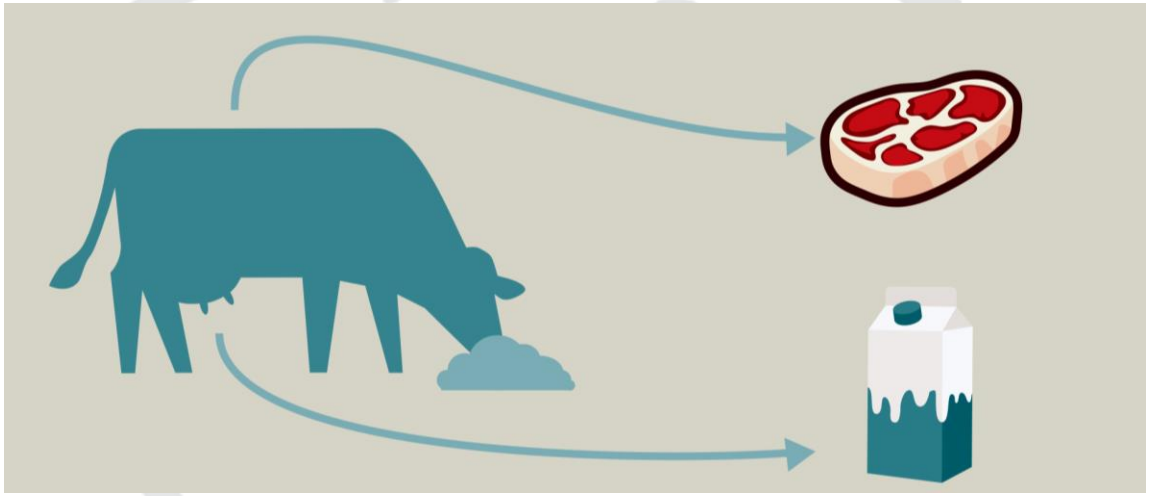
Nordic Genetic Evaluation of Saved feed including use of CFIT data



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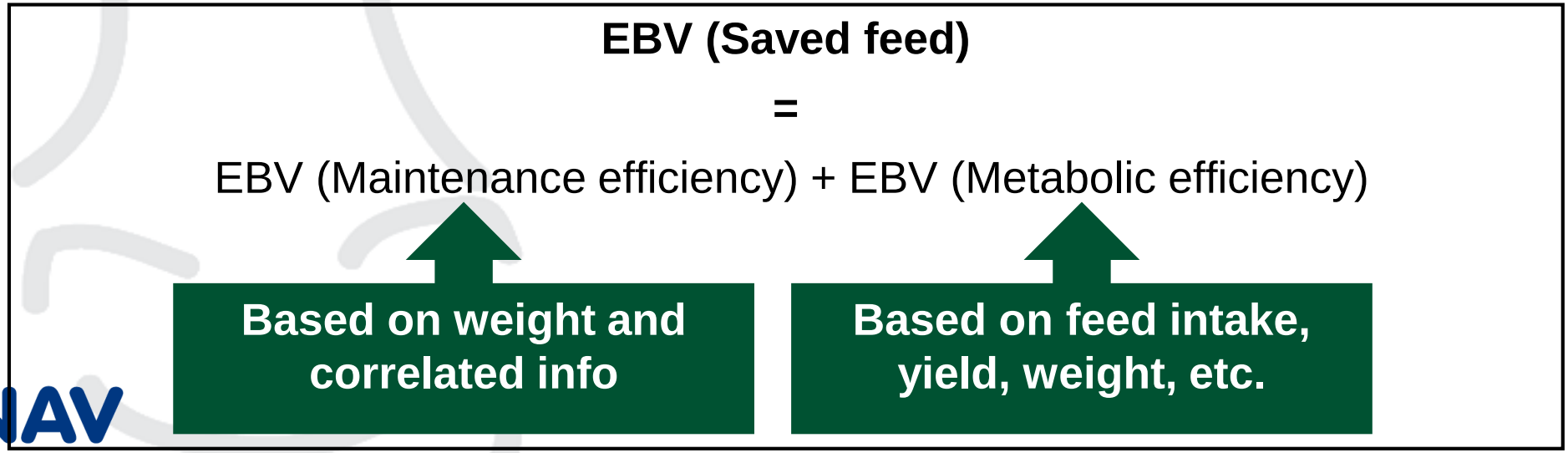
The overall aim of Saved feed

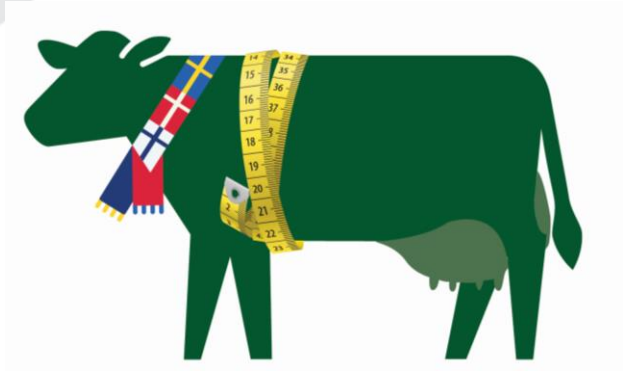
Saved feed

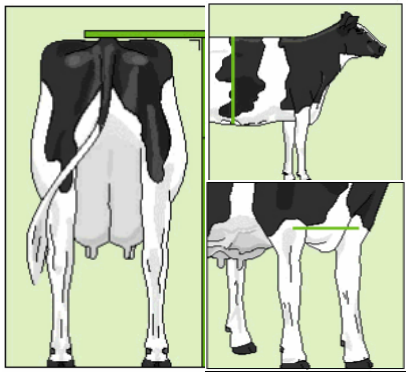
- **Maintenance efficiency (Aug ‘19)**
- **Saved feed in NTM (Aug ‘20)**
- **Metabolic efficiency (Nov ‘20)**



Data used for maintenance evaluation

- **Maintenance efficiency**
  - **Weight data**
    - **Scale (90,000 cows)**
    - **Tape (800,000 cows)**
  - **Conformation (indicator)**
    - **Stature, body depth and chest width**
    - **Data from 3.5M cows**





Genetic parameters
Maintenance

- Maintenance
  - Heritability: 0.65 for HOL+RDC and 0.58 for JER
  - Genetic correlation across parties: highly (>0.98)
- Genetic correlation to indicator traits: moderate/ high (see Table)

HOL/RDC/JER	Stature	Body depth	Chest width
Maintenance	**0.65-0.68**	**0.48-0.51**	**0.53-0.58**

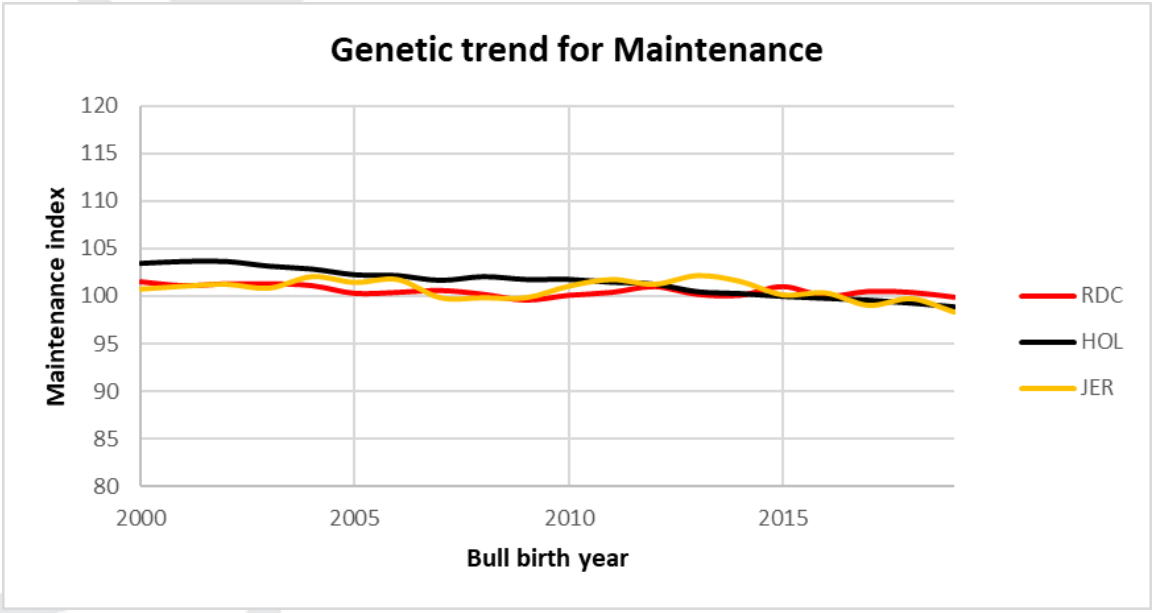
Genomic reliabilities
Maintenance

Genomic reliabilities **(pedigree + genomic information)**

	All breeds
Milk yield traits	70%
Maintenance eff.	60%

Genetic trend for cows
Maintenance

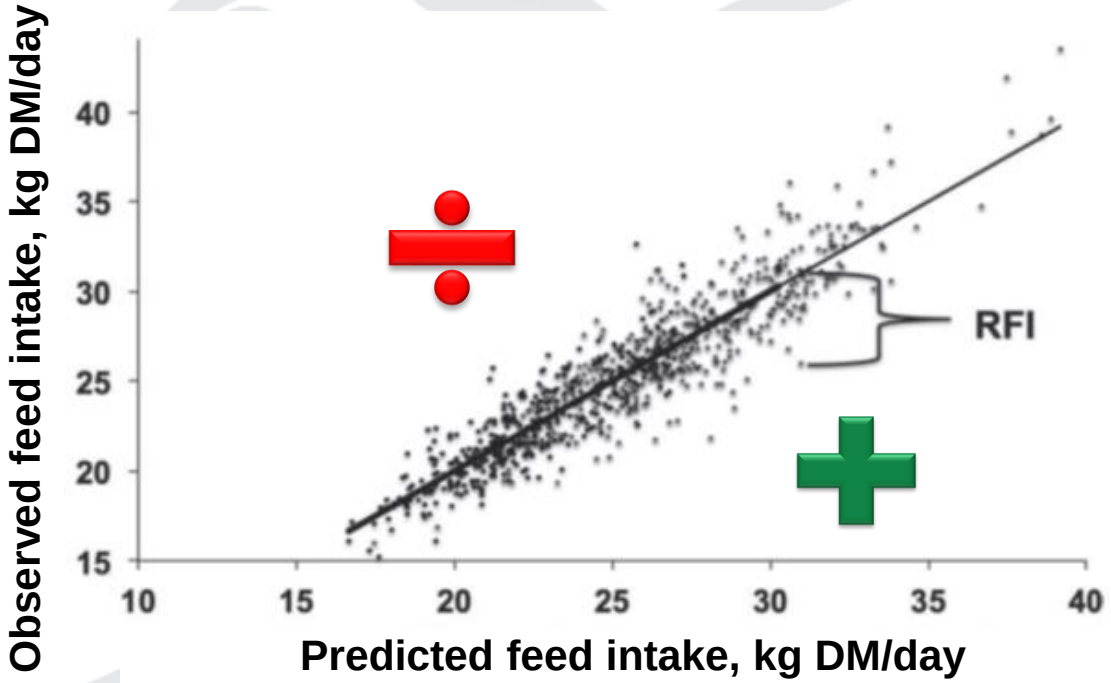
- **Slightly negative trend for HOL and JER → more heavy cows**
- **No trend for RDC**



Metabolic efficiency – what is that?

Metabolic efficiency =
observed feed intake – predicted feed intake

- **Predicted feed intake is based on yield, maintenance, mobilization, etc.**



Feed intake data for metabolic efficiency

- **Nordic HOL (Foulum) | Repeated records from 1st to 3rd parity**
  - **Testing CFIT data**
- **HOL abroad (AUS, CAN, USA) | Repeated records from 1st to 6th parity**
- **Nordic RDC (Luke+CFIT) | Repeated records within 1st to 6th parity**
  - **CFIT data from February 2020 until December 2020**
- **Nordic JER (CFIT) | Repeated records from 1st to 6th parity**
  - **CFIT data from January 2019 until December 2020**

	Nordic HOL	Abroad HOL	Nordic RDC	Nordic JER
	N lactations	N lactations	N lactations	N lactations
1st parity	753	962	810	298
2st parity	553	786	66	236
3+ parity	341	465	84	404
N cows Genotyped	799 436	1,581 1,450	907 462	550 512

Merge research and CFIT data

- Tested for RDC
  - Assumption: the same trait in Luke and CFIT
- Luke cows change very little as expected
- Reranking for CFIT RDC cows as expected
  - Cross validation between biggest Luke herd and CFIT shows a good predictability – indicate same trait is measured
- RDC CFIT data included in the February evaluation
  - Next step is HOL CFIT data

Genetic parameters
Metabolic efficiency

Assumptions

- Heritability: 15% for all 3 breeds
- Same trait across parities and within lactation
  - It is a rough assumption but a consequence of few data
- Assumptions are based on analysis and results from the Saved feed Group
- For the first time in NAV, a Single Step model is used to calculate GEBVs

Genomic reliabilities
Metabolic efficiency

Extra reliability in addition to pedigree information

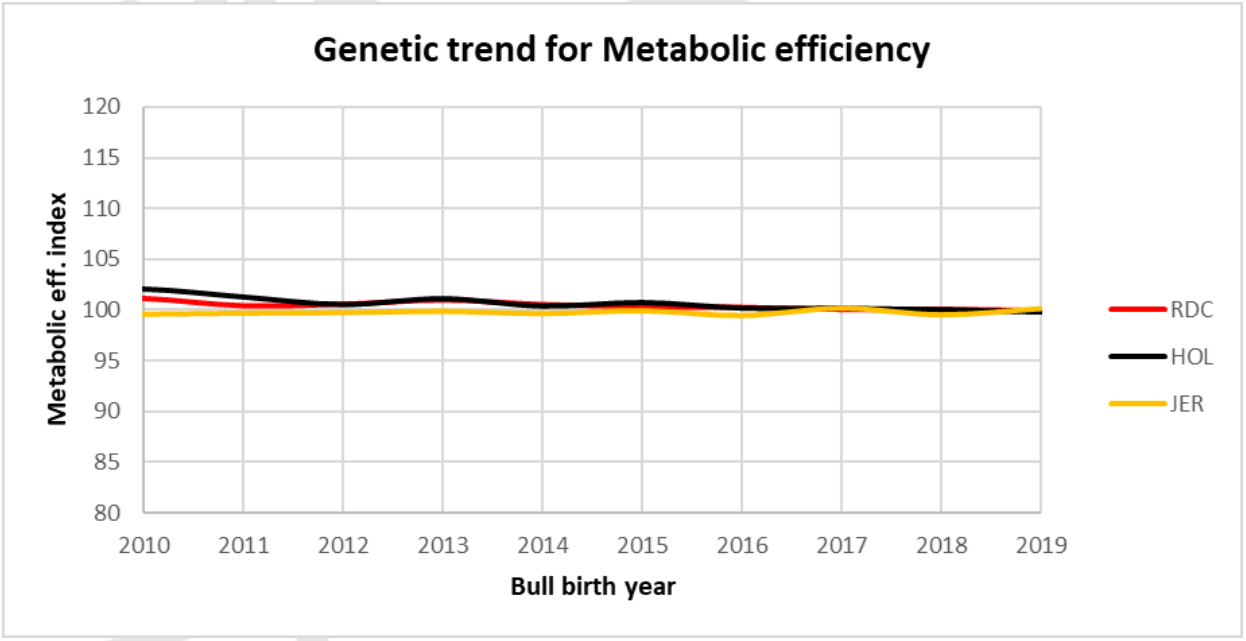
- **Tested for production traits from research data**
  - **Finnish RDC data 310 cows, Lidauer, M.**
  - **EDGP HOL data 1,650 cows, Stephansen, R.S. & Nielsen, U.S.**

	RDC	HOL
Metabolic eff.	1-3%	3-7%

More females in the reference population will increase genomic reliability

Genetic trend
Metabolic efficiency

- No trend for any of the breeds
- Expected since the trait is unselected



Standardization of Metabolic eff.

- **The aim is to standardize Metabolic eff. breeding values on maintenance scale**
  - **Genetic variation is assumed to be the same for Maintenance and Metabolic eff.**
  - **The genomic reliability is assumed to be 3%**

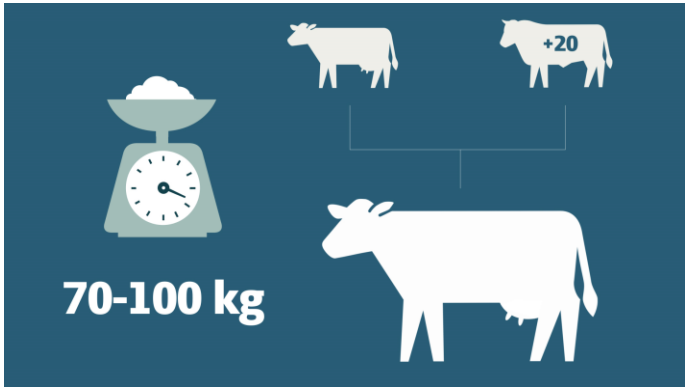
Results from standardization

- **Average and standard deviation for different groups**
  - **Candidates were born from 2017-2019**

Breed	Animal group	N animals	Mean (SD) index
RDC	**Candidate heifers**	**59,726**	**99.7 (2.3)**
RDC	**Candidate bulls**	**7,648**	**100.0 (2.2)**
RDC	Bulls with offspring	308	98.6 (3.9)
HOL	**Candidate heifers**	**118,500**	**100.0 (1.7)**
HOL	**Candidate bulls**	**9,838**	**100.0 (1.6)**
HOL	Bulls with offspring	141	98.8 (5.1)
JER	**Candidate heifers**	**32,749**	**100.3 (1.7)**
JER	**Candidate bulls**	**1,461**	**100.0 (1.7)**
JER	Bulls with offspring	118	100.1 (2.2)

Effect of 1 index unit Saved feed

- The effect of 1 index unit is the same for maintenance and metabolic efficiency
  - RDC = 9.8 kg DMI per annual cow
  - HOL = 8.2 kg DMI per annual cow
  - JER = 6.7 kg DMI per annual cow
- Example for Saved feed:
  - Offspring with parent average of 110 is expected to eat 70-100 kg less DMI in an average lactation



Correlations in Saved feed

- **The correlation between the index for maintenance and metabolic eff. is close to 0**
  - **Expected from the definition of metabolic eff.**
- **Primarily, the maintenance breeding values influence the Saved feed Index**
  - **Caused by low reliability on metabolic eff. GEBVs**

	RDC		HOL		JER	
	Saved feed	Maint.	Saved feed	Maint.	Saved feed	Maint.
Maintenance	0.98	-	0.98	-	0.97	-
Metabolic eff.	0.22	0.01	0.32	0.11	0.20	-0.05

Correlations between NTM sub-indices and metabolic eff.

- **All correlations are close to 0 as expected with few feed intake data**
  - **Remember low reliability on GEBVs for metabolic eff.**

Born 2017 & 2018	RDC	HOL	JER
N bulls	**5187**	**6239**	**951**
NTM	0.14	0.05	0.03
Y-index	0.00	-0.08	0.01
Fertility	0.10	0.15	0.02
Udder health	0.08	0.11	-0.01
Udder	0.10	-0.06	-0.04

Final remarks

- **Both component traits of Saved feed are now available**
- **Selection for the Saved feed index will lead to:**
  - **More profitable cows**
  - **More efficient and climate friendly cattle**
- **With a higher reliability on metabolic eff. indices, we can expect bigger contribution to NTM**
- **Next steps**
  - **Test minimum data period required for evaluation**
  - **Include CFIT data in Holstein evaluation**