Future index for Udder

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This paper is, together with the talk on the webinar 15. September 2015, the next step towards a decision about weights in the future Udder index.

Summary:
- Breeds has more that twice the weight on Udder index than originally suggested in NTM report from 2008
- Expected influence on labour for milking, and correlations between linear udder traits to longevity and udder health are the tools, which can be used to decide how to combine the different udder traits
- Suggestions for alternative weights of linear traits in Udder index are based on input from the breeding organisations and can be used as a basis for a discussion about the combination of linear traits
- Alternative weightings for RDC, Holstein and Jersey are shown in table 2, 4 and 6
- Results from alternative weightings are shown in table 3 and 5

Weight in NTM

In 2008 when NTM was introduced all breeds decided to put more weight on Udder index than was estimated in the economic analyses done by NAV. The increased weight was decided because the breeds expected that longevity and udder health would be more economical important in the future, and because all breeds wanted to improve udder conformation more than suggested by the NAV working group. The history from 2008 might be important to keep in mind when discussion weights on the different linear udder conformation traits in the Udder index. Table 1 show the weight given to Udder index in NTM for the different breeds over years.

Table 1. Weight on Udder index in NTM – from 2008 to 2015

	Holstein	**RDC**	**Jersey**	**Red Holstein**
Suggestion 2008 NAV NTM report	0.09	0.13	0.13	
Oct 2008	0.18	0.32	0.15	0.24
Feb 2012			0.20	
May 2013	0.25		0.26	
Current	0.25	0.32	0.26	0.24

Weights on single linear udder traits in overall Udder index

One discussion is of course which weight to give to Udder in NTM and another aspect is how to optimally combine the linear traits. The first question is not addressed in this paper. This is discussed more in detail in powerpoint presentation shown at the webinar. In relation to second question, we do not have any unique way to decide, how linear udder conformation traits should be combined. Expected influence on labour for milking, and correlations between linear udder traits to longevity and udder health are the tools, which can be used to decide how to combine the different udder traits. In relation to labour, analysis of data from AMS could be of some help. It could give knowledge of relation between teat placement/udder shape and time putting on milking machine. It could perhaps also give knowledge of relation between the same traits and frequency of cows loosing the milking machine during milking.

During 2014 the optimal combination of linear udder traits in overall Udder has been discussed intensively. NAV has done some alternative analyses for all breeds to illustrate the effect of applying different weights (table 2, 4, 6). The results are presented in table 3, 5 and 7. The alternatives are based on input from the breeding organisations and can be used as a basis for a discussion about the combination of linear traits

Table 2. Alternative weightings of linear udder traits in Udder. RDC

Traits	Current	Alternatives		
		I	II	III
Fore udder attachment	20	10	5	5
Rear udder height	8			
Rear udder width	5			
Udder cleft	12		5	5
Udder depth	20	30	30	30
Teat length	10			-8
Teat thickness	10			-8
Teat placement, front	10			
Teat placement, back	5			
Udder balance	0			

Table 3. Correlations between linear traits and Udder index for alternative weightings of linear traits. 569 RDC bulls born 2006-2008.

Traits	Current	Alternatives		
		I	II	III
Fore udder attachment	0,69	0,69	0,58	0,50
Rear udder height	0,45	0,28	0,29	0,24
Rear udder width	0,35	0,15	0,14	0,12
Udder cleft	0,24	0,08	0,25	0,24
Udder depth	0,71	0,97	0,98	0,91
Teat length	0,42	-0,05	-0,07	-0,39
Teat thickness	0,27	-0,19	-0,21	-0,52
Teat placement, front	0,32	0,21	0,23	0,26
Teat placement, back	0,23	0,13	0,23	0,25
Udder balance	0,34	0,33	0,35	0,30
Udder health + longevity	0,19	0,35	0,37	0,40
Udder health	0,26	0,40	0,41	0,40
Longevity	0,06	0,18	0,19	0,25
Milking speed	-0,02	0,10	0,10	0,16
Y-index	-0,20	-0,21	-0,22	-0,16
NTM	0,22	0,24	0,25	0,24
Current udder		0,78	0,77	0,52

Note the correlations between current and the three alternatives are between 0.52-0.78 indicating a significant reranking of bulls.

Table 4. Alternative weightings of linear udder traits in Udder. Holstein

Traits	Current	Alternatives		
		I	II	III
Fore udder attachment	17	15	15	15
Rear udder height	10			
Rear udder width	0			
Udder cleft	10	15	15	15
Udder depth	24	30	40	35
Teat length	5			
Teat thickness	5			
Teat placement, front	7			
Teat placement, back	-12	-25	-25	-25
Udder balance	-10	-15	-5	-10

Table 5. Correlations between linear traits and Udder index for alternative weightings of linear traits. 1274 Holstein bulls born 2005-2008.

Traits	Current	Alternatives		
		I	II	III
Fore udder attachment	0,72	0,59	0,64	0,63
Rear udder height	0,50	0,23	0,35	0,30
Rear udder width	0,29	0,13	0,15	0,14
Udder cleft	0,15	0,03	0,05	0,05
Udder depth	0,88	0,77	0,90	0,85
Teat length	0,17	0,06	0,05	0,05
Teat thickness	0,05	-0,06	-0,09	-0,08
Teat placement, front	0,15	-0,16	-0,11	-0,14
Teat placement, back	0,01	-0,29	-0,20	-0,24
Udder balance	0,24	-0,09	0,21	0,08
Udder health + longevity	0,30	0,34	0,37	0,36
Udder health	0,36	0,37	0,41	0,40
Longevity	0,15	0,20	0,22	0,21
Milking speed	0,01	0,04	0,05	0,05
Y-index	-0,21	-0,19	-0,22	-0,21
NTM	0,28	0,32	0,32	0,33
Current udder		0,86	0,93	0,91

Note the correlations between current and the three alternatives are between 0.86-0.91 indicating a significant reranking of bulls.

Table 6. Current and new weightings of linear udder traits in Udder. Jersey

Traits	Current	New
Fore udder attachment	25	**20**
Rear udder height	5	
Rear udder width		
Udder cleft		**10**
Udder depth	35	**25**
Teat length	3	
Teat thickness	12	
Teat placement, front	15	
Teat placement, back		**-10**
Udder balance		**-10**
Codes for udder	5	

Note the correlations between current and the three alternatives are between 0.79-0.85 indicating a significant reranking of bulls

Phenotypic relationship between linear udder traits and survival
The effect of linear udder traits on the farmer's satisfaction with the cow is also reflected in his choice of keeping or culling the cow. The choice is influenced by many things – work load, udder health ect.. Culling rate therefore illustrate the overall importance of the different traits. If culling rate is equal no matter how the cow is scored from 1 – 9 the trait is unimportant.

Table 7, 9 and 11 shows % culled Nordic cows earlier than 700 after 1 calving for the single linear scores for udder conformation traits e.g. 37% of all Holstein cows with score=4 for fore udder attachment are culled at day 700 after first calving (see table 7). Only cows having first calving in 2010 and 2011 are included.

IMPORTANT: The tables with % culled cows have to be read together with the tables with number of cows per score (table 8, 10, and 12) to evaluate the importance of a deviating % culled cows. In some cases very few cows have got a given score e.g. only 81 Holstein cows has got score=1 for fore udder attachment.

Table 7. % culled cows before day 700 after 1st calving. RDC cows with 1st calving in 2010-2011

Trait	Linear score									Optimum
	1	2	3	4	5	6	7	8	9	
Fore udder attachment	73	51	41	35	31	31	32	31	30	9
Rear udder height	59	52	43	36	32	31	29	28	20	9
Rear udder width	46	41	37	33	32	31	31	29	32	9
Udder cleft	72	49	39	35	32	31	31	30	35	9
Udder depth	65	53	39	34	32	31	30	32	30	9
Teat length	34	34	31	31	33	33	35	41	40	5,5
Teat thickness	40	34	32	31	31	35	37	38	45	6
Teat placement, front	67	45	35	31	31	32	34	36	35	8
Teat placement, back	68	57	39	33	33	32	31	31	32	5
Udder balance	52	42	37	33	30	34	34	41	47	5

Table 8. Number of cows per linear score. RDC cows with 1st calving in 2010-2011

Trait	Linear score								
	1	2	3	4	5	6	7	8	9
Fore udder attachment	135	596	3131	10233	21463	25337	13363	2255	294
Rear udder height	219	1114	3544	9263	23333	28824	9504	1205	102
Rear udder width	182	1469	6946	17685	25998	18883	5199	688	56
Udder cleft	270	1003	3145	9352	23234	23753	13808	2297	244
Udder depth	277	775	3486	11975	23846	23555	11023	1878	291
Teat length	975	3190	9722	19878	26616	11244	4244	904	331
Teat thickness	733	2703	6759	17121	26475	17119	4893	983	317
Teat placement, front	359	1284	5670	15453	27697	18357	7198	949	136
Teat placement, back	258	691	2188	7971	16413	22801	18686	6557	1537
Udder balance	135	730	5177	18798	32927	16860	2209	227	34

Table 9. % culled cows before day 700 after 1st calving. Holstein cows with 1st calving in 2010-2011.

Trait	Linear score									Optimum
	1	2	3	4	5	6	7	8	9	
Fore udder attachment	69	53	41	37	33	32	32	30	31	9
Rear udder height	65	61	45	39	35	33	32	31	30	9
Rear udder width	63	49	39	35	33	32	32	30	30	9
Udder cleft	65	47	40	35	33	32	32	33	36	8
Udder depth	75	56	49	38	33	32	32	33	35	9
Teat length	36	36	35	33	32	32	34	33	39	5,5
Teat thickness	32	35	33	33	32	33	36	40	45	5
Teat placement, front	60	44	35	32	32	33	34	35	38	8
Teat placement, back	67	56	42	35	33	33	32	33	34	5
Udder balance	56	48	41	36	32	32	33	37	45	5

Table 10. Number of cows per linear score. Holstein cows with 1st calving in 2010-2011

Trait	Linear score								
	1	2	3	4	5	6	7	8	9
Fore udder attachment	81	358	2576	14549	44681	66720	37490	6856	660
Rear udder height	17	75	542	3706	20395	70470	66111	11741	914
Rear udder width	43	432	4670	23822	55813	61308	24712	2883	287
Udder cleft	155	567	2132	8033	27149	53493	63551	17499	1388
Udder depth	52	235	1174	6601	25942	62315	59648	15722	2280
Teat length	458	2320	16062	47284	53692	34218	15184	3529	1223
Teat thickness	381	2428	11791	46289	65620	36325	9534	1352	246
Teat placement, front	136	650	3435	15988	48695	56062	40441	7946	609
Teat placement, back	75	370	1395	7760	35054	54039	50109	20608	4552
Udder balance	64	370	3156	19505	85280	52370	11704	1329	146

Table 11. % culled cows before day 700 after 1ˢᵗ calving. Jersey cows with 1ˢᵗ calving in 2010-2011

Trait	Linear score									Optimum
	1	2	3	4	5	6	7	8	9	
Fore udder attachment	81	56	43	36	35	35	33	34	27	9
Rear udder height	76	66	48	42	37	35	33	31	37	9
Rear udder width	90	68	51	40	36	34	33	36	37	9
Udder cleft	79	61	41	36	36	34	34	35	39	9
Udder depth	71	59	47	38	35	34	34	35	50	9
Teat length	40	36	35	35	36	36	37	36	45	5,5
Teat thickness	38	36	35	36	36	36	35	40	45	6
Teat placement, front	78	53	39	37	36	34	35	34	39	7,5
Teat placement, back	74	56	43	35	35	34	36	39	36	5
Udder balance	54	50	44	39	35	34	37	41	50	5

Table 12. Number of cows per linear score. Jersey cows with 1ˢᵗ calving in 2010-2011

Trait	Linear score								
	1	2	3	4	5	6	7	8	9
Fore udder attachment	88	293	1792	5983	6668	9270	4284	939	60
Rear udder height	17	158	472	1748	7324	11412	6078	1972	195
Rear udder width	10	106	695	2939	7679	13858	3580	475	35
Udder cleft	98	379	950	4176	9414	8402	4964	919	75
Udder depth	86	374	792	4990	13904	6903	2102	212	14
Teat length	373	1458	4300	7114	9009	4265	2108	536	214
Teat thickness	968	2553	3390	5769	7350	7261	1748	287	51
Teat placement, front	152	355	1490	4051	7039	12627	3056	520	87
Teat placement, back	162	284	1024	2744	6109	13021	4825	1069	139
Udder balance	24	129	1065	4269	9038	13258	1417	108	28