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Economic value of Young Stock Survival index

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Introduction

In November 2014 the new Young Stock Survival index was published. This index is based on genetic evaluations of four traits: Survival of heifer calves in the periods 1-30 days and 31-458 days – and survival of bull calves in the periods 1-30 days and 31-184 days. The four breeding values are summarized in the Young Stock Survival index using the economic values described in this note.

Up to now, the published breeding values of the sires are based only on phenotypic information on their progeny groups of heifer and bull calves. As soon as possible, we plan to introduce genomic breeding values as well.

When the genomic breeding values for Young Stock Survival are ready it becomes possible to include the index in the total merit index (NTM) in the same way as all other traits.

For that purpose, the economic value of the Young Stock Survival Index has been estimated using the same assumptions as for all the other traits included in the NTM.

Status and plans for the Young Stock Survival index

- November 2014: Young Stock Survival breeding values based phenotypes were introduced
- January 2015 (workshop): Discussion/decision on inclusion in NTM
  - Weight relative to other indexes
  - A new index (15^{th} sub-index) – or a composite index with e.g. Longevity
- Spring 2015: Genomic breeding values developed
- Workshop 2016 (or before): Final recommendation on the use of the Young Stock Survival Index

Economic value of an index unit

The economic value of an index unit is based on 2 factors: Economic value of a calf survival and the standard deviation of the solutions from the basic prediction of breeding values.

In table 1 the main results of the economic analyses of young stock survival are shown expressed as value (€) of young stock survival per cow. A more detailed description is given later in this note.

The standard deviation of the solutions from the basic calculation of breeding values: In the basic calculation of breeding values the results are expressed in frequency of survived calves. Therefore, the first step in the calculation of indexes is the conversion of the estimated solutions from the scale of frequency to index units. Long time ago, we decided that the standard deviation of our indexes should be 10 index units for progeny tested bulls. Therefore we know that the standard deviation of the solutions is equal to 10 index units. In table 2 the standard deviation is shown (expressed as number of calves per 10 index units).

Additional information

- *The standard deviations are based on sires born in 2004-05 with at least 200 progenies (heifer + bull calves) and a reliability of the breeding value above 50*
- *The standard deviations will depend on the genetic variation(heritability) of the traits and of the size of the progeny groups*

By multiplying the economic values of a survived calf (table 1) by the number of calves in 10 index units (table 2) and divide by 10 we get the value of 1 index unit (table 3).

Then we calculate the value of the young stock survival index:

- For each animal we calculate the sum of economic value * solution for the 4 traits. This sum is an economic breeding value (€) for the animal
- Then the standard deviation is estimated and divided by 10. This is the economic value of the Young Stock Survival Index
- The result is given in the bottom row of table 3

Table 1. Economic value of young stock survival (€).

Trait	HOL	RDC	JER
Survival, heifers 1-30 days (HP1)	**344.5**	**355.0**	**200.4**
Survival, heifers 31-458 days (HP2)	**405.0**	**415.1**	**240.6**
Survival, bulls 1-30 days (BP1)	**128.8**	**143.1**	**27.2**
Survival, bulls 31-184 days (BP2)	**179.3**	**202.1**	**79.1**

Table 2. Number of calves survived per 10 index units (calves/10 index units)

	HOL (and RED)	RDC(and FIC)	JER
Survival, heifers 1-30 days (HP1)	**0.0098**	**0.0107**	**0.0259**
Survival, heifers 31-458 days (HP2)	**0.0118**	**0.0192**	**0.0169**
Survival, bulls 1-30 days (BP1)	**0.0097**	**0.0109**	**0.0275**
Survival, bulls 31-184 days (BP2)	**0.0208**	**0.0283**	**0.0188**

Table 3. Value (€) of 1 index units (table 1 * table 2 / 10)

	HOL (and RED)	RDC(and FIC)	JER
Survival, heifers 1-30 days (HP1)	**0.34**	**0.38**	**0.52**
Survival, heifers 31-458 days (HP2)	**0.48**	**0.80**	**0.41**
Survival, bulls 1-30 days (BP1)	**0.12**	**0.16**	**0.07**
Survival, bulls 31-184 days (BP2)	**0.37**	**0.57**	**0.15**
Young Stock Survival	**1.13**	**1.77**	**0.98**

Comparison with the other NTM-traits

Table 4 shows the economic values of the traits currently included in NTM (and the NTM-weights used).

Table 5 shows the correlations with the NTM traits. These correlations are low and most of them are not statistical different from zero. The tendency is that the most positive correlations are to longevity and health traits.

Table 4. Comparison to the current economic value of the NTM-traits

	€/index unit			*NTM-weights*		
	HOL	**RDC**	**JER**	*HOL*	*RDC*	*JER*
Yield	**7.61**	**8.33**	**6.80**	*0.75*	*0.96*	*0.87*
Growth	**0.61**	**0.00**	**0.00**	*0.06*	*0.00*	*0.00*
Fertility	**3.15**	**2.26**	**1.56**	*0.31*	*0.26*	*0.20*
Birth	**1.52**	**1.21**	**0.47**	*0.15*	*0.14*	*0.06*
Calving	**1.72**	**1.04**	**0.47**	*0.17*	*0.12*	*0.06*
Udder health	**3.55**	**2.78**	**3.44**	*0.35*	*0.32*	*0.44*
Other diseases	**1.12**	**1.04**	**0.31**	*0.11*	*0.12*	*0.04*
Claw health	**0.81**	**0.43**	**0.39**	*0.08*	*0.05*	*0.05*
Longevity	**1.12**	**0.61**	**0.63**	*0.11*	*0.07*	*0.08*
Body conformation	**0.00**	**0.00**	**0.00**	*0.00*	*0.00*	*0.00*
Legs conformation	**1.22**	**0.78**	**0.31**	*0.12*	*0.09*	*0.04*
Udder conformation	**2.54**	**2.78**	**2.03**	*0.25*	*0.32*	*0.26*
Milking speed	**0.81**	**0.87**	**0.78**	*0.08*	*0.10*	*0.10*
Temperament	**0.30**	**0.26**	**0.23**	*0.03*	*0.03*	*0.03*
Young Stock Survival	**1.13**	**1.77**	**0.98**	*0.11 ?*	*0.20 ?*	*0.13 ?*

Table 5. Correlations between Young Stock Survival index and the current NTM-traits. Based on sires born 2005-2007.

	HOL	**RDC**	**JER**
Yield	**0.02**	**-0.01**	**-0.09**
Growth	**0.01**	**-0.12**	**0.08**
Fertility	**0.04**	**0.11**	**0.04**
Birth	**0.07**	**0.27**	**0.08**
Calving	**0.06**	**-0.04**	**0.10**
Udder health	**0.04**	**0.03**	**0.21**
Other diseases	**0.10**	**0.02**	**0.09**
Claw health	**0.13**	**0.06**	**0.02**
Longevity	**0.15**	**0.18**	**0.05**
Body conformation	**-0.04**	**-0.26**	**-0.13**
Legs conformation	**0.04**	**0.22**	**0.01**
Udder conformation	**-0.04**	**-0.07**	**0.10**
Milking speed	**-0.04**	**-0.11**	**-0.02**
Temperament	**0.01**	**-0.07**	**-0.09**
NTM	**0.09**	**0.07**	**0.08**
Number of sires	**1050**	**650**	**148**

Economic value of a survived calf – more details and economic assumptions

An economic evaluation of survival of young stock has been included in the model (NTM-model) that previously has been used for calculation of economic values of the traits included in the NTM-index (see "Report on Economic Basis for a Nordic Total Merit Index",2008). In order to be able to compare with the results that are the basis of our current NTM-weights, the economic assumptions were kept unchanged.

Assumptions related to mortality of young stock

I table 6 the assumed costs related to mortality of young stock are shown.

Table 6. Costs related to mortality of young stock

	Costs, €
Destruction of dead calf, €/calf	21.30
Extra work related to dead heifers period 1-30 days, hours	0.25
Extra work related to dead heifers period 31-458 days, hours	0.50
Extra work related to dead bull calves period 1-30 days, hours	0.25
Extra work related to dead bull calves period 31-184 days, hours	0.50
Extra costs related to dead heifers period 1-30 days, €/calf	5.00
Extra costs related to dead heifers day period 31-458 days, €/calf	10.00
Extra costs related to dead bull calves period 1-30 days, €/calf	5.00
Extra costs related to dead bull calves period 31-184 days, €/calf	10.00
Current NTM-model (still born calves)	
Destruction of dead calf, €/calf	*21.30*
Extra work related to dead calf, hours	*0.25*
Extra costs related to dead calf, €/calf	*0.00*

Feed costs in relationship with mortality of young stock

The calculation of feed costs for young stock had to been reworked according to the defined periods. For dead calves feeds costs were included up to the average number of days survived within each period.

General effect of survival of young stock

The direct economic effect of increased survival of young stock is increased income due more heifers and more bull calves available for sale (export) or slaughter. An increased number of heifers might also allow more crossbreeding or more intense selection among females.

In general, inclusion of survival of young stock in the economic model did not change the economic results for the other traits.

However, one problem was observed. The survival rates in young stock assumed in the NTM-model from 2008 were quite low compared to the survival rates found in the current analyses. In the original NTM-model a fixed survival rates were assumed to be 0.97 for heifers and 0.95 for bull calves for all breeds and countries. For Danish HOL and RDC, the results of the current analyses showed survival rates that are somewhat lower than the survival rates assumed in the NTM-model (except in FIN). For Jersey, the survival rate found in the current analysis was much lower than used in the NTM-model (see table 7). The changed level of survival of young stock had an effect on

the economic value of especially stillbirth rate but also a minor effect on value of growth and fertility traits. Value of stillbirth rate was reduced by 19%, 10% and 8% in Jersey, RDC and Holstein, respectively.

Table 7. Average survival rate of calves born 2008-2012

	HP1	HP2	HP1+HP2	BP1	BP2	BP1+BP2
DNK HOL	**0.963**	**0.962**	**0.926**	**0.950**	**0.950**	**0.903**
FIN HOL	**0.985**	**0.975**	**0.960**	**0.969**	**0.968**	**0.938**
SWE HOL	**0.978**	**0.952**	**0.931**			
DNK RDC	**0.963**	**0.954**	**0.919**	**0.957**	**0.935**	**0.895**
FIN RDC	**0.981**	**0.968**	**0.950**	**0.965**	**0.952**	**0.919**
SWE RDC	**0.978**	**0.941**	**0.920**			
DNK JER	**0.926**	**0.934**	**0.865**	**0.878**	**0.909**	**0.798**

Results

Table 8 shows the final results of the economic analyses. It seems to be most logical to compare to value of stillbirth. However, this comparison is not so straightforward. Stillbirth is expressed separately for 1st and later parity, but across sexes – whereas survival of young stock is expressed per sex, but across all parities of the dam.

Table 8. Value of improving each of the 4 survival traits (€/calf) – also shown in table 1.

Trait	HOL	RDC	JER
Survival, heifers 1-30 days	**344.5**	**355.0**	**200.4**
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Discussion and conclusion

The main focus of the economic analysis has been to estimate values that are comparable with values used in the current NTM. Therefore all the economic assumptions of the NTM-model from 2008 were adapted.

The economic assumptions can and will always be questioned – for example, the milk price was very high last spring and there were arguments for higher weight on yield. Now, the argument might go in the opposite direction. Seen over a larger time span only one tendency seems to be clear, namely that especially the fixed costs are increasing slightly faster than the income per produced kilogram of milk.

The economic value of the Young Stock Survival index is 0.98 to 1.77 €/index unit. The highest value was found for RDC due to higher heritability (genetic variation) - especially for survival in the late period (31-458 days for heifer calves and 31-184 days for bull calves). The value is lowest for Jersey due to the lower economic value of young stock – and especially the low value of bull calves contributes to the final result.