How ICBF and cattle genetics are changing the sustainability game

Kevin Downing
October 11th 2018
Introduction

• ICBF – Make-up & Role
• National Cattle Breeding Database & Industry Links
• Beef Euro-Star Index
• Impact of the Euro-Star Index
• Focus areas that are driving innovation
One Database, Many Partners
less duplication and cost for farmers

Stakeholders in cattle breeding control decision making
Farmer owned & controlled
Role of ICBF

• Focus on genetic improvement as a tool for improving future profit on Irish cattle farms.
• Establish & maintain a central database of performance data.
• Define a breeding goal and selection index (e.g. Euro-Star Index).
• Provide routine genetic evaluations for all breeds and traits.
• Ensure a breeding scheme of optimal design is operating in Ireland (e.g. Gene Ireland).
• Ensure continuous improvement base on science.
Data in the ICBF Database

- Herds: 107k
- Live Animals: 6.2m
- Calving Records: 2.1m/yr
- Milk Recording: 2.6m/yr
- Farm Movements: 7m/yr
- AI Inseminations: 700k/yr
- Slaughter Data: 2m/yr
- BVD records: 2.1m/y
Big Data - Genotype Data

- 77.7 Billion Genotype SNP @ Sep 2018
- 62.7 Billion Genotype SNP @ Mar 2018
- 18.3 Billion Genotype SNP @ Mar 2016
- 8.6 Billion Genotype SNP @ Jan 2015
- 1.8 Billion Breeding Value Records
What is the Beef Euro-Star Index?

- Profit Index, e.g., €80 more per calving
  - Multi-breed evaluations.
- Star system; 5 star versus 1 star.
  - Across all breeds, including commercial.
- Two main profit indexes; (i) Replacement and (ii) Terminal
## Make-up of the Replacement Index

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<td>Docility</td>
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The ideal Irish beef cow - A weaned calf every year of good weight & quality.
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**Range of breeds on Top Bull Listing => Focused on promoting these bulls within the relevant breeds.**
The Irish Beef Breeding Goal

- To generate more 5-star cows (i.e., for milk, fertility, weight for age.....) for Irish beef farmers.....which when crossed with 5-star terminal index sires, produce progeny with better weight for age, feed efficiency, etc.
Are we making progress? => **YES**

*Trends from National data.*

- 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.

- Clear evidence that commercial beef farmers are responding positively to new technologies such as Euro-Stars & beef genomics.

<table>
<thead>
<tr>
<th>Year</th>
<th>Calves per cow per year</th>
<th>Calving Interval (days)</th>
<th>Calving at 2 years age (%)</th>
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<td>2017</td>
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*Based on data from 24k herds involved in Beef Data and Genomics Program.*
**Are we making progress? => YES.**

*Trends from Teagasc-ICBF validation.*

- Validation study based on 46 suckler herds & ~7k cows. All cows & calves weighed for last 3 years on participating farms.
- Initial results based on Teagasc-ICBF validation study indicate that 5 star cows are €136 more profitable per parity and produce 550 kg less CO2e in their lifetime.
- **Breeding for profit & breeding for sustainability are effectively same.**

<table>
<thead>
<tr>
<th>Star Rating</th>
<th>No. Animals</th>
<th>Replacement Index/parity</th>
<th>Lifetime CO2e*</th>
<th>AFC (days)</th>
<th>CIV (days)</th>
<th>Cow Wt (kg)</th>
<th>Wean Wt (kg)</th>
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*Based on Gross Emissions Output over the cows lifetime. Includes emissions from the cow and her progeny.*
Are we making progress? => **YES**

Trends from Bord Bia-ICBF validation
Increasing Profitability & Carbon Efficiency

• Moving National Herd from €82 to €200 => a reduction in carbon emissions (CO2 eq) per kg beef from 11.6 kg to 10kg (-14%).

• How quickly can we move our suckler herd to having a herd replacement index of €200+?

• **About 15 years => Can we shorten this process?**
Focus Areas - Driving Innovation

• Beef Data & Genomics Program (BDGP)
• Weight recording pilot
• GreenBreed project
• DNA based calf registration
• Health & Disease traits
• Meat Eating Quality
Current Problem

- 12% of global GHG emissions are from agriculture (figure is 33% for Ireland).
  - Cattle are worst offenders.
- Environmental Solution; cut our cattle herd.
- Irish Solution; Breed more sustainable animals => BDGP 2015-2020.

Scheme was sold on the basis of climate change benefits
Beef Data and Genomics Program (BDGP)

- Breed more profitable, sustainable & carbon efficient cows.
- €300m total funding 6 years (2015-2020).
  - Farmers paid ~€90/cow/year to complete key actions re: the scheme, e.g., targets for 4/5 star cows & bulls
  - Data recording x 14 e.g. Scour & Pneumonia, Calf Vigour & Quality
  - ~23k suckler herds & ~550k cows
  - ~1.4m animals genotyped to-date
  - Genotyping costs €22/animal
- Other countries now looking at introducing similar schemes.
Weight Recording Pilot

Budget 2019: suckler scheme worth €20m confirmed

Further details of the suckler support scheme, revealed by the Irish Farmers Journal on Monday night, were confirmed as part of Budget 2019.

- New €20 million Beef Environmental Efficiency Pilot (BEEP) scheme launched by DAFM
- Weights from up to 500k Suckler cows and their calves!
- Payment of €40 per Suckler cow for providing weight data on both cows and calves.
Greenbreed Project

- €3m DAFM funded project
- Aims to develop tools & resources to improve the environmental footprint.
- For same meat or milk output, there still is a ~15-20% in GHG output between individual animals.
- Opportunity to breed even more climate efficient cows for the future.
DNA Calf Registration

- Very successful pilot project undertaken this Spring.
- 18 herds & ~2,000 calves DNA registered.
- Further pilot for this Autumn - App

Output (by day 14)
- EU Registration
- Parentage
- Genomic Evaluation
- Major Genes
- Herdbook (optional)
- Quality Assurance

Database predicts
- Sire
- Dam
- Sex
- Breed

© Irish Cattle Breeding Federation Society Ltd 2016
Health & Disease Traits

• Farmer Recorded
  – Lameness & Mastitis
  – Pneumonia & Scour

• Factory Data
  – Liver Fluke
  – TB
Predicting TB prevalence from EBV

*(FR sires with reliability ≥90%)*

Scenario: Bull has an EBV of -0.05 or +0.05 for TB

What will be the expected prevalence of TB in his progeny if my herd gets infected?

\[
(66.692 \times -0.05) + 6.6432 = 3\
(66.692 \times +0.05) + 6.6432 = 10%
\]
Progeny Prevalence Per Sire

- ≥ 50 daughters
- ≥ 10 herds
New Traits - Meat Eating Quality

- ~2,000 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.

<table>
<thead>
<tr>
<th>Trait</th>
<th>Heritability</th>
</tr>
</thead>
<tbody>
<tr>
<td>Tenderness</td>
<td>0.16</td>
</tr>
<tr>
<td>Juiciness</td>
<td>0.10</td>
</tr>
<tr>
<td>Flavour</td>
<td>0.09</td>
</tr>
</tbody>
</table>
Genomics for Meat Eating Quality

TENDERNESS EBV BY A.I. SIRES BREED

Summary statistics

<table>
<thead>
<tr>
<th>Breed</th>
<th>N</th>
<th>Mean</th>
<th>Std Dev</th>
</tr>
</thead>
<tbody>
<tr>
<td>HE</td>
<td>111</td>
<td>0.16</td>
<td>0.07</td>
</tr>
<tr>
<td>BB</td>
<td>122</td>
<td>0.13</td>
<td>0.09</td>
</tr>
<tr>
<td>AA</td>
<td>148</td>
<td>0.12</td>
<td>0.06</td>
</tr>
<tr>
<td>LM</td>
<td>234</td>
<td>-0.00</td>
<td>0.09</td>
</tr>
<tr>
<td>CH</td>
<td>257</td>
<td>-0.03</td>
<td>0.07</td>
</tr>
<tr>
<td>SA</td>
<td>26</td>
<td>-0.13</td>
<td>0.08</td>
</tr>
<tr>
<td>SI</td>
<td>142</td>
<td>-0.25</td>
<td>0.07</td>
</tr>
</tbody>
</table>

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

- Beef breeding is delivering. Goal is to now increase gain & deliver herd target of €200+. These cows are also more climate efficient.
  - Current and future programs will help to deliver on this opportunity (e.g. BEEP).
- DNA calf registration a major opportunity.
- GHG/weanling efficiency a key focus trait.
- ICBF is driving change in the beef industry. Not always popular, but “high level” industry metrics are now moving in right direction.
Our Farmer & Government Representation

Department of Agriculture, Food and the Marine
An Taisce Talmhaloichta, Bia agus Mara

IRISH CREAMERY MILK SUPPLIERS
ASSOCIATION

IFA

Our AI & Milk Recording Organisations

DoveaGENETICS
munster cattle breeding group
PROGRESSIVE GENETICS
TIPPERARY CIBP

Our Herdbooks

AYRSHIRES
THE ABERDEEN-ANGUS CATTLE SOCIETY
IBBCS EASBB
IRISH AUBRAC
BLONDE D' AQUITAINE
Irish Charolais Cattle Society
HIGH HEREFORDS

Acknowledging Our Members

MRI Cattle Society of Ireland
M Belts & Limousin

Salers Cattle Society of Ireland Ltd

Norwegian Red Cattle Society