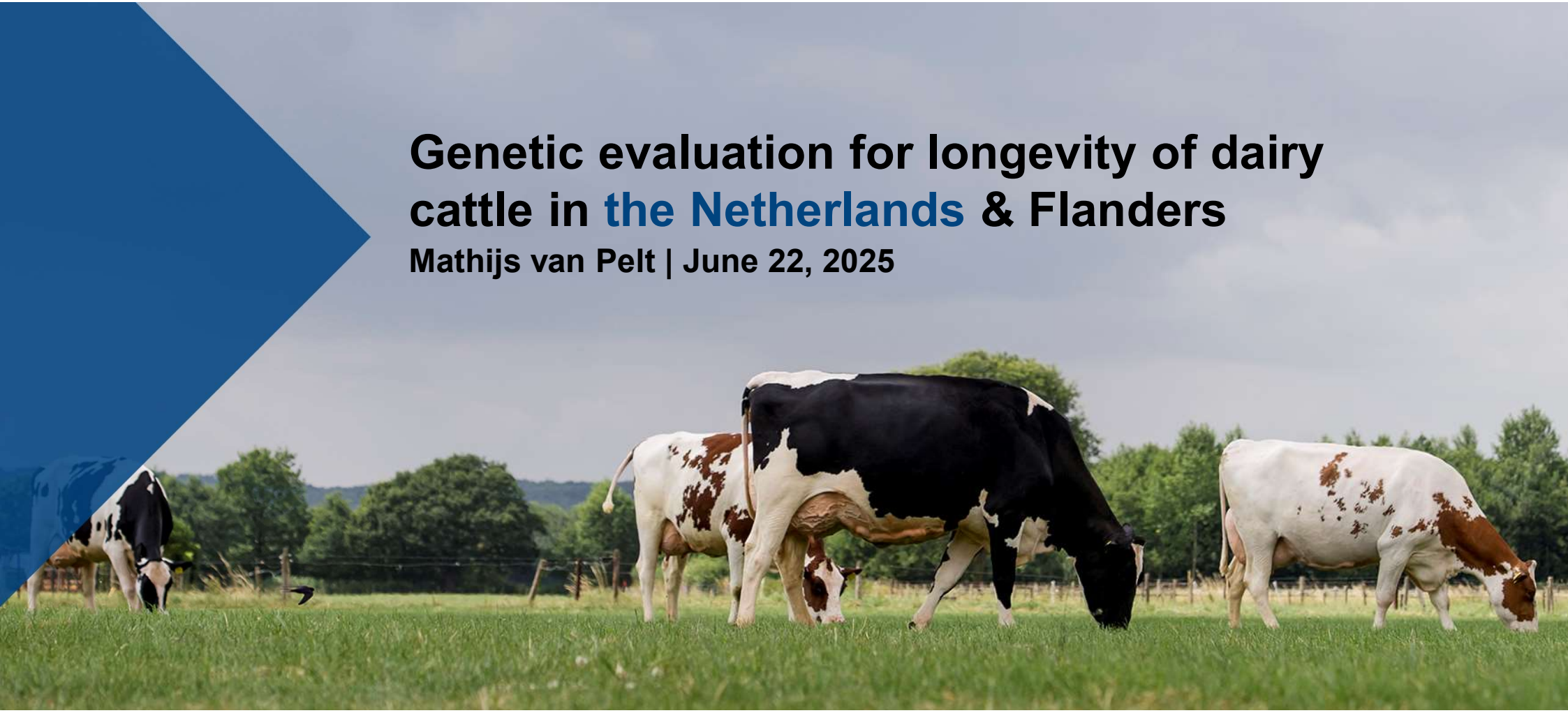
Genetic evaluation for longevity of dairy cattle in the Netherlands & Flanders

Mathijs van Pelt | June 22, 2025



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Introduction

Important trait
- Economy
- Welfare
- Society
- Government

Older cows
- Reduce rearing costs
- Older cows produce more
- More feed for dairy cows, and converted more efficiently
- Reduce environmental impact

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Genetic evaluation

- **Random regression animal model**
  $Y = X\beta + Za + e$
- **Y = Survival per month after first calving (month 1 – 72)**
- **β = Fixed effects**
  1. Herd-year-season x lactation-stage
  2. Year-season x AFC x prod x lactation-stage
  3. Herdsize change
  4. Heterosis
  5. Recombination
- **a = Additive genetic effect** (5^{th} order Legendre polynomial)
- **e = Residual**

- Year-season of first calving
- Lactation: 1, 2, 3+ for 1. and 1, 2, 3, 4, 5+ for 2.
- Stage: month 1-2, 3-9, 10+ and dry period
- AFC: age at first calving in months: 21, 22,…,34, 35+
- Prod: within-herd production level, 5 classes of 20%

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Published breeding value

Longevity is published
Across total lifespan

Genetic evaluation is on functional longevity
Correction for within-herd production level
- Functional longevity is a more stable trait over time

Selection index
1. Direct longevity : Add production
2. Longevity : Add predictors subclinical mastitis, claw health, locomotion

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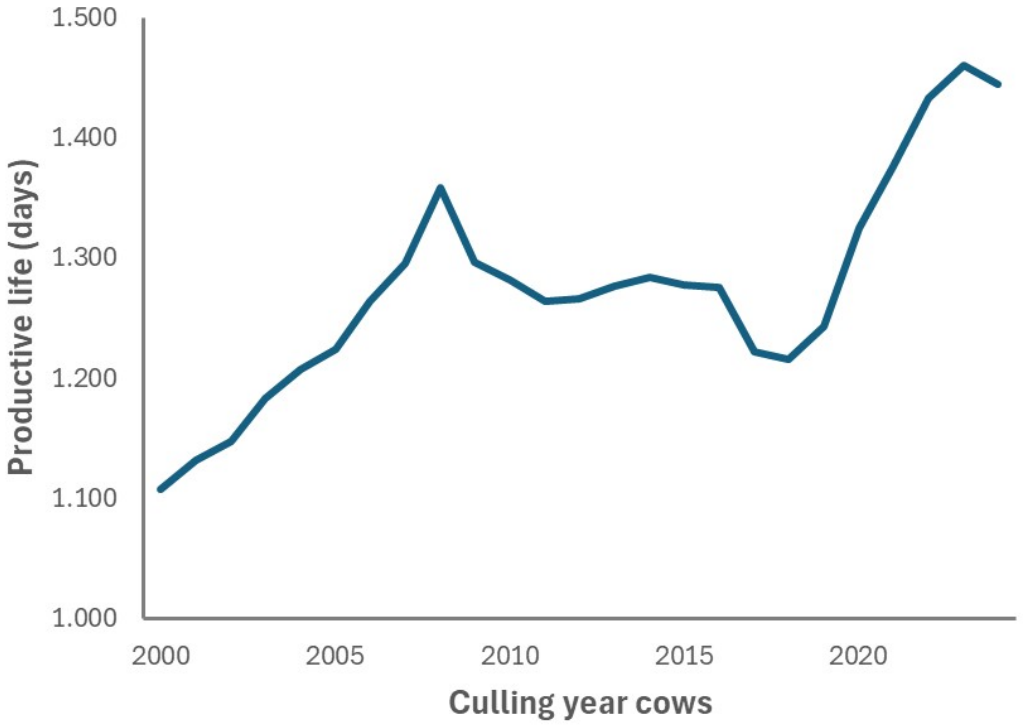
Phenotypic trend



Increase of 337 days

What is main reason for fluctuations?
Replacement strategy

This is shown by
- Quota until 2015
- Culling of excess cows in 2016-2017
  – Because of phosphate regulation
- Outbreak of blue tongue in 2023-2024

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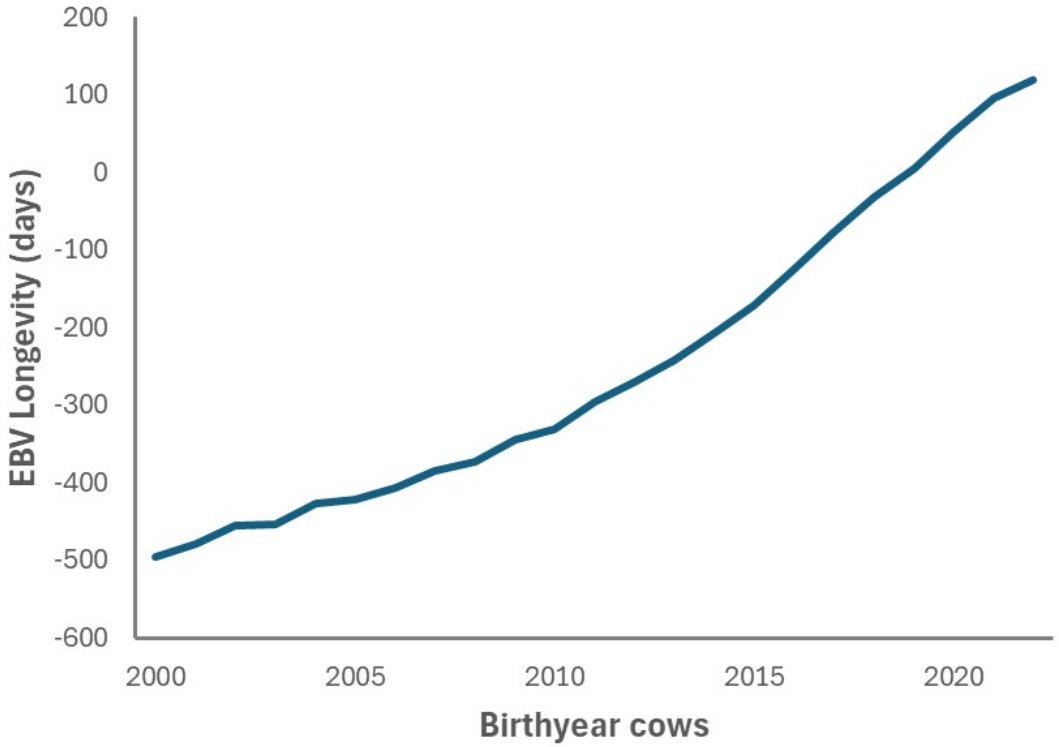
Genetic trend

EBV longevity introduced in 1999

- Increase of 615 days
- Steady increase in trend up to 2010
- Followed by accelaration in trend, progress doubled



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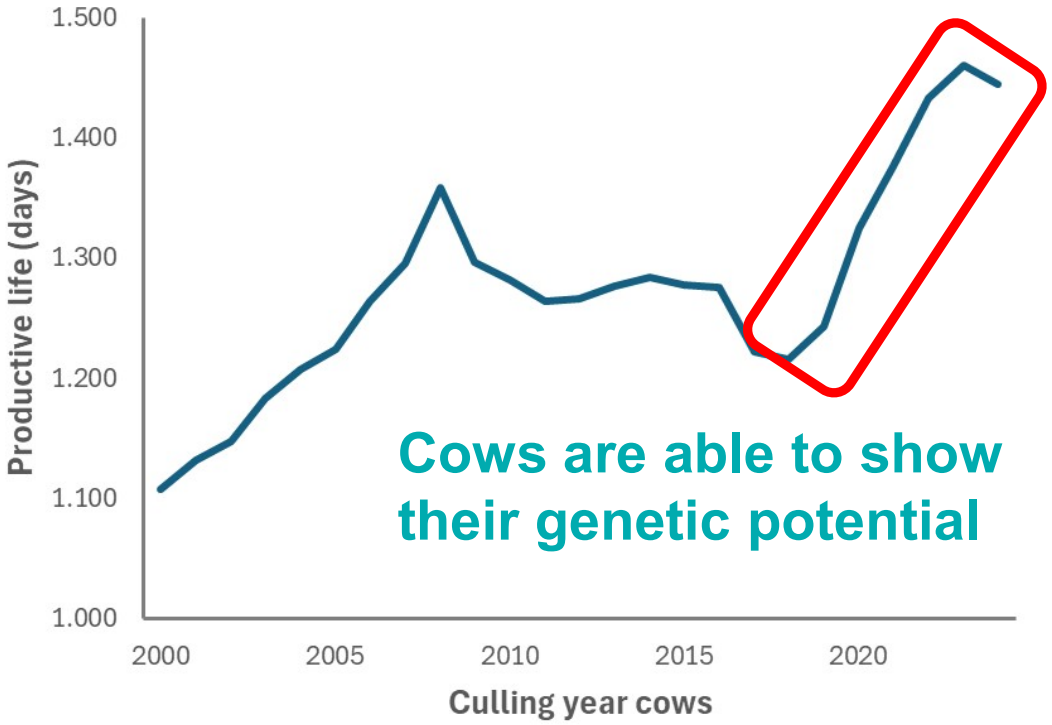
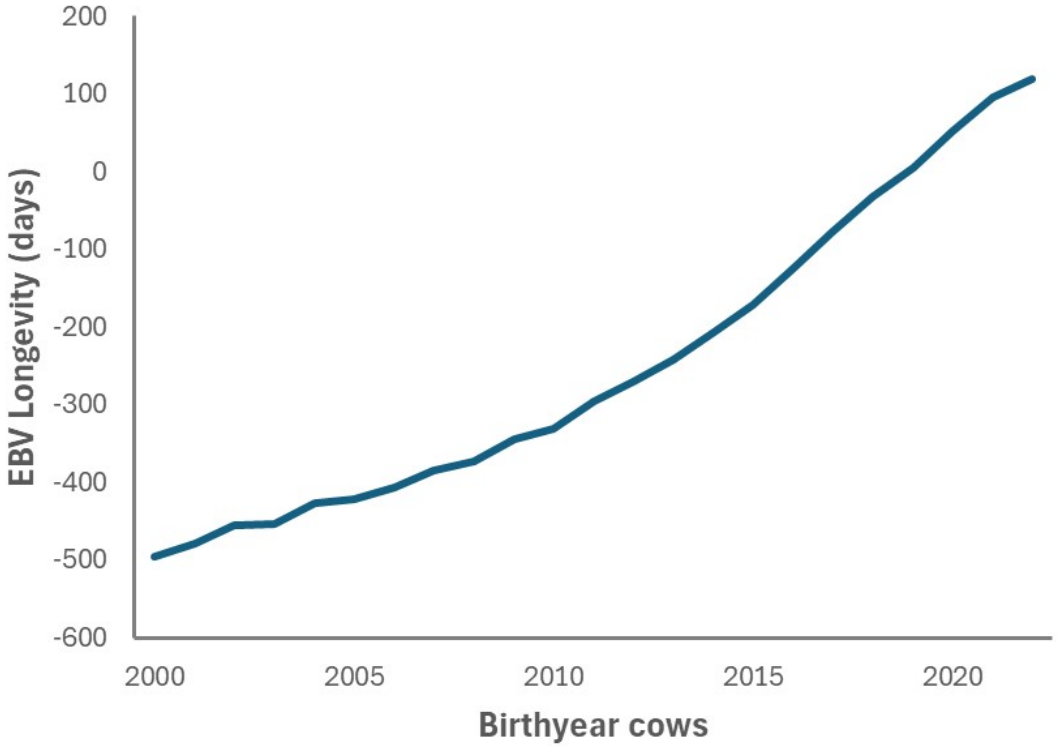
Phenotypic trend



Genetic trend



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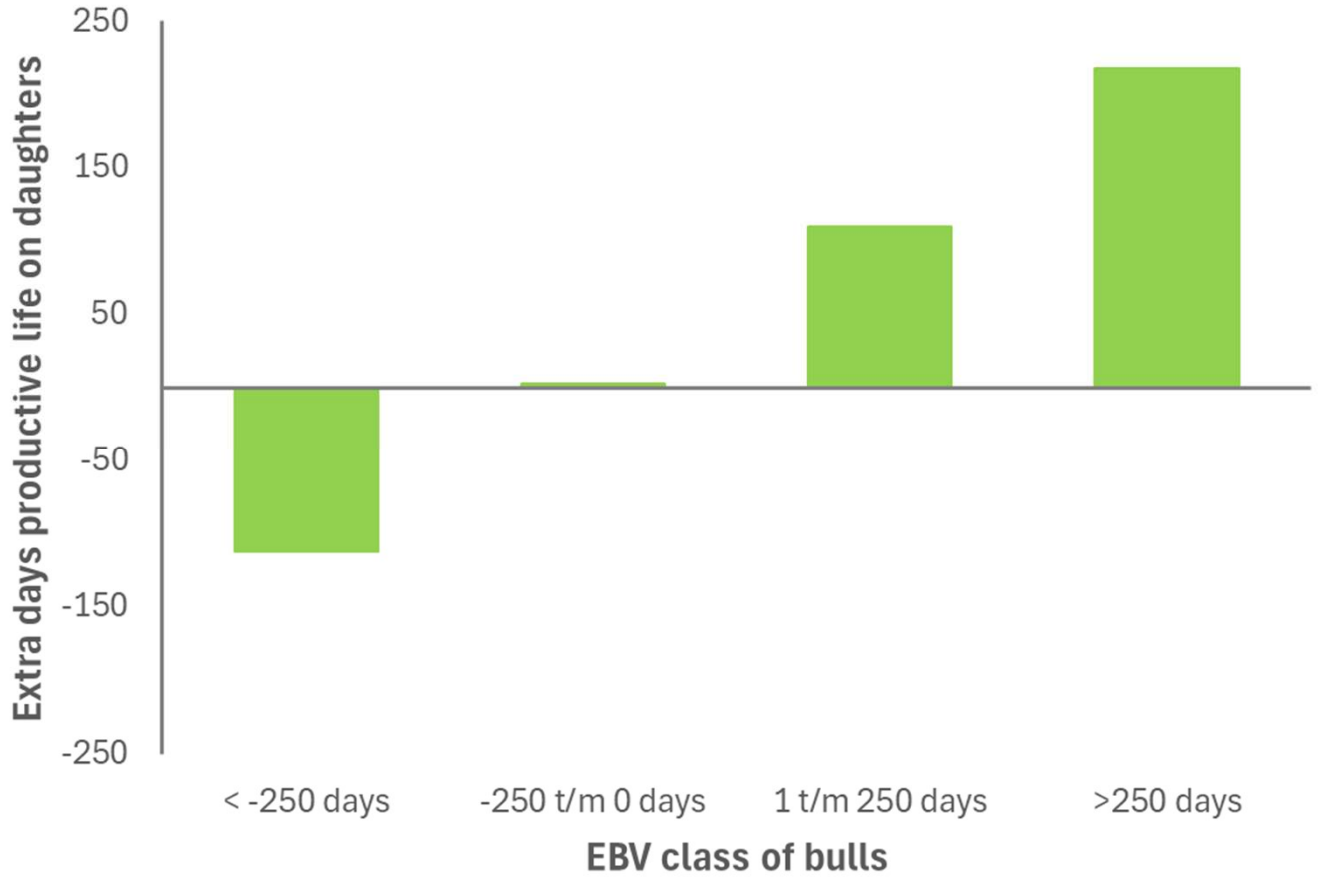
Realised extra days productive life on daughters



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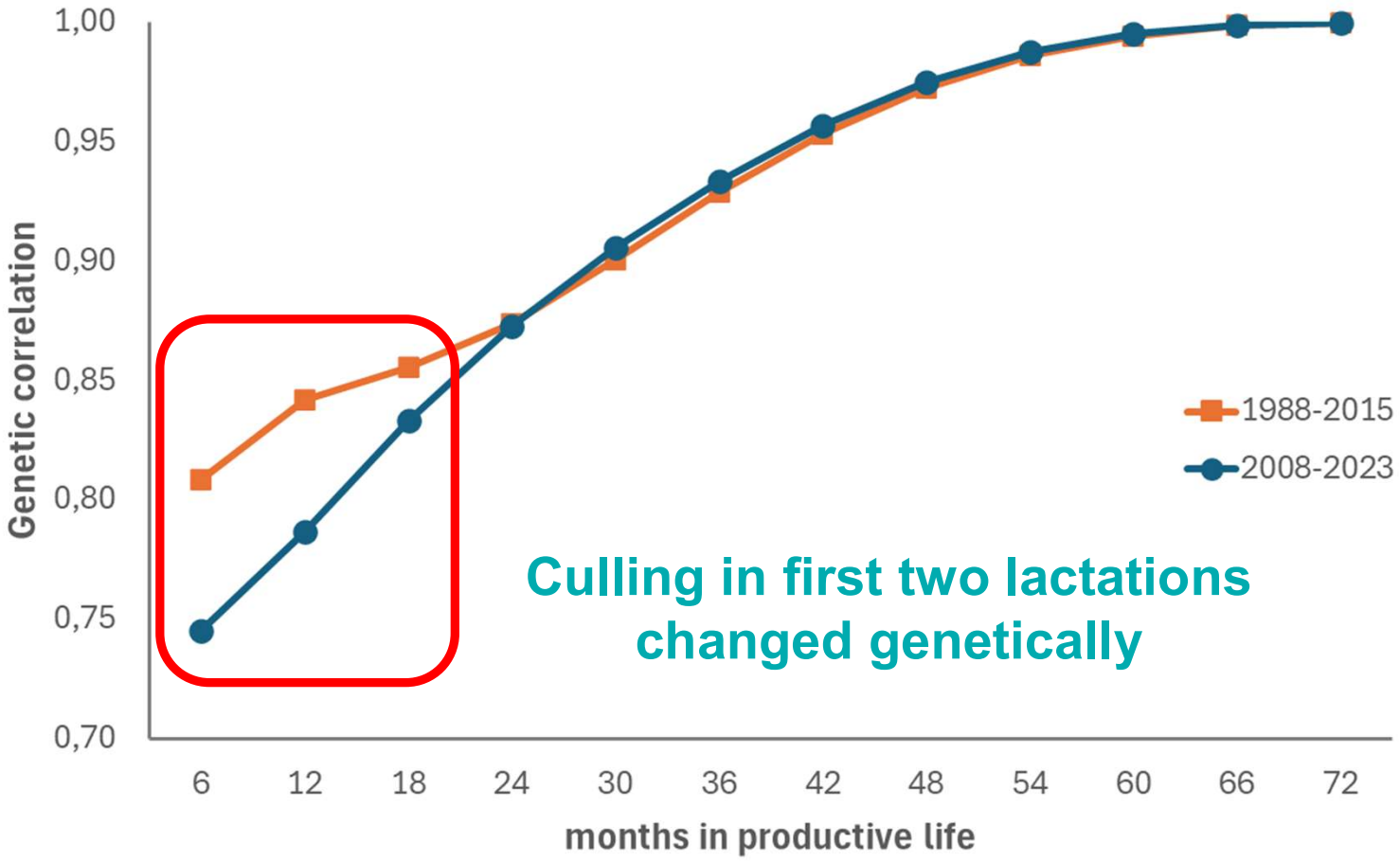
Genetic parameters changed over time



Longevity changed over time

Account for within-herd production level

- Genetically functional longevity is more stable over time

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Genetic changes of survival traits over the past 25 yr in Dutch dairy cattle

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- Culling for low production level reduced phenotypically

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animal

Changes in the genetic level and the effects of age at first calving and milk production on survival during the first lactation over the last 25 years

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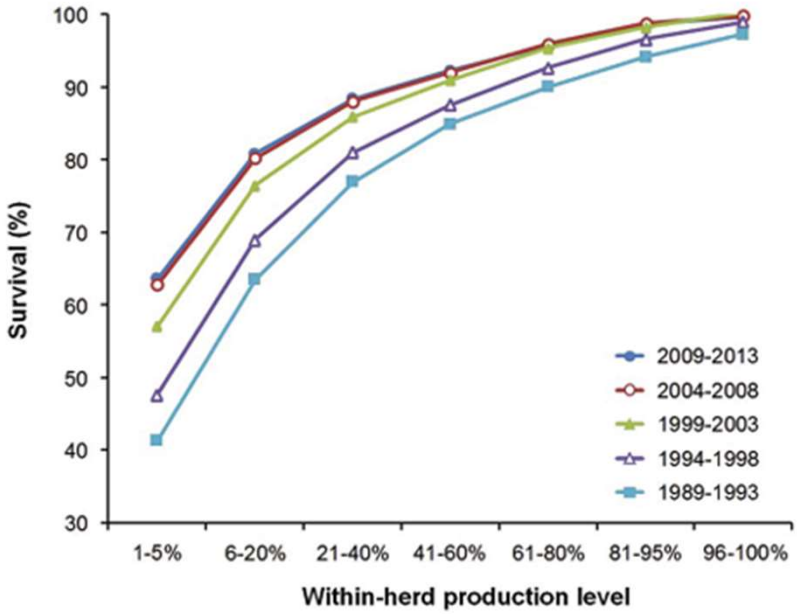

Figure 5 Predicted means for survival at 12 months for within-herd production level per 5-year interval (reference level: 41% to 60%, 2004–08). Class 96% to 100% is the highest within-herd production level.

Evolution of lifetime production statistics

	2000	2024	Change (abs)	Change (%)
number of calvings	3.1	3.9	0.8	26%
production days	967	1,291	324	**34%**
days herdlife	1,957	2,238	281	14%
kg milk per day	24.9	29.7	4.8	19%
lifetime production kg f+p	1,895	3,053	1,158	**61%**
lifetime production kg milk	24,044	38,283	14,239	**59%**
productive life	1,108	1,445	337	30%
rearing period	803	763	-40	-5%
kg milk per day of life	12.3	17.1	4.8	**39%**
kg f+p per day of life	0.97	1.36	0.40	**41%**

Breeding goal

Total merit index NVI
Breeding goal evolved
- Only production
- + longevity
- + health traits

Result is that response on longevity is highest
- All traits in NVI have a positive correlation with longevity

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Conclusions

Longevity improved genetically and phenotypically
Replacement strategy biggest factor whether genetic potential is fully utilized

Increase in longevity → improvement of health
Improvement of health → increase in longevity

Cows are able to produce more lactations, and stay healthy
- what society wants as well as farmers

Will cows in 2050 have 60% higher lifetime production?

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Thank you!

First Dutch cow > 200,000 kg milk

Boukje 192 EX90 (Cash x Labelle x F16 x Tops)

207,827 kg milk 4.64 %f 3.86 %p 17,678 kg f+p

Mts. Knoef-Hendriksen, Geesteren

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