Participation of Croatian dairy breeds in Interbull test-run for production traits

Špehar M.[1], Štepec M. [2] Ivkić Z.[1], Lučić M.[1], Smetko A.[1], Dražić M.[1], Barać Z.[1]

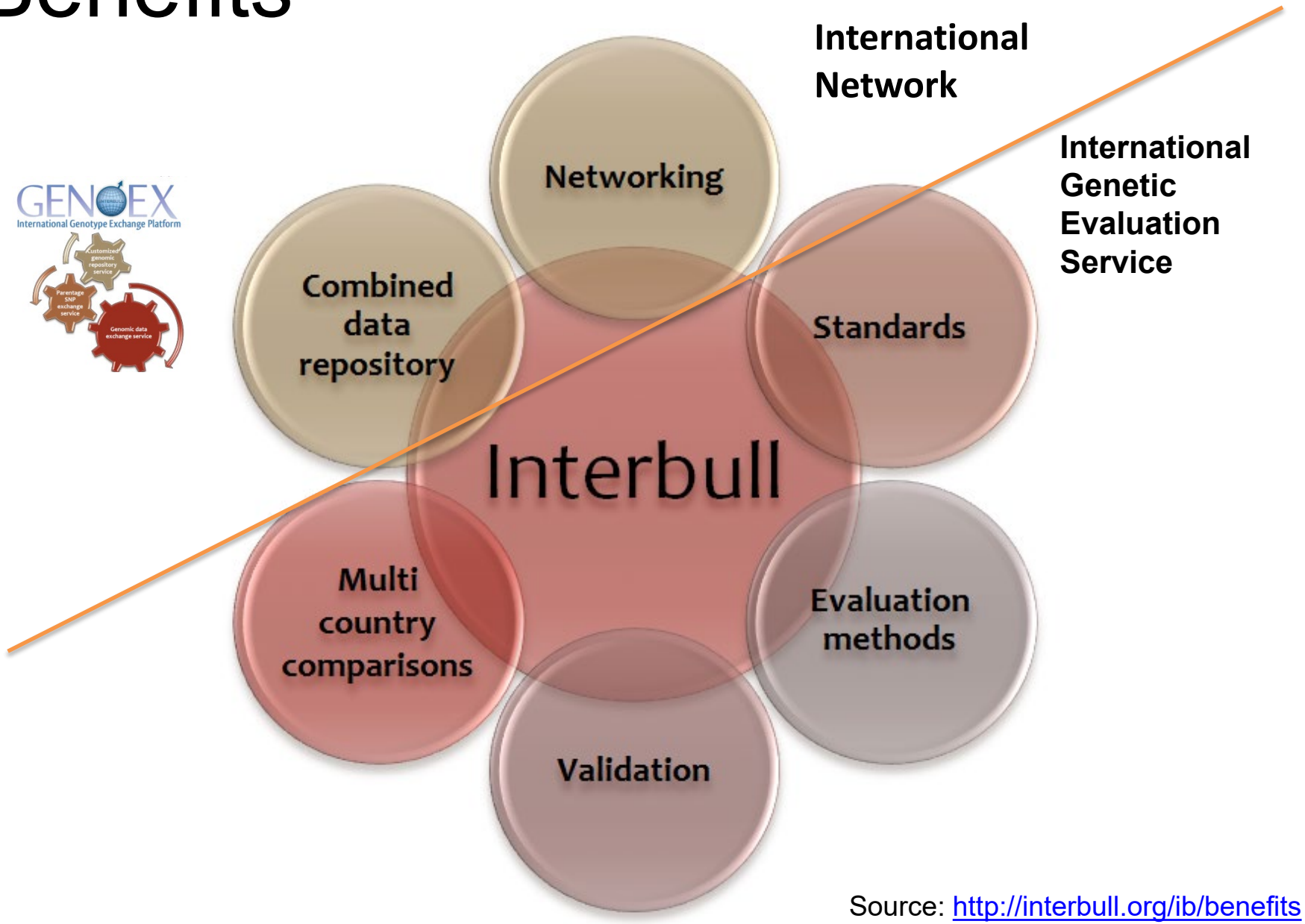
[1]Croatian Agricultural Agency, Ilica 101, 10000 Zagreb, Croatia
[2]University of Ljubljana, Biotechnical Fac., Animal Science Dep., Groblje 3, 1260 Domžale, Slovenia

Introduction

International **B**ull **E**valuation **S**ervice

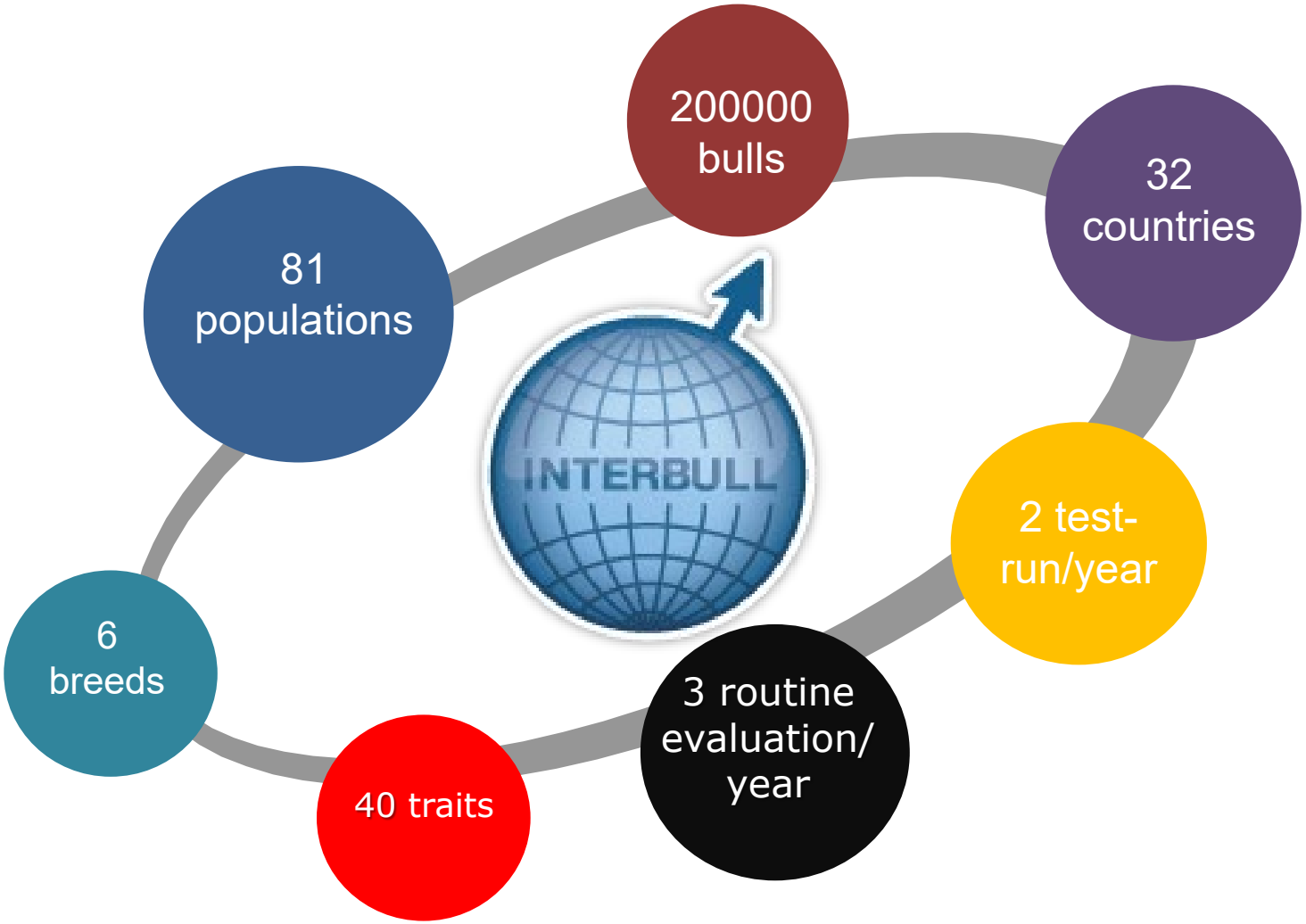
Non-profit organization responsible for promotion, development and the standardization of international genetic evaluation of dairy cattle

Benefits



Source: http://interbull.org/ib/benefits

Interbull (from 1994)

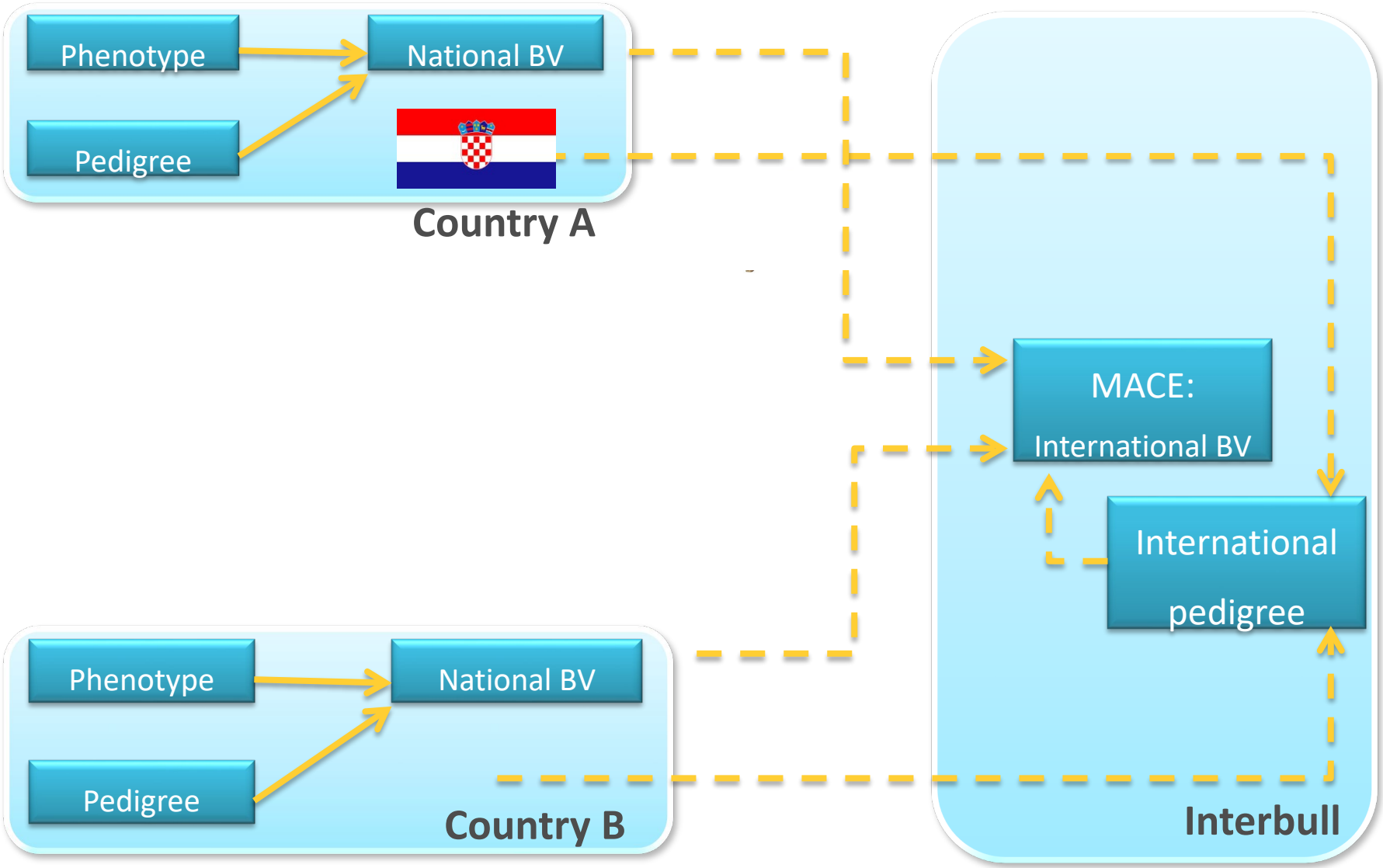


Source: http://interbull.org/ib/benefits

Objective

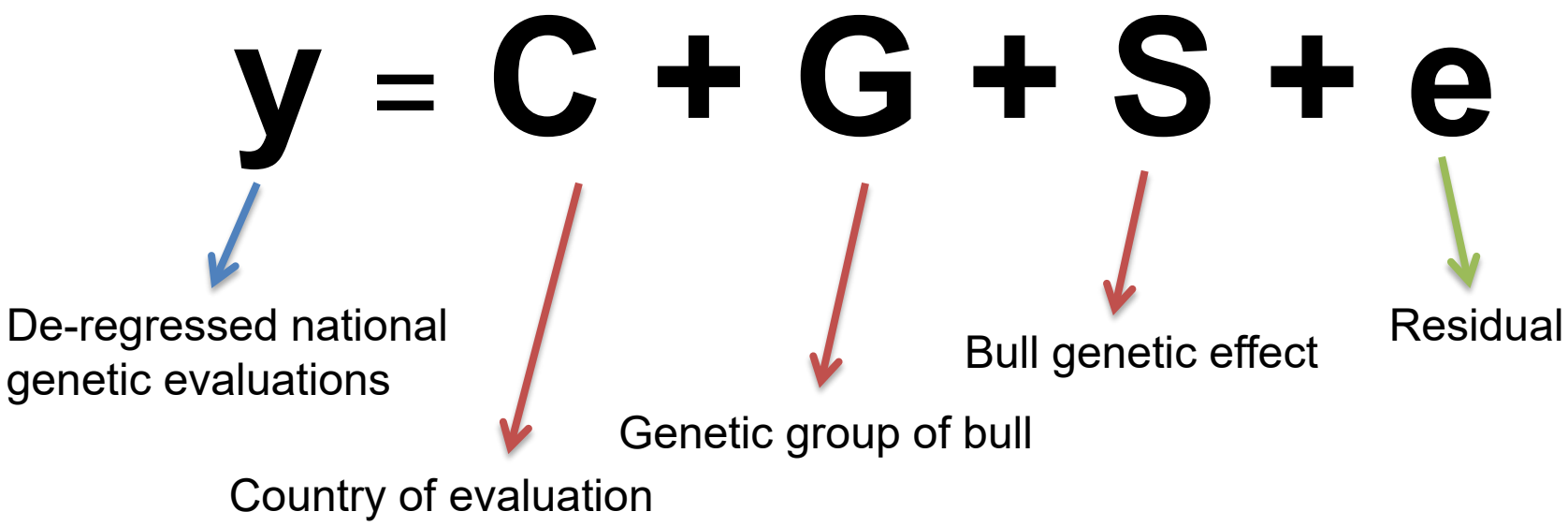
- To calculate across country genetic correlations of production traits
  - Milk (MY), fat (FY), and protein yield (PY)
  - Holstein and Simmental bulls
- Comparison of BV for bulls
  - All bulls on all scales
  - All bulls on national scale

Material and data stream

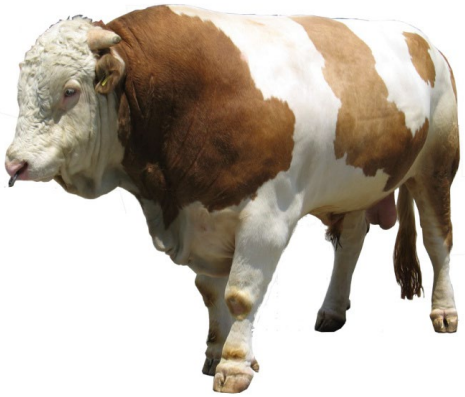


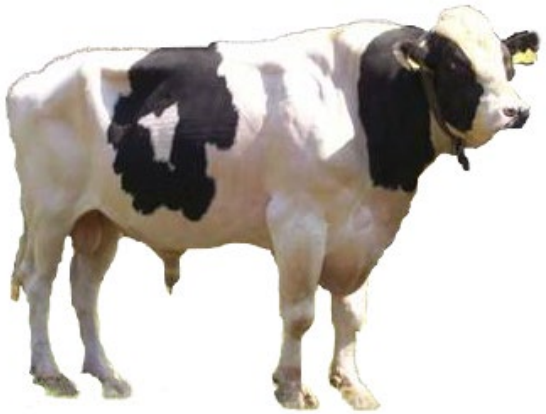
Method

- Multiple Across Country Evaluation (MACE)
  - Use of all known relationships between animals
  - Genotype by environment interactions



Results





Country	BSW	GUE	HOL	JER	RDC	SIM
ARG			1313			
AUS		117	6618	1487	604	
BEL			1008			
CAN	196	91	10321	557	708	
CHE	2801		1162			3143
CHR			1867			
CZE			3667			
DEA	5415					21469
DEU			24870	116	385	
DFS			11719	1907	6983	
ESP			2910			
EST			866		362	
FRA	327		15365			366
FRR			200			
GBR	117	305	6036	799	510	85
HUN			2758			190
IRL			1949	98	34	81
ISR			1170			
ITA	1881		9064	158		1367
JPN			4814			
KOR			999			
LTU			577		369	
LVA			813		651	
NLD	148		13515	109	49	255
NZL	44	58	6493	4203	1200	
POL			8078			
PRT			2227			
SVK			968			522
SVN	300		360			427
URY			787			
USA	963	723	32674	3720	593	
HRV			558			692
No.Records	12192	1331	176917	13787	16206	32675
Pub. Proofs	10086	1071	138676	11381	14685	29939

Bulls with daughters in national evaluation

Origin	Daughters					
	n_bulls	sum	mean	std	min	max
DEU	201	19,922	99	241	6	2,061
NLD	113	18,913	167	478	8	3,861
USA	86	11,902	138	329	12	2,890
HRV	37	19,401	524	650	17	2,781
CAN	20	697	35	20	8	84
FRA	15	812	54	62	8	203
HUN	8	7,090	886	831	26	1,994
ITA	8	1,735	217	356	8	907
AUT	3	122	41	34	17	80
DNK	2	249	125	63	80	169
BEL	1	33	33		33	33
CHE	1	120	120		120	120
LUX	1	2,866	2,866		2,866	2,866
Sum	496	83,862	169	415	6	3,861

Origin	Daughters					
	n_bulls	sum	mean	std	min	max
DEU	255	45,058	177	389	7	2,582
HRV	255	80,520	316	522	9	3,725
AUT	176	14,273	81	205	7	1,504
CZE	4	99	25	5	20	30
CHE	1	12	12		12	12
ITA	1	144	144		144	144
Sum	692	140,106	202	419	7	3,725

Genetic correlations among HRV and other countries for production traits

	CAN	DEU	DFS	FRA	ITA	NLD	USA	CHE	NZL	AUS	IRL	ESP	CZE	SVN	ISR	HUN	POL
MY	0.85	0.85	0.85	0.85	0.85	0.85	0.85	0.86	0.75	0.75	0.76	0.85	0.85	0.86	0.76	0.85	0.85
FY	0.86	0.85	0.85	0.85	0.85	0.85	0.85	0.86	0.76	0.76	0.76	0.85	0.85	0.86	0.77	0.85	0.85
PY	0.86	0.85	0.85	0.85	0.85	0.85	0.85	0.86	0.76	0.76	0.76	0.85	0.85	0.86	0.77	0.85	0.85

	CHE	DEA	ITA	SVN	FRA	HUN	NLD	IRL	SVK	GBR
MY	0.87	0.85	0.85	0.86	0.86	0.87	0.86	0.77	0.86	0.86
FY	0.87	0.85	0.85	0.86	0.86	0.87	0.86	0.77	0.86	0.86
PY	0.87	0.85	0.85	0.86	0.86	0.87	0.86	0.77	0.86	0.86

Comparison on different scales

Animal		CAN		DEU		DFS		HRV		NLD		USA	
		nDau.	Rel.	nDau.	Rel.	nDau.	Rel.	nDau.	Rel.	nDau.	Rel.	nDau.	Rel.
HOLCANM000007588022	GILLETTE JORDAN	5789	0.99	1490	0.99	299	0.98	0	0.84	1393	0.97	1289	0.99
HOLDEUM001401957074	MALLIN	0	0.86	167	0.97	0	0.87	1614	0.99	0	0.87	0	0.85
HOLHRVM009101305414	O-MAR	0	0.75	0	0.75	0	0.75	558	0.98	0	0.75	0	0.75
HOLNLDM000339291027	PARAMOUNT	170	0.98	3824	0.99	646	0.99	161	0.96	43924	0.99	1172	0.99
HOLNLDM000387767468	MANIA	0	0.87	764	0.99	0	0.89	169	0.95	0	0.88	0	0.86
HOLNLDM000429759583	BIG WINNER	0	0.89	123	0.95	0	0.90	0	0.78	1273	0.99	0	0.85

Animal		CAN		DEU		DFS		HRV		NLD		USA	
		EBV	%R	EBV	%R	EBV	%R	EBV	%R	EBV	%R	EBV	%R
HOLCANM000007588022	GILLETTE JORDAN	421	24.1	421	35.2	103	17.1	104	40.6	479	20.9	-39	23.9
HOLDEUM001401957074	MALLIN	1285	4.5	1463	3.2	112	4.5	120	6.1	1020	6.1	754	4.3
HOLHRVM009101305414	O-MAR	-738	66.8	-59	58.6	84	63.6	93	70.2	-511	64.6	-1131	69.1
HOLNLDM000339291027	PARAMOUNT	1379	3.5	1356	4.6	117	1.6	113	17.3	1414	1.8	1030	1.9
HOLNLDM000387767468	MANIA	260	29.6	629	25.8	97	29.3	111	20.8	291	28.3	-357	36.3
HOLNLDM000429759583	BIG WINNER	26	38.3	638	25.4	97	30.7	100	50.2	10	40.9	-160	28.4

Comaprison on national scale

Animal		nDau_ib	Rel_ib	EBV_ib	%R_ib	nDau_nat	Rel_nat	EBV_nat	%R_nat
HOLCANM000007588022	GILLETTE JORDAN	0	0.85	104	40.5	2	0.44	101	53.2
HOLDEUM000345615319	ETAPPE	0	0.74	100	50.8				
HOLDEUM001401957074	MALLIN	1614	0.99	120	6.5	1614	0.99	120	3.3
HOLHRVM009101305414	O-MAR	558	0.98	93	70.1	558	0.99	93	85.4
HOLNLDM000339291027	PARAMOUNT	161	0.96	113	17.4	161	0.96	108	24.1
HOLNLDM000387767468	MANIA	169	0.95	111	22.5	169	0.95	114	10.7
HOLNLDM000429759583	BIG WINNER	0	0.78	100	49.9	1	0.34	120	3.8

All bulls on national scale

Type * Source * Trait			N_Daughter					Reliability					BV				
			n	mean	std	min	max	n	mean	std	min	max	n	mean	std	min	max
cbv	ib	mil	558	175.95	424.58	6.00	3861.00	138676	0.70	0.06	0.29	0.99	138676	99.86	14.01	40.55	155.77
		fat	558	175.00	422.25	6.00	3845.00	138675	0.70	0.06	0.20	0.99	138675	97.84	12.20	31.64	145.38
		pro	558	175.62	423.86	6.00	3857.00	138560	0.70	0.06	0.29	0.99	138560	97.79	14.02	37.41	148.49
pbv	ib	mil	0					138676	0.34	0.05	0.00	0.45	138676	99.84	12.00	49.79	137.40
		fat	0					138675	0.34	0.05	0.00	0.45	138675	97.67	9.58	45.62	132.07
		pro	0					138560	0.34	0.05	0.00	0.45	138560	97.68	12.23	48.20	135.38

Type * Source * Trait			N_Daughter					Reliability					BV				
			n	mean	std	min	max	n	mean	std	min	max	n	mean	std	min	max
cbv	ib	mil	692	202.47	418.59	7.00	3725.00	29921	0.71	0.06	0.34	0.99	29921	105.60	14.18	51.66	164.26
		fat	690	202.39	417.85	7.00	3712.00	29936	0.71	0.07	0.25	0.99	29936	105.05	13.66	48.00	161.82
		pro	692	202.19	418.10	7.00	3717.00	29905	0.70	0.07	0.29	0.99	29905	104.99	14.66	50.21	163.09
pbv	ib	mil	0					29921	0.30	0.05	0.00	0.44	29921	105.12	12.21	64.09	153.05
		fat	0					29936	0.30	0.05	0.00	0.44	29936	104.60	11.57	60.77	146.93
		pro	0					29905	0.30	0.05	0.00	0.44	29905	104.44	12.64	60.09	153.96

Correlations MY : IB_BV - IB_PA - NAT_BV

Trait - Reliab.min. - Corr.traits			ib_bv	ib_pa	nat_bv
daily milk yield	0	ib_bv	1.00	0.79	0.44
		ib_pa		1.00	0.41
		nat_bv			1.00
	50	ib_bv	1.00	0.73	0.65
		ib_pa		1.00	0.52
		nat_bv			1.00
	75	ib_bv	1.00	0.73	0.83
		ib_pa		1.00	0.58
		nat_bv			1.00
	95	ib_bv	1.00	0.76	0.99
		ib_pa		1.00	0.75
		nat_bv			1.00

Trait - Reliab.min. - Corr.traits			ib_bv	ib_pa	nat_bv
daily milk yield	0	ib_bv	1.00	0.92	0.58
		ib_pa		1.00	0.56
		nat_bv			1.00
	50	ib_bv	1.00	0.85	0.77
		ib_pa		1.00	0.64
		nat_bv			1.00
	75	ib_bv	1.00	0.83	0.92
		ib_pa		1.00	0.73
		nat_bv			1.00
	95	ib_bv	1.00	0.86	0.99
		ib_pa		1.00	0.84
		nat_bv			1.00

Correlations FY: IB_BV - IB_PA - NAT_BV

daily fat yield					
	0	ib_bv	1.00	0.76	0.37
		ib_pa		1.00	0.35
		nat_bv			1.00
	50	ib_bv	1.00	0.70	0.61
		ib_pa		1.00	0.45
		nat_bv			1.00
	75	ib_bv	1.00	0.69	0.80
		ib_pa		1.00	0.53
		nat_bv			1.00
	95	ib_bv	1.00	0.74	0.99
		ib_pa		1.00	0.72
		nat_bv			1.00

daily fat yield					
	0	ib_bv	1.00	0.92	0.53
		ib_pa		1.00	0.51
		nat_bv			1.00
	50	ib_bv	1.00	0.84	0.77
		ib_pa		1.00	0.63
		nat_bv			1.00
	75	ib_bv	1.00	0.83	0.92
		ib_pa		1.00	0.72
		nat_bv			1.00
	95	ib_bv	1.00	0.84	0.99
		ib_pa		1.00	0.82
		nat_bv			1.00

Correlations PY: IB_BV - IB_PA - NAT_BV

daily protein yield	0	ib_bv	1.00	0.81	0.44
		ib_pa		1.00	0.41
		nat_bv			1.00
	50	ib_bv	1.00	0.76	0.67
		ib_pa		1.00	0.56
		nat_bv			1.00
	75	ib_bv	1.00	0.74	0.84
		ib_pa		1.00	0.60
		nat_bv			1.00
	95	ib_bv	1.00	0.77	0.99
		ib_pa		1.00	0.76
		nat_bv			1.00

daily protein yield	0	ib_bv	1.00	0.93	0.55
		ib_pa		1.00	0.51
		nat_bv			1.00
	50	ib_bv	1.00	0.85	0.75
		ib_pa		1.00	0.61
		nat_bv			1.00
	75	ib_bv	1.00	0.83	0.91
		ib_pa		1.00	0.70
		nat_bv			1.00
	95	ib_bv	1.00	0.86	1.00
		ib_pa		1.00	0.84
		nat_bv			1.00

Conclusions

- Cooperation with Interbull
  - Breeding values of all bulls on Croatian scale
  - Possibility of bulls re-ranking between certain countries
  - Comparison of Croatian bulls in world-wide bulls population
  - Higher genetic gain
  - Genomic evaluation

Thank you for the attention