ICBF Dairy Industry Meeting.
Agenda.

- Review of prioritisation exercise from January workshop – Andrew Cromie
- Female fertility Update – Donagh Berry & Francis Kearney.
- Lameness & mastitis – Siobhan Ring & Donagh Berry.
- Cow Index – Margaret Kelleher.
- Genetic evaluations – Review of Systems & Processes – Andrew Cromie
- AOB.
Review of Prioritisation Exercise.
## Trait Priorities.

<table>
<thead>
<tr>
<th>Traits</th>
<th>Priority Rank (based on surveys)</th>
<th>Research Completeness (1=low, 5=high)</th>
<th>Ease of roll-out (1=low &amp; 5=high)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Fertility</td>
<td>1</td>
<td>1</td>
<td>3</td>
</tr>
<tr>
<td>Test Day Model</td>
<td>2</td>
<td>4</td>
<td>4</td>
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<tr>
<td>Lameness</td>
<td>3</td>
<td>1</td>
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<tr>
<td>Calving Diff%</td>
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<td>3</td>
<td>4</td>
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<tr>
<td>Mastitis</td>
<td>5</td>
<td>3</td>
<td>5</td>
</tr>
<tr>
<td>Survival</td>
<td>6</td>
<td>2</td>
<td>4</td>
</tr>
<tr>
<td>Feed Intake</td>
<td>7</td>
<td>2</td>
<td>2</td>
</tr>
<tr>
<td>BCS</td>
<td>8</td>
<td>1</td>
<td>4</td>
</tr>
<tr>
<td>SCC</td>
<td>9</td>
<td>4</td>
<td>5</td>
</tr>
<tr>
<td>Live-weight</td>
<td>10</td>
<td>5</td>
<td>4</td>
</tr>
<tr>
<td>Type</td>
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<td>1</td>
<td>4</td>
</tr>
<tr>
<td>TB</td>
<td>12</td>
<td>4</td>
<td>5</td>
</tr>
<tr>
<td>Liverfluke</td>
<td>13</td>
<td>4</td>
<td>5</td>
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</table>
## Service/system Priorities

<table>
<thead>
<tr>
<th>Traits</th>
<th>Priority Rank (based on surveys)</th>
<th>Research Completeness (1=low, 5=high)</th>
<th>Ease of roll-out (1=low, 5=high)</th>
</tr>
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<tbody>
<tr>
<td>COWorth</td>
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<tr>
<td>Multi-breed genomics</td>
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<td>1</td>
<td>5</td>
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<tr>
<td>Sire Advice</td>
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<td>1</td>
<td>5</td>
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<tr>
<td>Sexed semen</td>
<td>4</td>
<td>2</td>
<td>4</td>
</tr>
<tr>
<td>Dairy Beef</td>
<td>5</td>
<td>4</td>
<td>3</td>
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</tbody>
</table>
Follow-up.

• ICBF & Teagasc meeting to recap on outcomes of workshop on 31 Jan 2017.
• Based on; (priority rank) + (research completion) + (ease of roll-out), particular work areas progressed.
• Opportunity to discuss these today.
Irish dairy cow fertility evaluations

ICBF industry meeting, July 2017
History of fertility evaluations

- **2001**: sire model parity 1 for ClV + survival
- **2002**: CMMS data used to better define survival, 13x13 multi-trait sire model (3*ClV, 3*survival, 3*milk, BCS, ANG, FA, UD)
- **2003**: sire model → animal model
- **2004**: new genetic parameters + lifespan to account for parity >3 cows
- **2006**: across-breed evaluations (new model)
- **2010**: 22x22 across-breed multi-trait animal model – 5*ClV/Survival/milk, 3*CFS/NS, lifespan
...and it worked!!!
(national data)
...and it worked!!!

(Moorepark Next Gen Herd)
Motivation

• Need to re-estimate genetic parameters
  • Need to represent the current population
  • Better quality data
    • 18% increase in heritability when parentage corrected
• (One-step) genomics and simpler models
• More pertinent fertility trait and genetic/genomic evaluations
  • Fertility improvements due to “fertility” or gestation length?
Motivation

365 day calving interval

Start of calving
Start of breeding

365 day calving interval

Start of calving
Start of breeding
Calving date v calving interval

Average calving interval

- All year round
- Split calving
- Relaxed seasonal herd definitions
- Strict seasonal herd definitions

Jan 1st, March 15th, May 30th

Day in year of first calving in the interval

The Irish Agriculture and Food Development Authority
Motivation
Traits

Number of days from herd start of calving to cow calving date

Calved or not in the first 6 weeks

Calving interval

Number of days from herd mating start date to cow mating

Served or not in the first 3 weeks of breeding season

Number of days from herd mating start date to conception

The Irish Agriculture and Food Development Authority
Gestation length v calving interval

\[ y = 0.1257x - 2.2144 \]
Traits

Age at first calving

- Number of days from herd mating start date to conception
- Gestation length
Conclusions

• Constantly challenging how things can be done better
  • Genetic evaluations → genomic evaluations
  • 305-day milk → test-day model

• Last fertility research was ~10 years ago
  • New data, new knowledge, new traits, genomics….

• Research progressing.
Nordic Test-Day model

Timo Pitkänen
Natural Resources Institute Finland (LUKE)
Contents

• Natural Resources Institute Finland (LUKE)
• Biometrical Genetic research team in LUKE
• Nordic Test-Day model
• From 305d model to TD model: What to expect?
Natural Resources Institute Finland has long traditions

- **1898**: MTT Agrifood Research Finland is founded
- **1917**: Finnish Forest Research Institute (Metla)
- **1971**: Finnish Game and Fisheries Research Institute (RKTL)
- **1993**: Information Centre of the Ministry of Agriculture and Forestry (Tike)

**2015**: MTT, Metla, RKTL and Tike's statistic services are merged. Natural Resources Institute Finland (Luke) is formed.
Locations and personnel

668
649

1317
Employees

27%
Doctoral degree

51
Professors

51
Average age, y
Biometrical genetics research team
Research and Expertise

Genetic evaluation methodology
- quantitative genetics
- statistical methods
- numerical methods
- software development

Utilization of genomic and phenotypic information
- modelling of SNP information
- modelling of biological data
- genomic prediction

Design of breeding programs
- farm animal biology
- breeding goals
- economic value of genetic improvement
Genetic evaluation methodology

- Animal evaluation and genetic models – Toolbox (MiX99, Relax2, snpblup_rel, hginv)
- Developing of breeding value prediction software (MiXBLUP)
- Multibreed genomic prediction for Irish dairy cattle
- Russian dairy cattle genetic evaluation

Cattle

- Use of genomic information to improve reproduction and welfare
- New fertility evaluation for Nordic dairy cattle
- Redefined and novel cow fertility measures
- Towards genetic improvement of feed efficiency
- Ethiopian genetic evaluation for dairy cattle
- Mitigation of methane emission in dairy systems
- Genetics and breeding of beef breeds

Barley

- Genomic selection for barley

Fur Animals

- National genetic evaluation for blue fox
- Strong legs

Pig

- Sustainable pig and poultry production

Sheep

- Sustainable sheep and goat production in EU

Fish

- Finnish fish breeding programme
- Improving EU aquaculture by selective breeding
- Vietnam - selective fish breeding
- Gulf of Bothnia as resource of growth
- Sevan trout breeding in Armenia
Nordic Test-Day model

1st lactation

2nd lactation

Realized test-day observations
Yield prediction

Components of the yield prediction
- Herd management effect
- Days carried calf
- Genetic lactation curve
- Calving year x season x DIM
- Days dry effect
- Calving age

Milk yield kg/d

Jan 2010    Mar    May    Jul    Sep    Nov    Jan 2011    Mar    May    Jul
A Short History of Finnish and Nordic Test-day model

1992: 305d repeatability animal model in Finland

2000: First Test-Day model in Finland
   – Traits: first parity, and later parities

2006: First Nordic TDM
   – Traits: First, second, and later parities
   – For Sweden 305d yields were used

2010: Model update
   - Traits: first, second, and third parities
   - Swedish test-day records included

2016: Model update
   - Parameters for observations from milking robots
Nordic Test-day model: 2016

- Joint evaluation for Finnish, Swedish and Danish dairy cattle
- Milk, protein, and fat yields as biological traits
- First, second, and third parity as a separate trait
- 3 countries * 9 traits = 27 traits in the model evaluated at the same time
- Genetic correlation between countries 1.0
- Separate model for HOL, RED, and JER breeds
- Separate residual variances for conventional and robot milking
- Heterogenous variance adjustment
Evaluations and test-day records

Routine Evaluations
• Routine evaluations done by Nordic Cattle Genetic Evaluation (NAV)
• NAV is jointly owned by three countries

Test-day recording
• On average milk recording is done once in a month
• In Finland fat and protein contents are determined every second month
• Test-days from DIM=8 to 315 are included
• 9-10 TDs per cow per parity
Nordic Test-day model, figures

• HOL evaluation May 2017:
  – 157,731,912 test-day records from FIN, DNK, and SWE
  – 405,349,185 yield observations (milk + protein + fat)
  – 9,955,910 animals in the pedigree
  – 7,739,238 cows with TD records
From 305d model to TD model: What to expect?

Multiple-Trait Random Regression Test-Day Model for all Lactations

M. Lidauer¹, E. A. Mäntysaari¹, I. Strandén¹ and J. Pösö²
¹Agricultural Research Centre MTT, Animal Production Research, FIN-31600 Jokioinen, Finland
²Finnish Animal Breeding Association, FIN-01301 Vantaa, Finland

• Comparison between Finnish 305d model and Finnish test-day model
Comparison of Standard Deviations of Estimated Breeding values

Table 2. Standard deviations (kg) of estimated breeding values for milk (M), protein (P), and fat (F) yields for first lactation (FIRST), later lactations (LATER), average of first and later lactations (0.5(FIRST+LATER)) obtained from the multiple-trait multi-lactation random regression test-day animal model (TD-MODEL), and obtained from the previously used single trait repeatability animal model (ST-R-AM) by different groups of animals; Ayrshire (AY) and Friesian (FR) bulls born 1991-1993 with at least 60 daughters, and Ay and Fr cows born in 1995 with at least 4 test-day observations. Number of animals in parenthesis.

<table>
<thead>
<tr>
<th></th>
<th>TD-MODEL</th>
<th></th>
<th></th>
<th>ST-R-AM</th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>FIRST</td>
<td>LATER</td>
<td>.5(FIRST+LATER)</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>M</td>
<td>P</td>
<td>F</td>
<td>M</td>
<td>P</td>
</tr>
<tr>
<td>AY bulls (335)</td>
<td>415.</td>
<td>10.4</td>
<td>16.4</td>
<td>496.</td>
<td>14.5</td>
</tr>
<tr>
<td>FR bulls (132)</td>
<td>426.</td>
<td>11.0</td>
<td>18.9</td>
<td>477.</td>
<td>13.3</td>
</tr>
<tr>
<td>AY cows (67,252)</td>
<td>401.</td>
<td>9.3</td>
<td>14.1</td>
<td>436.</td>
<td>11.5</td>
</tr>
<tr>
<td>FR cows (20,804)</td>
<td>449.</td>
<td>10.7</td>
<td>14.5</td>
<td>491.</td>
<td>12.9</td>
</tr>
</tbody>
</table>
Correlations between estimated breeding values

Table 3. Correlations between estimated breeding values for milk (M), protein (P), and fat (F) yield for first lactation (FIRST), later lactation (LATER), first and later lactations average (0.5(FIRST+LATER)) obtained from the multiple-trait multi-lactation random regression test-day animal model, and corresponding breeding values obtained from the previously used single trait repeatability animal model by different groups of animals; Ayrshire (AY) and Friesian (FR) bulls born 1991-1993 with at least 60 daughters, and Ayrshire and Friesian cows born in 1995 with at least 4 test-day observations. Number of animals in parenthesis.

<table>
<thead>
<tr>
<th></th>
<th>FIRST</th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>M</td>
<td>P</td>
<td>F</td>
<td>M</td>
<td>P</td>
<td>F</td>
<td>M</td>
</tr>
<tr>
<td>AY bulls (335)</td>
<td>0.96</td>
<td>0.93</td>
<td>0.95</td>
<td>0.90</td>
<td>0.89</td>
<td>0.90</td>
<td>0.97</td>
</tr>
<tr>
<td>FR bulls (122)</td>
<td>0.95</td>
<td>0.94</td>
<td>0.87</td>
<td>0.89</td>
<td>0.87</td>
<td>0.93</td>
<td>0.96</td>
</tr>
<tr>
<td>AY cows (67,252)</td>
<td>0.86</td>
<td>0.85</td>
<td>0.88</td>
<td>0.83</td>
<td>0.82</td>
<td>0.85</td>
<td>0.87</td>
</tr>
<tr>
<td>FR cows (20,804)</td>
<td>0.88</td>
<td>0.87</td>
<td>0.88</td>
<td>0.84</td>
<td>0.84</td>
<td>0.85</td>
<td>0.88</td>
</tr>
</tbody>
</table>
Background

• Currently calculate 305 day values for each lactation
• 305 day model uses one 305 day figure for Milk/Fat/Protein which summarises whole lactation
• Operated on contract by CRV Holland – only evaluation not run in-house by ICBF.
• Current model - trait is Heifer-Equivalent (calving @26 months)
• Test day model – each parity (1-3) is a different (but correlated) genetic trait. Separate breeding value for each parity(1-3)
Why Change?

- Current model has performed very well
- More accurate estimation of environmental effects from including the influence of particular recording day
- Optimal use of information from all test days
- Better use of records in progress
- Possibility of persistency evaluation
- Method of choice for most dairy evaluations internationally (New Zealand, Holland, Nordic Countries, Canada, Germany, UK, Belgium)
Actions – Test Day Model

• Genetic parameters estimated 2012 milk/fat/prot incl additional Heterogenous Variance parameters
• Submit initial HO/FR evaluation to interbull test run Jan 2013 Milk/Fat/Prot - passed Interbull test
• Submit all breed (HO/FR, Je, NR/SR, Sim) evaluation to interbull test run Sept 2013 – passed Interbull test
• Dec 2013 – test proofs generated incl genomics
• Milk/Prot proofs stack up well, Fat proofs stack up well overall – some queries
• Decision – not made official due to queries on fat
Actions

• 2014 re-estimate parameters, full re-work of model
• Submit milk/fat/prot to Interbull test run Sep 2014
• Results – passed Interbull test
• Decision – not to proceed
Actions

• Specific evaluation by CRV excluding HV correction
• Apr 2017 - Timo Pitkänen (LUKE) visit ICBF 4 months
• Complete analysis of model
• Results presented here (basically same as previous presented but with 2 years more data)
• Plan submit Interbull Test run Sep 2017
• Implement at suitable time afterwards
Data

- Individual test day records (i.e. raw milk recording)
- Tests since 1/1/1996
- Animals with known sire/dam
- All parities up to 15

<table>
<thead>
<tr>
<th>PARITY</th>
<th>Records</th>
<th>Cows</th>
<th>PARITY</th>
<th>Records</th>
<th>Cows</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>7,524,368</td>
<td>1,517,884</td>
<td>9</td>
<td>327,470</td>
<td>70,960</td>
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<tr>
<td>2</td>
<td>6,199,088</td>
<td>1,231,431</td>
<td>10</td>
<td>158,772</td>
<td>35,176</td>
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<tr>
<td>3</td>
<td>4,845,157</td>
<td>964,849</td>
<td>11</td>
<td>70,574</td>
<td>15,966</td>
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<tr>
<td>4</td>
<td>3,655,977</td>
<td>734,590</td>
<td>12</td>
<td>29,370</td>
<td>6,780</td>
</tr>
<tr>
<td>5</td>
<td>2,591,464</td>
<td>526,347</td>
<td>13</td>
<td>10,904</td>
<td>2,581</td>
</tr>
<tr>
<td>6</td>
<td>1,728,348</td>
<td>355,871</td>
<td>14</td>
<td>3,825</td>
<td>945</td>
</tr>
<tr>
<td>7</td>
<td>1,070,985</td>
<td>223,290</td>
<td>15</td>
<td>1,590</td>
<td>356</td>
</tr>
<tr>
<td>8</td>
<td>614,545</td>
<td>130,847</td>
<td></td>
<td></td>
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</tr>
</tbody>
</table>
# Weighing by Parity

## Records from last 6 years

<table>
<thead>
<tr>
<th>PARITY</th>
<th>Num Records</th>
<th>Fraction</th>
<th>Weighting</th>
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<tbody>
<tr>
<td>1</td>
<td>970,737</td>
<td>1</td>
<td>41%</td>
</tr>
<tr>
<td>2</td>
<td>781,567</td>
<td>0.81</td>
<td>33%</td>
</tr>
<tr>
<td>3</td>
<td>611,521</td>
<td>0.63</td>
<td>26%</td>
</tr>
<tr>
<td>4</td>
<td>468,900</td>
<td>0.48</td>
<td>20%</td>
</tr>
<tr>
<td>5</td>
<td>339,935</td>
<td>0.35</td>
<td>14%</td>
</tr>
<tr>
<td>6</td>
<td>233,054</td>
<td>0.24</td>
<td>10%</td>
</tr>
<tr>
<td>7</td>
<td>148,637</td>
<td>0.15</td>
<td>6%</td>
</tr>
<tr>
<td>8</td>
<td>88,362</td>
<td>0.09</td>
<td>4%</td>
</tr>
<tr>
<td>9</td>
<td>48,495</td>
<td>0.05</td>
<td>2%</td>
</tr>
<tr>
<td>10</td>
<td>24,413</td>
<td>0.03</td>
<td>1%</td>
</tr>
<tr>
<td>11</td>
<td>11,519</td>
<td>0.01</td>
<td>0%</td>
</tr>
<tr>
<td>12</td>
<td>5,072</td>
<td>0.01</td>
<td>0%</td>
</tr>
<tr>
<td>13</td>
<td>1,952</td>
<td>0.00</td>
<td>0%</td>
</tr>
<tr>
<td>14</td>
<td>710</td>
<td>0.00</td>
<td>0%</td>
</tr>
<tr>
<td>15</td>
<td>189</td>
<td>0</td>
<td>0%</td>
</tr>
</tbody>
</table>

## Other Countries

- **Nordic Countries**
  - 50 : 30 : 20
- **UK**
  - 38 : 31 : 31
- **Holland**
  - 41 : 33 : 26

Base cow is unchanged
(born 2005, calved 2007)

Geneic Trend

- Higher $h^2$ in new model compared to old
  - Old Model 0.35
  - New Model 0.46
## Correlations between old/new proofs

<table>
<thead>
<tr>
<th></th>
<th>Num</th>
<th>Anis</th>
<th>Milk</th>
<th>Fat</th>
<th>Prot</th>
</tr>
</thead>
<tbody>
<tr>
<td>Bulls &gt;90%</td>
<td>2258</td>
<td>0.966</td>
<td>0.970</td>
<td>0.956</td>
<td></td>
</tr>
<tr>
<td>Bulls &gt;70%</td>
<td>3557</td>
<td>0.954</td>
<td>0.947</td>
<td>0.939</td>
<td></td>
</tr>
<tr>
<td>All Cows with records</td>
<td>1831295</td>
<td>0.924</td>
<td>0.935</td>
<td>0.923</td>
<td></td>
</tr>
<tr>
<td>Alive Cows with records</td>
<td>626774</td>
<td>0.956</td>
<td>0.958</td>
<td>0.953</td>
<td></td>
</tr>
</tbody>
</table>
Old vs New – Ai Bulls
Milk Sub Index
Old vs New – Ai Bulls
Milk PTA(Overall)
Old vs New – Ai Bulls
Milk (Parity 1)

- Note tighter correlation with parity 1 PTA, as current model is Heifer Equivalent
### Reliability Changes

<table>
<thead>
<tr>
<th></th>
<th>Num Anis</th>
<th>Milk Rel</th>
</tr>
</thead>
<tbody>
<tr>
<td>Cows with records</td>
<td>1,831,295</td>
<td>305d</td>
</tr>
<tr>
<td>Alive Cows with records</td>
<td>602,218</td>
<td>Td</td>
</tr>
<tr>
<td></td>
<td></td>
<td>58.6</td>
</tr>
<tr>
<td></td>
<td></td>
<td>67.7</td>
</tr>
<tr>
<td></td>
<td></td>
<td>57.2</td>
</tr>
<tr>
<td></td>
<td></td>
<td>65.3</td>
</tr>
</tbody>
</table>
# Changes different Animals

<table>
<thead>
<tr>
<th>Num Anis</th>
<th>Milk</th>
<th>Fat</th>
<th>Prot</th>
<th>Milk SI Euro Difference</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Td 305</td>
<td>Td 305</td>
<td>Td 305</td>
<td></td>
</tr>
<tr>
<td>Active AI Bulls</td>
<td>530</td>
<td>44.73</td>
<td>-2.04</td>
<td>5.52 4.44 4.20 2.57</td>
</tr>
<tr>
<td>Bulls &gt;50%</td>
<td>4246</td>
<td>-2.56</td>
<td>-25.56</td>
<td>0.54 0.17 -0.35 -0.83</td>
</tr>
<tr>
<td>Bulls &gt;70%</td>
<td>3557</td>
<td>14.82</td>
<td>-4.16</td>
<td>1.37 1.17 0.39 -0.01</td>
</tr>
<tr>
<td>Bulls &gt;90%</td>
<td>2258</td>
<td>36.38</td>
<td>17.22</td>
<td>2.31 2.15 1.39 0.95</td>
</tr>
<tr>
<td>All Cows</td>
<td>1831295</td>
<td>-2.47</td>
<td>-13.21</td>
<td>0.58 0.55 0.06 -0.07</td>
</tr>
<tr>
<td>All Cows alive</td>
<td>626774</td>
<td>42.39</td>
<td>1.96</td>
<td>2.95 3.04 2.87 1.61</td>
</tr>
</tbody>
</table>
Changes different Breeds

<table>
<thead>
<tr>
<th>Milk</th>
<th>Fat</th>
<th>Prot</th>
<th>Milk SI Euro diff</th>
<th>Num Bulls</th>
<th>Avg Age</th>
<th>Breed</th>
</tr>
</thead>
<tbody>
<tr>
<td>Avg Td</td>
<td>Avg 305d</td>
<td>Avg Td</td>
<td>Avg 305d</td>
<td>Avg Td</td>
<td>Avg 305d</td>
<td></td>
</tr>
<tr>
<td>122.44</td>
<td>102.41</td>
<td>3.82</td>
<td>3.59</td>
<td>3.37</td>
<td>2.86</td>
<td>3.37</td>
</tr>
<tr>
<td>-165.87</td>
<td>-200.28</td>
<td>-2.79</td>
<td>-3.35</td>
<td>-3.72</td>
<td>-4.81</td>
<td>5.12</td>
</tr>
<tr>
<td>-305.77</td>
<td>-356.50</td>
<td>12.71</td>
<td>11.71</td>
<td>0.67</td>
<td>-0.44</td>
<td>5.64</td>
</tr>
<tr>
<td>-126.15</td>
<td>-103.31</td>
<td>-7.87</td>
<td>-5.82</td>
<td>-3.57</td>
<td>-2.84</td>
<td>-4.21</td>
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<tr>
<td>-157.05</td>
<td>-191.26</td>
<td>-2.76</td>
<td>-3.53</td>
<td>-1.38</td>
<td>-2.70</td>
<td>8.28</td>
</tr>
<tr>
<td>-296.64</td>
<td>-323.57</td>
<td>-8.39</td>
<td>-8.59</td>
<td>-5.54</td>
<td>-6.66</td>
<td>4.53</td>
</tr>
<tr>
<td>-121.50</td>
<td>-168.69</td>
<td>0.13</td>
<td>-1.50</td>
<td>-1.67</td>
<td>-3.31</td>
<td>8.34</td>
</tr>
</tbody>
</table>

- Bulls >=87.5% of the breed
## Parity differences

<table>
<thead>
<tr>
<th></th>
<th>Milk 1 PTA</th>
<th>Milk 2 PTA</th>
<th>Milk 3 PTA</th>
<th>Milk Incr 1-3</th>
</tr>
</thead>
<tbody>
<tr>
<td>Bull 1</td>
<td>372</td>
<td>626</td>
<td>887</td>
<td>515</td>
</tr>
<tr>
<td>Bull 2</td>
<td>53</td>
<td>-27</td>
<td>-163</td>
<td>-215</td>
</tr>
<tr>
<td>Average</td>
<td>62</td>
<td>69</td>
<td>99</td>
<td>37</td>
</tr>
</tbody>
</table>

- Daughters of some bulls better (or worst) as they mature (Average across 1063 AI bulls born since 1/1/2000, rel >90)
Variation in proofs

- Note data taken from Nov 2016 (to allow comparison with 305d model)
Rankings Changes

- Active AI bulls (daughter proven) – ranked by milk sub index
  - Top 10 bulls – 9 bulls still in top 10
  - Top 100 bulls – 89 bulls still in top 100
  - Top 200 bulls – 191 bulls still in top 200
  - Bottom 100 bulls – 92 still in bottom 100
  - Top 10 cows – 6 still in top 10
  - Top 1000 cows – 577 still in top 1000
Actions

• Specific evaluation by CRV excluding HV correction
• Apr 2017 - Timo Pitkänen (LUKE) visit ICBF 4 months
• Complete analysis of model
• Results presented here (basically same as previous presented but with 2 years more data)
• Plan submit Interbull Test run Sep 2017
• Implement at suitable time afterwards
Lameness update
Siobhán Ring & Thierry Pabiou
Current status

- Health sub-index introduced 2006
  - Locomotion (n = 45,813 parity 1 cows)
  - Feet & legs composite (older/foreign animals)
  - SCC
- First lameness parameters 2012
  - Heritability → 3.8%
- Multi-trait animal model
  - Milk yield, SCC, mastitis, lameness
Current status - data

- 881,640 lameness records (~90% DEP data)
  - 10.8% lame
  - 45% animals repeated records

Lameness event recording
Motivation

- Need to re-estimate genetic parameters
  - Parentage errors corrected
  - Incentive to provide lameness records removed
  - Increased farmer awareness of the importance of recording
  - Parameters need to reflect current population & data quality
Genetic trends

Reliability/trait ≥ 65%
- SCC (n=3,028)
- Mastitis (n=1,284)
- Lameness (n=469)

Rate of genetic gain = \[ \text{variance} \times \text{selection intensity} \times \text{accuracy} \times \text{generation interval} \]

Year of birth

- 1990
- 1992
- 1994
- 1996
- 1998
- 2000
- 2002
- 2004
- 2006
- 2008
- 2010
- 2012
- 2014

introduced
Conformation and lameness

1st parity clinical lameness and conformation score (n =16, 062)

Phenotypic scores

- Mean lameness vs Rear leg set score
- Mean lameness vs Foot angle score
- Mean lameness vs Locomotion score
- Mean lameness vs Feet & legs score
Conformation and lameness

1st parity lameness PTA and conformation PTA (n = 16,062)

Genetic evaluation

**Correlation: -0.05**

![Graph showing lameness PTA vs. Rear leg set PTA with a correlation of -0.05.]

**Correlation: 0.05**

![Graph showing lameness PTA vs. Foot angle PTA with a correlation of 0.05.]

**Correlation: -0.35**

![Graph showing lameness PTA vs. Locomotion PTA with a correlation of -0.35.]

**Correlation: -0.35**

![Graph showing lameness PTA vs. Feet & legs PTA with a correlation of -0.35.]

Genetic evaluation
Potential for change

**HealthyGenes**

- Collect accurate health records
  - ~11,000 dairy cows, 68 herds
  - Estimate genetic parameters

**BCS**

**Mobility**

**Hoof health**

(n = 7,579)
Overgrown hoof

White line disease

Sole bruising
Hoof health traits

Overgrown

Prev. (≥1) → 52%
Prev. (3) → 3%
Heritability → 9%

≥ 25 daughters,
≥ 5 herds

Number of sires

Average daughter prevalence (%)
Hoof health traits

White line

Prev. (≥1) → 49%
Prev. (3) → 8%
Heritability → 13%

Average daughter prevalence (%)

≥ 25 daughters,
≥ 5 herds
Hoof health traits

Bruising

Prev. (≥1) → 53%
Prev. (3) → 7%
Heritability → 24%

≥ 25 daughters, 
≥5 herds

Number of sires

Average daughter prevalence (%)
Increasing accuracy & genetic gain

Accuracy of breeding value vs. Number of half-sib progeny records for different trait heritability levels:

- **2% heritability:** (representative of the purple triangle symbol)
- **7% heritability:** (representative of the orange square symbol)
- **13% heritability:** (representative of the red diamond symbol)
- **24% heritability:** (representative of the green circle symbol)

Key points:

- **≤ 200 recs/sire yield ≥90% acc.**
- **≥ 800 recs/sire yield ≥90% acc.**
Conclusions

- Lag in lameness genetic progress
  - Availability of phenotypes
  - Accuracy of recording
- Locomotion/hoof health traits yield higher genetic variation
  - ↑ genetic progress. Availability of data still a major concern ⇒ combination of DEP + targeted herds.
- Re-evaluation required & in progress
  - Data – (editing)
  - Traits
  - Genetic evaluation models
  - Economic weights
  - Systems for recording
Cow’s Own Worth (COW)

Dr. Margaret Kelleher
Dairy Industry Meeting
21st June 2017

Department of Agriculture, Food and the Marine
An Roinn Talmhaíochta, Bia agus Mara
COW: Cow’s Own Worth

Predicted Performance – Culling tool

5 factors contributing to performance

Lifetime profit calculated by estimating:

- Current lactation profit
- Future lactation profit
- Net profit after culling and replacing cow
1. The COW was able to identify cows performing well within my herd.
2. The COW was able to identify cows for culling within my herd.
3. I would use the COW to help inform my culling decisions if it were to become a routine service from ICBF.
4. I found the report easy to read.
5. I found the extra summary tables useful to highlight specific areas of production (EG: Top 10 and bottom 10 on COW, Top 10 and bottom 10 on milk solids, High SCC cows).
6. I found the colour coding of the top 10% and bottom 10% on important traits useful.
7. I feel that my milk recording information has more value now that I can receive a COW index report.
8. I would like the COW to be generated for my herd from now on.
9. I would recommend the national extension of the COW to all dairy milk recording herds in 2017.
10. Additional comments.
Profile development 2017

- Development underway
- Pilot phase scheduled July
- Farmers testing screens and accuracy of COW rank
- Potential to encourage more data recording with data completeness dash bars
Current data recording
Conclusions

- Complimentary to the EBI
- Added value service
- Prospects to improve herd profitability
- Multiple sources of data available
- Live system
- Maximise COW accuracy by:
  - Recording **MORE** data
  - Recording **ACCURATE** data
- Pilot phase of on-line service July 2017
- Engagement with key stakeholders re: roll-out and support of service => all cattle breeding organisations will benefit from COW.
- Roll-out from Sept/Oct pending outcome of pilot phase
IRISH CATTLE BREEDING FEDERATION

Some key initiatives.

• Independent over-sight on genetic/genomic evaluations. Co-ordinated by Dr Roel Veerkamp.
• Mapping and risk analysis of genetic/genomic evaluation systems and processes undertaken. ISO-2015 certification achieved last week.
• Clearer separation of operational activities, from research/development/implementation.
• Graduate program with Wageningen UR, Netherlands. Target of three people/year.
Why change?

- Current dairy genomic evaluation software developed by Donagh Berry in 2009. It has served us well.
- Improvements to methodologies + need for increased scale-ability + need for flexibility, means that we now must start considering alternatives.
- Mix99 software the preferred approach.
  - Beef and calving already on Mix99. Opportunity to migrate milk and fertility.
- Development work underway.
Proposed Approach.

1. Mimic exactly same methodology applied by DB but in Mix99. Use the same reference population as is applied currently.

2. Move to applying latest methodology in Mix99. Use the same reference population as is applied currently.

3. Move to applying latest methodology in Mix99. Move to using updated training population including females.
Initial Results.

• Very promising.
• Further work underway.
• Align results/outcomes with the 1\textsuperscript{st} meeting of the new “Steering Group”.
• Update at next ICBF Dairy Industry Meeting.
Our Farmer & Government Representation

Our AI & Milk Recording Organisations

Our Herdbooks

Acknowledging Our Members