



Unlocking Digital Twins In Dairy Herds Through Dynamic Stochastic Modelling

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Digital twins for better decision making



COLLECT DATA



INTEGRATE DATA



**DIGITAL TWIN
MODEL**



GET INSIGHTS



TAKE ACTION

Digital twins for better decision making



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INTEGRATE DATA



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SimHerd

Improves Your Decisions

About SimHerd A/S.

Simulation model of a dairy herd including youngstock since 1992

SimHerd A/S founded in 2010

Shareholders since 2014

VikingDanmark (51%)

Aarhus University (29%)

Søren Østergaard (10%)

Jehan Ettema (10%)

7 employees in 2026



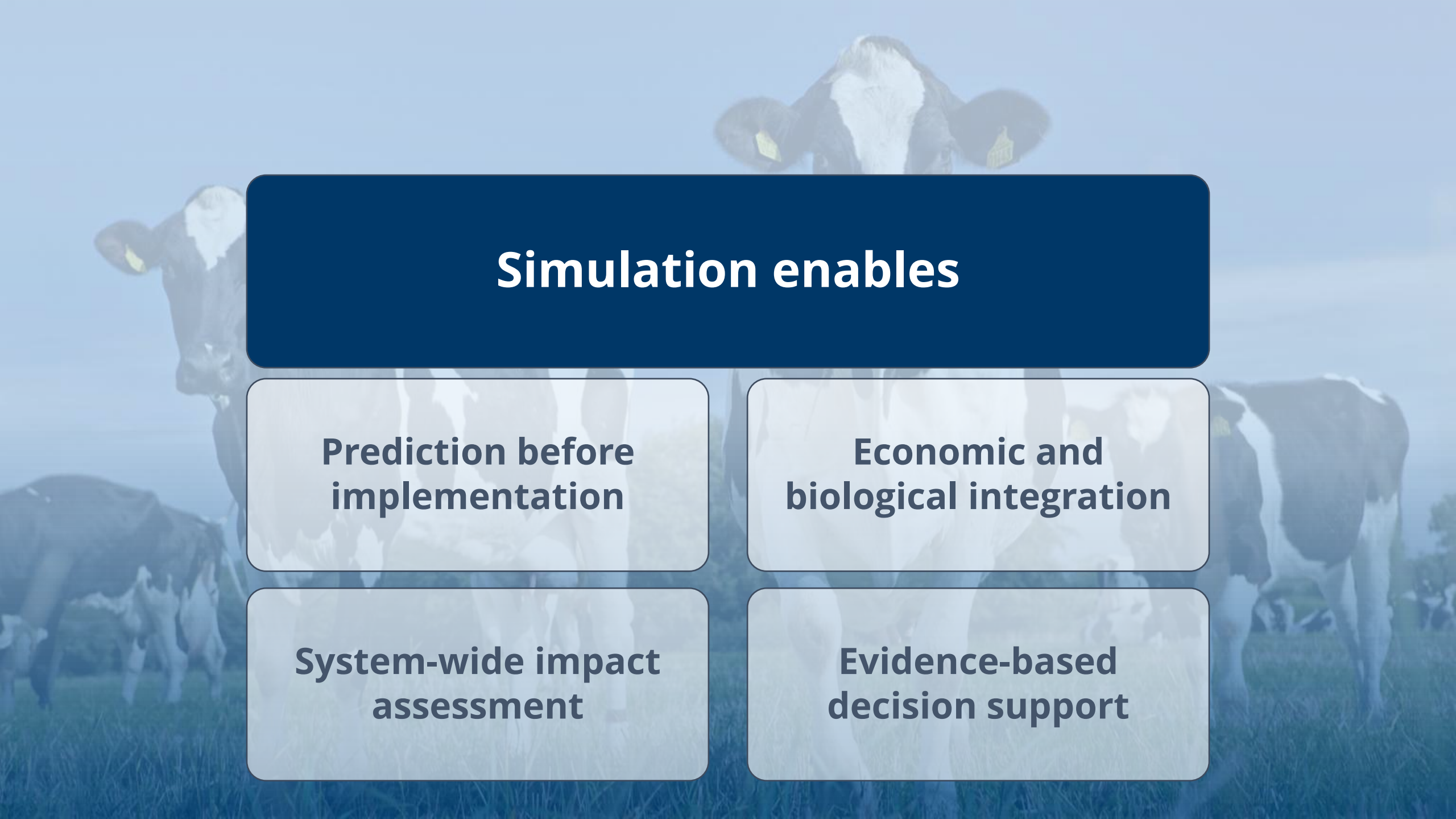
What is SimHerd?

A simulation model that provides economic quantification of changes in dairy herd management, using a scientific foundation and herd specific KPI's

What is SimHerd?

Digital twin

A ~~simulation~~ model that provides economic quantification of changes in dairy herd management, using a scientific foundation and herd specific KPI's

A background image of a cow in a field, slightly blurred, with a dark blue overlay at the top.

Simulation enables

**Prediction before
implementation**

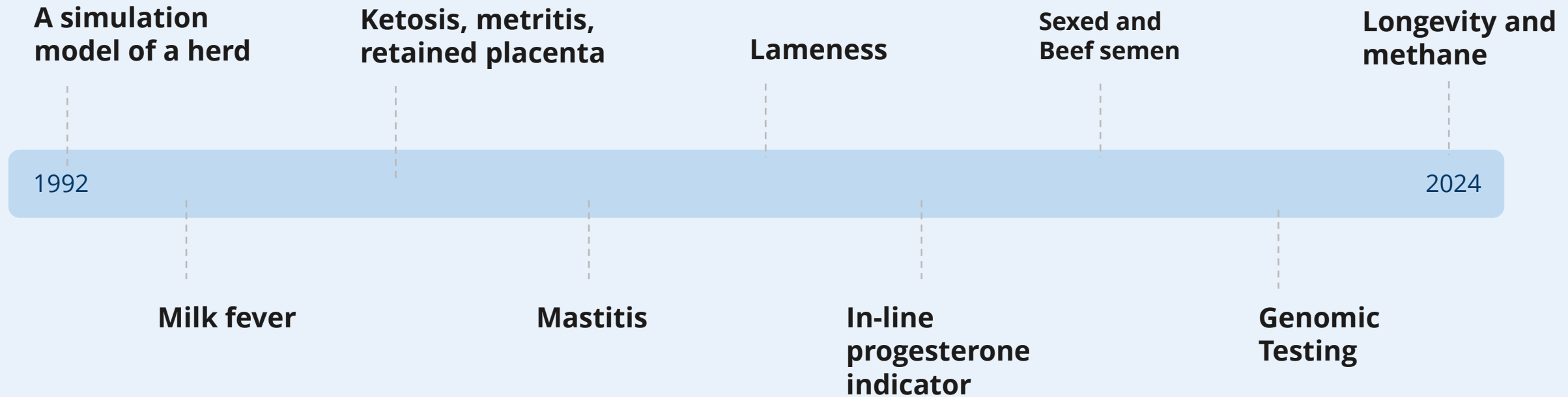
**Economic and
biological integration**

**System-wide impact
assessment**

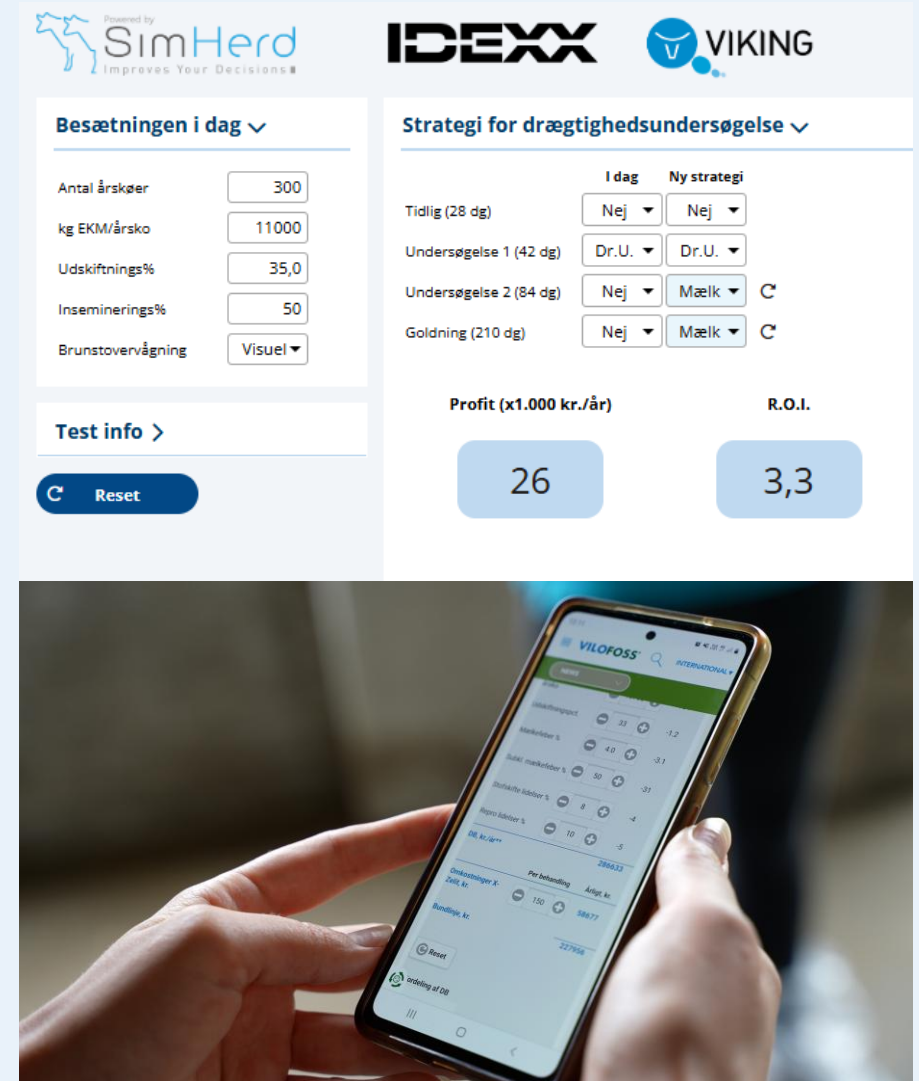
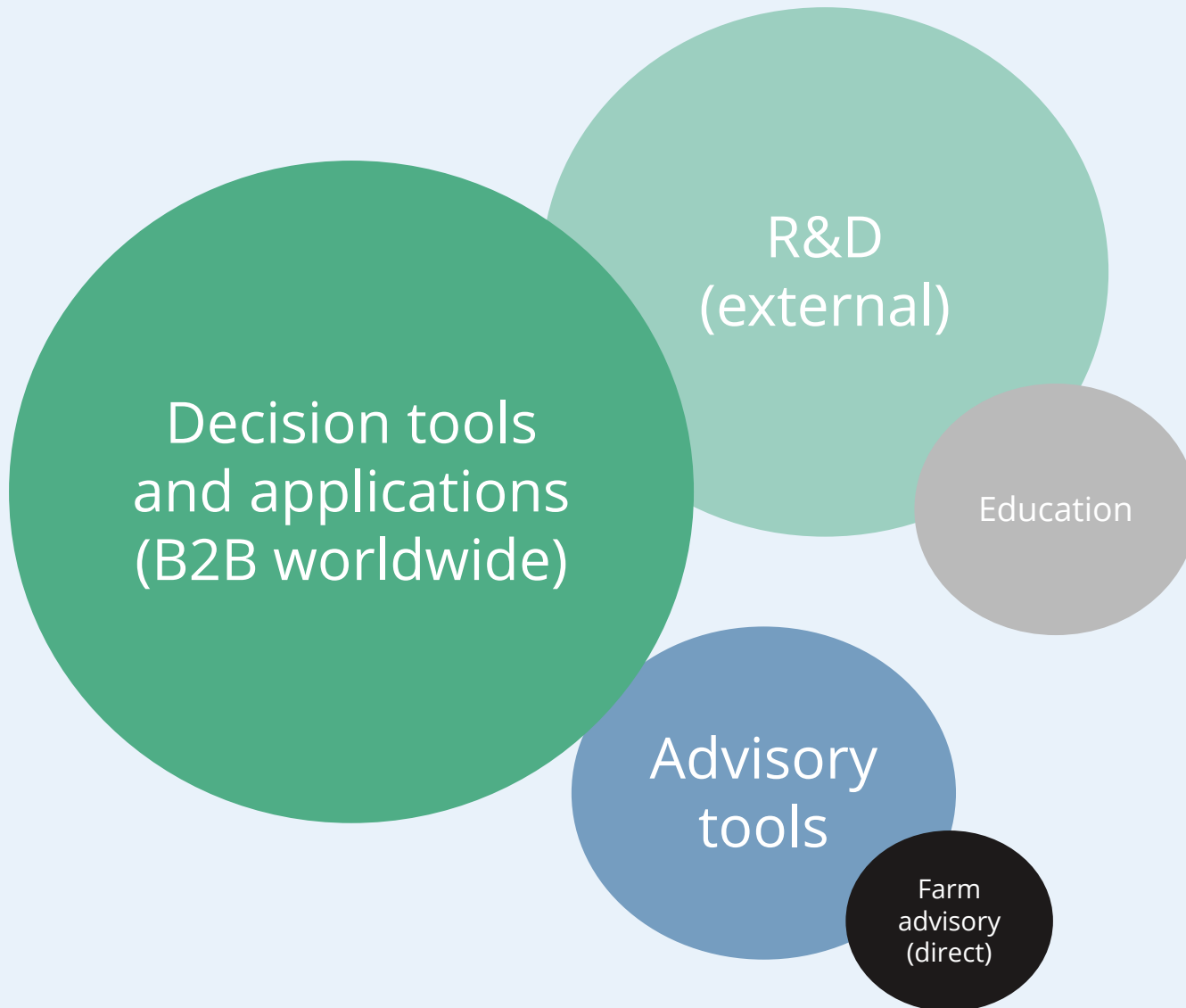
**Evidence-based
decision support**

Our journey

- Documented in over 30 articles



What do we do in SimHerd?



How does the model work?

Dynamic

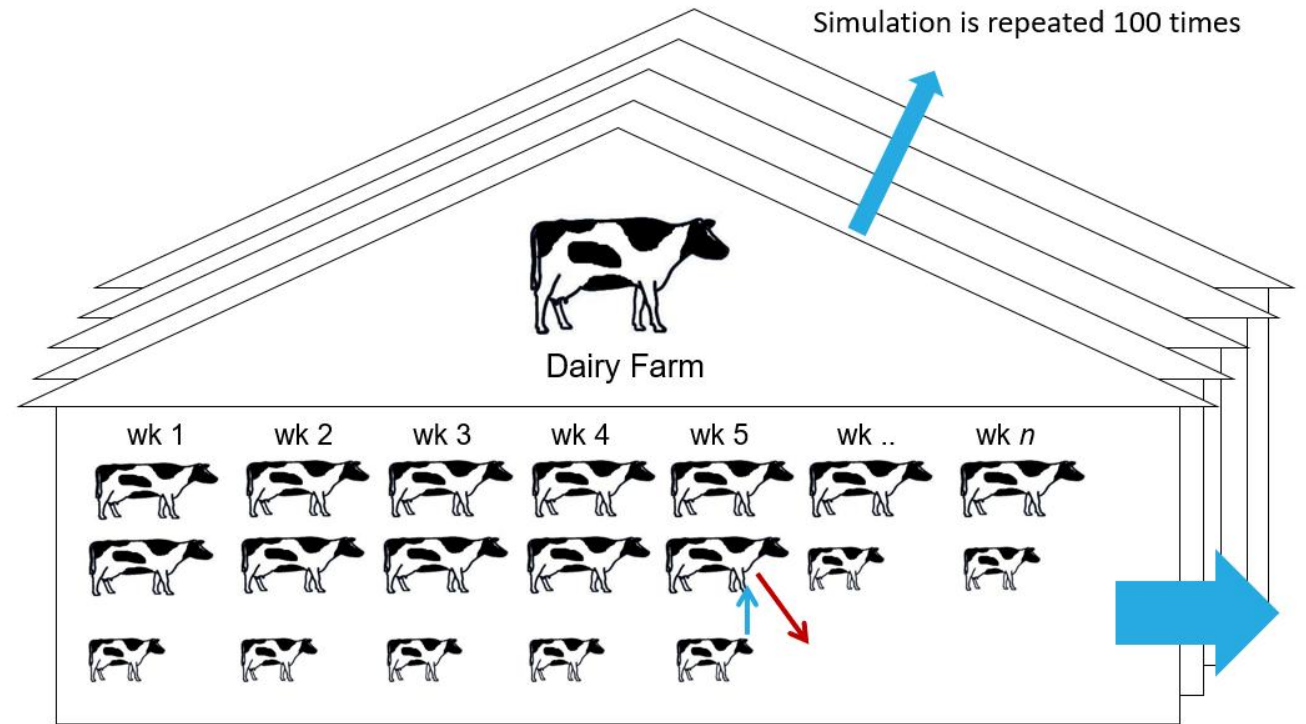
- Simulates in weekly steps

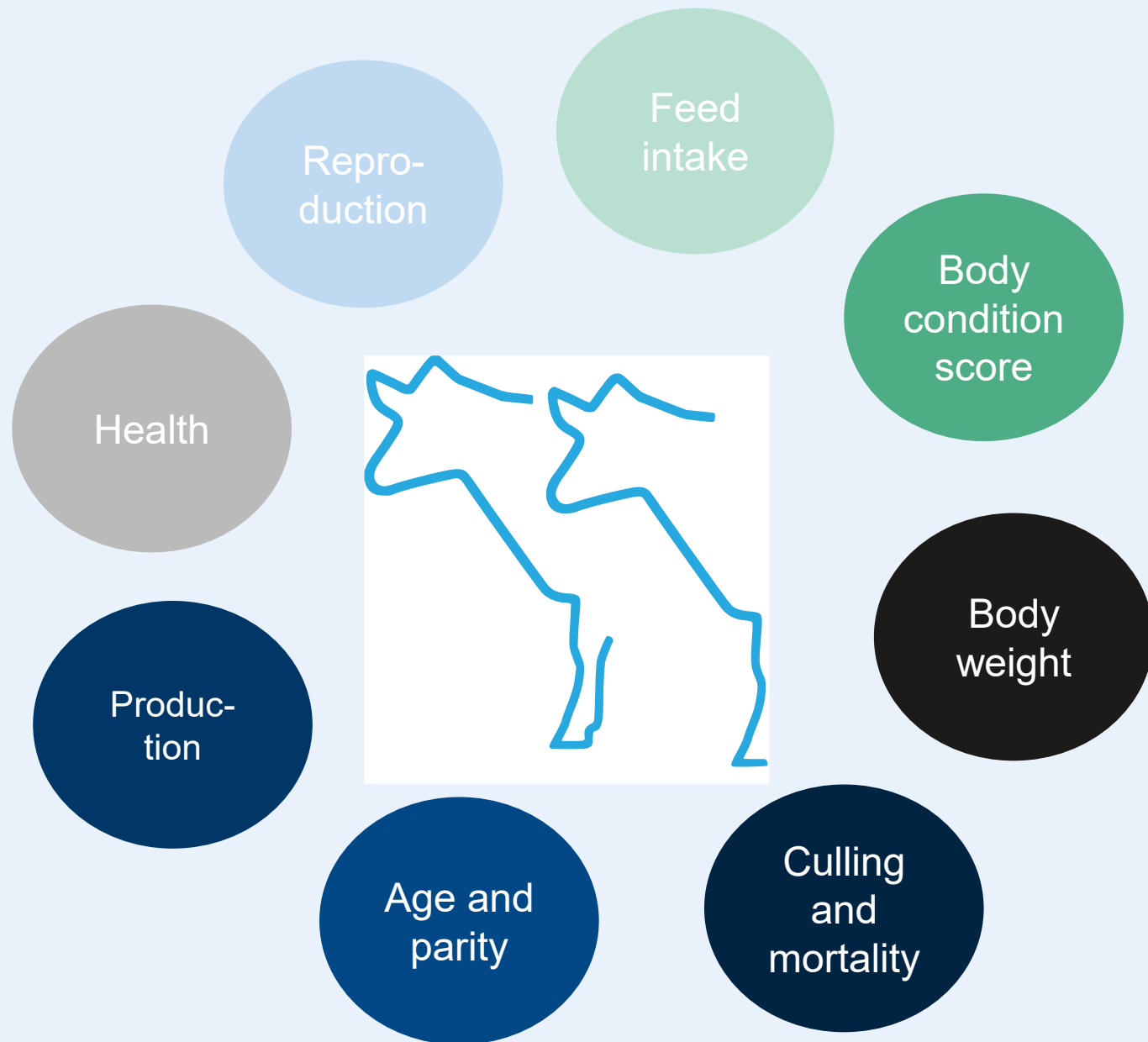
Stochastic

- A series of random events

Mechanistic

- All cows and calves





"What if" simulation

Simherd Expert

- High Detail – Used for research, advisory and development

Current topics in advisory

- Manual milking vs AMS
- Breed differences
- Reducing youngstock
- Breeding decisions

From biological simulation to economic calculation

The Danish Cattle Database

Animal flow

Production

Health

Reproduction

Feed use

Methane

Automatic transfer
of data

Semi-automatic
calibration



Create scenario

Disease treatments

- Reproduction
- Mortality and culling
- Milk yield
- Breeding strategy
- Control and settings
- Details

	Standard		Scenario
Udder diseases			
Mastitis	14.5	base risk	14,5
Somatic Cell Count	292	cells per ml (x 1000)	292
Reproduction diseases			
Dystocia	0.6	base risk	0,6
Retained placenta	2.4	base risk	2,4
Metritis	2.2	base risk	2,2
Metabolic diseases			
Milk fever	7.2	base risk	7,2
Ketosis	10.2	base risk	10,2
Displaced Abomasum	1	base risk	1
Hoof and leg diseases			
Digital Dermatitis	0	base risk	0
Foul in the foot	0	base risk	0

Check prices

Create scenario

beef

Change in contribution margin per year

beef	STANDARD	SCENARIO	DIFFERENCE
GM per year	SEK 4,557,900	SEK 4,554,447	SEK -3,453
GM per cow-year	SEK 36,166	SEK 36,405	SEK 240
GM per kg ECM	SEK 2.936	SEK 2.967	SEK 0.031

Milk yield, feeding and methane production

beef	STANDARD	SCENARIO	DIFFERENCE
Milk yield per cow-year, kg ECM	12320	12271	-49
Milk yield per cow-year (only milking days)	13863	13785	-78
Bulk tank somatic cell count, delivered	284041	289014	4973
Delivery percentage	99.6	99.6	0.0
Daily yield during first 24 w.a.c., first parity	33.4	33.4	0.0
Daily yield during first 24 w.a.c., older cows	46.2	46.2	0.1
Daily yield during entire lactation, all cows	38.1	37.9	-0.2
Daily feed intake in FE (1.1 kg Dry Matter/FE)	24.8	24.7	-0.1
Feed intake in FE per cow-year	8403	8371	-32
Gram methane per kg ECM	17.92	16.85	-1.08
Number of Animal Units (Danish environmental measu	228	202	-26
Milk yield per Animal Unit, kg ECM	6800	7599	800

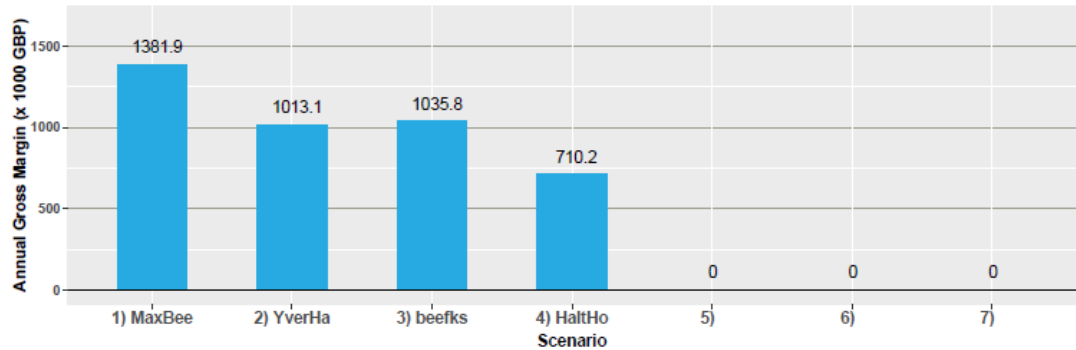
Herd dynamics



2nd May 2024

Economics of management changes Herd ID: 999999

The bar chart shows changes in Gross Margin (GM) per year for up to 7 scenarios compared to the Standard (status quo).



Technical results from the simulation

	Standard	1) MaxBee	2) YverHa	3) beefks	4) HaltHo	5)	6)	7)
Cow-years	4640	-13	2	6	3	0	0	0
Calvings	5629	-787	-71	-353	-66	0	0	0
Replacement rate	43	-12	-2	-7	-3	0	0	0
ECM/cow-year	12547	-164	248	69	235	0	0	0
Sold heifers	311	-311	52	-311	79	0	0	0
Youngstock	5735	-2192	-104	-1593	-132	0	0	0
Need for labor*	-1580.8	1095.5	36.4	869.7	49.0	0.0	0.0	0.0

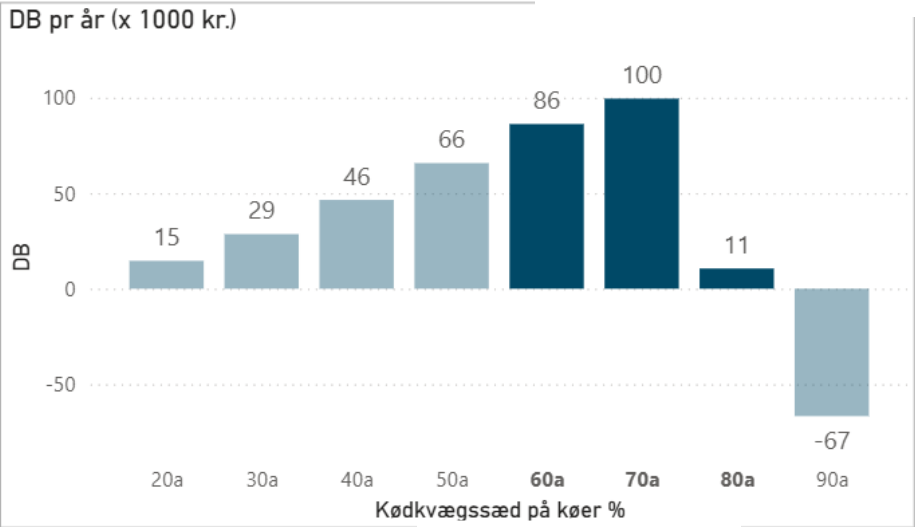
* Hours per week. Estimated time use, based on a Danish project on time-registration on dairy farms (www.seges.dk).

Description of the scenarios

The names for each scenario, used in the chart and in the table, are presented in the table below. Furthermore, the full description of each scenario is given.

	Full description
1) MaxBee	No conventional semen
2) YverHa	simtom
3) beefks	simtom

Breeding decisions



Kødkvægssæd på køer %		Beef semen on cows (%)	
Kvier %	Antal	1. kalvs %	
Andel X-vik	90	2	30
Nuværende kødkvægssæd på køer %	30	30	2
	10		

Priser og omkostninger		Rediger
11.000	1500	
Pris, kvier	Pris, tyrekalve	
1.850	2.500	
Pris, krydskviekalve	Pris, krydstyrekalve	
kr. 13	4	
Opdræt, pr. dag	Salg inden kælvn., mdr.	

	Nudrift	60a	70a	80a
iftningspct.	30	-1	-2	-5
EKM pr. årsko	10.985	0	-22	-176
Antal årskøer	201	0	0	-2

	Nudrift	60a	70a	80a
Krydsningskalve, tyre	7	39	45	50
Krydsningskalve, kvier	7	37	44	47
Solgte kælvkvier	28	-16	-23	-27
Solgte tyre	88	-56	-64	-69
Årskvier	199	-37	-56	-87

Økonomi (x 1000 kr.)	Nudrift	60a	70a	80a
Mælk	5.405	-5	-18	-673
Køer	262	-13	-20	-72
Kvier	348	-186	-272	-336
Kalve	163	82	99	126
Avlsfremgang	769	25	30	33
Indtægter i alt	6.947	-97	-180	-922
Foder, køer	2.184	-3	-8	-537
Insemineringer	87	-6	-12	-24
Behandlinger	104	0	0	74
Opdræt	963	-174	-259	-406
Øvrige	246	0	0	-50
Udgifter i alt	3.584	-183	-280	-933
DB	3.363	86	100	11

Decision support tools

- Prediction within a continuous Digital Twin
- Continuous output and monitoring of the herd

Culling index



Predicted
value



-100



-95



-25

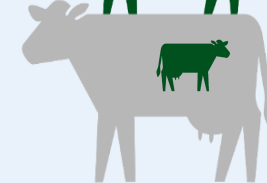


Average
potential of
replacement

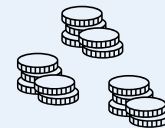
+10



+70



+100



Retention Pay Off (RPO) of individual cows (1/2)

Siggaard Agro ApS

Alle incl. kviepasning

Filtre

DIM

1

607

Lakt. nr

☐ Par 1

☐ Par 2

☐ Par 3

Pregnant

☐ +

☐ -

☐ ?

Markeret udsat

☐ ja

☐ nej

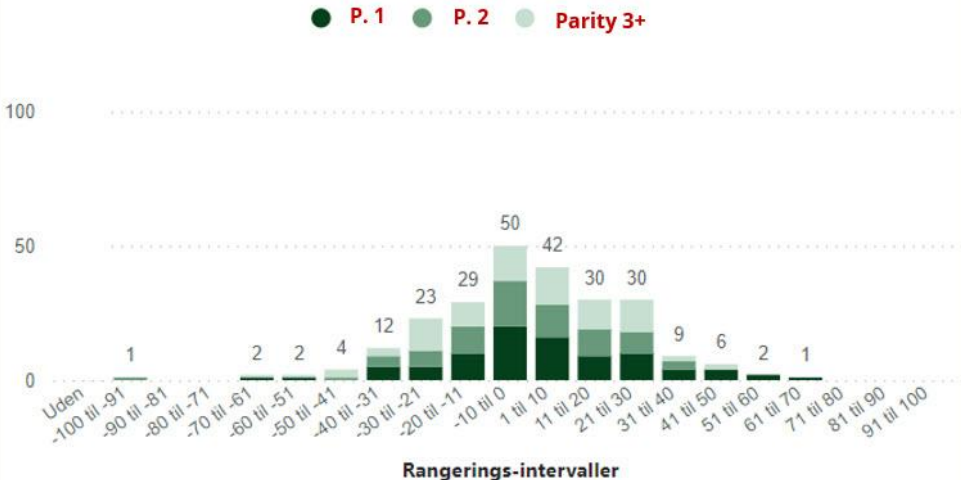
348

Køer i alt

243 (70%)

Køer med beregnet rangering

Fordeling af antal køer i rangerings-intervaller



Rangering

Rangering er et udtryk for den økonomiske fremtidsværdi af køerne.

Køerne bliver rangeret mellem -100 og 100 og kan bruges til at vurdere hvilke dyr, der er "mindst" værd, når der skal tages beslutning om udsætning.

Rangering på -100 betyder at dette dyr har mindst fremtidig værdi.

For at køerne opnår en rangering, skal de have mindst én ydelseskontrol, der ligger minimum 75 dage fra seneste kælvning.

Koens ydelse har en væsentlig betydning for koens fremtidige værdi og rangering. Denne kan ses med mouseover i nederste tabel med dyr detaljer.

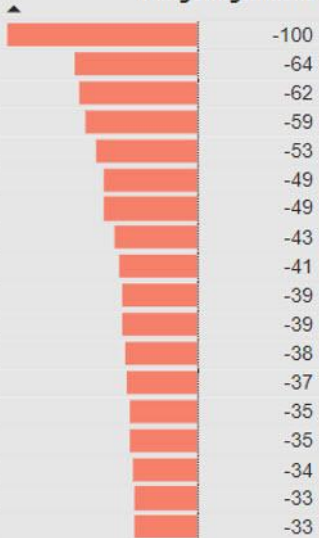
RPO Index

[Læs mere her](#)

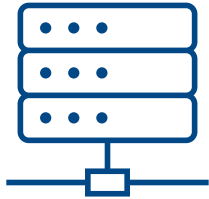
Detaljer

ID	Par.	DIM	TPA	Ins.Date	Semen	Preg	Lame	MF	Mast	Marked
2	109	-6	03-11-2025	kød	Nej					-100 til -91
1	125	0	09-10-2025	kød	Nej					-70 til -61
5	186	-12		ukendt	Nej				ja	-70 til -61
3	160	-3	09-08-2025	kød	Ja			ja		-60 til -51
1	372	4	01-03-2025	kød	Ja					-60 til -51
3	303	4	14-03-2025	kød	Ja					-50 til -41
2	119	12	22-10-2025	kød	Nej					-50 til -41
6	158	-7	05-09-2025	kød	Nej					-50 til -41
6	111	-2	05-10-2025	kød	Nej					-50 til -41
2	206	7	15-08-2025	kød	Ja					-40 til -31
2	121	4	10-09-2025	kød	Ja					-40 til -31
1	184	10	24-08-2025	kød	Ja					-40 til -31
1	135	10	20-09-2025	kød	Ja					-40 til -31
2	281	9	02-07-2025	kød	Nej					-40 til -31
1	467	3	19-02-2025	kød	Nej					-40 til -31
2	127	7	15-09-2025	kød	Ukendt					-40 til -31
4	271	-7	15-06-2025	kød	Ukendt				ja	-40 til -31
1	269	9	07-07-2025	kød	Ja					-40 til -31

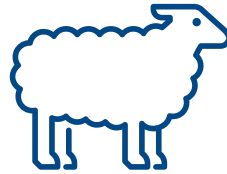
Rangeringsindeks



Future of SimHerd



Increased and
continuous data flow



New species



Decision support tools