



Service & Daten
aus einer Quelle

Validation of GMACE results based on direct genomic predictions

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Data

- gEBV GMACE-Implementation-Run December 2013
 - bulls with GMACE gEBV without DEU information

- *compared to*

- DEU gEBV November 2013 (= evaluation data sent for GMACE Dec. '13)

- Totally 847 bulls in GMACE without DEU info., but DEU info. available
 - thereof with country-of-origin:
 - USA+CAN = 599
 - DFS = 205 (for DFS bulls no SCS/RZS and no longevity)
 - Others = 43



Comparison of GMACE/DEU gEBV

	<i>GMACE</i>	<i>gEBV DEU</i>	<i>Diff. GM-DEU</i>	<i>s Diff.</i>
<i>rel. protein kg</i>	66.2	72.6	-6.3	
protein kg	40.6	41.3	-0.7	7.0
fat kg	40.4	42.7	-2.3	8.7
milk kg	1201	1154	48	229
prod. index (RZM)	119.7	120.5	-0.8	4.9
<i>rel. RZE</i>	61.7	55.8	5.9	
conf. index (RZE)	118.0	117.6	0.4	4.0
stature	109.0	109.8	-0.9	3.7
udder depth	114.2	116.0	-1.8	4.3

Except milk prod. traits
 All traits on relative scale
 $\emptyset = 100$
 $S = 12$

- Average GMACE-gEBV very similar to (independent) DEU-gEBV
- In tendency GMACE-gEBV are lower compared to DEU-gEBV



Comparison of GMACE/DEU gEBV by country-of-origin

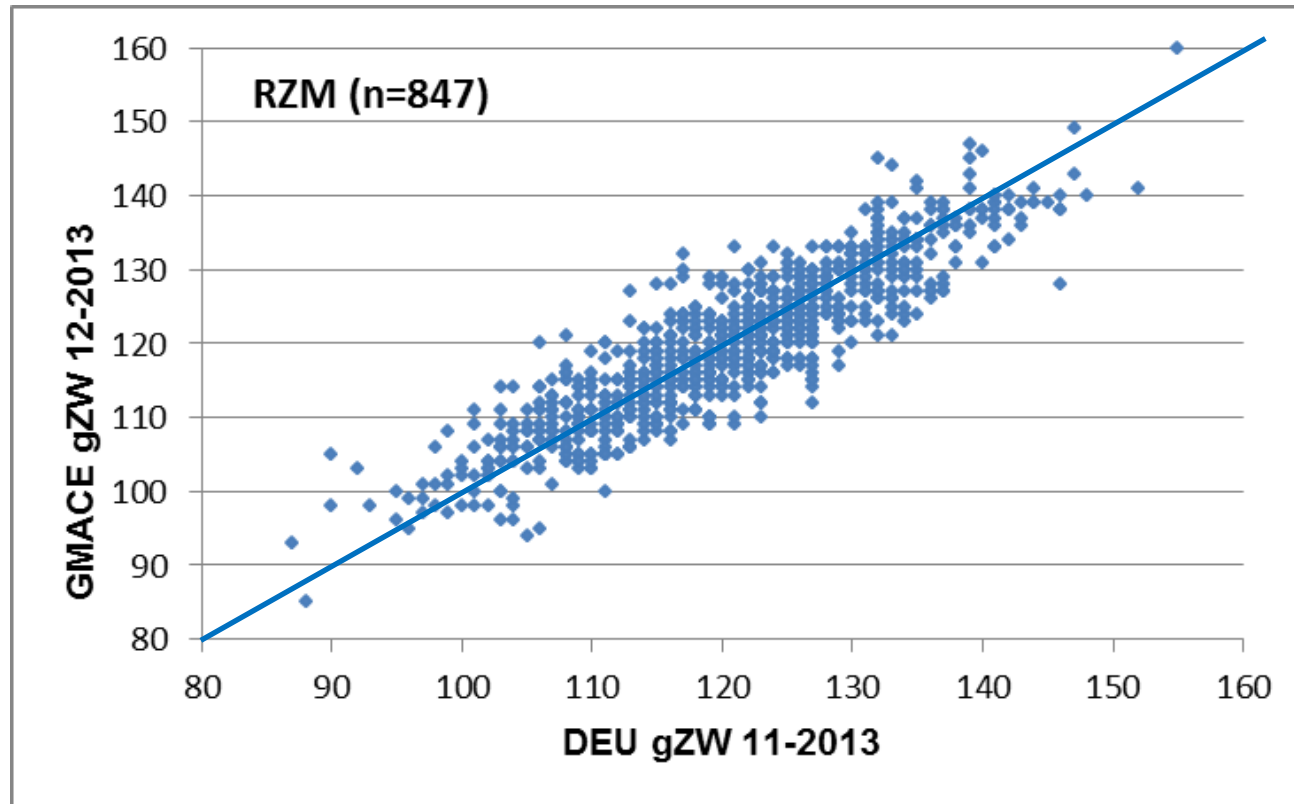
	599 USA/CAN bulls		205 DFS bulls	
	gEBV DEU	Diff. GM-DEU	gEBV DEU	Diff. GM-DEU
<i>rel. protein kg</i>	72.5	-4.3	72.7	-12.2
protein kg	43.1	0.0	36.9	-2.7
fat kg	46.4	-1.8	33.7	-3.3
milk kg	1284	75	820	-20
prod. index (RZM)	121.8	-0.3	117.3	-2.0
<i>rel. RZE</i>	55.6	8.2	56.0	0.0
conf. index (RZE)	122.7	0.8	103.2	-0.5
stature	113.6	-1.0	99.1	-0.6
udder depth	118.5	-2.0	110.1	-1.4
daug. fert. index (RZR)	109.9	-0.1	114.0	0.7
<i>rel. FL cows</i>	44.6	21.5	46.2	13.6
first to last cows	105.6	0.9	104.5	0.7
<i>rel. NR cows</i>	41.4	10.6	43.8	9.6
NonReturn cows	105.6	0.1	104.5	1.7
<i>rel. RZS</i>	76.2	-1.8		
SCS (relative)	115.3	-0.5		
<i>rel. Longevity</i>	50.0	9.5		
Longevity (RZN)	123.5	-2.0		

Except milk prod. traits
 All traits on relative scale
 $\emptyset = 100$
 $S = 12$

- \emptyset number countries in GMACE: USA/CAN 4.3; DFS 1.9
 - SCS and longevity for DFS bulls not available in GMACE implementation run Dec. 2013
- In tendency GMACE-gEBV are more similar to (independent) DEU-gEBV for USA/CAN bulls compared to DFS bulls



Comparison of GMACE/DEU gEBV

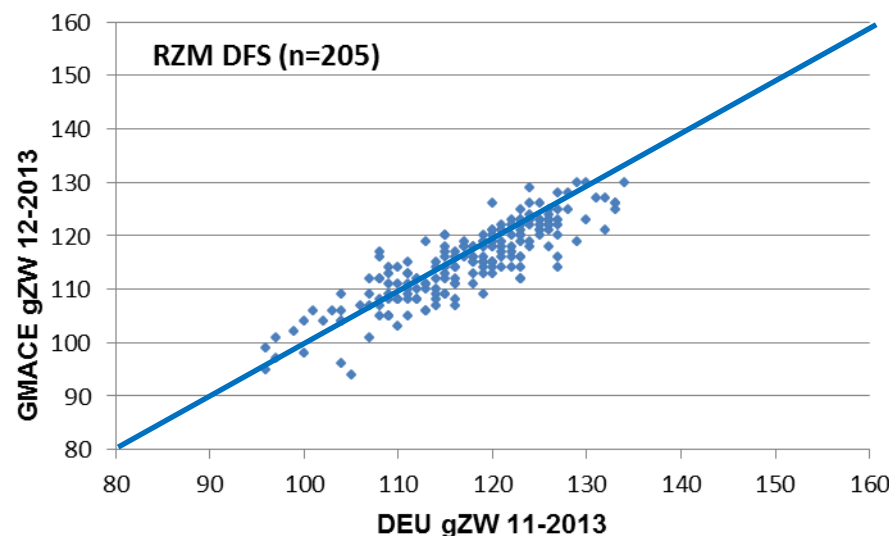
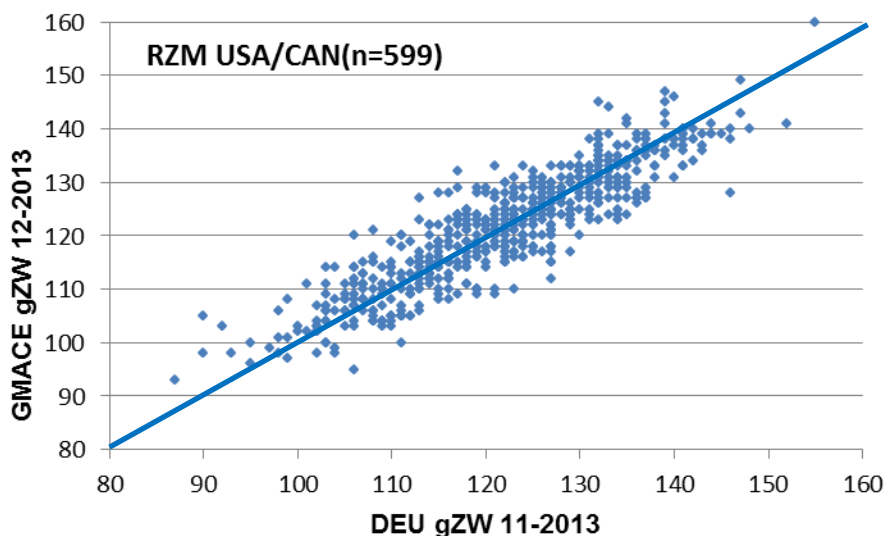


RZM =
production index
 Scale: $\emptyset=100$, $s=12$

- \emptyset GMACE: 119.7 \emptyset DEU: 120.5 Diff.: -0.8
- \emptyset deviation: ± 4.9
- No systematic over- or under-estimation for milk production traits
 - In tendency lower GMACE-gEBV for high bulls

Comparison of GMACE/DEU gEBV by country-of-origin

Production index RZM



■ \emptyset DEU-gEBV: 121.8

■ \emptyset n countries: 4.3

■ Diff.: -0.3 \emptyset deviation: ± 5.1

■ \emptyset DEU-gEBV: 117.3

■ \emptyset n countries: 1.9

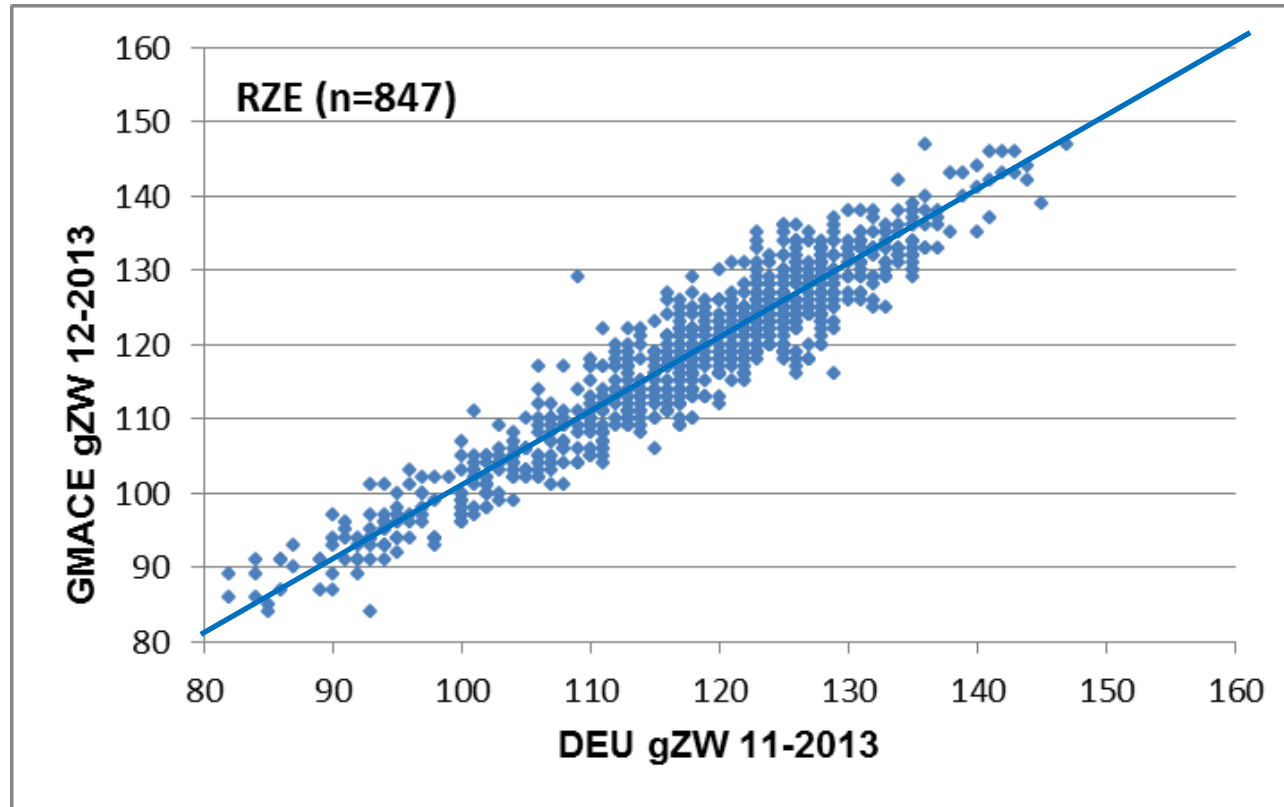
■ Diff.: -2.0 \emptyset deviation: ± 3.9

■ GMACE-gEBV from USA/CAN bulls realistic (even high bulls)

■ DFS bulls in average lower as DEU-gEBV, especially high bulls



Comparison of GMACE/DEU gEBV

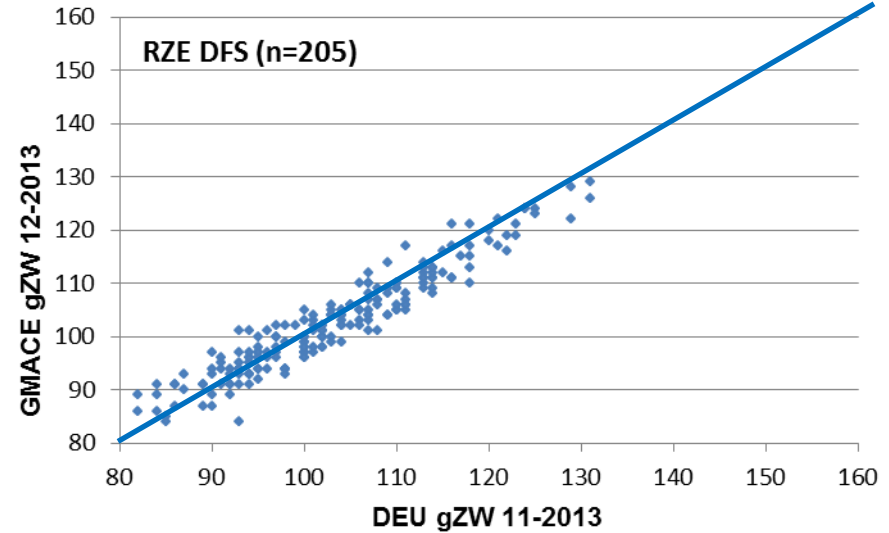
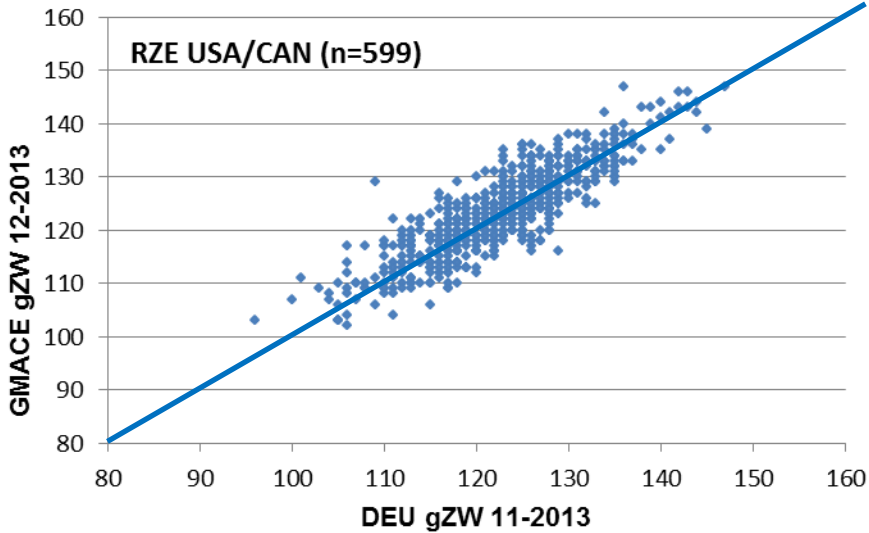


RZE =
conformation index
 Scale: $\emptyset=100$, $s=12$

- \emptyset GMACE: 118.0 \emptyset DEU: 117.6 Diff.: +0.4
- \emptyset deviation: ± 4.0
- In average across all conformation traits similar GMACE-gEBV compared to DEU-gEBV
 - but bigger differences per single conformation trait:
 - \emptyset Diff.-stature: -0.9 \emptyset Diff.-udder depth: -1.9

Comparison of GMACE/DEU gEBV by country-of-origin

Overall conformation index RZE



■ $\bar{\emptyset}$ DEU-gZW: 122.7

■ $\bar{\emptyset}$ n countries: 4.3

■ Diff.: +0.8 $\bar{\emptyset}$ deviation: ± 4.3

■ $\bar{\emptyset}$ DEU-gZW: 103.2

■ $\bar{\emptyset}$ n countries: 1.9

■ Diff.: -0.5 $\bar{\emptyset}$ deviation: ± 3.2

■ GMACE-gEBV of USA/CAN bulls in average slightly higher as DEU-gEBV

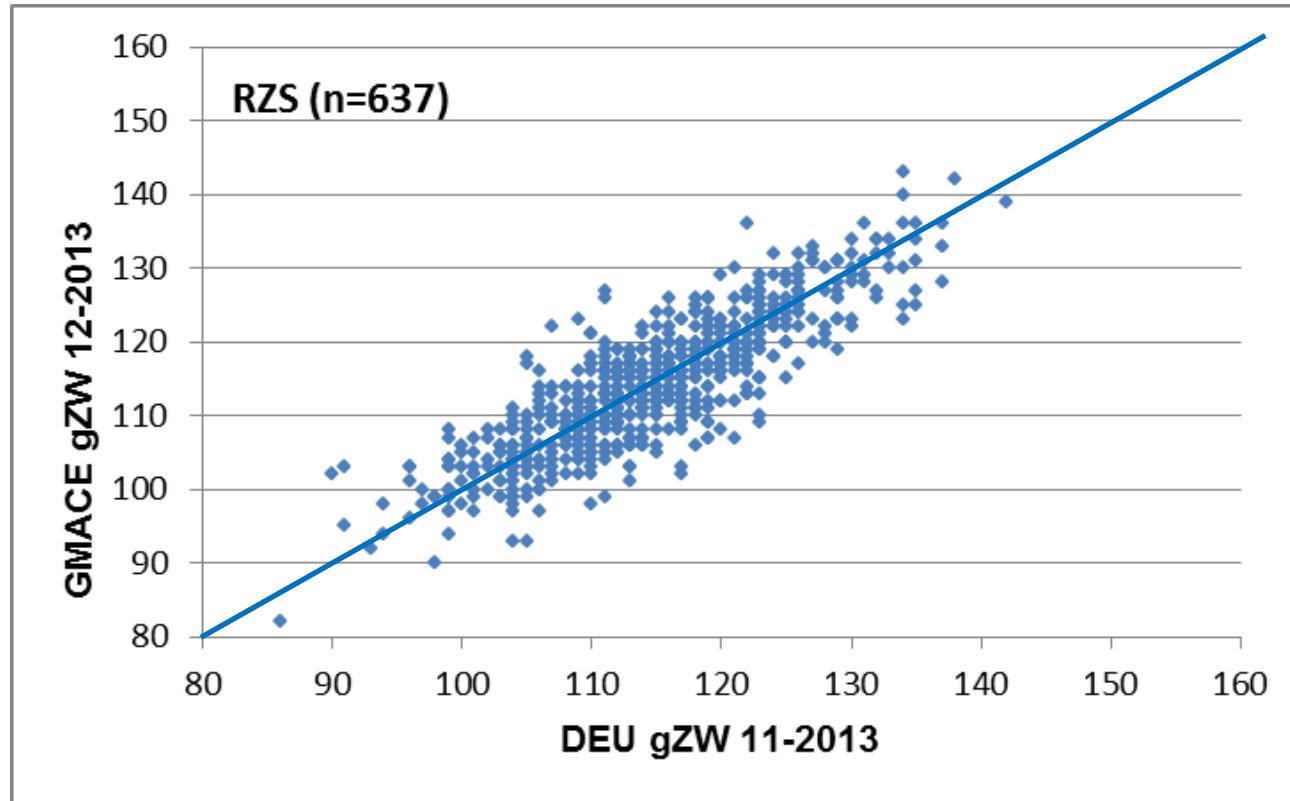
- For low bulls more pronounced, high bulls very similar gEBV

■ DFS bulls in average slightly lower gEBV from GMACE compared to DEU-gEBV

- but same tendency as USA/CAN bulls i.e. low bulls overestimated, high bulls slightly underestimated



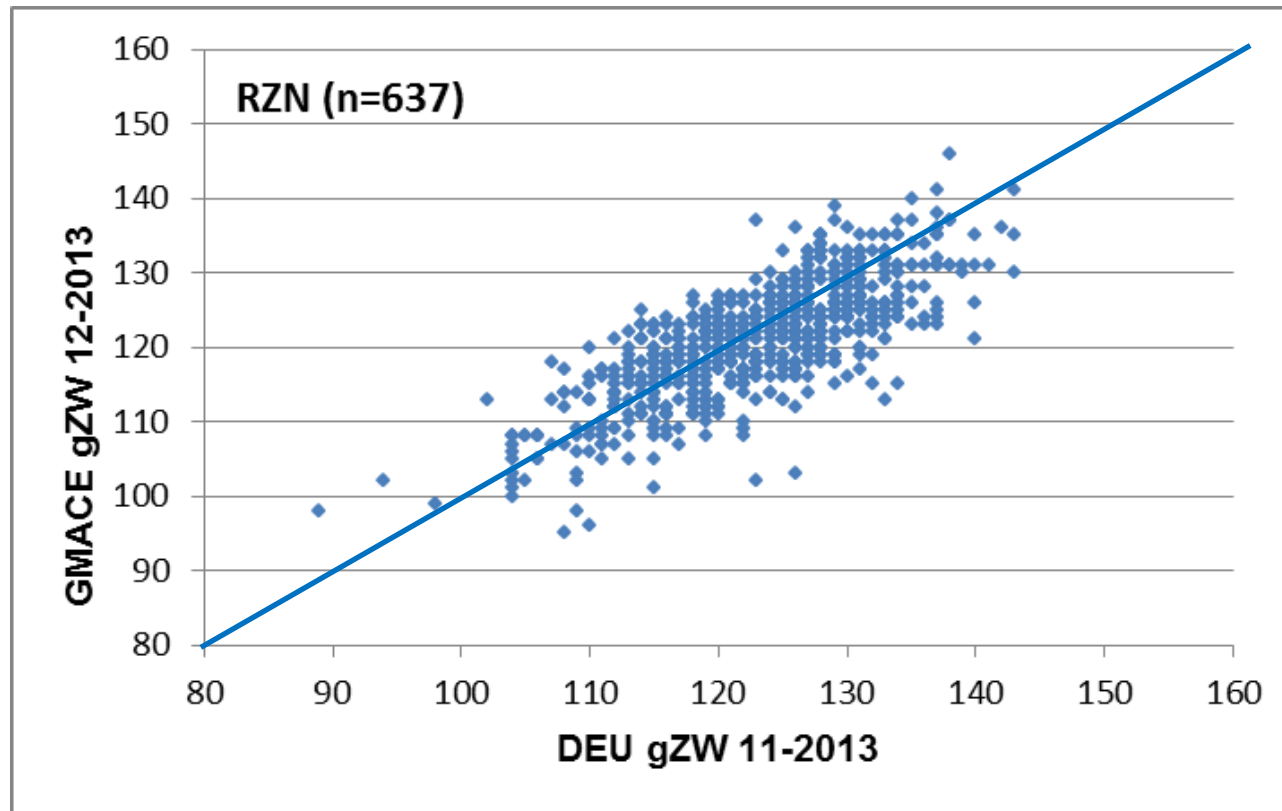
Comparison of GMACE/DEU gEBV



RZS =
SCS relative reversed
 Scale: $\emptyset=100$, $s=12$

- No GMACE SCS for DFS bulls → results dominated by 599 USA/CAN bulls
- \emptyset GMACE: 114.5 \emptyset DEU: 114.9 Diff.: -0.4
- \emptyset deviation : ± 4.9
- No systematic higher GMACE-gEBV for high bulls for SCS/RZS

Comparison of GMACE/DEU gEBV



RZN =
longevity
 Scale: $\emptyset=100$, $s=12$

- No GMACE longevity for DFS bulls → results dominated by 599 USA/CAN bulls
- \emptyset GMACE: 120.9 \emptyset DEU: 122.9 Diff.: -2.0 \emptyset deviation : ± 5.6
- GMACE-gEBV for longevity are systematic lower compared to DEU-gEBV
 - in German validation in practice some overestimation of DEU-gEBV is observed, too
 - → GMACE-gEBV are realistic

Summary

■ **GMACE seems to work**

- GMACE-gEBV (without DEU info) show good accordance with independent DEU-gEBV
 - even for high USA/CAN sire of sons



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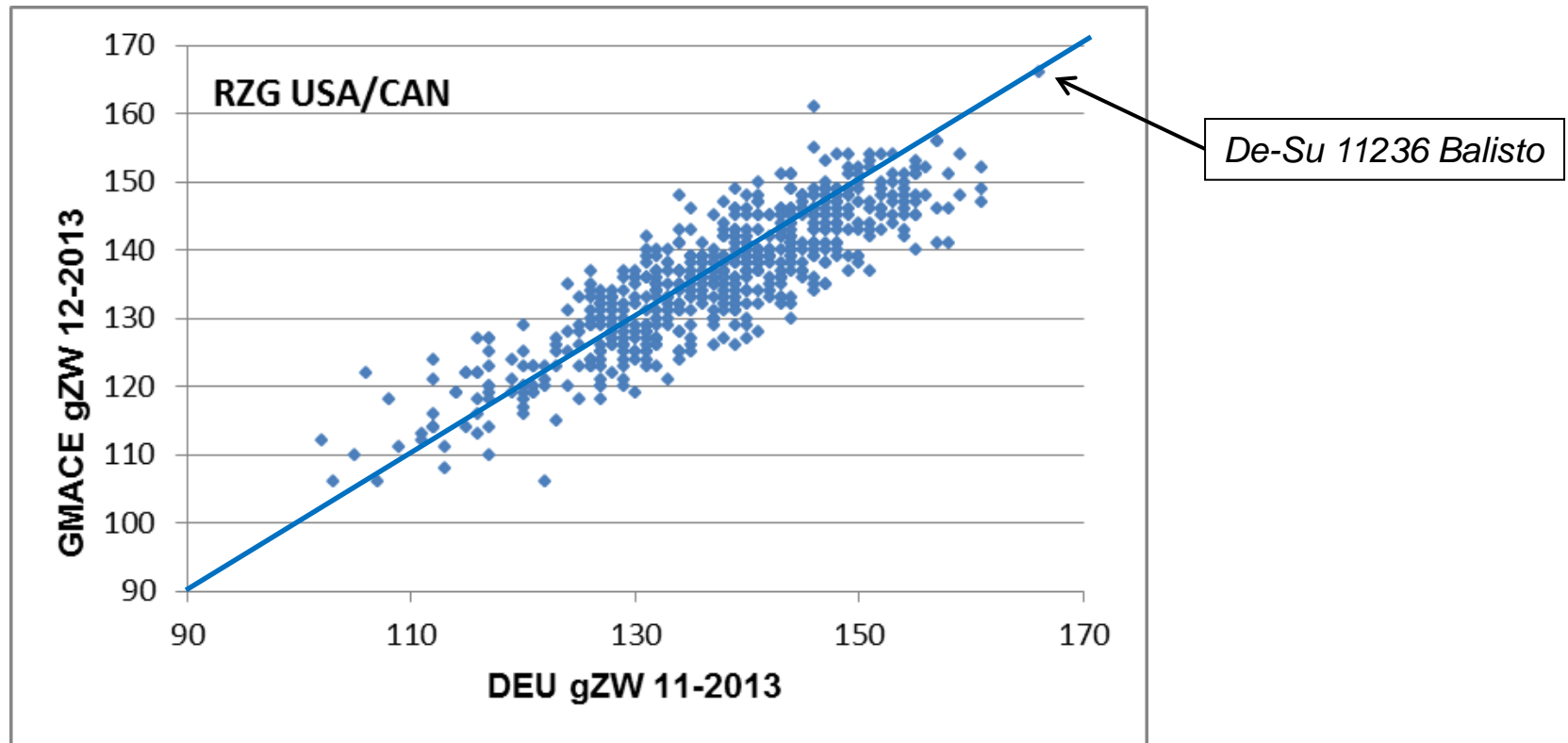


Thank you for attention !

Summary

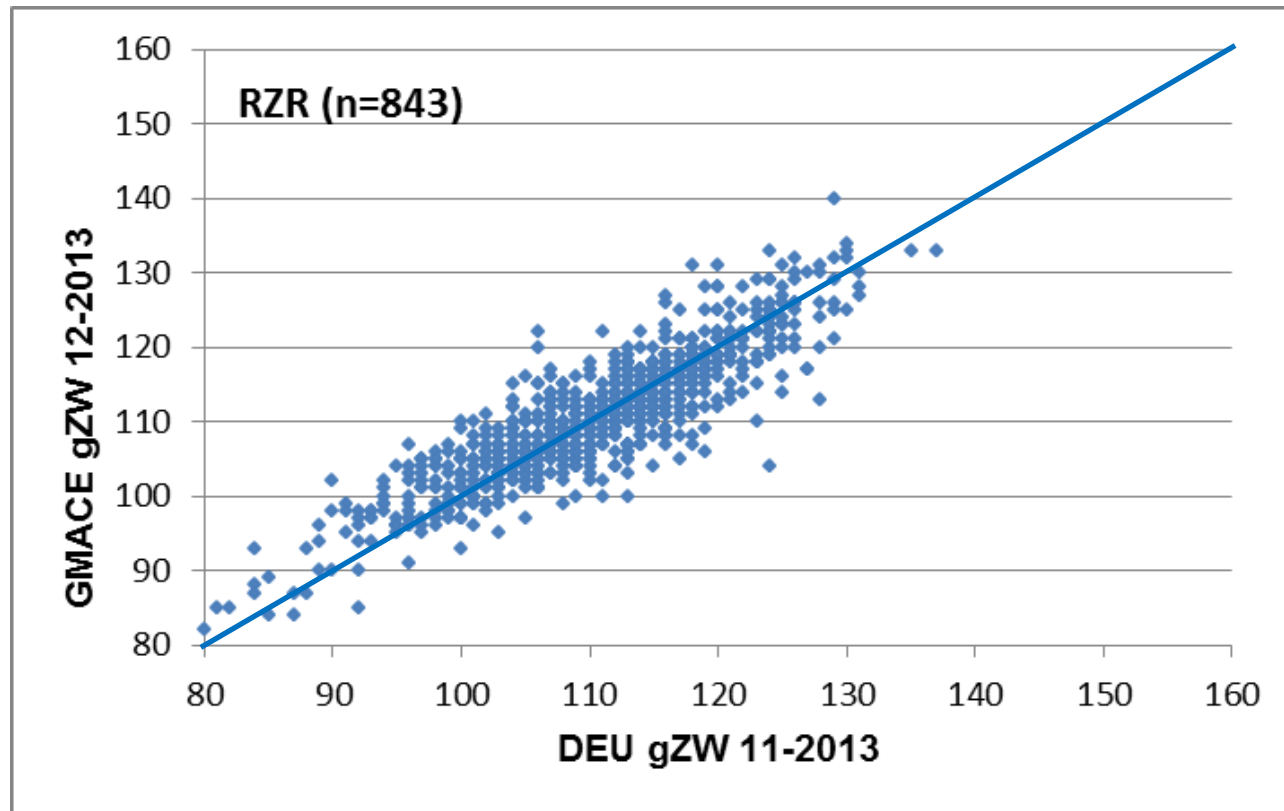
■ GMACE seems to work

- GMACE-gEBV (without DEU info) show good accordance with independent DEU-gEBV
 - even for high USA/CAN sire of sons





Comparison of GMACE/DEU gEBV

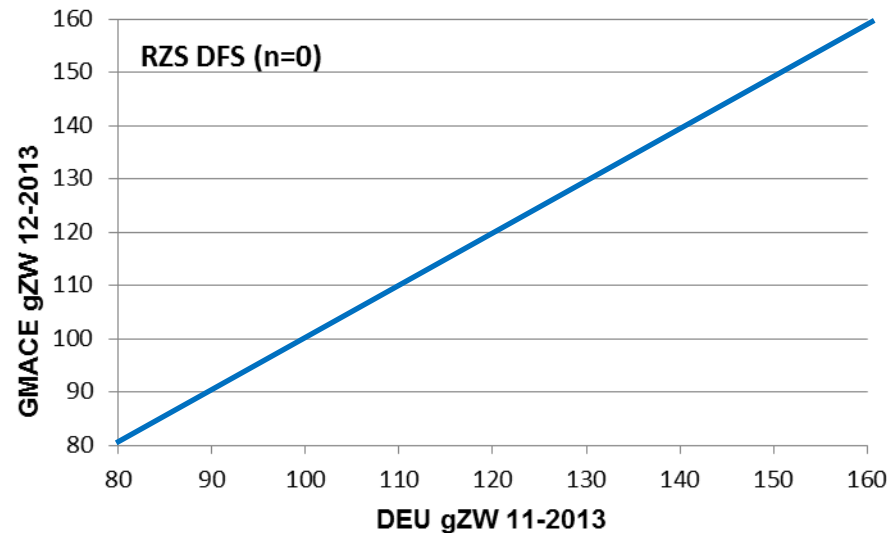
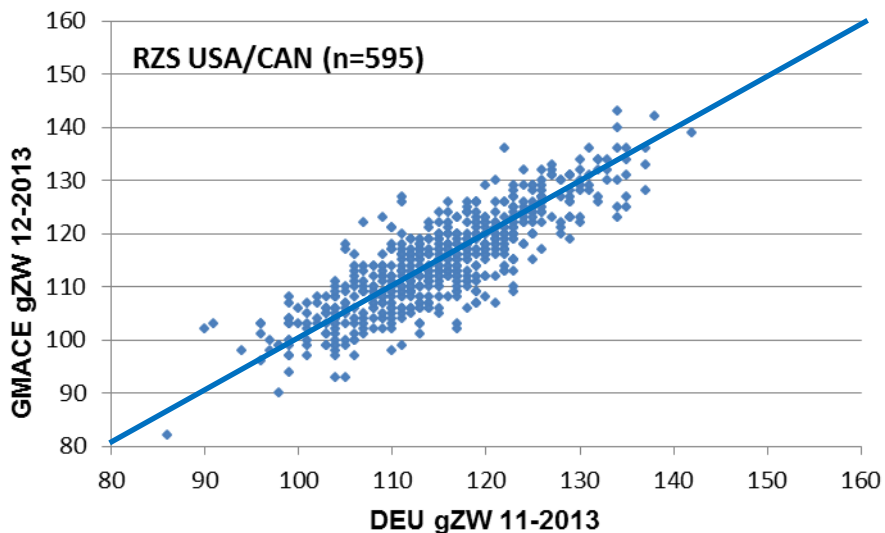


RZR =
Daug. Fert. index
 Scale: $\emptyset=100$, $s=12$

- \emptyset GMACE: 110.7 \emptyset DEU: 110.6 Diff.: +0.1
- \emptyset deviation: ± 4.3
- RZR is almost always a mix from GMACE- and DEU-gEBV (not all countries have the 5 IB traits)
 - But bigger differences per single trait:
 - \emptyset Diff.-NRc: +0.8 \emptyset Diff.-FLc: +0.9

Comparison of GMACE/DEU gEBV by country-of-origin

SCS = RZS (reversed relative scale)



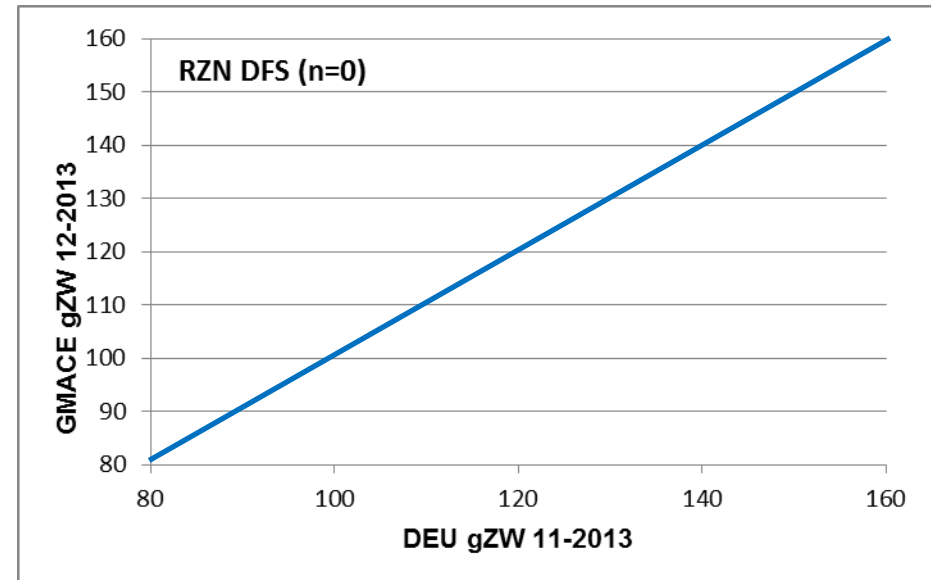
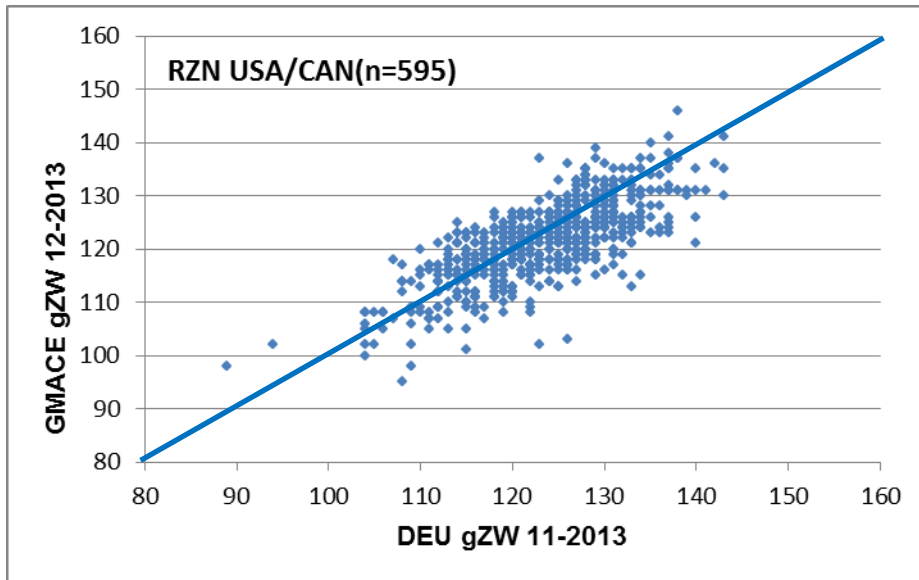
- \emptyset DEU-gEBV: 115.3
- \emptyset n countries: 4.3
- Diff.: -0.5 \emptyset deviation: ± 5.0

- DFS: no GMACE SCS



Comparison of GMACE/DEU gEBV by country-of-origin

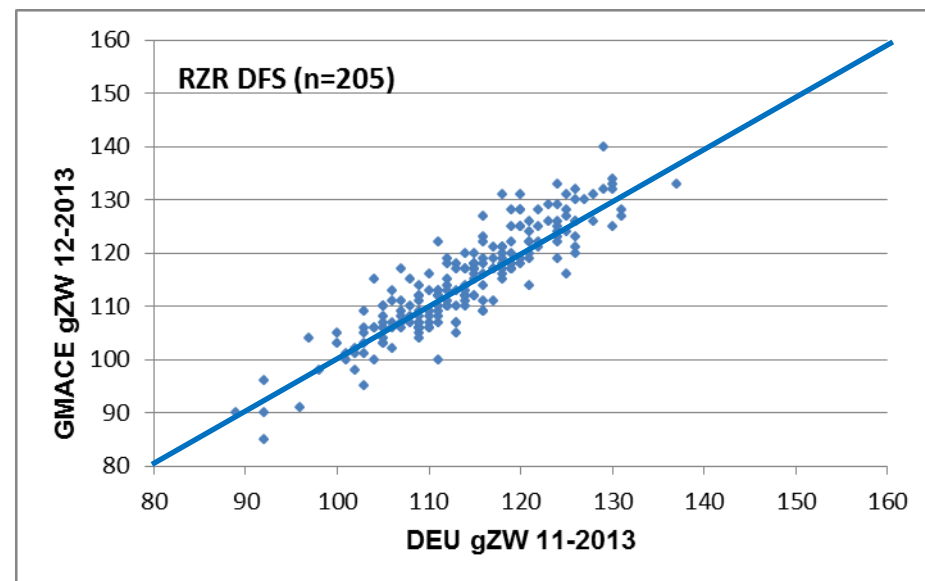
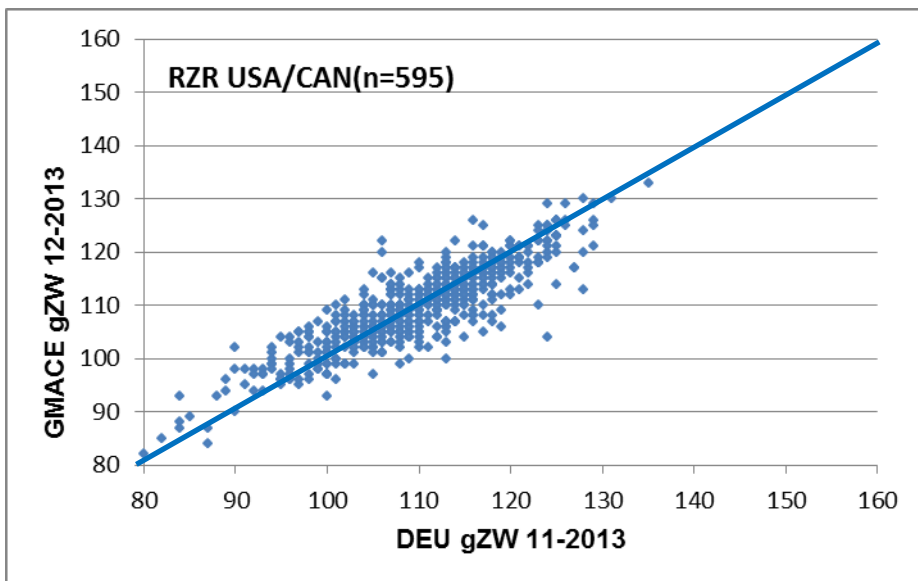
Longevity RZN



- \emptyset DEU-gZW: 123.5
- \emptyset n countries: 4.3
- Diff.: -2.0 \emptyset deviation: ± 5.6
- GMACE-gEBV longevity are systematic as lower compared to DEU-gEBV as is in German validation in practice
- → GMACE-gEBV are realistic
- DFS: no GMACE longevity

Comparison of GMACE/DEU gEBV by country-of-origin

Daughter fertility index RZR



■ $\bar{\varnothing}$ DEU-gEBV: 109.9

■ $\bar{\varnothing}$ n countries: 4.3

■ Diff.: -0.1 $\bar{\varnothing}$ deviation: ± 4.3

■ Diff.-NRc: +0.1 $\bar{\varnothing}$ deviation: ± 5.6

■ Diff.-FLc: +0.9 $\bar{\varnothing}$ deviation: ± 5.3

■ $\bar{\varnothing}$ DEU-gEBV: 114.7

■ $\bar{\varnothing}$ n countries: 1.9

■ Diff.: -0.7 $\bar{\varnothing}$ deviation: ± 4.2

■ Diff.-NRc: +1.7 $\bar{\varnothing}$ deviation: ± 4.5

■ Diff.-FLc: +0.7 $\bar{\varnothing}$ deviation: ± 4.1

■ GMACE-gEBV are almost always a mix of IB- + DEU-gEBV

■ Single fertility traits: overall slightly higher GMACE-gEBV compared to DEU-gEBV

- Problem of DEU-evaluation, or of GMACE (DEU fert. gEBV have low reliability)?





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Evaluation of GMACE-Pilot-Runs MP50 and GP50 December 2013

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Genetic Evaluation Division

Background and data

- IB used same national data as for implementation-run Dec. 2013
 - But with pilot runs all animals are distributed
 - Implementation-run: ca. 22,000 A.I. bulls
 - Pilot-runs: ca. 95,000 males (A.I. bulls + selection candidates)

- **Two pilot-runs:**
 - GP50: reliability weighted 50% national rel., 50% theoretical rel. (size reference pop.)
 - MP50: reliability weighted + MACE variance instead of genomic variance
 - *Background:*
 - *no international harmonization of national calculation of gEBV reliability*
 - *Some countries with small reference population seem to calculate relatively high reliabilities*
 - *Parameters from MACE may not be correct for GMACE*

- **Evaluation/comparison:**
 - With implementation-run i.e. only A.I. bulls that were in implementation-run
 - Only HOL bulls



Comparison of GMACE/DEU gEBV

Variable	gZW DEU	Implem.	s Diff.
<i>ncou_prod</i>		847	
RZM	120,50	-0,76	4,89
mkg	1153,55	47,88	228,58
fkg	42,66	-2,25	8,68
ekg	41,31	-0,70	6,95
<i>ncou_prod</i>		847	
RZE	117,57	0,44	4,02
gro	109,84	-0,88	3,68
eti	116,05	-1,80	4,30
<i>ncou_prod</i>		637	
RZS	114,91	-0,41	4,93
RZN	122,91	-1,99	5,58
<i>ncou_prod</i>		843	
RZR	110,62	0,10	4,32
flc	109,90	0,86	5,29
<i>ncou_prod</i>		637	
nrc	105,02	0,78	4,98

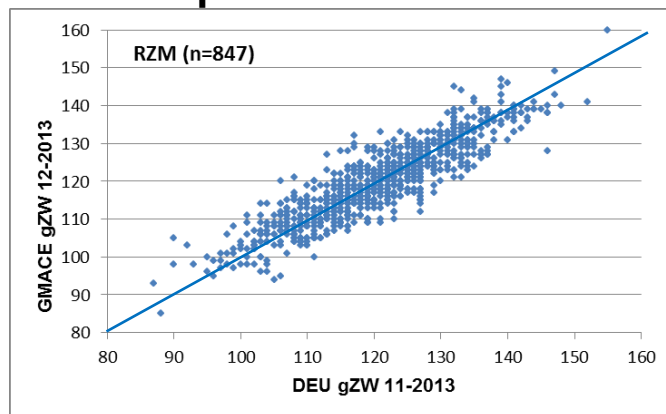
GP50	s Diff.
-0,82	4,83
47,12	227,65
-2,31	8,63
-0,77	6,87
0,18	3,82
-0,99	3,48
-1,84	4,34
-0,39	4,94
-2,68	5,30
-0,30	4,31
0,48	4,56
0,47	4,96

MP50	s Diff.
-1,49	4,59
28,50	218,43
-3,52	8,28
-1,67	6,50
-0,28	3,50
-1,22	3,41
-2,57	4,36
-1,16	4,57
-3,10	5,13
-0,47	4,17
0,29	8,71
0,29	4,76

- Only small differences for average gEBV and average deviation

Comparison of GMACE/DEU gEBV

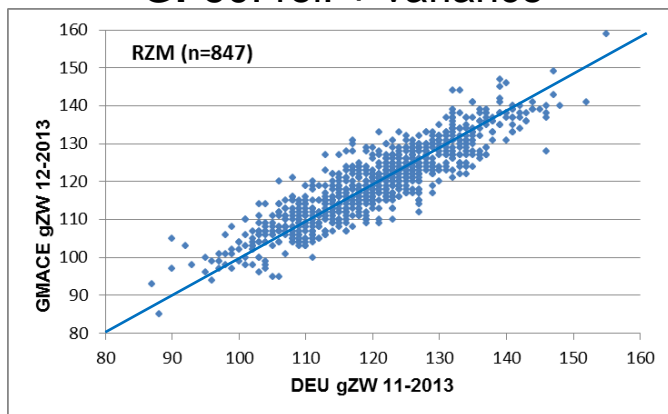
■ Implementation-run



RZM =
production index
Scale: $\emptyset=100$, $s=12$

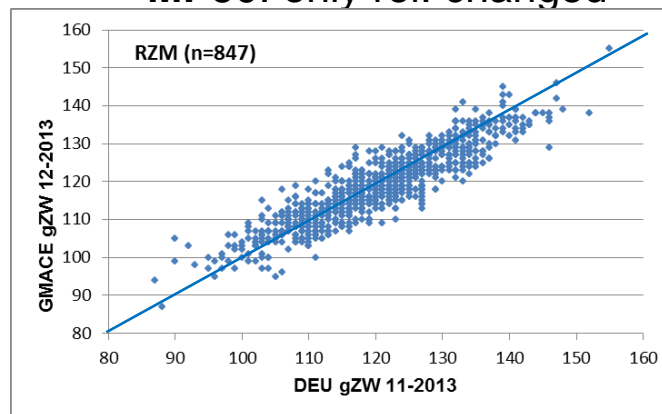
■ Diff.: -0.76
 \emptyset deviation: ± 4.89

■ GP50: rel. + variance



■ Diff.: -0.82 \emptyset deviation: ± 4.83

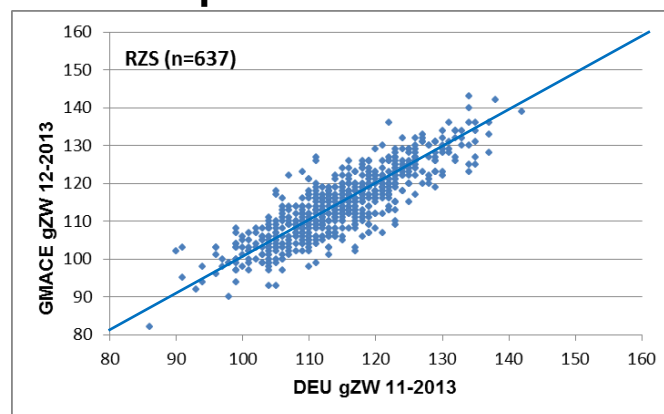
■ MP50: only rel. changed



■ Diff.: -1.49 \emptyset deviation: ± 4.59

Comparison of GMACE/DEU gEBV

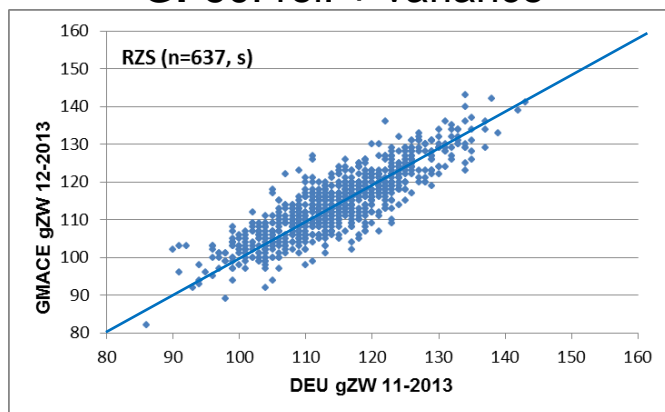
Implementation-run



RZS =
SCS relative reversed
Scale: $\emptyset=100$, $s=12$

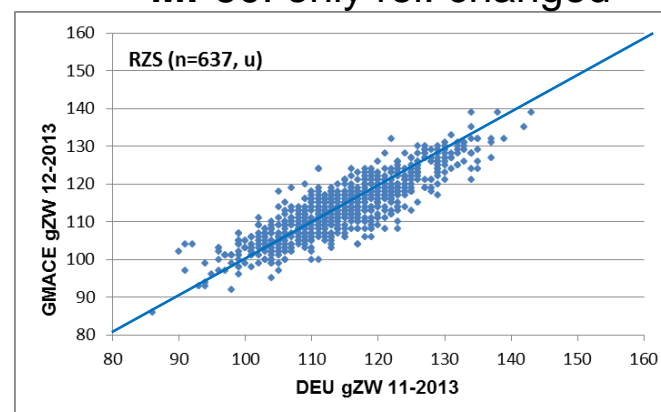
■ Diff.: -0.41
 \emptyset deviation: ± 4.93

GP50: rel. + variance



■ Diff.: -0.39 \emptyset deviation: ± 4.94

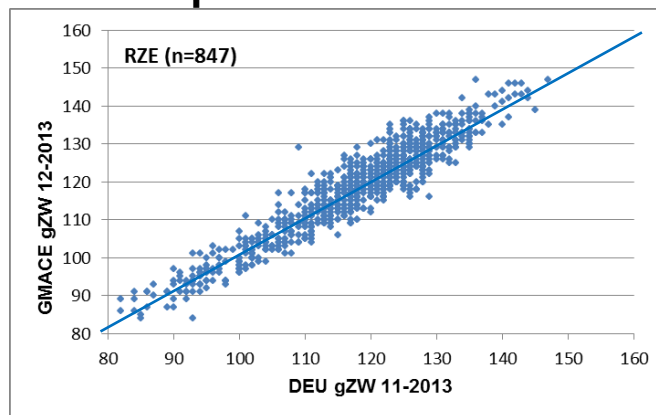
MP50: only rel. changed



■ Diff.: -1.16 \emptyset deviation: ± 4.57

Comparison of GMACE/DEU gEBV

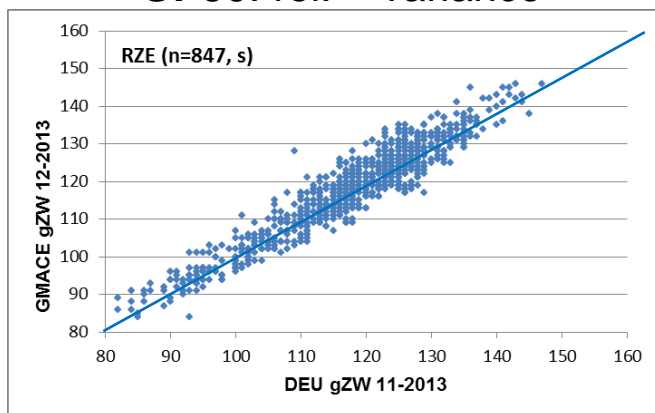
■ Implementation-run



■ Diff.: +0.44
 ∅ deviation: ± 4.02

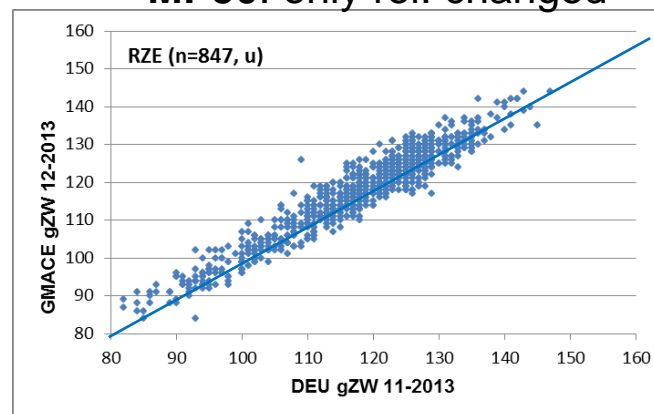
RZE =
conformation index
 Scale: ∅=100, s=12

■ GP50: rel. + variance



■ Diff.: +0.18 ∅ deviation: ± 3.82

■ MP50: only rel. changed

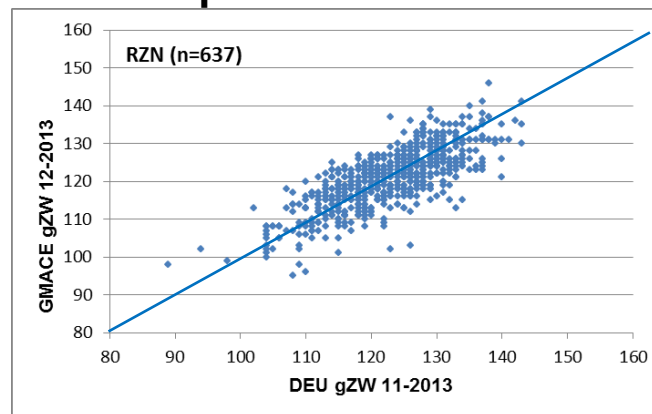


■ Diff.: -0.28 ∅ deviation: ± 3.50



Comparison of GMACE/DEU gEBV

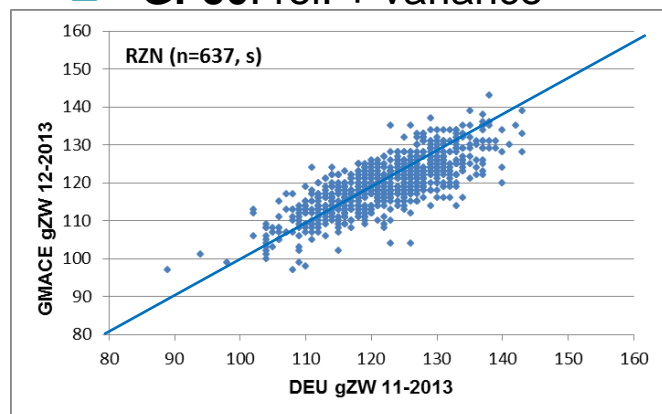
■ Implementation-run



■ Diff.: -1.99
 ∅ deviation: ± 5.58

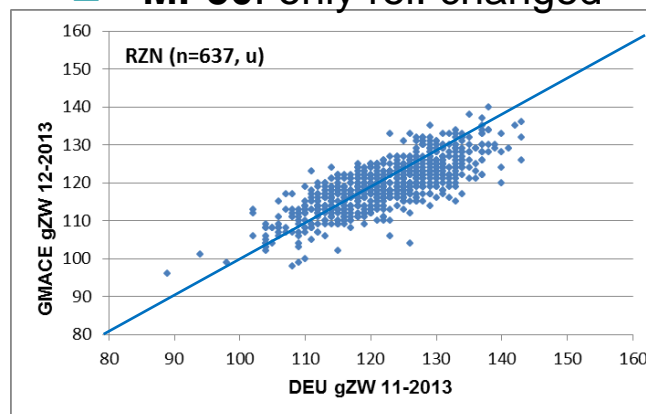
RZN =
longevity
 Scale: ∅=100, s=12

■ GP50: rel. + variance



■ Diff.: -2.68 ∅ deviation: ± 5.30

■ MP50: only rel. changed



■ Diff.: -3.10 ∅ deviation: ± 5.13



Additional aspects

- *What reliability is (more) correct?*
 - *National reliability*
 - *or theoretical reliability*

- DEU-rel. for SCS are relatively higher compared to international SCS-rel.
 - But from validation in practice with now almost 2,000 A.I. bulls with >100 daughters we know that this high reliability seems even under-estimated

- DEU-rel. for daughter fertility are relatively low
 - But from validation in practice with now almost 2,000 A.I. bulls with >100 daughters we know that this relatively low reliability seems correct



Conclusions

- No clear indication that modification of reliability towards “theoretical” reliability gives better (=more realistic) results across all countries and traits
- The single effect of using genomic variance is hard to derive from these pilots because it is only available in conjunction with changed reliabilities
- → **IB should stay with the procedure in implementation-runs**
- → and accelerate harmonization of national calculation of reliabilities

