Genomic bulls in The Netherlands and their impact on the population

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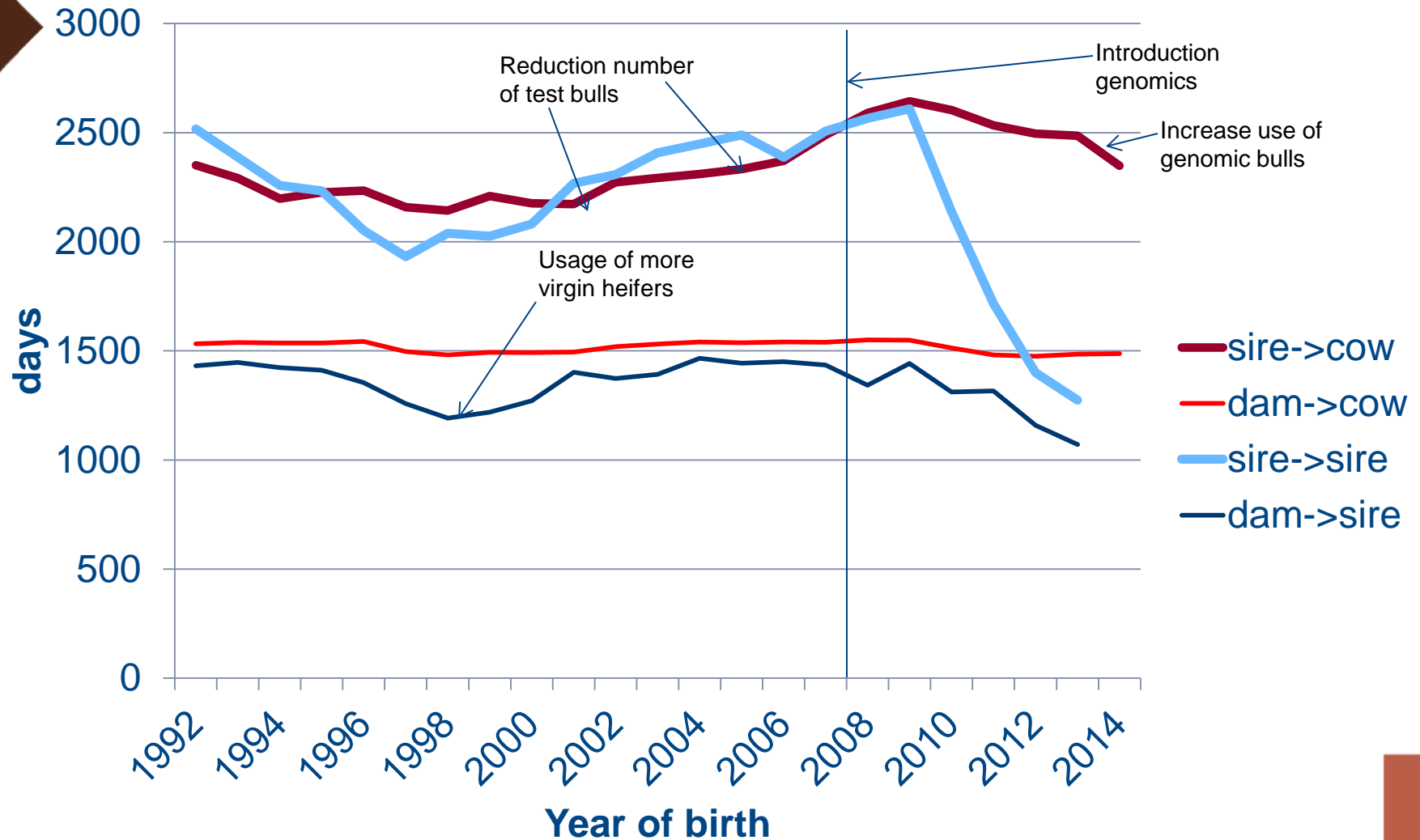AEU

Interbull Workshop Verden 2014

The start

2006 Proofs computed (3K SNPs) by CRV for breeding program

2007 Proofs computed based on 50K

2008 Introduction six packs genomic bulls in market

2010 Exchange genotypes Eurogenomics

First national proofs Genetic Evaluation Sires (GES)

- Blending on Paternal Pedigree Index
- Only CRV-bulls

2011 Genomic proofs added AI Kampen bulls

2014 GMACE proofs published
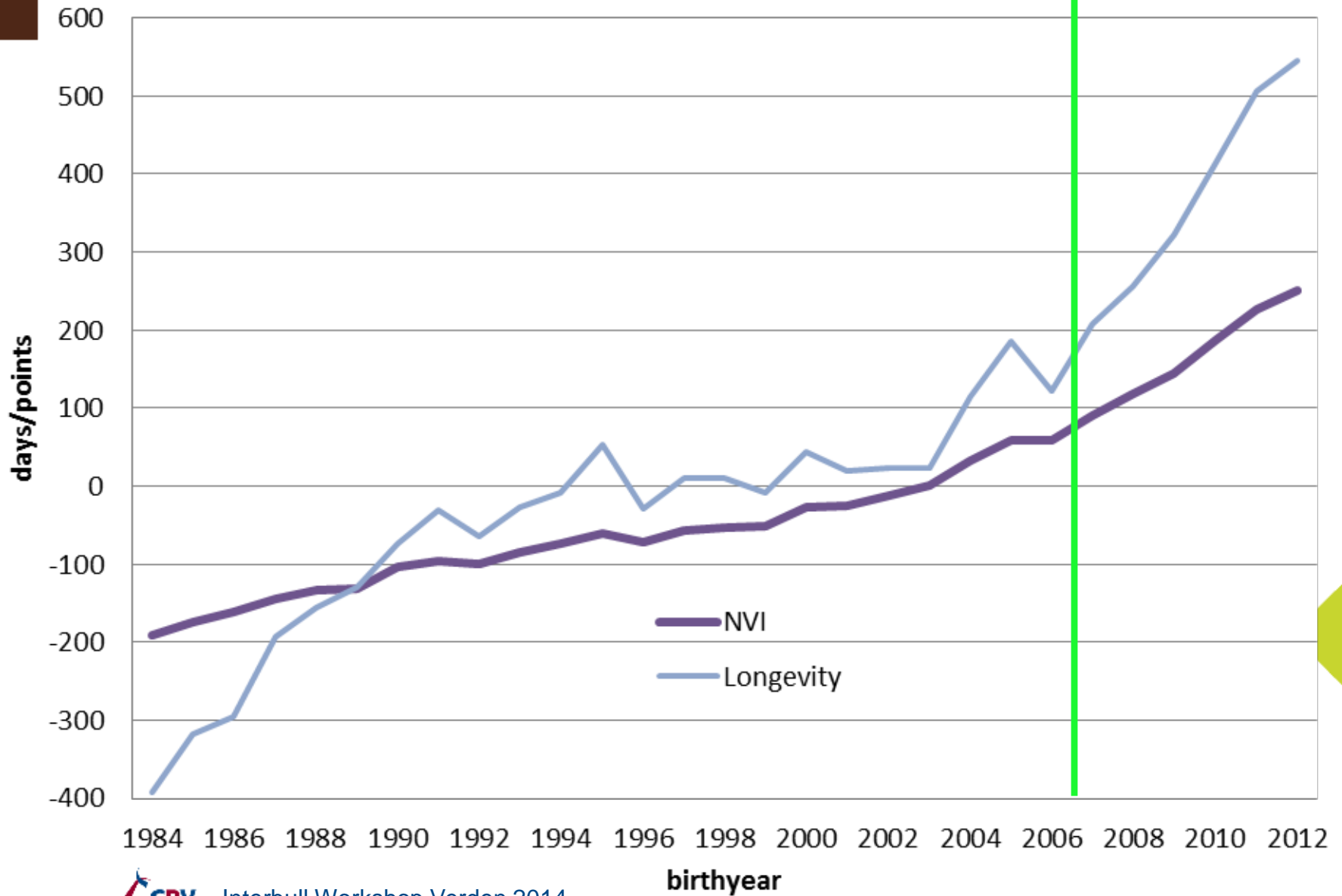Genomic proofs used as pseudorecords in genetic evaluation

Impact on population - Content

- Generation interval

- Genetic trends – after introduction genomics
  - Bulls
  - Cows

- How well do genomic EBVs predict daughter EBVs
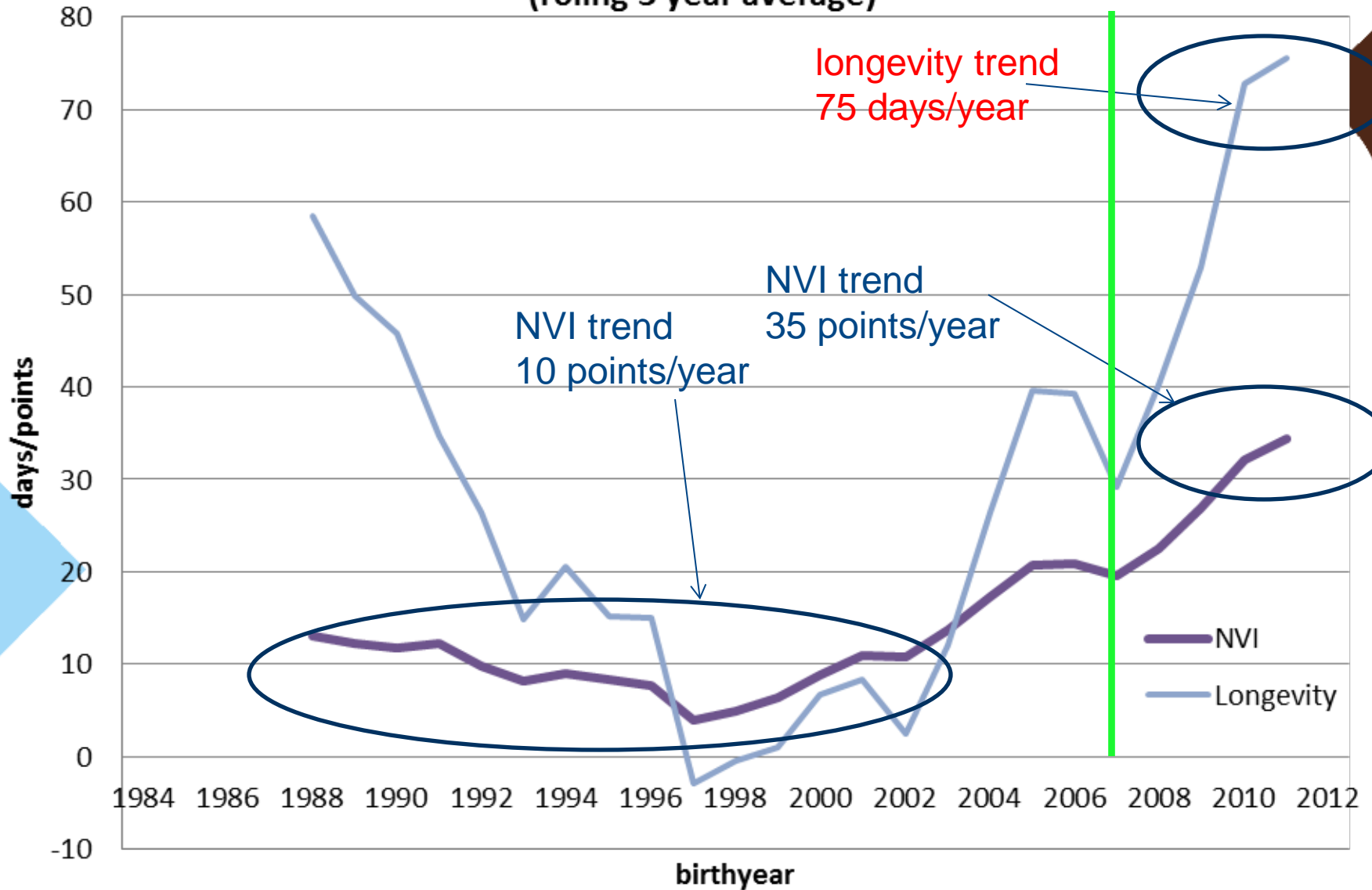
- Publication policy

Generation interval
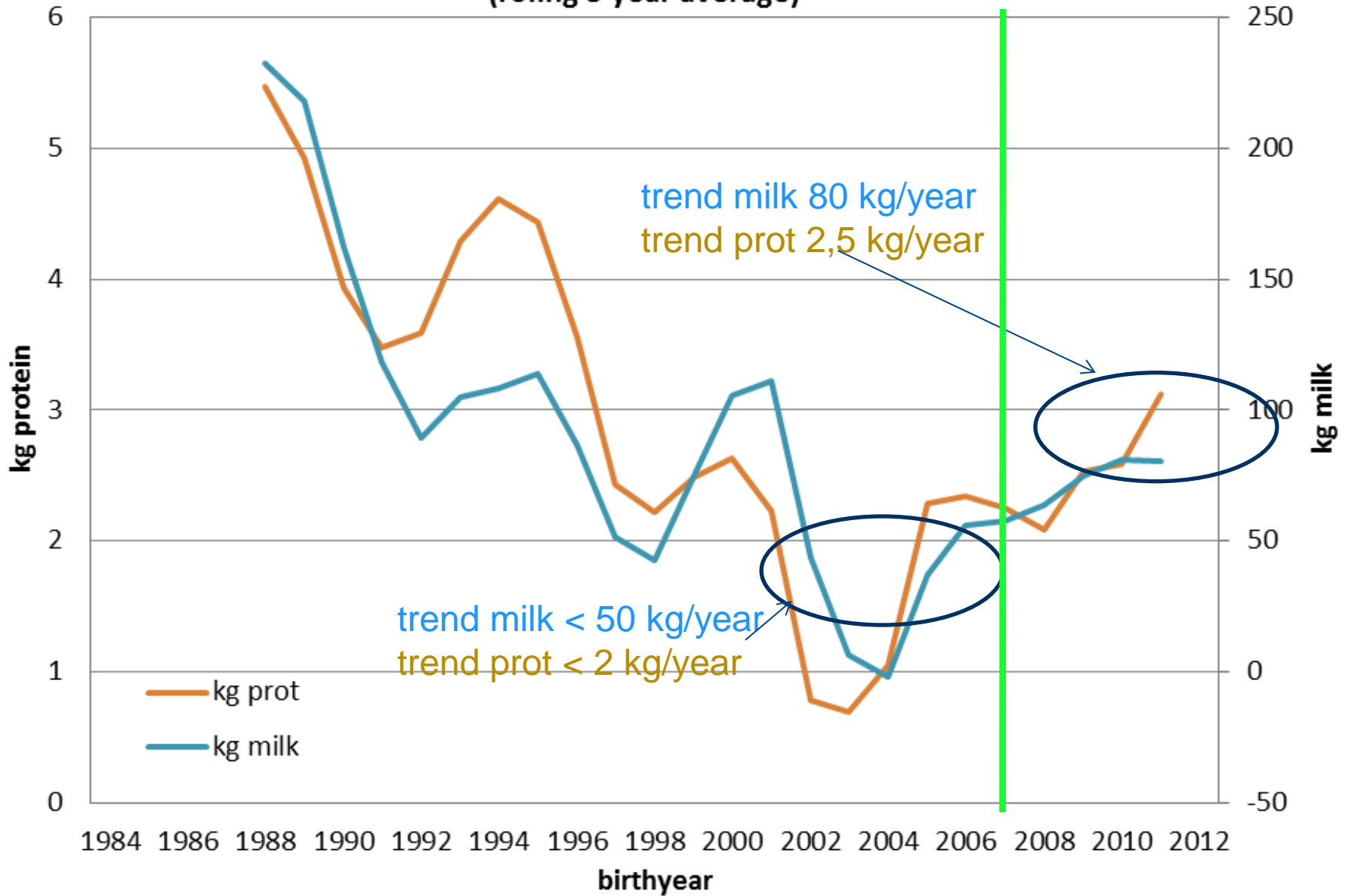
Genetic trend B&W bulls
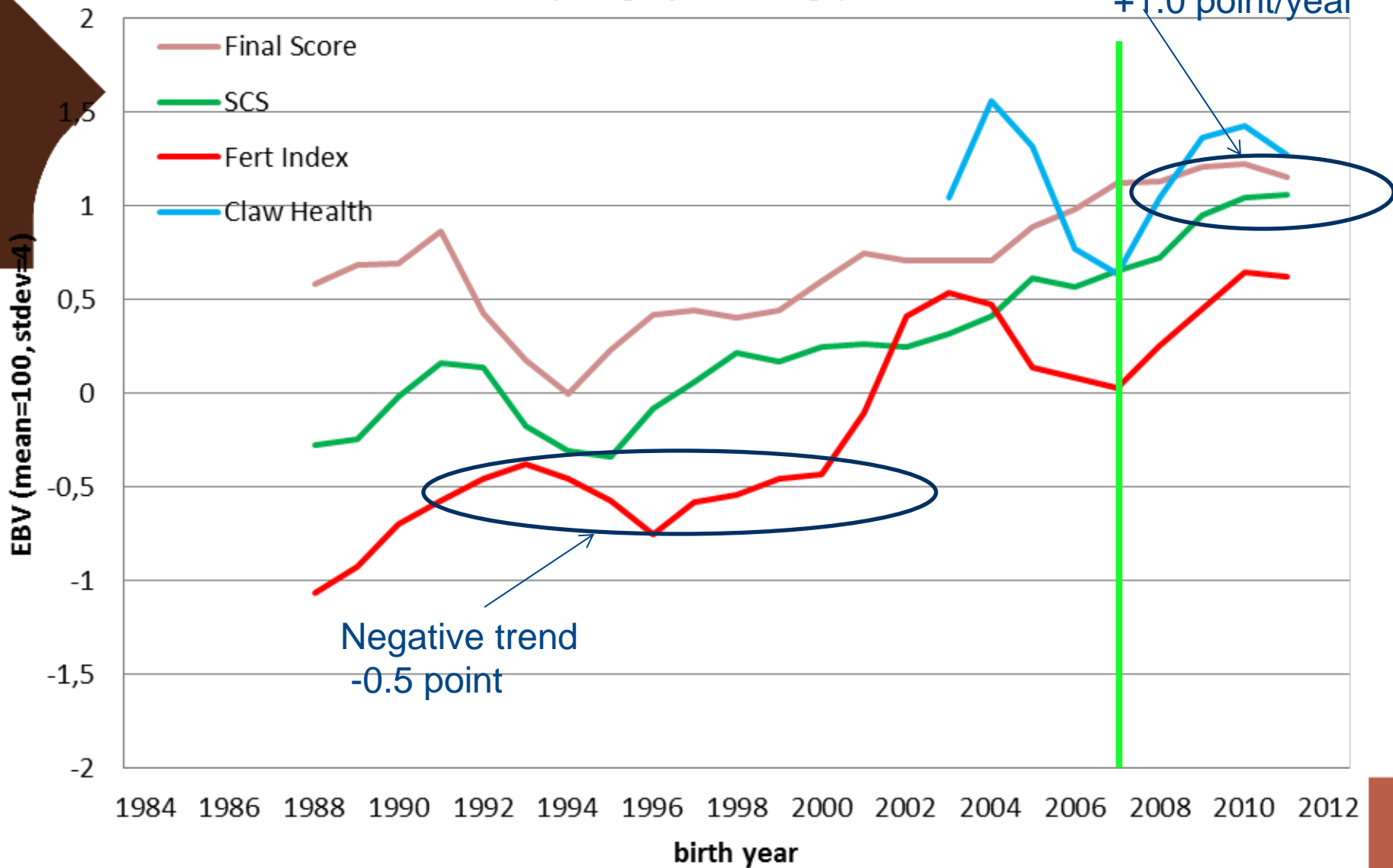
Genetic trend B&W bulls
(roling 3 year average)

longevity trend
75 days/year

NVI trend
35 points/year

NVI trend
10 points/year

NVI

Longevity

days/points

birthyear

Genetic trend B&W bulls
(roling 3 year average)

trend milk 80 kg/year
trend prot 2,5 kg/year

trend milk < 50 kg/year
trend prot < 2 kg/year

kg prot
kg milk

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Genetic trend B&W bulls

(roling 3 year average)

Positive trend +1.0 point/year

Negative trend -0.5 point

Legend:
- Final Score
- SCS
- Fert Index
- Claw Health

EBV (mean=100, stdev=4)

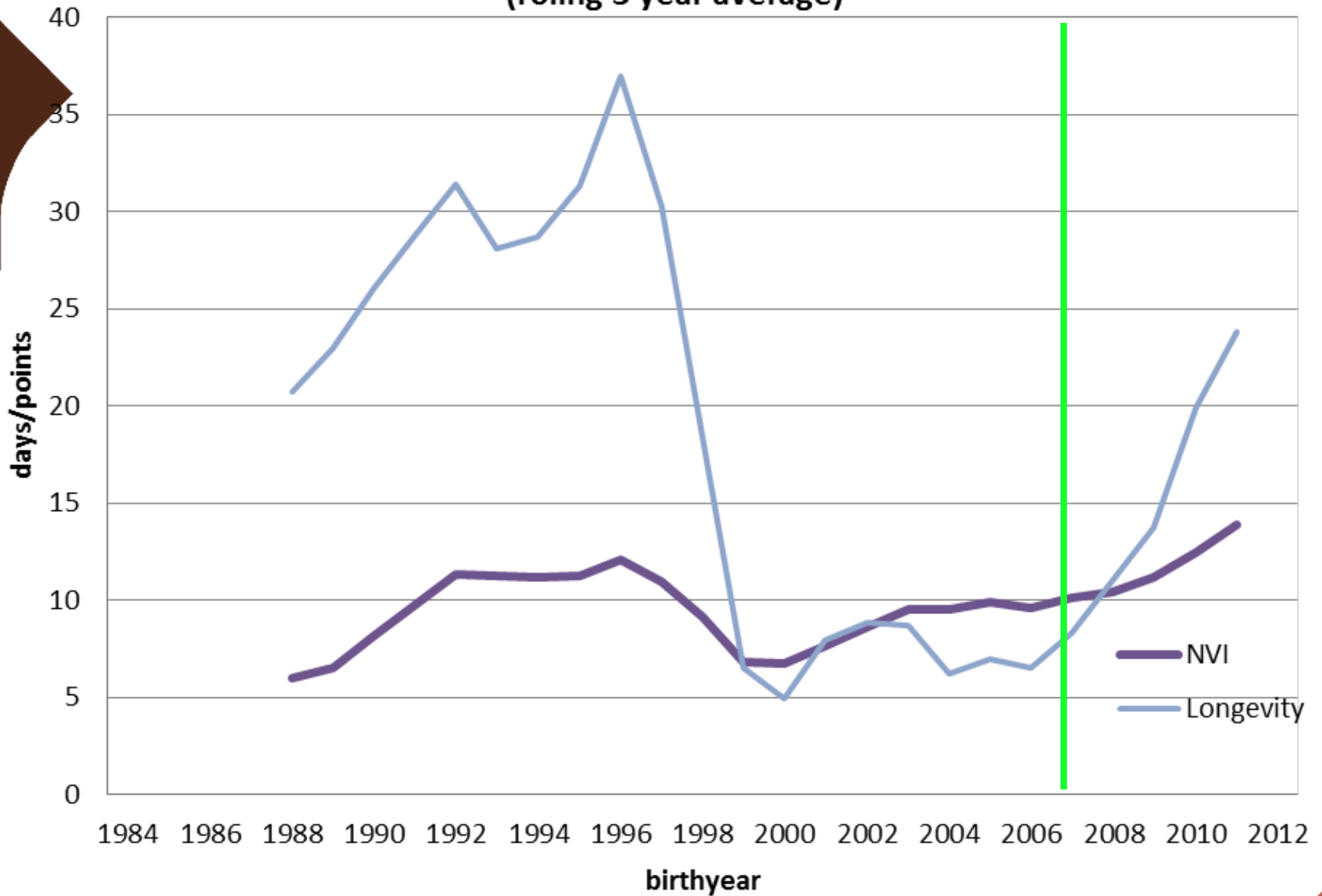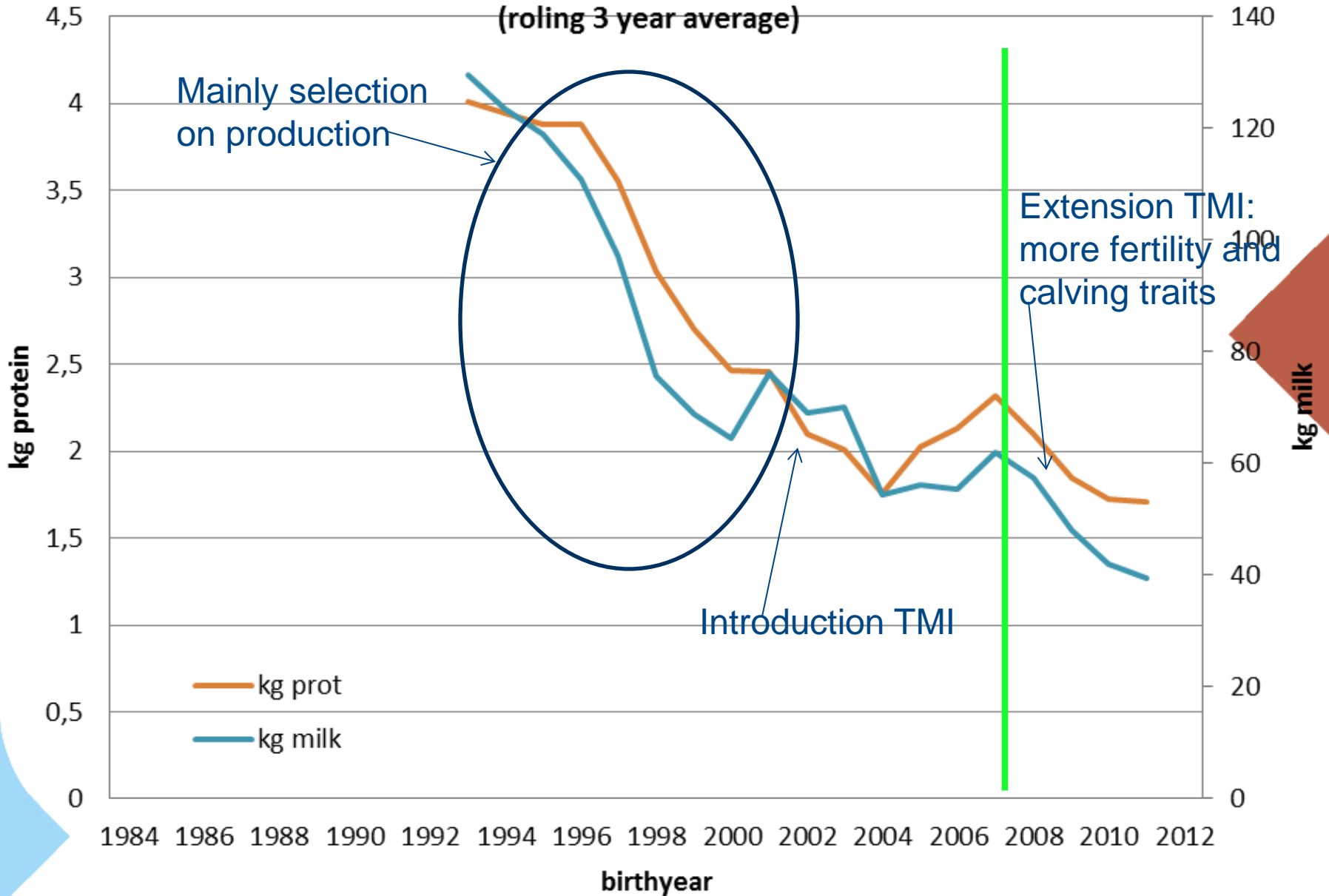birth year

Trends in cow population

Genetic trend B&W cows
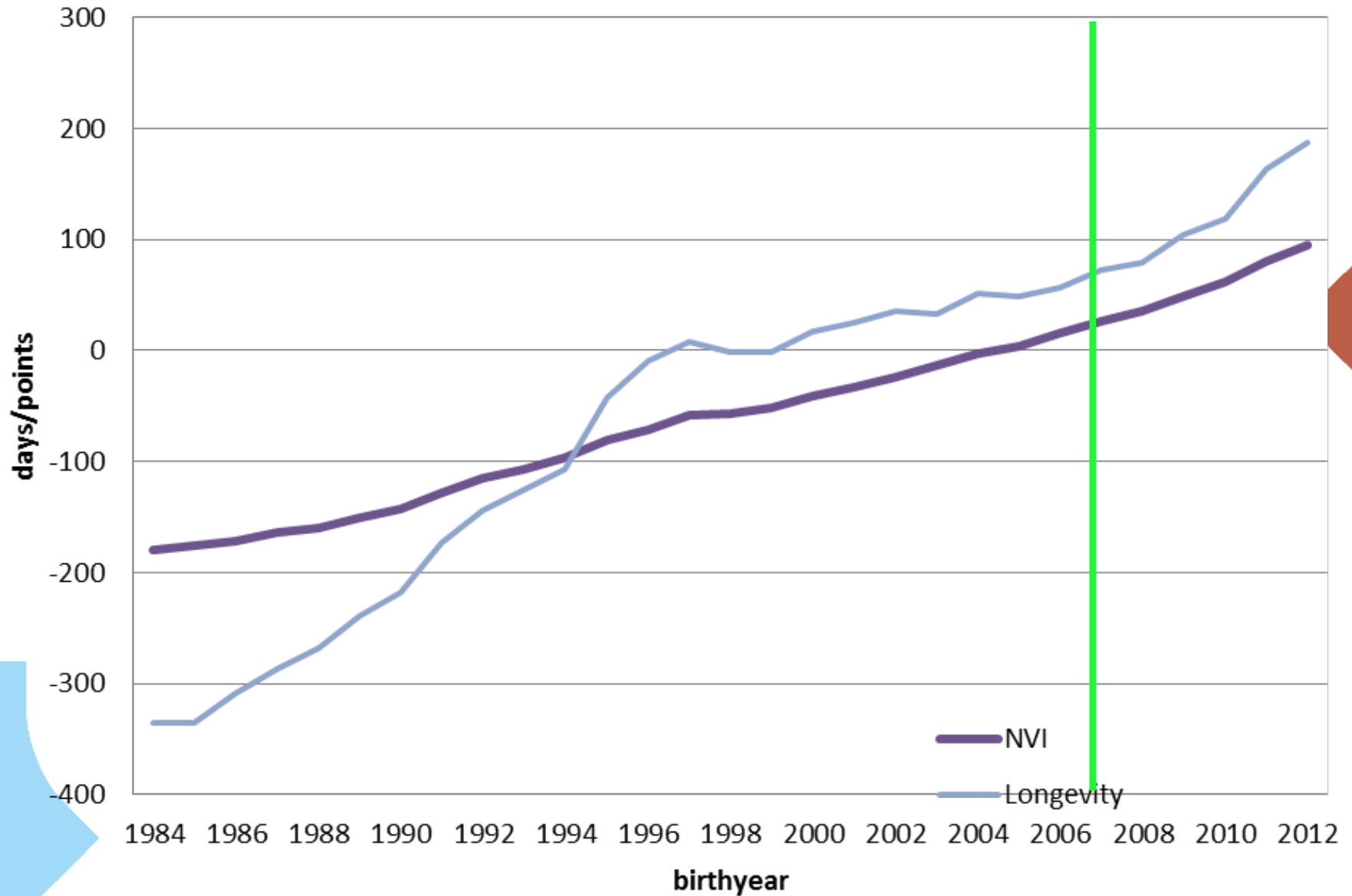
Genetic trend B&W cows
(roling 3 year average)

Genetic trend B&W cows
(roling 3 year average)

Mainly selection on production

Introduction TMI

Extension TMI: more fertility and calving traits

kg protein

kg milk

birthyear

— kg prot
— kg milk

Genetic trend B&W cows

Legend:
- Final Score
- SCS
- Fert Index
- Claw Health

Y-axis: EBV (mean=100, stdev=4)
X-axis: birth year (1984–2012)

Genetic trend B&W cows
(roling 3 year average)

Effect of TMI:
SCC and fertility

EBV (mean=100, stdev=4)

birth year

Legend:
- Final Score
- SCS
- Fert Index
- Claw Health

Genetic trend B&W cows and bulls

Legend: SCS cows (green), SCS bulls (blue)

Annotations on chart:
- Introduction genomics
- SCS in TMI-NVI
- First genetic evaluation
- Cows follow bulls:
  - First in negative trend
  - Now in positive trend

Y-axis: EBV (mean=100, stdev=4)
X-axis: birth year (1984–2012)
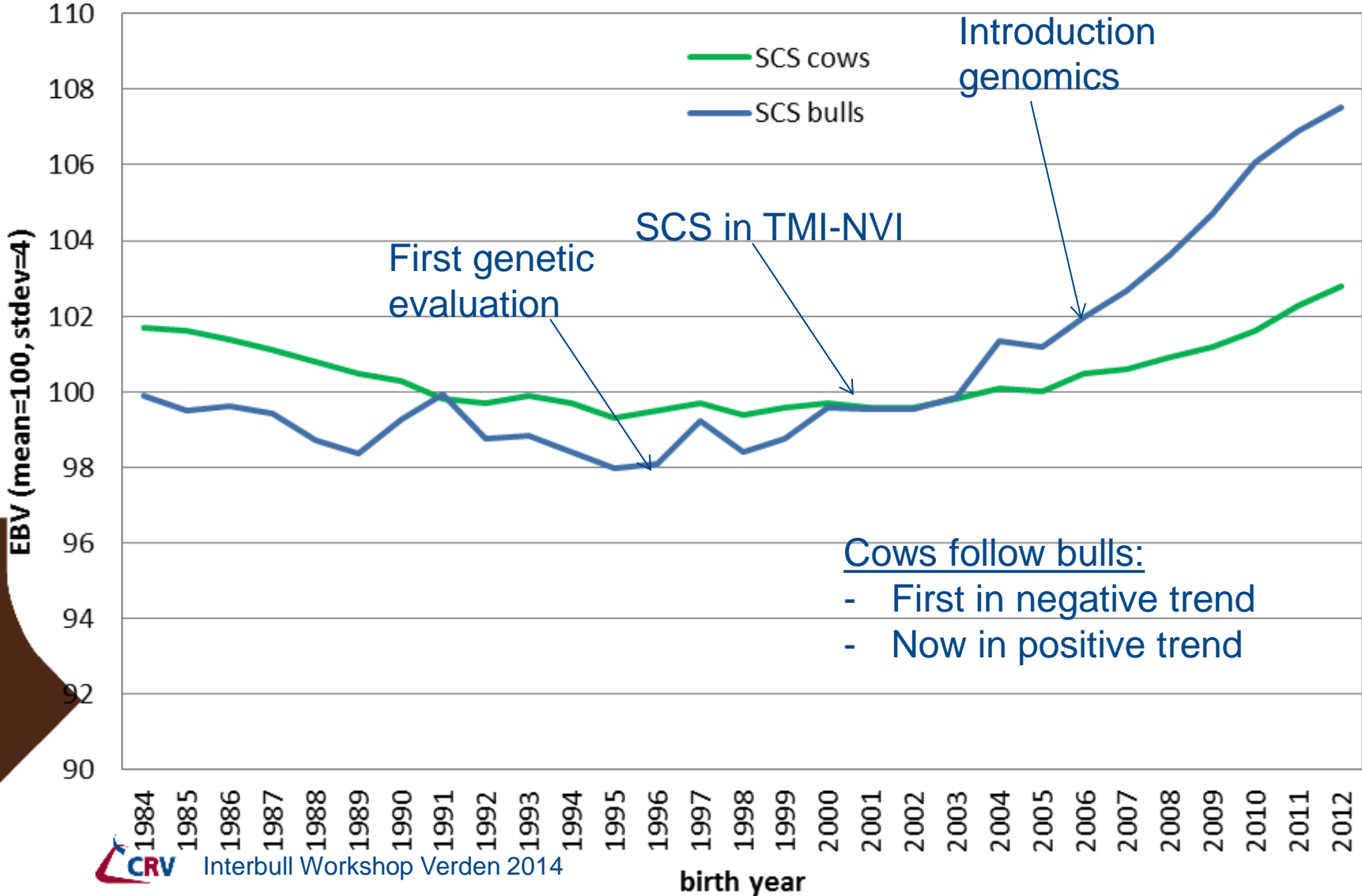
Effect of 'genomics'

Bulls:

- Increased trend in TMI – NVI

- Increased trend in production, longevity and health

Cow population:

- Change in genetic trends due to change in TMI/breeding goal

- No yet change in genetic trend due to genomics

  - But will follow the bulls !!!

How well does genomics work?

- More than 50% of CRV-inseminations in Holstein with genomic bulls

- Important that breeding values keep their level

    genomic proof -> daughter proof

- Validation
  - Interbull tests
  - Proof on farms :
    - compare published genomic proofs with daughter proofs

NVI for 3 groups of bull
(from press list)
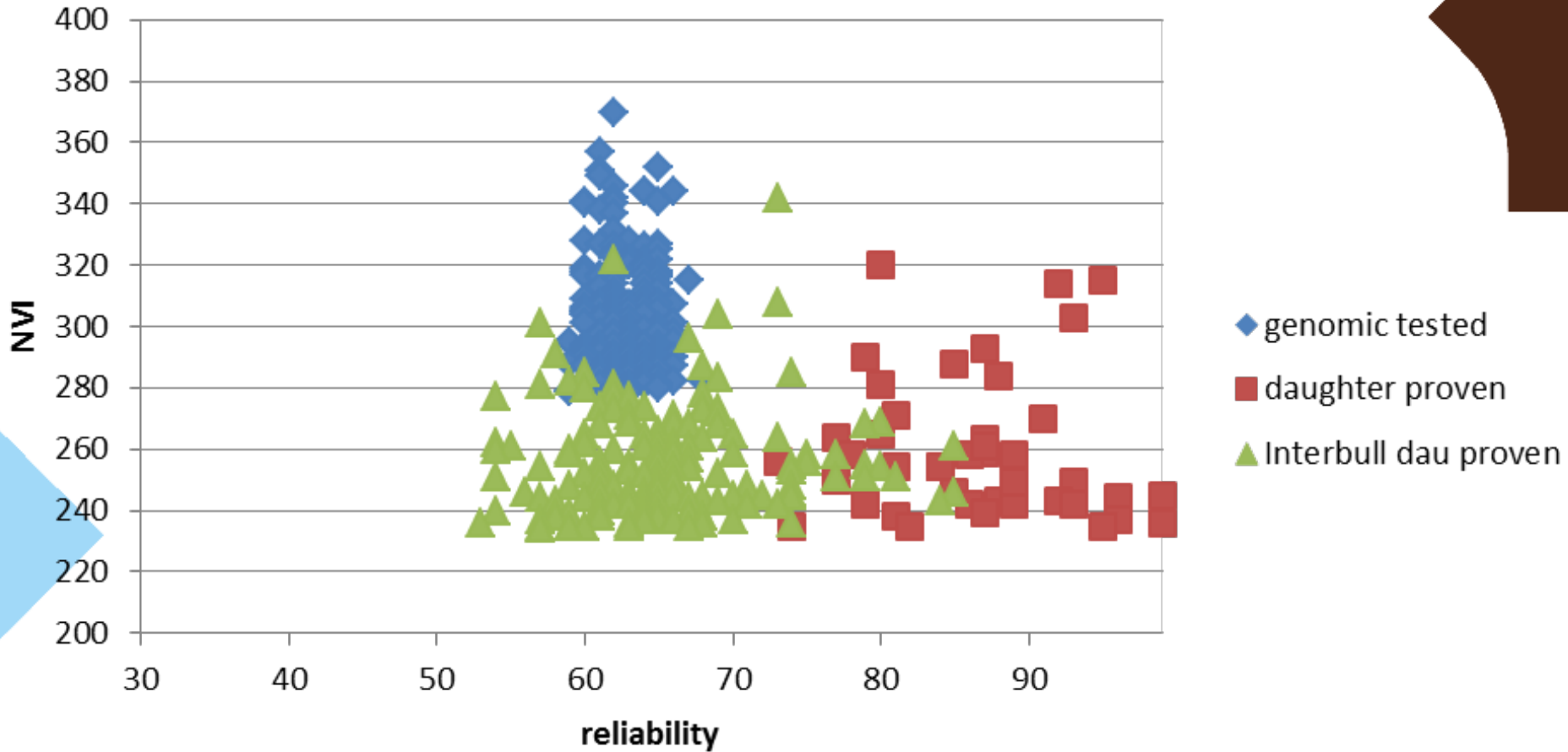
Comparing 3 groups of bull

| Top 200 in press list	NVI
National (NLD+FLA) daughter proven	208
Interbull daughter proven	243
Genomic bulls	306

-> genomic bulls are 60-100 points (> 1 gen. stdev) higher than daughter proven bull

= about 4 years of selection (without usage of genomic)
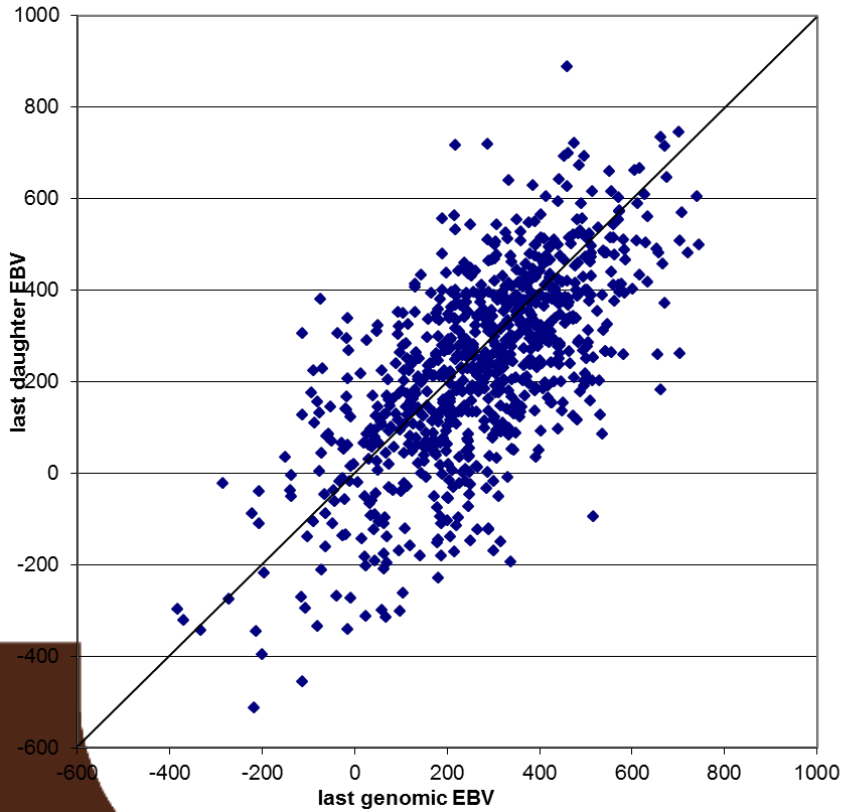
CRV

Comparison daughter EBV minus genomic EBV

(n = 821)

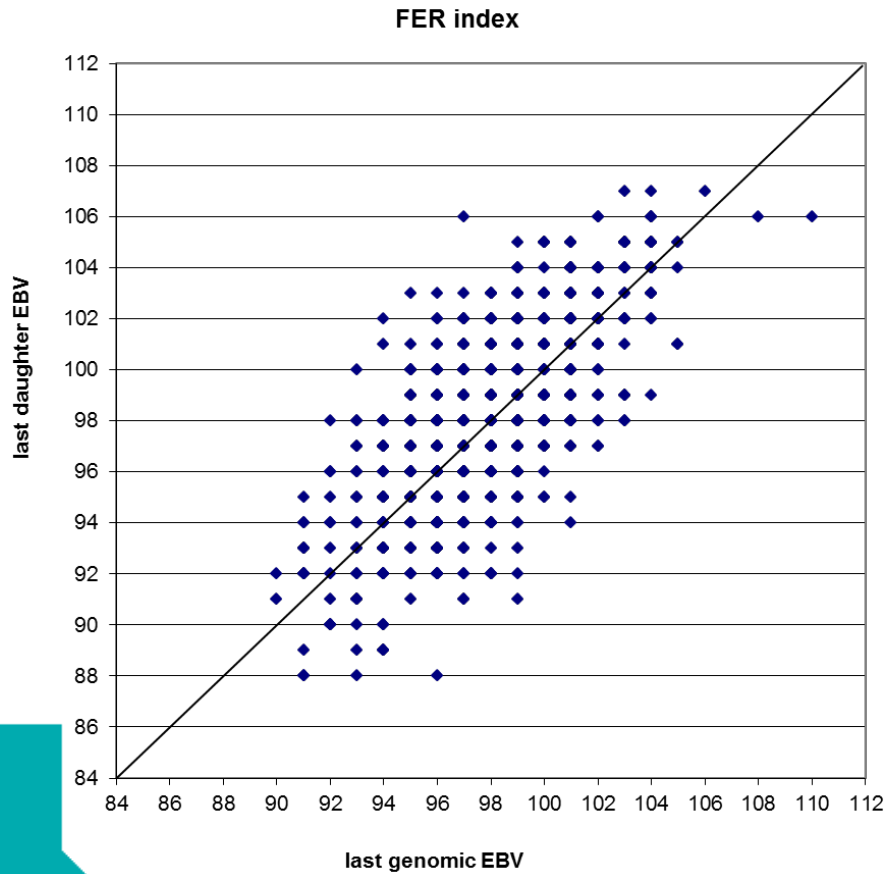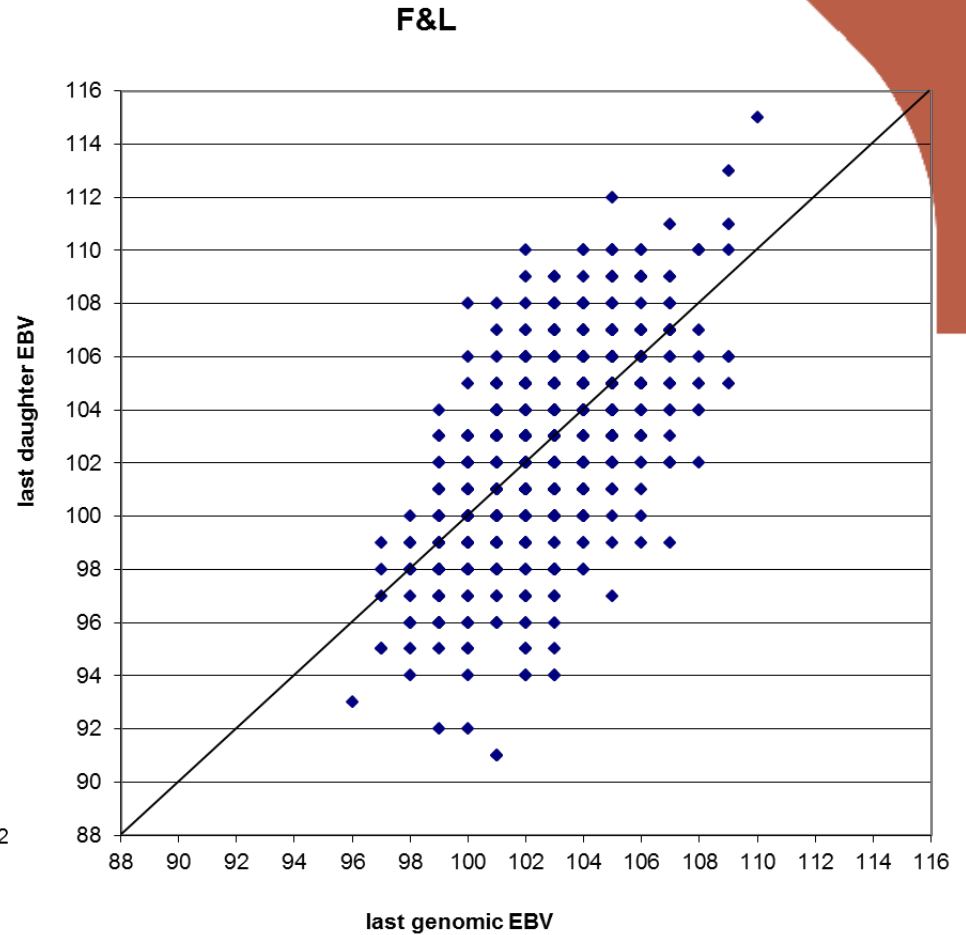|		unit	% gen.stdev.
rel NVI	26		
NVI	-9	pnt	-12%
milk	-36	kg	-6%
fat	-0,6	kg	-2%
protein	-0,9	kg	-6%
herdlife	-40	day	-15%
overall conformation	-0,5	pnt	-12%
frame	-0,4	pnt	-9%
udder conf	-0,1	pnt	-1%
F&L	-0,4	pnt	-9%
SCC	-0,3	pnt	-6%
Udder Health index	-0,2	pnt	-5%
Fertility index	0,1	pnt	3%

Genomic vs Daughter EBV

NVI

kg milk
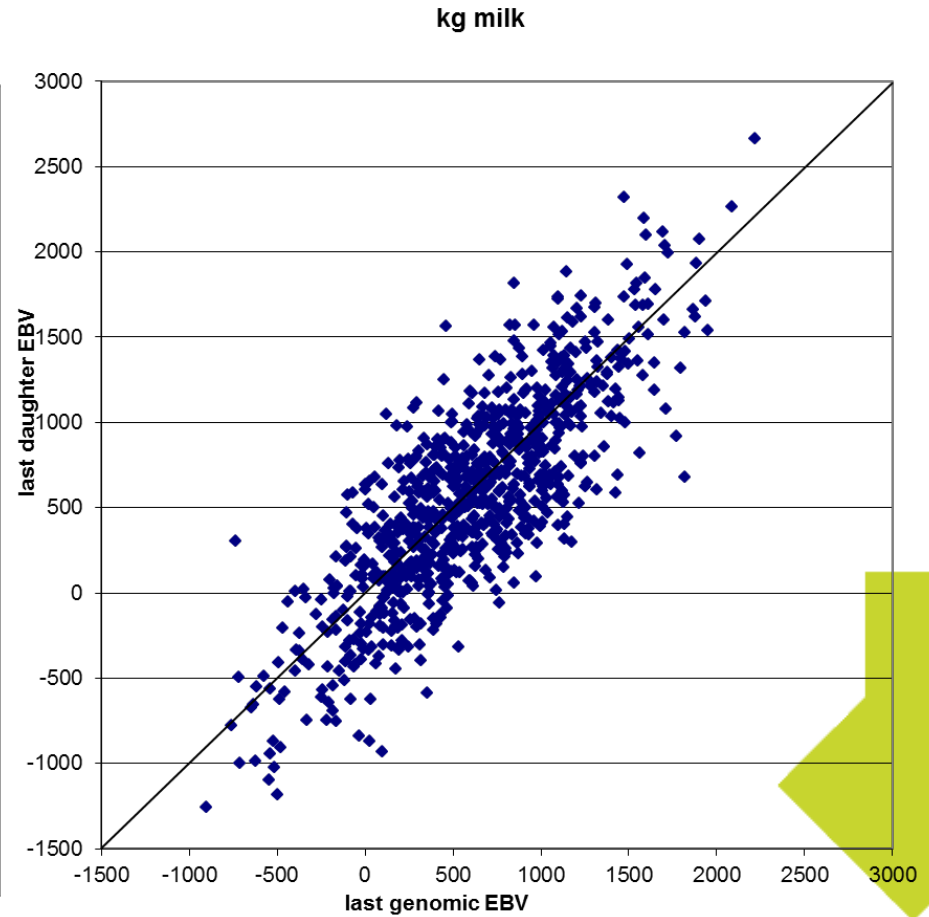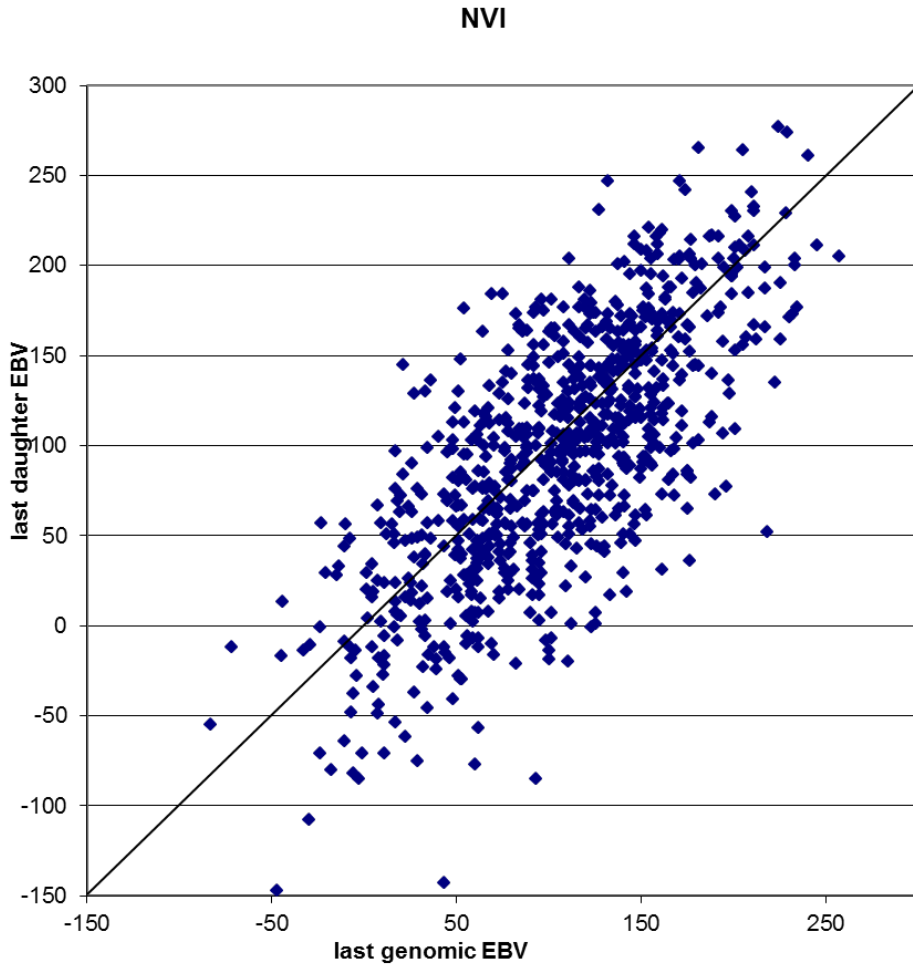
Herdlife

Udder Health
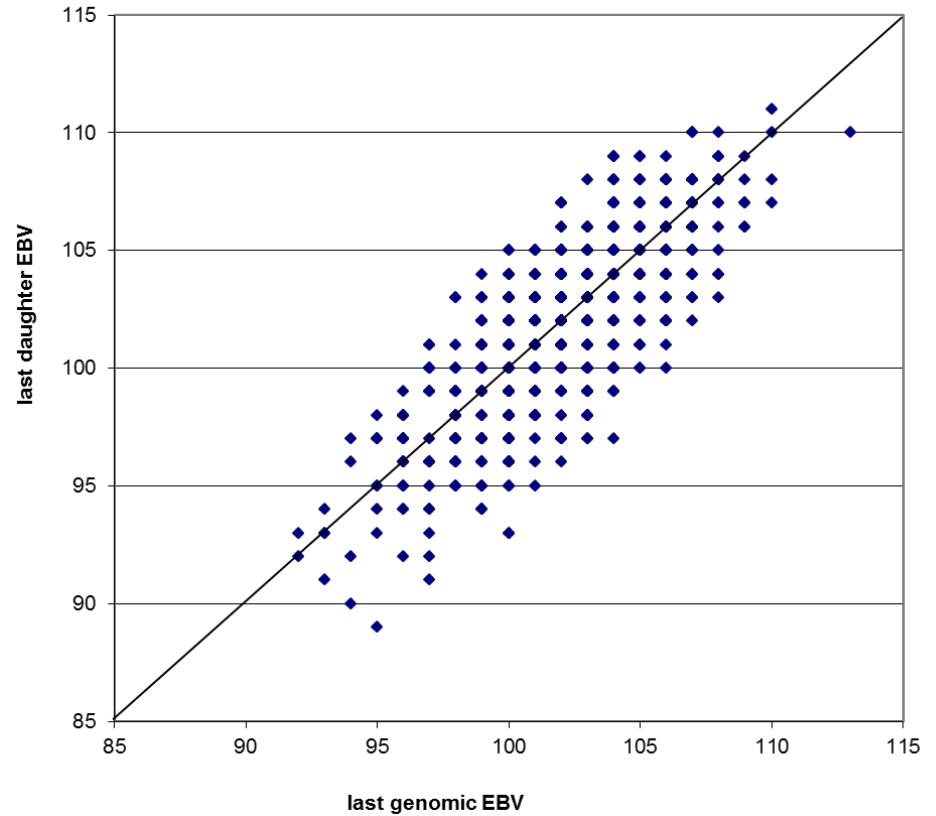
Fertility index

Feet & Legs

Changes EBV bulls genomics -> daughter EBV

class NVI based on dauEBV	Class NVI based on genomics					
	low				high	
	1	2	3	4	5	
1-20% 1	98	43	15	6	2	164
21-40% 2	42	56	40	23	8	169
41-60% 3	16	36	46	40	24	162
60-80% 4	7	21	43	57	35	163
81-100% 5	1	10	22	35	95	163
	164	166	166	161	164	821

Bulls ranking low (1) to high (5) in 5 classes

Of 164 bulls in lowest class based on genomics: 98 in the lowest class based on daughters and 1 in the highest class

Of 164 bulls in highest class based on genomics: 95 in the highest class based on daughters and 2 in the lowest class

CRV

Publication policy genomic EBVs

NLD GEBV published:

- reliability at least 30%

GMACE GEBV published:

– Bull has no EBV based on daughters having records

– Reliability at least 30%

– Reliability GMACE > 10% higher than NLD gEBV

-> as soon as foreign genomic proof is available through GMACE, it is published (following Interbull)

-> also with NVI (rank index) !!!

-> Interbull proofs available in publication list (gesfokwaarden.eu)

-> in database Stierzoeken/Siresearch (global.crv4all.com)

CRV

Final remarks

Effect on population

- large effect on bull population
    -> change in breeding programs

    -> shorter generation intervals

    -> larger genetic trend

- yet not much effect on cow population
    -> BUT coming years a large change

Genomic EBVs -> keep the same level

Thank you for your attention