2018 Review of Nordic Total Merit Index

Introduction to the NTM-model

Assumptions on biological, economic and production circumstances

Basic results

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January 2018

Nordic Total Merit Index

Nordic Total Merit Index

= Index weight$_{Yield}$ * (Yield index-100)

\+ Index weight$_{Fert.}$ * (Fertility index-100)

\+ Index weight$_{Udderhealth}$ * (Udder health index-100)

\+ and so on: 15 main indexes

Behind the 15 main indices there are: 90 single traits

Calculation of economic values are based on the value of each of the single traits

Definition of economic value

- The value of improving the trait with one unit – keeping the remaining traits constant
- Future production circumstances – for dairy cattle 10 years into the future:
  - Economy and production systems should be as expected in 2028
  - BUT especially economy is difficult/impossible to predict - mostly based on current circumstances

Economic values for single traits

Annual account for a herd (in an Excel sheet)

- Income from production: Milk and beef
- All variable costs included

- The bottom line:
  - *Annual profit for the herd*
  - *Annual profit per average cow (annualized cow)*

Economic values for single traits

Example: Protein yield

- Base situation: Profit per cow
- Protein breeding value increased by 1 kg for all 1st lactation cows: Profit per cow
  - *Protein yield in later lactations constant*
  - *Milk and fat constant*
  - *All other traits unchanged*
- Difference in profit per cow

  = value of increasing protein breeding value by 1 kg in 1st lactation

Economic scenarios

Workshop 2017:
Increased production in organic herds should be considered

Current share of milk from organic NAV herds: ~15 %

Separate calculation of economic values in a Conventional and Organic scenario

Separate economic scenarios per country (DNK, SWE,FIN)

Scenarios DNK SWE FIN

Biological parameters: Production levels per breed and country

DNK: RDM, DH, Jersey

SWE: SRB, SLB

FIN: FAY, HOL

Parameters that differ per breed and country *(in "2018 Review of Nordic Total Merit Index – Appendix; Biological and economic assumptions")*

- *Weights, Calving age, Yield, Fertility, Stillbirth rate*
- *Calving difficulty, Frequency of diseases, Claw health, Young stock survival*
- *Replacement rate*

Changes since 2008

New traits

- **Claw health introduced 2011**
- **Young Stock Survival introduced 2016**
- **In General health 2017: Ketosis and other metabolic become separate traits**

Changes since 2008: Economic assumptions

Much more detailed than in 2008

- Milk price more fluctuating than before
- Beef prices higher – very high in SWE (But, costs of producing surplus heifers have increased, due to higher feed costs)
- Generally increased costs (e.g. Wages, AI)
- Veterinary costs
  - Much higher costs
  - Health agreement schemes reduce costs for some diseases (especially mastitis) – common in DNK, similar programs tested in SWE and FIN. For 2028 it is assumed that health agreement schemes are common in all countries
  - Organic: No health agreement schemes

Changes since 2008

Biological assumptions – production levels

- In many cases of no/low importance (e.g. yield)
- Calving ease: Lower freq. of difficult calvings: *It will reduce economic value of calving ease*
- Replacement rate: Lower replacement rate *More surplus heifers*

Calving ease (4 categories):
Pct. difficult with vet. ass. (high cost - category)

	RDC (HOL is similar)		
	DNK	SWE	FIN
2008, 1st	1.5	1.2	1.0
2018, 1st	0.4	0.3	0.1
Difference, 1st	*-1.1*	*-0.9*	*-0.9*
2008, later	1.0	0.3	0.6
2018, later	0.4	0.3	0.2
Difference, later	*-0.6*	*0.0*	*-0.4*

Replacement rate, pct.

	HOL (JER similar – RDC smaller difference)		
	DNK	SWE	FIN
2008	42.4	41.6	39.4
2018 conventional	37.1	35.9	32.5
2018 organic	34.5	32.6	30.1
Dif. conventional	*-5.3*	*-5.7*	*-6.9*
Dif. organic	*-7.9*	*-9.0*	*-9.3*
2028 assumed	32.0	32.0	32.0

Changes since 2008

Structural changes due to use of sexed semen

Use of sexed semen for 1st AI (data from 2016)							
	RDC			HOL			JER
	DNK	SWE	FIN	DNK	SWE	FIN	DNK
Heifers	30	5	5	30	9	9	42
Cows	4	2	4	3	2	5	20

Workshop 2017:
Increased use of sexed semen should be considered

Replacement rate, sexed semen and beef semen

2017 situation

- Replacement rate much lower than in 2008
- Sexed semen used mostly for heifers (most in DNK)

- Consequence: Large surplus of replacement heifers
- Beef semen is used for cows in order to reduce number of surplus heifers

Future:
Replacement rate and sexed semen

Replacement rate: 32% all breeds and countries

Use of sexed semen in the NTM-model - Sexed semen only used at 1st AI – otherwise conventional semen

- **52% of calves born at 1st calving are by sexed semen**
  Rest (48%) at 1st calving by conventional semen (pure breed)
- **3-4% of calves born by older cows are by sexed semen**
  Rest (96-97%) at later calvings are by conventional – pure breed or beef breed

Future: Beef semen

Replacement heifers (incl. those disposed before 1.calving):

- **Around 65% at 1st calving** (45% by sexed semen – 20% conv. semen)
- **Rest at later calvings** (35% of replacement heifers – 30% of older cows)

For the remaining older cows

- **Beef semen** (around 70% available)
- **In the new NTM-model there are no surplus heifers**

Heifer-crosses treated as slaughter animals

Genetic improvement will only affect crosses by 50% compared to purebred (growth, form, young stock survival, direct calving traits(birth index))

Basic results for single traits
Average of DNK, SWE and FIN

Table 2.2 – 2.8 in ”Review of Nordic Total Merit Index – Results”

Results presented

- Original 2008-results
- “Classic”: No sexed semen – no beef semen – otherwise as new model (large number of surplus heifers)
- Conventional: With sexed semen and balancing beef crosses
- Organic: As conventional – but separate economic parameters and production level

Basic results for single traits
Average of DNK, SWE and FIN

Table 2.2 – 2.8 in ”Review of Nordic Total Merit Index – Results”

Yield, Diseases, Claw health, Conformation

- *Values are independent of use of sexed semen and beef semen (similar in ”classic” and conventional)*

Beef production, Fertility, Calving traits, Young Stock Survival, Longevity

- *Values depend of use of sexed semen and beef semen*
- *Number of animals expressing the traits*

Basic numbers - SWE HOL, 110 cows

	2008	Classic	Conv.	Organic
Number of calvings/year	115.16	111.74	111.74	111.74
Replacement rate	41.6%	32.0%	32.0%	32.0%
Distribution 1st calvings	39.7%	31.5%	31.5%	31.5%
Distribution 2nd calvings	27.4%	25.5%	25.5%	25.5%
Distribution 3rd+ calvings	32.9%	43.0%	43.0%	43.0%
Heifer calves born	57.6	55.9	40.4	40.4
Bull calves born	57.6	55.9	19.6	19.5
Heifer Beef crosses	0.0	0.0	25.9	25.9
Bull beef crosses	0.0	0.0	25.9	25.9
Heifers needed for replacement	45.7	35.2	35.2	35.2
Preg. sold (Surplus heifers)	4.3	14.0	0.0	0.0

Results: Production traits

	Original	Classic	Conventional	Organic
	Value of kg standard milk, €/kg			
HOL	0.181	0.191	0.191	0.143
RDC	0.190	0.189	0.189	0.141
JER	0.160	0.191	0.191	0.145
	Value of net. Daily gain €/(g/day)			
HOL	0.171	0.219	0.213	0.077
RDC	0.187	0.251	0.230	0.092
JER	0.019	0.216	0.192	0.007
	Value of EUROP form €/point			
HOL	13.3	14.2	23.8	26.0
RDC	12.9	14.6	24.4	27.7
JER	8.5	7.8	13.8	14.7

Mastitis and other diseases

Breeding value of "Frequency of 1st cases"

- 1st, 2nd and 3rd lactation

Value depends on:

- Total number of cases (number of repeated treatments)
- Cost of veterinary treatment (and health schemes)
- Extra work
- Discarded milk

Mastitis and other diseases

Summary of results:

- 2008 – Classic/Conventional: Moderate increase despite large increase in vet. costs – health schemes reduces costs.
- Conventional vs organic: Large increase in value – most for mastitis

Claw health

Breeding value of 1st cases
- 1st, 2nd and 3rd lactation

Value depends on:
- Total number of cases
- Cost of treatments
- Extra work

- Relatively small changes compared to 2008/2011
- Relatively small differences between conv. and organic

"Conformation" traits

Approach (same as in 2008)
- Estimated by a group of producers/breeders
- Saved work in a herd of 70 cows (converted to current herd size)
- Improvement of +1 point for all traits

Estimates of saved work - minutes per day
- Body 0 min. saved/day
- Feet & Legs 10 min. saved/day
- Udder 15 min. saved/day
- Milking speed 10 min. saved/day
- Temperament 5 min. saved/day

Conformation results

- No breed differences in saved work
- No difference between conventional and organic

- Labour costs is different per country (they were similar in 2008)
- Increase in labour cost is largest in DNK – therefore increase in values of conformation traits are largest for JER

Fertility assumptions

Factors of importance:

- AI Costs:
  - 21.44 €/AI average (lower in DNK – higher in SWE, FIN)
  - Extra 11 €/AI for sexed semen)
  - *Costs related to sire selection excluded*

- Work (for AI and heat surveillance)

Fertility Results

Better fertility

- Less AI costs (only IFL)
- More calvings/year (more heifer and bull calves born)

Conventional compared to Classic scenario:

- In conv./organic cows room for more beef crosses
- In conv./organic AI costs are larger

In organic compared to conventional:

- Lower value because beef production is not so profitable

Calving traits (maternal and direct)

Stillbirth

- Extra work, costs of destruction
- Number of surviving heifer and bull calves
- Note: Direct effect of genetic improvement is only 50% for beef crosses

Calving ease

- With or without veterinary assistance (changed distribution)
- Extra work
- Note: Direct effect of genetic improvement is only 50% for beef crosses

Calving traits – maternal and direct Value, €/pct change (HOL)

HOL	2008	Classic	Conv. maternal	Organic maternal	Conv. direct	Org. direct
Stillbirth, 1st	1.915	1.637	1.613	1.395	1.613	1.395
Stillbirth,later	3.095	3.642	3.918	3.048	2.548	2.010
Calving ease, 1st	10.99	5.63	5.63	5.85	5.63	5.85
Calving ease, later	14.86	15.03	26.58	28.00	15.67	16.58

Lower replacement rate:

- Fewer 1st calvings – smaller number/average cow – lower value
- More later calvings – larger number/average cow – higher value

Young Stock survival Value, €/pct change (RDC)

RDC	2008	Classic	Conv.	Organic
Survival heifers 2-30 days	3.40	2.52	3.30	3.19
Survival heifers 31-458 days	4.06	3.26	3.66	3.77
Survival bulls 2-30 days	1.89	2.70	1.92	1.44
Survival bulls 31-184 days	2.96	2.93	2.10	1.76

- 2008-Classic: Value of surplus heifers lower – value beef production higher
- Conv. heifer: Every survived heifer makes room for an extra beef cross
- Conv. Bull calf: Only 50% of gen. improvement is expressed for crosses
- Organic: Beef production is not so profitable

Longevity

Approach:
Changing culling rate/replacement rate

Effect
- **Increased longevity: More older cows – with more diseases but higher yield level**
- **Fewer heifer calving – lower stillbirth rate – less difficult**
- **Lower number of calvings per year – less heifer and bull calves born**

Most longevity value redistributed to other traits

Summary

Single trait economic values calculated for:
- **Conventional and Organic scenario**
- **7 country x breed situations**

Next step:
- **Converting to values per index unit**