

Herd expansion

Jehan Ettema, SimHerd

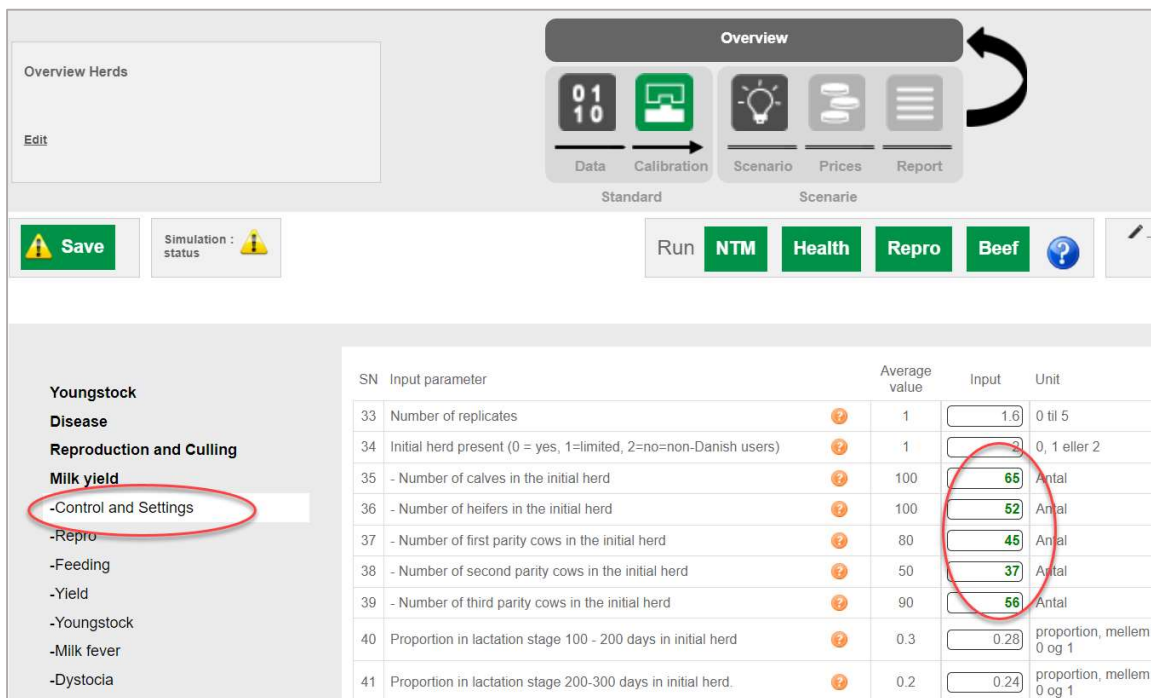
14-06-2021

How much Gross Margin (dækningsbidrag) can we generate when expanding our herd? How fast will we be able to increase in cow-number? Will we expand faster when using sexed semen?

- 1) You create your herd like you always do, but only when simulating a herd-expansion, you have to enter how many calves and heifers the herd has today. If you want to know how fast you can go from 134 to 180 cows, it is very important to know if you have 60 or 80 heifers today or if you have a very old (many third parity cows) or many young cows (many first parity cows).

Below: Enter how many calves, heifers, first parity, second parity and third parity cows you have today!

Click on "Save"



SN	Input parameter	Average value	Input	Unit
33	Number of replicates	1	1.6	0 til 5
34	Initial herd present (0 = yes, 1=limited, 2=no=non-Danish users)	1	2	0, 1 eller 2
35	- Number of calves in the initial herd	100	65	Antal
36	- Number of heifers in the initial herd	100	52	Antal
37	- Number of first parity cows in the initial herd	80	45	Antal
38	- Number of second parity cows in the initial herd	50	37	Antal
39	- Number of third parity cows in the initial herd	90	56	Antal
40	Proportion in lactation stage 100 - 200 days in initial herd	0.3	0.28	proportion, mellem 0 og 1
41	Proportion in lactation stage 200-300 days in initial herd	0.2	0.24	proportion, mellem 0 og 1

- 2) Click on "Calibrate" and go into the category "Reproduction and culling (dotted arrow)"

Overview Herds
 Marian
 42113
[Edit](#)

Overview

01
10

Data Calibration Scenario Prices Report

Standard Scenarie

Calibrate

Simulation : status

Run **NTM** **Health** **Repro** **Beef**

Youngstock
Disease
Reproduction and Culling
Milk yield
 -Control and Settings
 -Repro

SN	Input parameter	Average value	Input	Unit
33	Number of replicates	1	1.6	0 til 5
34	Initial herd present (0 = yes, 1=limited, 2=no=non-Danish users)	1	2	0, 1 eller 2
35	- Number of calves in the initial herd	100	65	Antal
36	- Number of heifers in the initial herd	100	52	Antal
37	- Number of first parity cows in the initial herd	80	45	Antal

Here you can see that this herd, in a situation with constant herd-size (Maximum number of cows is 134), can generate a surplus of 17 heifers every year. So there is “expansion capacity”. In case the herd would have 2-3 sold heifers, you could already now see, that it wouldn’t be interesting to study herd expansion with own youngstock.

- 3) Click on Scenario (dotted arrow) to create a scenario in which you are going to simulate herd expansion.

Overview Herds
 Edit

Overview

01
10

Data Calibration Scenario Prices Report

Standard Scenarie

Simulation : status

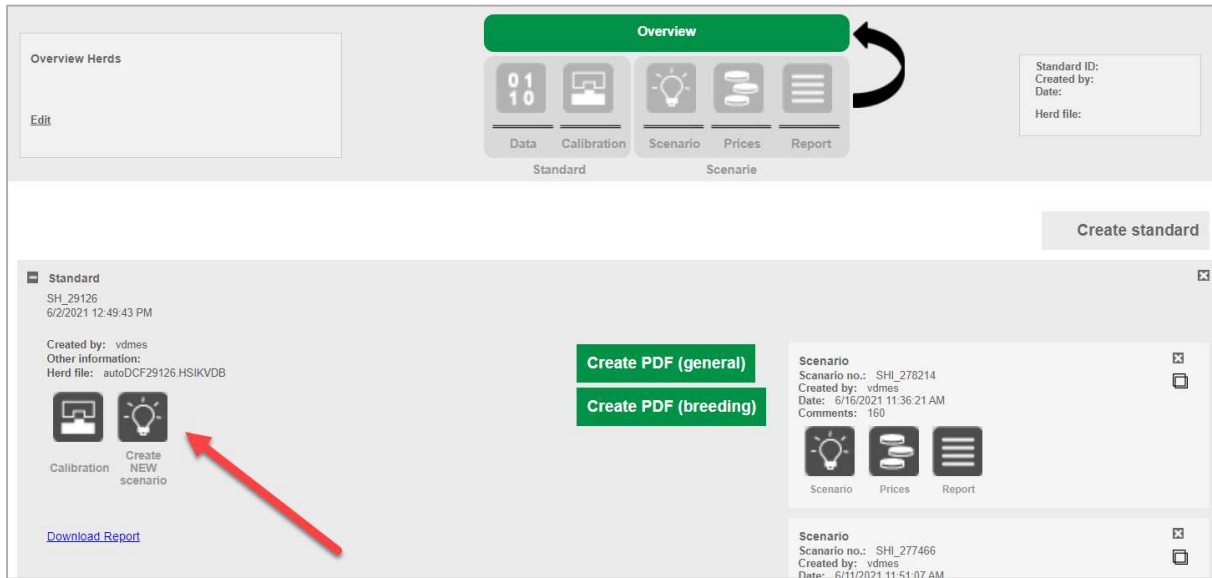
Run **NTM** **Health** **Repro** **Beef**

Standard ID: SHI_29126
 Created by: vdmes
 Date: 6/2/2021 12:49:43 PM
 Herd file: autoDCF29126.HSIKVB

Youngstock
Disease
Reproduction and Culling
Milk yield
 -Control and Settings
 -Repro
 -Feeding
 -Yield
 -Youngstock
 -Milk fever
 -Dystocia
 -Retained placenta
 -Metritis
 -Displaced abomasum
 -Ketosis
 -Mastitis

SN	Input parameter	Average value	Input	Unit	Simulated Results	Key figure
18	Start breeding, first parity cows	42	44	dage efter kælvning	141	Number of Calvings
19	Start breeding, other cows	42	44	dage efter kælvning	27	Replacement Rate
20	Heat observation rate	38	54	sandsynlighed	395	Calving Interval
21	Conception rate	49	46	sandsynlighed		
22	Insemination period	11	12	antal cyklusser	18	Number of cullings due to failure to conceive
23	Other culling	7.5	9.1	basis risiko	18	Number of other cullings incl. mortality
24	Limit for buying heifers	180	126	antal køer		Number of bought heifers
25	Strategy for heifer sale	0	0	0,1,2	17	Number of sold heifers
26	Maximum number of cows	200	134	antal køer	133	Number of cow-years

4) Click on “Create new scenario”



Overview Herds

Edit

Overview

0110 Data Calibration Scenario Prices Report

Standard Scenario

Standard ID: SHI_29
Created by: vdmes
Date: 6/2/2021 12:49:43 PM
Herd file: autoDCF29126.HSIKVDB

Create standard

Standard
SHI_29126
6/2/2021 12:49:43 PM

Created by: vdmes
Other information:
Herd file: autoDCF29126.HSIKVDB

Calibration Create NEW scenario

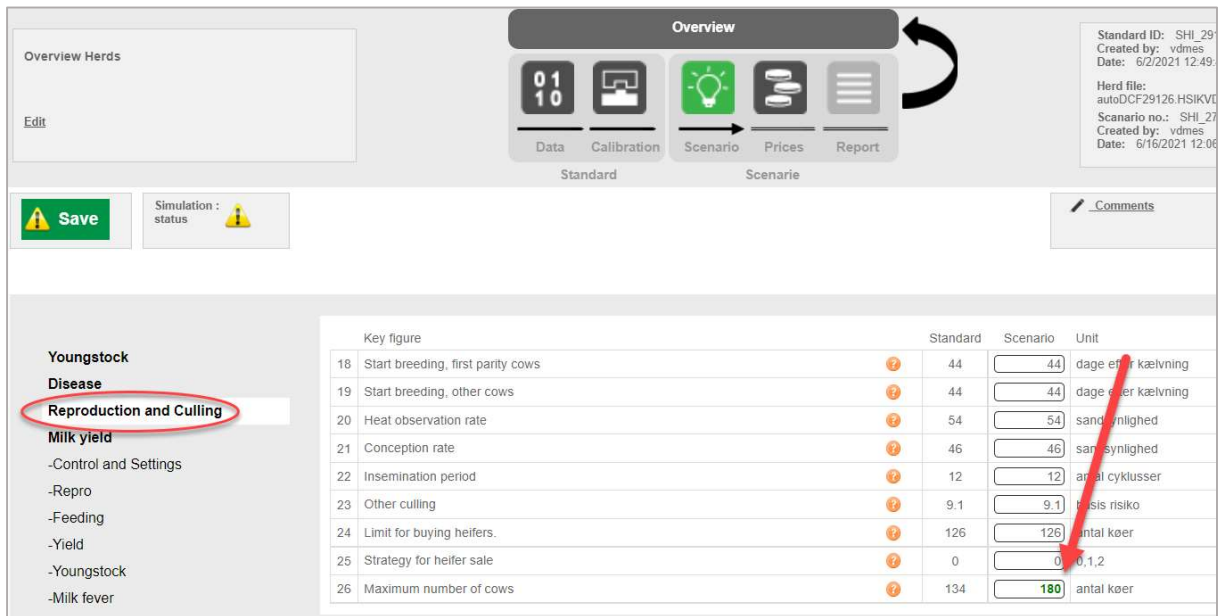
Download Report

Create PDF (general)
Create PDF (breeding)

Scenario
Scenario no.: SHI_278214
Created by: vdmes
Date: 6/16/2021 11:36:21 AM
Comments: 160

Scenario
Scenario no.: SHI_277466
Created by: vdmes
Date: 6/11/2021 11:51:07 AM

5) Increase the “Maximum number of cows” to (for example) 180. Click on “save and run”



Overview Herds

Edit

Overview

0110 Data Calibration Scenario Prices Report

Standard Scenario

Standard ID: SHI_29
Created by: vdmes
Date: 6/2/2021 12:49:43 PM
Herd file: autoDCF29126.HSIKVDB
Scenario no.: SHI_27
Created by: vdmes
Date: 6/16/2021 12:06:21 AM

Save

Simulation : status

Comments

Youngstock
Disease
Reproduction and Culling
Milk yield

-Control and Settings
-Repro
-Feeding
-Yield
-Youngstock
-Milk fever

Key figure	Standard	Scenario	Unit
18 Start breeding, first parity cows	44	44	dage efter kælvning
19 Start breeding, other cows	44	44	dage efter kælvning
20 Heat observation rate	54	54	sandsynlighed
21 Conception rate	46	46	sandsynlighed
22 Insemination period	12	12	antal cyklusser
23 Other culling	9.1	9.1	risiko
24 Limit for buying heifers	126	126	antal køer
25 Strategy for heifer sale	0	0,1,2	
26 Maximum number of cows	134	180	antal køer

- 6) In the Report you see that the Gross Margin per year of the farm is much higher (solid arrow), because you have more cows.

The Gross Margin per cow and also the milk yield per cow is the same (dotted arrow) because we didn't change milk yield or disease risk.

In this situation the Gross Margin on cow-level is a tiny bit lower, but that is not significant. Sometimes the results on cow-level can be a lot lower when we simulate a very big increase in cow-number; during and also after the expansion, the herd doesn't have enough heifers for culling which reduces milk yield per cow-year.

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Overview

01
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Data

Calibration

Scenario

Prices

Report

Standard
Scenario

Print report

Simulation : status

Gross margin (GM) after 5 years (average of simulation years 6 to 10)

	Standard	Scenario	Difference
GM per year	Kr 2.144.954	Kr 2.883.028	Kr 738.074
GM per cow-year	Kr 16.133	Kr 16.128	Kr -5
GM per kg ECM	Kr 1.314	Kr 1.314	Kr 0,000

Milk yield and feeding (average of simulation years 6 to 10)

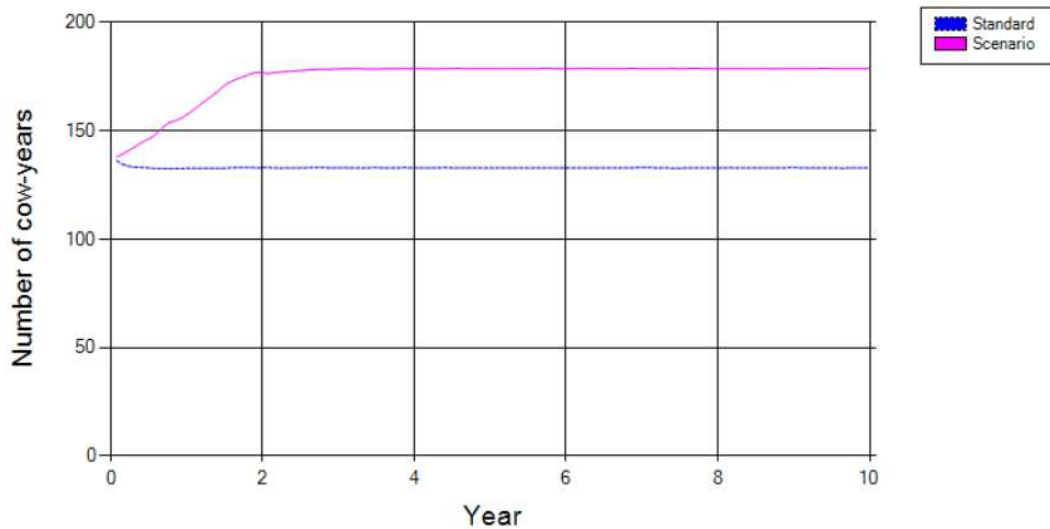
	Standard	Scenario	Difference
Milk yield per cow-year, kg ECM	12282	12275	-6
Milk yield per cow-year (only milking days)	13765	13762	-2
Bulk tank somatic cell count, delivered	146201	146046	-156
Delivery percentage	95,9	95,9	0,0
Daily yield during first 24 w.a.c., first parity	32,1	32,1	0,0

Scroll down in the report. This table shows that there is more of everything: more cows, calvings and sold heifers. But this is the long term situation; years 6 to 10.

Herd dynamics (average of simulation years 6 to 10)

	Standard	Scenario	Difference
Number of cow-years	133	179	46
Number of calvings	141	191	49
Replacement rate	26,9	27,0	0,1
-Number of Involuntary Cullings incl. mortality	18	24	6
-Number of Voluntary Cullings	18	24	6
Number of productive years per cow	3,7	3,7	0,0
Lifetime production, kg ECM	45649	45510	-139
Stillbirth, %	2,0	2,1	0,1
Calf mortality, after birth, %	1,7	1,8	0,0
Number of alive born bull calves	65	87	22
Number of alive born crossbred-calves	14	19	5
Number of bought heifers	0	0	0
Number of sold heifers	17	23	6

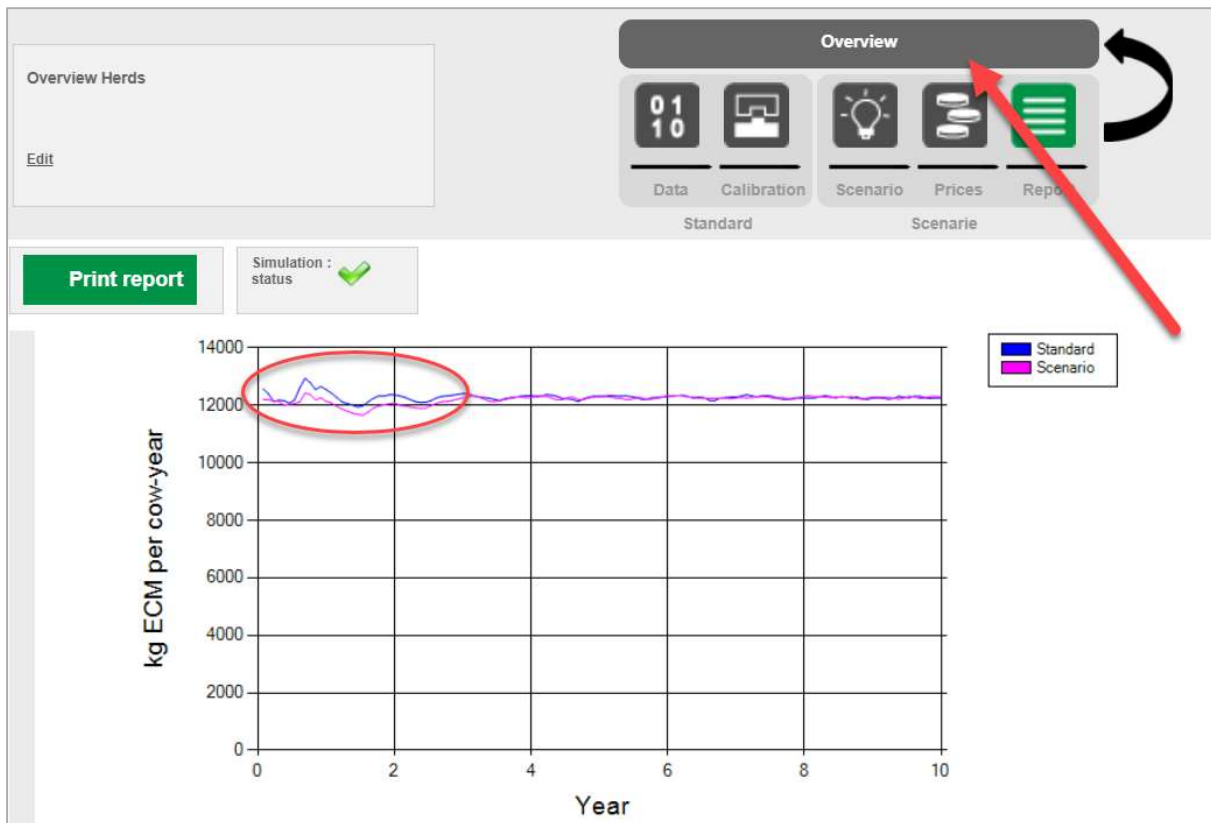
Scroll down in the report. See below: it takes 2 years for the herd to expand to 180 cows.



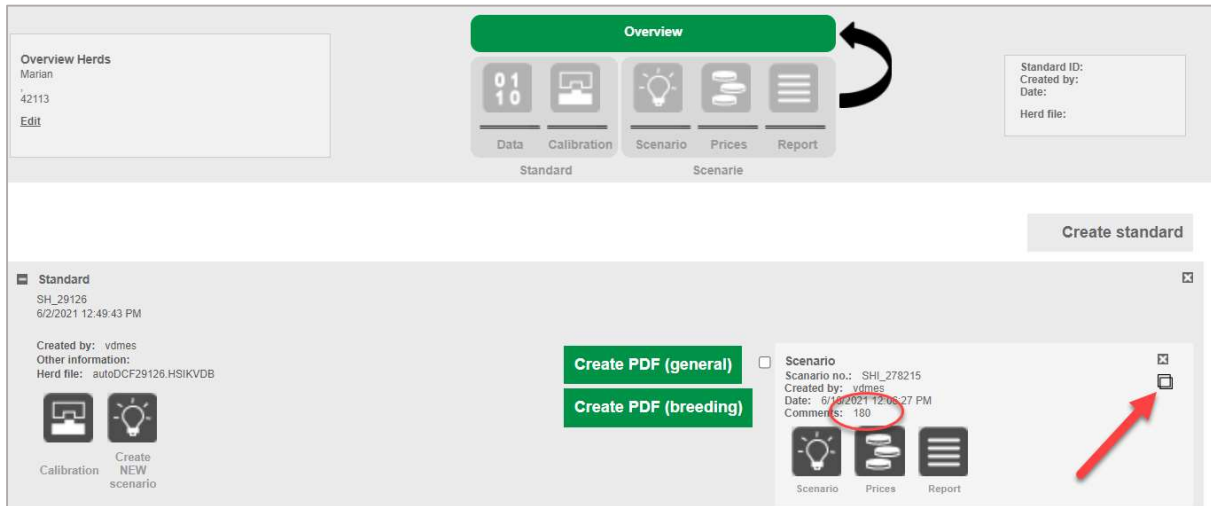
Scroll more down: you can see that the milk production is lower while the herd expands (circle below); more young cows and less culling of older cows, until the new cow-number is reached.

What if we also use sexed semen? Will that go faster?

7) Click on Overview in the top (red arrow).



8) Copy this scenario (red arrow): we want to add on to this scenario.



Overview

Standard: 0110, Calibration, Scenario, Prices, Report

Standard ID: SHI_29126
Created by: vdmes
Date: 6/2/2021 12:49:43 PM
Herd file: autoDCF29126.HSIKVDB

Create standard

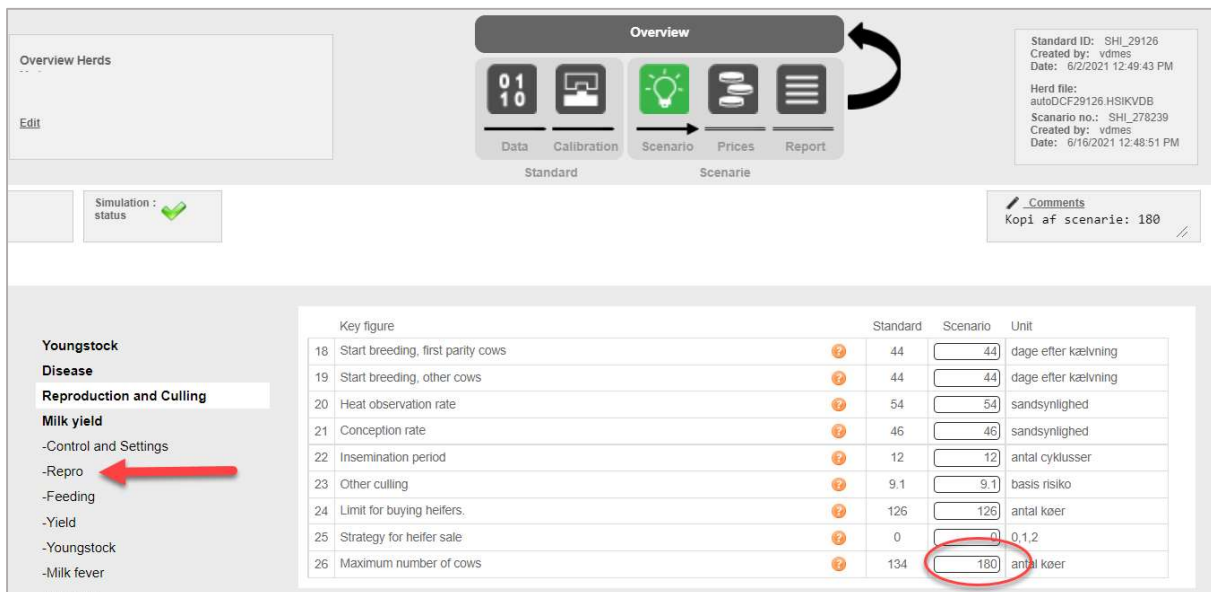
Standard: SHI_29126
6/2/2021 12:49:43 PM
Created by: vdmes
Other information: autoDCF29126.HSIKVDB

Create PDF (general)
Create PDF (breeding)

Scenario: SHI_278215
Created by: vdmes
Date: 6/16/2021 12:05:27 PM
Comments: 180

Scenario, Prices, Report

9) We don't need to specify the "maximum number of cows" again (see circle below, it's still there, because we copied the first scenario). Enter the category "-Repro" (Red arrow)



Overview

Standard: 0110, Calibration, Scenario, Prices, Report

Standard ID: SHI_29126
Created by: vdmes
Date: 6/2/2021 12:49:43 PM
Herd file: autoDCF29126.HSIKVDB
Scenario no.: SHI_278239
Created by: vdmes
Date: 6/16/2021 12:48:51 PM

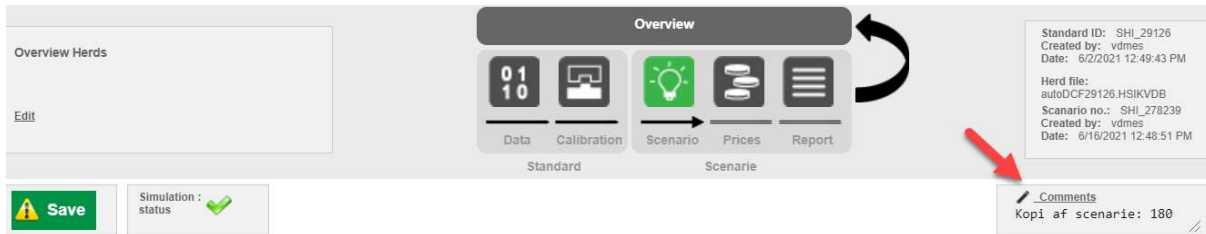
Simulation: status

Comments
Kopi af scenarie: 180

Youngstock
Disease
Reproduction and Culling
Milk yield
-Control and Settings
-Repro
-Feeding
-Yield
-Youngstock
-Milk fever

Key figure	Standard	Scenario	Unit
18 Start breeding, first parity cows	44	44	dage efter kælvning
19 Start breeding, other cows	44	44	dage efter kælvning
20 Heat observation rate	54	54	sandsynlighed
21 Conception rate	46	46	sandsynlighed
22 Insemination period	12	12	antal cyklusser
23 Other culling	9.1	9.1	basis risiko
24 Limit for buying heifers	126	126	antal køer
25 Strategy for heifer sale	0	0	0,1,2
26 Maximum number of cows	134	180	antal køer

10) Specify that you will inseminate ALL heifers (1) with sexed semen at a maximum of 2 insemination (read the question marks behind the parameters) and click on “Save”. Make sure you change the name of the scenario (Red arrow)



Overview Herds

Edit

Simulation : status

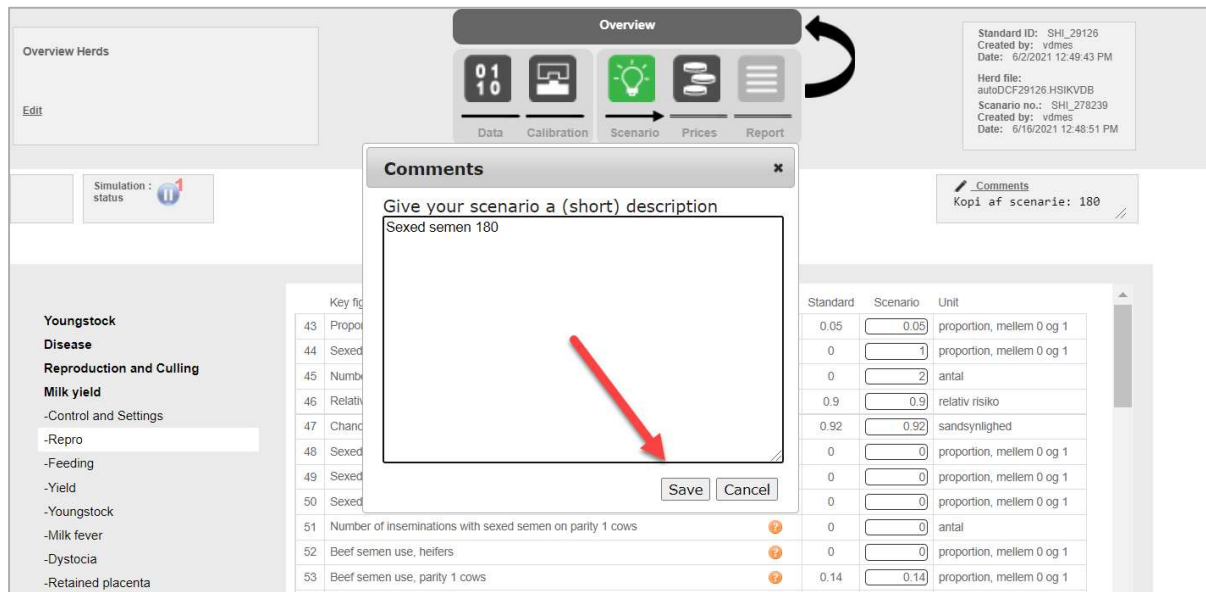
Standard ID: SHI_29126
Created by: vdmes
Date: 6/2/2021 12:49:43 PM

Herd file:
autoDCF29126.HSIKVDB
Scenario no.: SHI_278239
Created by: vdmes
Date: 6/16/2021 12:48:51 PM

Comments
Kopi af scenarie: 180

Key figure	Standard	Scenario	Unit
43 Proportion of heifers that never get in heat	0.05	0.05	proportion, mellem 0 og 1
44 Sexed semen use, heifers	0	1	proportion, mellem 0 og 1
45 Number of inseminations with sexed semen on heifers	0	2	antal
46 Relative conception chance of sexed dairy semen	0.9	0.9	relativ risiko
47 Chance of female calf, sexed dairy semen	0.92	0.92	sandsynlighed
48 Sexed semen use, parity 1 cows	0	0	proportion, mellem 0 og 1
49 Sexed semen use, parity 2 cows	0	0	proportion, mellem 0 og 1
50 Sexed semen use, parity 3+ cows	0	0	proportion, mellem 0 og 1

...and call it something like “sexed semen 180”



Overview Herds

Edit

Simulation : status

Standard ID: SHI_29126
Created by: vdmes
Date: 6/2/2021 12:49:43 PM

Herd file:
autoDCF29126.HSIKVDB
Scenario no.: SHI_278239
Created by: vdmes
Date: 6/16/2021 12:48:51 PM

Comments
Kopi af scenarie: 180

Comments

Give your scenario a (short) description

Sexed semen 180

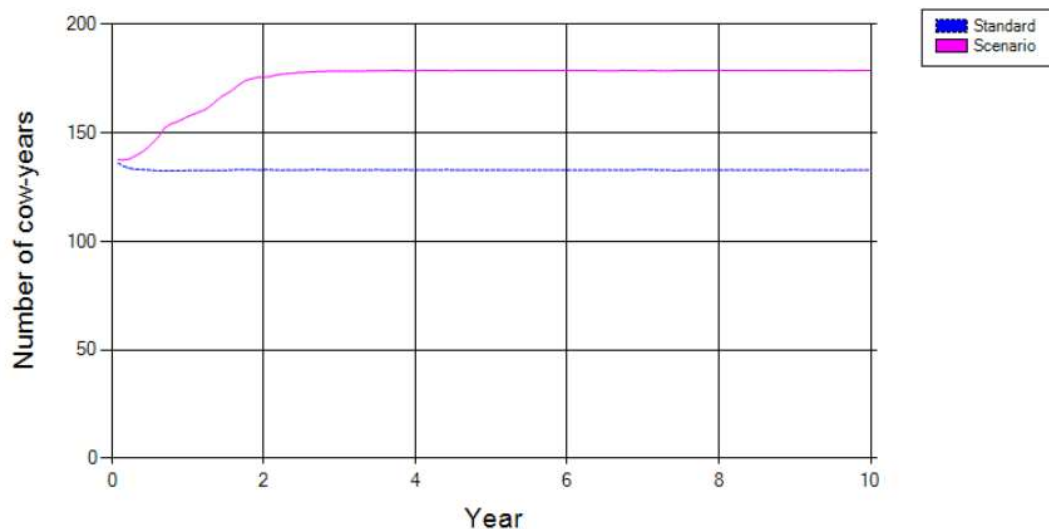
Save Cancel

- 11) The number of cows also increased after 6 to 10 years with 46, but the number of sold heifers is a lot higher now (the difference is 20, instead of 6 (see page 4)), because of the sexed semen.

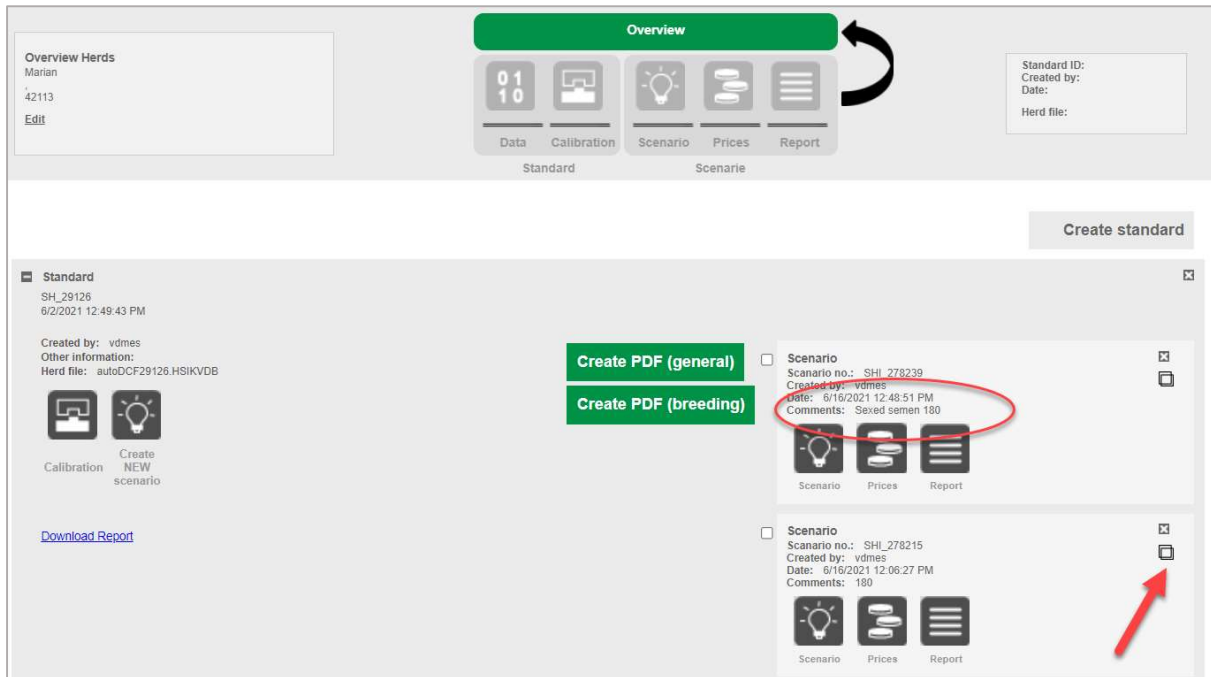
Herd dynamics (average of simulation years 6 to 10)

	Standard	Scenario	Difference
Number of cow-years	133	179	46
Number of calvings	141	192	51
Replacement rate	26,9	27,7	0,8
-Number of Involuntary Cullings incl. mortality	18	24	6
-Number of Voluntary Cullings	18	26	8
Number of productive years per cow	3,7	3,6	-0,1
Lifetime production, kg ECM	45649	44327	-1323
Stillbirth, %	2,0	2,0	-0,1
Calif mortality, after birth, %	1,7	1,8	0,0
Number of alive born bull calves	65	72	7
Number of alive born crossbred-calves	14	19	5
Number of bought heifers	0	0	0
Number of sold heifers	17	37	20

- 12) Scroll down to the timeline for “cow-years. What do you see? Any difference compared to the first scenario? No! in case you can expand the herd in 2 years, using sexed semen doesn’t make herd expansion go faster: it takes 9 months plus 2 years before the use of sexed semen results in more heifers.



13) What if we reduce the culling risk of the cow's? Go back to the overview (see step 7, page 5) and copy the first scenario again (red arrow). The second scenario is now *above* the first scenario (circle).



Overview Herds
Marian
42113
[Edit](#)

Overview
Data Calibration Scenario Prices Report

Standard ID:
Created by:
Date:
Herd file:

Create standard

Standard
SH_29126
6/2/2021 12:49:43 PM
Created by: vdmes
Other information:
Herd file: autoDCF29126.HSIKVD8

Calibration Create NEW scenario

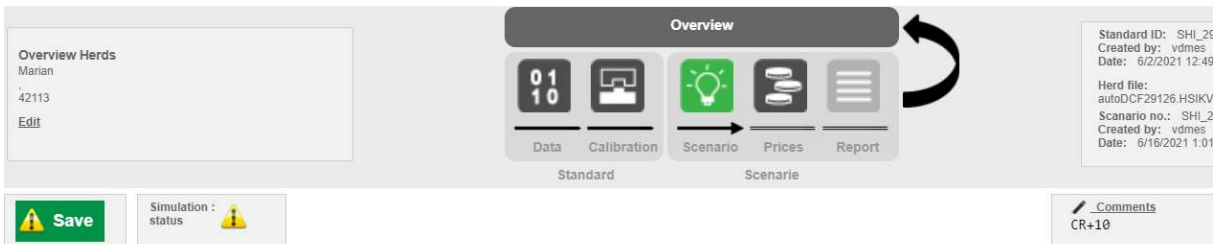
[Download Report](#)

Create PDF (general)
Create PDF (breeding)

☐ Scenario
Scenario no.: SHI_278239
Created by: vdmes
Date: 6/16/2021 12:48:51 PM
Comments: - Sexed semen 180

☐ Scenario
Scenario no.: SHI_278215
Created by: vdmes
Date: 6/16/2021 12:06:27 PM
Comments: 180

14) Create this scenario and change the name of the scenario to "cull-5"



Overview Herds
Marian
42113
[Edit](#)

Overview
Data Calibration Scenario Prices Report

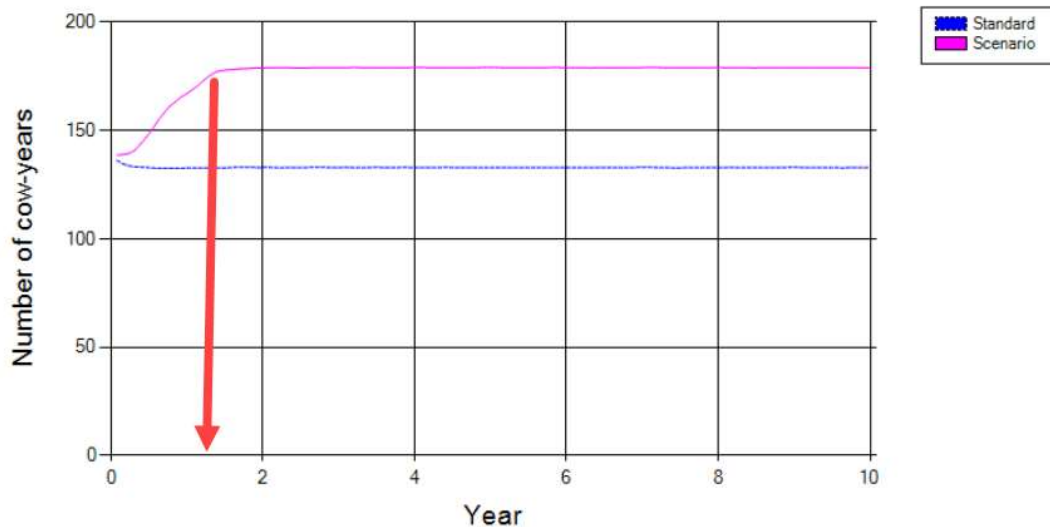
Standard ID: SHI_29126
Created by: vdmes
Date: 6/2/2021 12:49:43 PM
Herd file: autoDCF29126.HSIKVD8
Scenario no.: SHI_278239
Created by: vdmes
Date: 6/16/2021 12:06:27 PM

[Save](#) Simulation: status

[Comments](#)
CR+10

Key figure		Standard	Scenario	Unit
18	Start breeding, first parity cows	44	44	dage efter kælvning
19	Start breeding, other cows	44	44	dage efter kælvning
20	Heat observation rate	54	54	sandsynlighed
21	Conception rate	46	46	sandsynlighed
22	Insemination period	12	12	antal cyklusser
23	Other culling	9.1	4.1	basis risiko
24	Limit for buying heifers	126	126	antal køer
25	Strategy for heifer sale	0	0	0,1,2
26	Maximum number of cows	134	180	antal køer

15) Now you can see that expansion goes faster.



16) What if we buy heifers? Change the “Limit for buying heifers to 170”. This means that the model will always make sure that the herd has at least 170 heifers. On the first day of simulation this results in the herd buying 37 heifers (because the herd has 133 cows today and heifers are bought until the herd has 170 cows ($37+133=170$)).

Overview Herds
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[Edit](#)

Overview

01
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Data

Calibration

Scenario

Prices

Report

Standard Scenario

Standard ID: SHI_29126
Created by: vdmes
Date: 6/2/2021 12:49:43 PM

Herd file:
autoDCF29126.HSIKVDB
Scenario no.: SHI_278241
Created by: vdmes
Date: 6/16/2021 1:06:21 PM

[Save](#)

Simulation :

[Comments](#)
Kopi af scenarie: 180

Youngstock

Disease

Reproduction and Culling

Milk yield

-Control and Settings

-Repro

-Feeding

-Yield

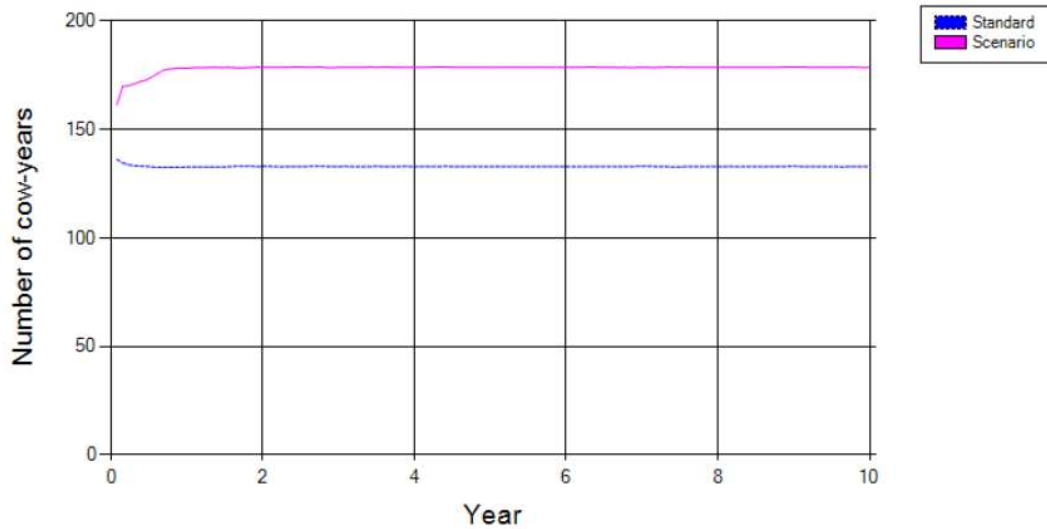
-Youngstock

-Milk fever

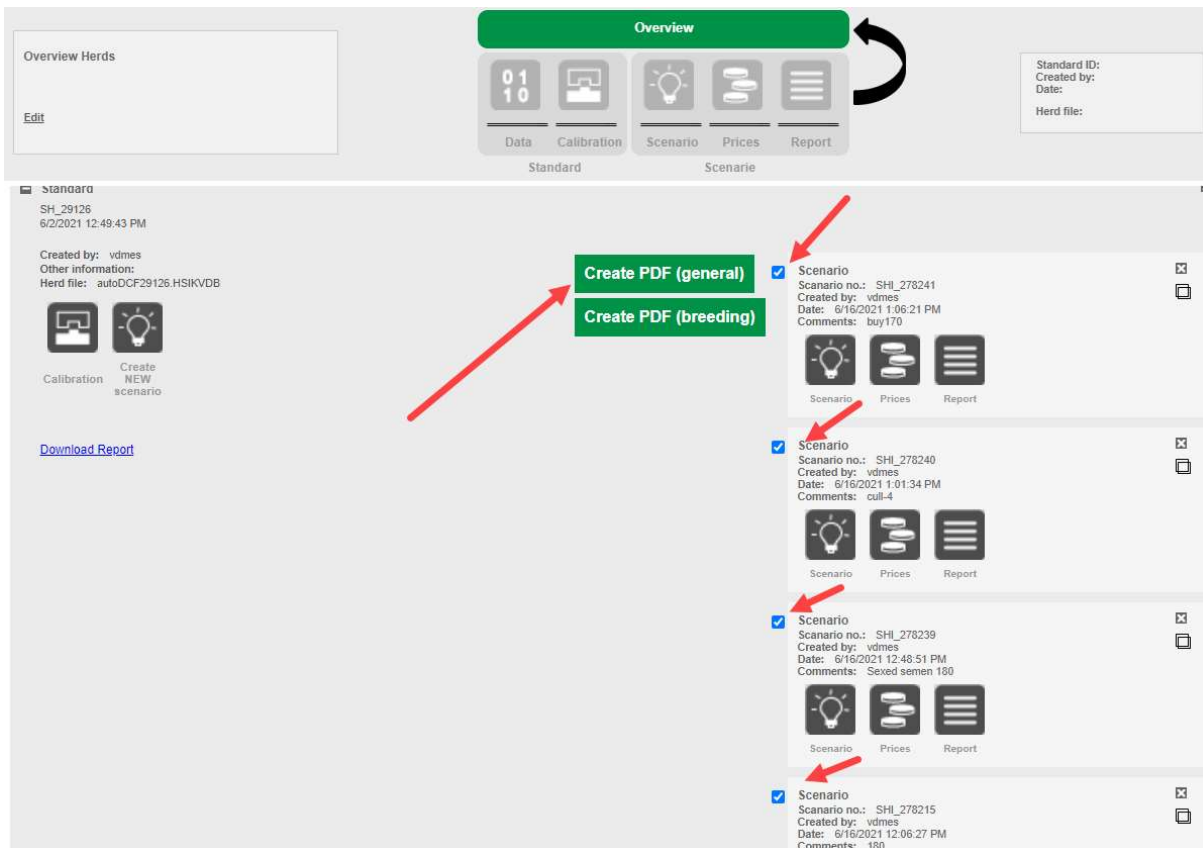
-Dystocia

Key figure	Standard	Scenario	Unit
18 Start breeding, first parity cows	44	44	dage efter kælvning
19 Start breeding, other cows	44	44	dage efter kælvning
20 Heat observation rate	54	54	sandsynlighed
21 Conception rate	46	46	sandsynlighed
22 Insemination period	12	12	antal cyklusser
23 Other culling	9.1	9.1	basal risiko
24 Limit for buying heifers.	126	170	antal køer
25 Strategy for heifer sale	0	0	0,1,2
26 Maximum number of cows	134	180	antal køer

17) This goes a lot faster!



18) Make a summary of the 4 scenarios. See below. Put a tick mark in all the boxed next to the scenario and click on "Create PDF".



The screenshot shows the SimHerd 'Overview' interface. At the top, there's a navigation bar with 'Overview' selected, and buttons for 'Data', 'Calibration', 'Scenario', 'Prices', and 'Report'. Below this, there's a section for 'Standard' and 'Scenario' models. On the left, there's a sidebar with 'Overview Herds' and 'Edit' buttons. The main area displays a list of scenarios. Each scenario entry includes a checkbox, the scenario number, creator, date, and comments. Red arrows point to the 'Create PDF (general)' and 'Create PDF (breeding)' buttons, and to the checkboxes for each of the four scenarios.

Scenario no.	Created by	Date	Comments
SHI_278241	vdmes	6/16/2021 1:06:21 PM	buy170
SHI_278240	vdmes	6/16/2021 1:01:34 PM	cull-4
SHI_278239	vdmes	6/16/2021 12:48:51 PM	Sexed semen 100
SHI_278215	vdmes	6/16/2021 12:06:27 PM	100

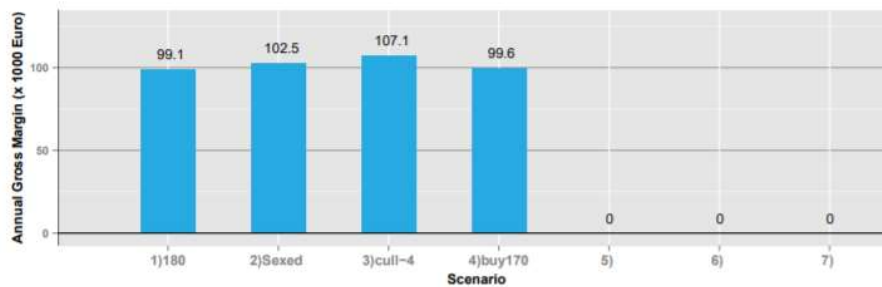
19) The bar chart shows the result for years 6 to 10. The scenario for “buy170” is the same for year 6 to 10; the long-term situation is the same. The table shows the same results as the ones presented on the previous pages; this PDF is just a summary of the same scenario.



16th June 2021

Economics of management changes Herd ID: 42113

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

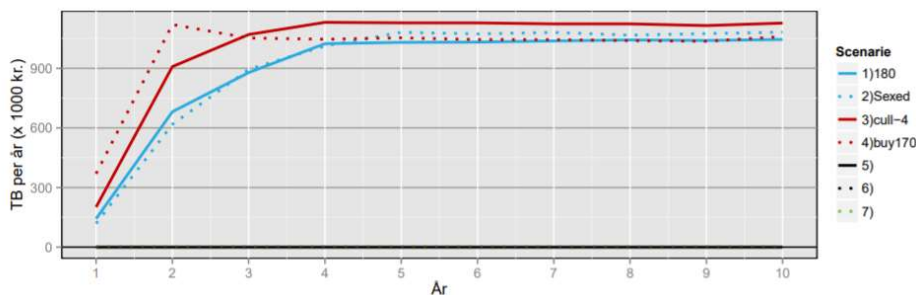
	Standard	1)180	2)Sexed	3)cull-4	4)buy170	5)	6)	7)
Cow-years	133	46	46	46	46	0	0	0
Calvings	141	49	51	44	50	0	0	0
Replacement rate	27	0	1	-4	0	0	0	0
ECM/cow-year	12282	-6	8	90	-1	0	0	0
Sold heifers	17	6	20	11	6	0	0	0
Youngstock	128	45	81	38	45	0	0	0
Need for labor*	85.3	27.9	33.2	27.0	27.9	0.0	0.0	0.0

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

But the development of Margin per year is quite different. In the “buy170” scenario the increase in Gross margin (TB) is a lot faster. This is important since the farmer already has invested in the stable-capacity.

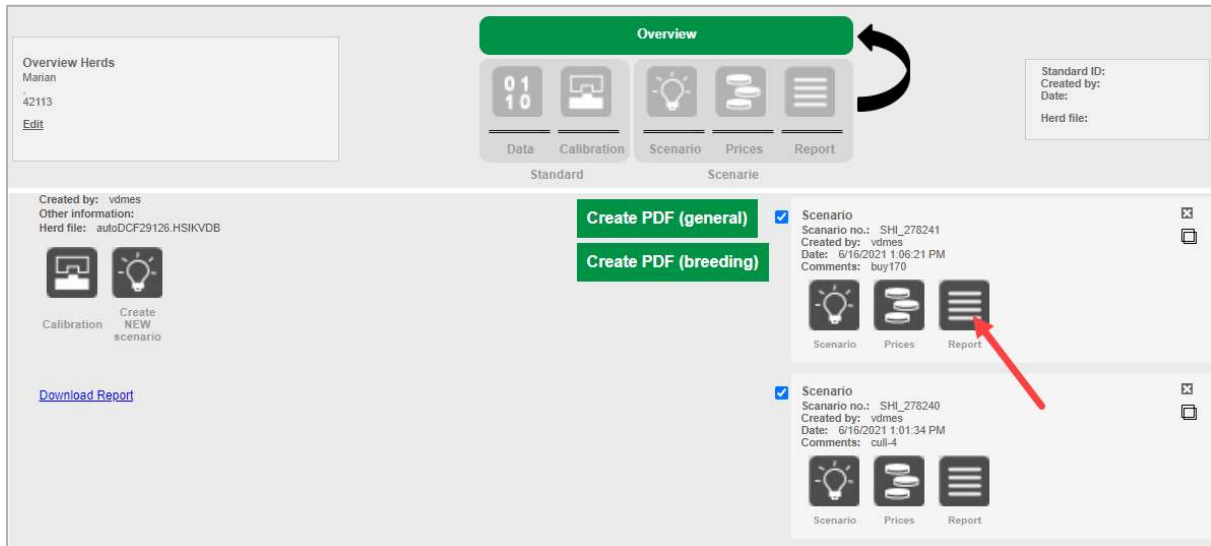
Utveckling av förändringen i TB per år

Nivån i åren 6 till 10 i figuren nedan överensstämmer med stapeldiagrammet.



We do NOT include that there is a risk of introducing disease into the herd, when buying heifers from another farm! That is a risk you have to assess in discussion with the farmer.

20) If you want to know precisely how much the margin is different in the first years, you have to go back in the single reports. See below:



Overview Herds
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[Edit](#)

Created by: vdmes
Other information:
Herd file: autoDCF29126.HSIKVD8

Calibration Create NEW scenario

[Download Report](#)

Overview

0110 Data Calibration Scenario Prices Report

Standard Scenario

Create PDF (general) Create PDF (breeding)

Scenario Scenario no.: SHI_278241
Created by: vdmes
Date: 6/16/2021 1:06:21 PM
Comments: buy170

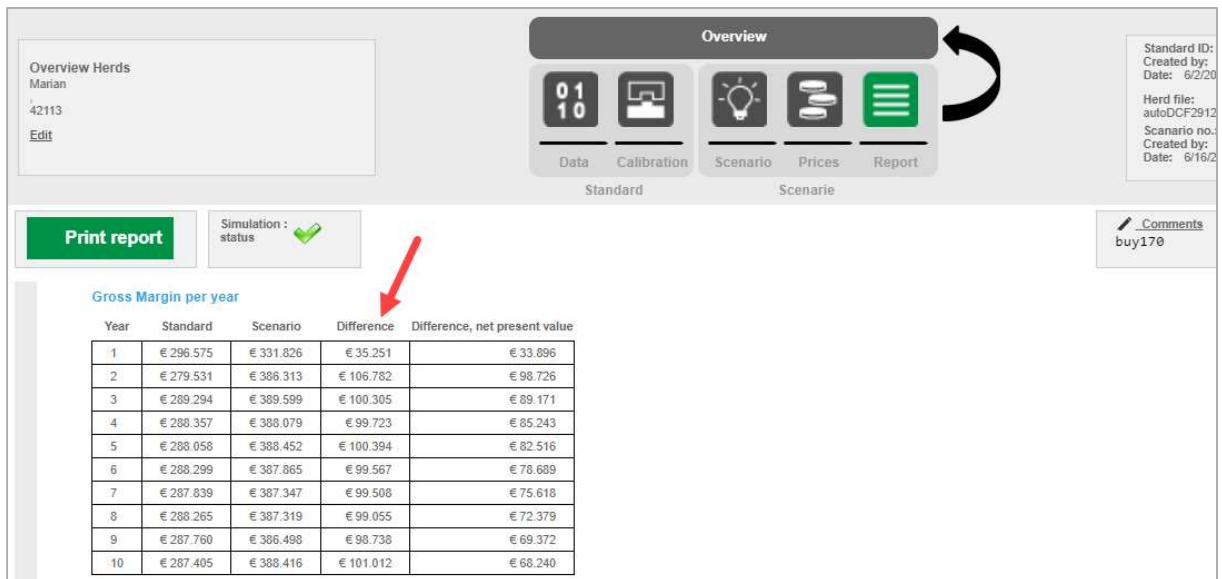
Scenario Prices Report

Scenario Scenario no.: SHI_278240
Created by: vdmes
Date: 6/16/2021 1:01:34 PM
Comments: cull-4


Scenario Prices Report

Standard ID:
Created by:
Date:
Herd file:

Scroll down



Overview Herds
Marian
42113
[Edit](#)

Print report Simulation : status 

Gross Margin per year

Year	Standard	Scenario	Difference	Difference, net present value
1	€ 296.575	€ 331.826	€ 35.251	€ 33.896
2	€ 279.531	€ 386.313	€ 106.782	€ 96.726
3	€ 289.294	€ 389.599	€ 100.305	€ 89.171
4	€ 288.357	€ 388.079	€ 99.723	€ 85.243
5	€ 288.058	€ 388.452	€ 100.394	€ 82.516
6	€ 288.299	€ 387.865	€ 99.567	€ 78.689
7	€ 287.839	€ 387.347	€ 99.508	€ 75.618
8	€ 288.265	€ 387.319	€ 99.055	€ 72.379
9	€ 287.760	€ 386.498	€ 98.738	€ 69.372
10	€ 287.405	€ 388.416	€ 101.012	€ 68.240

Standard ID:
Created by:
Date:
Herd file:
Scenario no.:
Created by:
Date:

Comments
buy170

“Net present value” is today's value of a future stream of payments (Wikipedia): today's value of money that you receive in the future.