

SS claw evaluation, preliminary results. 2022, USN

10 August

The current official claw evaluation is multi trait evaluation with 7 claw traits evaluated in 3 lactations. Traits and frequencies in first lactation for the last year are shown in table 1.

The evaluation is done in DMU, and the evaluation was changed to MIX99. The traditional evaluation was redone in MIX99, with the only change, that the pedigree was changed, so it also included genotyped animals and the pedigree were built in the same manner as for SS-type. The only change was caused by other phenotypic data than for type traits. EBV's from DMU and MIX99 were compared. 21 indexes were calculated in all evaluations (7 traits and 3 lactations). Bulls with min. 50 progenies in first lactation were compared. Results are shown in table 2. Standard deviations of raw solutions for traits in first lactation are shown. SD for the first 4 traits is bigger than for last 3 three traits especially for JER. Correlations between result were above 0,99 for most traits. Three runs per breed were performed:

1. A traditional evaluation where phenotypic data for progeny of genotyped bulls born after 2014 were deleted. Same pedigree kept. (called red EBV).
2. A Single Step evaluation with all phenotypic data. Same traditional pedigree. (called GEBV).
3. A Single Step evaluation where phenotypic data for progeny of genotyped bulls born after 2014 were deleted. (called red GEBV).

All indexes were standardized and transformed to relative indexes. Combined indexes for the 7 traits were made, but not the overall claw index. Only indexes from first lactation were used in the analyses to ensure, that reduced indexes include information from phenotypes.

Three forms of regressions were made for genotyped bulls with min. 50 daughters in the full data for bulls born after 2014:

1. EBV on red EBV. It is the same as Legara/Reverter on traditional model on pedigree indexes (model 1).
2. Full EBV on red GEBV. The test shows if genomic information adds extra information, compared to pedigree index. IF r^2 for this model (model 2) is bigger for model 1, then genomic information adds information compared pedigree information. The model avoid autocorrelation between full and reduced dataset on the genomic part.
3. GEBV on red GEBV. It is the same as Legara/Reverter regression. (Model3)

Results are shown tables 3-5. Results from model 1, where traditional EBV's from full and reduced model, show b_1 below 1 and r^2 in the expected range. When reduced EBV's are substituted by reduced GEBV's in model 2 r^2 increase. This is a clear indication, that genomic information add value to the pedigree information about the true EBV for the animal. The genomic test will add additional information and this is the reason, why r^2 for model 3 are even higher. This value may be an overprediction, because the same genomic information is included in GEBV and reduced GEBV.

Table 1. Klovlidelser i 1. laktation hos RDC-, Holstein- og Jerseykøer
Claw diseases in 1st lactation in red breeds, Holstein and Jersey , 2021-2022

Forekomst i % / Occurrence in %	RDC			Holstein			JER
	DNK	SWE	FIN	DNK	SWE	FIN	DNK
Dermatitis (Digital + spaltebet.) / <i>Dermatitis</i>	20,9	10,3	2,3	26,6	13,0	4,1	15,2
Balleforrådnelse / <i>Heel horn erosion</i>	2,9	5,8	4,6	6,0	3,4	4,6	2,2
Såleblødning / <i>Sole heamorrhage</i>	14,5	13,7	6,9	19,9	14,9	8,0	9,6
Sålesår / <i>Sole ulcer</i>	2,8	2,4	1,8	2,3	1,9	2,2	4,6
Proptrækker klov / <i>Cork screw claws</i>	4,3	2,3	3,7	5,1	1,5	2,2	5,0
Nydannelse + digital vorte / <i>Skin proliferation</i>	3,4	1,8	1,1	2,9	1,9	1,3	1,0
Hul væg + dobbelt sål / <i>White line separation + Double sole</i>	6,9	1,5	4,0	7,3	1,8	6,2	5,2

Table 2. Correlations between indexes in first lactation calculated in DMU and Mix99. SD for raw indexes for bulls with more than 50 progenies with data.

Trait	HOL		RDC		JER	
	SD	Correlation	SD	Correlation	SD	Correlation
dde1	0.07982	0.999	0.05561	0.998	0.08240	0.988
hhe1	0.05583	0.997	0.07174	0.995	0.02556	0.979
sh1	0.06091	0.996	0.08624	0.993	0.05125	0.976
su1	0.04666	0.996	0.03405	0.991	0.03761	0.979
clc1	0.00767	0.994	0.01702	0.992	0.00564	0.970
skp1	0.02681	0.999	0.01953	0.997	0.00739	0.979
wls1	0.01191	0.996	0.00961	0.987	0.00463	0.982

Table 3. Results of different regressions for HOL. See text.

	EBV on red EBV		EBV on red GEBV		GEBV on red GEBV		GEBV on red GEBV VG bulls		
	B1	R2	B1	R2	B1	R2	B1	R2	Bias
dde1	0,78	0,22	0,80	0,49	0,95	0,65	0,96	0,64	-0,9
hhe1	0,72	0,27	0,71	0,44	0,87	0,64	0,84	0,57	0,4
sh1	0,67	0,17	0,72	0,44	0,92	0,63	0,92	0,63	0,7
su1	0,68	0,15	0,73	0,38	0,88	0,53	0,86	0,52	0,9
clc1	0,77	0,26	0,69	0,42	0,91	0,63	0,91	0,60	2.3
skp1	0,75	0,25	0,74	0,47	0,87	0,61	0,87	0,59	-0,4
wls1	0,97	0,22	0,82	0,41	1,05	0,63	1,05	0,63	-1,1
N	310		310		310		236		

Table 4. Results of different regressions for RDC. See text

	EBV on red EBV		EBV on red GEBV		GEBV on red GEBV	
N	B1	R2	B1	R2	B1	R2
dde1	0,96	0,40	0,96	0,53	1,04	0,64
hhe1	1,02	0,35	0,91	0,46	1,04	0,63
sh1	0,95	0,32	0,89	0,50	1,02	0,62
su1	0,99	0,31	0,94	0,49	1,06	0,61
clc1	0,83	0,35	0,87	0,45	0,98	0,58
skp1	0,88	0,34	0,92	0,50	1,02	0,60
wls1	1,16	0,50	1,02	0,61	1,14	0,73
N	169		169		169	

Table 5. Results of different regressions for JER. See text

	EBV on red EBV		EBV on red GEBV		GEBV on red GEBV	
	B1	R2	B1	R2	B1	R2
dde1	1,21	0,35	0,94	0,53	1,02	0,62
hhe1	0,99	0,34	0,87	0,52	1,04	0,66
sh1	0,92	0,37	1,04	0,49	1,09	0,54
su1	0,97	0,39	0,94	0,47	1,03	0,58
clc1	1,51	0,52	1,19	0,48	1,36	0,62
skp1	1,02	0,30	0,92	0,45	1,02	0,55
wls1	1,14	0,50	1,06	0,51	1,17	0,60
N	78		78		78	

New March 2023

Single Step evaluation were redone on data used for official evaluation in February 2023. Polygenic effect of 0.3 was applied. The evaluation was also redone with a polygenic effect of 0.1. The lower polygenic effect was tested because Dutch results indicate the bias in genetic trend will be reduced with lower polygenic effect. It has been tested for production in Holland. The first Single Step results for claw do not indicate a big bias. Results for from the official evaluation, SS evaluation August 2022, SS evaluation February 2023, SS evaluation February 2023 with polygenic effect of 0.1, and reduced evaluation with progeny excluded for bulls born after 2014 and based on August 2022 data were correlated. Results for dermatitis in first lactation for VG bulls are shown in the table below. Evaluations based on August 2022 data were standardized to 2012-2014 base years, whereas evaluations based on February 2023 data were standardized to 2018-2020 based year. The difference in base years has a minor effect in level but no in correlations and standard deviations. In general, applying a polygenic of 0.1 effect of instead 0.3 have very little effect. Earlier investigations for type traits had indicated that using a polygenic effect 0.3 gives the expected weight between the genomic part and the phenotypic part, when animals have both information sources. The results indicate that the SS model is performing as expected. Results for dermatitis 1st lactation are shown.

HOL, 1st lactation dermatitis

VG Bulls born 2015, 2016 with a least 30 observations in 1st lactation.

Simple Statistics

Variable	N	Mean	Std Dev	Sum	Minimum	Maximum	Label
rbv1	160	103.95000	12.37049	16632	72.00000	142.00000	Official Feb23
gebv1	160	104.35000	12.42649	16696	73.00000	143.00000	Feb23 pol=0.3
gebv10_1	160	104.32500	12.32094	16692	73.00000	143.00000	Feb23 pol=0.1
pgebv1	160	105.28125	12.25113	16845	74.00000	144.00000	Aug2 pol=0.3
rgebv1	160	104.24375	10.33693	16679	78.00000	137.00000	Red Aug22 pol_0.3

Pearson Correlation Coefficients, N = 160

Prob > |r| under H0: Rho=0

	rbv1	gebv1	gebv10_1	pgebv1	rgebv1
rbv1 Official Feb23	1.00000	0.98977 <.0001	0.98157 <.0001	0.98072 <.0001	0.73663 <.0001
gebv1 Feb23 pol=0.3	0.98977 <.0001	1.00000	0.99790 <.0001	0.99411 <.0001	0.78978 <.0001
gebv10_1 Feb23 pol=0.1	0.98157 <.0001	0.99790 <.0001	1.00000	0.99442 <.0001	0.80805 <.0001
pgebv1 Aug2 pol=0.3	0.98072 <.0001	0.99411 <.0001	0.99442 <.0001	1.00000	0.79824 <.0001
rgebv1 Red Aug22 pol_0.3	0.73663 <.0001	0.78978 <.0001	0.80805 <.0001	0.79824 <.0001	1.00000

HOL VG bulls born 2019, 2020 and 2021

Simple Statistics

Variable	N	Mean	Std Dev	Sum	Minimum	Maximum	Label
rbv1	0	.	.	.	.	.	Official Feb23
gebv1	221	107.83258	11.25466	23831	76.00000	139.00000	Feb23 pol=0.3
gebv10_1	221	108.12670	11.63038	23896	76.00000	142.00000	Feb23 pol=0.1
pgebv1	221	108.19457	10.56164	23911	79.00000	138.00000	Aug2 pol=0.3
rgebv1	221	107.43439	9.19296	23743	80.00000	135.00000	RedAug22pol=0.3

Pearson Correlation Coefficients

Prob > |r| under H0: Rho=0

Number of Observations

	rbv1	gebv1	gebv10_1	pgebv1	rgebv1
rbv1	.	.	.	.	.
Official Feb23	.	.	.	.	.
	0	0	0	0	0
gebv1	.	1.00000	0.99599	0.98212	0.88648
Feb23 pol=0.3	.	.	<.0001	<.0001	<.0001
	0	221	221	221	221
gebv10_1	.	0.99599	1.00000	0.98137	0.89491
Feb23 pol=0.1	.	<.0001	.	<.0001	<.0001
	0	221	221	221	221
pgebv1	.	0.98212	0.98137	1.00000	0.91891
Aug2 pol=0.3	.	<.0001	<.0001	.	<.0001
	0	221	221	221	221
rgebv1	.	0.88648	0.89491	0.91891	1.00000
Red Aug22 pol_0.3	.	<.0001	<.0001	<.0001	.
	0	221	221	221	221

RDC, 1st lactation dermatitis

VG Bulls born 2015, 2016 with a least 30 observations in 1st lactation.

Variable	N	Mean	Std Dev	Sum	Minimum	Maximum	Label
rbv1	139	101.28058	11.53195	14078	69.00000	133.00000	Official Feb23
gebv1	139	101.23741	11.51092	14072	70.00000	128.00000	Feb23 pol=0.3
gebv10_1	139	101.30935	11.38258	14082	70.00000	128.00000	Feb23 pol=0.1
pgebv1	139	102.10072	11.12596	14192	68.00000	128.00000	Aug2 pol=0.3
rgebv1	139	102.52518	8.95021	14251	80.00000	127.00000	Red Aug22 pol_0.3

Pearson Correlation Coefficients, N = 139

Prob > |r| under H0: Rho=0

	rbv1	gebv1	gebv10_1	pgebv1	rgebv1
rbv1 Official Feb23	1.00000	0.96300 <.0001	0.94135 <.0001	0.94471 <.0001	0.70162 <.0001
gebv1 Feb23 pol=0.3	0.96300 <.0001	1.00000	0.99632 <.0001	0.98257 <.0001	0.79878 <.0001
gebv10_1 Feb23 pol=0.1	0.94135 <.0001	0.99632 <.0001	1.00000	0.98181 <.0001	0.82306 <.0001
pgebv1 Aug2 pol=0.3	0.94471 <.0001	0.98257 <.0001	0.98181 <.0001	1.00000	0.81456 <.0001
rgebv1 Red Aug22 pol_0.3	0.70162 <.0001	0.79878 <.0001	0.82306 <.0001	0.81456 <.0001	1.00000

RDC VG bulls born 2019, 2020 and 2021

Variable	N	Mean	Std Dev	Sum	Minimum	Maximum	Label
rbv1	0	.	.	.	.	.	Official Feb23
gebv1	216	104.03704	8.46709	22472	81.00000	133.00000	Feb23 pol=0.3
gebv10_1	216	104.40741	9.02816	22552	81.00000	134.00000	Feb23 pol=0.1
pgebv1	216	104.76389	8.32283	22629	81.00000	132.00000	Aug2 pol=0.3
rgebv1	216	105.05093	7.17892	22691	86.00000	128.00000	Red Aug22 pol_0.3

Pearson Correlation Coefficients
 Prob > |r| under H0: Rho=0
 Number of Observations

	rbv1	gebv1	gebv10_1	pgebv1	rgebv1
rbv1	.	.	.	.	.
Official Feb23	.	.	.	.	.
	0	0	0	0	0
gebv1	.	1.00000	0.99268	0.96685	0.87374
Feb23 pol=0.3	.	.	<.0001	<.0001	<.0001
	0	216	216	216	216
gebv10_1	.	0.99268	1.00000	0.96451	0.87842
Feb23 pol=0.1	.	<.0001	.	<.0001	<.0001
	0	216	216	216	216
pgebv1	.	0.96685	0.96451	1.00000	0.89573
Aug2 pol=0.3	.	<.0001	<.0001	.	<.0001
	0	216	216	216	216
rgebv1	.	0.87374	0.87842	0.89573	1.00000
Red Aug22 pol_0.3	.	<.0001	<.0001	<.0001	.
	0	216	216	216	216

JER, 1st lactation dermatitis

VG Bulls born 2015, 2016 with a least 30 observations in 1st lactation.

rbv1	54	99.24074	13.23223	5359	65.00000	124.00000	Official Feb23
gebv1	54	99.31481	13.43584	5363	67.00000	126.00000	Feb23 pol=0.3
gebv10_1	54	99.33333	13.34308	5364	67.00000	126.00000	Feb23 pol=0.1
pgebv1	54	98.88889	13.31571	5340	68.00000	127.00000	Aug2 pol=0.3
rgebv1	54	99.50000	10.61105	5373	80.00000	120.00000	Red Aug22 pol_0.3

Pearson Correlation Coefficients, N = 54
 Prob > |r| under H0: Rho=0

	rbv1	gebv1	gebv10_1	pgebv1	rgebv1
rbv1	1.00000	0.99079	0.98312	0.98148	0.78068
Official Feb23		<.0001	<.0001	<.0001	<.0001
gebv1	0.99079	1.00000	0.99829	0.99365	0.81755
Feb23 pol=0.3		<.0001	<.0001	<.0001	<.0001
gebv10_1	0.98312	0.99829	1.00000	0.99377	0.83169
Feb23 pol=0.1		<.0001		<.0001	<.0001
pgebv1	0.98148	0.99365	0.99377	1.00000	0.82326
Aug2 pol=0.3		<.0001	<.0001		<.0001
rgebv1	0.78068	0.81755	0.83169	0.82326	1.00000
Red Aug22 pol_0.3		<.0001	<.0001	<.0001	

JER VG bulls born 2019, 2020 and 2021

Variable	N	Mean	Std Dev	Sum	Minimum	Maximum	Label
rbv1	0	.	.	.	.	.	Official Feb23
gebv1	121	100.23967	9.74083	12129	61.00000	117.00000	Feb23 pol=0.3
gebv10_1	121	100.20661	10.22409	12125	62.00000	119.00000	Feb23 pol=0.1
pgebv1	121	99.83471	10.00196	12080	60.00000	118.00000	Aug2 pol=0.3
rgebv1	121	99.33884	7.35250	12020	81.00000	118.00000	Red Aug22 pol_0.3

Pearson Correlation Coefficients
 Prob > |r| under H0: Rho=0
 Number of Observations

	rbv1	gebv1	gebv10_1	pgebv1	rgebv1
rbv1	.	.	.	.	.
Official Feb23	.	.	.	.	.
	0	0	0	0	0
gebv1	.	1.00000	0.99407	0.97233	0.77204
Feb23 pol=0.3	.	.	<.0001	<.0001	<.0001
	0	121	121	121	121
gebv10_1	.	0.99407	1.00000	0.96747	0.78226
Feb23 pol=0.1	.	<.0001	.	<.0001	<.0001
	0	121	121	121	121
pgebv1	.	0.97233	0.96747	1.00000	0.79422
Aug2 pol=0.3	.	<.0001	<.0001	.	<.0001
	0	121	121	121	121
rgebv1	.	0.77204	0.78226	0.79422	1.00000
Red Aug22 pol_0.3	.	<.0001	<.0001	<.0001	.
	0	121	121	121	121