

Effect of including Feed Saved in NTM

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Saved feed was introduced a breeding value in August 2019, and is so far based on maintenance efficiency only, but during 2020 Saved feed will be calculated as a weighted sum of maintenance efficiency and metabolic efficiency. The value (reduced cost) of the one unit saved feed for cows is the same independent if the improvement originates from lower maintenance cost or higher metabolic feed efficiency.

Furthermore, increased maintenance efficiency might lead to reduced carcass weight of slaughtered cows, and reduced weight at first calving including reduced heifer maintenance in the growth period

Three factors have effect on the result of maintenance efficiency in the TMI-model calculations

- Reduced feed for maintenance of cow
- Reduced carcass weight of slaughtered cows
- Reduced weight at first calving including heifer maintenance in the growth period

Two factors have effect on the result of metabolic efficiency in the TMI-model calculations

- Reduced feed for production due higher metabolic efficiency
- Reduced feed for growth as heifer due higher metabolic efficiency

The weight factors in table 1 include only the effect of the reduced feed for cow maintenance efficiency and cow metabolic efficiency and ignore the effect on heifer maintenance and metabolic efficiency plus carcass weight. By including these effects, the economic weight factor for Saved feed shown in table 1 will be 15-40% higher, since the costs for producing extra kilo of carcass on a calving heifer is larger than the extra income from extra carcass at slaughter.

The weight factor for RDC is a bit higher than for Holstein and Jersey due to a larger effect of one Saved feed index for RDC than for the other breeds.

Table 1. Relative weights for each sub-index in NTM after standardization for Holstein, RDC and Jersey. Current weight factors (Curr NTM) and weight factors when including Saved feed (SF NTM)

	Holstein		RDC		Jersey	
	Curr. NTM	SF NTM	Curr. NTM	SF NTM	Curr NTM	SF NTM
Yield	0.90	0.90	1.02	1.02	0.83	0.83
Growth	0.08	0.08	0.10	0.10	0.00	0.00
Fertility	0.36	0.36	0.36	0.36	0.26	0.26
Birth	0.14	0.14	0.11	0.11	0.04	0.04
Calving	0.14	0.14	0.10	0.10	0.07	0.07
Udder health	0.30	0.30	0.26	0.26	0.44	0.44
General health	0.14	0.14	0.11	0.11	0.14	0.14
Frame	0.00	0.00	0.00	0.00	0.00	0.00
Feet & legs	0.05	0.05	0.06	0.06	0.07	0.07
Udder	0.18	0.18	0.26	0.26	0.15	0.15
Milkability	0.09	0.09	0.11	0.11	0.09	0.09
Temperament	0.04	0.04	0.03	0.03	0.03	0.03
Longevity	0.06	0.06	0.06	0.06	0.09	0.09
Claw health	0.10	0.10	0.07	0.07	0.04	0.04
Young stock surv.	0.13	0.13	0.19	0.19	0.10	0.10
Saved Feed		0.18		0.23		0.18

Today the EBV for Saved feed include only information about maintenance efficiency, which is entirely based on (metabolic) body weight, and an increased/decreased body weight can directly be translated in to energy requirement for maintenance. Information about metabolic efficiency will be added during 2020 for all 3 breeds. But the reliability of metabolic efficiency EBV will be low - and much lower than for the maintenance efficiency - due to a limited amount of feed intake data.

The overall value of NTM in €/kr per NTM unit will increase by including Saved feed to NTM since Saved has an economic value. It means that about 2-3% larger economic progress can be achieved by using the SF NTM than what is possible using the current NTM

In table 2 correlations are presented between current NTM and single traits in NTM, and between an NTM including saved feed (SF NTM) and single traits. Weight factors from table 1 have been used. Correlations presented in table 2-4 are based on the current Saved feed index including maintenance information only. Correlations give information about the relative genetic progress in the single trait one can achieve by selecting based on a NTM including many traits versus the single trait alone. E.g. for Holstein the response for udder health by using the current NTM is 33% of the maximum response one can achieve if udder health was the only trait in the breeding goal.

From the correlations in table 2 it can be concluded for all three breeds, that the response by including saved feed in NTM compared to current NTM will result in:

- Slightly lower progress in yield
- Slightly higher progress in all health traits and longevity
- Somewhat smaller cows
- Somewhat lower progress in udder

Table 2. Correlations between current NTM (Curr NTM) and single traits in NTM, and between an NTM including saved feed (SF NTM) and single traits in NTM – genotyped bull calves born in year 2017.

	Holstein		RDC		Jersey* ¹⁾	
	Curr. NTM	SF NTM	Curr. NTM	SF NTM	Curr. NTM	SF NTM
Yield	0.66	0.63	0.69	0.63	0.70	0.66
Growth	0.09	0.06	0.03	-0.06	0.09	0.10
Fertility	0.25	0.27	0.26	0.28	0.07	0.10
Birth	0.17	0.22	0.18	0.30	0.02	0.02
Calving	0.23	0.20	0.20	0.20	0.15	0.15
Udder health	0.33	0.34	0.34	0.30	0.43	0.44
General health	0.27	0.29	0.21	0.22	0.29	0.29
Frame	0.05	-0.10	-0.04	-0.26	0.11	-0.04
Legs	0.11	0.14	0.21	0.31	0.15	0.21
Udder	0.23	0.19	0.23	0.14	0.22	0.20
Milking speed	0.05	0.04	0.10	0.10	0.14	0.13
Temperament	0.06	0.03	-0.03	-0.05	0.09	0.08
Longevity	0.42	0.45	0.44	0.45	0.38	0.40
Claw health	0.22	0.24	0.15	0.24	0.06	0.08
Young stock survival	0.17	0.20	0.22	0.28	-	-
Persistence	0.14	0.14	0.18	0.20	0.07	0.09
Saved feed	-0.06	0.12	-0.02	0.25	-0.12	0.08
Number of bull calves		3118		2557		930

¹⁾Jersey birth year 2017 and 2018

Table 3 shows correlations between saved feed and the single NTM traits, and between yield and the single NTM traits. The correlations in table 3 help understanding the observed responses found in table 2. The following can be noted from table 3:

- Saved feed and frame (strongly related to the size of the cow) is strongly negatively correlated
- Saved feed and yield is slightly unfavorable correlated
- Saved feed and udder is slightly unfavorable correlated
- Saved feed is in general positively correlated to longevity and health traits

Table 3. Correlations between Saved feed and Yield with other NTM traits – bull calves born in year 2017

	Holstein		RDC		Jersey* ¹⁾	
	Saved feed	Yield	Saved feed	Yield	Saved feed	Yield
Yield	-0.18	1.00	-0.17	1.00	-0.25	1.00
Growth	-0.13	0.08	-0.32	0.10	0.04	0.02
Fertility	0.16	-0.34	0.08	-0.20	0.19	-0.31
Birth	0.28	-0.10	0.48	-0.06	0.02	-0.03
Calving	-0.15	-0.09	0.03	-0.02	-0.03	0.06
Udder health	0.02	-0.15	-0.08	-0.10	0.10	-0.21
General health	0.15	-0.21	0.10	-0.14	0.04	-0.10
Frame	-0.83	0.28	-0.78	0.19	-0.77	0.26
Legs	0.20	-0.07	0.41	-0.01	0.28	-0.08
Udder	-0.23	-0.15	-0.29	-0.12	-0.12	-0.26
Milking speed	-0.03	0.07	0.00	0.02	-0.14	0.18
Temperament	-0.16	0.14	-0.11	0.06	-0.03	0.09
Longevity	0.17	-0.16	0.14	0.05	0.12	-0.06
Claw health	0.13	-0.11	0.31	-0.10	0.21	-0.10
Young stock survival	0.23	-0.05	0.28	0.01	-	-
Persistence	0.04	0.13	0.10	0.15	0.00	-0.07
Saved feed	1.00	-0.18	1.00	-0.17	1.00	-0.25

Number of bull calves see table 2

¹⁾Jersey birth year 2017 and 2018

Table 4 shows correlations between single traits within yield, growth, frame and udder to be understand the response achieved in table 2. The following can be noted from table 4:

- Saved feed and frame (strongly related to the size of the cow) is strongly negatively correlated and this mainly due to a very negative correlation to stature.
- Saved feed and yield is slightly unfavorable correlated, and the slight negative correlations holds for all 3 yield traits
- Saved feed and udder is slightly unfavorable correlated, it seems that scoring of some of the udder traits is correlated to the height of the cow e.g. udder depth
- Saved feed is positively correlated to daily gain and slightly negative to carcass conformation

To better evaluate the effect of the strong unfavorable correlation between Saved feed and stature. We have calculated the correlated response by selecting for SF NTM on stature in cm. 30 SF NTM units progress in SF NTM will lead to cows being genetically 1.0-1.5 cm lower than today. This must be compared with that the genetic progress in stature has been over 10 cm from 1990-2020.

We have also calculated the correlated genetic response by selecting for SF NTM versus current NTM on udder depth assuming a genetic progress of 30 NTM unit which will take 7-8 years to reach at the current genetic trend of 4 NTM units per year in the bull population.

30 SF NTM units progress in SF NTM will lead to a genetic progress in Udder depth of 4.2-6.0 index units. Corresponding to 0.2-0.3 point on the linear scale from 1 to 9.

30 current NTM units progress will lead to a genetic progress in Udder depth of about 6,9 index units. Corresponding to 0.4 point on the linear scale from 1 to 9.

It means that by selecting after SF NTM the positive genetic progress for udder depth will be a bit lower than achieved by current NTM. The difference in genetic progress corresponds to 0.1-0.2 point on the linear scale (1-9).

Table 4. Correlations between Saved feed and some single traits – bull calves born in year 2017

	Holstein	RDC	Jersey* ¹⁾
Yield	-0.18	-0.17	-0.25
Milk	-0.16	-0.08	-0.10
Fat	-0.11	-0.09	-0.25
Protein	-0.20	-0.14	-0.20
Growth	-0.13	-0.32	0.04
Daily gain	-0.42	-0.52	-
Carcass conformation	0.22	0.05	-
Frame	-0.83	-0.78	-0.77
Stature	-0.79	-0.80	-0.83
Body Depth	-0.58	-0.53	-0.57
Chest width	-0.57	-0.55	-0.60
Dairy form	-0.38	-0.13	-0.23
Top line	-0.18	0.08	-0.13
Rump width	-0.46	-0.55	-0.54
Rump angle	-0.13	0.03	-0.12
Udder	-0.23	-0.29	-0.10
Fore udder attachment	-0.17	-0.18	-0.08
Rear udder height	-0.14	0.13	0.03
Rear udder width	-0.28	-0.04	-0.18
Udder support	-0.11	-0.01	0.08
Udder depth	-0.23	-0.23	-0.08
Teat length	-0.08	-0.23	-0.20
Teat thickness	-0.13	-0.21	-0.19
Teat plac front	-0.09	0.00	0.07
Teat plac back	-0.13	0.04	0.10
Udder balance	-0.06	-0.03	-0.01
Number of bull calves see table 2			

¹⁾Jersey birth year 2017 and 2018