Implementation of Saved Feed in NTM

NAV follow up work based on group work 16.1.2020 at NAV

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Today the EBV for Saved feed include information about maintenance efficiency, which is entirely based on (metabolic) body weight, and an increased/decreased body weight can directly be translated into 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 € per NTM unit will increase by including Saved feed to NTM since Saved has an economic value. It means 2-3% larger economic progress can be achieved by using the SF NTM compared to the current NTM. In the note *Effect of including Saved feed in NTM* a lot of information about including Saved Feed in NTM is given. This note gives further information, requested by participants at the NAV workshop 16th January, and it might be an advance to look at the two notes in common.

Conclusions from group work at the NAV workshop 16th 2020:

- All 3 breeds are interested to include Saved Feed in NTM
- RDC and Holstein wanted some more analyses, Jersey was prepared to use suggested weights
- NAV will provide extra analyses before February 1st
- Aim final decision at NAV board meeting March 19th
- Per Johan Svensson and Torben Lund will coordinate breed discussion within RDC and Holstein respectively to come up with final recommendation

Sensitivity analyses

RDC and Holstein asked for sensitivity analyses giving a lower weight to Saved feed than suggested at the workshop (table1)

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**

Sensitivity analyses were conducted using two alternative weight factors per breed (table 2)

Table 2. Alternative weight factors given to Saved feed

Weight factors	**Holstein**	**RDC**
Original	**0.18**	**0.23**
Alternative I	0.13	0.18
Alternative II	0.08	0.13

In table 3 and 4 correlations are presented between current NTM and single traits in NTM for the scenarios in table 2 giving different weights to Saved feed in NTM.

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 3 it can be concluded 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 3. Correlations between current NTM (Curr NTM) and single traits in NTM, and between an NTM including saved feed (SF0.18, SF0.13, SF0.08) and single traits in NTM – genotyped **Holstein** bull calves born in year 2017 or 2018.

	Birth year 2017				**Birth year 2018**			
	Curr. NTM	**NTM SF0.18**	**NTM SF0.13**	**NTM SF0.08**	**Curr NTM**	**NTM SF0.18**	**NTM SF0.13**	**NTM SF0.08**
Yield	**0.66**	0.63	0.64	0.65	**0.69**	0.65	0.67	0.68
Growth	**0.09**	0.06	0.07	0.08	**0.08**	0.06	0.06	0.07
Fertility	**0.25**	0.27	0.27	0.26	**0.24**	0.26	0.26	0.25
Birth	**0.17**	0.22	0.20	0.19	**0.16**	0.20	0.20	0.18
Calving	**0.23**	0.20	0.21	0.22	**0.27**	0.24	0.25	0.26
Udder health	**0.33**	0.34	0.34	0.34	**0.34**	0.35	0.35	0.34
General health	**0.27**	0.29	0.29	0.28	**0.26**	0.28	0.28	0.28
Frame	**0.05**	-0.10	-0.06	-0.01	**0.05**	-0.11	-0.06	-0.02
Legs	**0.11**	0.14	0.13	0.12	**0.19**	0.23	0.22	0.21
Udder	**0.23**	0.19	0.20	0.21	**0.19**	0.14	0.15	0.16
Milking speed	**0.05**	0.04	0.05	0.05	**0.02**	0.02	0.02	0.02
Temperament	**0.06**	0.03	0.04	0.05	**0.08**	0.06	0.07	0.08
Longevity	**0.42**	0.45	0.44	0.43	**0.38**	0.42	0.42	0.41
Claw health	**0.22**	0.24	0.23	0.23	**0.18**	0.20	0.19	0.19
Young stock survival	**0.17**	0.20	0.20	0.19	**0.22**	0.26	0.25	0.23
Persistency	**0.14**	0.14	0.14	0.14	**0.10**	0.10	0.10	0.10
Saved feed	**-0.06**	0.12	0.07	0.02	**-0.06**	0.13	0.07	0.02
Number of bull calves		3118				2967		

Table 4. Correlations between current NTM (Curr NTM) and single traits in NTM, and between an NTM including saved feed (SF0.18, SF0.13, SF0.08) and single traits in NTM – genotyped RDC bull calves born in year 2017 or 2018.

	Birth year 2017				Birth year 2018			
	Curr. NTM	**NTM SF0.23**	**NTM SF0.18**	**NTM SF0.13**	**Curr NTM**	**NTM SF0.23**	**NTM SF0.18**	**NTM SF0.13**
Yield	**0.69**	0.63	0.65	0.66	**0.71**	0.64	0.66	0.68
Growth	**0.03**	-0.06	-0.04	-0.02	**0.02**	-0.07	-0.05	-0.03
Fertility	**0.26**	0.28	0.28	0.28	**0.17**	0.21	0.21	0.20
Birth	**0.18**	0.30	0.28	0.26	**0.12**	0.26	0.23	0.20
Calving	**0.20**	0.20	0.20	0.20	**0.23**	0.21	0.22	0.22
Udder health	**0.34**	0.30	0.31	0.33	**0.31**	0.29	0.30	0.30
General health	**0.21**	0.22	0.21	0.22	**0.19**	0.20	0.20	0.20
Frame	**-0.04**	-0.26	-0.21	-0.17	**0.07**	-0.18	-0.13	-0.07
Legs	**0.21**	0.31	0.29	0.27	**0.16**	0.29	0.26	0.24
Udder	**0.23**	0.14	0.17	0.18	**0.27**	0.16	0.18	0.21
Milking speed	**0.10**	0.10	0.10	0.10	**0.16**	0.13	0.14	0.14
Temperament	**-0.03**	-0.05	-0.05	-0.03	**0.11**	0.07	0.08	0.09
Longevity	**0.44**	0.45	0.45	0.45	**0.48**	0.49	0.49	0.49
Claw health	**0.15**	0.24	0.22	0.20	**0.19**	0.25	0.24	0.23
Young stock survival	**0.22**	0.28	0.27	0.26	**0.14**	0.22	0.21	0.19
Persistency	**0.18**	0.20	0.20	0.19	**0.22**	0.24	0.24	0.24
Saved feed	**-0.02**	0.25	0.19	0.14	**-0.03**	0.27	0.21	0.14
Number of bull calves		2557				2537		

Saved feed genetic trend

The genetic trends for males and females are shown in figure 1-6 for Holstein, RDC and Jersey.

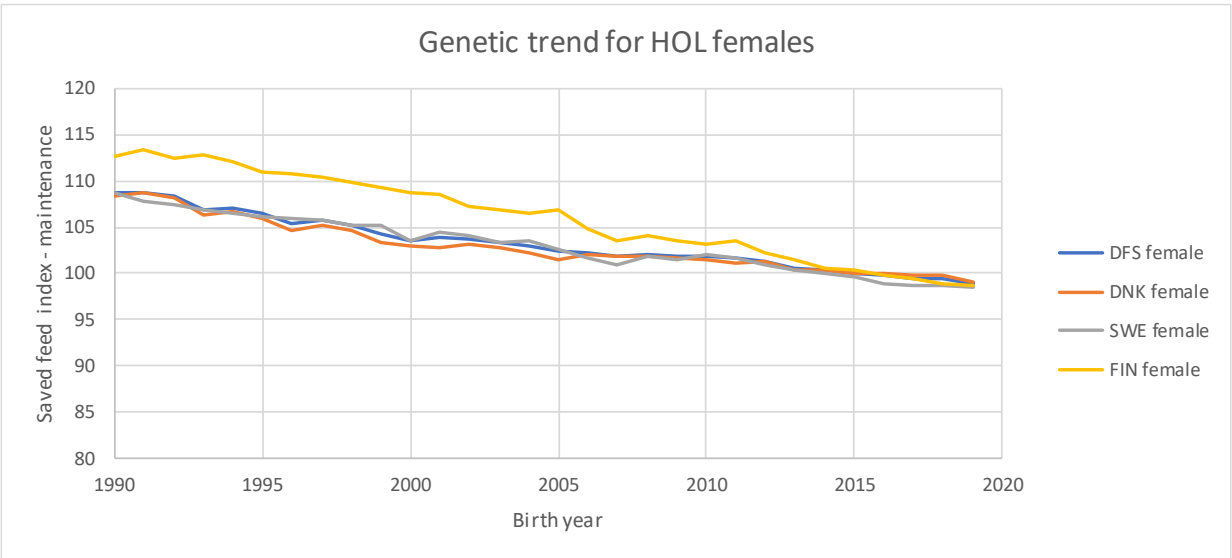

Figure 1. Saved feed genetic trend, Holstein females

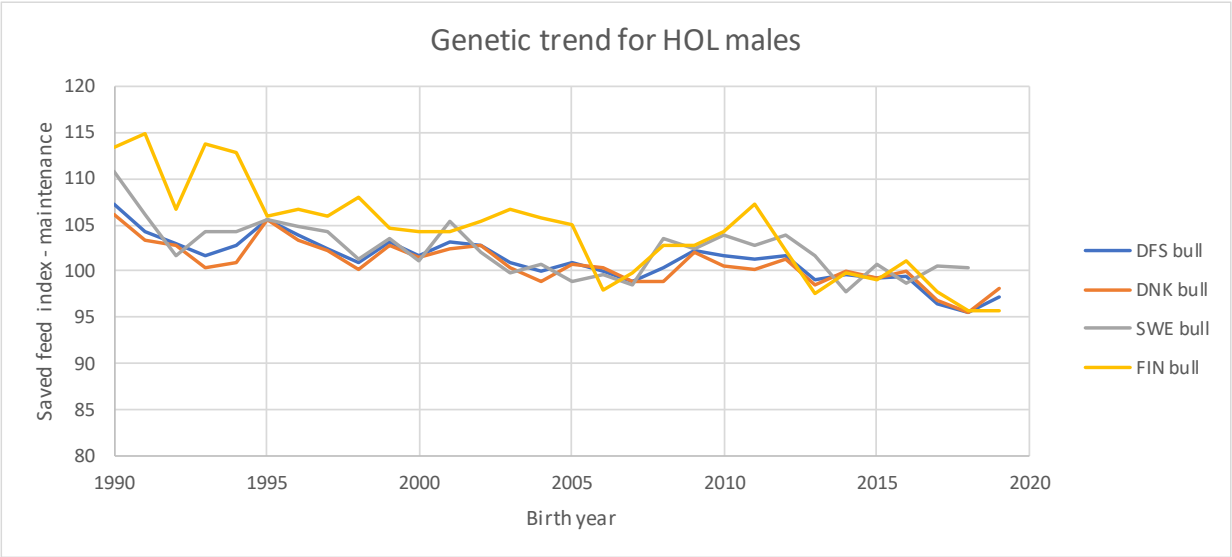

Figure 2. Saved feed genetic trend, Holstein males

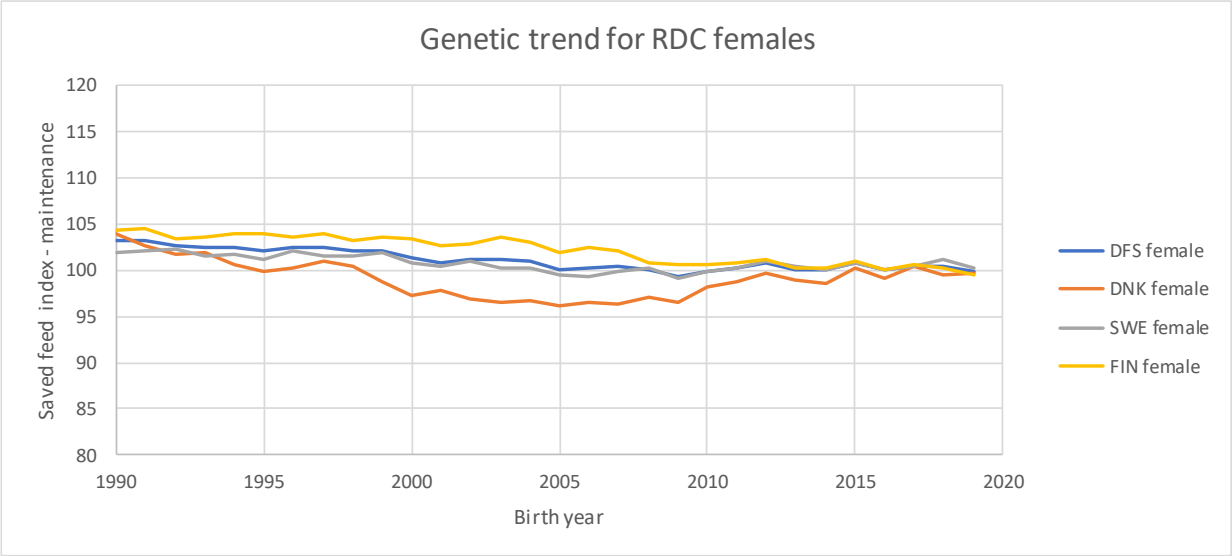

Figure 3. Saved feed genetic trend, RDC females

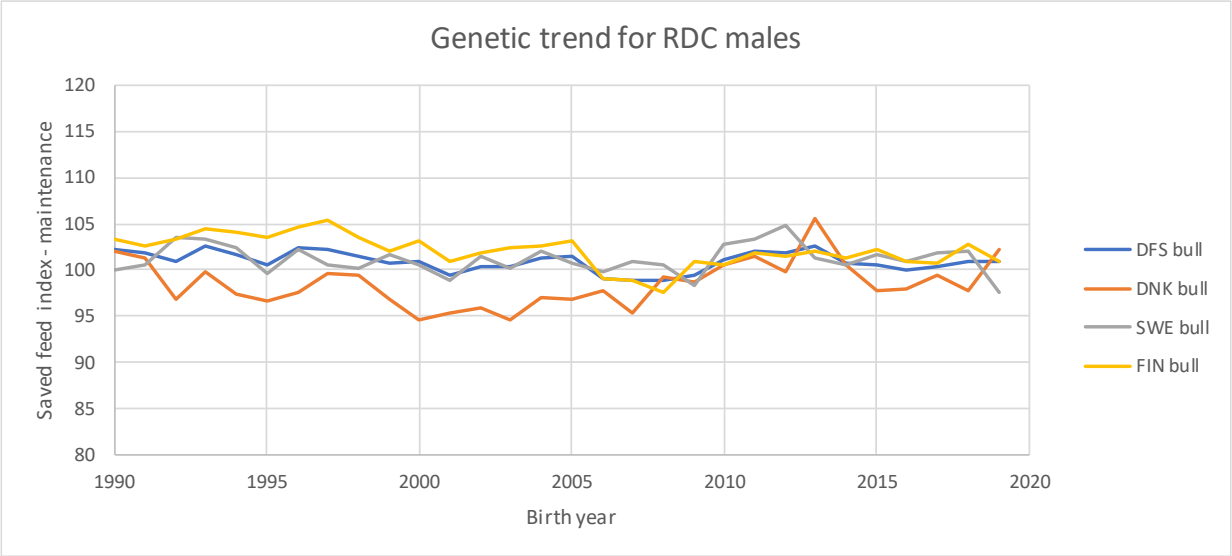

Figure 4. Saved feed genetic trend, RDC males

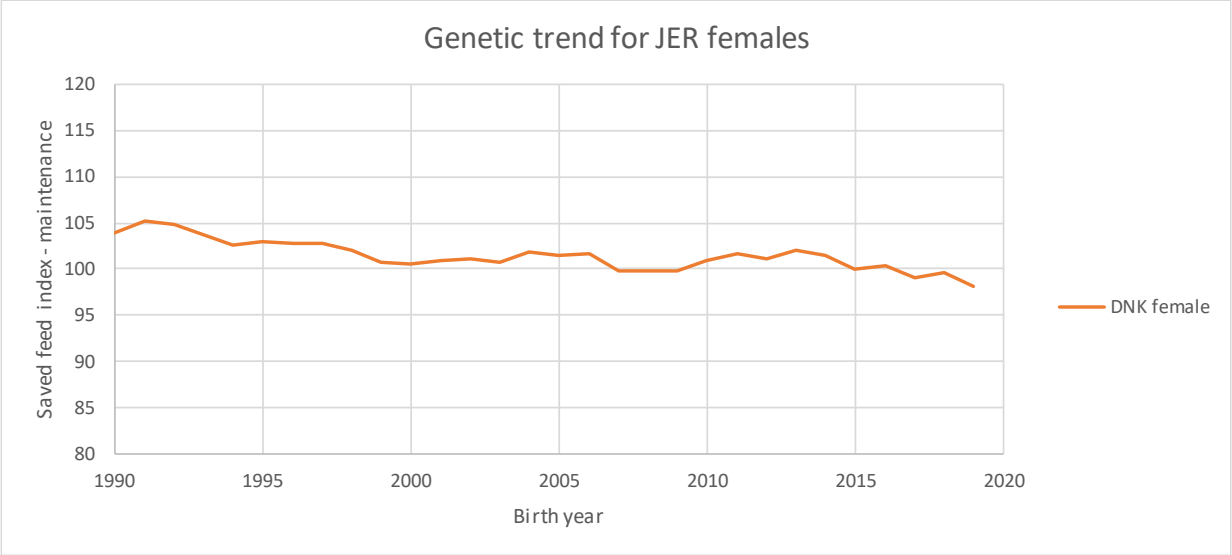

Figure 5. Saved feed genetic trend, Jersey females

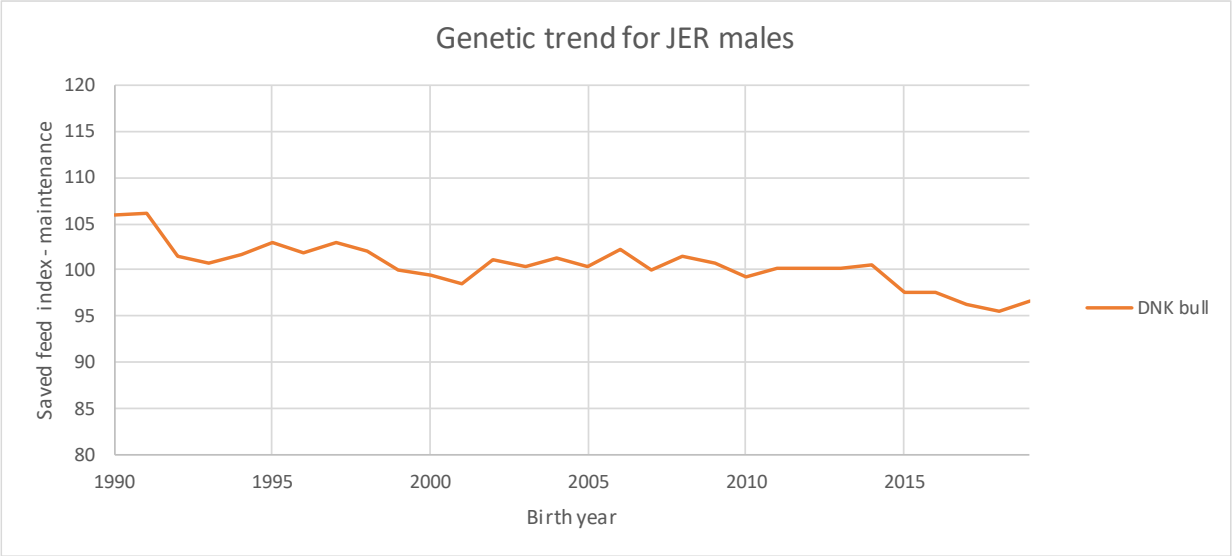

Figure 6. Saved feed genetic trend, Jersey males

NTM with constrains on specific traits

Holstein questions: Weight for Saved feed to achieve a zero increase in stature/Frame – keep same size and equally wide/deep

Answer:
A Saved feed weight factor of 0.08 will give a correlation between frame and NTM close to 0.00 (see table 3).

RDC question: What weight to give Saved feed if correlations between NTM and production and udder respectively should stay at the similar level as before?

Answer: Since Saved feed is slightly unfavorable corelated to both yield and udder it is not possible to give weight to saved feed and keep the response in yield and udder unchanged (see table 4).

Selection for Saved feed consequences for chest width & body depth

To better evaluate the effect of the strong unfavorable correlation between Saved feed and stature. We have calculated the correlated response by selecting for NTMSF0.18 (the scenario with the highest

weight on saved feed see table 2). We have looked at a genetic progress of 30 NTM units (corresponding to 8 years of genetic trend).
30 NTM units progress 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

0.04-0.06 point on the linear scale from 1 to 9 more narrow than today (body width).

0.04-0.06 point on the linear scale from 1 to 9 more shallow than today (body depth).

What have we achieved for BW and BD the last 30 years?

Please also note the answer to the constraint question above

Economic effect

We have calculated the response in Saved feed units by selecting for NTMSF0.18 (the scenario with the highest weight on saved feed see table 2). We have looked at a genetic progress of 30 NTM units (corresponding to 8 years of genetic trend). The response in that situation will be 3.6 Saved index units corresponding to about 7 euro per cow or 35 SFU.

Genetic response fertility Holstein

The genetic response in table 3 and 4 deviate for a few traits from the response shown in the NTM report from 2018 (https://www.nordicebv.info/reports/). This is caused by changes introduced since November 2017 in the genetic evaluation, weights of traits, and to a minor degree differences in the cohort. The following changes in the genetic evaluation has been introduced since Nov 2017:

Feb 2018

- Females are included in the reference population for fertility, calving traits, claw health, general health, and longevity (feb 2018)

Nov 2018

- Swedish bull calf data are included in evaluation of young stock survival
- Lactation weights changed for all traits
- Yield index weights changed all breeds
- Udder conformation changed in Holstein
- Frame changed in RDC

Feb 2019

- New editing procedure Swedish mastitis data

May 2019

- Improvements General Health evaluation

The main reason for the drop in correlation might be that by introducing females in the reference population in February 2018 a new validation of genomic prediction was conducted and the standard deviation of the GEBVs for fertility was decreased resulting in somewhat lower in table 3 (0.25) than in the NTM report (0.45). Due to the very short time window for this follow up we have not had the possibility to look more in details at this aspect.