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AMS data

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Why using AMS data?

- Automatic data collection
- Repeated records
- Quicker availability
- More animals

- Reliability ⬆
- Heritability ⬆

- In addition to the existing traits or deriving new traits

AMS data

JoinData -> organisation for standard farm data exchange between organisations

Data:
  Milk yield
  Visit time
  Average milking speed (kg milk / minute)
  Teat coordinates (x, y ,z)
  Body weight (kg)

Not all AMS brands make/have all data available

1. Milking speed

Available via AMS and via classification

AMS	Classification
Objective measurement	Subjective score of farmer
Milk yield / milk time (kg/min)	Score 1 – 9
Average 2.27 kg/min	Average score is 5
Measured every milking	Scored once in a lactation
All cows (only parity 1 used)	Only in parity 1

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Milking speed

Trait	Parity	Heritability	Repeatability
Milking speed AMS	1	0.51	0.81
Milking speed classification	1	0.23	

- Is milking speed measured with AMS and scored by the farmer the same trait?
  - Genetic correlation AMS with classification is 0.99

- Published breeding value is milking speed AMS
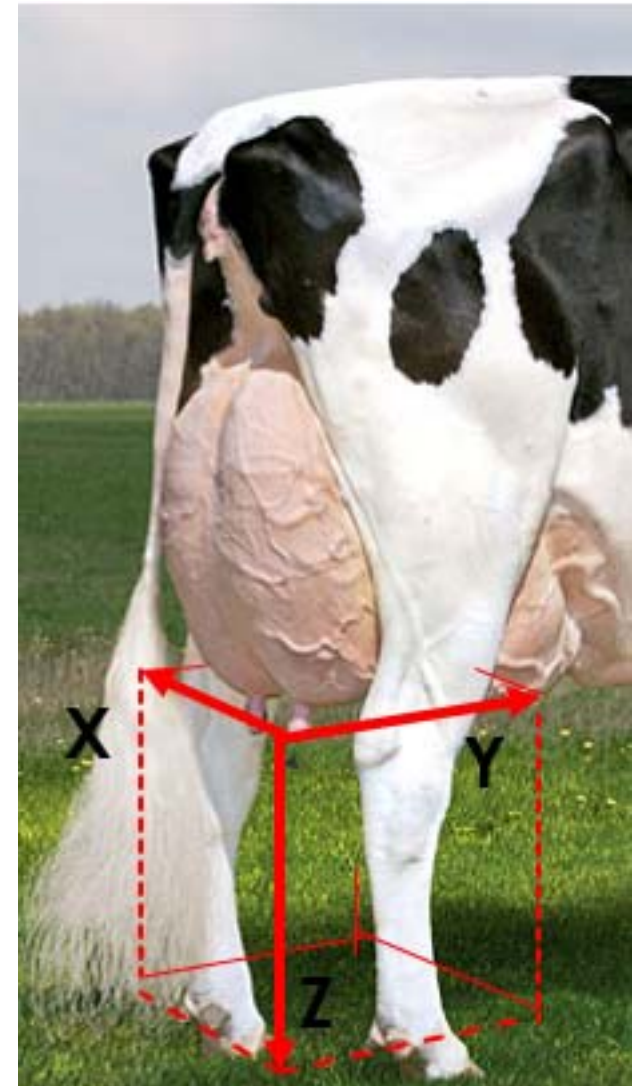
- **Introduction in april 2023**

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2. Udder conformation

Routinely recorded by classifiers for 7 traits
AMS uses coordinates (x, y, z) to locate teat tips for attachment
• Derive (new) udder traits

Udder trait scored by classifier	Derived trait from AMS
Front teat placement	Front teat distance
Fore udder attachment	
Teat length	
Udder depth	Udder depth
Rear udder height	
Udder support	
Rear teat placement	Rear teat distance
	Udder balance (new)

Udder conformation

Trait	heritability			
	classifier	AMS parity 1	AMS parity 2	AMS parity 3
Front teat placement	0.25	0.60	0.53	0.45
Fore udder attachment	0.31			
Teat length	0.38			
Udder depth	0.39	0.56	0.56	0.52
Rear udder height	0.26			
Udder support	0.22			
Rear teat placement	0.29	0.45	0.38	0.33
Udder balance		0.45	0.42	0.43

* repeatability AMS-traits ≥ 0.90

Udder conformation – genetic correlations

Are the traits from AMS and classifier the same?

Genetic correlations
    classifier   **AMS**

		parity 1	*parity 2*	*parity 3*
-	Udder depth	: 0,98	0,97	0,97
-	Front teats	: 0,98	0,98	0,97
-	Rear teats	: 0,99	0,99	0,96

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Udder conformation – genetic correlations

Are the traits from AMS and classifier the same?

Genetic correlations

classifier		AMS		
		parity 1	*parity 2*	*parity 3*
- Udder depth	:	0,98	0,97	0,97
- Front teats	:	0,98	0,98	0,97
- Rear teats	:	0,99	0,99	0,96

Genetic correlations within AMS traits between lactations:

		parity 1-2	*parity 2-3*	*parity 1-3*
- Udder depth	:	0,97	0,99	0,93
- Front teats	:	0,99	0,99	0,94
- Rear teats	:	0,97	0,98	0,90
- Udder balance	:	0,96	0,98	0,85

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3. AMS specific traits

- In 2014 we saw an increase in use of automatic milking systems (AMS)

- Efficient use of the AMS

- Breed cows that are suitable for this system

  - ➢ AMS efficiency

  - ➢ Milking interval

  - ➢ Habituation of heifers

=> Development of genetic analysis for AMS traits

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Trait definition

AMS efficiency =

Produced amount of milk in kg per total AMS time in minutes

Milking interval =

Time between 2 consecutive successful milkings in minutes

Habituation of heifers =

Time period a heifer needs to get familiar with the AMS =

Comparing the milking interval in the first three weeks after calving with a period later in lactation (week 10 – 12)

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AMS / milk robot traits

Trait	Parity	Heritability	Repeatability	Gen.sd
AMS efficiency	1	0.19	0.58	0.20 kg/min
Milking interval	1	0.08	0.43	40.4 minutes
Habituation	1	0.07		20.3 minutes
AMS efficiency	2+	0.17	0.56	0.22 kg/min
Milking interval	2+	0.06	0.32	35.5 minutes

AMS / milk robot traits

Published breeding values (mean = 100 and sd = 4 points)
- AMS efficiency
  - Converted to euro/min, using also fat and protein content
- Milking interval
- Habituation of heifers

- Overall AMS / milk robot index
  - Combining AMS efficiency, milking interval, habituation and udder health
  - to breed cows that are **suitable for the AMS** system, by improving the AMS traits, without negative effects on udder health

4. 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)

Genetic improvement of resilience in dairy cattle using longitudinal data

Marieke Poppe

News

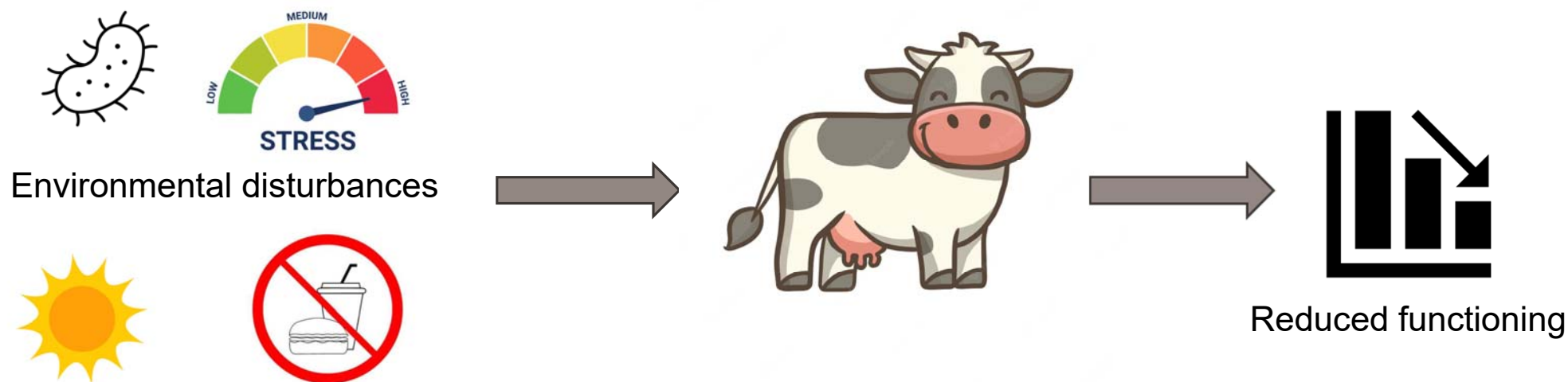## Milk yield resilience indicators and sensor features for a more diverse and sustainable dairy production landscape

Milking robot helps breed 'trouble-free' cows

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

August 29, 2023

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Resilience

Environmental disturbances

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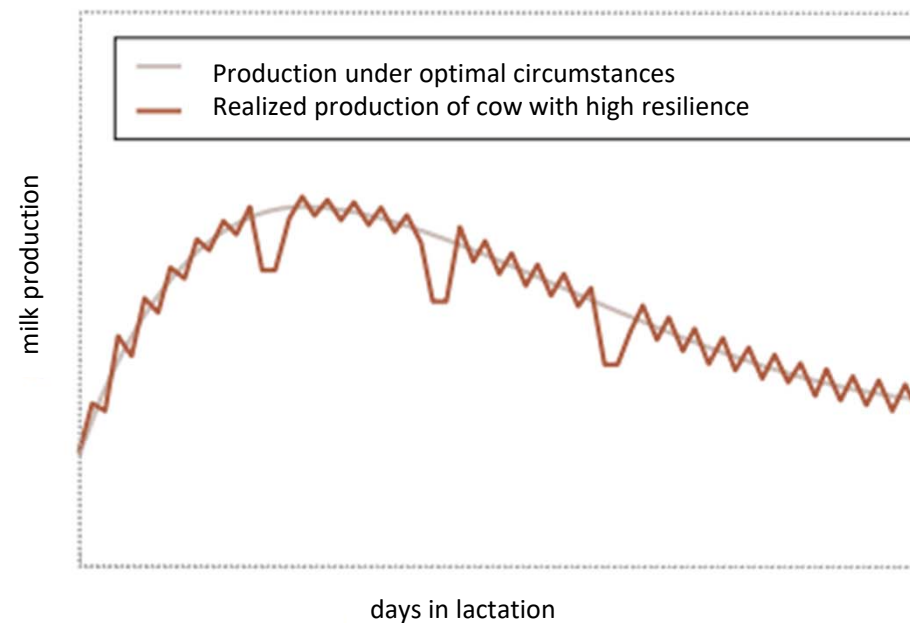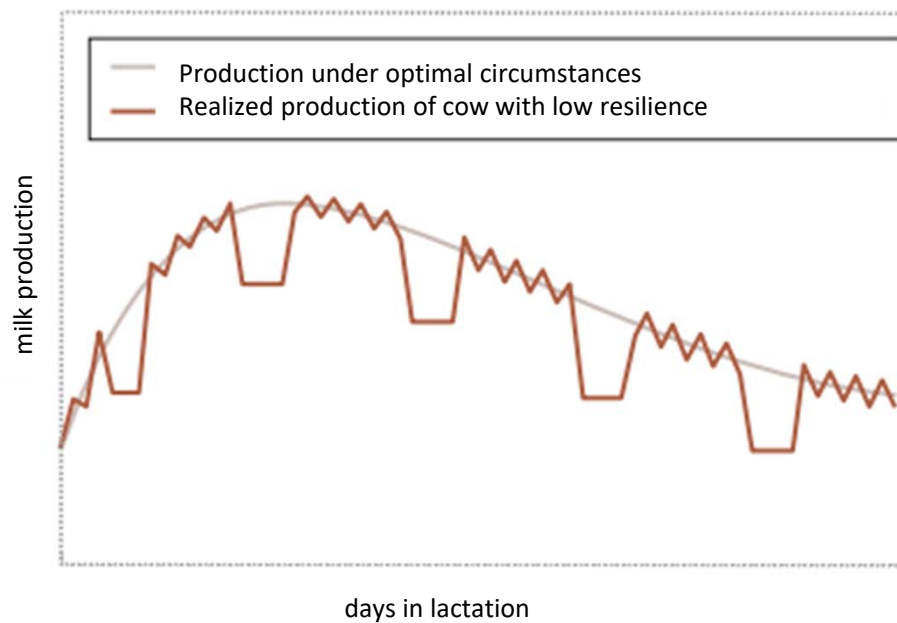
*The ability to be minimally affected by disturbances
AND / OR
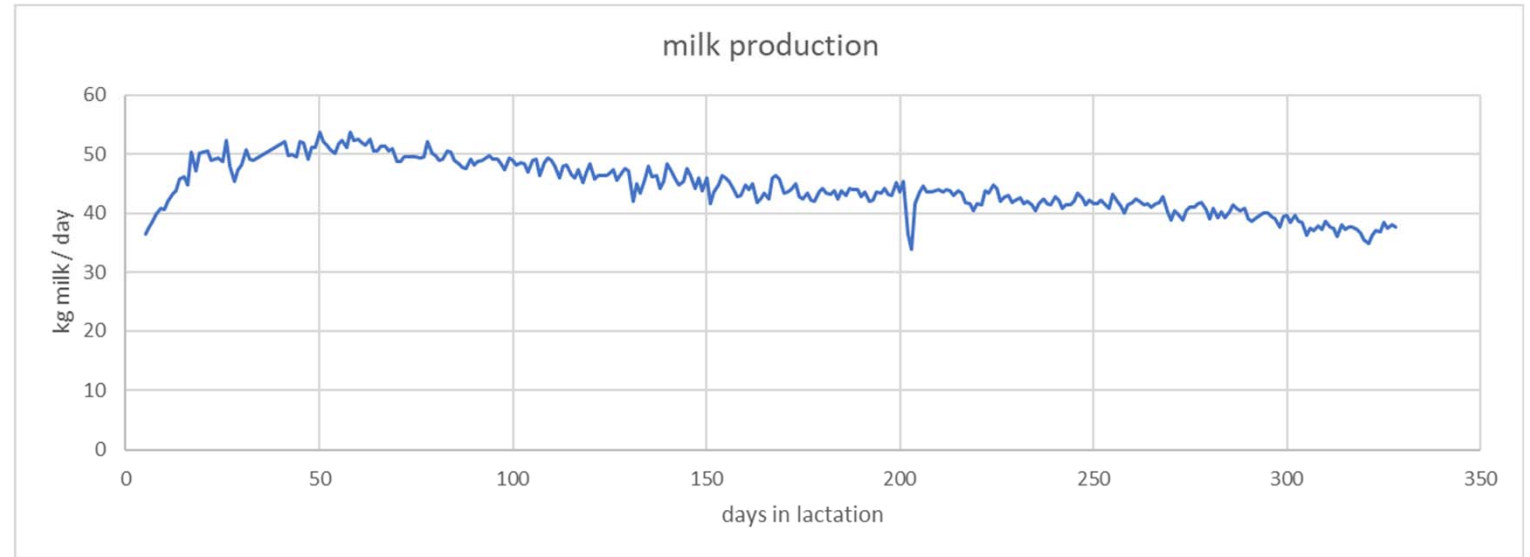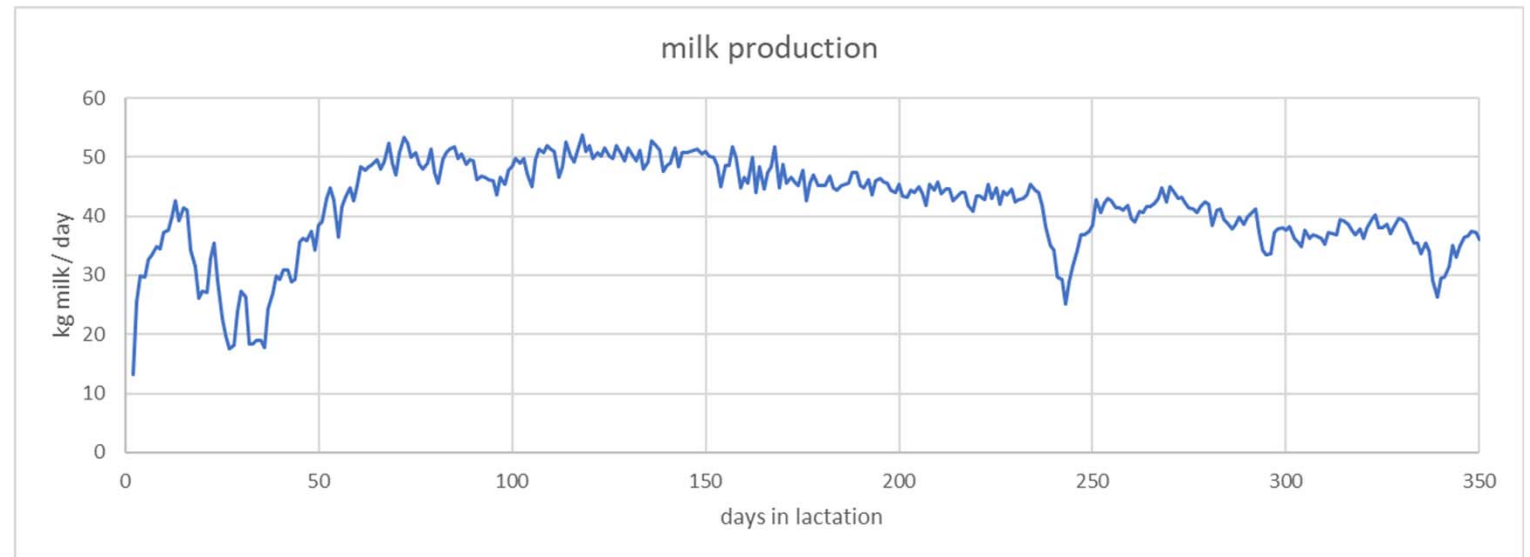to recover quickly when affected*
Colditz & Hine, 2016

Resilience

Left chart legend:
- Production under optimal circumstances
- Realized production of cow with low resilience

Axes: milk production (y-axis), days in lactation (x-axis)

Right chart legend:
- Production under optimal circumstances
- Realized production of cow with high resilience

Axes: milk production (y-axis), days in lactation (x-axis)

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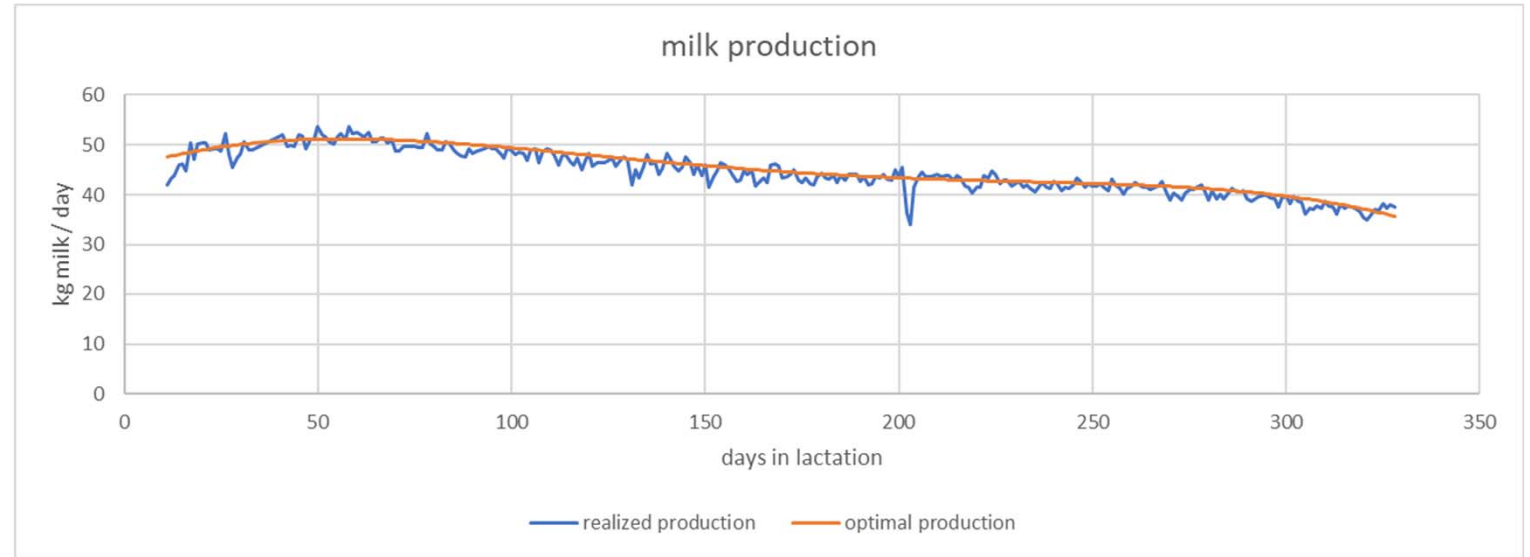
Example

high resilience
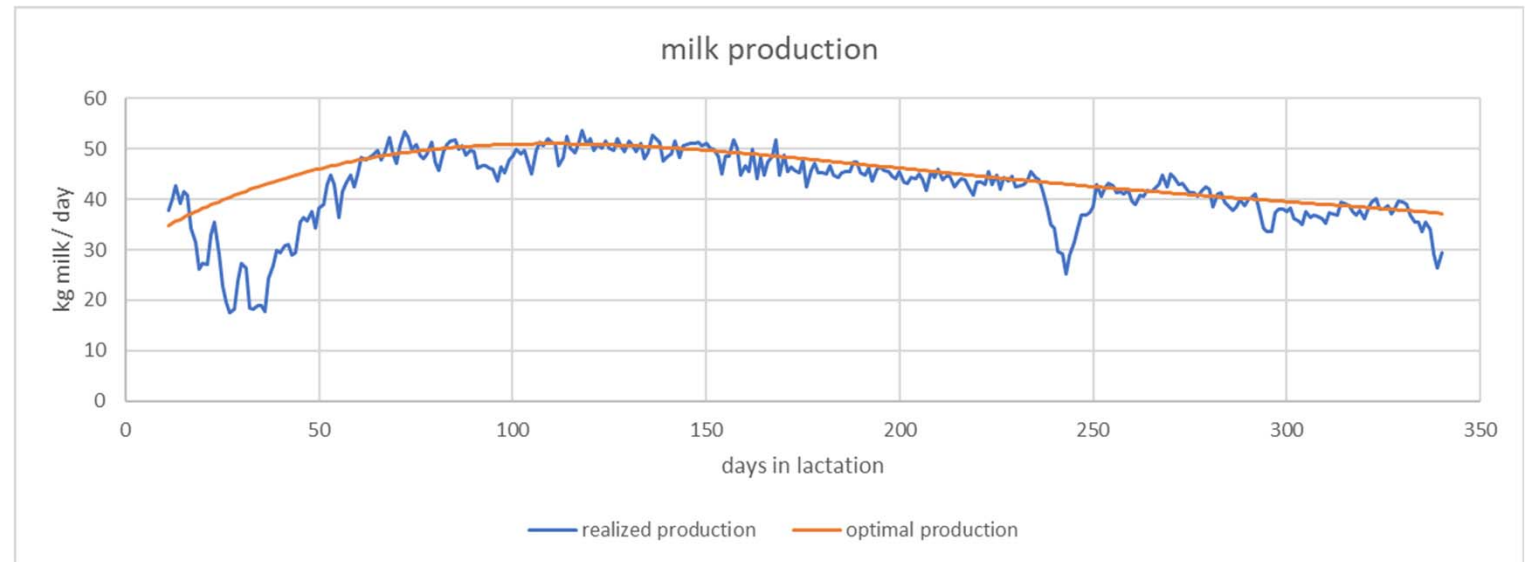
low resilience
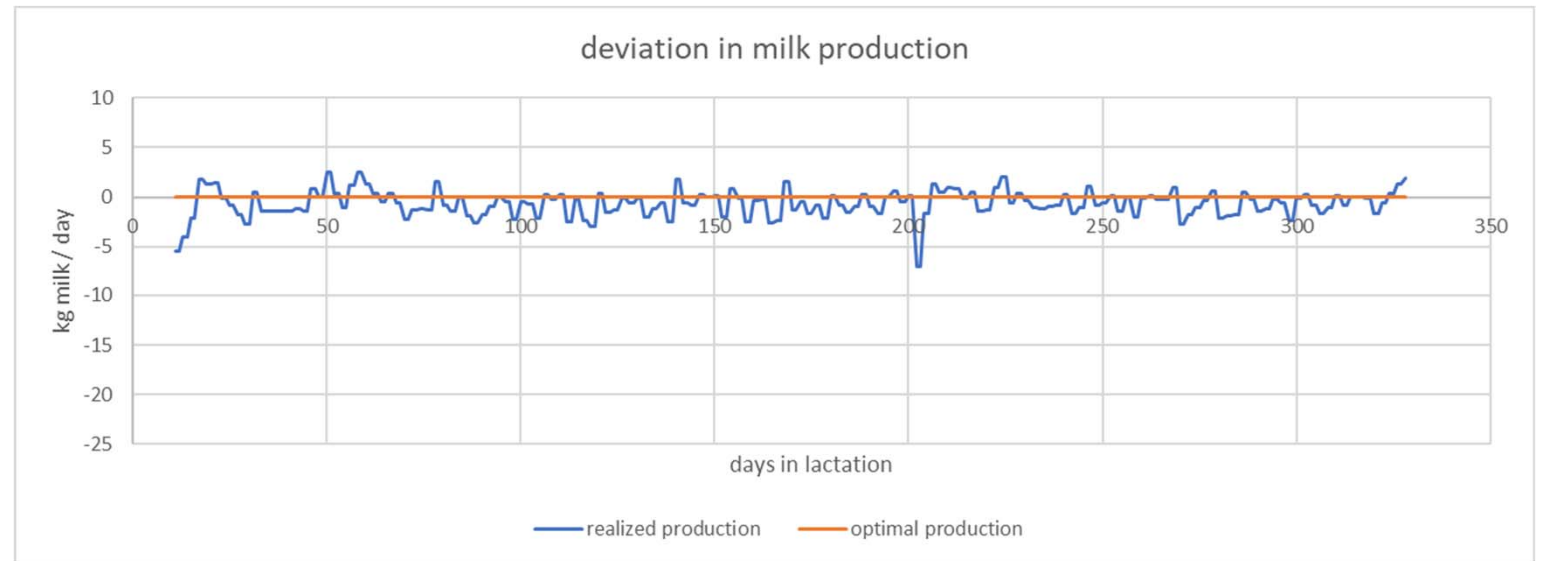
Example

high resilience

low resilience
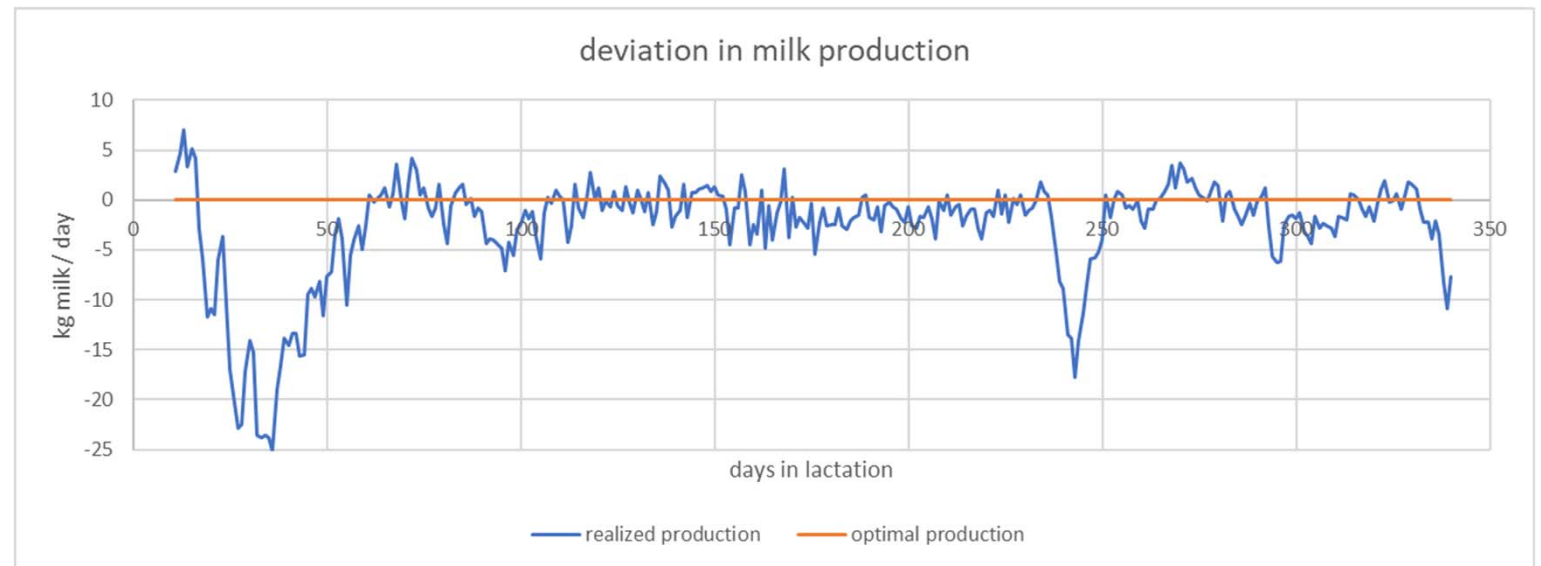

milk production

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	3 parities	2 milking systems
• Recovery • Stability	• Parity 1 • Parity 2 • Parity 3+	• 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

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

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

45% not explained → added value

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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 **NEW**

Easy managable cows **NO PROBLEM**

Cows can cope with different environmental systems

Animal welfare

Introduced since April 2024

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5. Body weight

Some AMS systems also have scales installed – previous types of Lely AMS systems

Daily measurements on body weight

Currently working on development of genetic evaluation for body weight

Final remarks

AMS data useful for genetic evaluations:
- existing traits like milking speed and udder conformation traits
- new traits like AMS efficiency, udder balance, resillience

Once the logistics are built the data source is relative cheap for usage in genetic evaluation
- higher heritabilities
- higher reliabilities breeding values

AMS is an example of a new source of data
- more sources are there or coming soon

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