## *Lactation curve modelling*

A lactation curve was fitted for every lactation using the MilkBot model (Ehrlich, 2011) using the MilkBot lactation API (<https://api.milkbot.com/>). The full MilkBot equation is shown as:

(1)

where Y(t) is the estimated milk production when DIM is t, and scale a, ramp b, offset c and decay dare the lactation curve characteristics (**LCC**) describing the lactation curve. LCC are estimated for every daily record using the data up to and including that day. For example, LCC at DIM 50 are estimated after a lactation curve was fitted for the daily milk records up to and including DIM 50.

In the current study, the a (scale) was renamed magnitude of milk production (in kg/day) and the b (ramp) was renamed time to peak yield (in days). The d (decay) was transformed into a measure of persistency (in days) using the equation (Ehrlich, 2011):

(2)

Persistency is interpreted as the days it takes to halve milk production in the declining stage of lactation.

The 305-day milk production (**M305**, in kg) can be estimated using the equation:

(3)

The peak yield (in kg) can be estimated using the equation:

(4)

**Table S1** Cut-off values used in data editing procedures.

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| Step | Variable | Filter | 1% | 99% | 95% |
| 1 | Parity | >0 |  |  |  |
| 2 | Age within parity | 1-99% per parity |  |  |  |
|  |  | Parity 1 | 637 | 1140 |  |
|  |  | Parity 2 | 981 | 1642 |  |
|  |  | Parity 3 | 1305 | 2089 |  |
|  |  | Parity 4 | 1630 | 2523 |  |
|  |  | Parity 5 | 1963 | 2971 |  |
|  |  | Parity 6 | 2288 | 3439 |  |
|  |  | Parity 7 | 2658 | 3860 |  |
|  |  | Parity 8 | 3028 | 4270 |  |
|  |  | Parity 9 | 3384 | 4671 |  |
|  |  | Parity 10 | 3739 | 5096 |  |
|  |  | Parity 11 | 4229 | 5470 |  |
|  |  | Parity 12 | 4552 | 5749 |  |
|  |  | Parity 13 | 4923 | 5789 |  |
|  |  | Parity 14 | 5406 | 5759 |  |
| 3 | Last DIM | <99% |  | 605 |  |
| 4 | Decay | >0 |  |  |  |
| 5 | RMSE | <95% |  |  | 5.44 |
| 6 | Lactation curve characteristics | 1-99% |  |  |  |
|  |  | Magnitude | 19.25 | 70.73 |  |
|  |  | Time to peak yield | 8.36 | 40.10 |  |
|  |  | Decay | 0.00011 | 0.00505 |  |
| 7 | Exclude those without LCC at DIM 305 |  |  |  |  |
| 8 | Keep open cow |  |  |  |  |
| 9 | Exclude herds without previous year records |  |  |  |  |