,572,720	2,638,801	66,081	2.5%
survival	5,477,848	5,742,922	265,074	4.6%
cow docility	2,350,435	2,587,252	236,817	9.2%
cow live weight	1,011,949	1,148,679	136,730	11.9%
cull cow carcass wt	1,795,311	1,856,836	61,525	3.3%
Genotypes	1,163,750	1,201,351	37,601	3.1%
foreign ebvs calving	28,285	28,814	529	1.8%
foreign ebvs weaning wt	50,393	51,746	1,353	2.6%
foreign ebvs linear	43,461	43,780	319	0.7%
foreign ebvs carcass	30,127	31,110	983	3.2%
foreign ebvs milk	51,203	52,144	941	1.8%

- Key data;
  - Calving – 14.1m
  - Live-weight – 1.3m
  - Carcass – 7.6m
  - Cost of feed – 6k.
  - Female fert – 5.0m
  - Cow milk – 2.6m
  - Genotypes – 1.2m
  - Foreign EBV's -50k
- 90% of data is from commercial cattle.

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ICBF Spring Active Beef Bull List 2018

| Rank	Code	Bull Name	Breed	Gene Ireland	Index	Rel %	Stars Within	Stars Across	Calv Diff %	Rel %	Calv Recs	Daughter Milk (kgs)	Rel %	Price	Supplier
		Bull Details			**Replacement**				**Calving**			**Milk**		**Semen**	
1	SA4059	Beguin	SA	No	€252	59	5	5	1.6	83	121	15.8	72	€26	Munster,PG
2	SA2189	Ulsan	SA	No	€203	63	5	5	1	96	780	11.7	73	€10	Dovea
3	SI4383	Derreen Declan	SI	No	€192	54	5	5	3.2	74	69	12	49	€12	Dunmasc
4	ZAG	Castleview Gazelle	LM	**Yes**	€191	77	5	5	4.4	99	27072	0.9	76	€10	Munster,PG
5	SFL	Du Stordeur Flaneur	BB	No	€183	96	5	5	5.1	99	10244	4.4	99	€15	Bova
6	VTA	Vaillant	SA	No	€179	77	5	5	2.1	93	300	6.2	85	€14	Bova
7	ISL	Islavale Cracker 11	SI	No	€171	76	5	5	7.2	97	1148	8.6	86	€10	Dovea
8	SI2469	Lisnacrann Fifty Cent	SI	**Yes**	€170	57									PG
9	SA2153	Highfield Odran	SA	**Yes**	€166	54									PG
10	QCD	Cloondroon Calling	SI	**Yes**	€161	82									
11	SA4060	Baron	SA	No	€161	50									PG
12	JSS	Usse	LM	No	€160	52									e
13	SI2152	Curaheen Earp	SI	**Yes**	€159	59									PG
14	VMO	Voimo	CH	No	€159	64									PG
15	CH2218	Bivouac	CH	No	€155	59									
16	XCD	Clonagh Direct Debit	SI	No	€155	60									
17	GEU	Gordon Et Du Golard	BB	No	€155	77									PG
18	SI4030	Auchorachan Wizard	SI	No	€153	54									e
19	TSO	Curaheen Tyson (Et)	SI	No	€150	89									es
20	LZR	Lataster Eric	SA	No	€150	92									PG
21	SI2099	Kilbride Farm Escalop 13	SI	No	€149	51									
22	ZLL	Lanigan Red Deep Canyon Et	AA	No	€146	78	5	5	2	98	2415	9.7	84	€30	Bova
23	KYA	Cornamuckla Lord Hardy K222	AA	No	€145	95	5	5	0.8	99	39775	3.6	98	€10	Munster,PG
24	ZEP	Hawkley Red Zeppelin N659	AA	No	€143	50	5	5	2.1	91	380	5.3	38	€10	Dovea
25	PZB	Bonaparte	SA	No	€142	81	3	5	3	97	1284	1.1	90	€10	Munster,PG
26	DZJ	Drumlegagh Dennis	SA	No	€141	64	3	5	3.2	87	244	6.3	68	€12	Eurogene
27	AHC	Auroch Deuter Pp	SI	**Yes**	€140	61	5	5	5.4	96	827	9.5	44	€10	Munster,PG
28	YFK	Kilbride Farm Delboy 12	SI	No	€138	64	5	5	10.6	96	805	9.7	58	€15	Eurogene
29	OKH	Keltic Handsome	LM	**Yes**	€138	66	5	5	6.1	99	4322	1.5	54	€12	Munster,PG
30	SI4083	Clonagh Frosty King Et	SI	**Yes**	€137	50	4	5	4.1	65	36	12.2	50	€10	Munster,PG

- Range of breeds on Top Bull Listing => Focused on promoting these bulls within the relevant breeds.
- 50% of top bulls are imported => why international collaboration is important to Ireland.
  - CH data now shared from UK Breedplan => New top CH bull (Adonis) on May 2018 listing.

Do the indexes work?

	Dam – 1 Star	Dam – 3 Star	Dam – 5 Star
Sire - 1 Star on Terminal Index	**378 kg**	**393 kg**	**400 kg**
	863 days	**847 days**	**825 days**
	R= 3=	**R+ 3=**	**R+ 3=**
Sire - 3 Star on Terminal Index	**382 kg**	**395 kg**	
	854 days	**838 days**	
	R= 3=	**R+ 3=**	
Sire – 5 Star on Terminal Index	**388 kg**		**405 kg**
	845 days		**798 days**
	R= 3=		**R+ 3=**

* Based on 83,944 ¾ bred beef steers slaughtered in 2017, where sire and dam were both genotyped

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Genetics Works; Beef.
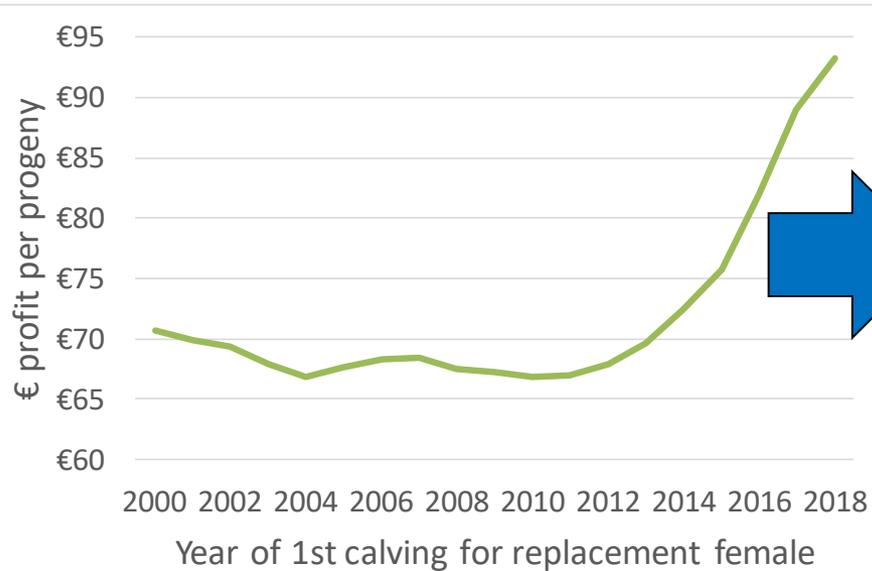
Year	Calves per cow per year	Calving Interval (days)	Calving at 2 years age (%)
2014	0.80	407	0.17
2017	0.87	393	0.26

Year	Carcass Weightt (kg)	Carcass Conformation (Sc)	Age Slaughter (months)
2014	380.6	R=	29.6
2017	386.3	R=	28.0

- Past focus on terminal traits=> decline in maternal traits & no gain in replacement index.

- Beef genomics scheme introduced (2014), replacement index has turned around => Major gains in calves/cow/year and carcass traits.

- €uro-Stars & beef genomics are moving industry in right direction.

Genetics of Carcass Performance.

- ICBF approach;
  - Access to data from meat processors for all animals slaughtered in Ireland.
  - High level of sire recording by farmers.
  - Complete movement data.
- => More accurate data for genetic evaluations.
- Requires high level of trust re: data sharing & a "common good" ethos => farmer benefit.

Average heifer performance (2017).

Sire	Dam	Number	Cwt kg	Conf (1-15)	Fat (1-15)	Price/kg	Overall	Age Slau	Cwt/day*
Main beef breeds.									
CH	CH	39,147	348.5	8.8	8.7	€4.08	€1,422	811.1	0.43
LM	LM	43,802	336.0	9.0	8.5	€4.07	€1,368	816.0	0.41
SI	SI	3,107	320.2	7.6	8.9	€3.95	€1,265	827.5	0.39
AA	AA	8,684	285.1	6.5	10.0	€3.85	€1,097	761.4	0.37
HE	HE	3,669	282.8	6.1	10.2	€3.88	€1,097	795.6	0.36
Main dairy cross									
HE	FR	42,669	277.5	5.3	9.9	€3.99	€1,107	748.0	0.37
AA	FR	70,470	273.5	5.5	9.6	€4.00	€1,094	741.3	0.37
Dairy									
HO	HO	25,092	274.1	3.5	8.2	€3.57	€978	887.4	0.31
Expressed as carcass weight/age at slaughter.									

- Charolais is best breed based on overall carcass weight, carcass value and carcass gain/day.

- This does **_NOT_** consider "cost of feed" (either feed intake during finishing period or system of finish) => Profit.

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Traits & models.

- Carcass weight and fat score => 12 trait model including carcass, live-weight, cow & foreign EBV's.

- Carcass conformation => 9 trait model including carcass, price, quality and foreign EBV's.

- Models account for gender (steers, heifers, bulls & cows), finishing herd, pedigree versus non-pedigree.

- Contemporary groups as random=> smaller breeds.

- Genetic groups to account for breed differences.

- Heterosis and recombination fitted in model.

- Genomics – two step with blending DGV (from SNP Blup) with PA and Trad Eval *(Van Raden 2009).*

Carcass weight – Key parameters.

Trait	Parameter
Heritability	38%
Key genetic correlations.	
- Weaning weight	0.57
- 400 day weight	0.65
- 600 day weight	0.70
- Cow live-weight	0.50
- Cull cow carcass weight	0.60

- Live-weight is a good predictor of carcass weight, but its not carcass weight!

Carcass Conformation – Key parameters.

Trait	Parameter
Heritability	33%
Key genetic correlations.	
- Cull cow conformation score	0.57
- Muscle composite (linear sores).	0.47
- Weanling quality score (farmers)	0.30
- Weanling price/kg (marts).	0.36
- Post weanling price/kg (marts).	0.51

- Carcass conformation score is more difficult to predict.

Resultant Genetic Evaluations.

Breed	1pc	50 pc	99pc
All Breeds	-6.07	15.99	33.88
- Angus	-8.25	5.00	20.00
- Charolais	16.50	32.88	47.50
- Hereford	-7.50	4.37	15.50
- Limousine	9.75	22.75	38.50
- Simmental	7.96	21.25	36.50

- Resultant evaluations presented as PTA's (i.e., what the sire/dam will pass on to progeny).
- Range of 25kg within breed & 40 kg across breeds
- Considerable overlap between breeds.

Validating Carcass Evaluations.

- Approach taken;
  - 105,837 beef heifers slaughtered in 2018 (year to date).
  - 40,694 with official genomic evaluations from Sept 2017, i.e., before carcass data was included in their evaluation.
- How well would the genomic index predict future performance?
- Is it better than other predictors, e.g., breed and traditional genetic evaluations?

Accuracy of carcass weight evaluations

Genomic Eval Cwt	Number	Actual Cwt kg	EBV Cwt (pred)	Price/kg	Overall	Age Slau	Cwt/day
5 stars - Top 20%	10,953	365.3	52.1	€4.29	€1,582	751	0.49
4 stars	8,160	348.3	38.9	€4.23	€1,497	760	0.46
3 stars - Ave	8,150	339.3	31.1	€4.19	€1,450	766	0.44
2 stars	7,417	326.1	22.4	€4.13	€1,384	774	0.42
1 star - Btm 20%	6,013	301.7	7.3	€3.94	€1,266	775	0.39
No Stars	21,342	326.6		€4.22	€1,383	779	0.42

- Genomic Evaluations for carcass weight accurately predicted actual performance.
  - Top 20% predicted at +52.1 kg compared to +7.3 for bottom 20%. Difference of 44.8. Actual difference => 63.6
  - Significant additional gains on age at slaughter.
- Moving industry from 3 stars to 5 stars=>+€200 per animal slaughtered (~€200m for Irish beef industry).

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5 Stars versus CH breed?

Comparison	Number	Actual Cwt kg	EBV Cwt (pred)	Price/kg	Overall	Age Slau	Cwt/day
5 stars - Top 20% Breed	10,953	365.3	52.1	€4.29	€1,582	751	0.49
CH*CH	45,200	350.0	40.0	€4.27	€1,499	767	0.46

- 5 star animals significantly outperformed the CH breed. Similar trends for other breeds.

- 5 star animals are made up of animals from all of the individual breeds.

- The key reason why ICBF invests so much effort into our within breed improvement programs (i.e., G€N€ IR€LAND)=> *genetic gain for beef industry.*

Genomic vs Traditional evaluation.

Comparison of Genomic EBV for carcass weight with actual carcass weight for beef heifers.

$y = 0.16x - 21.0$
$R^2 = 0.222$

GenEBV on raw phenotype
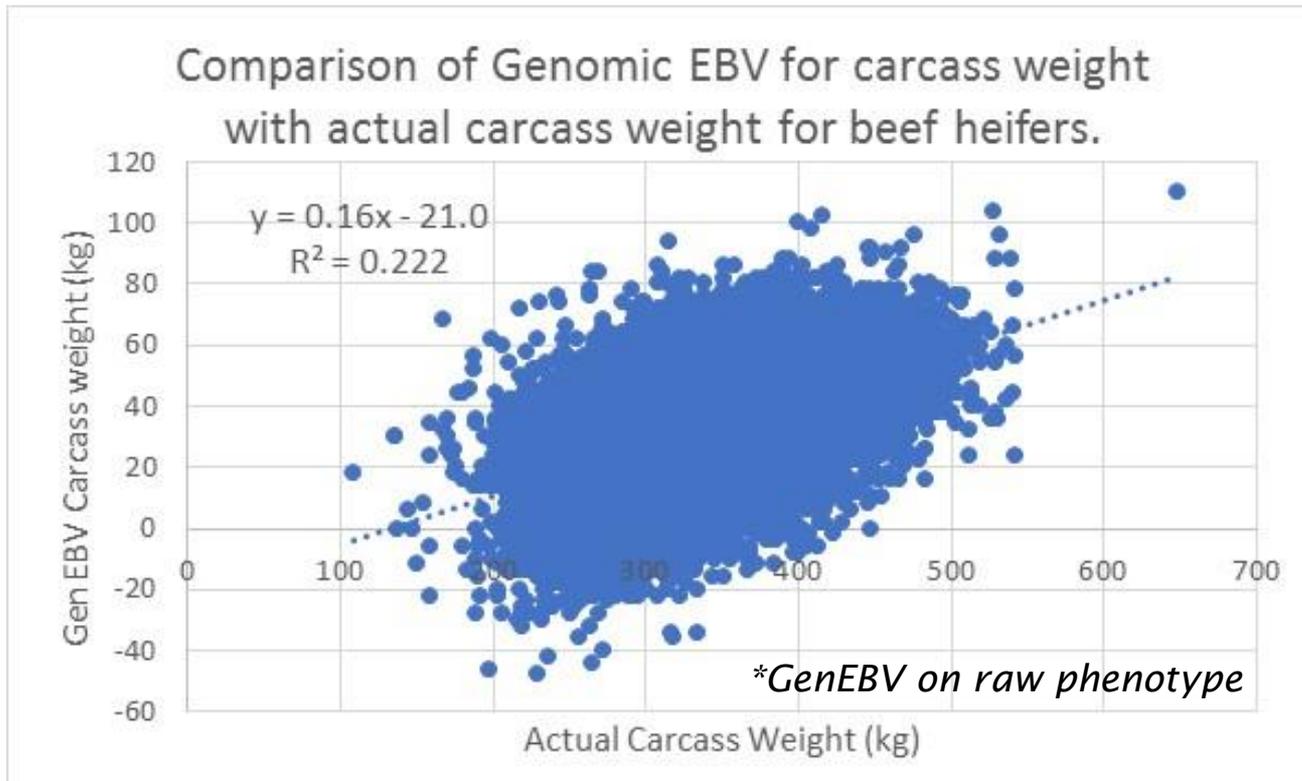
- Irish experience; Genomic evaluation is only marginally better than traditional evaluation ($R^2=0.20$).

- Benefits of genomics=> more from lower h^2 traits.

- Work on single step ongoing but size & complexity of data remains a challenge! (Garrick, Veerkamp, Stranden)

Genetic & Phenotypic Trends.

Comparison of Genetic and Phenotypic Trends for Carcass weight in beef heifers (2010-2018)
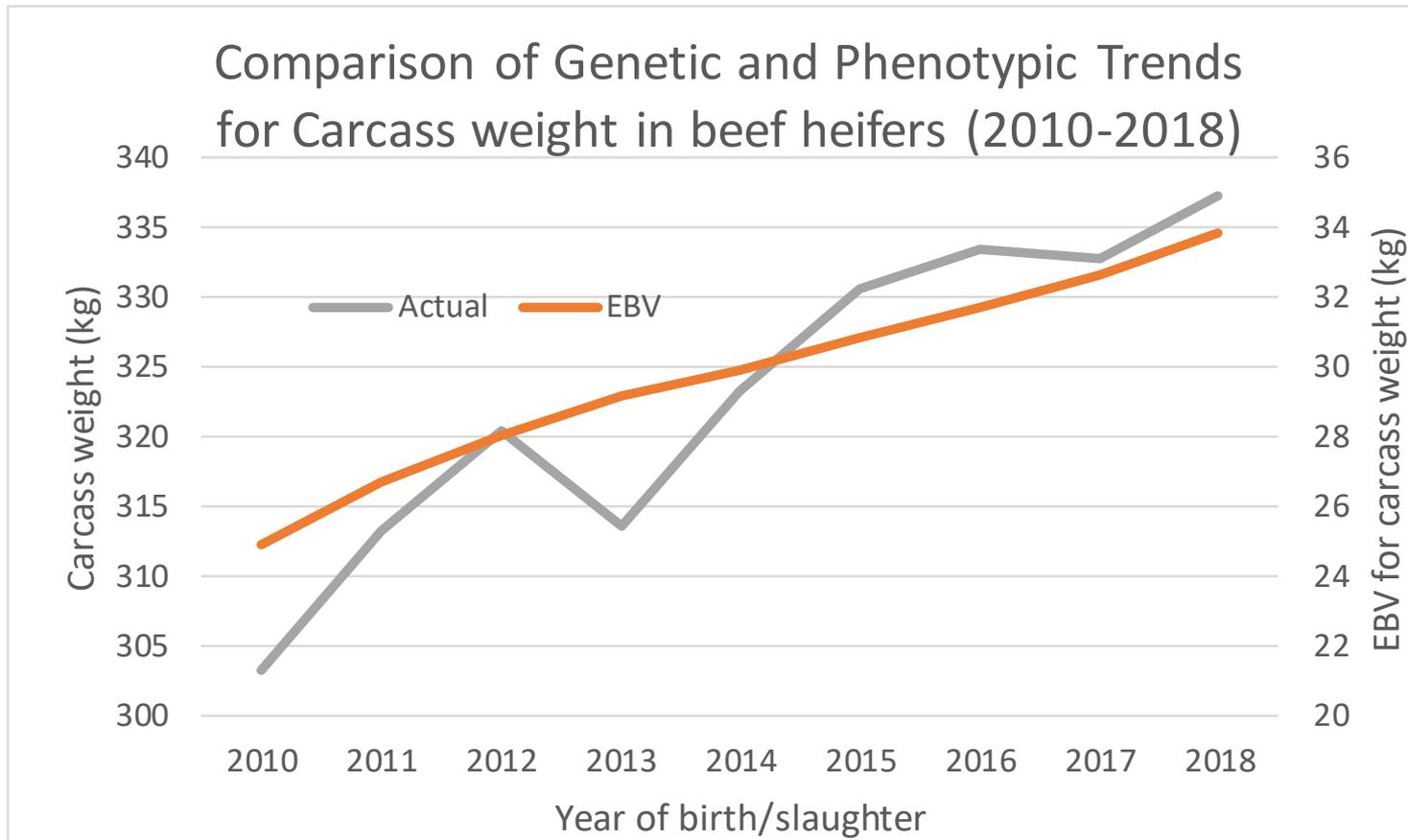
- Genetic gain of ~1kg Cwt/year. Actual = 3kg => In line with expectations. Worth €100m to Irish beef farmers.

Its not just about carcass weight!
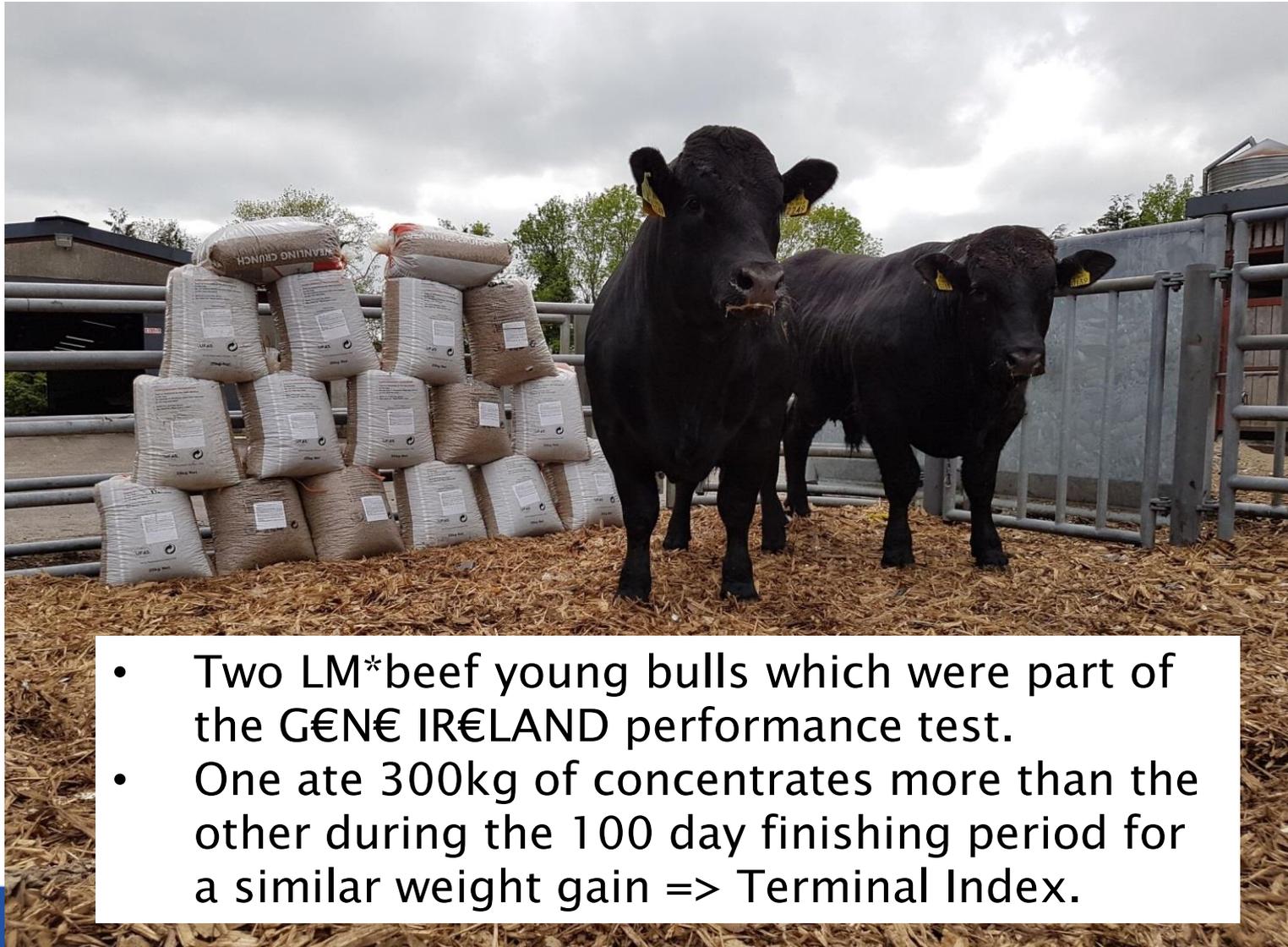
- Two LM*beef young bulls which were part of the G€N€ IR€LAND performance test.
- One ate 300kg of concentrates more than the other during the 100 day finishing period for a similar weight gain => Terminal Index.

Carcass Traits – where next?

Lower value cuts

Medium value cuts

High value cuts

Very high value cuts
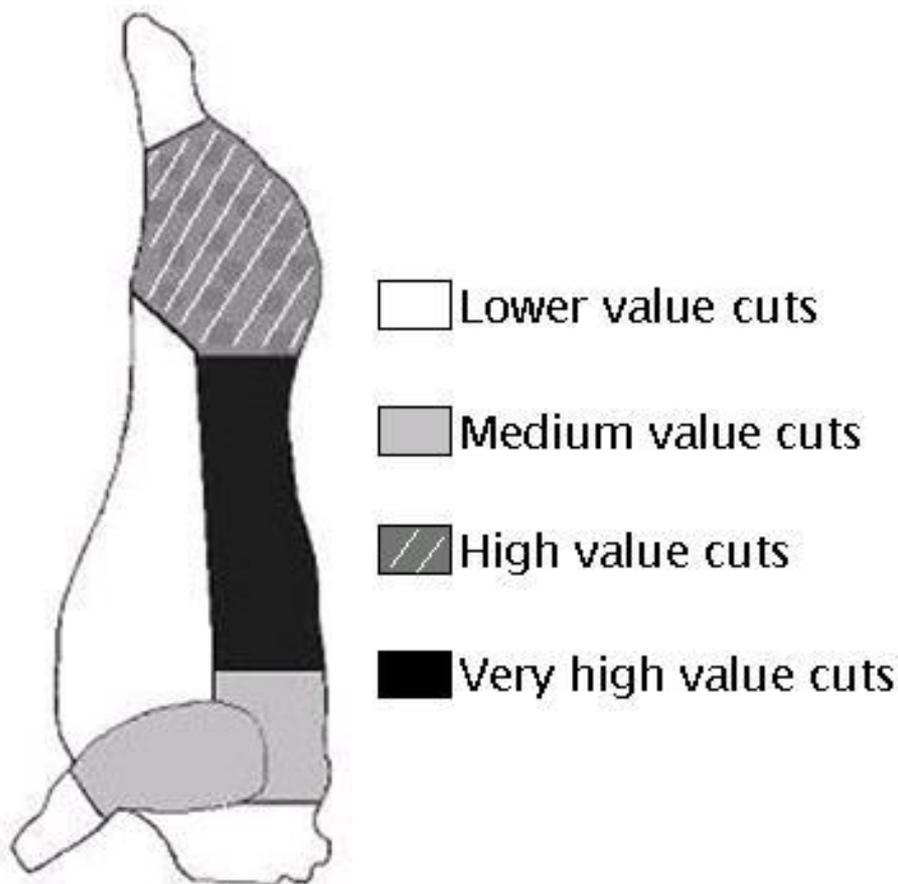
- Move from use of carcass weight data to individual cuts.
- Initial work completed in 2012, but failed to implement.
  - Enough dissections to establish accurate predictions (n=500).
  - Routine access to cut data from meat processors.
- New project under way with Teagasc, ICBF & Irish meat processing industry=> Meat Technology Ireland.
  - 1200 dissection records + data from Morel boning systems.
  - 7000 animals with sensory data.

Why is this important?

Adjusted Average Very High Value Cuts by Sire €uro-stars

- By selecting on carcass weight (and Terminal index), we are getting NO gain in very high value cuts (strip-loin, fillet & rump).

Chart — Adj. average carcass weight (y-axis: 39 to 45) vs Across-breed stars (x-axis: *, * *, * * *, * * * *, * * * * *)

Legend: TERMINAL (blue), CCW (red)
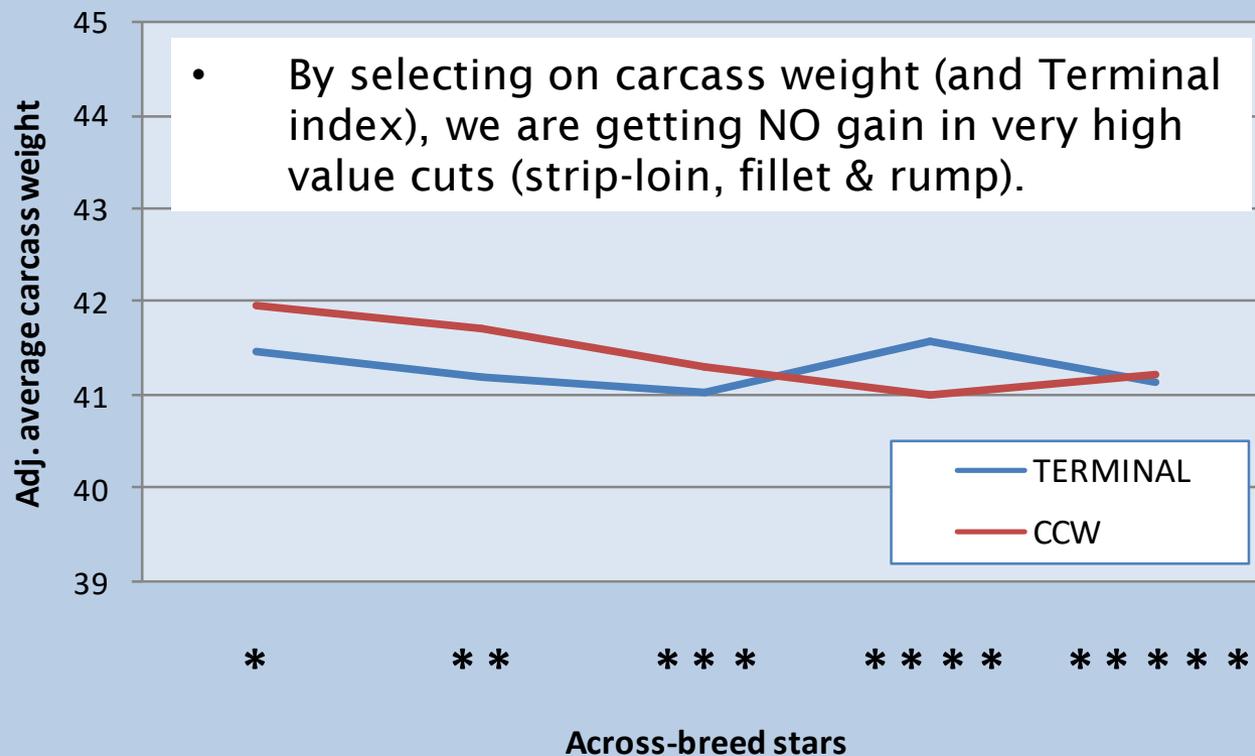
Cut name	Recs	Mean (kg)	SD	h²
Topside	50,935	22.84	3.69	0.58 (0.03)
SS Flat	39,938	16.09	2.84	0.27 (0.03)
Eye of round	38,066	6.43	1.24	0.56 (0.04)
Knuckle	45,630	14.07	2.11	0.45 (0.03)
Rump	48,744	18.92	2.92	0.26 (0.03)
Striploin	23,853	16.02	2.74	0.17 (0.03)
Fillet	34,546	7.02	1.17	0.22 (0.03)
Cuberoll	16,767	12.39	2.29	0.19 (0.04)
Bavette	27,191	16.59	2.67	0.12 (0.03)
Brisket	34,540	16.10	3.03	0.28 (0.03)
Chuck Tender	29,973	13.25	2.09	0.32 (0.03)
LMC/ FQ Misc.	47,356	26.53	4.22	0.22 (0.02)
Chuck & Neck	49,516	36.49	6.74	0.34 (0.03)
Heel/Shank	48,317	11.91	1.72	0.49 (0.03)

Dr Michelle Judge & Prof Donagh Berry

Future; Converting images=>genomic evaluations.

Meat Processors
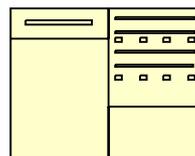
ICBF

- Program of work underway. Major focus for ICBF and beef industry.

- New genomic evaluations for carcass cut data, including indexes for 2019+

ICBF.com

Meat Eating Quality.

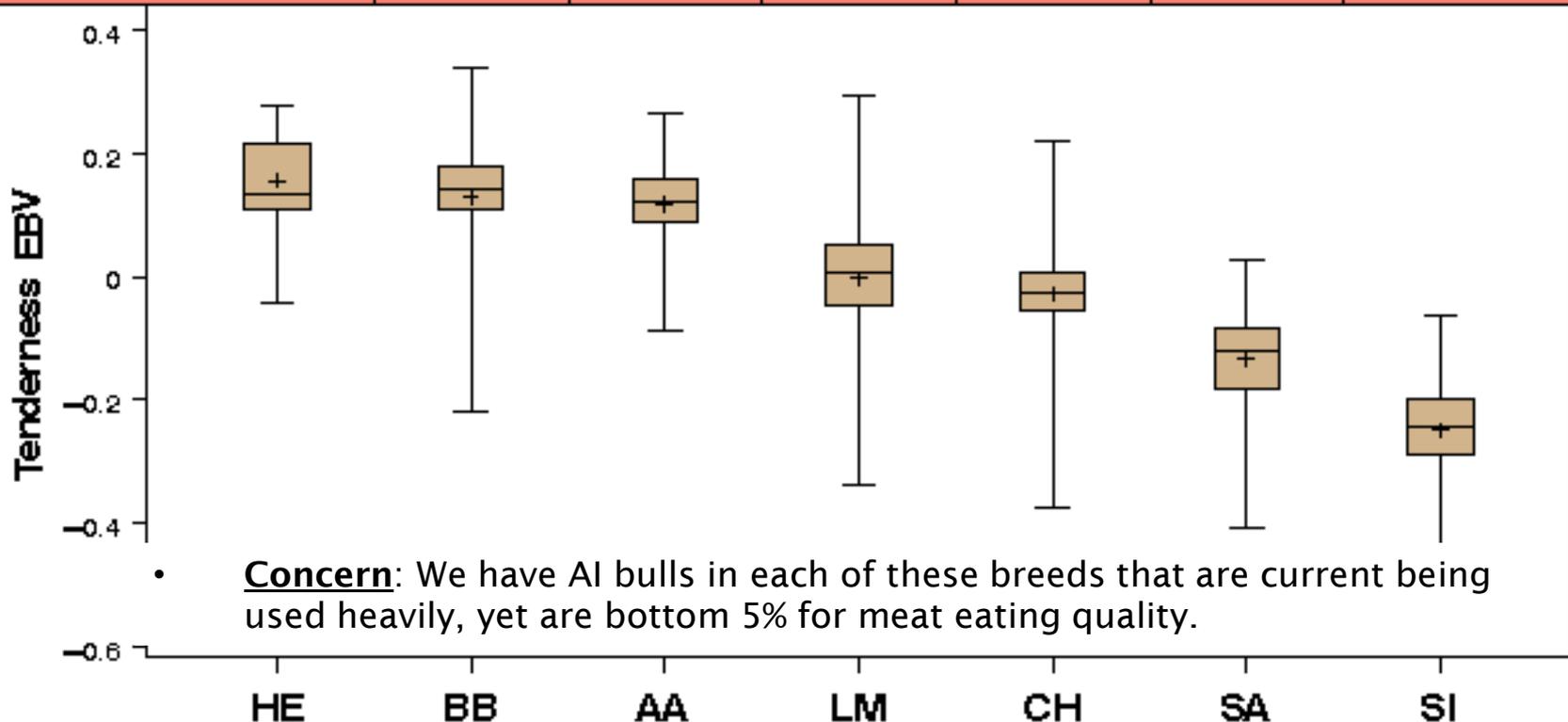| Trait	Heritability
Tenderness	0.16
Juiciness	0.10
Flavour.	0.09

- ~2000 animals analysed to date, based on "trained panel" data (~14k records).

- Initial parameters indicate significant opportunity to increase meat eating quality through genetics.

  - High genetic correlations (>0.8).

- Test EBV's generated and validation work undertaken.

- Target for release through MTI & ICBF later this year.

ICBF.com

Genomics for Meat Eating Quality.

TENDERNESS EBV BY A.I. SIRES BREED

Summary statistics							
N	111	122	148	234	257	26	142
Mean	0.16	0.13	0.12	−0.00	−0.03	−0.13	−0.25
Std Dev	0.07	0.09	0.06	0.09	0.07	0.08	0.07

- **Concern**: We have AI bulls in each of these breeds that are current being used heavily, yet are bottom 5% for meat eating quality.

Graph limited to 1040 A.I. sires of AA, BB, CH, HE, LM, SA, and SI breeds

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Project; MEQ & Consumers.

- App developed to collect relevant meat eating quality data directly from consumers.
- Initial field trial/validation work under way.

Current Priority Projects.

- DNA Calf Registration.

- Carcass cut and meat eating quality.

- App's for collection of data on farm.
  - Particular focus on health & disease traits (including animal treatments etc).

- GHG => cow size/live-weight (cow efficiency).

- Dairy beef => increasing value of beef from dairy herd (sexed semen, calving, carcass, quality….).

- G€N€ IR€LAND => increase rate genetic gain in beef.

- International collaboration => to ensure Irish beef farmers have access to best genetics globally.

Collaboration in data sharing.

A rising tide lifts all the boats.

(John F. Kennedy)

izquotes.com
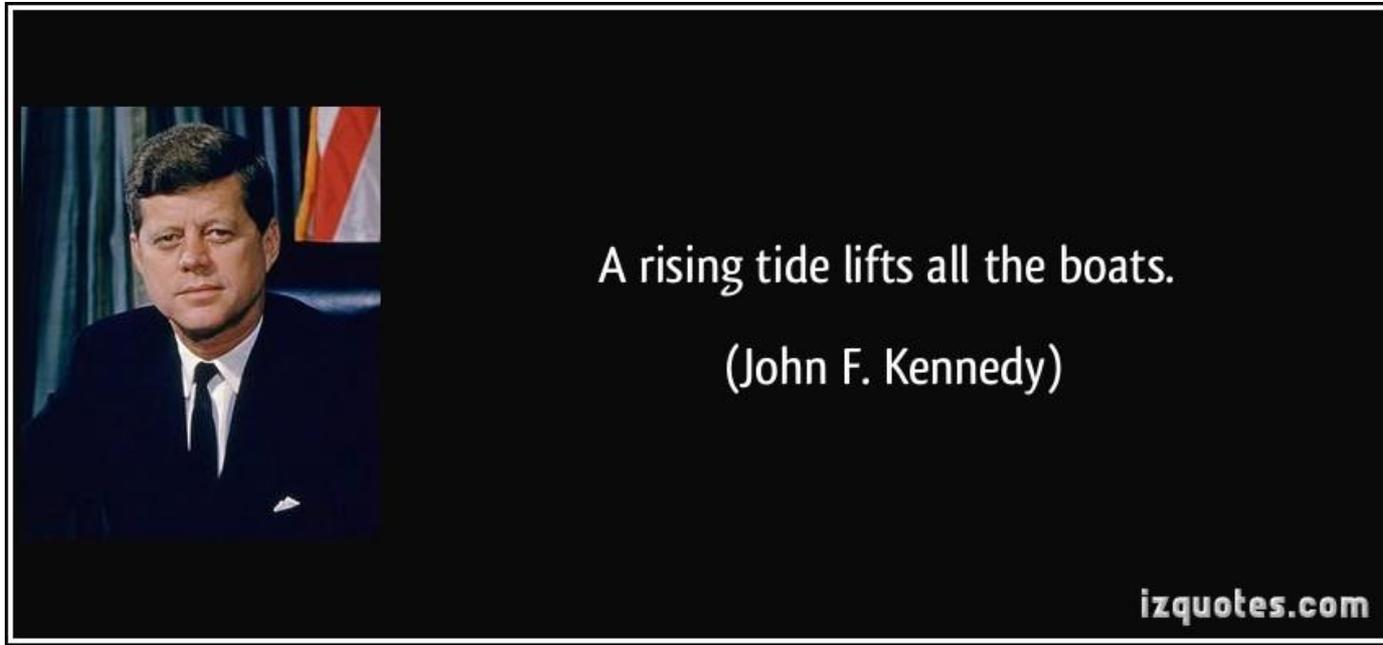
- Ireland & ICBF are strong advocates, both nationally (ICBF central database) & internationally (ICAR, Interbull, Interbeef, today!….).
    - Not without its challenges => ownership, agreements , services…..
- ICBF approach; Keep the "farmer at the core" and focus on long term genetic gain off "more from less" => sustainable beef.

Summary.

- There are no downsides to data sharing.
  - Challenges, but many upsides (profit & societal good).
- Genetics works (humans, dairy & beef).
  - 5 star animals are more profitable & sustainable than average & 1 star animals. How do we generate more=> breeding programs focused on long term genetic gain.
- Live-weight is not carcass weight! However, future focus needs to be on carcass cut data.
- Meat eating quality will be a key trait for the future.
- Ireland is always open to engaging with like minded partners in the area of cattle breeding.

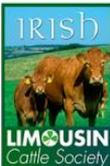Thank you for the invitation and please visit us in Ireland!

ICBF.com

Our Farmer & Government Representation

Our AI & Milk Recording Organisations

Our Herdbooks

Acknowledging Our Members