Cow’s Own Worth
Test day model and 305 day predictions

Margaret Kelleher, John McCarthy and Ross Evans
mmkelleher@icbf.com
11th February 2018
C.O.W. = Cow’s Own Worth
Expected profit from:

Current Lactation
- Production
- Health (SCC)
- Fertility (calving date)
- Management
- Maintenance

Net Replacement Cost
- Cull cow value
- Replacement cost

Future Lactations
- Production
- Health
- Beef
- Calving
- Management
- Maintenance
- Fertility
- Descendants

+ predictions on fertility, survival and SCC performance
For more details on C.O.W.

Poster session
Theory to Application
Tomorrow 9.30 – 10.00 am

Implementation of the C.O.W. decision support tool

M.M. Kelleher¹, D.P. Berry², P.R. Amer³, A. Cromie¹, P. Owens¹ & R. Evans¹

Introduction

• Rank cows on expected profitability
• Aid in **culling and retention** decisions
• Possible due to ICBF’s centralised database
Introduction

Cow’s Own Worth (C.O.W.)
• Researched and published 2015 (Kelleher et al., 2015 JDS)
• Trialled on commercial herds 2016 & 2017
• Implemented October 2017
• Currently uses 305D model solutions for production traits

Test Day Model (TDM)
• TDM genetic evaluation submitted to Interbull test run September 2017
• TDM implemented in domestic evaluation December 2017
• Moved from the 305D model for production traits

Question
What effect do TDM evaluation solutions have on the accuracy of the C.O.W. rankings of dairy females???
Materials and methods

Data
- Milk yield
- Fat
- Protein

Alternative cow ranking indices
- 305D and TDM evaluations
- Phenotypic performance
- Spring calving herds

Validation dataset
- Genetic model ranking
- 305D model ranking
- Test day model ranking

Validation phenotype
n = 108,827
Materials and methods

Genetic model ranking

\[ \sum_{t=1}^{3} \epsilon_t \times (EBV_t) \]

305D model ranking

\[ \sum_{t=1}^{3} \epsilon_t \times (EBV_t + Gen.\ het_t + Gen.\ rec_t + Perm\ env_t) \]

Test day model ranking

\[ \sum_{t=1}^{3} \epsilon_t \times (EBV_t + Brd\ sp.\ het_t + Brd\ sp.\ rec_t + Perm\ env_t) \]
Results: Milk yield

Difference between top 25% and bottom 25%

<table>
<thead>
<tr>
<th>Model</th>
<th>kg</th>
</tr>
</thead>
<tbody>
<tr>
<td>Genetic model</td>
<td>547</td>
</tr>
<tr>
<td>305D model</td>
<td>633</td>
</tr>
<tr>
<td>Test day model</td>
<td>801</td>
</tr>
</tbody>
</table>

Milk yield (kg)

Quartiles

- Top 25%
- Second quartile
- Third quartile
- Bottom 25%

- Genetic model
- 305D model
- Test Day Model
Results: Fat yield

Difference between top 25% and bottom 25%

<table>
<thead>
<tr>
<th>Model</th>
<th>kg</th>
</tr>
</thead>
<tbody>
<tr>
<td>Genetic model</td>
<td>30</td>
</tr>
<tr>
<td>305D model</td>
<td>34</td>
</tr>
<tr>
<td>Test day model</td>
<td>37</td>
</tr>
</tbody>
</table>

![Fat yield graph](image)
Results: Protein yield

Difference between top 25% and bottom 25%

<table>
<thead>
<tr>
<th>Model</th>
<th>kg</th>
</tr>
</thead>
<tbody>
<tr>
<td>Genetic model</td>
<td>26</td>
</tr>
<tr>
<td>305D model</td>
<td>29</td>
</tr>
<tr>
<td>Test day model</td>
<td>33</td>
</tr>
</tbody>
</table>
### Results: Monetary value

**Difference between top 25% and bottom 25% and milk price for each model**

<table>
<thead>
<tr>
<th>Group</th>
<th>Price (€)</th>
<th>Genetic model</th>
<th>305D model</th>
<th>Test Day Model</th>
</tr>
</thead>
<tbody>
<tr>
<td>Milk</td>
<td>-0.040</td>
<td>-22.53</td>
<td>-26.07</td>
<td>-32.98</td>
</tr>
<tr>
<td>Fat</td>
<td>4.066</td>
<td>123.77</td>
<td>137.24</td>
<td>150.66</td>
</tr>
<tr>
<td>Protein</td>
<td>6.653</td>
<td>171.83</td>
<td>189.88</td>
<td>217.63</td>
</tr>
<tr>
<td>Total (€)</td>
<td></td>
<td>273.07</td>
<td>301.05</td>
<td>335.31</td>
</tr>
</tbody>
</table>

- The difference between top 25% and bottom 25% using TDM is **€335 per cow** per lactation
- Worth **€8375** in a 100 cow herd
- €34 per cow per lactation improvement between the 305D model and Test Day Model
### Analysis by component

**Validation accuracy and slope between phenotypic production traits and both the 305D and Test Day Model**

<table>
<thead>
<tr>
<th>Traits</th>
<th>305D</th>
<th>TDM</th>
<th>305D</th>
<th>TDM</th>
<th>305D</th>
<th>TDM</th>
<th>305D</th>
<th>TDM</th>
</tr>
</thead>
<tbody>
<tr>
<td>Milk (kg)</td>
<td>0.455</td>
<td>0.462</td>
<td>0.152</td>
<td>0.308</td>
<td>1.718</td>
<td>1.552</td>
<td>2.078</td>
<td>0.564</td>
</tr>
<tr>
<td>Fat (kg)</td>
<td>0.323</td>
<td>0.334</td>
<td>0.148</td>
<td>0.310</td>
<td>1.262</td>
<td>1.164</td>
<td>2.056</td>
<td>0.591</td>
</tr>
<tr>
<td>Protein (kg)</td>
<td>0.351</td>
<td>0.341</td>
<td>0.146</td>
<td>0.313</td>
<td>1.454</td>
<td>1.331</td>
<td>2.053</td>
<td>0.523</td>
</tr>
</tbody>
</table>

- Breeding values accuracy very similar
- Accuracy doubles for **TDM permanent environment** effects and production traits
- Improvements in the validation bias as measure by the slope for TDM over 305D model
Conclusions

• C.O.W. currently uses 305D model evaluation solutions

• Using TDM production solutions in C.O.W. have shown **favourable outcomes** due to more accurate prediction of future phenotypic performance of production traits

  • The **permanent environment** effects from TDM account for the majority of the improvements

  • However the method of handling these needs more **refinement**