

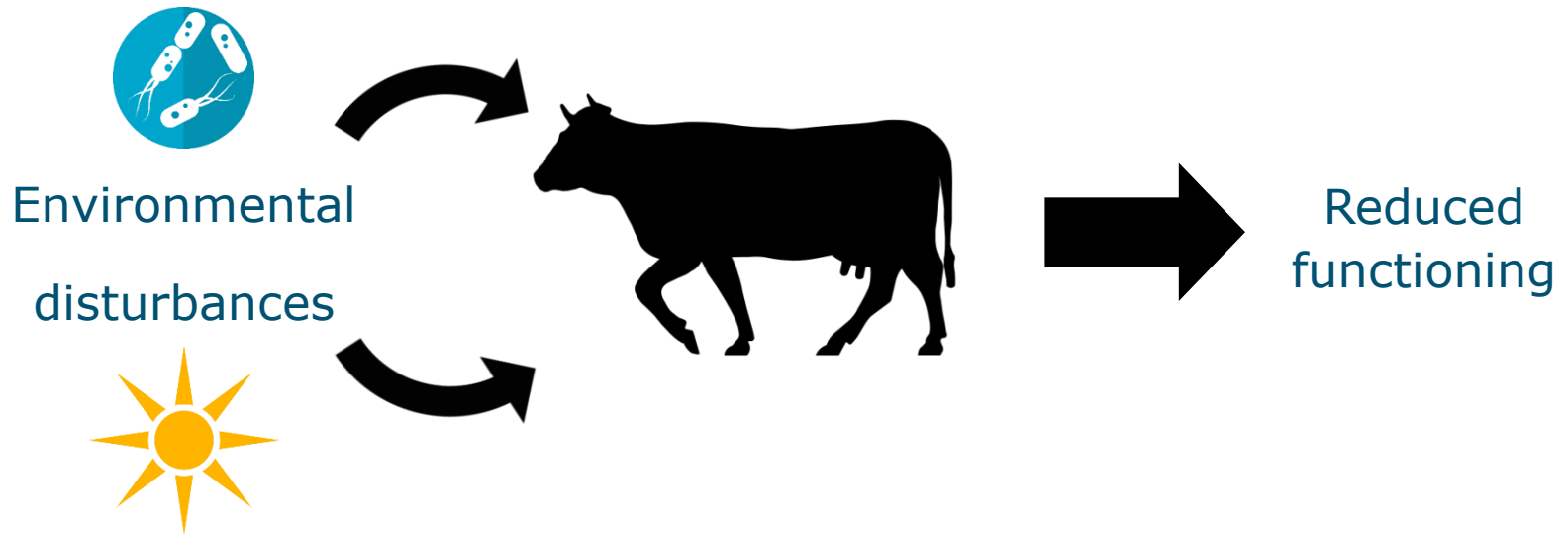
Validation of resilience indicators for dairy cattle based on milk yield data

Marieke Poppe, Han Mulder, Roel Veerkamp

WIAS Annual Conference April 28, 2021



Resilience in dairy cattle

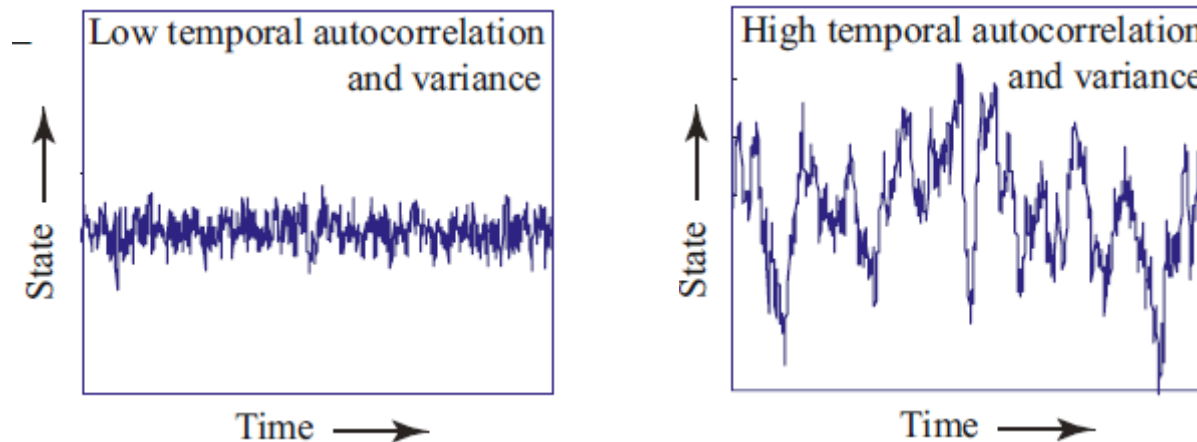


The ability to be minimally affected by disturbances
AND/OR
to quickly recover

Colditz & Hine, 2016

Background: developing resilience indicators

- Resilience theory of Marten Scheffer
 - Fluctuations of longitudinal traits of a system describe response and recovery to small natural disturbances
 - Variance
 - Autocorrelation

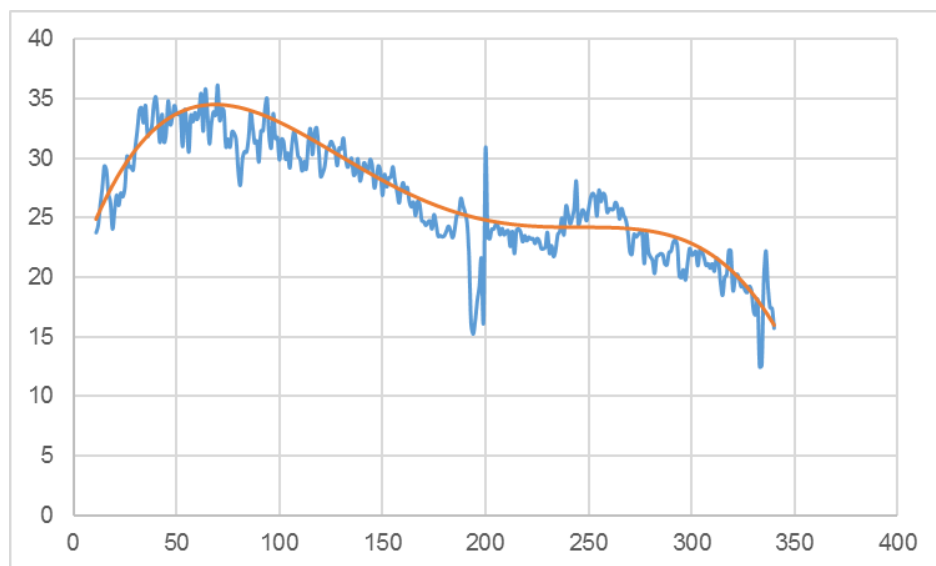


¹Scheffer et al. 2018. Quantifying resilience of humans and other animals. PNAS.

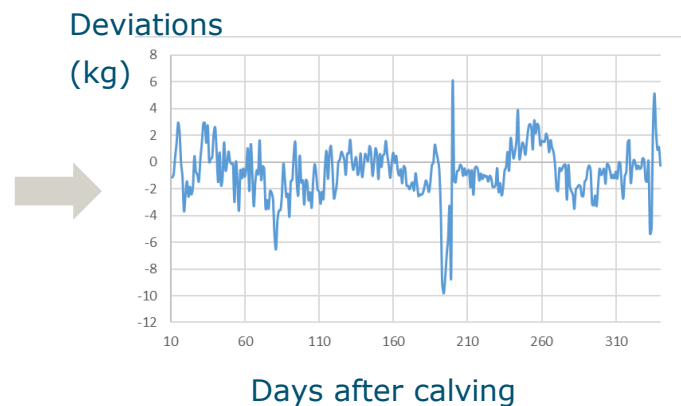
Background: developing resilience indicators

- Apply Scheffer theory on daily milk yield data
 - Variance & autocorrelation of deviations from curves

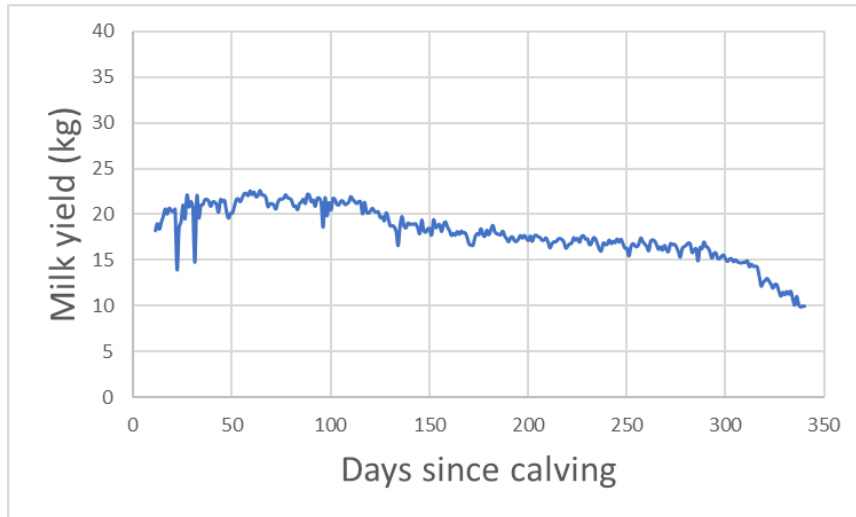
Milk yield
(kg)



Days after calving

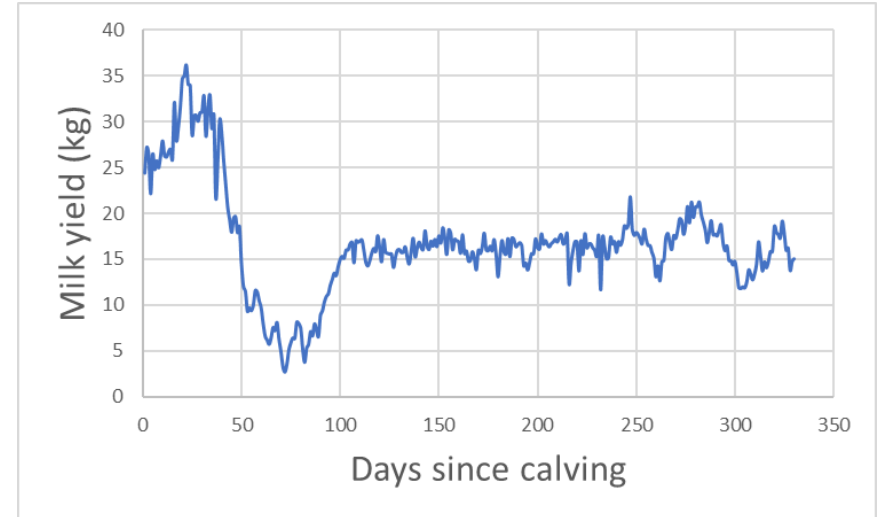


Resilience indicators examples



Low variance
&
low autocorrelation

Resilient (?)



High variance
&
high autocorrelation

Not resilient (?)

Background: developing resilience indicators

- Variance & autocorrelation heritable (0.21 and 0.09)
- Seem to indicate resilience: favourable genetic correlations with health and other functional traits
 - However, stronger for variance than autocorrelation
- Problem: health & longevity \neq resilience !

The ability to be minimally affected by disturbances

AND/OR

to quickly recover

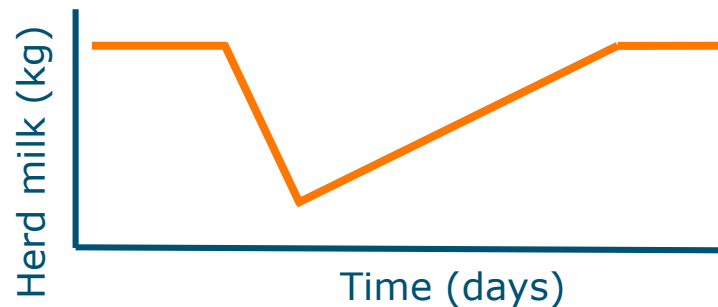
Colditz & Hine, 2016

Research question

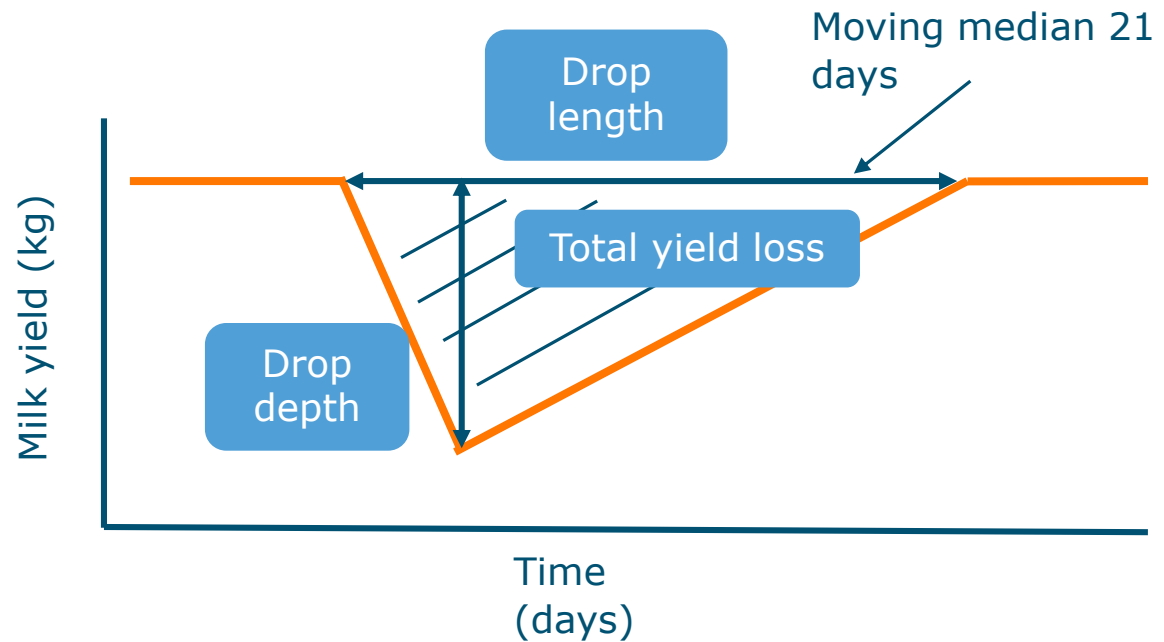
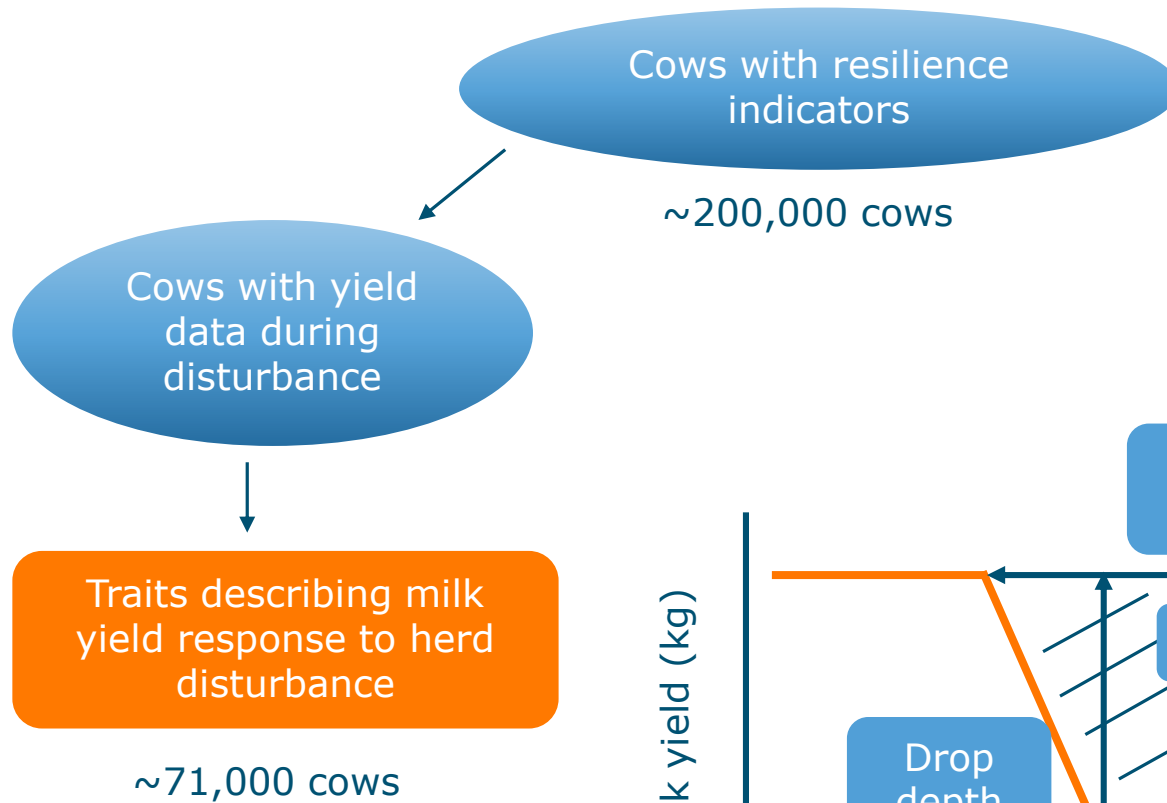
Do cows with good genetic merit for resilience indicators show **smaller decline in milk yield** and **quicker recovery** than cows with poor genetic merit

In case of real-life disturbances?

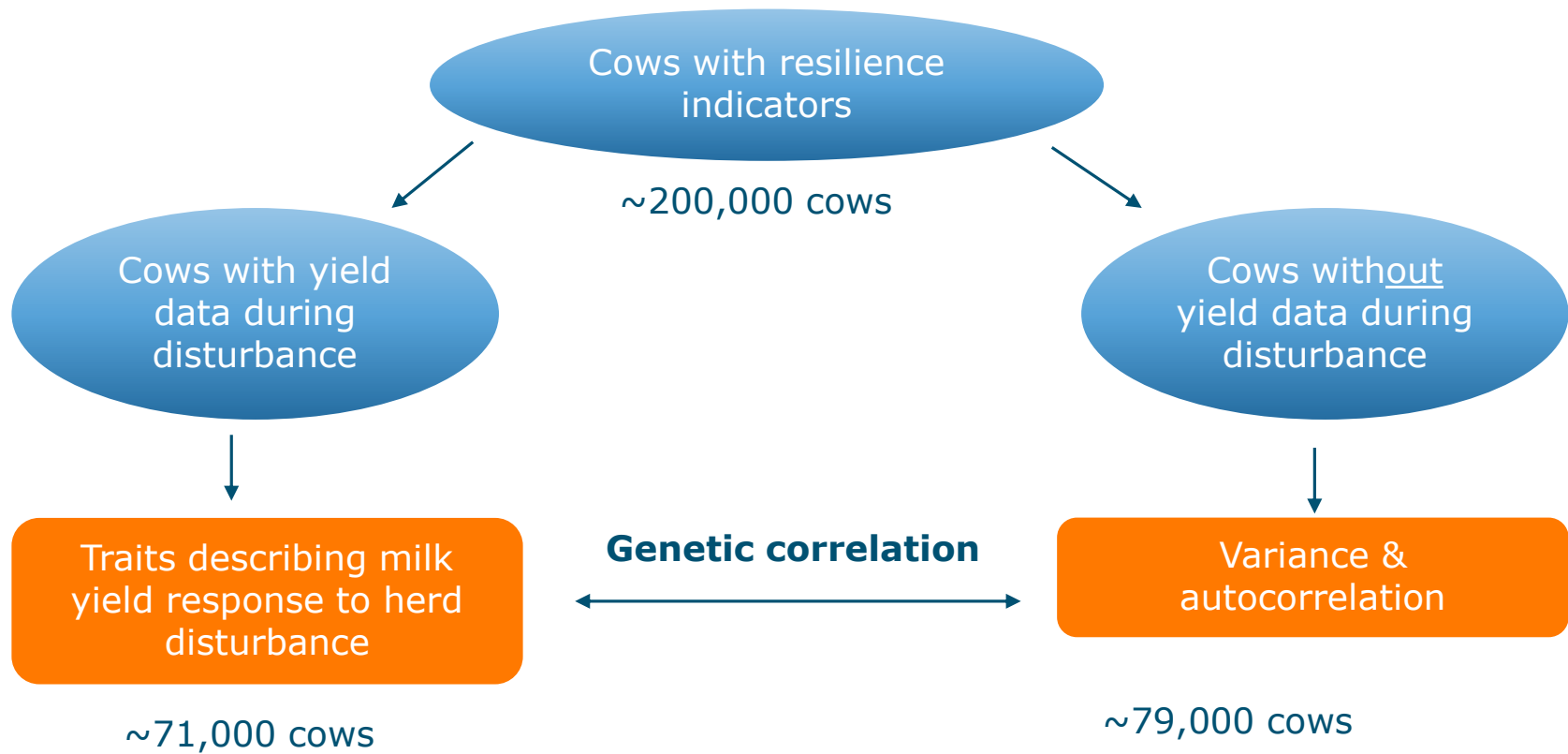
Unknown disturbance affecting herd milk yield



Data & methods



Data & methods



Results

Genetic correlations between resilience indicators and 'response traits'

	Variance	Variance _{partial}	Autocorrelation
Depth drop	0.93 (0.04)	0.82	-0.13 (0.12)
Length drop	-0.001 (0.29)	-0.18	0.97 (0.35)
Total yield loss	0.90 (0.05)	0.74	-0.01 (0.13)

Want to read more?



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Validation of resilience indicators by estimating genetic correlations among daughter groups and with yield responses to a heat wave and disturbances at herd level

M. Poppe,*  **H. A. Mulder,**  **and R. F. Veerkamp** 

Wageningen University & Research, Animal Breeding and Genomics, PO Box 338, 6700 AH Wageningen, the Netherlands

Conclusions

- We can select for resilience in dairy cows using resilience indicators based on daily milk yield records
 - Heritable
 - **Variance** genetically associated with:
 - Strength of response to actual disturbances
 - **Autocorrelation** genetically associated with:
 - Recovery rate after actual disturbances
- Combination of variance & autocorrelation → improve all aspects of resilience