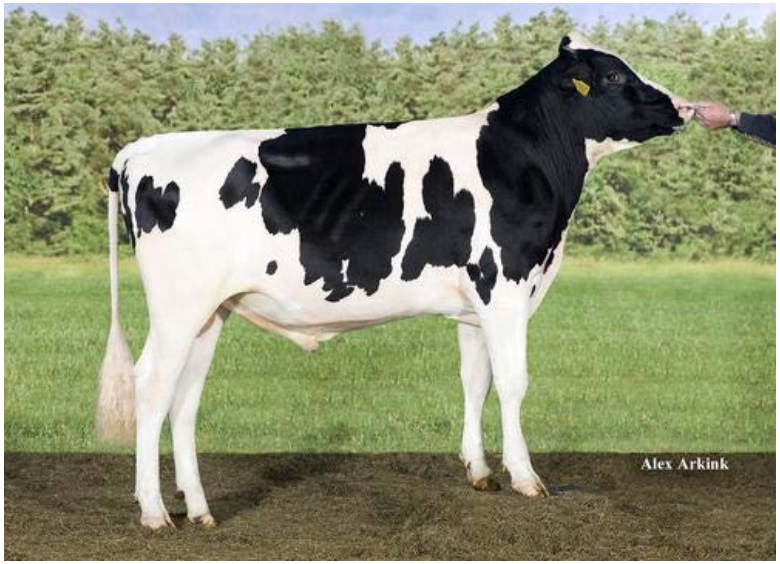
Use of genomic versus daughter proven bulls

Introduction

- Optimal % young bulls?
- What mating strategy?
- How managing risks?



Delta Cupido

Introduction

- Geneticists' point of view

$$\Delta G_{year} = \frac{i \; r_{AI} \; \sigma_A}{L}$$

i = Selection intensity

r_{AI} = Accuracy

σ_A = Genetic standard deviation

L = Generation interval

- Farmers' point of view

- Breeding company's point of view

Geneticists' point of view

Maximum • G per year

$$\Delta G_{year} = \frac{i \; r_{AI} \; \sigma_A}{L}$$

i = Selection intensity
r_{AI} = Accuracy
σ_A = Genetic standard deviation
L = Generation interval

Use bulls with highest index

- index must match your breeding goal
- breeding company : restrict • F
- farmer : avoid high F matings

Don't look at reliability

- BLUP methods take account of amount of info

Stiernaam / Bull name	Vader / Sire	M-vader / MGS	Bt Rel	NVI pnt	+/- NVI +/-	dtrs daus	Bt Rel	kgM kgM	%V %F	%E %P	kgV kgF	kgE kgP	INET €	+/- INET +/-	Bt Rel	Lvd Lon	Ugh Udh	Vru Fer	Bt Rel	F F	R R	U U	B F&L	Ext T
								Productie								Functioneel				Exterieur				
Delta Cupido	Wonder	Paramount	57	+334	+16	0	64	+903	-0.27	+0.01	+14	+32	+164	+1	46	+794	111	102	56	108	108	116	108	115
Apina Hurricane	Sunset	Ramos	57	+317	n	0	64	+928	+0.05	-0.14	+45	+19	+166	n	45	+780	111	103	56	107	103	113	107	112
Bouw Rocky	Shamrock	Goli	56	+315	+10	0	63	+1137	-0.02	+0.00	+47	+39	+264	-20	44	+778	109	101	55	105	107	112	105	111
Weelder Solution	Goliath	Laudan	56	+311	n	0	63	+1734	-0.31	-0.08	+44	+52	+305	n	45	+821	106	101	56	101	104	110	106	109
Delta Atlantic	Ramos	O Man	84	+308	+11	223	91	+527	-0.03	+0.14	+20	+30	+178	-8	60	+720	106	105	91	111	116	108	111	114
Delta Bookem Danno	Bookem	Bolton	58	+306	+18	0	65	+1386	-0.09	+0.04	+51	+52	+331	+7	46	+521	106	102	57	104	105	111	106	110
Vero Crown	Sudan	Goli	58	+304	n	0	65	+1366	+0.37	-0.08	+94	+39	+361	n	47	+574	107	99	57	105	102	109	108	110
Jhs Snowrush	Snowman	Shottle	60	+300	-7	0	66	+2492	-0.41	-0.23	+63	+61	+369	+7	49	+722	107	97	60	109	105	111	105	111
De Biesheuvel Science	Edison	Goldwyn	56	+299	n	0	63	+744	+0.09	+0.02	+40	+27	+201	n	45	+699	110	103	55	106	107	110	107	111
Lowlands Chican																						110	109	110
Vekis Chevrolet																						108	106	108
Delta Franco																						114	107	114
Buisweerd Mobil																						108	106	108
Delta Antidote																						109	108	109
Newhouse Skyfal																						109	106	109
Apina Super Hero																						109	106	109
Bouw Snowfever																						113	106	114
Bieuw Emerald E																						115	108	113
Lowlands El Salv																						111	106	110
Delta Climax																						112	108	114
Delta Alonso																						109	111	112
Lowlands Monop																						108	104	108
Vero Convoy																						112	105	111
Hbc Gabriel																						107	105	108
Delta Diverse																						111	108	111
Oosterzicht Meda																						111	106	112
Delta Sherlock																						112	114	114
Delta Casino																						108	105	108
Willem´s Hoeve F																						111	107	112
Vero Goliath																						111	104	109
Jhs Paradise																						112	106	111
Newhouse Clever																						109	104	109
Vds Metallic																						110	108	111
Bouw Snowblast																						116	101	111
Ter Beek Dani																						113	109	112
Ms Eusebio																						111	108	113
Apina Health																						105	106	108
Delta Samurai																						113	106	112
Bouw Snowflake																						114	104	112
Delta Tablet																						115	105	113
Delta Dakar																						113	108	112
Skalsumer Sylvai																						112	108	111
Delta Grafitty																						109	110	111
Delta Sightor																						112	106	112
Ensenada Iota Pepper	Altaiota	Mr Regelcreek S	59	+275	+23	0	65	+882	+0.13	+0.02	+30	+32	+244	+7	47	+407	110	103	58	109	105	111	103	110
Ms Stanley	Stan	Jeeves	56	+275	-7	0	63	+814	-0.05	-0.02	+31	+26	+174	+7	45	+538	108	104	55	105	109	113	105	112
De Biesheuvel Xavi	Gold Chip	O Man	57	+273	n	0	63	+941	+0.02	-0.18	+42	+16	+144	n	46	+537	110	102	56	111	107	113	106	114
Mars Eldorado	G-Force	Fibrax	56	+272	+4	0	63	+948	-0.01	+0.02	+40	+34	+230	-14	45	+567	107	103	56	110	108	112	104	112
Delta Craig	Edison	Cricket	56	+272	+5	0	63	+188	-0.07	+0.16	+2	+20	+99	-6	45	+815	107	106	55	104	104	112	105	110
Skalsumer Blitz	Paramount	O Man	77	+271	+26	91	84	+2182	-0.28	-0.08	+65	+67	+413	+111	59	+580	105	98	80	101	103	104	106	105
Tjebbinga Geelong	G-Force	Mascol	56	+270	+1	0	63	+763	+0.29	+0.19	+59	+43	+322	-14	45	+616	107	99	56	106	103	107	106	108
Delta Joyride	Atlantic	Paramount	60	+270	-5	0	66	+1099	-0.14	+0.07	+34	+44	+262	-1	47	+530	103	101	60	107	113	108	110	112
De Vrendt Ironic	Altaiota	Kylian	59	+270	+21	0	65	+663	+0.32	+0.08	+57	+30	+256	+23	48	+430	107	102	60	106	103	111	105	110
Lowlands Celebrity	Wonder	Peinzer Boy	57	+270	+0	0	64	+1170	-0.16	-0.07	+35	+34	+212	-1	45	+527	109	101	56	106	105	112	104	111
Apina Fast Illusion	Gofast	Ramos	60	+270	-21	0	66	+617	+0.02	-0.06	+28	+16	+123	-42	47	+668	104	106	60	104	108	112	108	112

CRV bulls >10 months old

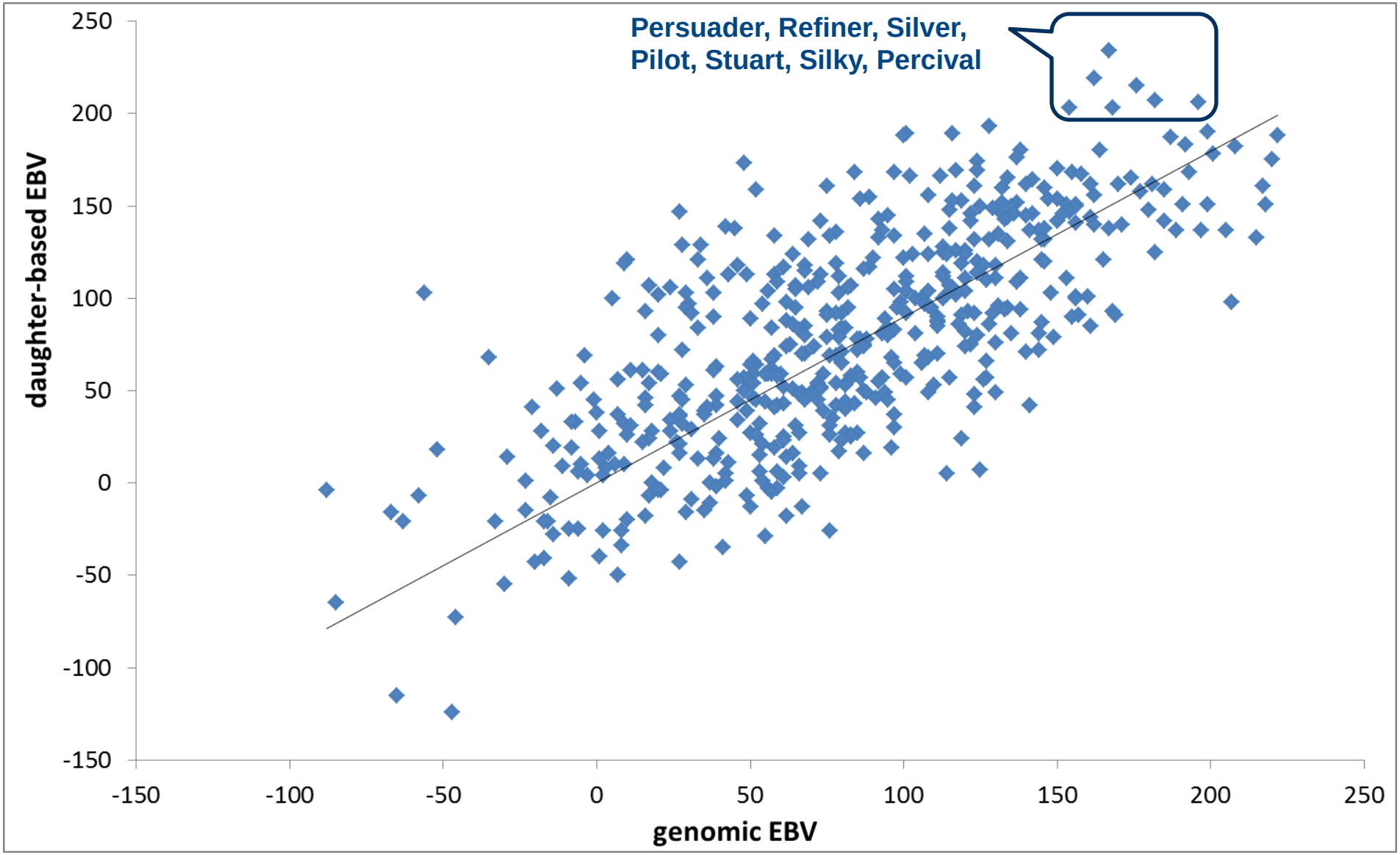
	young	proven
NVI > 300	7	1
NVI > 280	36	1
NVI > 260	74	3
NVI > 240	136	8

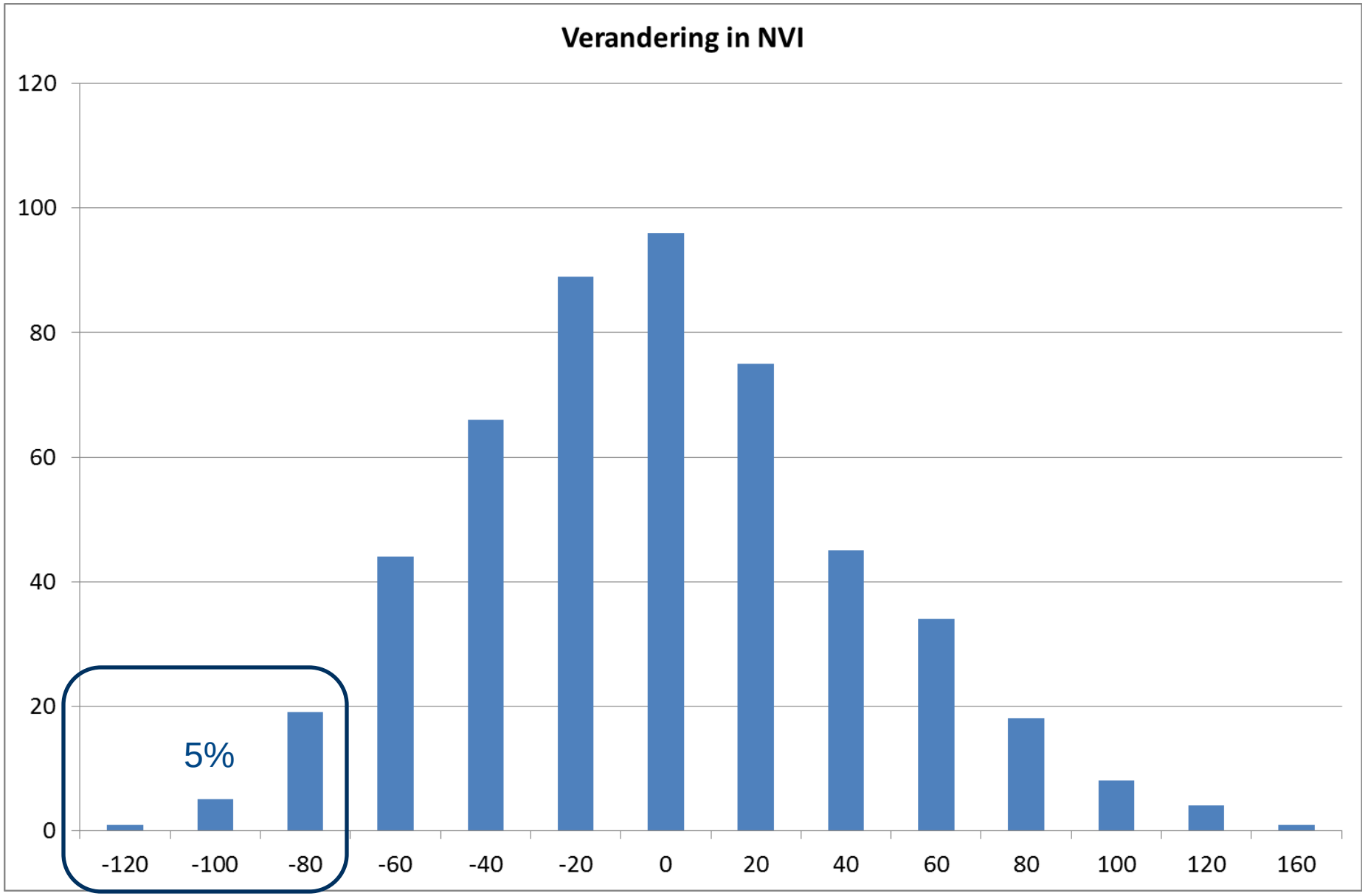
95% young, 5% proven

Geneticists' point of view

Are genomic EBVs overestimated?

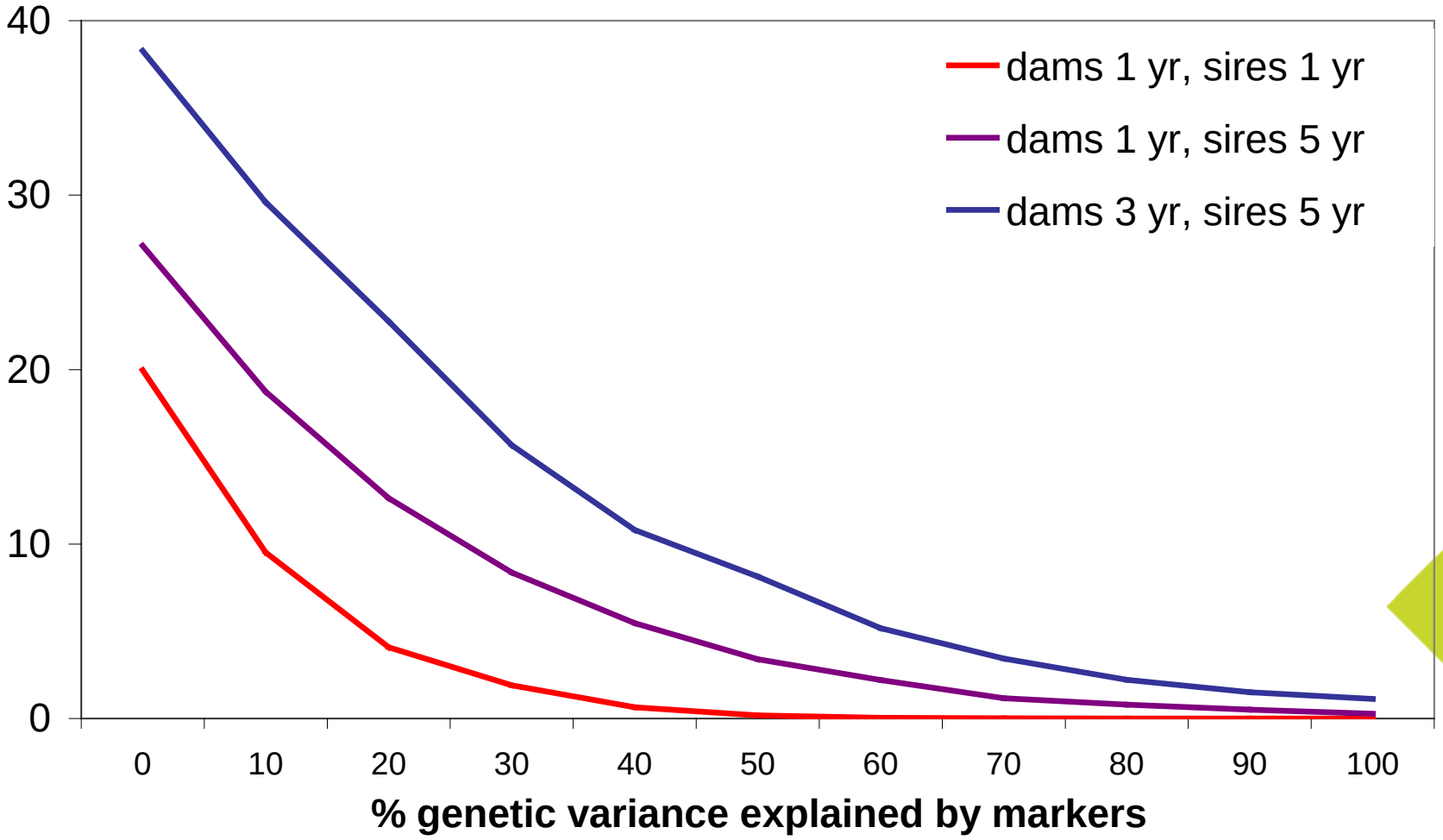
What % proven bulls in top 100 can you expect?


Persuader, Refiner, Silver,
Pilot, Stuart, Silky, Percival
daughter-based EBV
genomic EBV
250
200
150
100
50
0
-50
-100
-150
-150
-100
-50
0
50
100
150
200
250


Verandering in NVI
120
100
80
60
40
20
0
5%
-120
-100
-80
-60
-40
-20
0
20
40
60
80
100
120
160

% proven bulls in top 100

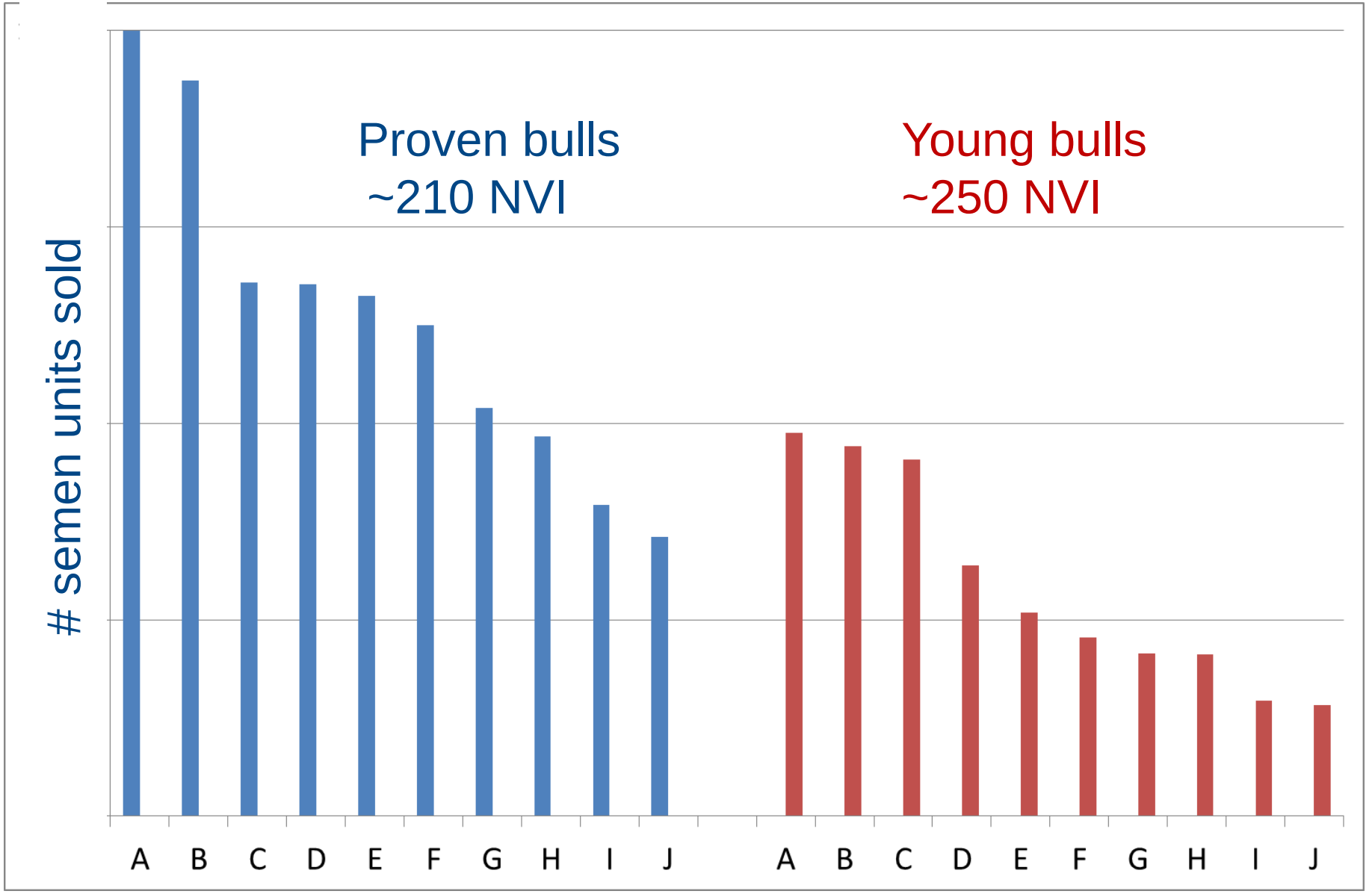
Simulation study by
De Roos et al. 2011
J Dairy Sci 94:1559



If young bulls are so great,
farmers probably use
>80% young bulls?

No, it is about 40%

Why?


semen units sold
Proven bulls
~210 NVI
Young bulls
~250 NVI
A B C D E F G H I J
A B C D E F G H I J

Our customers

Farmers' point of view

Many farmers are primarily
focused on continuity and progress
for their herd, their farm and their way of life

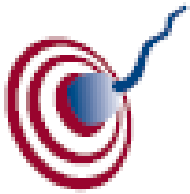
Performance of the herd is very important
Breeding is important, but daily management even more

Knowledge and opinions about breeding are variable

Criteria for purchasing semen

Genetic merit (NVI, underlying traits)

Semen fertility



Price

Performance of daughters on own herd

STIERENKAART ZWARTBONT — LEVENSPRODUCTIE — APRIL 2013

KI-CODE	NAAM	N = NIEUW	AAA-CODE	AFSTAMMING	% BETROUWBAARH.	NVI	% BETROUWBAARH.	KG MELK	% VET	% EIWIT	KG VET	KG EIWIT	INET	% BETROUWBAARH.	FRAME	ROBUUSTHEID	UIER	BEENWERK	TOTAAL EXTERIEUR	HOOGTEMAAT	VOORHAND	INHOUD	OPENHEID	CONDITIE	KRUISLIGGING	KRUISBREEDTE	BEENSTAND ACHTER	BEENSTAND ZIJ	KLAUWHOEK	BEENGEBRUIK	V.UIERAANHECHTING	V.SPEENPLAATSING	SPEENLENGTE	UIERDIEPTE	A.UIERHOOGTE	A.SPEENPLAATSING	OPHANGBAND	% BETROUWBAARH.	LEVENSDUUR (DGEN)	AFKALFGEMAK	VRUCHTBAARHEID	MELKSNELHEID	KLAUWGEZONDH.	UIERGEZONDH.	CELGETAL	KARAKTER	GEBR.GEMAK	BEVRUCHTING	BE	
INSIRE TOPSTIEREN *(InSire)*																																																	
94-0731	**SNOWRUSH**		324165	Snowman x Shottle		60	**307**	66	2457	-.39	-.24	64	59	**362**	59	109	105	111	105	**111**	111	97	101	105	98	102	102	100	93	111	102	104	104	105	110	110	103	107	49	**747**	102	98	100	103	107	110	103	101	nb	vrij	30
94-0821	**EL SALVADOR**	N	354126	Sterngold x Ramos		58	**307**	65	765	+.03	+.04	36	30	**206**	57	104	107	111	107	**111**	105	103	104	103	103	99	99	105	98	100	105	108	102	100	112	109	100	102	46	**731**	104	103	103	104	110	112	101	104	nb	res	34
94-0689	**SNOWFEVER**		342516	Snowman x Goldwyn		60	**298**	66	1272	+.10	+.01	64	45	**328**	59	111	107	112	106	**113**	112	101	105	106	99	104	104	105	93	107	104	109	106	101	111	111	106	108	49	**570**	104	98	101	104	108	110	102	104	nb	vrij	34
94-0818	**MONOPOLY**	N	243156	Aswin x Mascol		56	**289**	63	260	+.22	+.22	30	28	**198**	55	106	104	109	105	**109**	106	102	104	103	100	98	97	103	107	96	103	104	102	101	109	106	106	104	45	**713**	105	105	104	103	109	113	100	106	nb	vrij	24
94-0624	**EUSEBIO**	N	234165	Atlantic x Goldwyn		59	**276**	66	1335	-.37	-.07	22	39	**203**	59	109	108	111	108	**113**	108	104	107	107	102	98	103	108	101	101	107	107	103	101	106	108	104	107	47	**633**	104	101	100	102	106	107	103	103	nb	vrij	22
94-0429	**TITANIUM**		534126	Ramos x O Man		62	**264**	67	911	+.13	+.04	51	35	**260**	61	102	105	107	105	**107**	103	101	104	104	100	99	98	102	96	100	105	106	105	94	105	106	100	100	53	**620**	106	103	107	105	104	105	102	106	0	vrij	23
94-0372	**SOLERO**		531462	Eminem x Laudan		60	**255**	66	542	+.03	+.13	26	30	**191**	59	99	100	108	105	**106**	101	97	97	98	96	94	100	103	102	99	104	104	101	93	108	107	102	102	48	**733**	104	103	107	102	104	105	101	103	nb	vrij	16
94-0211	**G-FORCE**		315246	Man-O-Man x Jordan		60	**249**	66	1126	+.05	+.13	53	51	**338**	60	107	100	108	104	**108**	111	100	103	105	96	102	102	102	99	103	104	103	104	102	106	108	105	107	48	**570**	102	100	101	104	103	107	102	108	+1	vrij	23
94-0361	**ROZELLO**	N	243156	Sunrise x Shottle		60	**249**	66	1509	-.34	-.03	32	49	**270**	60	110	107	114	102	**112**	113	103	103	106	99	101	105	99	98	99	99	109	113	96	112	108	111	109	49	**531**	104	98	100	100	105	106	103	103	🎯	vrij	19
94-0489	**PACKMAN**		342156	Bogart x Jordan		60	**240**	66	694	+.15	+.15	43	37	**259**	60	106	102	105	102	**106**	106	105	104	100	103	107	107	101	94	105	101	103	102	102	103	104	100	98	49	**551**	102	104	102	101	106	107	99	110	-1	vrij	19
94-0409	**SUNSET**		342516	Diamond x Goldwyn		61	**229**	66	895	-.04	-.07	35	24	**170**	60	107	101	112	104	**110**	110	98	99	101	101	98	99	101	96	105	103	106	104	100	112	109	105	108	51	**601**	102	100	102	102	106	109	102	104	+1	vrij	16
94-0556	**STELLANDO** rf		432516	Fidelity x O Man		61	**210**	67	622	+.18	+.22	43	41	**281**	61	103	106	106	110	**109**	100	106	101	102	104	98	101	108	94	106	109	103	104	100	101	104	102	102	51	**200**	101	100	104	107	100	100	102	104	+3	res	16
FOKSTIEREN																																																		
97-8797	**ATLANTIC**		234165	Ramos x O Man		81	**297**	88	609	-.07	+.12	20	32	**186**	87	110	115	109	110	**113**	109	109	108	109	106	100	103	109	98	101	109	103	103	100	106	109	101	101	60	**715**	105	104	97	107	105	105	101	106	+1	vrij	34
97-9919	**GOFAST**	N	234165	Goldwyn x O Man		69	**282**	67★	1016	-.14	-.03	31	32	**198**	80	109	108	113	108	**114**	109	103	104	104	103	101	102	99	95	101	102	109	106	96	111	110	106	107	53	**515**	102	104	102	106	105	108	98	109	+2	vrij	28
39-424	**DANILLO**		231456	Goldwyn x O Man		90	**260**	97	641	+.04	+.04	31	26	**179**	93	106	111	114	110	**114**	108	105	108	109	103	90	100	106	100	106	107	113	103	99	108	112	107	107	68	**457**	105	100	93	102	103	105	100	105	🎯	res	30
97-9944	**AWARD** rf by	N	132546	Ramos x O Man		75	**249**	83	852	-.04	-.05	33	25	**172**	77	107	108	109	104	**109**	104	103	102	103	105	99	102	101	100	99	102	109	103	98	106	105	96	97	59	**610**	107	103	100	106	108	111	101	106	🎯	vrij	26
97-8155	**PERSUADER**		534126	Mascol x Dustin		85	**236**	94	683	-.26	+.05	5	28	**133**	85	103	109	101	110	**106**	101	103	101	103	102	103	101	108	96	103	110	97	97	97	103	100	102	97	65	**616**	101	103	99	104	108	111	98	103	0	vrij	24
97-9977	**BANKER**	N	nb	Goldwyn x Mascol		76	**231**	84	590	+.02	+.00	27	20	**142**	78	111	108	111	106	**112**	110	103	105	105	103	100	101	100	98	100	103	107	103	101	109	108	105	106	59	**415**	103	103	97	104	106	108	96	111	nb	res	24
97-8491	**PILOT**		135246	Mascol x Jocko		87	**230**	94	686	-.06	+.02	24	25	**157**	91	107	108	105	107	**111**	103	102	106	107	100	104	102	104	105	95	107	103	106	90	106	106	110	107	65	**492**	106	101	104	106	106	104	100	106	-2	vrij	18
97-8792	**ASTRO**	N	243165	Goldwyn x O Man		82	**227**	88	637	+.24	+.11	49	32	**249**	89	115	115	110	107	**114**	114	109	111	112	104	105	107	102	95	101	104	106	105	101	103	110	102	104	61	**278**	104	99	102	104	103	104	100	103	nb	vrij	23
97-8856	**UPGRADE**		324156	Paramount x Dustin		80	**214**	88	1668	-.45	-.08	27	49	**254**	84	105	102	113	107	**112**	100	98	93	101	97	99	101	104	96	102	103	108	107	95	107	113	105	104	61	**274**	102	98	107	100	101	101	104	97	nb	vrij	18
76-6020	**SUDAN***		324	Jammer x Sailor		62	**213**	71	1088	+.01	-.10	43	28	**213**	65	107	nb	107	107	**110**	110	107	109	105	95	101	106	106	94	106	105	106	103	98	105	104	104	106	50	**435**	nb	99	nb	nb	105	104	nb	98	nb	res	29
10-8729	**GOLI**		534126	O Man x BW Marshall		89	**213**	96	812	+.02	-.02	37	26	**187**	91	106	110	109	105	**110**	106	107	107	104	106	99	107	103	97	106	102	104	110	94	105	108	104	105	72	**592**	102	101	101	105	102	106	95	106	-1	res	23
10-8727	**CRICKET** by		432516	O Man x Durham		94	**212**	98	802	-.43	-.08	-4	20	**67**	99	112	111	109	105	**112**	110	110	106	104	106	100	106	100	99	103	103	107	107	96	114	98	101	101	74	**576**	106	104	102	103	108	113	106	110	0	vrij	23
97-8996	**AMMO**	N	132564	Goldwyn x Win 395		80	**212**	88	1167	-.11	-.10	40	31	**208**	84	104	105	110	103	**108**	106	99	104	106	98	96	100	100	101	98	100	105	103	100	107	111	104	106	59	**372**	107	101	100	102	104	106	103	108	0	vrij	16
97-8287	**GRIMSBY**		324156	Shottle x O Man		87	**204**	95	992	-.21	-.12	23	23	**136**	90	109	108	110	105	**111**	107	108	111	110	100	97	108	102	99	104	102	107	105	102	109	106	103	103	68	**519**	99	99	105	100	106	109	105	98	-2	vrij	14
97-7745	**MALAGA**		432561	Jordan x Jocko		86	**199**	95	1497	-.45	-.14	21	38	**191**	84	102	101	107	108	**108**	100	97	96	96	99	115	98	104	93	103	103	104	102	101	106	106	104	102	70	**745**	104	93	104	104	101	102	102	108	-3	vrij	9
97-8354	**SILKY**		312546	Mascol x Jocko		82	**195**	89	960	-.30	-.03	14	30	**152**	87	103	103	109	101	**107**	104	100	105	106	97	97	101	96	102	100	103	103	105	102	108	110	106	106	61	**652**	103	95	102	105	109	108	98	105	nb	vrij	16
97-4794	**PARAMOUNT**		651423	Jocko x Fatal		99	**191**	99	1415	-.49	-.08	14	41	**193**	99	102	104	109	109	**109**	98	99	100	104	99	100	102	104	95	103	107	104	109	92	101	111	110	109	99	**466**	104	97	103	97	100	100	106	96	0	vrij	14
97-8762	**SUMMIT**		423615	Mascol x Dustin		83	**171**	90	1273	-.42	+.11	15	54	**265**	87	105	105	106	107	**108**	105	102	102	106	96	98	104	107	104	97	107	102	101	95	105	107	99	94	64	**352**	98	96	95	105	100	103	98	105	nb	vrij	16
76-5961	**LOYDIE***		435	O Man x BW Marshall		75	**166**	78	744	+.11	+.17	42	41	275	72	104	nb	103	102	**104**	107	107	107	102	103	97	102	101	96	103	100	101	102	101	100	105	97	99	68	**334**	102	102	nb	nb	103	105	nb	109	+2	res	21
97-7267	**IMPROVER**		312456	O Man x Aaron		88	**164**	95	153	+.15	+.13	19	16	117	88	105	109	108	109	**110**	107	103	103	101	105	95	104	107	90	106	106	107	102	98	110	105	96	97	76	**230**	105	101	105	106	100	98	102	104	+2	vrij	9

* CRI-stier

★ zie toelichting achterzijde

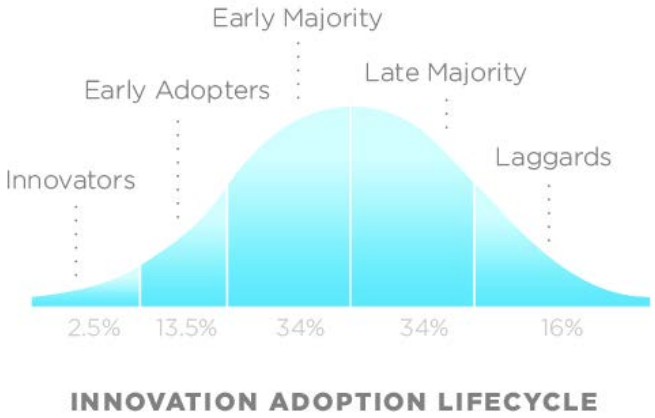
🎯 = BullsEye (topbevruchter)

Farmers' point of view

Reasons why not to use young bulls (by some farmers):

- the genomic EBVs are overestimated
- it gives more variation, so more poor cows too
- there is no real daughter information, so I don't trust it
- it is just a number game, that's not breeding
- don't know how they breed so you can't do good mating
- I have good daughters of bulls X so I keep using him
- I will wait until the technology is proven

Technology adoption lifecycle



INNOVATION ADOPTION LIFECYCLE

purchase patterns of hybrid seed corn by farmers

Innovators

–larger farms, more educated, and more risk-oriented

Early adopters

– younger, more educated, community leaders

Early majority

– more conservative but open to new ideas, active in community, influence to neighbors

Late majority

– older, less educated, fairly conservative and less socially active

Laggards

– very conservative, had small farms and capital, oldest and least educated

Breeding company’s point of view

We are market driven,
so we follow customers

Neutral in marketing, no push towards young bulls

No advertisements for individual young bulls

Variable knowledge and opinions among staff

Our advise

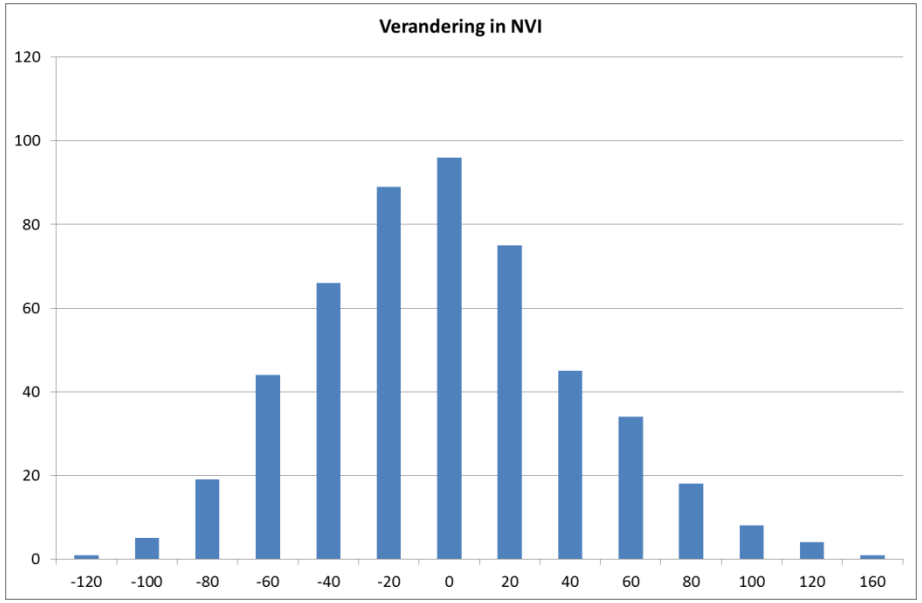
Our young bulls are our best bulls

Lower reliability, so can go up or down

Only few big drops

After big drop still comparable to proven bull

Use multiple bulls



Which bull is best?

Bull	# dau	rel	NVI	milk	%p	udd	f&l	fert
Direct	0	61	247	706	+.27	108	111	99
Fidelity	13573	97	221	839	+.21	108	116	92
Kian	108353	99	140	37	+.27	102	110	95

Implications for breeding program

Major changes have been implemented:

use of 1-year-old sires & dams, intense selection among candidates, heavy reproductive programs, cow reference populations

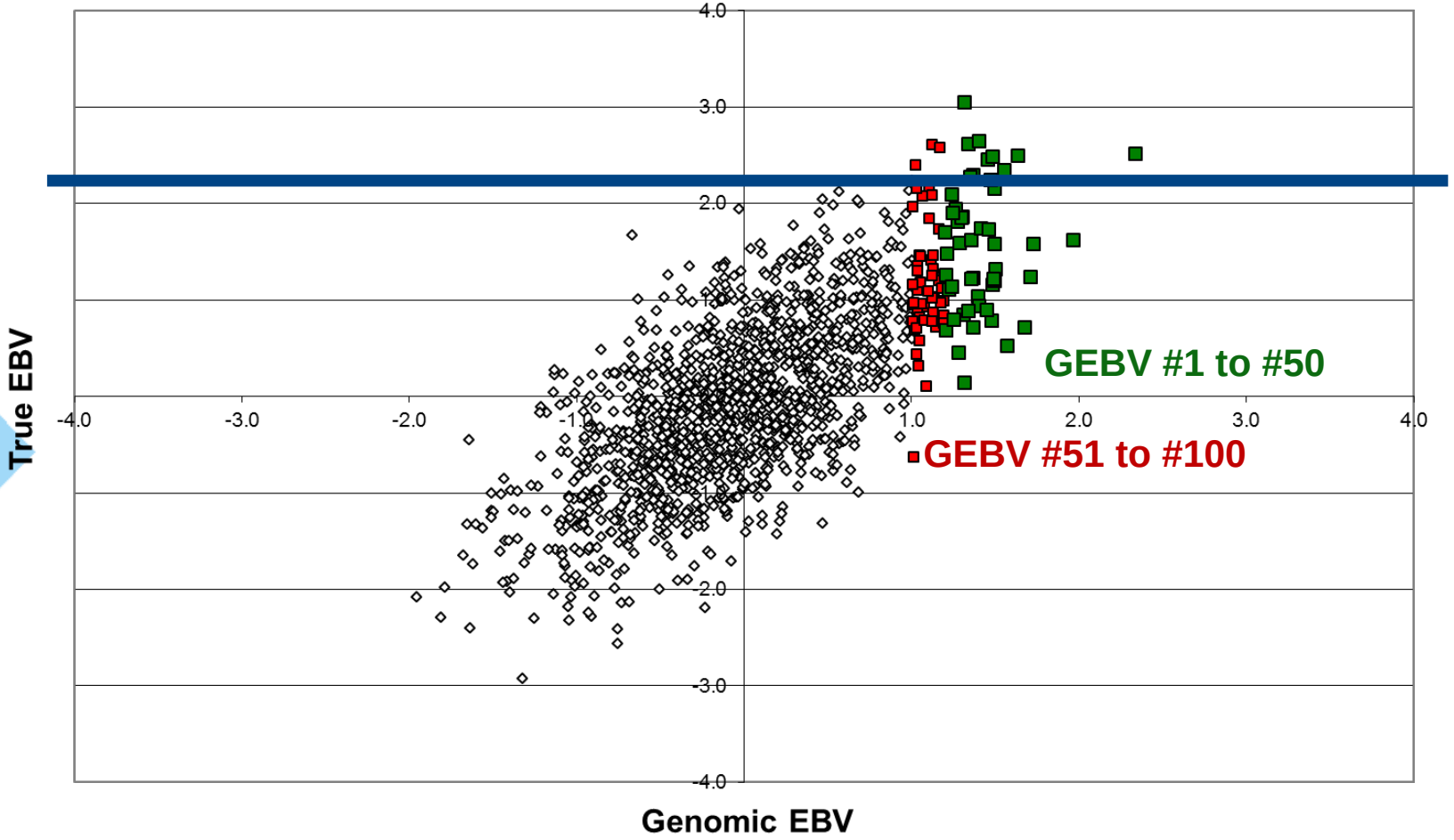
% use of young bulls important for # bulls per year

More test bulls in 2013 = better proven bull portfolio in 2017

Additional costs are 4 years x 365 d x € 9 = € 13k / bull

- How many bulls is cost effective?

In future, all bulls will be culled after they produced enough semen to fulfill their demand as young bull


4.0
3.0
2.0
1.0
-1.0
-2.0
-3.0
-4.0
-4.0
-3.0
-2.0
1.0
2.0
3.0
4.0
True EBV
Genomic EBV
GEBV #1 to #50
GEBV #51 to #100

Conclusions

Young bulls dominate top list as they are better

Use of young bulls is growing and will continue to grow

Use multiple bulls to avoid bad luck

Breeding programs have changed enormously and will make keep changing