

Calculation and use of genetic evaluations for feed saved

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Topics



- Revision of cow maintenance cost
- Economics for Feed Saved (**FSAV**)
- Reliability for residual feed intake (**RFI**) and FSAV
- Formulas to combine RFI and BWC into FSAV
- Feed costs for each pound of milk, fat, or protein
- Future national impact of FSAV

Body weight (BW) and body weight composite (BWC)

- Since 2000, Net Merit (**NM\$**) has deducted for higher feed costs of larger cows by including a penalty on BWC.
- Since 2017, the previous composite formula from U Minnesota was replaced by new BWC formulas based on HAUSA research and AJCA research to better predict actual cow BW.
 - Dairy form included to predict weight instead of frame size.
- More data from university research herds and genomic regressions now indicate **35** instead of **40** pounds increase in BW for each unit of HO BWC.

Body weight and maintenance feed (dry matter intake)

- National Research Council publishes nutrients required
- Estimate is increasing
- Estimates from CDCB data are much higher
- Phenotypic, cow genomic, and sire regressions give similar, high estimates
- NM\$ should put **2.3 X** more emphasis on small body size

Maintenance estimate:	DMI lb / BW lb / year
NM\$ 2018 assumed	1.7
NRC 2001	2.7
NRC 2021	3.4
Phenotypic	5.8
Genomic	5.5
Sire genomic	5.9
NM\$ 2021 proposed	4.5

Other incomes and costs for BWC already in NM\$

- **+\$0.75** Income from cull cows / pound BW
 - **+\$0.17** Income from larger calves / pound cow BW
 - **-\$0.75** Heifer growth cost up to 1200 pounds
 - **-\$0.50** Cow growth cost from 1200 to 1500 pounds
 - **-\$0.10** Extra housing costs for cows
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- Incomes and expenses all converted to feed pounds / lactation
 - Maintenance + other items = 138 pounds DMI / unit BWC

FSAV formulas and reliability averages



- Combining BWC and RFI into FSAV

- $PTA_{FSAV} = -138 * PTA_{BWC} - 1 * PTA_{RFI}$ pounds / lactation

- $REL_{FSAV} = 0.35 * REL_{BWC} + 0.65 * REL_{RFI}$

- Reversing these formulas can give PTA_{RFI} and REL_{RFI} if interested

- REL averages for calf predictions

- **BWC and RFI** 77% and 15%

- **Feed Saved** 37%

- Low REL will reduce REL of NM\$ but increase genetic progress

Including Feed Saved PTA and REL in NM\$



- Lifetime value of FSAV = \$0.12/lb DMI * 2.6 lactations = \$0.31
- Reliability of NM\$ with FSAV (or RFI) included
 - **NM\$ with FSAV** $REL_{NM\$} \times 0.89 + REL_{RFI} \times 0.11$
 - **NM\$ current** 76%
 - **NM\$ with FSAV** 69%
- Correlation of NM\$ with and without FSAV included = 0.984
- Extra progress from FSAV is worth ~\$8 million/ year nationally

Milk component prices and feed costs (proposed \$)

- Few researchers estimated costs for milk components.
- New data indicates that milk fluid and protein may require less feed and fat more feed than previously assumed.
- Feed cost for fat still poorly estimated because body fat loss during feeding trials not accounted for, only body weight change (next slide).

Income – cost \$	Milk	Fat	Protein
2021 base milk price \$ / lb	0.014	2.10	2.60
2018 feed cost	0.027	0.65	0.90
2021 feed cost	0.007	0.96	0.84
2018 profit / lb	-0.013	1.45	1.70
2021 profit / lb	+0.007	1.14	1.76

Feed consumed to produce milk, fat, or protein



Model	Description	Marginal feed \$ / 100 pounds milk	DMI (lb) for component yields		
			Milk	Fat	Protein
1	Phenotypic	3.32	0.008	2.82	5.32
2	Genomic	8.93	0.087	11.41	8.05
3	Sire genomic	6.08	0.040	6.58	7.38
NM\$	Assumed 2018	7.68	0.225	5.42	7.50
NM\$	Proposed 2021	6.96	0.060	8.00	7.00
ECM	Energy corrected milk	-	0.327	12.95	7.65

Relative emphasis in NM\$ and progress (proposed)

Trait	Relative emphasis		Correlation with index	
	2018	2021	2018	2021
Milk	-0.7	7.1	.51	.62
Fat	26.8	16.3	.78	.71
Protein	16.9	13.7	.68	.73
BWC	-5.3	-10.4	-.23	-.37
RFI	0.0	-14.2	.00	.14
[Feed Saved]		24.6		.39

Many other proposed changes will affect the 2021 emphasis and progress.

Proposed NM\$ revisions for April 2021



- Revise maintenance cost for **BWC** for all breeds
- Include **RFI** and **BWC** feed reductions in **FSAV** for Holsteins
- Adjust feed costs for milk components
- Include heifer livability (**HLIV**) and early first calving (**EFC**)
- Revise opportunity and maturity costs in productive life (**PL**)
- Adjust price forecasts and other economic assumptions

Conclusions



- Selection for Feed Saved should improve US profit by **\$8 million / year**
 - **\$4.3 million** extra progress from DMI data via residual feed intake
 - **\$4.0 million** from more penalty on BWC via more maintenance cost
- RFI could get **~14%** of relative emphasis in net merit, but low REL of **~15%** for RFI and **~37%** for FSAV of young animals will limit progress
- REL of NM\$ is lower when feed intake or other traits with low REL (such as fertility) are included in selection goal, but progress is faster

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