



Breeding for resilience in the Netherlands and Flanders

Niek Meijer | 3 September 2024



Royal Cooperative CRV u.a.

Cooperation of cattle breeders

the Netherlands and Flanders

20,000 members

Herd book

Herd book registration

Herd classification

Animal evaluation

Owner of CRV Holding BV



Breeding

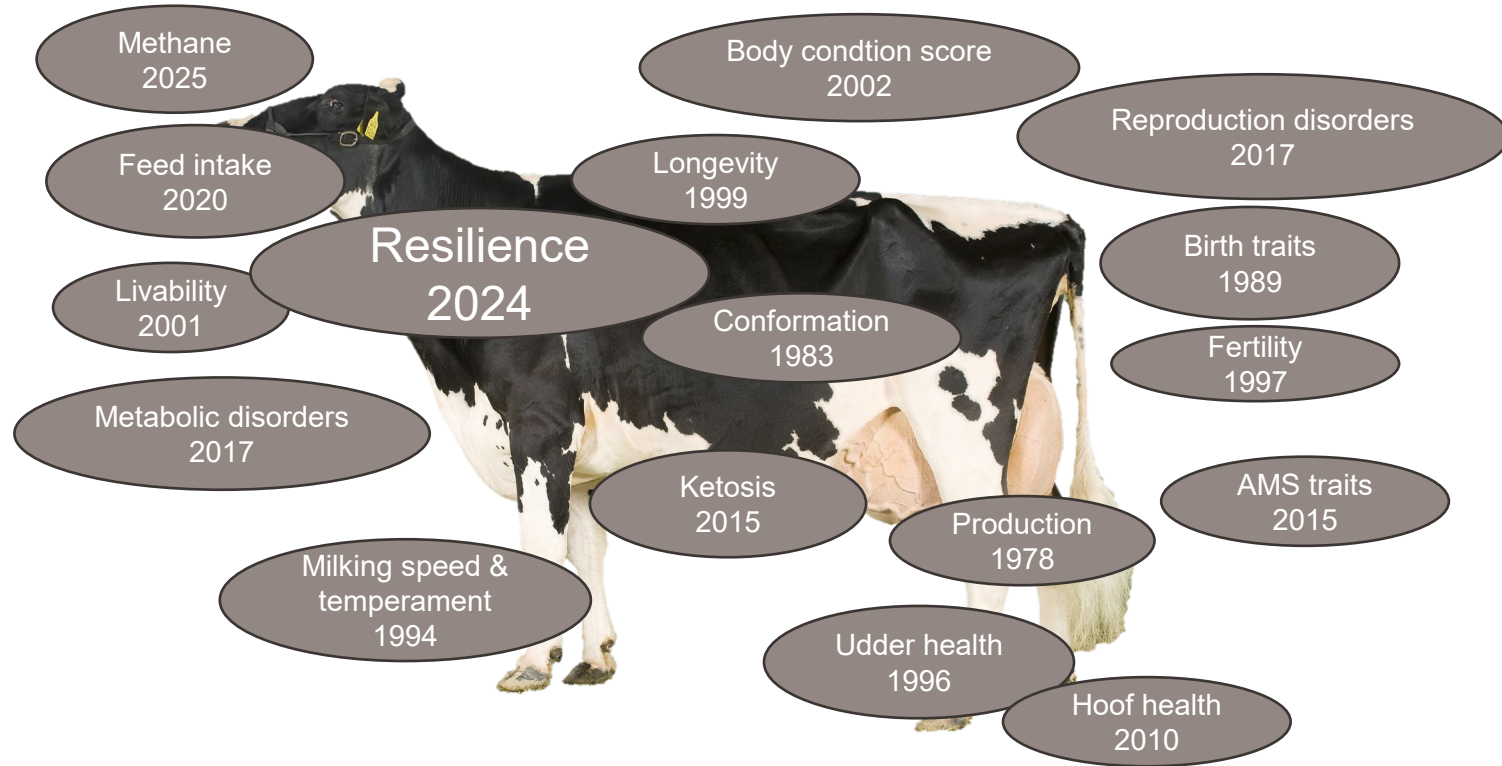
Selecting the best animals for the next generation.

Which animals are the best?

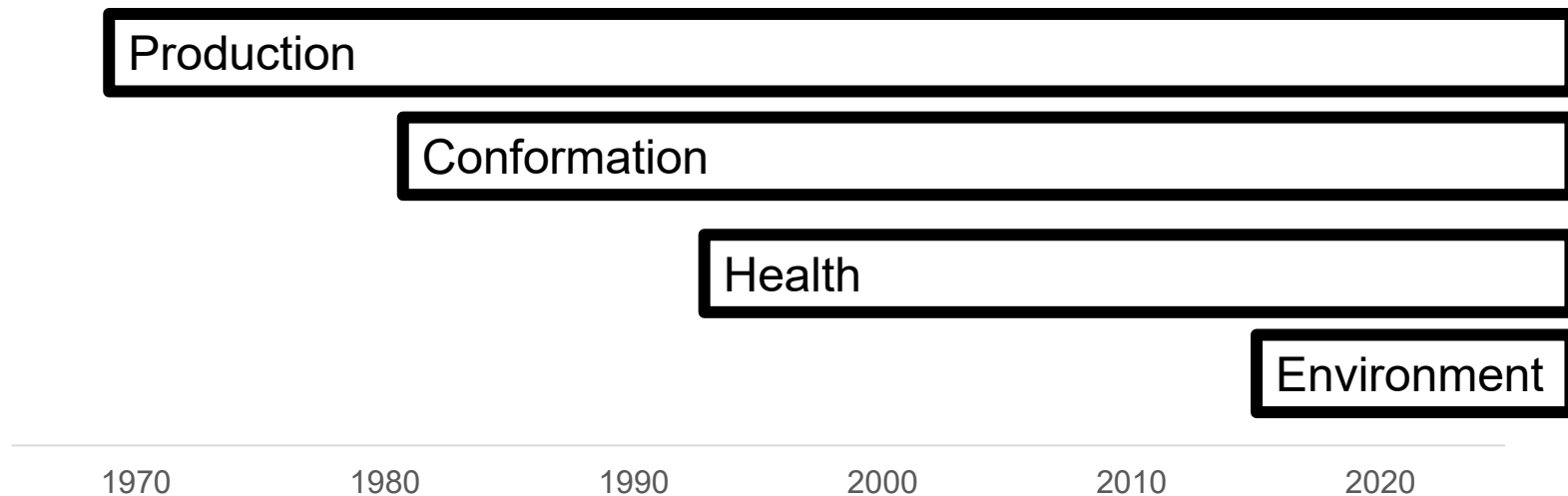
Estimated breeding values!

A breeding value is an estimate of an animal's genetic merit for a particular trait.

Breeding values - traits



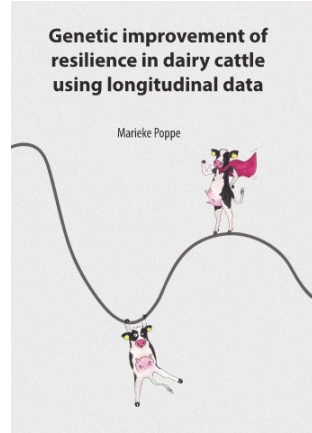
Timelapse



Resilience

How can the overall health of cows be improved from a genetic point of view?

Based on PhD of Marieke Poppe at Wageningen University (2022)



News

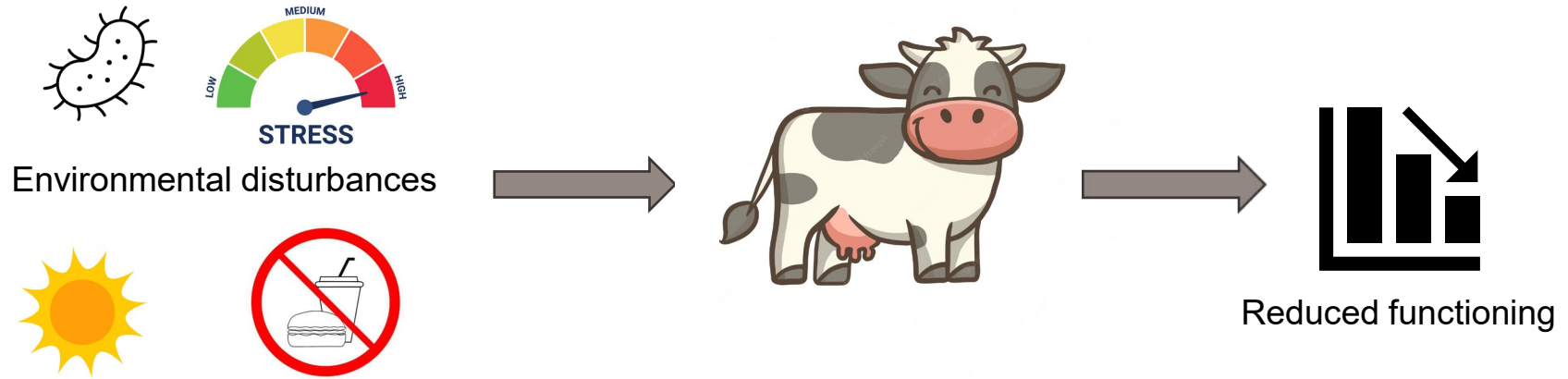
Milk yield resilience indicators and sensor features for a more diverse and sustainable dairy production landscape

August 29, 2023

Milking robot helps breed 'trouble-free' cows

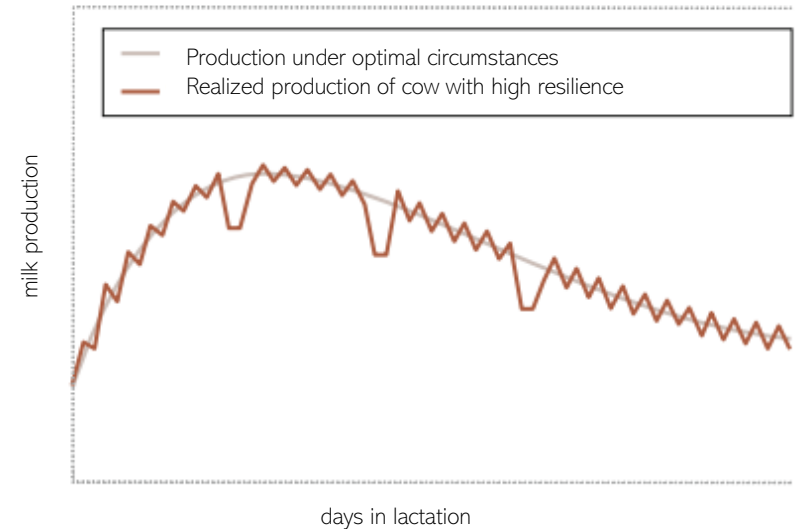
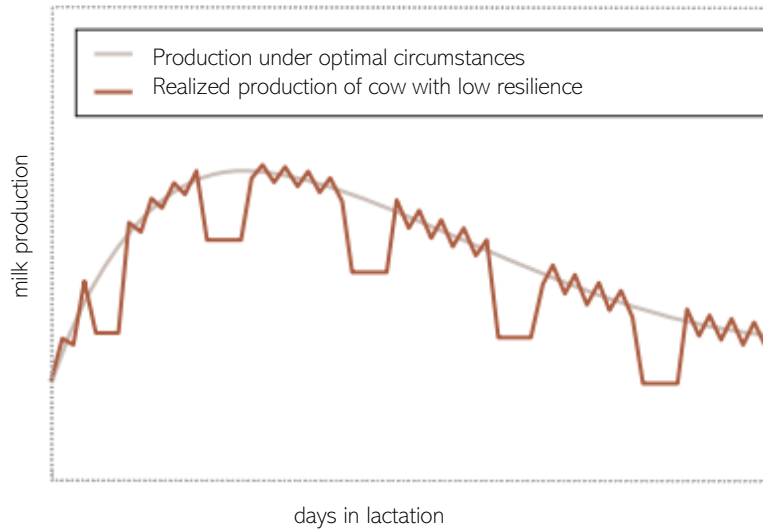
22 January 2020 | by FarmingUK Team | Dairy, Machinery, News

Resilience



*The ability to be minimally affected by disturbances
AND / OR
to recover quickly when affected*
Colditz & Hine, 2016

Resilience





Breeding for resilience = breeding for cows which can cope with disturbances in the environment regardless of the system in which they are kept



How to measure resilience?

Dataset with information with individual milk records since 2010 (> 5 billion)

Automatic milk systems (AMS) and milking parlour with electronic milk devices

Calculate daily milk yield

Predict optimal production curve for each cow, each lactation

Calculate for each cow how much the cow has produces less / more than predicted

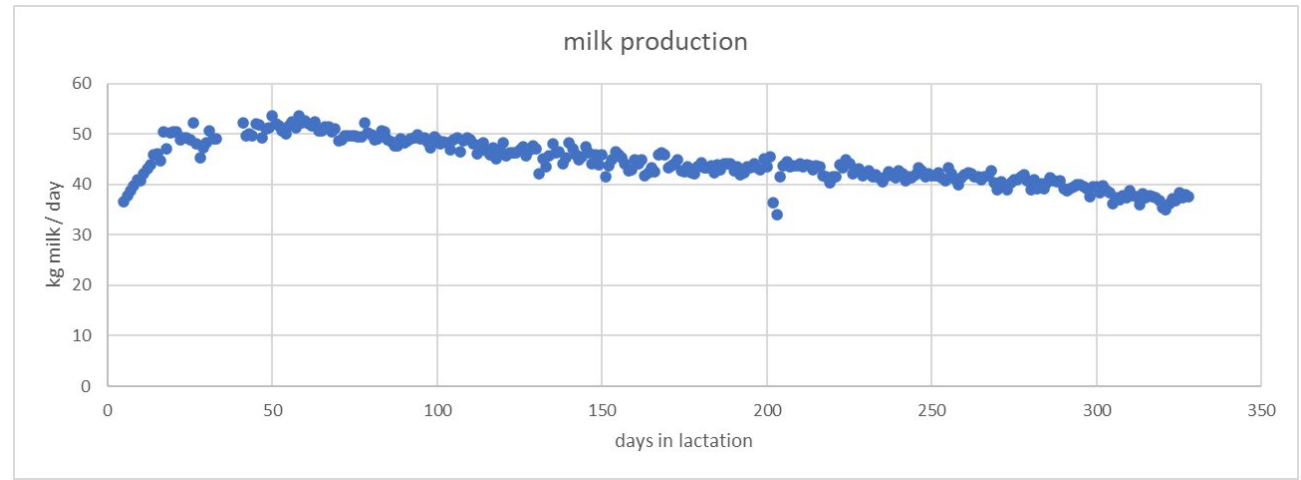
large difference → low resilience

low difference → high resilience

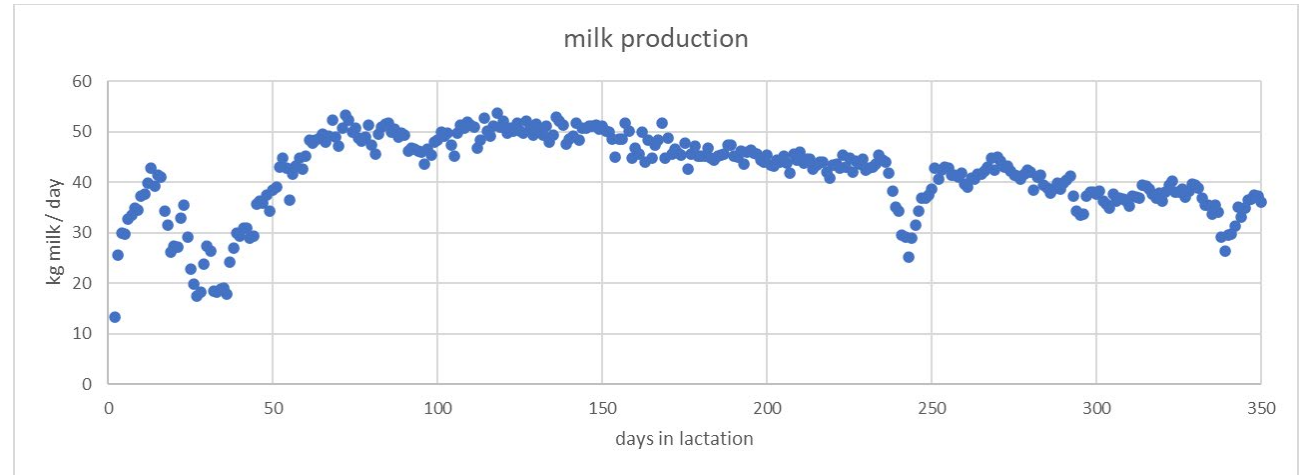
Example



high resilience



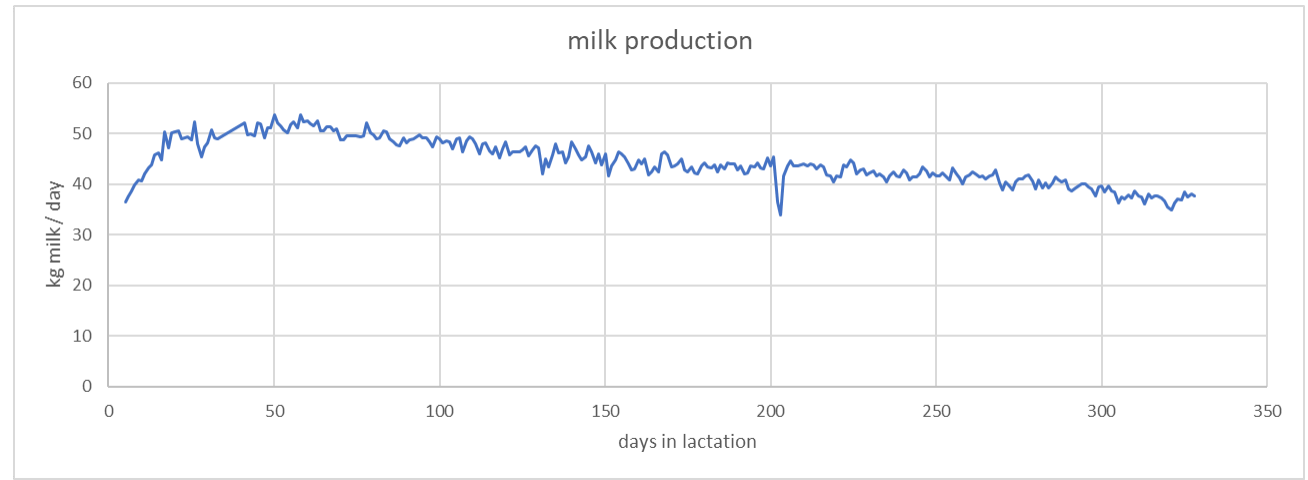
low resilience



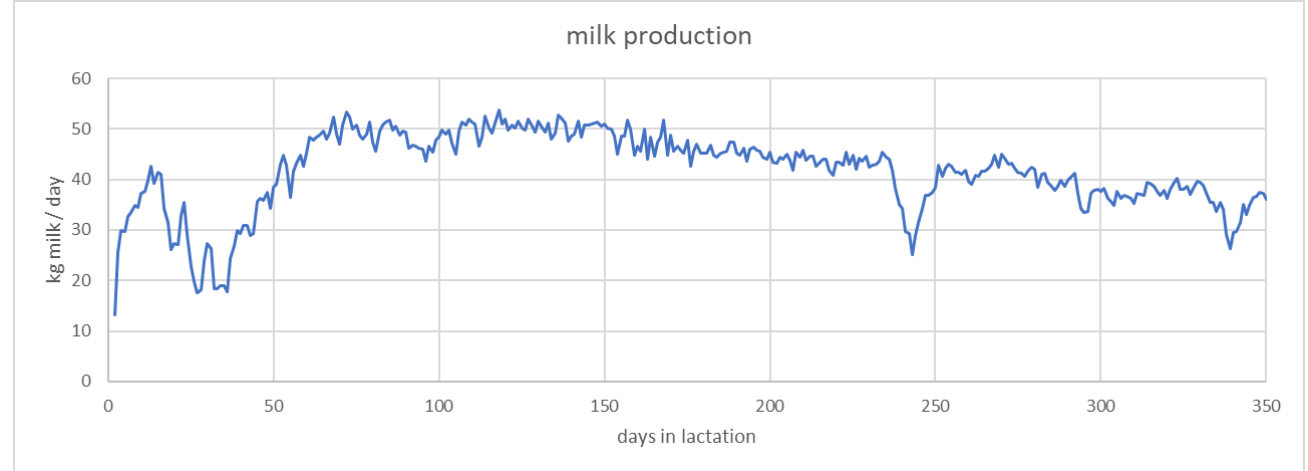
Example



high resilience



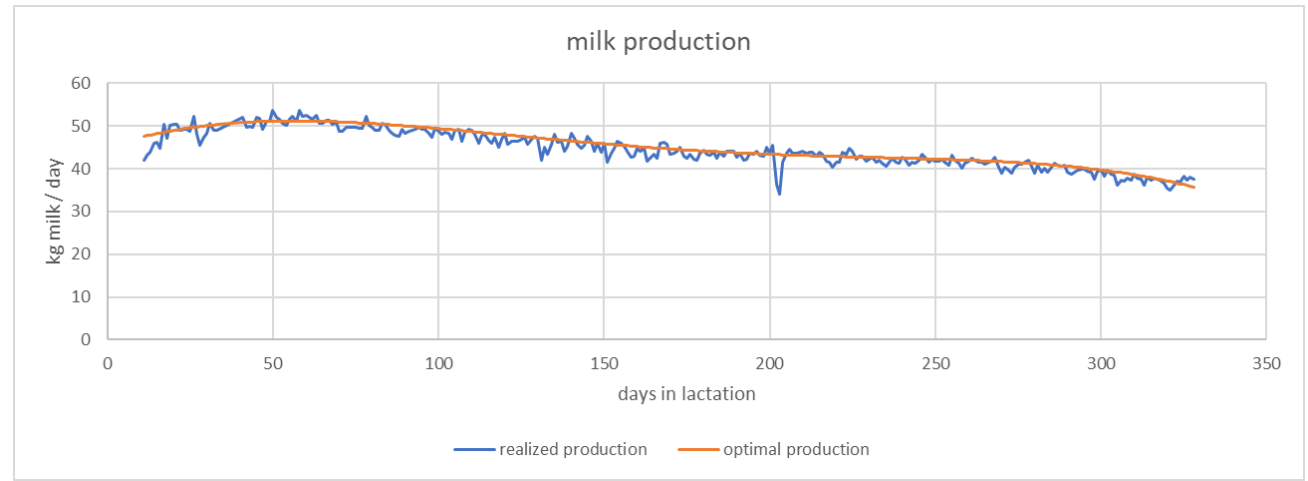
low resilience



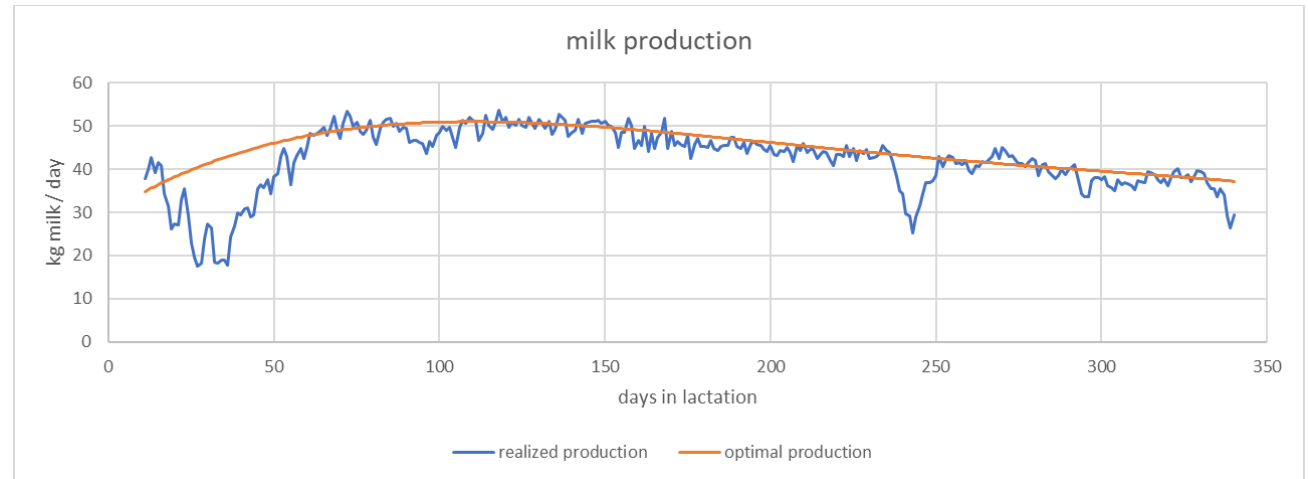
Example



high resilience



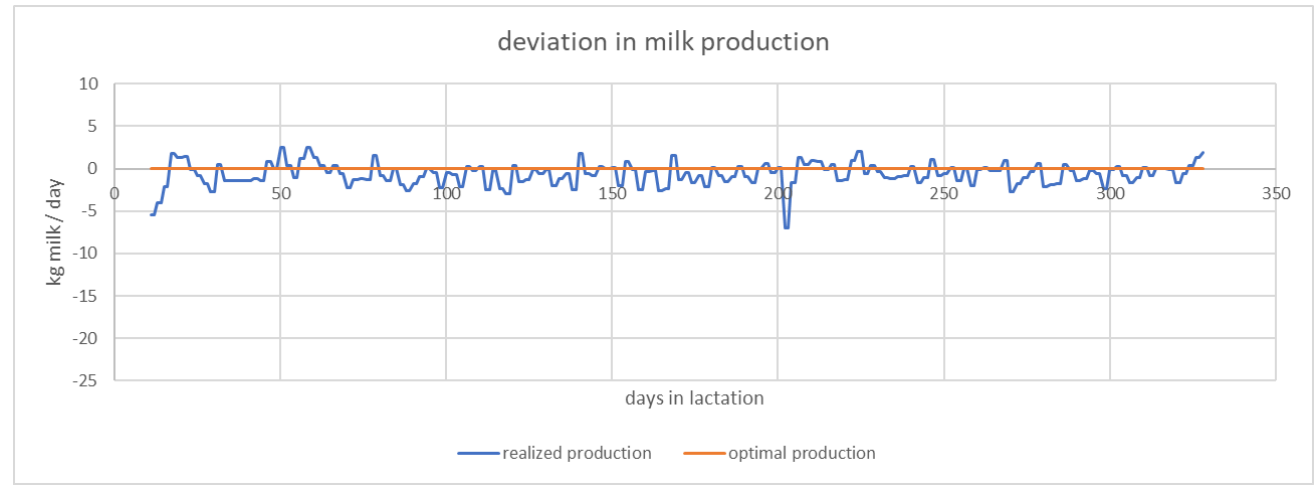
low resilience



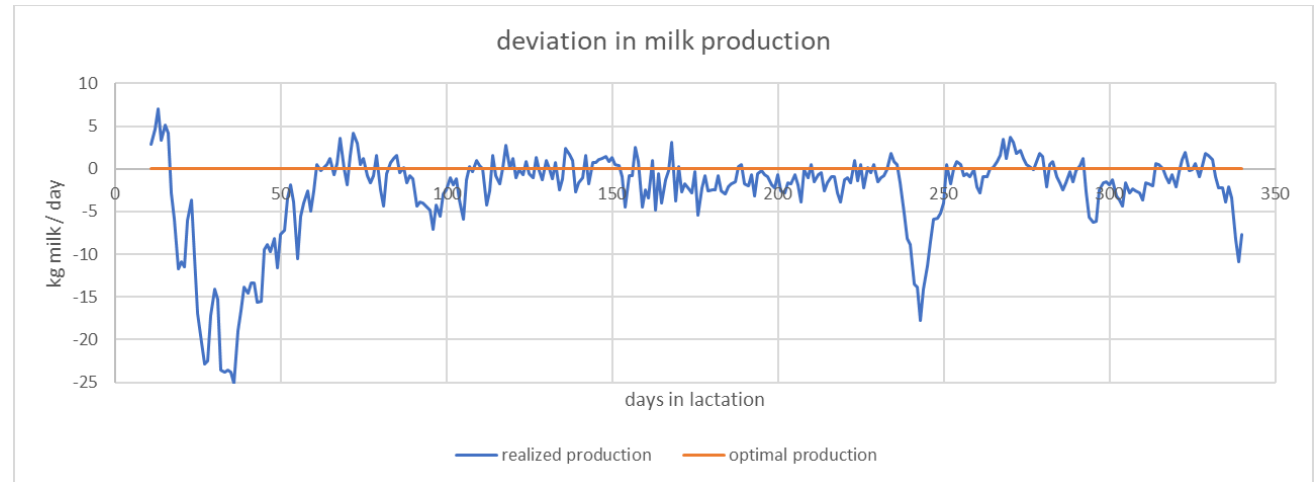
Example



high resilience



low resilience



Resilience – trait definition

Recovery

the time it takes to recover from a disturbance

Stability

the amount of disturbances that were met during a lactation

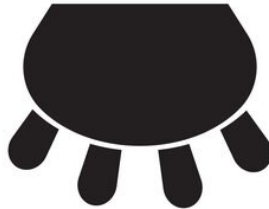
Traits

2 characteristics



- Recovery
- Stability

3 parities



- Parity 1
- Parity 2
- Parity 3+

2 milking systems



- Automatic milking system (AMS)
- Electronic milking measurement (EMM)

12 traits in total

Traits based on AMS are the breeding goal trait

Genetic parameters - heritability

	AMS	EMM
Recovery 1	0.07	0.04
Recovery 2	0.04	0.03
Recovery 3+	0.04	0.02
Stability 1	0.09	0.05
Stability 2	0.06	0.05
Stability 3+	0.09	0.04

**Heritability is the proportion of variation in the phenotype of a trait due to genetics
0.00 – 1.00**

AMS higher heritability

Stability higher heritability

Genetic correlations with other traits

	Recovery	Stability
Milk production	-0.14	-0.36
Fertility	0.08	0.31
Ketosis	0.16	0.49
Longevity	-0.06	0.33
Metabolic disorders	0.14	0.48
Claw health	-0.03	0.14
Reproduction disorders	0.06	0.15
Udder health	0.22	0.50

**The genetic correlation describes the genetic relationship between two traits
-1.00 – +1.00**

55% of the variance in resilience can be explained by other health traits and longevity

45% not explained → added value



Resilience on farm

Netherlands and Flanders:

- mean EBV = 100
- sd. EBV = 4

	EBV 92	EBV 100	EBV 108
Recovery – time to recover	14.0 days	10.9 days	7.0 days
Stability – number of disturbances	4.8	3.8	2.4



APPROVED

Breed differences

Breed	Recovery	Stability
Holstein	100.4	99.0
Dutch Friesian	100.4	106.0
Meuse-Rhine-Yssel (MRY)	101.5	107.3
Fleckvieh	106.0	103.0
Brown Swiss	103.5	100.8
Schwedish Red	101.6	99.9
Groninger Blaarkop	99.8	105.8
Jersey	105.2	108.4
Montbéliarde	103.8	101.1

Dual purpose breeds and Jerseys are more resilient



Publication

1. Total breeding value recovery (*recovery*)
2. Total breeding value stability (*stability*)
3. Index resilience (*resilience*)



Vj Kjoelby Higher Highlan
Best bull for resilience

Perspublicatie Veerkracht NvI is berekend op ZB basis en veerkracht op eigen basis

Augustus 2024

Ki	Stiernummer	Stiernaam	Erf-fact	Vader	M-vader	B	N	Bt	NVI	Basis	dtrs	Bt	Veerkracht	Herstel	Stabiliteit
Ai	Bull number	Bull name	Her-fact	Sire	MGs	S	N	Rel	NVI	Base	daus	Rel	Resilience	Recovery	Stability
Kolom1	Kolom2	Kolom3	Kolom4	Kolom5	Kolom6	Kolom7	Kolom8	pnt							
K&L	DK 03786504671	Vj Kjoelby Higher Highlan		Vj Higher	Vj Pil	Int		73	-1	-roodbont	23	40	114	109	112
	FR 2212574810	Uheliad		Buttercup P	Gfww	n		69	+187	roodbont	0	65	113	111	110
CRV	CZ 563882032	Galileo		Osmium	Levier	Nat		94	-86	roodbont	303	94	113	112	110
Alt	US 3131664037	Peak Altadepot		Hotshot	Montross	Gnat		88	+239	-zwartbont	58	84	112	107	111
CRV	NL 743430180	Delta Bonjour		Sidekick	Guard	Gnat		95	+231	+zwartbont	837	96	112	108	110
43	NL 657485003	Bloemplant Hoeve Cash		Lord 108	Thierry	Nat		49	-222	dubbeldoel	43	67	112	108	110
Sem	CA 12857898	Progenisis Wimbledon		Altarobson	Denver	Int		76	+217	-zwartbont	27	73	111	106	110
CRV	NL 942139549	Weinterper Zodiac	LR	Leverage	Ranger	Gfww		78	+148	-zwartbont	5	72	111	102	111
Sem	CA 12556108	Legend-Maker Victor		Kingpin	Liquid Gold	Nat		93	+114	-zwartbont	364	93	111	114	107
Kam	NL 656965812	Gansey's Antartica		Stellando Rf	Dakker	Gnat		93	+23	roodbont	553	92	111	113	107
CRV	US 118313241	Jx Wilsonview M/z Stormy (4)		Marvel	Pr Oomsdale Jt	Nat		91	+3	roodbont	175	88	111	108	109
K&L	DK 03740801889	Vj Hoeholt Hjort Hjørri		Vj Hjorvangs H	Dj Holmer	Int		77	-23	roodbont	4	40	111	105	110
Sam	DK 05344803736	Adelgaard Collin		Vj Quintana	Hirse	Nat		72	-24	roodbont	62	54	111	106	109
CRV	NL 884336796	Delta Cream P-Red	PO	Goldline	Nominator	Gfww		70	+343	roodbont	0	66	110	103	109
	FR 2936057646	Uhelgoat P		Drone Pp	Yield	Gfww		69	+269	roodbont	0	65	110	109	107
CRV	NL 684982928	Lowlands Goldline-Red		Listrotto	Rosebud	Gfww		76	+263	roodbont	0	72	110	99	111
CRV	NL 574327024	Willem's-Hoeve R Sakarun P	RF PO	Launch Pp	Martin	Gfww		74	+267	+zwartbont	0	70	110	99	111
Alt	US 3201895032	Co-Op Dd Altamodex		Josuper	Blowtorch	Nat		74	+246	+zwartbont	36	71	110	103	110
CRV	BE 914488171	Delta Nominator-Red		Jacuzzi	Finder	Gnat		90	+199	-roodbont	853	92	110	107	108
CRV	NL 926807954	Delta Buttercup P-Red	PO	Nominator	Jim P	Gfww		75	+186	-roodbont	0	72	110	108	108
	DK 260548	Vh Badger Burst		Vh Bruce Badg	Vh Odense Og	Gint		78	+208	-zwartbont	0	62	110	103	110
CRV	NL 563456386	Delta Prepper P	RF PO	Jawline Pp	Nobel	Gfww		73	+202	-zwartbont	0	69	110	104	110
CRV	NL 623636125	Delta Fond PP-Red	PP	Mingo P Rf	Laurent P Rf	Gnat	Gn	21	+116	+roodbont	106	78	110	98	111
K&L	DK 03372307328	Vh Anderstrup Battlecry Baylor		Battlecry	G-Force	Int		75	+147	zwartbont	1	68	110	104	110

Breeding for resilience

Healthy cows (positive correlations with health traits) 

Increased longevity (positive correlations with longevity) 

Captures health that is not in the current health traits 

Easy manageable cows 

Cows can cope with different environmental systems 

Animal welfare 

Introduced since April 2024



