The economic value of NTM

The economic value of NTM is calculated for different purposes, for example to document the value of breeding stock. This note presents the economic potential (value of NTM) for different groups of female animals. Here the value of progeny or animal is expressed as the expected production value of having higher NTM of this progeny or animal at a certain time point of the animal's life cycle.

The value can be simplified as a set of "Rules of thumb". However, details behind these can be seen by clicking the links

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Rule of thumb – the value of 1 NTM unit

Value per cow year	**9 €**
Value of heifer at birth	**24 €**
Value of heifer at first calving	**27 €**
Value of AI sire on progeny (conv. semen)	**6 €**

Values per NTM unit are averages across breeds

In the values above the improved production value in future generations is neglected. Furthermore, the production values of the animals are non-discounted values, eg. don't take into account that economic return gained today has a higher value than return in 5 or 10 years. When comparing the value of two animals, the animals should therefore be at approximately similar ages.

It should be emphasized that the economic value of NTM depends on the assumptions used for calculating the economic value for each trait that is included in NTM (NTM 2018 Report). However, the economic value of NTM is quite robust with respect to changes to assumptions.

Value per cow year
The economic value of NTM is defined as the additional income per year per cow (or annual cow) per NTM index unit and is shown below. For translating between Euros and Danish and Swedish kronor, exchange rates of 7.5 and 10 are used for DKK and SEK, respectively.

Economic value (in €) of one NTM index unit per annual cow for Holstein, RDC and Jersey are based on average production circumstances behind the revised NTM. Details can be found in: NTM 2018 Report

	HOL	RDC	JER
Euros per NTM unit	**9.9**	**9.2**	**8.0**

The average value per NTM unit across breeds is 9 €

Value of NTM expressed on herd level
The above values can also be interpreted on herd level. As an example, the annual added economic value of a difference of 10 NTM units between two herds with 150 annual cows is used to illustrate this in the box below. The economic value that is transferred to subsequent generations (progeny of the cows) is not included.

Formula for calculating yearly value of herd with 150 cows and an NTM value of +10:

HOL: 10 NTM units × 9.9 €/NTM unit × 150 cows	= **€ 14,850** (DKK: 111,500; SEK: 148,500)
RDC: 10 NTM units × 9.2 €/NTM unit × 150 cows	= **€ 13,800** (DKK: 103,500; SEK: 138,000)
JER: 10 NTM units × 8.0 €/NTM unit × 150 cows	= **€ 12,000** (DKK: 90,000; SEK: 120,000)

Value for new-born heifer calf as production animal

From the assumptions used to calculate the economic value of each sub-index in NTM, the value of a new-born heifer calf can be calculated. The assumptions are a yearly preplacement rate of 32% and an average calving interval of 13.5 month corresponding to an average of 2.8 lactations per cow. The calculations are similar to the calculations used for a heifer at first calving (see next section) with a few exceptions.

- Not all new-born heifers will reach first calving; thus, the average number of lactations per new-born heifer will be lower than the average number of lactations per cow. Approximately 85 % of heifers reach first calving; thus, the average number of lactations per new-born heifer calf is 2.4
- The average production time is then 2.4*(13.5/12) = 2.7 years
- The female part of the economic value for young stock survival accounts for approximately 2/3 of the total economic value of the young stock survival index.
- Male growth is not expressed in females; value = 0

The economic value that is transferred to subsequent generations (i.e. offspring of the calf) if the heifer calf reaches first calving is not included. The values below are for comparing the economic value of two new-born heifers with NTM of 0 and +1, respectively.

Formula for calculating value of new-born heifer with +1 NTM unit:

HOL: 2.7 production years × 9.4 € = **€ 25.4** (DKK: 190; SEK: 254)
RDC: 2.7 production years × 8.7 € = **€ 23.5** (DKK: 176; SEK: 235)
JER: 2.7 production years × 7.9 € = **€ 21.3** (DKK: 160; SEK: 213)

The average value per NTM unit across breeds is 24 **€.**

Regarding the calculations for new-born heifer calves, we take young stock survival into account, but not growth.

Value for heifer, just before first calving, as production animal

Assumptions:
- Average number of lactations per cow: 2.8 (NTM 2018)
- The average calving interval is 13.5 month
- The average production time is then 2.8*(13.5/12) = 3.15 years
- Male growth is not expressed in females; value = 0
- Young stock survival already expressed when heifer reaches first calving; value = 0

Formula for calculating value of heifer at first calving with +1 NTM unit:

HOL: 3.15 prod. years × 9.1 € = **€ 28.7** (DKK: 215; SEK: 287)
RDC: 3.15 prod. years × 8.3 € = **€ 26.1** (DKK: 196; SEK: 261)
JER: 3.15 prod. years × 7.6 € = **€ 23.9** (DKK: 180; SEK: 239)

The average value per NTM unit across breeds is 27 **€**

The economic values shown above are based on the assumptions behind NTM, i.e. based on aver-age production circumstances. In herds with better longevity than the 2.8 lactations the economic value will be higher and vice versa for herds with lower longevity.

Regarding the calculations for heifers at first calving, we don't take growth and young stock sur-vival into account

Economic effect of AI sire on the progeny as production animal

The economic value of NTM when semen from an AI bull is resulting in a liveborn calf. The first multiplication by 0.5 expresses that only half the value of the sire is transferred to progeny. The value is expressed for a new-born calf with unspecified sex, i.e. only 50% of the calves are expected to be female. In these calculations the very small economic value originating from the bull calves are ignored. The economic value that is transferred to subsequent generations (progeny of progeny) is not included.

Formula for calculating value of offspring from semen (not sexed) with +1 NTM unit:

HOL: $0.5*1$ NTM units $\times 9.4$ €/NTM unit $\times 0.5*2{,}7 \ = $ **€ 6.3** (DKK: 47.5; SEK: 63.5)
RDC: $0.5*1$ NTM units $\times 8.7$ €/NTM unit $\times 0.5*2.7 \ = $ **€ 5.9** (**D**KK: 44; SEK: 59)
JER: $0.5*1$ NTM units $\times 7.9$ €/ NTM unit $\times 0.5*2.7 \ = $ **€ 5.3** (DKK: 40; SEK: 53.5)

The economic effect of AI sire on progeny changes if sexed semen is used. Assuming that 90 % of calves born after sexed semen are heifers, the economic value transferred to progeny is equal to *0.9 × economic value per NTM unit for a new-born heifer* (again ignoring the value of a bull calf).

Formula for calculating value of offspring from semen (sexed) with +1 NTM unit:

HOL: $0.5*1$ NTM units $\times 9.4$ €/NTM unit $\times 0.9*2{,}7 \ = $ **€ 11.4** (DKK: 85.5; SEK: 114)
RDC: $0.5*1$ NTM units $\times 8.7$ €/NTM unit $\times 0.9*2.7 \ = $ **€ 10.6** (**D**KK: 79.5; SEK: 106)
JER: $0.5*1$ NTM units $\times 7.9$ €/NTM unit $\times 0.9*2.7 = $ **€ 9.6** (DKK: 72; SEK: 96)

The average value per NTM unit across breeds is 6 €.

These values may be used for determining if it is worth paying for a conventional or sexed semen dose, respectively.