## Introduction

The latest routine international evaluation for **workability traits** took place as scheduled at the Interbull Centre. Data from ten (10) countries were included in this evaluation.

International genetic evaluations for workability traits of bulls from Austria-Germany, Canada, Denmark-Finland-Sweden, France, Italy, Netherlands, Norway, New Zealand, Slovenia and Switzerland were computed. Brown Swiss, Holstein, Jersey and Red Dairy Cattle breed
data were included in this evaluation.

## Changes in national procedures

Changes in the national genetic evaluation of workability traits are as follows:

DFS (HOL) HOL and RED HOL (RED) have merged. Cows with min 87 % HOL genes and and bulls with min 93 % HOL genes have been converted to HOL.
Animals with less % HOL genes will no longer be a part of the evaluation

SVN (ALL) Some bulls losing informations mostly as a consequence of changes in data base related to the pedigree completness as well as phenotypic data improvement

NOR (RDC) The rolling definition of hys is causing the daughters to distribute somewhat differently over hys-classes at each evaluation.
Therefore some bulls occasionally may loose EDC although the number of daughters stay the same. Reliability changes is a function of the EDC changes.

DEU(RDC) Few bulls whose ownership has been corrected, they are now foreign AI bulls, therefore their Type of Proof changed and some of these are not publishable anymore.

CHE (HOL) Some bulls with large decreases in reliability. These bulls are rather old and dld and do not have daughters with observations for temperament (EDC=0).

ITA(HOL) Changes in information due to data-flow and editing.

DEA(BSW) Base change + number of bulls with decrease in reliability larger than in previous runs. Most likely due to the new version of the software used to calculate reliabilities.

NZL(ALL) Continuous DNA parentage testing affecting daughters, herds, EDCs and reliabilities, in addition for For HOL, RDC and JER the TOP scores have been Canonically transformed before they enter
the models, resulting on 10% of the data for Temperament and Milking Speed being deleted because there were incomplete scores.

CAM (RDC) First time inclusion of Canadian Milking Shorthorn with population code CAM

## INTERBULL CHANGES COMPARED TO THE DECEMBER ROUTINE RUN

### Subsetting:

As decided by the ITC in Orlando, new subsetting was introduced in the september test run. Sub-setting is necessary for operational purposes and restrictions of time scales. To minimize the effect of subsetting, larger subsets with 10-12 countries and with 4 link providing countries have been applied.

### Window:

According to the decision taken by ITC in Orlando, the following changes have been introduced in regards to the windows used for post processing:

The upper bounds have been set to 0.99 as these were judged to have very little effect on evaluations. The lower values have been set to about the 25% percentile value. The largest changes are for the lower values for conformation traits, with the lowest window being 40% for OFL otherwise it is about 50% for all other confirmation traits. It is anticipated that these low values may not have large impact on evaluations since there were very few countries combinations whose estimated correlations fell between the old limit of 0.30 and these new limits.

## DATA AND METHOD OF ANALYSIS

Data were national genetic evaluations of AI sampled bulls with at least 10 daughters or 10 EDC (for clinical mastitis and maternal calving traits at least 50 daughters or 50 EDC, and for direct calving traits at least 50 calvings or 50 EDC) in at least 10 herds. Table 1 presents the amount of data included in this Interbull evaluation for all breeds.

National proofs were first de-regressed within country and then analysed jointly with a linear model including the effects of evaluation country, genetic group of bull and bull merit. Heritability estimates used in both the de-regression and international evaluation were as in each country's national evaluation.

Table 2 presents the date of evaluation as supplied by each country

Estimated genetic parameters and sire standard deviations are shown in APPENDIX I and the corresponding number of common bulls are listed in APPENDIX II.

## SCIENTIFIC LITERATURE

The international genetic evaluation procedure is based on international work described in the following scientific publications:

International genetic evaluation computation:
- Schaeffer. 1994. J. Dairy Sci. 77:2671-2678
- Klei, 1998. Interbull Bulletin 17:3-7

Verification and Genetic trend validation:
- Klei et al., 2002. Interbull Bulletin 29:178-182.
- Boichard et al., 1995. J. Dairy Sci. 78:431-437

Weighting factors:
- Fikse and Banos, 2001. J. Dairy Sci. 84:1759-1767

De-regression:
- Sigurdsson and G. Banos. 1995. Acta Agric. Scand. 45:207-219
- Jairath et al. 1998. J. Dairy Sci. Vol. 81:550-562

Genetic parameter estimation:
- Klei and Weigel, 1998, Interbull Bulletin 17:8-14
- Sullivan, 1999. Interbull Bulletin 22:146-148

Post-processing of estimated genetic correlations:
- Mark et al., 2003, Interbull Bulletin 30:126-135
- Jorjani et al., 2003. J. Dairy Sci. 86:677-679
- https://wiki.interbull.org/public/rG%20procedure?action=print

Time edits
- Weigel and Banos. 1997. J. Dairy Sci. 80:3425-3430

International reliability estimation
- Harris and Johnson. 1998. Interbull Bulletin 17:31-36

## NEXT ROUTINE INTERNATIONAL EVALUATION

Dates for the next routine evaluation can be found on http://www.interbull.org/ib/servicecalendar.

## NEXT TEST INTERNATIONAL EVALUATION

Dates for the next test run can be found on http://www.interbull.org/ib/servicecalendar.

## PUBLICATION OF INTERBULL TEST RUN

Test evaluation results are meant for review purposes only and should not be published.

^LTable 1. National evaluation data considered in the Interbull evaluation for Workability (December Routine Evaluation 2017). Number of records for milking speed by breed

| Country | BSW | GUE | HOL | JER | RDC | SIM |
|---|---|---|---|---|---|---|
| AUS | | | 6085 | 1168 | 471 | |
| BEL | | | | | | |
| CAN | 165 | | 11480 | 616 | 775 | |
| CHE | 2526 | | 2886 | | | |
| CZE | | | | | | |
| DEA | 3912 | | | | | |
| DEU | | | 17746 | | 239 | |
| DFS | | | 11247 | 1849 | 6324 | |
| ESP | | | | | | |
| EST | | | | | | |
| FRA | 320 | | 16187 | | | |
| FRM | | | | | | |
| GBR | | | 5211 | | | |
| HUN | | | | | | |
| IRL | | | | | | |
| ISR | | | | | | |
| ITA | 1876 | | 6611 | | | |
| JPN | | | | | | |
| KOR | | | | | | |
| LTU | | | | | | |
| LVA | | | | | | |
| NLD | 97 | | 12778 | 25 | | |
| NOR | | | | | 3675 | |
| NZL | | | 5588 | 3607 | 549 | |
| POL | | | | | | |
| PRT | | | | | | |
| SVK | | | | | | |
| SVN | 267 | | 417 | | | |
| URY | | | | | | |
| USA | | | | | | |
| ZAF | | | | | | |
| HRV | | | | | | |
| MEX | | | | | | |
| CAM | | | | | 31 | |
| No.Records | 9163 | | 96236 | 7265 | 12064 | |
| Pub. Proofs | 7804 | 0 | 84329 | 6806 | 11611 | 0 |

^LAPPENDIX I. Sire standard deviations in diagonal and genetic correlations below diagonal

BSW msp

| | CAN | CHE | DEA | ITA | NLD | SVN | FRA |
|---|---|---|---|---|---|---|---|
| CAN | 7.26 | | | | | | |
| CHE | 0.92 | 15.72 | | | | | |
| DEA | 0.89 | 0.96 | 11.69 | | | | |
| ITA | 0.90 | 0.95 | 0.93 | 17.92 | | | |
| NLD | 0.93 | 0.95 | 0.94 | 0.92 | 6.16 | | |
| SVN | 0.87 | 0.90 | 0.90 | 0.94 | 0.87 | 24.34 | |
| FRA | 0.93 | 0.92 | 0.86 | 0.89 | 0.95 | 0.86 | 0.87 |

HOL msp

| | CAN | CHE | DEU | DFS | FRA | NLD | AUS | GBR | SVN | NZL | ITA |
|---|---|---|---|---|---|---|---|---|---|---|---|
| CAN | 7.61 | | | | | | | | | | |
| CHE | 0.88 | 12.17 | | | | | | | | | |
| DEU | 0.90 | 0.97 | 11.48 | | | | | | | | |
| DFS | 0.94 | 0.94 | 0.97 | 14.48 | | | | | | | |
| FRA | 0.94 | 0.97 | 0.96 | 0.96 | 1.08 | | | | | | |
| NLD | 0.95 | 0.97 | 0.96 | 0.98 | 0.98 | 5.58 | | | | | |
| AUS | 0.89 | 0.88 | 0.87 | 0.89 | 0.91 | 0.91 | 3.55 | | | | |
| GBR | 0.85 | 0.85 | 0.85 | 0.85 | 0.85 | 0.85 | 0.86 | 0.15 | | | |
| SVN | 0.86 | 0.86 | 0.86 | 0.85 | 0.85 | 0.85 | 0.86 | 0.86 | 23.00 | | |
| NZL | 0.91 | 0.90 | 0.87 | 0.87 | 0.93 | 0.92 | 0.94 | 0.85 | 0.86 | 0.37 | |
| ITA | 0.94 | 0.93 | 0.93 | 0.95 | 0.96 | 0.95 | 0.92 | 0.85 | 0.85 | 0.92 | 7.22 |

HOL tem

| | CAN | CHE | DEU | DFS | FRA | NLD | AUS | GBR | NZL | ITA |
|---|---|---|---|---|---|---|---|---|---|---|
| CAN | 6.95 | | | | | | | | | |
| CHE | 0.70 | 10.90 | | | | | | | | |
| DEU | 0.85 | 0.77 | 12.08 | | | | | | | |
| DFS | 0.78 | 0.82 | 0.87 | 13.25 | | | | | | |
| FRA | 0.71 | 0.90 | 0.82 | 0.92 | 0.99 | | | | | |
| NLD | 0.85 | 0.72 | 0.87 | 0.87 | 0.81 | 4.98 | | | | |
| AUS | 0.70 | 0.70 | 0.70 | 0.72 | 0.72 | 0.74 | 3.07 | | | |
| GBR | 0.70 | 0.79 | 0.71 | 0.81 | 0.86 | 0.71 | 0.70 | 0.14 | | |
| NZL | 0.70 | 0.70 | 0.71 | 0.70 | 0.70 | 0.71 | 0.74 | 0.70 | 0.34 | |
| ITA | 0.70 | 0.70 | 0.70 | 0.70 | 0.70 | 0.70 | 0.70 | 0.70 | 0.70 | 7.25 |

JER msp

| | CAN | DFS | NLD | AUS | NZL |
|---|---|---|---|---|---|
| CAN | 8.62 | | | | |
| DFS | 0.91 | 14.29 | | | |
| NLD | 0.94 | 0.97 | 4.69 | | |
| AUS | 0.86 | 0.87 | 0.92 | 3.32 | |
| NZL | 0.87 | 0.86 | 0.91 | 0.88 | 0.33 |

RDC msp

| | CAN | DEU | DFS | NOR | AUS | NZL | CAM |
|---|---|---|---|---|---|---|---|
| CAN | 6.63 | | | | | | |
| DEU | 0.90 | 9.28 | | | | | |
| DFS | 0.96 | 0.94 | 13.51 | | | | |
| NOR | 0.91 | 0.88 | 0.96 | 14.59 | | | |
| AUS | 0.88 | 0.87 | 0.87 | 0.86 | 4.33 | | |
| NZL | 0.90 | 0.88 | 0.89 | 0.91 | 0.90 | 0.40 | |
| CAM | 0.90 | 0.90 | 0.90 | 0.90 | 0.88 | 0.90 | 7.83 |

RDC tem

| | CAN | DEU | DFS | NOR | AUS | NZL | CAM |
|---|---|---|---|---|---|---|---|
| CAN | 6.48 | | | | | | |
| DEU | 0.83 | 9.89 | | | | | |
| DFS | 0.76 | 0.81 | 11.12 | | | | |
| NOR | 0.78 | 0.72 | 0.92 | 17.18 | | | |
| AUS | 0.71 | 0.71 | 0.71 | 0.71 | 3.45 | | |
| NZL | 0.71 | 0.72 | 0.73 | 0.72 | 0.79 | 0.40 | |
| CAM | 0.74 | 0.74 | 0.74 | 0.74 | 0.72 | 0.74 | 7.02 |

^LAPPENDIX II. Number of common bulls

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BSW

common bulls below diagonal
common three quarter sib group above diagonal

| | CAN | CHE | DEA | ITA | NLD | SVN | FRA |
|---|---|---|---|---|---|---|---|
| CAN | 0 | 91 | 97 | 91 | 33 | 15 | 61 |
| CHE | 73 | 0 | 490 | 385 | 52 | 40 | 140 |
| DEA | 80 | 405 | 0 | 528 | 74 | 60 | 170 |
| ITA | 75 | 327 | 434 | 0 | 69 | 54 | 149 |
| NLD | 27 | 49 | 65 | 54 | 0 | 22 | 50 |
| SVN | 13 | 39 | 56 | 53 | 21 | 0 | 31 |
| FRA | 53 | 107 | 126 | 120 | 41 | 30 | 0 |

BSW

GUE

GUE

HOL

common bulls below diagonal
common three quarter sib group above diagonal

| | CAN | CHE | DEU | DFS | FRA | NLD | AUS | GBR | SVN | NZL | ITA |
|---|---|---|---|---|---|---|---|---|---|---|---|
| CAN | 0 | 703 | 1676 | 1010 | 1185 | 1092 | 886 | 1290 | 137 | 344 | 1288 |
| CHE | 569 | 0 | 830 | 497 | 499 | 663 | 408 | 569 | 95 | 219 | 546 |
| DEU | 860 | 628 | 0 | 1689 | 1743 | 2036 | 908 | 1433 | 207 | 373 | 1648 |
| DFS | 670 | 412 | 808 | 0 | 1270 | 1400 | 800 | 1142 | 160 | 403 | 1022 |
| FRA | 617 | 407 | 640 | 477 | 0 | 1539 | 864 | 1238 | 131 | 438 | 1210 |
| NLD | 921 | 626 | 1250 | 957 | 732 | 0 | 941 | 1348 | 172 | 526 | 1157 |
| AUS | 737 | 324 | 491 | 412 | 457 | 702 | 0 | 889 | 100 | 564 | 672 |
| GBR | 1295 | 547 | 846 | 720 | 644 | 1041 | 634 | 0 | 154 | 424 | 1156 |
| SVN | 107 | 74 | 191 | 128 | 92 | 150 | 71 | 118 | 0 | 50 | 166 |
| NZL | 311 | 184 | 246 | 242 | 212 | 470 | 439 | 328 | 37 | 0 | 309 |
| ITA | 951 | 473 | 843 | 682 | 543 | 829 | 446 | 884 | 137 | 243 | 0 |

HOL

common bulls below diagonal
common three quarter sib group above diagonal

| | CAN | CHE | DEU | DFS | FRA | NLD | AUS | GBR | NZL | ITA |
|---|---|---|---|---|---|---|---|---|---|---|
| CAN | 0 | 604 | 1372 | 864 | 1053 | 1043 | 853 | 1257 | 333 | 1236 |
| CHE | 480 | 0 | 583 | 398 | 434 | 522 | 351 | 508 | 191 | 485 |
| DEU | 575 | 396 | 0 | 1295 | 1461 | 1695 | 782 | 1220 | 320 | 1405 |
| DFS | 514 | 316 | 506 | 0 | 1139 | 1193 | 750 | 1038 | 389 | 920 |
| FRA | 608 | 358 | 529 | 427 | 0 | 1435 | 810 | 1183 | 404 | 1194 |
| NLD | 875 | 487 | 909 | 691 | 701 | 0 | 934 | 1338 | 521 | 1127 |
| AUS | 714 | 288 | 374 | 352 | 454 | 694 | 0 | 891 | 563 | 670 |
| GBR | 1269 | 473 | 632 | 580 | 640 | 1036 | 633 | 0 | 421 | 1134 |
| NZL | 303 | 163 | 204 | 217 | 210 | 463 | 438 | 326 | 0 | 307 |
| ITA | 884 | 414 | 655 | 570 | 539 | 791 | 441 | 858 | 243 | 0 |

JER

common bulls below diagonal
common three quarter sib group above diagonal

| | CAN | DFS | NLD | AUS | NZL |
|---|---|---|---|---|---|
| CAN | 0 | 58 | 9 | 151 | 64 |
| DFS | 43 | 0 | 11 | 73 | 74 |
| NLD | 7 | 7 | 0 | 14 | 13 |
| AUS | 150 | 46 | 15 | 0 | 178 |
| NZL | 66 | 51 | 12 | 167 | 0 |

JER

RDC

common bulls below diagonal
common three quarter sib group above diagonal

| | CAN | DEU | DFS | NOR | AUS | NZL | CAM |
|---|---|---|---|---|---|---|---|
| CAN | 0 | 7 | 109 | 5 | 34 | 31 | 0 |
| DEU | 7 | 0 | 35 | 10 | 20 | 3 | 0 |
| DFS | 109 | 26 | 0 | 99 | 101 | 52 | 0 |
| NOR | 5 | 10 | 75 | 0 | 45 | 10 | 0 |
| AUS | 31 | 20 | 75 | 37 | 0 | 35 | 8 |
| NZL | 28 | 3 | 50 | 9 | 32 | 0 | 1 |
| CAM | 0 | 0 | 0 | 0 | 8 | 1 | 0 |

RDC

common bulls below diagonal
common three quarter sib group above diagonal

| | CAN | DEU | DFS | NOR | AUS | NZL | CAM |
|---|---|---|---|---|---|---|---|
| CAN | 0 | 5 | 93 | 5 | 34 | 30 | 0 |
| DEU | 5 | 0 | 24 | 8 | 18 | 2 | 0 |
| DFS | 92 | 19 | 0 | 92 | 101 | 52 | 0 |
| NOR | 5 | 8 | 68 | 0 | 42 | 9 | 0 |
| AUS | 31 | 18 | 75 | 34 | 0 | 35 | 8 |
| NZL | 28 | 2 | 50 | 8 | 32 | 0 | 1 |
| CAM | 0 | 0 | 0 | 0 | 8 | 1 | 0 |