NTM

an index with continuous improvement

Emma Carlén, Anders Fogh, Terhi Vahlsten,
Ulrik Sander Nielsen, Jukka Pösö, Jan-Åke Eriksson,
Gert Pedersen Aamand

NTM – the best measure for economic value of breeding animals under Nordic conditions

Nordic

Total

Merit

- based on many and unique recordings
- created for nordic production conditions
- the most extended breeding goal in the world
- 13 sub-indices combined with economic weights
- gives dairy farmer best profitablility
- internationally accepted and taken after

NTM – brief background

- Breeding goal = Total Merit Index
  - Traits important for economical or other reasons
  - Combine these using economic weights that maximize profit and determines direction/speed of genetic improvement
- Joint Nordic breeding goal introduced 2008
  - Project analysing economic conditions in DFS, developed an economic model and estimated economic values of important traits → economic weights as value per index unit
  - Modified by breed representatives at implementation

Economic values – the basics

Value of 1 kg extra milk, fat or protein

\+ 

Value of one day shorter empty cow

\+ 

Value of one disease case less

\+ .....

= 

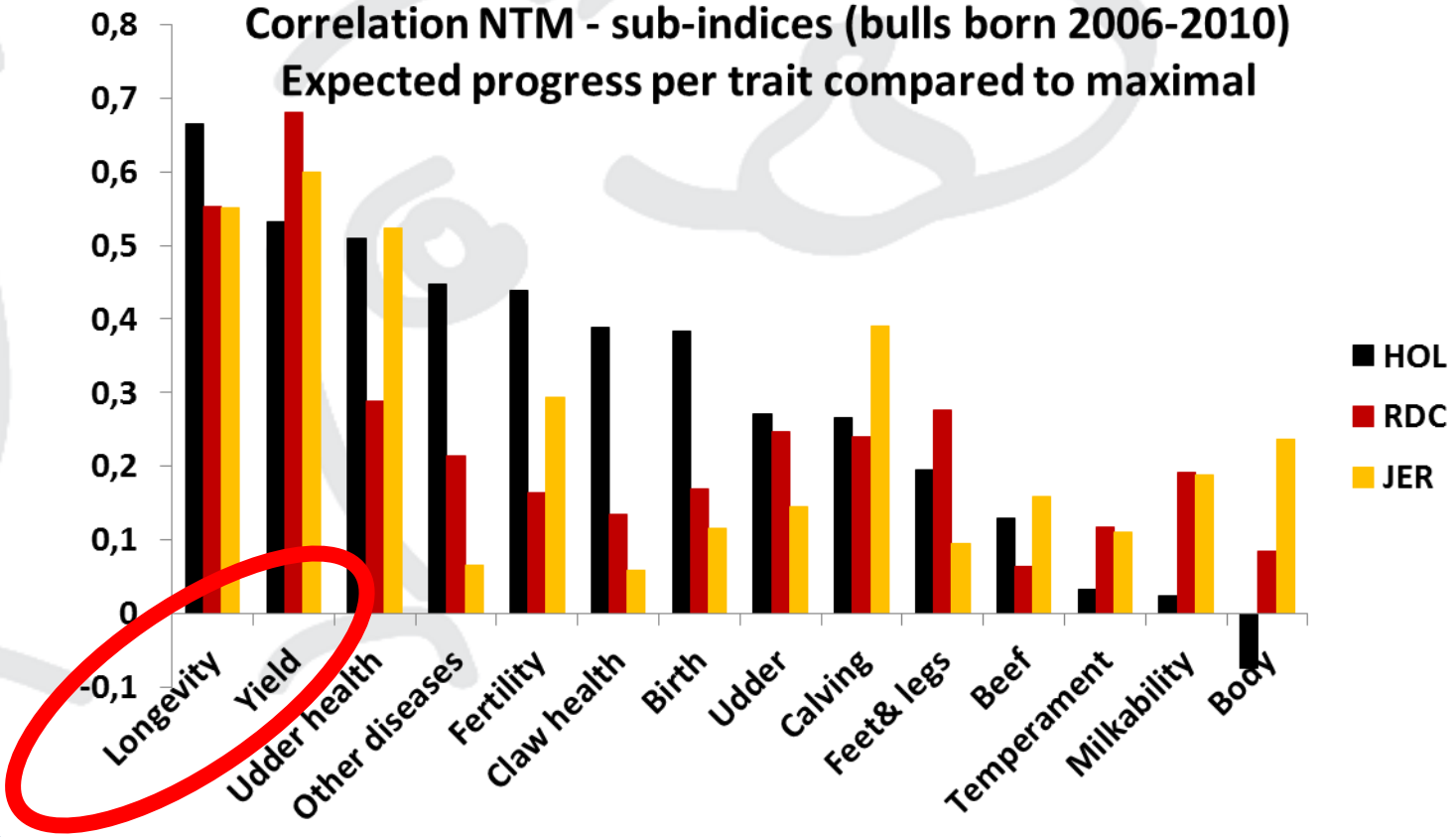
Cows and bulls whose offspring is expected to give best profit get highest NTM

More difficult assign values to traits important for other reasons than economically

- **Ethical**
- **Feeling-based**
- **Future scenarios**

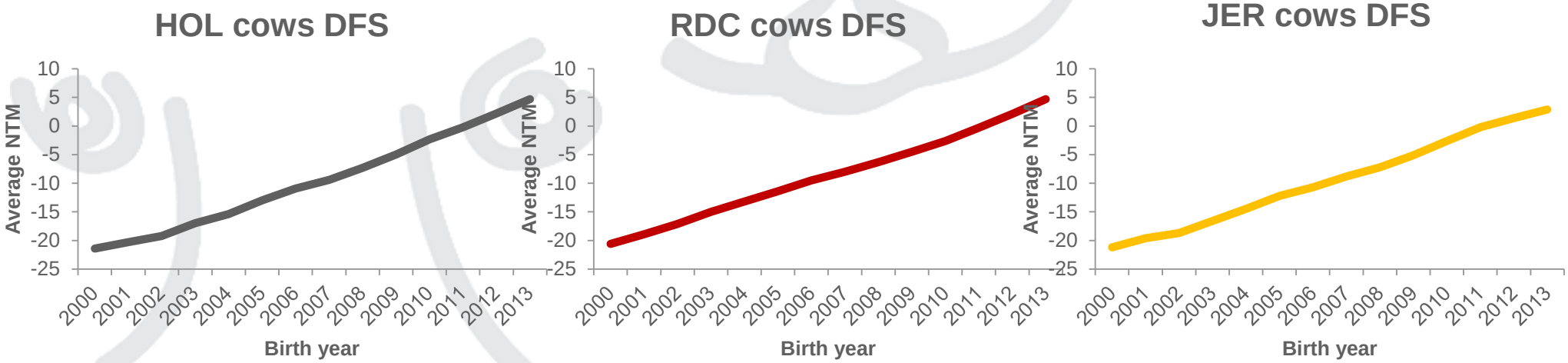
NTM – the effect

- Genetic progress in many traits



NTM – the effect

- More profitable cows
  - Higher NTM has economic impact on breed and herd level



Average progress 2 NTM-units/year →
cow born 2013 is 250 Euro more efficient than cow born 2000

NTM – examples of improvements

- Modified economic weights
  - In NTM and in sub-indices
- Inclusion of new indices
  - Claw health 2011
- Inclusion of more information
  - Milk flow from AMS
- Better models and methods

Sub-indices

- Yield
- Growth
- Fertility
- Birth
- Calving
- Udder health
- Other diseases
- Claw health
- (Body)
- Feet and legs
- Udder
- Milkability
- Temperament
- Longevity

Youngstock survival 2016?

Changes in Udder 2016?

Including a new index: choice → effect

- 1 NTM-unit ≈10 euro
- How spend limited resources to optimize pleasure?

Scenario 1

Scenario 2

Scenario 3

If we decide to distrubute the weight on more traits → progress in more traits but possibly less progress per trait

Including a new index: choice → effect

- Increase in progress for new trait?
- Change in progress for other traits in breeding goal?
- More value of one NTM unit (Euro)?

Present traits In NTM

Value of 1 NTM unit

Present traits + new trait in NTM

Youngstock survival
a sub-index with economic value

Jørn Pedersen,
Emma Carlén, Anders Fogh, Terhi Vahlsten,
Ulrik Sander Nielsen, Jukka Pösö, Jan-Åke Eriksson,
Gert Pedersen Aamand

Outline

- Why is youngstock survival (YSS) important?
- Can we it improve by breeding?
- Youngstock survival in NTM?

The importance of YSS

- Losing young animals implies economic loss
  - No replacement heifer or reduced beef sales
  - Extra work and possibly health costs

- Animal welfare and consumer concerns
- NTM focus on productive+long-lasting=profitable cows
  - Currently not covering rearing period for heifer and bull calves

New born

30 days old

Maiden heifer

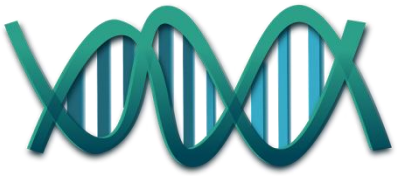
Tools to follow up, control and improve…

- Recent report from German dairy industry
- Holstein calves born without symptoms starved to death between 1-6 months of age
- Heritable - mutation caused disfunctional fat metabolism
- Estimated large economic impact
- Test for carriers developed

Without registration no possibility for detection and action

YSS index – background

- Breeding for lowly heritable traits possible are often important to prevent deteroriation
  - Selection for stillbirth, longevity: prevents impaired genetic level for YSS
  - To improve a trait direct selection most efficient
- Calf survival project:
  - Analysed data on calves born alive from 1998
  - Excluded: slaughtered and exported animals
  - 4 single traits depending on sex of calf and rearing period
  - Low heritability (few %) ≈ stillbirth and health traits



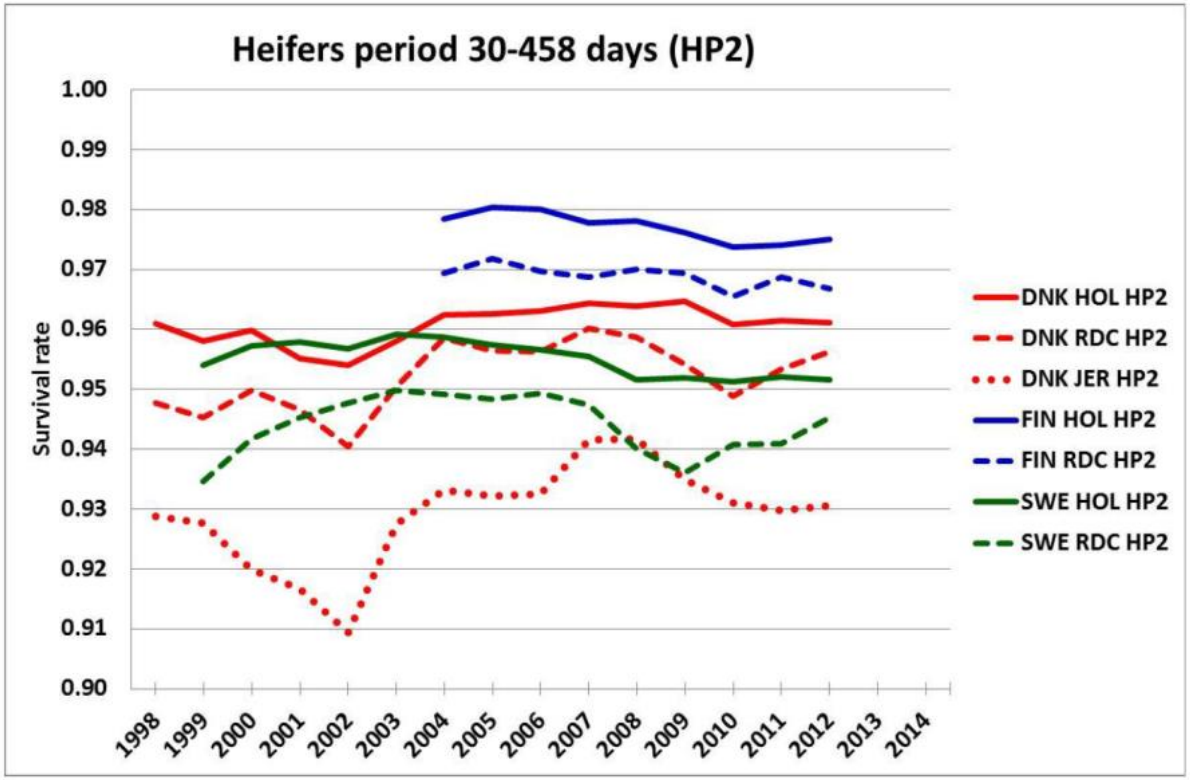
YSS index – background

- NAV sub-index for YSS 2014
  - Created by weighing together four single traits
  - Economic values single traits and YSS from revised economic model
    - only Danish assumptions
  - Results presented on NAV workshop
  - EBV YSS and single traits published on NAV Bull Search, not yet in NTM

Single traits	Rearing period
Heifer period 1 (HP1)	Day 2 up to 1 month
Heifer period 2 (HP2)	1 up to 15 months
Bull period 1 (BP1)	Day 2 up to 1 month
Bull period 2 (BP2)	1 up to 6 months

Survival rate – rather constant over years

- Survival rates differ between periods/genders/countries/breeds*
  - Example: phenotypical survival trends in HP2 in different countries/breeds



Country level

- Highest FIN
- Lowest SWE (if ignoring JER)

Breed level

- Highest HOL ——
- Lowest JER .....

* All values are presented in report: NAV evaluation for calf survival

It can be improved by selection

- Example from NAV Bull Search
  - 2 proven red bulls (NTM=26) with high or low value for YSS index

International ID	Name	Birth year	NTM	Yield	Growth	Fertility	Birth	Calving	Udder health	Other diseases	Claw health	Frame	Feet & legs	Udder	Milking speed	Tempe-rament	Longevity	Youngstock survival
DNK000000000036327	R Fanfare	2004	26	117	125	98	102	114	103	105	89	107	107	114	112	91	114	121
FIN000000000044412	S.Valpas	2006	26	123	108	111	94	94	106	96	95	113	92	101	105	108	109	77

- **Economic difference in YSS**
  - Diff YSS between average daughters: (121-77)/2=22 units; Value/index unit RDC: 0.3638€
  - ➢ **Per cow and life-time (3 yrs): 22*0.3638*3= 24€**

- **Phenotypic difference in YSS** (example HP2)
  - Diff HP2: (123-73)/2=25 units; Survival rate/index unit HP2: 0.00192%
  - ➢ **In this period: 25* 0.00192*100 ≈ 5 %**

Two important decisions to be made…

Should YSS be included in NTM?

And how should we do it – which weight and in separate index or not?

- Process
  - New revised material (economic values) at this meeting
  - Country- and breed discussions during autumn
  - NAV workshop in Jan 2016 – presenting alternatives
  - NAV board meeting Spring 2016

YSS in NTM?

- NTM should ideally include all important traits
- New economic values for YSS calculated (Jan 2015)
  - Added in original economical model from 2008 to make it comparable with values for other sub-indices
  - Some additional assumptions needed for YSS
  - Relation income and cost (eg milk price/feed cost) relatively constant
- Now based on assumptions from all three countries (Sept 2015)
  - Previously only Danish input values

BIOLOGICAL ASSUMPTIONS*:

- Mortality rates
- Average age of death

Data: calves 2008-2012
Excluded: exported/slaughtered

Some differences between genders / countries / breeds

ECONOMICAL ASSUMPTIONS = ADDITIONAL COSTS YSS**:

- Destruction
- Extra cost to prevent death
- Extra work

Some differences between periods**

NORMAL COSTS (same as 2008):

- Feed
- Housing
- Labour

ANIMAL VALUE** (same as 2008):

- Slaughter price
- Heifer

RDC/HOL €1200
JER €700

ECONOMIC VALUES FOR YSS

That are comparable with other NTM traits

NAV

Nordisk Avlsværdi Vurdering • Nordic Cattle Genetic Evaluation

*,** See all values in table 1-2 and 3 in Note on economic value of Young Stock Survival

Resulting economic values

- **Value (€) of improving survival by 1% unit per cow and year**
  (Multiply by 100 ≈ value of one calf)

Country differences

- Diff in survival rate and economic assumptions

DFS average

- **Highest HP2**
  ≈ €406 for RDC heifer between 1-15 mo of age
- **Lowest BP1**
  ≈ €189 to loose RDC bull calf younger then 1 mo

Table 4 in Note on economic value of YSS

	DNK	FIN	SWE	Average
		RDC		
HP1: Survival of heifers 2-30 days	3.46	3.52	3.20	3.40
HP2: Survival of heifers 31-458 days	4.09	4.08	4.02	4.06
BP1: Survival of bull calves 2-30 days	1.35	2.17	2.14	1.89
BP1: Survival of bull calves 31-184 days	1.96	3.40	3.50	2.96
		HOL		
HP1: Survival of heifers 2-30 days	3.36	4.20	3.19	3.58
HP2: Survival of heifers 31-458 days	4.01	4.84	4.01	4.29
BP1: Survival of bull calves 2-30 days	1.20	2.15	1.99	1.78
BP1: Survival of bull calves 31-184 days	1.73	3.36	3.29	2.79
		JER		
HP1: Survival of heifers 2-30 days	1.92			1.92
HP2: Survival of heifers 31-458 days	2.38			2.38
BP1: Survival of bull calves 2-30 days	0.19			0.19
BP1: Survival of bull calves 31-184 days	0.73			0.73

Economic value of YSS = cost of losing youngstock
(value first month as expected a bit higher than for stillbirth)

Resulting economic values - alternatives

- **Value (€) of improving survival by 1% unit per cow and year**

DFS average (Sept vs. Jan)

- Value of esp. bull calves ↑ with assumptions also from FIN and SWE
- Heifer values more similar

Alt 1: ↑ heifer value

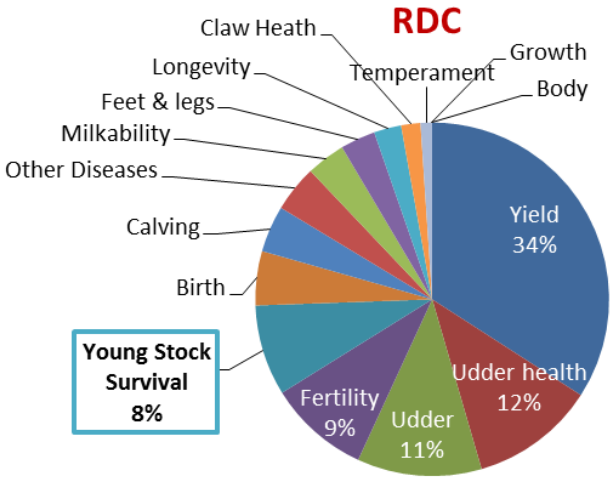
Alt 2: ↑ beef value

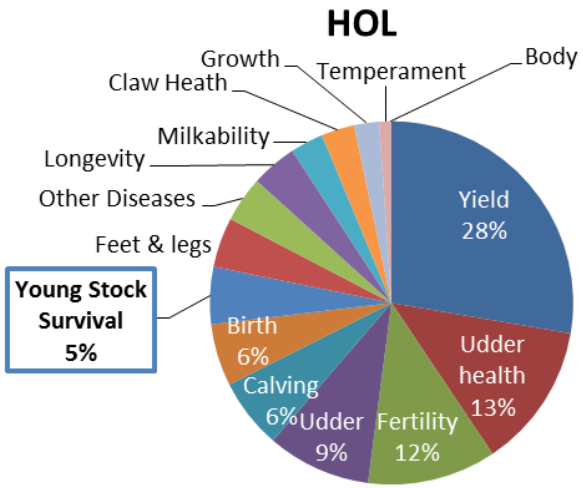
Table 5 in Note on economic value of YSS

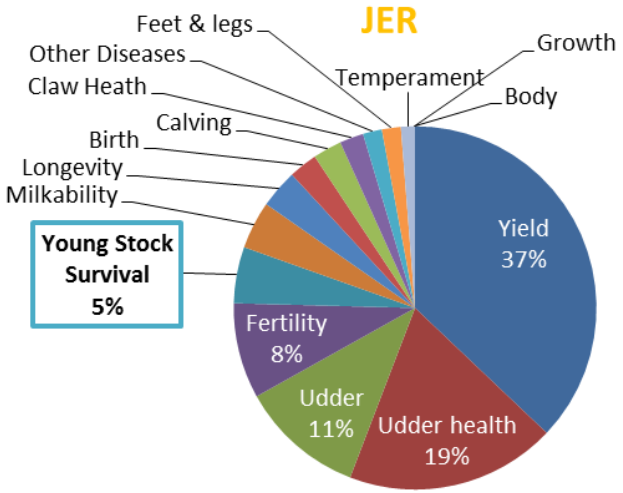
	Average Table 4	Heifer value + 10% Average	Beef value + 10% Average
		RDC	
HP1: Survival of heifers 2-30 days	3.40	3.96	3.40
HP2: Survival of heifers 31-458 days	4.06	4.64	4.07
BP1: Survival of bull calves 2-30 days	1.89	1.89	2.30
BP1: Survival of bull calves 31-184 days	2.96	2.96	3.38
		HOL	
HP1: Survival of heifers 2-30 days	3.58	4.17	3.59
HP2: Survival of heifers 31-458 days	4.29	4.88	4.29
BP1: Survival of bull calves 2-30 days	1.78	1.78	2.20
BP1: Survival of bull calves 31-184 days	2.79	2.79	3.21
		JER	
HP1: Survival of heifers 2-30 days	1.92	2.26	1.92
HP2: Survival of heifers 31-458 days	2.38	2.72	2.38
BP1: Survival of bull calves 2-30 days	0.19	0.19	0.43
BP1: Survival of bull calves 31-184 days	0.73	0.73	0.96

Weight of YSS – compared to other traits

Relative economic weight (%)*







YSS higher for all traits except:

- Yield, Udder health, Fertility (all breeds) + Udder (due to ↑ wt here)
- Calving, Birth (in Holstein only)

* Based on economic wt in table 8 in Note on economic value of YSS

Economic weight of YSS in NTM

Value (€) 1 index unit YSS = economic wt in NTM

RDC: 2.03 / HOL: 1.40 / JER: 0.92 €

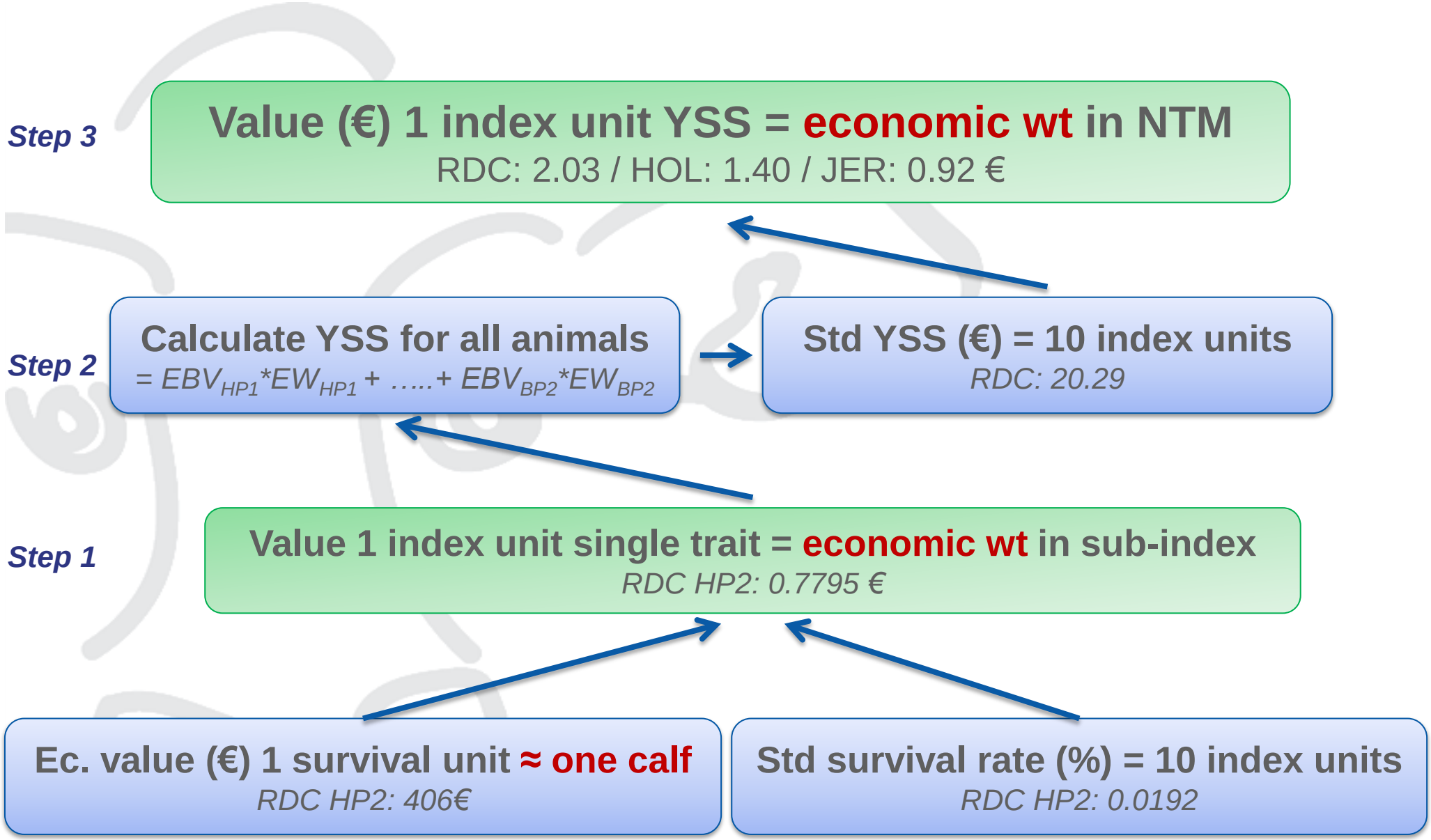
Higher genetic variation in survival + higher value for growth in **RDC**

Higher values **RDC** and **HOL** compared to when DNK data only

NAV

Nordisk Avlsværdi Vurdering • Nordic Cattle Genetic Evaluation

*** See all values and involved steps in table 6 in Note on economic value of YSS**



*** See all values and involved steps in table 6 in Note on economic value of YSS**

Effect of breeding for YSS?

- Look at effect rather than economic weights
- Sire EBV correlations* - expected size of re-ranking of animals
  - Bulls born 2006-2008 (633 RDC, 948 HOL, 149 JER)

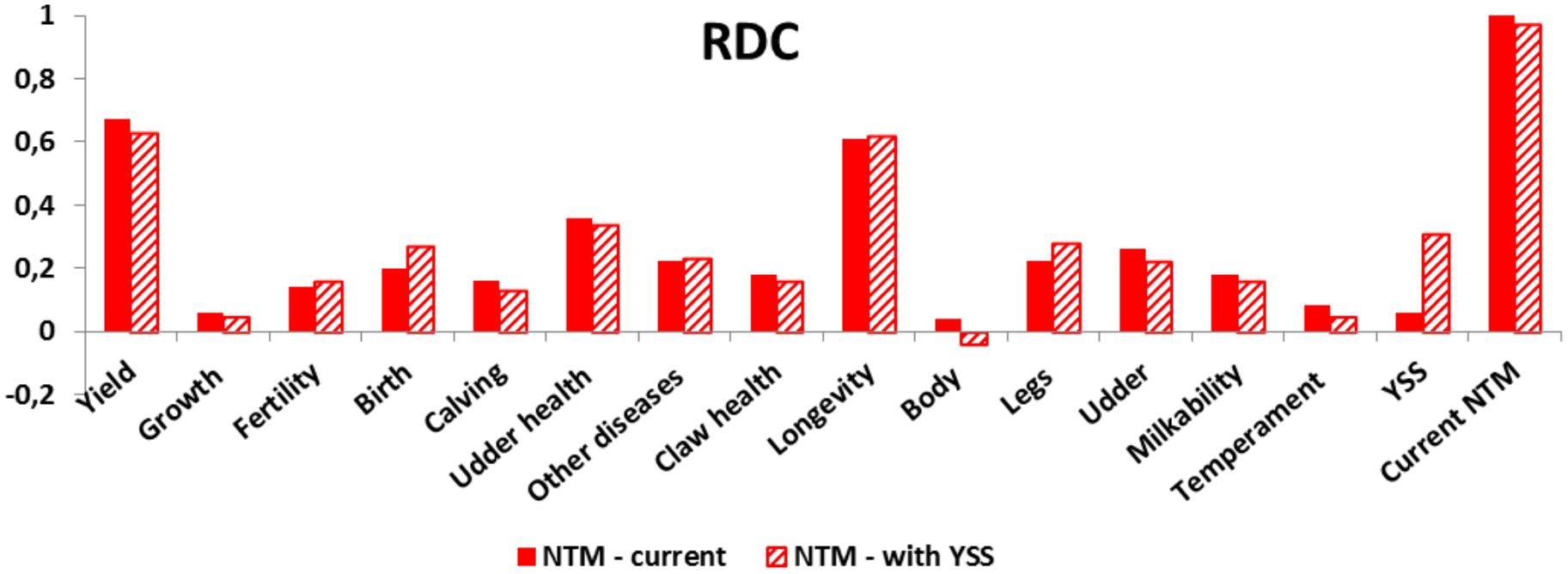
1. YSS vs. NTM (current) and sub-indices
   - No strong correlations to other traits (most correlations close to 0)
   - Positive to NTM + functional traits and negative mainly to Body
   - ➢ Small correlated effects expected by including YSS in NTM

2. NTM (current) – NTM (with YSS)
   - ➢ **Small effect on NTM** - especially in HOL/JER, a bit larger RDC
   - ➢ **Fairly small difference in effect on many sub-indices**

*** See all values in table 9 and 10 in Note on economic value of Young Stock Survival**

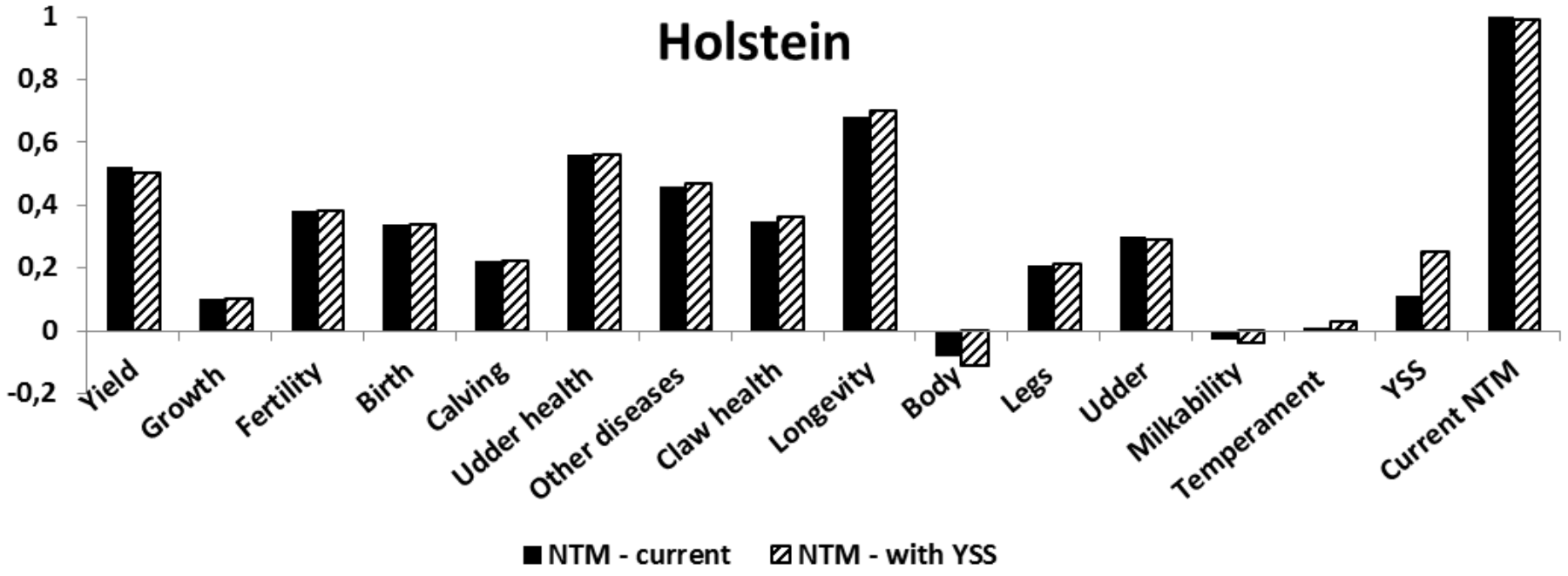
Effect of including YSS in NTM - RDC

- **Fairly small difference in current sub-indices and NTM**
  - Largest change: ↑ progress in YSS (RDC +0.25) and ↓ in Body
  - For RDC also ↑ in Birth and Legs, slight ↓ in Yield and Udder



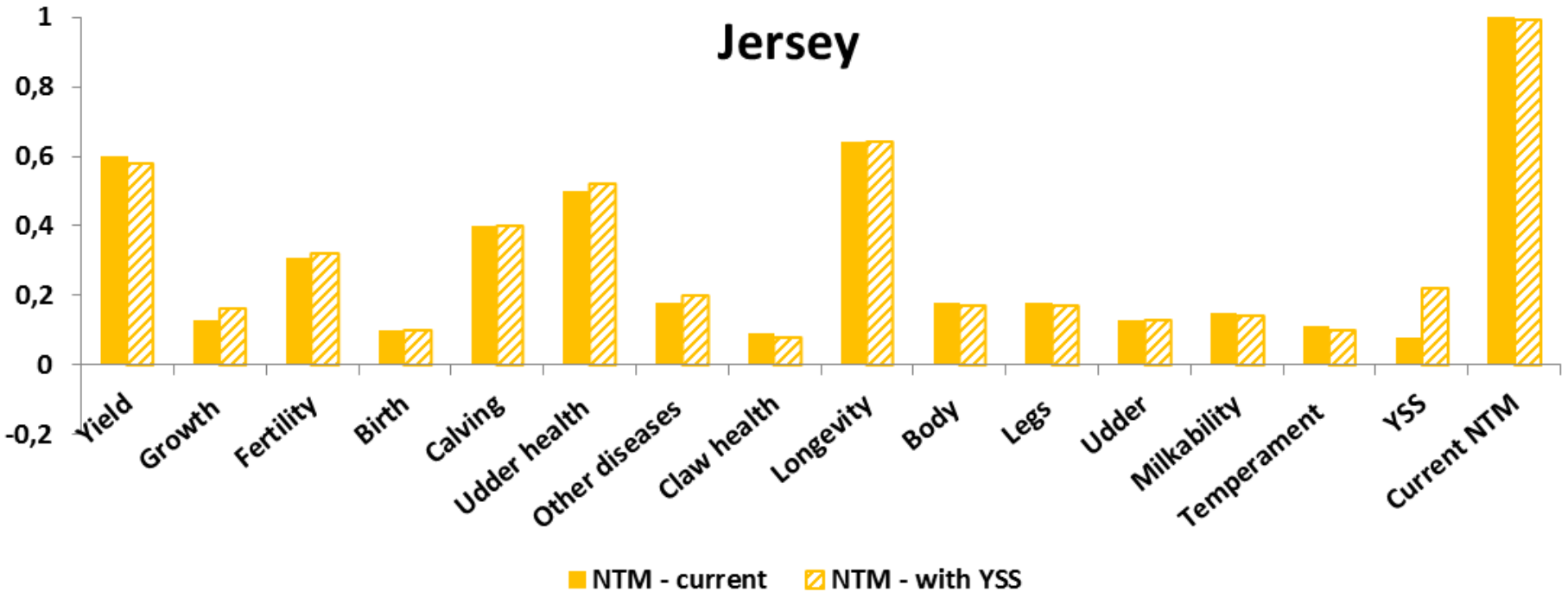
Effect of including YSS in NTM - HOL

- **Small difference in current sub-indices and NTM**
  - Largest change: ↑ progress in YSS (HOL +0.14) and ↓ in Body

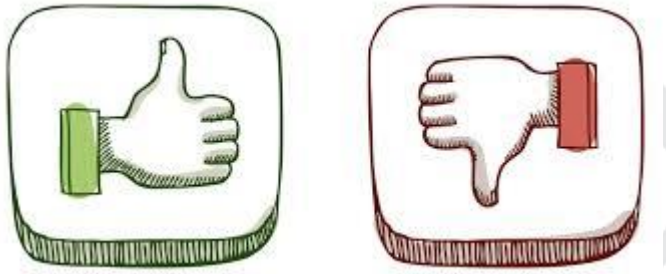


Effect of including YSS in NTM - JER

- **Small difference in current sub-indices and NTM**
  - Largest change: ↑ progress in YSS (JER +0.14)



Pros and cons by including YSS in NTM



- Has an economic value
- Strengthen ”NTM brand”
- Detect worst YSS bulls
- No big effect current NTM
- Improve genetic trend YSS

- Small negative effect on a few other sub-indices

To sum up Youngstock survival

- If decision to include YSS (with an agreed weight), general advice for a separate index:
  - More efficient breed directly for trait
  - Not highly correlated to other traits

- More analyses and discussions might be needed

With Youngstock survival in NTM, we will get a more economically optimal breeding goal