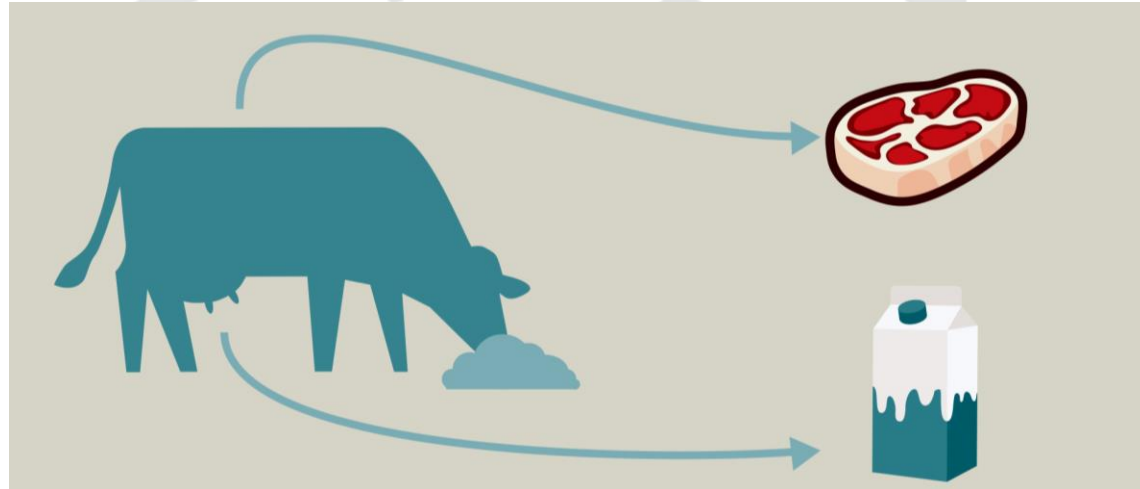# Genetic evaluation for Saved feed
– including metabolic efficiency

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STØTTET AF

mælkeafgiftsfonden

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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)

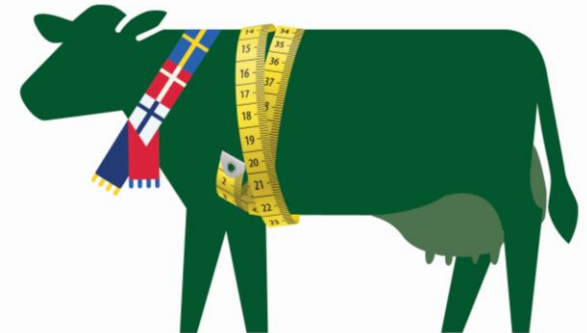**Based on weight and correlated info**

Based on feed intake, yield, weight, etc.

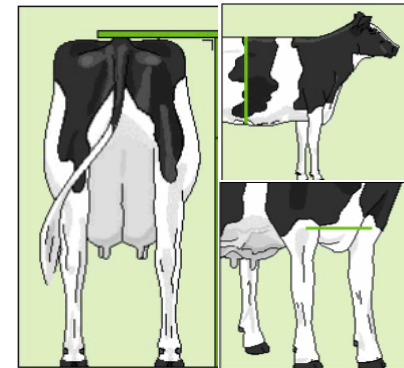# Data used for maintenance evaluation

- **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

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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**

Genetic trend for Maintenance
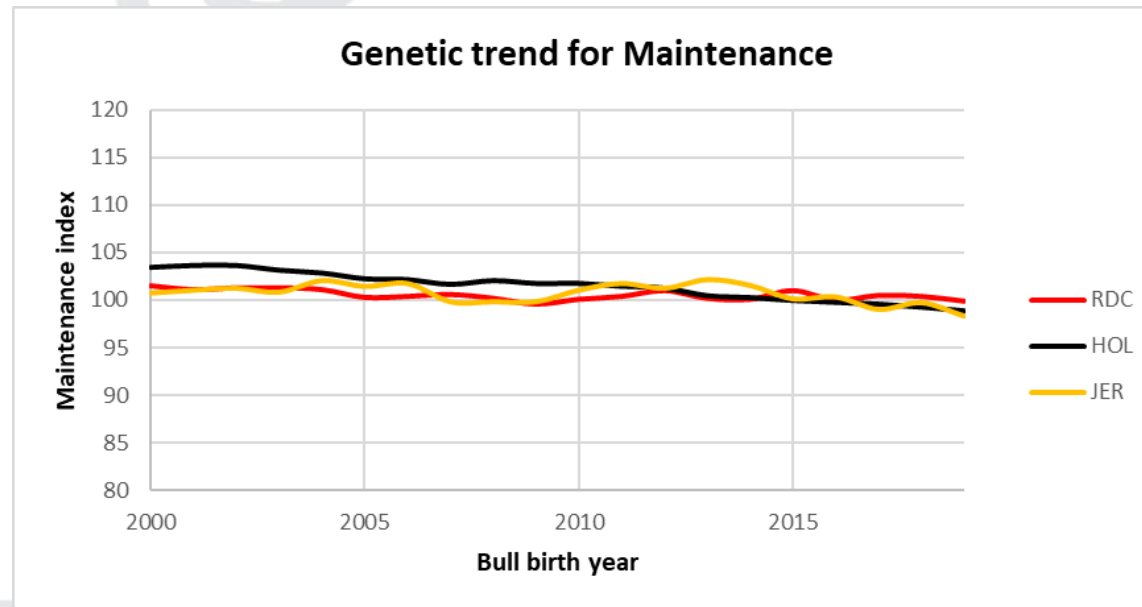
Metabolic efficiency – what is that?

**Metabolic efficiency =
observed feed intake – predicted feed intake**

- **Predicted feed intake is based on yield, maintenance, mobilization, etc.**
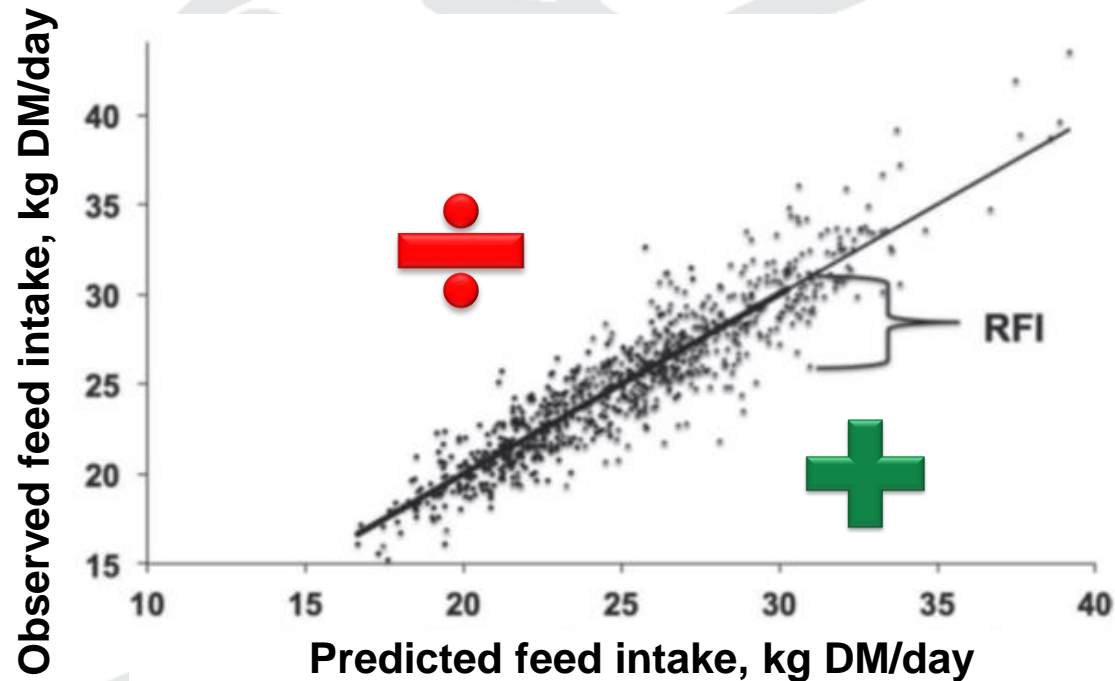
Feed intake data for metabolic efficiency

- **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 Genotyped	799 436		1,581 1,450		725 372		505 475	

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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**

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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**

Genetic trend for Metabolic efficiency
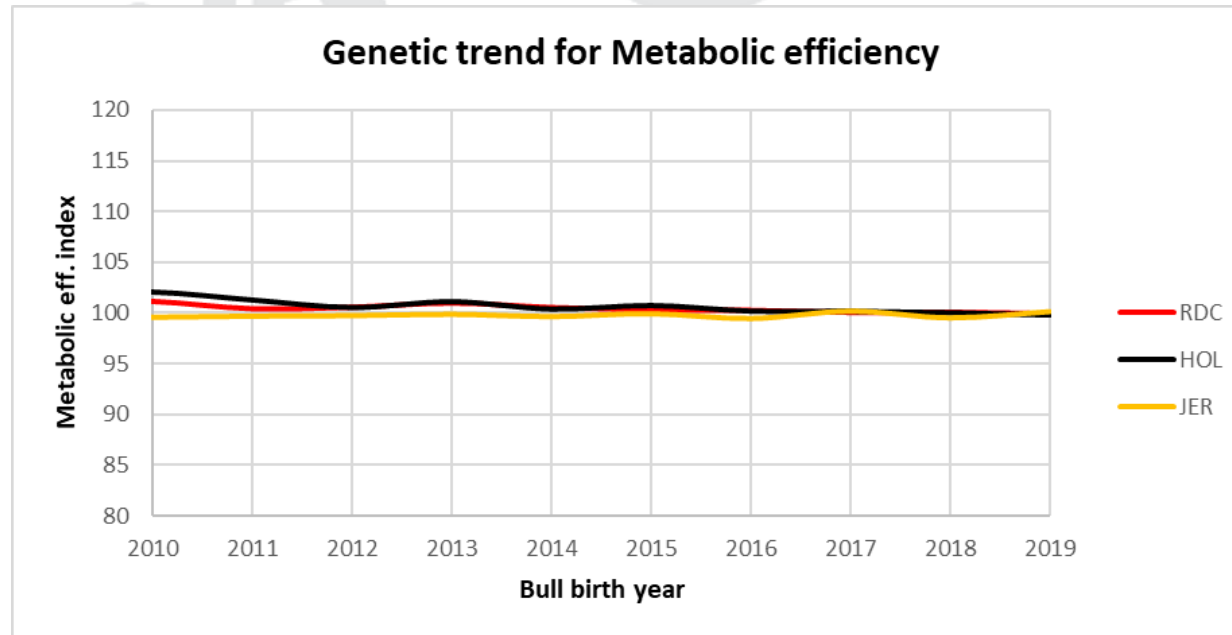
Standardization of Metabolic eff.

- **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)

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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**

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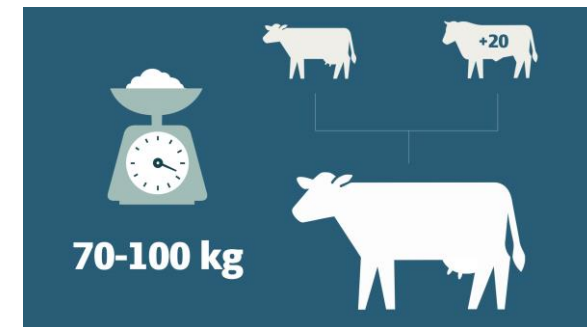
Correlations in Saved feed

- **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

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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

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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**

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