

Economic value of claw health

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Introduction

The inclusion of the new claw health index in the NTM-index requires an assessment of the economic values of the traits involved. This assessment is carried out and described in the present report. The economic value of the claw health index is comparable with the economic values used for other traits in NTM.

The NTM-model

The original NTM-model (originally named TMI-model) has been modified, and can now evaluate up to 8 claw trimmer traits. Each trait is evaluated separately in 3 lactations (3 x 8 traits). Of course the new version of the NTM-model can evaluate less than 8 traits.

Estimation of breeding value of claw health traits

Seven claw traits are evaluated based on claw trimmer records, and included in the new claw health index. Three of these traits are combinations of two disorders. The disorders are given below, and details of the naming of the disorders are shown in table 1:

- Sole Ulcer(SU)
- Sole Hemorrhage(SH)
- Heel Horn Erosion(HH)
- Digital Dermatitis(DE) = Digital Dermatitis + Interdigital Dermatitis
- Skin proliferation(SP) = Interdigital Hyperplasia + Verrucose Dermatitis
- White Line Separation(WLS) = White Line Separation + Double sole
- Cork Screw Claws(CSC)

Table 1. Names of traits in the claw health index

English name	Abbreviation	Danish name	Swedish name	Finish name
Sole Ulcer	SU	Såleknusning/Sålesår	Klövsulesår	Anturahaavauma
Sole Hemorrhage	SH	Såleblødning	Sulblödning	Vertymiä anturassa
Heel Horn Erosion	HH	Balleforrådnelse	Klövröta	Kantasyöpymä
Digital Dermatitis	DE	Digital dermatitis	Klöveksem	Sorkka-alueen ihotulehdus
Interdigital dermatitis	DE	Betændelse, klovspalte	Klövspalteksem	Sorkkavälin ihon tulehdus
Verrucose dermatitis	SP	Vorte	Vårta	Sorkkasyyliä
interdigital hyperplasia	SP	Nydannelse, klovspalten	Limax	Sorkkavälin liikakasvu
Double sole	WLS	Dobbeltsål	Dubbelsula	Kaksoispohja
White line separation	WLS	Hul væg	Hålvägg	Valkoviivan repeämä
Cork screw claw	CSC	Proptærækkerklov	Korkskruvklöv	Sorkkakiertymä

Each disorder is evaluated separately in 1st, 2nd and 3rd lactation in a multi-trait linear model (a 21-trait model).

SU, SH, HH, and DE have 3 possible input values: 0 = no disorder, 1 = mild disorder, 2 = severe disorders. Up to now, Finnish data include very few observations of severe disorders. However, it is expected that the Finnish data structure will become more similar to Swedish and Danish structure in the future. CSC, SP and WLS have only 2 possible input values: 0 = no disorder, 1 = disorder (mild or severe).

Economic value of claw disorders

Costs related to claw disorders

Below are some statements about costs related to claw disorders.

- Claw-trimmer costs: The basic cost of the claw-trimming itself **should not** be included as claw trimming is general for all cows in a herd
- If the observed disorder is connected with some extra work by the claw trimmer, these costs **should be** included. Especially, if the lesion require an extra acute visit by the claw trimmer the costs will be significant. Sole Ulcer will normally require additional treatments by the claw trimmer
- Also extra work of the herdsman for follow-up treatment **should be** included, whereas veterinarian follow-up treatments **should not** be included. They are included via the disease recording
- If medicine, bandages or something similar is used in the treatment by the claw trimmer or herdsman, then the costs **should be** included
- Production loss **should not** be included as this is included in the yield index.
- Effect on longevity caused by increased risk of disposal **should not** be included (longevity is include otherwise)
- Effect on fertility and other diseases **should not** be included (included in fertility index)
- Veterinarian treatments are already included in the genetic evaluation in other disease index and retained milk is not taken into account as claw disorders recorded by claw trimmers do not involve veterinarian treatments

Previous analyses of economic value of claw diseases

The main results from some previous analyses of economic value of claw diseases are shown in tables 2 - 4. Common to most of these analyses and other similar analyses are that a major part of the economic value of a claw disorder is determined by cost of permanent production loss, costs due to increased risk of culling, more subsequent claw diseases or other diseases and lower fertility. Besides, most of the analyses are based on costs of veterinarian treatments. That includes veterinarian costs, medicine and value of retained milk.

However, in a Swedish report by Marcus Oskarsson ("Kostnader för hälsostörningar hos mjölkkor", Svensk Mjölk, 2010) there are some estimates of costs connected to claw trimmer records (for SU, DE and SP). Besides Pia Nielsen, a Danish expert on claw trimmer records has been consulted.

Table 2. Economy from "Kostnader for hälsostörningar hos mjolkkor" (Markus Oskarsson, Svensk Mjök, 2010)

	<i>Permanently lost milk production, kg</i>	Acute treatment, SEK	Extra work, Hours	Treatment, SEK	Medicine, SEK	Retained milk, Kg
Sole Ulcer, mild	100	0	0	-	0	0
Sole Ulcer, medium	300	0	0	-	0	0
Sole Ulcer, severe	500	750	4.50	-	0	0
Sole Ulcer, Vet. treatm.	500	375	5.55	624	70	240
Digital Dermatitis	200	-	0.50	50	0	0
Interdigital hyperplasia	100		1.35	432	196	255

Table 3. Economy from "The Costs of Production Diseases in Dairy Herds in England" (Kossaibati&Esslemont, 1997 Vet. J. 154:41-51) – 1995 prices

Vet. Treatment of	<i>Permanently lost milk production, kg</i>	Extra work, Hours	Treatment	Medicine	Retained milk, Kg
Sole Ulcer	180	5.0	26.00 £	15.00 £	70
Digital Dermatitis	120	3.0	19.50 £	13.00 £	90
Interdigital dermatitis	60	1.0	15.60 £	10.80 £	60

Table 4. Economy from CowEcon - parameters used as basis for calculation of economic value of feet and leg diseases in current NTM. (CowEcon is a spreadsheet developed at Knowledge Centre for Agriculture)

	<i>Permanently lost milk production, kg</i>	Extra work, Hours	Treatment	Medicine	Retained milk, Kg
Inflamations, hocks (tyk has)	643	1.0	55.00€	17.14€	3 days
Infections hoof diseases	615	1.0	46.67€	30.61€	1 days
Horn related diseases	874	1.0	41.33€	22.70€	5 days

Input needed for the NTM-model

Frequencies of disorders

For each of the 7 possible disorders the NTM-model require information on the observed frequencies of the 3 observed outcomes for each disorder (no disorder, mild case, severe case)

- Per breed (HOL, RDC, JER)
- Per country (DNK, SWE, FIN)
- Per lactation (1st, 2nd, 3rd and later)

In tables 5-7 the frequency of mild and severe cases for each of the 7 disorders are shown

Table 5. Frequency of claw disorders in RDC (CSC, SP and WLS have only one category)

	1 st lact.			2 nd lact.			3 rd lact.		
	DNK	SWE	FIN	DNK	SWE	FIN	DNK	SWE	FIN
Mild									
SU	0.027	0.025	0.039	0.055	0.011	0.016	0.068	0.023	0.023
SH	0.087	0.169	0.388	0.075	0.139	0.189	0.110	0.153	0.232
HH	0.041	0.190	0.114	0.058	0.223	0.127	0.113	0.239	0.110
DE	0.079	0.094	0.014	0.091	0.105	0.008	0.061	0.104	0.006
Severe (for CSC, SP and WLS mild + severe)									
SU	0.027	0.014	0	0.038	0.011	0	0.063	0.018	0
SH	0.010	0.065	0	0.009	0.028	0	0.008	0.049	0
HH	0.003	0.028	0	0.003	0.043	0	0.005	0.057	0
DE	0.077	0.025	0.005	0.070	0.024	0.004	0.071	0.024	0.003
CSC	0.002	0.023	0.132	0.002	0.029	0.090	0.002	0.030	0.086
SP	0.054	0.021	0.009	0.095	0.043	0.000	0.074	0.051	0
WLS	0.051	0.028	0.088	0.091	0.037	0.080	0.094	0.055	0.115

Table 6. Frequency of claw disorders in HOL (CSC, SP and WLS have only one category)

	1 st lact.			2 nd lact.			3 rd lact.		
	DNK	SWE	FIN	DNK	SWE	FIN	DNK	SWE	FIN
Mild									
SU	0.036	0.032	0.069	0.045	0.034	0.044	0.057	0.049	0.064
SH	0.139	0.198	0.417	0.125	0.185	0.283	0.141	0.213	0.362
HH	0.080	0.176	0.114	0.098	0.217	0.124	0.129	0.248	0.124
DE	0.135	0.108	0.014	0.130	0.121	0.008	0.125	0.118	0.009
Severe (for CSC, SP and WLS mild + severe)									
SU	0.027	0.020	0	0.039	0.023	0	0.050	0.035	0
SH	0.016	0.066	0	0.013	0.051	0	0.019	0.074	0
HH	0.004	0.025	0	0.007	0.041	0	0.009	0.055	0
DE	0.141	0.034	0.004	0.115	0.032	0.003	0.106	0.028	0.003
CSC	0.140	0.015	0.118	0.101	0.018	0.097	0.008	0.019	0.086
SP	0.043	0.025	0.002	0.068	0.051	0.000	0.089	0.062	0.001
WLS	0.085	0.028	0.126	0.118	0.048	0.119	0.157	0.077	0.159

Table 7. Frequency of claw disorders in Danish JER (CSC, SP and WLS have only one category)

	1 st lact.	2 nd lact.	3 rd lact.
Mild			
SU	0.042	0.040	0.035
SH	0.069	0.058	0.080
HH	0.042	0.050	0.069
DE	0.070	0.061	0.056
Severe (for CSC, SP and WLS mild + severe)			
SU	0.019	0.019	0.045
SH	0.007	0.007	0.014
HH	0.001	0.002	0.007
DE	0.069	0.054	0.048
CSC	0.020	0.006	0.001
SP	0.006	0.009	0.006
WLS	0.035	0.050	0.071

Basic costs of the disorders:

For each of the 7 possible disorders we must somehow determine the cost connected to a mild or severe case. The costs considered up to now is extra work of herdsman and claw trimmer and additional costs such bandages and medicine.

There are few estimates of the extra work of the claw trimmer, except that treatments in general are charged on hour basis (approximately 4 times farmer wage). According to Pia Nielsen the extra work of claw trimmers do not exceed 5 minutes per case for any of the disorders (repeated treatment not included). Therefore a value of 5 minutes extra work is assumed for all severe disorders

SU is the most costly of the claw disorders. For a severe case the extra work for the herdsman was 270 minutes according to Oskarsson. According to Pia Nielsen it is also true under Danish conditions in herds that keep diseased cows in separate units. Besides, a severe SU will require at least 1 extra visit by the claw trimmer. It is assumed that the extra visits will add 70 € to treatment costs. Besides, the treatment costs are set to 10 € (bandages, shoes). For a mild case of SU, Oskarssons estimates of costs were zero. That is in accordance with Pia Niensens opinion. The recommendations by Oskarsson were adapted for severe SU. For mild SU the consensus of the project group was that there must be some costs connected to a mild SU. Therefore extra work of herdsman was assumed to be 30 minutes per case.

For SH there are no estimates of costs, and according to Pia Nielsen there is no extra work claw trimmer or herdsman. However, it is assumed that the cost of a severe case of SH is similar to a mild case of SU. For mild cases the cost were assumed to be 50% of a severe case.

The same costs are assumed for HH and DE. Based on Oskarssons analyses the extra work of the herdsman was 30 minutes. However, Pia Nielsen questioned this estimate - under Danish condition the herdsman is not involved in the treatment of DE. The project group decided to follow the recommendation by Oskarsson. For mild cases of HH and DE 50% of the cost for a severe case was assumed. SP are assumed to carry the same costs as the severe cases of HH and DE.

The costs of WLS are assumed to be the same as for a mild case of SH.

No estimates of the costs related to CSC have been found, but it is assumed that this disorder causes some extra work for the claw trimmer. Therefore some minor costs are assumed for CSC.

All together the basic cost used in NTM-program is shown in table 8. The costs are assumed to be the same in all three countries and for all three breed groups.

Table 8. Estimates on basic cost related to claw disorders. Same assumption for all three countries (DNK, SWE, FIN) and all three breed groups (HOL, RDC, JER)

	Mild disorder			Severe disorder		
	Extra work, herdsman, Minutes	Extra work, claw trimmer, minutes	Treatment, €	Extra work, herdsman, minutes	Extra work, claw trimmer, minutes	Acute effect/ Treatment, €
SU	30	5	0	270	5	80
SH	15	2.5	0	30	5	0
HH	15	2.5	5	30	5	10
DE	15	2.5	5	30	5	10
SP	-	-	-	30	5	10
WLS	-	-	-	15	2.5	0
CSC	-	-	-	0	5	0

Economic input to the NTM-model

First it important to notice that the economic input to the NTM-program should be the economic value per unit of change on the input scale, and not the value per case of the disorder. In table 8, we have the costs (value) per case. The setup of the evaluation model with 3 input categories, automatically define the value of a “mild” case to 50% of the value of a “severe” case. Therefore the values per case in table 8 must be transformed into values on the input-scale (input data for the evaluation program).

When cost per case and frequency is multiplied we can calculate the average cost per disorder. If we assume an underlying normal scale for the 2 or 3 categories – we can calculate the effect changing the mean on the underlying scale, both the effect on average cost and the effect on the mean observed value. Based on these results it is possible to estimate the cost per unit change on the input scale.

This method will give fair estimates of the economic input values even if costs and input values are not linear dependent (e.g. if costs of a mild case are not exactly 50% of the costs of a severe case). The same approach has been used for assessment of value of calving ease in the NTM-model.

The disadvantage is that the cost per case of a claw disorders will depend on the distribution of mild and severe cases (only a problem for SU, SH, and SE with 3 input values). If the frequency of severe cases are low (as in Finland) then cost of the disorder will be lower than in the other countries with higher frequency of severe cases. The same will be true for lactations and breeds if there are differences in distribution.

NTM-model results

These basic economic assumptions of table 8 are used in the revised NTM-model. The final results are averages of the results obtained for Denmark and Sweden. The Finnish results are not yet included, because the missing recording of severe cases of SU, SH, HH, and DE give biased Finnish results. The final results are shown in table 9. For the original NTM-traits the results are identical to those obtained previously and reported in "Report on Nordic Total Merit".

In table 10 the Holstein- and RDC-results for DNK, SWE and FIN are shown separately. This table shows that especially the SU-results are very biased for Finland due to the missing recording of severe cases. For SH, HH and DE the biases in the Finnish results are not very large, because costs of mild cases are exactly 50% of the cost per severe case. Otherwise, table 10 demonstrates that the differences between breeds and countries in economic value of the traits are quite small.

The results shown in table 9 and 10 should be applied to unstandardized breeding values (raw solutions from the breeding value estimation). In order to obtain index-weights the standard deviation of the solution must be known (the standardization-factors used in calculation of the indexes)

Weight on each of the 7 claw health traits

In table 11 the standard deviation of the individual claw traits are shown, both traits per lactation and total index across lactations (lactation solutions weighted by 0.5, 0.3 and 0.2 for 1st, 2nd and 3rd lactation). The standard deviation is based on a selected group of sires where the standard deviation of the indexes should be 10.

The standard deviations in table 11 are the "content" of original points that goes into 10 index units. Therefore, by multiplying the standard deviations in table 11 by the economic values per point in table 9 we obtain the economic value per index units. The results are shown in table 12.

By inspection of the results in table 11 it is obvious that there are quite large differences between breeds in the standard deviations – and between the content of an index unit. Even though there were small breed differences in economic value per point in the original scale (table 9) the differences in standard deviation (table 11) create substantial difference in relative weights for the 7 claw indexes (table 12)

Table 9. Results from NTM-program: Economic values (€) per unit of estimates EBVs (unstandardized solutions) for claw traits and a few other traits. The remaining results can be found in “Report on Nordic Total Merit”

	Unit	HOL	RDC	JER
Protein	Kg	4.60	4.81	4.15
Feet&Leg diseases	%-units	1.75	1.70	1.69
Feet&Legs conformation	Point	17.0	17.0	17.0
Sole Ulcer	Point	64.91	65.23	66.43
Sole Hemorrhage	Point	8.67	8.71	9.00
Horn Heel Erosion	Point	13.98	14.05	14.52
Digital Dermatitis	Point	13.98	14.05	14.52
Int. Dig. Hyperplasia	Point	25.56	25.68	24.14
White Line disease	Point	8.67	8.71	9.00
Cork Screw claws	Point	9.67	9.73	12.81

Table 10. Results from NTM-program: Economic values (€) per unit of estimates EBVs (unstandardized solutions). Results per country for Holstein and RDC

	Units	HOL			RDC		
		DNK	SWE	FIN	DNK	SWE	FIN
Sole Ulcer	Point	64.82	64.99	18.28	65.47	64.99	17.44
Sole Hemorrhage	Point	8.79	8.55	8.77	8.87	8.55	8.37
Horn Heel Erosion	Point	14.17	13.78	14.14	14.31	13.79	13.49
Digital Dermatitis	Point	14.17	13.78	14.14	14.31	13.79	13.49
Int. Dig. Hyperplasia	Point	23.55	27.57	28.27	23.79	27.57	26.97
White Line disease	Point	8.79	8.55	8.77	8.87	8.55	8.37
Cork Screw claws	Point	12.50	6.84	7.01	12.63	6.84	6.69

Table 11. Standardization factors used in calculation of claw health indexes. (SD of solutions for sires chosen to represent the standardization base)

	Unit	HOL	RDC	JER
Sole Ulcer	Point	0.0418	0.0252	0.0247
Sole Hemorrhage	Point	0.0591	0.0679	0.0401
Horn Heel Erosion	Point	0.0564	0.0697	0.0504
Digital Dermatitis	Point	0.0521	0.0473	0.0428
Int. Dig. Hyperplasia	Point	0.0231	0.0183	0.0169
White Line disease	Point	0.0129	0.0091	0.0082
Cork Screw claws	Point	0.0090	0.0146	0.0059
Total claw health(1)	Point	0.0625	0.0478	0.0435

(1): SD of a total claw health calculated from original solutions using the “Relative weights for unstandardized breeding values” in table 12

Table 12. Final result: Index values and index weights relative to value of SU-index.

	HOL DNK+SWE	RDC DNK+SWE	JER DNK
Sole ulcer value €/index units	0.271	0.164	0.164
Sole Ulcer value €/unit unstandardized EBV	64.91	65.23	66.43
Relative weights for standardized indexes relative to SU-index			
Sole Ulcer	1.000	1.000	1.000
Sole Hemorrhage	0.189	0.360	0.220
Horn Heel Erosion	0.291	0.596	0.446
Digital Dermatitis	0.268	0.404	0.379
Interdigital Hyperplasia	0.218	0.286	0.249
White Line disease	0.041	0.048	0.045
Cork Screw claws	0.032	0.086	0.046
Relative weights for unstandardized breeding values relative to SU			
Sole Ulcer	1.000	1.000	1.000
Sole Hemorrhage	0.134	0.134	0.136
Horn Heel Erosion	0.215	0.215	0.219
Digital Dermatitis	0.215	0.215	0.219
Interdigital Hyperplasia	0.394	0.394	0.363
White Line disease	0.134	0.134	0.136
Cork Screw claws	0.149	0.149	0.193
Value of claw health			
Total Claw health, €/index	0.4057	0.3118	0.2890
Total Claw health, DKK/index(1)	3.04	2.34	2.17
Total Claw health, SEK/index(1)	3.77	2.90	2.69
For comparison (2)			
Value of yield, €/index	7.61	8.33	6.00
Value of other diseases, €/index	0.84	0.76	0.30
Value of Feet & Legs, €/index	0.30	0.50	0.24

(1) Exchange rates 7.50 DKK/€, 9.30 SEK/€

(2) The values of Other Diseases and Feet&Legs are the original proposals before transfer of value from Longevity – and before the final adjustments by the NAV-board (from table 5.4-5.6 in “Report on Economic Basis for a Nordic Total Merit Index”)

Other factors of importance

The longevity problem

In the NTM-model the value of longevity is estimated via variation in the traits: % culled in 1st lactation, % culled in 2nd lactation, and % culled in 3rd and later lactation. It is well known that the breeding value for longevity is heavily influenced by fertility, udder health, other diseases, udder conformation and of Feet&Legs problems. Due to model limitations, the economic effect of reduced culling on the value of these traits is not included. Therefore, as much value as possible is transferred from longevity to the other trait in the NTM-index.

This transfer is based on analyses of the relationship between longevity and the other trait in the NTM. The value expressing how large part of the variance in longevity to be explained by the six traits) is given in table 13 as well as the relative size of these regression coefficients determining how much of the transferred value each trait should “receive”. However, it is difficult to estimate these relationships because relatively few sires currently have a reliable breeding value for claw health.

Analyses have shown that

- 14% of the longevity value should be transferred to the claw health index in Holstein
- 7% of the longevity value should be transferred to the claw health index in RDC
- It has not yet been possible to obtain reliable estimates for Jersey, but it is assumed that the percentage of the longevity value to be transferred is 7% as for RDC

As some of the longevity value is now transferred to the claw health index, the value transferred to other indexes must be reduced. It is assumed that values transferred from other diseases will be reduced by 12.5% - because feet&leg diseases determine approximately 25% of the value of other diseases – and it is assumed the claw health index will account for around 50% of the feet&leg disease effect on longevity. The remaining part is removed from feet&leg conformation.

The consequence is that introduction of the claw health index will cause some changes in the redistribution of the longevity value. There will be a very slight reduction in weight on other diseases and a reduction of weight on feet&leg conformation.

Table 13 The amount of longevity explained by other traits and the relative importance of the other traits

	HOL: 70% of longevity value transferred		RDC:70% of longevity value transferred		JER: 50% of longevity value transferred	
	Current distribution	New distribution	Current distribution	New distribution	Current distribution	New distribution
Fertility	26%	26%	26%	26%	0%	0%
Udder health	32%	32%	26%	26%	73%	73%
Other diseases	15%	13%	16%	14%	0%	0%
Feet&Legs conf.	18%	5%	5%	0%	13%	6%
Udder	9%	9%	26%	26%	13%	13%
Claw health	0%	14%	0%	7%	0%	7%

Increased risk of death

The NTM-model for calculation does not take into account that claw disorders probably increase the risk of death (or create cows with lower carcass value). It might be a problem in large herds where less attention is given to cows with decreased locomotion.

The effect of claw disorders on death risk might depend on:

- Trait and category of disorder (mild or severe)
- Country (herd size, housing system)
- Breed
- Age/lactation

The NTM-program can be modified to include risk of death, but it would require detailed estimates of relationship between claw disorders and death risk for each of the 21 traits. This detailed information is not available at the moment.

However, using the NTM-model we have estimated that the average cost of a dead cow is around 600 € in HOL and RDC and 320 € in Jersey. By simple methods we can calculate that decreased death risk due to improved claw health will have the following effect:

- HOL and RDC: 6 € are added to the value of claw health index (breeding value scale) for each percent unit the death risk of diseased cow go beyond the death risk of healthy cows. For Jersey the corresponding value is 3.2 €. *An example: If death risk of healthy cows is 4% - and death risk of cows with a claw disorder is 8%, then the value of claw health index will be increased by $6 * (8-4) = 24$ €. This result should be compared to the results in table 9.*
- For SU the 6 € will correspond to a 9% increase of the value for HOL and RDC and 5% for Jersey. *In the example with a doubling of death risk from 4% to 8% the effect will be a 36% increase in value for HOL and RDC and a 20% increase in value of claw health for Jersey.*

However, it is important to notice that these calculations are very general – and that the project group has not been able to give any qualified estimates of the effect of claw disorders on death risk for cows that are treated by a claw trimmer.

Including the Claw Health in NTM

In table 14, 15 and 16 is shown the changes in the relative weight for all traits when claw health is included

- The first column show the current results from the NTM-model, including transfer of longevity value to fertility, udder health, other diseases, feet&leg conformation and udder conformation.
- The second column shows the final NAV results decided by the NAV-board after input from the breed associations and others. It is the relative weight used in the current NTM-index
- The third column show the new results from the NTM-model, including transfer of longevity value to fertility, udder health, other diseases, feet&leg conformation, udder conformation and claw health. This results are comparable with the weights in the first column
- In the last column we have tried to recreate the “final NAV” results based on the new results and the political corrections used in 2008

All the weights are expressed relative to the yield index. The final index weights to be used in practice cannot be estimated before we have a decision on the weights. However, when we introduce a new index with a claw health weight relative to yield between 0.05 and 0.10, the results will be a slight reduction in the weight on the other traits.

Table 14. Holstein relative weights for the current NTM – and a new NTM with claw health included

	Current NTM		A new NTM including claw health	
	Economic 2008	Final NAV 2008	New economic	New Final NAV
Yield	1.00	1.00	1.00	1.00
Growth	0.08	0.08	0.08	0.08
Fertility	0.41	0.41	0.41	0.41
Birth index	0.20	0.20	0.20	0.20
Calving index	0.22	0.22	0.22	0.22
Udder health	0.46	0.46	0.46	0.46
Other diseases	0.16	0.16	0.15	0.15
Body	0.00	0.00	0.00	0.00
Feet&Legs	0.10	0.20	0.06	0.16
Udder	0.12	0.24	0.12	0.24
Milk ability	0.11	0.11	0.11	0.11
Temperament	0.04	0.04	0.04	0.04
Longevity	0.15	0.15	0.15	0.15
Claw health	0.00	0.00	0.10	0.10

Economic value of yield: 7.61 €/index unit

Table 15. RDC relative weights for the current NTM – and a new NTM with claw health included

	Current NTM		A new NTM including claw health	
	Economic 2008	Final NAV 2008	New economic	New Final NAV
Yield	1.00	1.00	1.00	1.00
Growth	0.11	0.00	0.11	0.00
Fertility	0.28	0.28	0.28	0.28
Birth index	0.15	0.15	0.15	0.15
Calving index	0.13	0.13	0.13	0.13
Udder health	0.34	0.35	0.34	0.35
Other diseases	0.13	0.13	0.13	0.13
Body	0.00	0.00	0.00	0.00
Feet&Legs	0.07	0.10	0.06	0.09
Udder	0.14	0.35	0.14	0.35
Milk ability	0.07	0.07	0.07	0.07
Temperament	0.03	0.03	0.03	0.03
Longevity	0.09	0.09	0.09	0.09
Claw health	0.00	0.00	0.05	0.05

Economic value of yield: 8.33 €/index unit

Table 16. Jersey relative weights for the current NTM – and a new NTM with claw health included

	Current NTM		A new NTM including claw health	
	Economic 2008	Final NAV 2008	New economic	New Final NAV
Yield	1.00	1.00	1.00	1.00
Growth	0.03	0.00	0.03	0.00
Fertility	0.23	0.30	0.23	0.30
Birth index	0.07	0.07	0.07	0.07
Calving index	0.06	0.07	0.06	0.07
Udder health	0.51	0.56	0.51	0.56
Other diseases	0.05	0.05	0.05	0.05
Body	0.00	0.00	0.00	0.00
Feet&Legs	0.06	0.06	0.05	0.05
Udder	0.15	0.17	0.15	0.17
Milk ability	0.11	0.11	0.11	0.11
Temperament	0.03	0.03	0.03	0.03
Longevity	0.14	0.14	0.14	0.14
Claw health	0.00	0.00	0.06	0.06

Economic value of Yield: 6.00 €/index unit

Discussion

During assessment of the weights to be given to the new claw health in the NTM index the most important issues is by far taken into account. There is however still improvement which eventually can be considered.

Beside the direct cost of a claw disorder (extra work for herdsman, claw trimmer and treatment) and the indirect cost already included in genetic evaluation (yield, fertility, longevity, veterinarian treatments), we might consider additional effects not included in evaluation.

Most important is probably an increased risk of death for cows with claw disorders. A very rough estimate of the economic importance is given. If we assume that the effect of increased death risk is proportional to the estimated economic values, then one extra percent unit of death risk will increase value of claw index by 9% for HOL and RDC and 5% for Jersey. That could be a substantial effect. However, we have no reliable estimates of these effects at all.

It has been also discussed if the cost of regaining weight loss should be included (4 SFU/kg weight loss). The weight loss is of cause due to reduced locomotion. The NTM-program can include cost of weight loss, but no reliable estimates of the weight loss connected to each disorder is available. Preliminary analyses indicate that the economic importance is not very large.

Conclusion

A system for estimation of economic values of the 21 breeding values included in the new claw health is developed. The system can evaluate the relative values of the 21 traits and for the 7 main traits that are included in the claw. It can also be used for estimation of the value of the claw health relative to the other traits in the NTM.

With economic assumptions used up to now (table 8), the estimated economic value of a unit of the claw health is 0.4057 € for Holstein, 0.3118 € for RDC and 0.2890 € for Jersey without longevity value included and 0.7677 € for Holstein, 0.4227 € for RDC and 0.3517 € for Jersey with longevity value included.