Do genetic indexes work?

Background

- Accurate genetic evaluations are key to sustainable genetic gain

- Must be reflective of on-farm performance

- Assess to accurate genetic evaluations → selection of superior animals for breeding

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Economic Breeding Index.

HIGH EBI DELIVERS

Will a high EBI herd deliver better fertility? Yes is the answer so far in Cork

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The Elite high EBI herd in the Teagasc Kilworth farm is outperforming the lower EBI herd this year, especially in fertility performance.

The Next Generation herd trial at the Teagasc Kilworth farm is trying to measure the fertility and milk performance of the highest EBI

what is the diet.

Both genetic herds are divided into three groups on three different feeding treatments. The three Elite herds (EBI €244) on average are yielding 18.0 kg, at 4.94 F%, 3.96 P% (1.57 kg MS/day), with two of the herds on zero meal and one herd on 4kg of meal with grazed grass.

The national average herds were yielding slightly higher milk volume at 19kg at 4.59% fat, 3.69% protein (1.55kg MS/day) on the same feed.

- Yes – 80%
- Not Sure – 15%
- No – 5%

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€uro–Star Replacement Index

Replacement index delivers just €20/head

Results from the first year of the Teagasc maternal herd trial at Teagasc Grange have been disappointing.

The herd, which was established to validate the new replacement index, showed just €20 variation between high- and low-index cows.

There were just four days of variation in the calving interval between the two groups and the calving-to-conception interval was identical.

Pregnancy rate to first service was actually higher in the low index group. Meanwhile, when ranked on the key profit driving traits of milk yield and calf performance, the Teagasc work found that the high-index group had a milk yield of just 0.4kg/day above the low-index group.

This resulted in progeny from both groups recording similar liveweight at 212 days old.

Average liveweight gain from birth to weaning was also similar.

However, when the same group of animals was ranked on cow type, the dairy-crossed beef cows significantly outperformed the suckler beef cross cows. With the dairy-bred cows recording 2.1kg more milk per day, the weaning weight of progeny from this group was 23kg heavier than progeny from the pure beef-bred heifers.

FRESH COW YMCP - POST-CALVING BOOST

The start of each new lactation challenges a dairy cow's ability to maintain normal blood calcium, even under the best Dry Cow Management Programs.

- Milk including colostrum is very rich in calcium and cows must quickly shift their priorities for this sudden calcium outflow.
- Blood calcium is also essential for muscle (rumen-gut motility) and nerve function.

Calcium supplementation with selected micro nutrients including yeast, osmolytes and energy sources can enhance rumen function, helping achieve higher intakes resulting in improved milk yield and fertility.

Fresh Cow YMCP aids in the prevention of milk fever and costly metabolic disorders by supplying critical nutrients (Yeast, Magnesium, Calcium, Potassium, Electrolytes, Niacin and Betaine) post-calving. Fresh Cow YMCP boosts calcium levels and helps maximise rumen function.

For best results mix 500g of Fresh Cow YMCP powder in 19 litres of warm water in the first drinking water given post-calving.

Fresh Cow YMCP is available from stockist's nationwide. For further details please contact CAHL on 059 0151251 or visit www.cahl.ie.

- Yes – 20%?
- Not Sure – 60%?
- No – 20%?

The challenge?

- People/industry believe strongly in the EBI.

- People/industry are not sure about the €uro-Star Replacement Index.

- Why the difference?
  - EBI is based on 10 years more data, more AI in dairy, greater uptake of technical messages in dairy.........

- Are peoples concerns well-founded?

More profitable replacements

- Can we test – given that both indexes are designed to identify more profitable female replacements?
  - Dairy farmers want a cow that will calve each year (365 day CI), produce high kg milk solids & stay on farm for a long time.
  - Beef farmers want a cow that will calve each year (365 day CI), produce good calves (weight/age) & stay on farm for a long time.

Validation

- Large number of datasets available:
  1. National dataset
     - Compare beef versus dairy
  2. BETTER farm dataset
     - Large amount of accurate information
  3. Grange Maternal Herd
     - Established to validate Replacement index

Do genetic evaluations work?

Published Breeding values

compare to

Subsequent Performance data

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Calculation of Breeding Values

GrandDam GrandSire   GrandDam   GrandSire

Sire   PTA   Dam   ½ PTA

Animal genetic merit

Own Performance

Progeny

1. National dataset

- Female's (beef & dairy) born in 2010, that entered the herd subsequently as replacements.
  - 261,007 dairy females.
  - 183,461 suckler beef females.
- How accurate are the EBI and €uro-Star replacement index at identifying the most profitable replacements.

Analysis.

- Indexes taken from August 2011.
- Animals ranked on "parent-average" index into 10 percentile groups.
  - Akin to buying a "maiden" heifer based on genetic index.
- Same data edits applied.
  - For example, CI between 300 & 800 days.
- Both sets of indexes (dairy & beef) validated for key profit traits.

Key profit traits.

- Age at first calving – *target 730 days.*
- Calving interval days – *target 365 days.*
- Number with 3 calving's – *target 60%*
  - Calved at ~2 years & with 3 calving's to-date.
- Kg output/calving.
  - Milk solids/lactation – *target 450 kg & weaning weight of calf – target 350 kg*
- Kg output/replacement.
  - Milk solids/lactation – *target 1350 kg & weaning weight of calf – target 1050 kg*

EBI Analysis; Top 10% with Ave

Percentile	Num	EBI*	AFC	CI Days	3 lacts	MS kg	DIM	MS/day	Parities	Cum MS
Top 10%	17,000	€162	772.1	385.6	62%	420.9	281.9	1.49	2.63	1141
80-90	17,000	€139	779.0	386.3	55%	421.7	283.4	1.49	2.59	1120
70-80	17,000	€127	787.5	388.0	50%	425.6	284.7	1.50	2.57	1119
60-70	17,000	€116	793.0	388.4	46%	425.2	285.1	1.49	2.55	1107
50-60	17,000	€106	797.6	389.5	45%	428.5	286.5	1.50	2.52	1096
Average	17,000	€96	806.0	391.7	42%	430.4	287.9	1.50	2.47	1075
30-40	17,000	€85	811.2	393.3	40%	435.8	290.7	1.50	2.45	1070
20-30	17,000	€72	825.0	396.4	38%	438.6	293.3	1.50	2.39	1041
10-20	17,000	€54	839.1	401.7	37%	462.0	303.9	1.52	2.31	1021
Bottom 10%	20,177	€10	874.2	418.3	45%	523.4	327.8	1.60	2.10	977
No EBI	87,830		863.2	396.5	43%	397.2	287.1	1.38	2.27	913
Overall	261,006	€95	827.7	394.7	50%	434.6	291.0	1.49	2.39	1038
Diff*		€66	-33.9	-6.2	20%	-9.5	-6.0	0.00	0.15	65.3
* EBI Genetic Standard Deviation = €42										

€uro–Star Analysis; Top 10% with Ave

Percentile	Num	€ Star*	AFC	CI Days	3 lacts	W Wt	Age	W wt/day	Parities	Cum Wt	M Wwt**
Top 10%	12,000	€141	909.9	413.0	32%	303.7	298.8	0.85	2.10	531	295.0
80-90	12,000	€112	913.7	415.6	31%	299.1	299.1	0.83	2.08	515	294.0
70-80	12,000	€98	920.7	417.1	29%	298.4	298.8	0.83	2.05	509	294.8
60-70	12,000	€88	924.3	416.5	29%	296.0	299.2	0.82	2.05	503	293.7
50-60	12,000	€78	927.4	416.1	28%	293.1	299.0	0.81	2.04	496	291.9
Average	12,000	€69	933.7	418.4	28%	293.5	298.5	0.82	2.03	493	293.0
30-40	12,000	€60	934.0	418.7	27%	291.2	298.4	0.81	2.02	487	291.5
20-30	12,000	€49	940.3	418.7	26%	290.8	297.8	0.81	2.01	484	292.2
10-20	12,000	€37	944.2	419.2	26%	284.8	297.9	0.79	2.00	469	287.4
Btm 10%	12,958	€12	956.2	419.9	24%	279.5	297.9	0.77	1.96	450	284.2
No EBI	62,503		928.5	421.8	26%	293.0	297.6	0.82	1.98	482	287.8
Overall	183,460	€74	929.9	418.8	27%	293.5	298.3	0.82	2.02	490	292.1
Diff*		€72	-23.8	-5.4	4%	10.2	0.3	0.03	0.07	38.1	2.0

Genetic Standard Deviation of €uro-Star Replacement index is €37.

** Maternal weaning weight is the weaning weight after accounting for direct effect of genes.

Straight comparison; EBI versus €uro-Stars

EBI

Percentile	Num	EBI*	AFC	CI Days	3 lacts	MS kg	DIM	MS/day	Parities	Cum MS
Top 10%	17,000	€162	772.1	385.6	62%	420.9	281.9	1.49	2.63	1141
Average	17,000	€96	806.0	391.7	42%	430.4	287.9	1.50	2.47	1075
Diff*		**€66**	**-33.9**	**-6.2**	**20%**	**-9.5**	**-6.0**	**0.00**	**0.15**	**65.3**

€uro-Star Replacement

Percentile	Num	€ Star	AFC	CI Days	3 lacts	W Wt	Age	W wt/d	Parities	Cum Wt
Top 10%	12,000	€141	909.9	413.0	32%	303.7	298.8	0.85	2.10	531
Average	12,000	€69	933.7	418.4	28%	293.5	298.5	0.82	2.03	493
Diff*		**€72**	**-23.8**	**-5.4**	**4%**	**10.2**	**0.3**	**0.03**	**0.07**	**38.1**

- Both indexes are accurately identifying more profitable animals for breeding; better fertility, survival and more product output.

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Which breed?!

Percentile	Num	€ Star*	AFC	CI Days	3 lacts	W Wt	Age	W wt/day	Parities	Cum Wt	M Wwt
Top 10%	12,000	€141	909.9	413.0	32%	303.7	298.8	0.85	2.10	531	295.0
LM * beef	53,198	€70.1	942.8	419.7	25.5%	290.8	298.5	0.81	2.00	481.8	292.3
CH * beef	39,177	€76.0	925.8	417.8	27.3%	291.4	298.8	0.81	2.00	481.5	287.3
SI * beef	13,598	€102.8	923.4	416.2	30.4%	304.2	297.6	0.85	2.08	528.4	299.3
AA * beef	11,866	€54.3	908.3	413.4	29.7%	276.9	297.8	0.76	2.05	464.5	279.3
HE * beef	5,850	€34.5	922.0	414.1	27.7%	270.9	300.5	0.73	1.99	436.8	267.0
SA * beef	2,742	€107.1	931.3	408.1	32.7%	294.1	301.1	0.81	2.12	511.3	299.3
LM * dairy	9,202	€73.8	947.7	418.9	28.1%	307.6	298.1	0.86	2.03	523.2	306.4
AA * dairy	10,841	€63.6	914.4	420.8	28.9%	294.5	299.6	0.82	2.01	489.6	300.3
Diff		-€67.4	-37.8	-6.0	4%	-3.87	0.71	-0.01	0.07	7.53	-11.40

- Top 10% females on €uro–Star replacement index performed best.
  - LM & Dairy – best for weaning weight & milk, poorer for female fertility.

Top 10% Females.

Breed	Number
SI-Beef	3176
LM-Beef	2728
CH-Beef	2682
BB-Beef	894
SA-Beef	722
SI-Dairy	318
BB-Dairy	274
AA-Beef	217
LM-Dairy	169
PT-Beef	158

- Top 10% females are from a wide range of different breed combinations.
- Focus of G€N€ IR€LAND is to generate genetic gain within breeds.

Major challenge.

- Average fertility performance of suckler herd is significantly behind dairy;
  - Age 1st calving of top 10% is 30 months in sucklers compared to 25 months in dairy.
  - Calving interval of top 10% is 413 days in sucklers compared to 385 days in dairy.
- "Mindset" change regarding ~2 year calving.
- €uro-Star indexes can play a vital part.

Summary national dataset

- Do genetic indexes work?
  - Economic Breeding Index (EBI) – YES.
  - €uro–Star Replacement Index – YES.
- The EBI is somewhat "more accurate", as it is based on more data.
- To get more data for €uro–Stars, we now need strong industry support.
- ***Use €uro–Star's to identify more profitable replacements***

2. BETTER farm dataset

BETTER farm performance data from 2011 onwards

compare to

Breeding values published April 2011

Results – Individual trait level

Trait	No recs	⭐	⭐⭐⭐⭐⭐	P value
Calving Ease	1,279	1.31	1.16	P=0.06
AFC	713	934	890	P<0.01
Calving Interval	828	380	375	P=0.31
Weaning weight	635	332	346	P<0.05

Maternal Traits

1 Star ⭐ V's 5 Star ⭐⭐⭐⭐⭐

Relative to 5 star animal:

- 6% higher probability of direct calving dystocia

- 2% higher probability of maternal calving dystocia

- 1.75 less likely to survive to next parity

- No significant differences in calf mortality (low levels of mortality recorded)

eagasc
AGRICULTURE AND FOOD DEVELOPMENT AUTHORITY

The Irish Agriculture and Food Development Authority

Summary BETTER farms

- **High genetic merit for = superior performance in BETTER farms**

- **Highlights importance of key profit traits for improving productivity**

3. Grange Maternal Herd

Maternal Herd (2013)

¾ Suckler heifers

½ dairy heifers

High genetic merit

Low genetic merit

High genetic merit

Low genetic merit

Validation of Index

Two breeding strategies:
    1. **cows sourced from the suckler herd**
    2. **beef cross cows sourced from the dairy herd**

Two diverse genotypes:
    A. **high genetic merit animals**
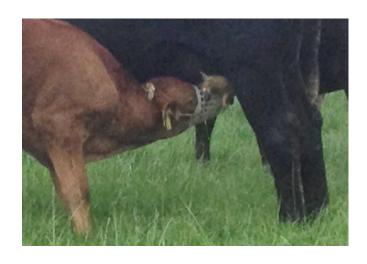   **B.** **low genetic merit animals**

Measurements

- **Onset of puberty**
- **Calving**
- **Live weight and BCS**
- **Reproductive performance**
- **Grazing behaviour**

- **Milk yield**
- **Calf performance**
- **Feed intake**

Results to date

- **Calving**
  - **Highs calved +6 d earlier**
  - **Similar body weight, BCS, calving score**
- **Reproductive performance**
  - **Similar weight and BCS at breeding**
  - **Highs have higher submission rate in 1st 24 d**
  - **5% higher final pregnancy rate**
- **Calf Performance**
  - **Similar milk yields (High + 0.3 kg/d)**
  - **Similar calf weights at weaning (high + 6kgs)**

€€ High vs Low

	Low	High	H vs L
Index Value	€102	€158	
AFC (days)			
Calving diff (1 to 4)			
Mat wean weight (kg)			
CIV (days)			
Feed Intake (kg)			
Cow survival			

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€€ High vs Low

	Low	High	H vs L
Index Value	€102	€158	
AFC (days)			
Calving diff (1 to 4)			
Mat wean weight (kg)			
CIV (days)			
Feed Intake (kg)			
Cow survival			

Over lifetime

Lows €20.40/ yr

Highs €31.60/ yr

€€ High vs Low

	Low	High	H vs L
Index Value	€102	€158	
AFC (days)	767	757	€3.30
Calving diff (1 to 4)	2.16	2.05	€0.25
Mat wean weight (kg)	242	248	€10.86
CIV (days)	365	366	–€2.20
Feed Intake (kg)	707	692	€3.08
Cow survival	84	89	€20

Benefit of high vs low	€35.29

Summary Maternal Herd

- **Small differences** were found between high and low groups for year one

- **Financial benefit** from using high replacement index cows

- Study is **on going** and final result available after year 4

Conclusions

- **Genetic merit for maternal traits was associated with superior performance for:**

  1. **National dataset**

  2. **BETTER farms**

  3. **Maternal herd**

- **Importance of breeding values for improving profitability in maternal traits**