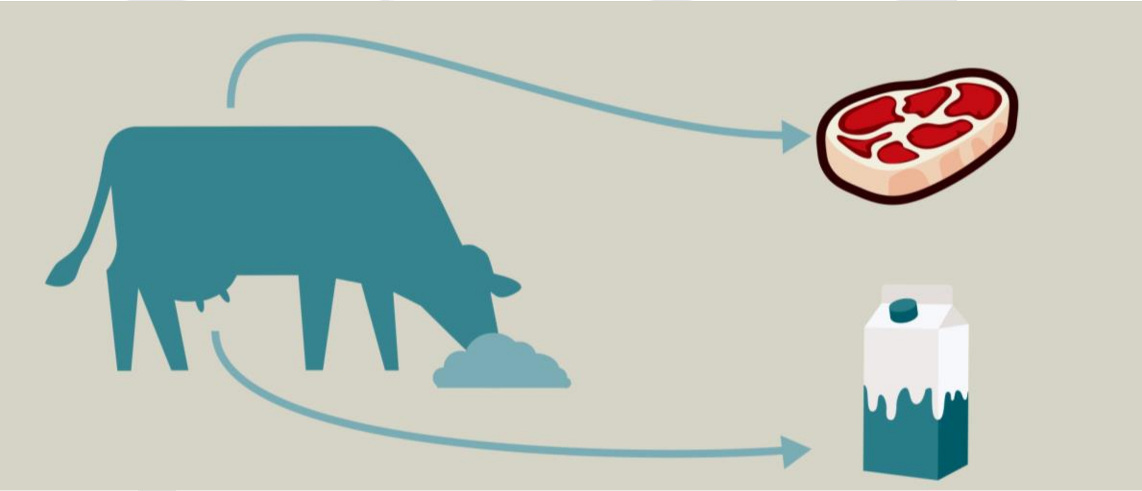
Genetic evaluation for Saved feed

– including metabolic efficiency



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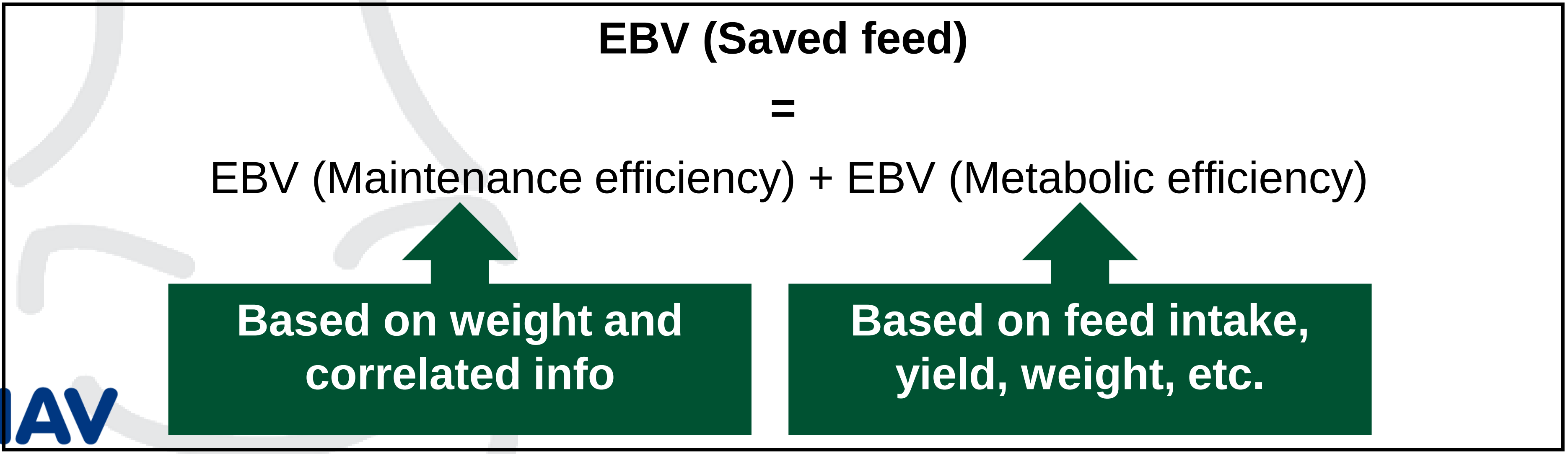
The overall aim of Saved feed

Saved feed

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



EBV (Saved feed)

=

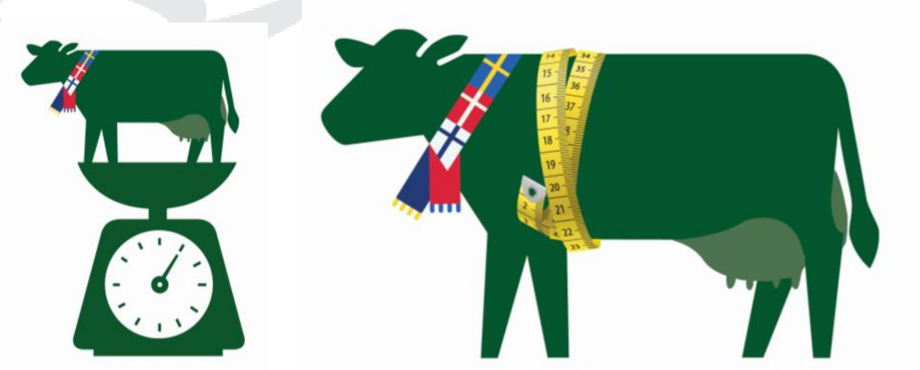
EBV (Maintenance efficiency) + EBV (Metabolic efficiency)

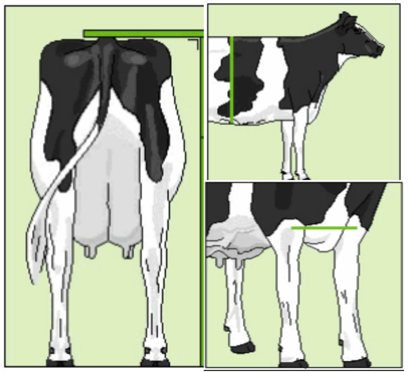
Based on weight and correlated info

Based on feed intake, yield, weight, etc.

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

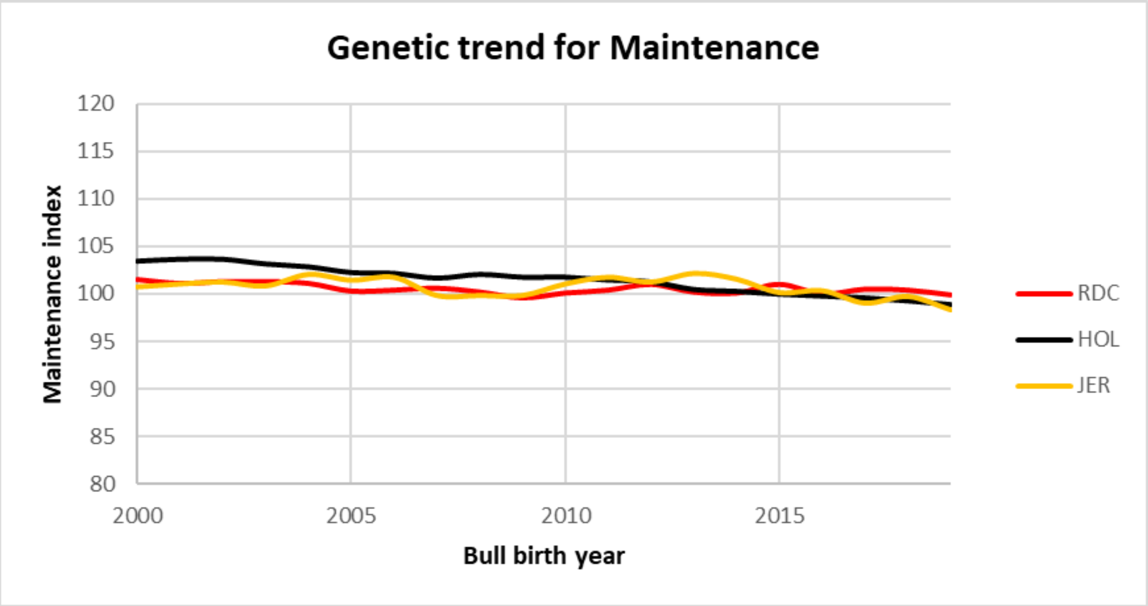
Genomic reliabilities **(pedigree + genomic information)**

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

Genetic trend for cows

Maintenance

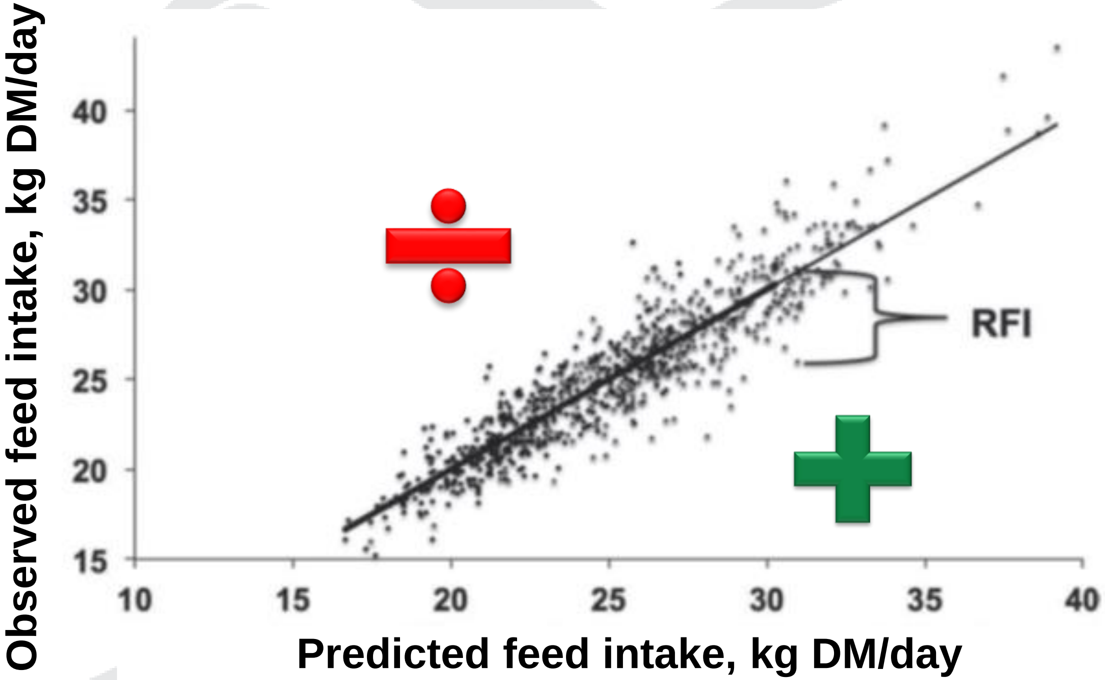
- **Slightly negative trend for HOL and JER → more heavy cows**
- **No trend for RDC**



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**
- **HOL abroad (AUS, CAN, USA)** | **Repeated records from 1st to 6th parity**
- **Nordic RDC (Luke)** | **Repeated records within 1st parity**
- **Nordic JER (CFIT)** | **Repeated records from 1st to 6th parity**

	Nordic HOL		Abroad HOL		Nordic RDC		Nordic JER	
	N cows	**N obs**	**N cows**	**N obs**	**N cows**	**N obs**	**N cows**	**N obs**
1st parity	753	25,542	962	17,953	725	20,355	253	5,602
2st parity	553	18,435	786	8,741			205	4,450
3+ parity	341	10,138	465	5,039			340	7,585
N cows	799		1,581		725		505	
Genotyped	436		1,450		372		475	

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.**

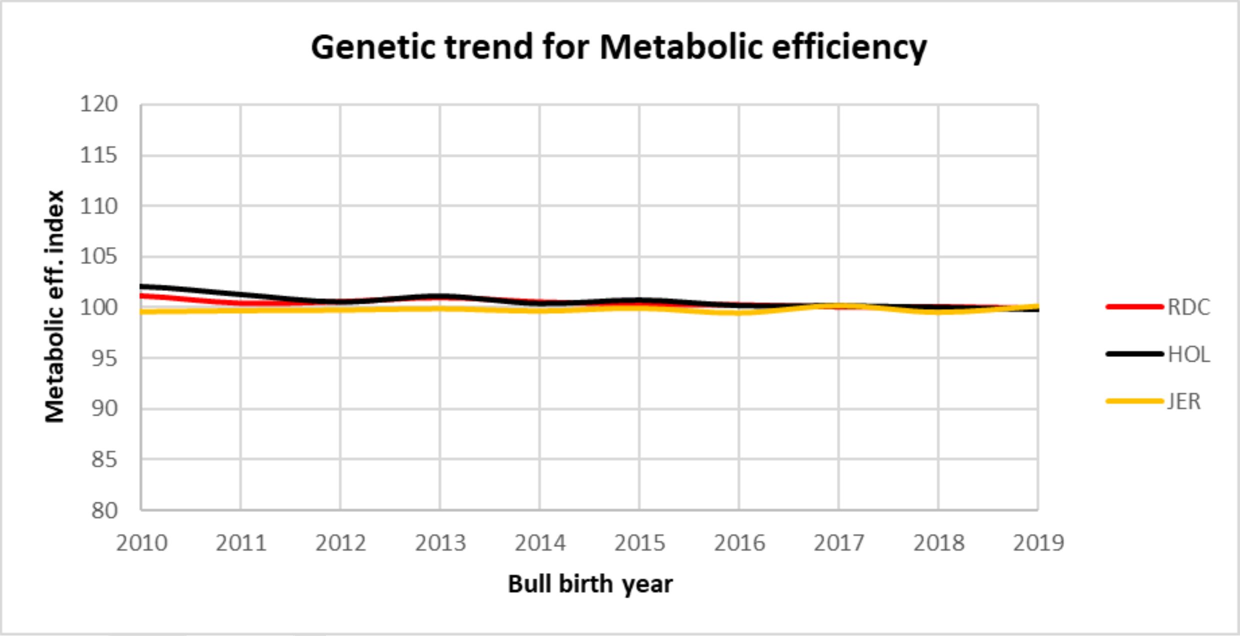
	RDC	HOL
Metabolic eff.	1-3%	3-7%

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%**

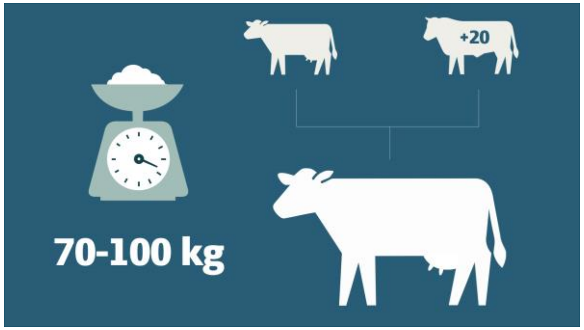
Results from standardization

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

Breed	Animal group	N animals	Mean (SD) index
RDC	Phenotyped cows	679	102.1 (3.9)
RDC	**Candidate heifers**	**58,156**	**100.2 (1.9)**
RDC	**Candidate bulls**	**7,562**	**100.0 (1.7)**
RDC	Bulls with offspring	251	101.5 (3.6)
HOL	Phenotyped cows	798	101.0 (7.6)
HOL	**Candidate heifers**	**111,858**	**100.3 (1.8)**
HOL	**Candidate bulls**	**9,848**	**100.0 (1.7)**
HOL	Bulls with offspring	141	103.4 (5.6)
JER	Phenotyped cows	474	100.1 (3.0)
JER	**Candidate heifers**	**28,642**	**99.8 (1.75)**
JER	**Candidate bulls**	**1,401**	**100.0 (1.74)**
JER	Bulls with offspring	110	100.0 (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 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	1.00	0.97	1.00	0.97	1.00
Metabolic eff.	0.17	-0.01	0.21	-0.01	0.21	-0.02

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.**
  - **We expect 0 correlation to frame and production**

Born 2017 & 2018	RDC	HOL	JER
N bulls	**5195**	**6252**	**951**
NTM	0.00	-0.07	0.12
Y-index	0.02	-0.07	0.05
Fertility	-0.06	0.01	-0.03
Udder health	-0.04	0.00	-0.01
General health	0.01	0.01	-0.06
Frame	0.02	0.02	-0.14
Udder	-0.06	-0.04	0.06

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**