Total Merit Index (NBDI) for beef sires used for dairy cattle

Economic value of beef sire traits

Jørn Pedersen, Gert Pedersen Aamand,
Freddy Fikse, Jukka Pösö and Kevin Byskov
October 2024

Introduction and the method used

This report is a rewrite of the report "Total merit index (NBDI) for beef sires used for dairy cattle" from October 2019.The model and assumptions have been revised during 2023 and spring 2024.

The program used for the calculations was the TMI-model for estimation of economic values of the NTM traits in dairy cattle. The input for this model is a set of economic and biological assumptions. Besides, several management scenarios with different culling rates and different use of sexed semen and beef sires can be tested (See the description of the dairy-model in: "Review of Nordic Total Merit Index, Full Report, November 2018"). For the calculation of economic value of improving beef cattle traits the standard scenario is used. The standard scenario is a conventional herd with a culling rate of 32%, 50% of replacement heifers born by sexed semen and 70-75% of the cows inseminated with beef sires – and **no** heifers inseminated with beef semen.

For this purpose, the dairy version of the TMI-model is modified such that:

- Growth rate and EUROP form score of beef sires are improved – and the effect on the crossbred calves is analyzed.
- EUROP fat score is introduced. The reason is that slaughter animals with high fat score is heavily punished in the Swedish and Finnish price system. Therefor improvement of fat score has received much attention in Sweden and Finland.
- Survival rate and calving ease of beef sires are improved – and the effect on the crossbred calves is analyzed.
- Besides, the section of the model that describe the effect of improvement of beef traits is calculated separately for purebred and crossbred bull calves and for heifer crosses. That also include the calculation of feed consumption.
- Differences between beef breeds are **NOT** considered. The basic biological assumptions should be average of beef crosses for the country and dairy breed in question.

The effect on calving difficulty at later calvings for crossbred - on cow mortality have been taken into account - based and DNK results. Otherwise, the subsequent effect on the dairy cow giving birth to a beef cross is not considered by this model. Danish analyses have shown that the most important consequence of using beef sire for dairy cows is the increased frequency of difficult calvings – and that difficult calvings have an effect on subsequent cow mortality.

Since 2019 the following have been updated:

- Average growth rates, age at slaughter, live and carcass weight at slaughter (daily gain and daily net gain) for crossbreed calves.
- Assumptions on EUROP form and fat scores. That includes separate assumptions for male and female calves.
- Assumptions on calf mortality and calving ease for crossbred calves. That includes separate assumptions for male and female calves.
- Assumptions related to young stock survival (average survival rates and age at death).
- Economic assumption with respect to beef prices for crossbreed calves including deduction or additions due to EUROP form and fat score.
- Besides, the model has been modified in order to take into account the use of Y-sorted beef semen.
- The calculation of feed consumption for the long growth period has been changed such that the crossbred calves are slaughtered at a fixed weight when growth rate is increased. In the previous version of the model all calves were slaughtered at a fixed age when growth rate increased.
- Besides, feed consumption has been adjusted for crossbred heifer calves – such that it corresponds to observations from practice.
- Also, the difference between labour cost of calves that survive to slaughter and calves that leave early is taken into account.

In the dairy version of the TMI-model the results were expressed per annual cow. If the results in the beef sire version of the TMI-model are expressed per annual cow the values will depend on percent dairy cows used for beef crosses – that again will depend the assumptions on culling rate and the use of X-sorted semen.

In the beef sire version of the TMI-model it is more reasonable to express the results per crossbred calf (stillborn + liveborn). Then the values will be independent of management systems with respect to culling rate, use of X-sorted semen and percent cows used for beef crosses.

The economic values presented are the effect of improving a trait of **the beef sires** with one unit. The effect is the value per crossbred calf born.

The TMI-model calculates economic values per dam breed for each NAV country. In the dairy version of the model the results were averaged per breed over countries because it was important to create a common breeding goal per breed across countries. For beef sires to be used for dairy cows to produce beef crosses for slaughter, we would like to have one set of values across all dam breeds. However, a common NBDI across countries (and dam breeds) is not an ultimate requirement. It is just simpler and easier to manage in practice.

General assumption on beef production

Table 1 and 2 show the average beef production results for male and female beef crosses. In DNK the calves are slaughtered at much lower age than in SWE and FIN. Furthermore, the majority of the DNK calves are slaughtered under the concept "Danish Calf" (calves below one year). The daily gain information is used for calculation of feed consumption and net daily gain is used for calculation of income. The income also depends on EUROP form score (15 classes) and EUROP fat score (5 classes)

Table 1. Average beef production results for male beef crosses

	Age at slaughter, days	Live weight, kg	Carcass weight, kg	Daily gain (kg/day)	Net daily gain (kg/day)	EUROP Form score	EUROP Fat score	Share of calves
				Young beef crosses (below 1 year)				
RDC – DNK	307	400	210	1.300	0.776	8.10	2.68	67%
HOL – DNK	299	400	210	1.330	0.784	7.60	2.54	80%
JER – DNK	313	390	195	1.250	0.677	6.80	2.64	52%
				Older beef crosses (more than 1 year)				
RDC – DNK	401	485	260	1.209	0.707	8.20	2.43	33%
RDC – SWE	565	670	359	1.187	0.636	9.33	3.00	100%
RDC – FIN	600	751	403	1.252	0.671	8.10	1.35	100%
HOL – DNK	404	480	255	1.230	0.703	7.60	2.36	20%
HOL – SWE	555	691	367	1.245	0.661	8.62	2.47	100%
HOL – FIN	594	769	411	1.294	0.687	7.80	1.50	100%
JER – DNK	426	450	235	1.200	0.613	7.00	2.44	48%

Table 2. Average beef production results for female beef crosses

	Age at slaughter, days	Live weight, kg	Carcass weight, kg	Daily gain (kg/day)	Net daily gain (kg/day)	EUROP Form score	EUROP Fat score	Share of calves
				Young beef crosses (below 1 year)				
RDC – DNK	313	400	210	1.250	0.671	7.40	3.15	51%
HOL – DNK	309	400	210	1.250	0.680	6.80	3.06	67%
JER – DNK	320	390	195	1.200	0.570	6.00	3.09	29%
				Older beef crosses (more than 1 year)				
RDC – DNK	449	500	275	1.050	0.587	7.60	3.87	49%
RDC – SWE	721	573	315	0.795	0.437	6.60	3.00	100%
RDC – FIN	522	487	271	0.933	0.513	6.70	2.03	100%
HOL – DNK	443	490	260	1.106	0.590	7.10	2.84	33%
HOL – SWE	710	604	321	0.851	0.452	7.10	3.00	100%
HOL – FIN	514	512	275	0.996	0.529	6.30	1.95	100%

JER – DNK	456	460	245	0.900	0.489	6.20	2.87	71%

The assumed beef prices for EUROP score 5 and EUROP fat score 3 are shown in table 3. They are higher than used in the 2019-report, but not as high as they have been in the recent year (2022)

The feed prices are shown in table 4.

Table 3. Assumed beef prices for beef crosses (and pure bred) – for EUROP form = 5, EUROP fatness = 3

	SWE	DNK	FIN
Young bull calves, €/kg carcass	-	4.40	-
Older bull, €/kg carcass	4.40	4.00	4.00
Young Heifer calves, €/kg carcass	-	4.40	-
Older heifers, €/kg carcass	4.10	4.00	4.00

Table 4. Assumed feed costs for beef crosses (and pure bred)

	SWE	DNK	FIN
Concentrates, €/SFU	0.24	0.24	0.25
Calf Mixture, €/SFU	0.27	0.27	0.34
Roughage, €/SFU	0.157	0.147	0.179
Pct. Roughage in diet	15%	0%	15%

Economic value of EUROP form score

Table 5 shows the assumptions used in the current version of the model. They are all low - especially for the very young calves ("Danish Calf concept"). That is because the price differences between form classes is not so large for the high form classes. If we had looked at results for purebred dairy calves the effect of improving EUROP form is somewhat larger because the average form score is lower and the economic difference between form classes are larger.

Table 5. Economic effect on value of one kg beef by improving EUROP form class by one unit calculated by linear regression of deduction or addition on EUROP form classes (positive for EUROP scores above 5 – and negative below).

	Extra value (€) per kg of beef per unit of EUROP-form			
	SWE	DNK	FIN	Based on
Very young calves ("Danish calf"-concept)	-	0.0068	-	class 5-11
Crossbred bulls and heifers	0.0435	0.0621	0.0804	class 5-11

Assumption for EUROP fat score

Table 6 shows the distribution of fat scores for crossbred male and female calves. In FIN the share of male calves with fat score 1, 2 and 3 is very high.

In table 7 it is shown that in DNK and SWE there is a deduction in beef price for the lean animals and a small deduction for the very fat animals. However, in DNK there is very few fat animals due to the lower age at slaughter. In FIN there is only deduction for the high fat scores.
The non-linear relationships often create problems with the direction of the selection (that is a problem that also exists for some conformation traits).

Table 6. Distribution of fat scores for crossbred calves.

	Fat score					
	1	2	3	4	5	Avg. score
Male calves						
	Short growth period					
DNK RDC	0.0084	0.5613	0.4266	0.0038	0.0000	2.43
DNK HOL	0.0092	0.6226	0.3665	0.0017	0.0000	2.36
DNK JER	0.0069	0.5488	0.4436	0.0007	0.0000	2.44
	Long growth period					
SWE RDC	0.0052	0.2065	0.6942	0.0924	0.0011	2.88
FIN RDC	0.0638	0.5075	0.3583	0.0616	0.0089	2.44
SWE HOL	0.0062	0.2623	0.6774	0.0529	0.0006	2.78
FIN HOL	0.0811	0.5346	0.3334	0.0451	0.0058	2.36
Female calves						
	Short growth period					
DNK RDC	0.0020	0.1424	0.8408	0.0149	0.0000	2.87
DNK HOL	0.0019	0.1593	0.8319	0.0069	0.0000	2.84
DNK JER	0.0009	0.1405	0.8428	0.0158	0.0000	2.87
	Long growth period					
SWE RDC	0.0016	0.0484	0.5731	0.3595	0.0175	3.34
FIN RDC	0.0377	0.3304	0.4337	0.1578	0.0403	2.83
SWE HOL	0.0022	0.0544	0.5739	0.3570	0.0123	3.32
FIN HOL	0.0454	0.3358	0.4396	0.1464	0.0327	2.78

Table 7. Deduction in price per kg carcass depending on EUROP fat score

	Male calves			Female calves (heifers)		
EUROP fat score	DNK, €/kg	SWE, €/kg	FIN, €/kg	DNK, €/kg	SWE, €/kg	FIN, €/kg
1	-0.27	-0.18	0.00	-0.27	-0.18	0.00
2	-0.03	-0.04	0.00	-0.03	-0.04	0.00
3	0.00	0.00	0.00	0.00	0.00	0.00
4	0.00	0.00	-0.20	0.00	0.00	-0.20
5	-0.13	-0.44	-0.50	-0.13	-0.44	-0.50

Calving traits

Table 8 and 9 show the average results for stillbirth and calving ease for beef crosses. In the current version of the model only the results for later calvings are in effect. But the model is prepared to include beef crosses born at 1st calving as well.

Table 8. Average stillbirth rates for beef cross calves (per dam breed and origin – in the current version of the TMI-model only results from later calvings are used)

	Female birth weight, kg	*Male birth weight, kg*	*% stillborn females, 1st*	*% stillborn males, 1st*	**% stillborn females, 2nd+**	**% stillborn males, 2nd+**
RDC - DNK	*40*	*45*	*3.5*	*5.8*	**2.1**	**3.8**
RDC - SWE	*36*	*39*	*3.0*	*6.0*	**2.0**	**3.9**
RDC - FIN	*40*	*42*	*4.9*	*6.4*	**3.7**	**5.4**
HOL - DNK	*40*	*44*	*5.2*	*9.6*	**2.5**	**4.7**
HOL - SWE	*40*	*43*	*5.3*	*9.8*	**2.1**	**4.1**
HOL - FIN	*43*	*46*	*6.9*	*9.4*	**3.3**	**4.8**
JER - DNK	*37*	*40*	*4.6*	*4.6*	**2.9**	**4.7**

Table 9. Distribution of calving ease codes for beef cross calves (per dam breed and origin – in the current version of the NBDI-model only results from later calvings are used)

	1st calving				**Later calvings**			
	% easy	*% easy with help*	*% difficult without vet. ass.*	*% difficult with vet. ass.*	**% easy**	**% easy with help**	**% difficult without vet. ass.**	**% difficult with vet. ass.**
					Male calves			
RDC - DNK	*82.88*	*9.01*	*7.21*	*0.90*	**90.22**	**6.95**	**2.32**	**0.51**
RDC – SWE	*87.15*	*8.94*	*3.39*	*0.53*	**90.75**	**6.50**	**2.29**	**0.47**
RDC - FIN	*69.17*	*20.73*	*9.90*	*0.20*	**80.97**	**13.97**	**4.85**	**0.21**
HOL - DNK	*77.66*	*16.62*	*4.54*	*1.18*	**86.75**	**10.22**	**2.47**	**0.56**
HOL - SWE	*86.60*	*8.89*	*4.06*	*0.44*	**91.40**	**5.99**	**1.95**	**0.66**
HOL - FIN	*67.33*	*22.47*	*10.00*	*0.20*	**82.03**	**13.20**	**4.45**	**0.32**
JER - DNK	*82.96*	*10.01*	*6.13*	*0.90*	**89.50**	**7.06**	**2.87**	**0.50**
					Female calves			
RDC - DNK	*89.13*	*6.52*	*3.26*	*1.09*	**94.36**	**4.46**	**1.04**	**0.14**
RDC - SWE	*92.58*	*5.84*	*1.44*	*0.14*	**94.90**	**3.93**	**0.93**	**0.24**
RDC - FIN	*80.68*	*16.00*	*3.23*	*0.09*	**87.89**	**9.78**	**2.19**	**0.14**
HOL - DNK	*85.28*	*12.12*	*2.18*	*0.41*	**91.35**	**7.23**	**1.06**	**0.36**
HOL - SWE	*91.94*	*6.26*	*1.70*	*0.09*	**94.20**	**4.38**	**1.04**	**0.38**
HOL - FIN	*80.27*	*15.60*	*3.80*	*0.26*	**89.16**	**8.67**	**2.00**	**0.17**
JER - DNK	*88.21*	*7.39*	*3.62*	*0.79*	**95.50**	**3.27**	**0.95**	**0.28**

Effect of difficult calvings on cow mortality in subsequent lactation

The effect of difficult calvings have been calculated on Danish data – for 2nd and later lactations and only for cows giving birth to crossbred calves.

Cow mortality is increased by:

- 0.00 percent-point: Easy calving without help
- 1.78 percent-point: Easy calving with some help
- 8.58 percent-point: Difficult calving
- 15.93 percent-point: Difficult calving with veterinarian assistance

These assumptions are used across countries and for all dam breeds. The consequence of improving calving ease is decreased costs of disposal of dead cows but especially higher slaughter value because more cows survive. For first calving average cow mortality is assumed.

Young stock survival

In table 10 the assumptions for young stock survival of beef crosses are shown. Calf mortality is higher in DNK than in SWE and FIN for both periods and for all dam breeds. The age at dead is quite similar for all countries and breeds in period 1 (13-14 days). For period 2 there are slightly larger differences. The age at death is between 75 and 100 days.

Table 10. Assumptions for young stock survival

	% dead calves				Age of dead calves, days			
Dam breed	Heifers 1-30	Heifers >=31	Bull calves 1-30	Bull calves >=31	Heifers 1-30	Heifers 31-200	Bull calves 1-30	Bull calves >=31
RDC – DNK	3.12%	4.49%	3.41%	6.66%	13.9	96.4	12.9	99.9
RDC – SWE	1.85%	3.15%	2.11%	3.04%	14.3	92.5	14.1	87.0
RDC – FIN	2.72%	3.81%	4.07%	4.86%	13.9	97.0	14.5	93.3
HOL – DNK	3.49%	4.41%	4.38%	6.04%	12.7	85.1	12.4	90.0
HOL – SWE	1.69%	2.60%	2.06%	2.54%	13.2	92.8	13.0	87.3
HOL – FIN	2.39%	2.68%	3.87%	3.65%	13.4	91.3	14.4	89.2
JER – DNK	4.66%	5.50%	5.03%	7.31%	13.4	73.4	13.2	82.7

Costs of work

Calves that survive until slaughtered stay in the herds much longer time than calves that die during the growth period – and they require more resources in form of work and other variable cost. The version of the NBDI-model used in 2029 took into account differences in feed costs and cost of disposing dead calves, but not other costs.

Therefor it was decided to include the basic variable costs of work by assessing:

- Minutes per day per calf for calves 1-30 days
- Minutes per day per calf for calves 31 days to dead or slaughter.

A major problem was to specify the amount of basic work, because there are very few references dealing with this subject. However, a Danish study from 2010 (published in “Håndbog for

Kvæghold, 2015") gave some estimates on workload for different animal groups in a dairy herd. The estimates were based on questionaries.

- Period 1-30 days: For small calves the basic work was estimated to 250 minutes per annual cow. This result can be converted to 5.6 minutes per calf per day (1 liveborn calf per annual cow in 45 days per calf).
- Period > 30 days: The study did not specify results for slaughter animals - only for female replacement heifers, but the results might be a guidance to results for slaughter animals as well. The study estimated the work to 175 minutes per annual cow (time for heat control excluded). The result can be converted 0.5 minutes per calf/heifer per day (0.5 liveborn heifer pr annual cow – in a period of 700 days)

Both estimates seem to be high. That might be because the study included total work and some might be due to tasks that do not depend on number of calves. Besides, there might be some differences for the late period between short (intensive) growth period and the long (extensive) growth period.

At the outset the following values was used:

- 5.6 minutes per calf per day for the period 1-30 days.
- 0.5 minutes per calf per day for the period after 31 days

Feed consumption

It has turned out that feed consumption of heifer crosses was too low in the original version of NBDI. That has been adjusted such that the feed consumption corresponds to results from practice (table 11).

Table 11. Survey of feed consumption per kg liveweight (SFU/kg LW). Information received from DNK, SWE and FIN – and results calculated in used the NBDI program.

	Information from DNK, SWE and FIN				NBDI results after adjustment of feed consumption			
	DNK info HOL&RDC	DNK info JER	SWE info HOL&RDC	FIN Info HOL&RDC	DNK Avg HOL&RDC	SWE Avg HOL&RDC	FIN Avg HOL&RDC	DNK JER
Bull crosses, Short period	4.2	4.5	-	-	**4.34**	**-**	**-**	**4.59**
Heifer crosses, Short period	4.6	4.8	-	-	**4.75**	**-**	**-**	**4.86**
Bull crosses, Long period	-	-	1.6 kg DM 2.0 SFU conc.	8.4 kg DM	**4.61**	**6.01**	**6.93**	**5.05**
Heifer crosses, Long period	-	-	4.3 kg DM 0.9 SFU conc.	8.9 kg DM	**5.07**	**7.57**	**7.36**	**5.36**
				Heifer – Bull relation				
Short period: Heifer/Bull	1.10	1.07	-	-	**1.10**	**-**	**-**	**1.06**
Long period: Heifer/Bull	-	-	1.3	1.06	**1.10**	**1.26**	**1.06**	**1.06**

Results using basic assumptions

In table 12, the main results are shown using the basic assumptions of the beef sire version of NBDI-model. The basic assumptions include:

- Differences in economic assumptions in each country – important is the differences in beef prices and differences in payment systems for EUROP fat score.
- Differences in basic biological assumption, for example differences in survival rate and calving ease
- Differences in management systems: In SWE the growth period for bull calves is 18 months in SWE - and close to 20 months in FIN. In DNK age at slaughter is just below 10 months for at least 50% of the calves. For the remaining part of the calves the age is on average 13-15 months. This difference has effect on value of EUROP form score and EUROP fat score because the value of these traits has a direct relationship to the carcass weight.

Table 12. Value of improving traits of beef sires used in dairy herds. Value per crossbred calf born in DNK, SWE and FIN. Basic assumptions from the NBDI-model.

Country	DNK	DNK	DNK	SWE	SWE	FIN	FIN
Dam breed	JER	RDC	HOL	RDC	HOL	RDC	HOL
Daily carcass gain, € per g/day	0.26	0.26	0.25	0.38	0.36	0.33	0.33
EUROP form score, € per point	4.19	3.19	2.45	7.46	8.20	11.42	13.24
EUROP fat score, € per point	3.74	4.34	4.28	-5.72	-3.76	-8.50	-8.25
Survival at birth, later (0-1)	127.36	204.19	199.32	287.49	274.79	167.32	146.55
Calving ease, later, € per point	32.61	40.91	43.47	48.49	59.11	28.25	29.96
Survival, heifers 1-30 days (0-1)	66.85	108.67	103.69	97.13	82.42	67.44	54.61
Survival, heifers >= 31 days (0-1)	108.68	154.57	144.61	131.80	117.65	98.62	83.02
Survival, bulls 1-30 days (0-1)	88.07	121.45	119.35	185.35	181.44	116.97	108.63
Survival, bulls >= 31 days (0-1)	132.21	171.03	161.34	219.42	215.63	147.22	135.44
Survival, heifers+bulls 2-30 days	154.92	230.12	223.04	282.49	263.86	184.41	163.24
Survival, heifers+bulls >= 31 days	240.89	325.60	305.95	351.22	333.27	245.83	218.47

The results shown in table 12 are the value of improving the breeding value of the beef sire traits with one unit.

- For JER only DNK results are calculated. For survival and calving ease, the values are zero for 1st calving because one of the assumptions is that no beef crosses are born at 1st calving. Within country the differences between RDC and HOL dam breeds are small.

- There is difference between the short and long growth period for EUROP form and fat score because both traits are expressed on more kilograms of carcass in the long growth period.
    - The value of improving EUROP form is highest in SWE and FIN because the animals are slaughtered at a much higher age and larger carcass weight than in DNK. The carcass weight has a direct effect on the value of EUROP form because the slaughter value of each kilogram is higher when EUROP form is improved. In FIN the value is highest because the extra price per unit of form score is highest.
    - For EUROP fat score the carcass weight also has direct effect on the value. The results of the differences in payment for fatness are that the value of higher fat score is negative in SWE and FIN, but slightly positive in DNK.
- For survival at birth the value is highest in SWE, because the revenue by producing a slaughter animal is highest in SWE.
- For calving ease, the value is lowest in FIN. It is because the frequency of the very difficult calvings is lowest in FIN and therefore an improvement of calving ease will not change the frequency of very difficult calvings very much (if there is no difficult calvings then an improvement will not change the frequency – it would still be zero)
- For young stock survival the values:
    - are highest in SWE and lowest in FIN. The values are lowest for JER.
    - are 25-50% larger for the late period (>= 31 days) compared to the short period (1-30 days).
    - are highest for bull calves.

Table 13. Value of improving survival traits of beef sires used in dairy herds when 100% of the beef semen for dairy crosses are Y-sorted.

Country	DNK	DNK	DNK	SWE	SWE	FIN	FIN
Dam breed	JER	RDC	HOL	RDC	HOL	RDC	HOL
Daily carcass gain, € per g/day	0.27	0.27	0.27	0.34	0.32	0.37	0.37
EUROP form score, € per point	3.69	2.70	2.08	7.87	8.65	13.42	15.60
EUROP fat score, € per point	4.22	4.57	4.46	-0.61	1.65	-6.20	-6.05
Survival at birth, later (0-1)	178.56	276.80	275.90	462.17	455.35	247.02	225.90
Calving ease, later, € per point	46.14	58.15	55.58	65.57	74.84	36.72	39.64
Survival, heifers 1-30 days (0-1)	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Survival, heifers >= 31 days (0-1)	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Survival, bulls 1-30 days (0-1)	176.13	242.89	238.69	370.70	362.87	233.94	217.25
Survival, bulls >0 31 days (0-1)	264.42	342.07	322.67	438.85	431.25	294.43	270.89
Survival, heifers+bulls 2-30 days	176.13	242.89	238.69	370.70	362.87	233.94	217.25
Survival, heifers+bulls >= 31 days	264.42	342.07	322.67	438.85	431.25	294.43	270.89

Table 14. Percent change by using 100% Y-sorted semen (comparison of table 12 and 13)

Country Dam breed	DNK JER	DNK RDC	DNK HOL	SWE RDC	SWE HOL	FIN RDC	FIN HOL
Daily carcass gain, € per g/day	3.9%	4.4%	6.6%	-10.3%	-10.9%	13.1%	13.1%
EUROP form score, € per point	-12.0%	-15.3%	-14.9%	5.5%	5.5%	17.5%	17.9%
EUROP fat score, € per point	12.8%	5.3%	4.2%	-89.3%	-143.9%	-27.0%	-26.7%
Survival at birth, later (0-1)	40.2%	35.6%	38.4%	60.8%	65.7%	47.6%	54.1%
Calving ease, later, € per point	41.5%	42.1%	27.9%	35.2%	26.6%	30.0%	32.3%
Surv., heifers+bulls 1-30 days (0-1)	13.7%	5.6%	7.0%	31.2%	37.5%	26.9%	33.1%
Surv., heifers+bulls >= 31 d. (0-1)	9.8%	5.1%	5.5%	24.9%	29.4%	19.8%	24.0%

Table 13 shows the results for a situation with 100% Y-sorted beef semen such that all crossbred calves are males – and in table 14 there is a comparison between table 12 and 13. The effect of increased use om Y-sorted semen on the value of traits in beef breed will be:

- Slightly changed value of daily gain (For SWE the change is negative), because it turned out that improvement of daily gain of heifer calves had a high value in SWE and with 100% Y-sorted only results for bull calves have effect. (In SWE the growth period of heifer crosses is very long (table 2) and improvement of daily gain of heifer crosses have relatively positive economic effect).
- Higher value of EUROP form score in SWE and especially FIN, but lower value in DNK. The value is lower in DNK because nearly all (bull) calves are slaughtered under the concept “Danish Calf” where form score has a low value.
- The value of survival at birth (as direct trait) is increased very much. That is because mortality is somewhat higher for bull calves compared female calves. The increase highest in SWE where revenue from beef production is highest.
- The value of calving ease (as direct trait) is increased. That is because there is a large difference between calving ease of bull calves compared female calves.
- For young stock survival
  - The value of heifer survival is of course zero, because no heifer crosses are born
  - The value of bull calf survival is doubled because all calves born are bulls
  - But when evaluated as sum of heifer and bull calf results, the change is as large as for survival at birth.

Comparison with result from 2019-report

How do these results compare to the results of the 2019-report. Table 15 show the 2019 results and table 16 show a comparison with the results in table 12. However, the changes in model and assumptions are so numerous that it is difficult to point out the reason for the changes:

- Value of daily gain are decrease in SWE and increased in FIN – and nearly unchanged in DNK (except for JER)
- Value of for score are increased in DNK and SWE.
- For fat score the values have become less negative in SWE and FIN
- Value of survival at birth and of young stock survival have decreased - except for YSS in the late period in DNK (YSS was not included in the 2019-NBDI)
- Value of calving ease has also decreased.

Table 15. Value of improving traits of beef sires used in dairy herds. Results from the 2019-report.

Country	DNK	DNK	DNK	SWE	SWE	FIN	FIN
Dam breed	JER	RDC	HOL	RDC	HOL	RDC	HOL
Daily carcass gain, € per g/day	0.21	0.27	0.27	0.48	0.43	0.29	0.21
EUROP form score, € per point	3.00	2.40	1.90	5.40	5.90	11.20	13.10
EUROP fat score, € per point	3.40	4.60	3.70	-15.20	-10.40	-11.00	-9.00
Survival at birth, later (0-1)	156.30	238.40	232.30	359.10	352.10	259.40	249.60
Calving ease, later, € per point	50.84	51.88	57.52	69.33	70.63	35.61	38.77
Survival, heifers+bulls 2-30 days	171.60	251.60	240.40	373.80	366.70	273.00	269.10
Survival, heifers+bulls >= 31 days	187.60	281.40	265.40	398.30	388.30	282.50	272.90

Table 16. Percent change compared to 2019 results (comparison of table 12 and 15)

Country	DNK	DNK	DNK	SWE	SWE	FIN	FIN
Dam breed	JER	RDC	HOL	RDC	HOL	RDC	HOL
Daily carcass gain, € per g/day	22.9%	-3.1%	-5.9%	-21.6%	-15.5%	13.1%	55.2%
EUROP form score, € per point	39.7%	32.9%	28.7%	38.2%	38.9%	1.9%	1.1%
EUROP fat score, € per point	10.0%	-5.7%	15.7%	-62.3%	-63.9%	-22.8%	-8.3%
Survival at birth, later (0-1)	-18.5%	-14.3%	-14.2%	-19.9%	-22.0%	-35.5%	-41.3%
Calving ease, later, € per point	-35.9%	-21.1%	-24.4%	-30.1%	-16.3%	-20.7%	-22.7%
Surv., heifers+bulls 1-30 days (0-1)	-9.7%	-8.5%	-7.2%	-24.4%	-28.0%	-32.5%	-39.3%
Surv., heifers+bulls >= 31 days (0-1)	28.4%	15.7%	15.3%	-11.8%	-14.2%	-13.0%	-19.9%

Results for the short and long growth period.

The current evaluation has separate index weights for the short and the long growth period. The values for the short growth period is average of DNK results and the values for the long growth period is average of SWE and FIN results. Table 17 shows these averages.

Table 17. Average results for the short growth period (DNK) and long growth period (SWE and FIN) – based on results in table 12, 13 and 15.

	0% Y-sorted		100% Y-sorted		2019-report	
Group	**DNK**	**SWE+FIN**	**DNK**	**SWE+FIN**	**DNK**	**SWE+FIN**
Daily carcass gain, € per g/day	**0.26**	**0.35**	**0.27**	**0.35**	**0.25**	**0.35**
EUROP form score, € per point	**3.28**	**10.08**	**2.82**	**11.38**	**2.43**	**8.90**
EUROP fat score, € per point	**4.12**	**-6.56**	**4.42**	**-2.80**	**3.90**	**-11.40**
Survival at birth, later (0-1)	**176.96**	**219.04**	**243.75**	**347.61**	**209.00**	**305.05**
Calving ease, later, € per point	**38.99**	**41.45**	**53.29**	**54.19**	**53.41**	**53.59**
Survival, heifers+bulls 2-30 days	**202.69**	**223.50**	**219.24**	**296.19**	**221.20**	**320.65**
Survival, heifers+bulls >= 31 days	**290.81**	**287.20**	**309.72**	**358.86**	**244.80**	**335.50**

Summary of results on economic values

There are quite some differences between the beef production systems in the three NAV countries and the economic values are different.

The difference between the dam breeds RDC and HOL is small within country whereas the results for JER deviate somewhat. However, for JER the relations between traits are quite similar to the other the DNK dam breeds.

Compared to results reported in 2019.

- Value of daily gain remain nearly unchanged
- Value of EUROP form score is increased
- Value of EUROP fat score is more positive
- Value of survival traits (survival at birth and young stock survival (YSS)) is deceased for the long growth period (YSS was not included in the 2019-NBDI)

With 100% use of Y-sorted semen the value of calving ease increased around 30%. The value of survival at birth increases 10% in DNK, 40-60% in SWE and FIN and 40%. There are also some changes for value of EUROP form and fat score.

The beef production traits (gain and EUROP scores) and survival in the late period (>=31 days) are of interest for the intensive beef producers whereas the calving traits and survival in the period from 1-30 days are of interest for the dairy herds.

Sensitivity analyses

Shorter SWE growth period

In SWE, the expert recommendation is to shorten the growth period for bull calves from 18-19 months to 16 months. The effect of a shorter SWE growth period has been tested in NBDI-model. Table 18 show the assumptions and table 19 the results of changed assumptions.

- The growth period was decreased to 490 days for RDC and 480 days for HOL
- The weight at slaughter is kept unchanged and %carcass is kept unchanged (and form and fat score are unchanged)
- Then average gain calculated from those.

Table 18. Shorter SWE growth period - changed assumptions.

	Original		**Shorter growth**	
	RDC	HOL	**RDC**	**HOL**
Age, days	565	555	**490**	**480**
Live weight, kg	670	691	**670**	**692**
Carcass weight, kg	359	367	**359**	**367**
Daily gain, g/day	1187	1245	**1368**	**1441**
Daily net gain, g/day	636	661	**733**	**765**
EUROP form score	9.33	8.62	**9.33**	**8.62**
% carcass	53.6	53.1	**53.6**	**53.1**

Table 19. Results– comparison of SWE original assumptions and shorter growth period

	Original (€/unit)		**Shorter growth (€/unit)**		**Pct difference**	
	RDC	HOL	**RDC**	**HOL**	**RDC**	**HOL**
Net daily gain (DG)	0.38	0.36	**0.31**	**0.30**	**-18.4%**	**-18.7%**
EUROP form score	7.46	8.20	**7.46**	**8.20**	0.0%	0.0%
EUROP fatness score	-5.72	-3.76	**-5.72**	**-3.76**	0.0%	0.0%
%stillborn, later	287.49	274.79	**294.15**	**281.51**	**2.3%**	**2.4%**
easy, later	48.49	59.11	**48.49**	**59.11**	0.0%	0.0%
Survival, heifers+bulls 2-30 d.	282.49	263.86	**287.40**	**268.80**	**1.7%**	**1.9%**
Survival, heifers+bulls >=31 d.	351.22	333.27	**360.50**	**342.86**	**2.6%**	**2.9%**

Value of DG. In SWE, the value of DG depends only on costs – the larger costs – the larger is value of DG. With reduced growth period the costs are reduced – and therefor the value of improving DG is reduced.

Value of carcass traits (form and fat score): The value remains unchanged.

Value of survival traits. The value of survival traits is slightly increased because the shorter growth period reduces some cost related to number of days in the growth period – and the profit per calf is slightly increased.

Reduction of beef prices with 20%

An obvious sensitivity analyses is to focus on the effect of changed beef prices. The effect of a 20% reduction of beef prices is shown in table 21 (and the change in assumptions are shown in table 20).

Table 20. Beef prices, €/kg carcass (form score 5, fat score 3)

	Original			**20% reduction**		
	DNK	SWE	FIN	**DNK**	**SWE**	**FIN**
Young bull calves (< 10 month)	4.40	-	-	**3.52**	**-**	**-**
Bull calves	4.00	4.40	4.00	**3.20**	**3.52**	**3.20**
Young Heifer calves (< 10 mth)	4.40	-	-	**3.52**	**-**	**-**
Heifer calves	4.00	4.10	4.00	**3.20**	**3.28**	**3.20**

Table 21. Results for a 20% reduction of beef prices (Short = average DNK results, Long = average SWE and FIN results)

	Original (€/unit)		**Reduced beef price (€/unit)**		**Pct difference**	
	Short	Long	**Short**	**Long**	**Short**	**Long**
Net daily gain (DG)	0.26	0.35	**0.19**	**0.35**	**-25.9%**	**0.0%**
EUROP form score	3.28	10.08	**3.28**	**10.08**	**0.0%**	**0.0%**
EUROP fatness score	4.12	-6.56	**4.12**	**-6.56**	**0.0%**	**0.0%**
%stillborn, later	176.96	219.04	**88.14**	**82.37**	**-50.2%**	**-62.4%**
easy, later	38.99	41.45	**35.48**	**36.96**	**-9.0%**	**-10.8%**
Survival, heifers+bulls 2-30 d.	202.69	223.50	**113.89**	**92.75**	**-43.8%**	**-58.5%**
Survival, heifers+bulls >=31 d.	290.81	287.20	**200.36**	**155.54**	**-31.1%**	**-45.8%**

Value of DG

The change of value is -25% in DNK - because most DNK calves are slaughtered at a fixed age. Then improved DG give higher weight at slaughter - and due to lower feed price - lower income compared to the original scenario.

In SWE and FIN there is no effect of reduced beef price – because all animals are slaughtered at the same weight.

Value of carcass traits (Form and fat score)**:** No effect.

All survival results – 30-60% decrease in value. That comes only from the differences in income from beef production. The costs remain unchanged. Lower value due to lower income - most for still birth (SB) - least for young stock survival in period 2 (YSS2)

Calving ease: Better calving ease reduces the number of dead cows – and more cows that are slaughtered – but when beef price is reduced that decreases the advantage of reduced cow mortality.

Increased of feed prices with 20%

Another approach is to analyze the result of increased feed prices. The expectation is that it would have some of the same effect as reducing beef price – but a 20% increase in feed price is not as drastic as a decrease of beef price on 20%. The assumptions are shown in table 22 and the results in table 23.

Table 22. Feed prices €/SFU (other costs remain unchanged)

	Original			**20% increase**		
	DNK	SWE	FIN	**DNK**	**SWE**	**FIN**
Concentrates	0.24	0.24	0.25	**0.29**	**0.29**	**0.30**
Roughage	0.157	0.147	0.179	**0.188**	**0.176**	**0.215**

Table 23. Results (Short = average DNK results, Long = average SWE and FIN results)

	Original (€/unit)		**Reduced feed price (€/unit)**		**Pct difference**	
	Short	Long	**Short**	**Long**	**Short**	**Long**
Net daily gain (DG)	0.26	0.35	**0.24**	**0.40**	**-8.5%**	**13.7%**
EUROP form score	3.28	10.08	**3.28**	**10.08**	0.0%	0.0%
EUROP fatness score	4.12	-6.56	**4.12**	**-6.56**	0.0%	0.0%
%stillborn, later	176.96	219.04	**139.54**	**139.23**	**-21.1%**	**-36.4%**
easy, later	38.99	41.45	**38.99**	**41.45**	0.0%	0.0%
Survival, heifers+bulls 2-30 d.	202.69	223.50	**166.15**	**146.77**	**-18.0%**	**-34.3%**
Survival, heifers+bulls >=31 d.	290.81	287.20	**262.39**	**216.78**	**-9.8%**	**-24.5%**

The expectations are fulfilled (same results as for lower beef price) **– except for:**

- **Value of DG in the long growth period** (in SWE and FIN): Increased beef price had no impact on value of DG in the long growth period. Increased feed price will increase costs and increased costs will increase value of DG.
- **Value of calving ease**. Increased feed prices have no impact on value of slaughtered cows and therefor the value of improved of calving ease remain unchanged.

Summary of sensitivity analyses

- A shorter growth period for SWE bull crosses will only have notable effect on value of daily gain. The value will decrease.
- Lower price on beef will decrease the value of survival traits. In a system where animals are slaughtered at a fixed age (as most animals in DNK) lower beef price will also reduce value of daily gain.
- Higher feed costs have effects in the same direction as lower beef price – except for increased value of daily gain in the long growth period.

Correlations between indexes

Currently two NBDI's are calculated:

- Shorth growth period: The index weights are based on average DNK economic values (average of RDC, HOL and Jersey dam breeds)
- Long growth period: The index weights are based on average SWE and FIN economic values for RDC and HOL dam breeds.

Young Stock Survival (YSS) is not included in the current NBDI. Therefor there is focus on the effect of including YSS. Besides, it has been observed that the value of YSS in the period after day 30 might be underestimated because breeding value of this trait only include survival up to day 200. Therefor the analyses include scenarios with 25% extra weight on YSS period 2.

Calculation of indexes

Indexes for individual traits are calculated by dividing estimated breeding values (EBV) by the standardization factors. These factors are described in the note of Freddy Fikse "Relation between index units and original phenotypes for the BxD evaluation". They are the "content" of an index unit measured in original evaluation units (kg gain per day, points or frequency survived). From table 12 and 13 (or 19, 21, 23 for sensitivity results) we know the economic value of one unit on the phenotypic scale (EV) and therefore we can easily calculate the value of an index unit by multiplication of the EV by the standardization factors. The results for the standardization factors:

- Calving traits – updated, but the results are nearly same as usual.
- Growth & Carcass traits – updated, but the results are nearly the same as usual.
- Young stock survival – new.

The composite indexes and final NBDI are calculated using:

- Mean of economic values (EV) expressed per trait unit.
- Mean of value of index unit.

The aggregate indexes are calculated for the following groups

- DNK = mean of (DNKJER, DNKRDC and DNKHOL) – similar to current short growth period
- FINSWE = mean of SWE and FIN (RDC and HOL) – similar to current long growth period
- SWE = mean of (SWERDC and SWEHOL)
- FIN = mean of (FINRDC and FINHOL)

YSS-index and YSS-index with 25% added to period 2 values (The 25% comes from an additional study by Kevin Byskov of mortality after day 200):

- DNK+P2 = DNK with 25% added to period 2 values
- FINSWE+P2 = FINSWE with 25% added to period 2 values
- SWE+P2 = SWE with 25% added to period 2 values
- FIN+P2 = FIN with 25% added to period 2 values

YSS results

The within dam breed correlations between the 8 YSS-indexes are alle 1.00 – and the correlation between the total YSS index with:

- YSS period 1 EBV is between 0.62 and 0.68
- YSS period 2 EBV is between 0.94 and 0.97. The total YSS is dominated by YSS period 2.

Table 24 show correlations between 8 different NBDIs: The correlation between NBDI and NBDI with extra weight and YSS period 2 is 1.00.

Table 24. Correlation between 8 different NBDI's

	DNK	FINSWE	SWE	FIN	DNK +P2	FINSWE +P2	SWE +P2	FIN +P2
DNK	**1**							
FINSWE	**0.91**	**1**						
SWE	**0.98**	**0.97**	**1**					
FIN	**0.78**	**0.97**	**0.88**	**1**				
DNK+P2	**1.00**	**0.93**	**0.97**	**0.76**	**1**			
FINSWE+P2	**0.93**	**1.00**	**0.98**	**0.95**	**0.92**	**1**		
SWE+P2	**0.98**	**0.98**	**1.00**	**0.87**	**0.98**	**0.98**	**1**	
FIN+P2	**0.81**	**0.95**	**0.91**	**1.00**	**0.79**	**0.97**	**0.91**	**1**

Table 25. Correlations between total YYS index – and YSS for period 1 and period2

	YSS period 1	YSS period 2
DNK	**0.666**	**0.949**
FINSWE	**0.680**	**0.943**
SWE	**0.682**	**0.941**
FIN	**0.675**	**0.945**
DNK + P2	**0.618**	**0.966**
FINSWE + P2	**0.638**	**0.960**
SWE + P2	**0.642**	**0.958**
FIN + P2	**0.631**	**0.962**

Table 26. Correlations between NBDI indexes – and YSS for period 1 and period2

	YSS period 1	YSS period 2
DNK	**0.437**	**0.617**
FINSWE	**0.315**	**0.434**
SWE	**0.416**	**0.570**
FIN	**0.192**	**0.283**
DNK + P2	**0.444**	**0.684**
FINSWE + P2	**0.336**	**0.509**
SWE + P2	**0.418**	**0.617**
FIN + P2	**0.228**	**0.364**

Sensitivity correlations

Shorter growth period in SWE

- No effect on Birth Index
- No effect on YSS index
- Hardly any effect on Growth Index
- Marginal effect on NBDI (correlations 0.99)

Beef price reduced by 20%

4 different situations analysed:

- DNK
- FINSWE
- DNK with reduced beef price
- FINSWE with reduced beef price

The main results are shown in table 27 and 28:

- No effect on Birth index
- No effect on YSS index
- Marginal effect on Growth
- $Growth_{short}$ and $Growth_{long}$ more alike with lower beef prices (r = 0.94 vs r = 0.92)
- NBDI
  - Marginal effect for DNK
  - Somewhat larger effect for FINSWE (r = 0.96)

Growth correlations

- Short – long: 0.92
- Short - long with lower beef price: 0.94
- Short: "normal" beef price – lower beef price: 1.00
- Long: "normal" beef price– lower beef price: 1.00

Table 27. Correlations between Growth indexes

	DNK	FINSWE	DNK red. Beef price	FINSWE, red. Beef price
DNK	**1**			
FINSWE	**0.92**	**1**		
DNK, reduce beef price	**1.00**	**0.94**	**1**	
FINSWE, reduced beef price	**0.92**	**1.00**	**0.94**	**1**

Table 28. Correlations between NBDIs

	DNK	FINSWE	DNK red. Beef price	FINSWE, red. Beef price
DNK	**1**			
FINSWE	**0.91**	**1**		
DNK, reduce beef price	**0.99**	**0.93**	**1**	
FINSWE, reduced beef price	**0.79**	**0.96**	**0.84**	**1**

NBDI correlations
- Short – long: 0.91
- Short - long with lower beef price: 0.84
- Short: “normal” beef price – lower beef price: 0.99
- Long: “normal” beef price – lower beef price: 0.96

Feed prices + 20%
- No effect on Birth index
- No effect on YSS index
- Marginal effect on Growth
  - $Growth_{short}$ and $Growth_{long}$ more alike with higher feed prices (r = 0.95 vs r = 0.92)
- NBDI
  - Marginal effect for DNK
  - Somewhat larger effect for FINSWE (r = 0.98)
  - NBDIshort and NBDIlong less alike with higher feed prices (r = 0.87 vs r = 0.87)

Growth correlations
- Short – long: 0.92
- Short - long with higher feed price: 0.95
- Short: “normal” feed price – higher feed price: 1.00
- Long: “normal” feed price– higher feed price: 1.00

NBDI correlations
- Short – long: 0.91
- Short - long with higher feed price: 0.87
- Short: “normal” beef price – higher feed price: 1.00
- Long: “normal” beef price – higher feed price: 0.98

No sexed semen vs 100% Y-sorted
- No effect on Birth index
- No effect on YSS index
- Marginal Effect on Growth
  - $Growth_{short}$ and $Growth_{long}$ less alike with Y-sexed semen (r = 0.90 vs r = 0.92)
- Some effect on NBDI

Growth correlations
- Short – long: 0.92
- Short - long with 100% Y-sorted: 0.90
- Short: No sexed – 100% Y-sorted: 1.00
- Long: No sexed – 100% Y-sorted: 1.00

NBDI correlations

- Short – long: 0.91
- Short - long with 100% Y-sorted: 0.92
- Short: No sexed – 100% Y-sorted: 0.99
- Long: No sexed – 100% Y-sorted: 0.98

Summary/Conclusions

Economic values (EV) – compared to 2019 values

- Value of daily gain are decreased in SWE and increased in FIN – and nearly unchanged in DNK (except for JER)
- Value of form score are increased in DNK and SWE.
- For fat score the values have become less negative in SWE and FIN.
- Value of survival at birth and of young stock survival have decreased - except for YSS in the late period in DNK.
- Value of calving ease has also decreased.

Effect on index level

Shorter SWE growth period has a small effect for the growth index
Reduced beef price or increased feed prices have a small effect – most for the long growth period

Compared to 2019 results the SWE results are less similar to FIN results – and more similar to DNK results. Also, the NBDI for the short and long growth period are more similar than before. However, the main conclusion is that we should still calculated a NBDI for the short and the long growth period. The inclusion of young stock survival does not change that conclusion.

The proposed 2024 NBDI consider the following updates compared to the 2019 NBDI:

- Average growth rates, age at slaughter, live and carcass weight at slaughter (daily gain and daily net gain) for crossbreed calves.
- Assumptions on EUROP form and fat scores. That includes separate assumptions for male and female calves.
- Assumptions on calf mortality and calving ease for crossbred calves. That includes separate assumptions for male and female calves.
- Assumptions related to young stock survival (average survival rates and age at death).
- Economic assumption with respect to beef prices for crossbreed calves including deduction or additions due to EUROP form and fat score.
- Besides the model have been modified in order to take into account the use of Y-sorted beef semen.
- The calculation of feed consumption for the long growth period has been changed such that the crossbred calves are slaughtered at a fixed weight when growth rate is increased. In the previous version of model all calves were slaughtered at a fixed age when growth rate increased.

- The difference between labour cost of calves that survive to slaughter and calves that leave early is taken into account.
- Besides, feed consumption has been adjusted for crossbred heifer calves – such that it corresponds to observations from practice. Continue publishing one young stock survival index, as ranking of beef sires on youngstock survival was found to be similar for short and long fattening periods. Emphasis on survival in the late period is increased by 25% compared to the economic calculations, to reflect that the late period covers until day 200 and that some losses occur after that.

Table 29 Current and proposed weights factors for NBDI short and NBDI long.

	Current		Proposal	
	NBDI short	**NBDI long**	**NBDI short**	**NBDI long**
Birth	1.08	1.01	0.50	0.45
Growth short	0.79	-	0.55	-
Growth long	-	1.07	-	0.79
Young stock survival	0	0	0.73	0.66

Table 30. Correlations between single and combined traits and NBDI based all bulls with publishable breeding values.

	Current		Proposal	
	NBDI short	**NBDI long**	**NBDI short**	**NBDI long**
Birth	**0.60**	**0.37**	**0.37**	**0.18**
Still birth	*0.60*	*0.39*	*0.38*	*0.20*
Calving ease	*0.55*	*0.33*	*0.33*	*0.15*
Growth short	**0.50**	**0.58**	**0.50**	**0.66**
Growth long	**0.39**	**0.70**	**0.43**	**0.72**
Daily carcass gain	*0.46*	*0.48*	*0.46*	*0.56*
EUROP Form score	*0.23*	*0.62*	*0.21*	*0.58*
EUROP fat score	*0.14*	*-0.27*	*0.12*	*-0.16*
Young stock survival	**0.15**	**0.06**	**0.69**	**0.51**
YSS early	*0.13*	*0.06*	*0.46*	*0.33*
YSS late	*0.12*	*0.04*	*0.68*	*0.51*

The correlation between the new and current NBDI short is 0.76 and between the new and current NBDI long it is 0.83. This indicates significant reranking caused by inclusion of young stock survival and updating economical weights.

The weights proposed in table 29 were approved by the NAV-board 22.08.2024 and were implemented at the NBDI evaluation in November 2024.

Finally, in table 31 the values per index unit is listed. The values for YSS1 and YSS2 are new. The difference between the short and long growth period is largest for EUROP form and fat score. For the fat score it is mostly due to the negative payment for high fat score in Sweden and Finland.

For a 10 units difference in NBDI of sires the value is 7.0 € per calf born for the short growth period and 7.8 € for the long growth period.

Table 31. Value per index unit

Trait	Value per index unit (€)
Stillbirth at later calvings (SB2)	0.2050
Calving ease at later calvings (CE2)	0.1862
Young Stock Survival, 1-30 days (YSS1)	0.1869
Young Stock Survival 31-200 days (YSS2)	0.4315
Daily gain, short growth period (DG-short)	0.3770
EUROP form score, short growth period (Form-short)	0.1005
EUROP fat score, short growth period (Fat-short)	0.0352
Daily gain, long growth period (DG-long)	0.4375
EUROP form score, long growth period (Form-long)	0.3261
EUROP fat score, long growth period (Fat-long)	-0.0744
NBDI short growth period	0.7085
NBDI long growth period	0.7821
Birth index	0.3526
YSS index	0.5191
Growth short growth period	0.3906
Growth long growth period	0.6205