***Supplementary Table S1.*** *Summary of the factors included in the models used for the analyses of the traits*

|  |  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| **Factor** | **Abbreviation** | **Levels** | **DMY**1 | **DM**2 | **CP**3 | **E**4 | **ADFI**5 | **ADWI**6 | **DW**7 | **IWW**8 | **SR**9 |
| Environmental conditions class *ith* | $$EC\_{i}$$ | 2: comfort, stress | x | x | x | x | x | x | x | x | x |
| Parity order *jth* | $$PO\_{j}$$ | 3 (3, 4, >4) | x | x | x | x | x | x |  | x | x |
| Gestation-lactation overlapping class *kth* | $$OGL\_{k}$$ | 2: overlapping and not overlapping | x |  |  |  | x | x | x | x | x |
| Interaction between environmental conditions and parity order gestation-lactation overlapping class and parity order | $$\left(EC×PO\right)\_{ij}$$ | 6 | x | x | x | x | x | x |  | x | x |
| Interaction between environmental conditions and gestation-lactation overlapping class | $$\left(EC×OGL\right)\_{ik}$$ | 4 | x |  |  |  |  |  |  |  |  |
| Quadratic polynomial regression on days in milk at time *tth* | $$\sum\_{l=0}^{2}β\_{1,l}×d\_{t}^{l}$$ | - | x |  |  |  |  |  |  |  |  |
| Interaction between environmental conditions and polynomial regression on days in milk at time *tth* within lactation *lth* | $$EC ×\sum\_{l=0}^{2}β\_{1,l}×d\_{t}^{l}$$ | - | x |  |  |  |  |  |  |  |  |
| Quadratic polynomial regression on number of suckling kits at lactation day $d\_{t}$ at time *tth* | $$\sum\_{l=0}^{2}β\_{2,l}×LS\_{t}^{l}$$ | - | x |  |  |  |  |  |  |  |  |
| Random quadratic polynomial on days in milk $d\_{t}$ at time *tth,* nested within doe *rth* | $$\sum\_{l=0}^{2}p\_{1,l,r}×d\_{t,r}^{l}$$ | 83 | x |  |  |  |  |  |  |  |  |
| Random quadratic polynomial on days in milk $d\_{t}$ at time *tth,* nested within lactation *lth* | $$\sum\_{l=0}^{2}p\_{2,l,rj}×d\_{t,rj}^{l}$$ | 155 | x |  |  |  |  |  |  |  |  |
| Linear regression on number of suckling kits | $$β×LS\_{o}$$ | - |  |  |  |  | x | x |  | x |  |
| Permanent effect of the doe *rth* | $$f\_{r}$$ | 82 |  |  |  |  | x | x |  |  | x |
| Age of the doe at time *tth* | *Tt* | - |  |  |  |  |  |  | x |  |  |
| Random linear regression on age $T\_{t,r}^{}$*,* nested within doe *rth* | $$\sum\_{l=0}^{1}p\_{l,r}×T\_{t,r}^{l}$$ | 82 |  |  |  |  |  |  | x |  |  |
| Permanent effect of lactation *sth* | $$l\_{s}$$ | 138 |  |  |  |  | x | x |  |  |  |
| Common litter effect *sth* | $$co\_{s}$$ | 106 |  |  |  |  |  |  |  | x |  |
| Week *kth* | $$W\_{k}$$ | 4 |  |  |  |  | x | x |  |  |  |
| Linear regression on doe age at time *tth* | $$β\_{1}×T\_{t}$$ | - |  |  |  |  |  |  |  |  |  |

1 DMY = Daily Milk Yield; 2 DM = Milk Dry Matter content; 3 CP = Milk Crude Protein Content; 4 E = Milk Gross Energy Content; 5 ADFI = Average Daily Feed Intake; 6 ADWI = Average Daily Water Intake; 7DW = Doe Weight, 8 IWW = Individual Weaning Weight; 9 SR = Survival rate.