*Supplementary Table S1. Genetic correlation structure among traits\* used in the selection index analysis*

|  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
|   | Milk | Fat | Protein | CI | Surv | Cull | Carc | Carc fat | Carc conf | Dir CD | Mort | Gest | Mat CD | SCS | Mast | Lame | Temp | Speed | Sat fat |
| Fat | 0.53 |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| Protein | 0.84 | 0.74 |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| CI | 0.54 | 0.14 | 0.32 |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| Survival | -0.30 | 0.04 | -0.11 | -0.78 |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| Cull | 0.31 | 0.08 | 0.23 | 0.21 | -0.18 |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| Carc | 0.40 | 0.22 | 0.38 | 0.26 | -0.18 | 0.71 |  |  |  |  |  |  |  |  |  |  |  |  |  |
| Carc fat | -0.26 | -0.03 | -0.10 | -0.25 | 0.12 | -0.29 | -0.11 |  |  |  |  |  |  |  |  |  |  |  |  |
| Carc conf | -0.47 | -0.25 | -0.36 | -0.43 | 0.25 | -0.34 | -0.16 | 0.50 |  |  |  |  |  |  |  |  |  |  |  |
| Dir CD | 0.19 | -0.98 | 0.00 | 0.50 | -0.46 | 0.27 | 0.21 | -0.25 | 0.27 |  |  |  |  |  |  |  |  |  |  |
| Mort | 0.07 | 0.03 | 0.06 | 0.12 | -0.12 | 0.09 | 0.08 | -0.11 | -0.16 | 0.29 |  |  |  |  |  |  |  |  |  |
| Gest | -0.07 | -0.24 | -0.21 | 0.30 | -0.31 | -0.08 | -0.03 | 0.09 | -0.02 | 0.45 | 0.10 |  |  |  |  |  |  |  |  |
| Mat CD | -0.27 | -0.25 | -0.30 | -0.06 | -0.09 | -0.36 | -0.33 | 0.23 | 0.33 | -0.19 | -0.07 | 0.16 |  |  |  |  |  |  |  |
| SCS | -0.04 | 0.00 | 0.04 | 0.16 | -0.27 | -0.19 | -0.06 | 0.14 | 0.13 | 0.09 | -0.04 | 0.11 | 0.14 |  |  |  |  |  |  |
| Mast | -0.16 | -0.13 | -0.17 | 0.08 | -0.17 | -0.30 | -0.19 | 0.20 | 0.28 | 0.01 | -0.15 | 0.28 | 0.33 | 0.64 |  |  |  |  |  |
| Lame | 0.20 | -0.02 | 0.77 | 0.39 | -0.40 | -0.15 | 0.00 | 0.07 | 0.06 | 0.15 | -0.10 | 0.30 | 0.25 | 0.61 | 0.82 |  |  |  |  |
| Temp | -0.01 | 0.05 | 0.05 | -0.16 | 0.18 | -0.06 | -0.05 | 0.06 | 0.04 | -0.12 | 0.03 | -0.15 | 0.03 | 0.02 | -0.01 | -0.04 |  |  |  |
| Speed | 0.08 | -0.02 | 0.02 | 0.15 | -0.10 | 0.00 | 0.07 | -0.02 | -0.05 | 0.09 | 0.00 | 0.16 | 0.00 | 0.05 | 0.13 | 0.19 | 0.09 |  |  |
| Sat fat | -0.50 | -0.50 | -0.50 | -0.15 | 0.15 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 |  |
| Cheese | -0.29 | -0.29 | -0.29 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | -0.46 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 |

\*Milk = milk yield, Fat=fat yield, Protein=protein yield, CI = calving interval, Surv = survival, Cull = cull cow weight, Carc = carcass weight, Carc fat = carcass fat, Carc conf = carcass confirmation, Dir CD = direct calving difficulty, Mort = mortality, Gest = gestation length, Mat CD = maternal calving difficulty, SCS = somatic cell score (i.e. loge (somatic cell count)), Mast = mastitis, Lame = lameness, Temp = temperament, Speed = milking speed, Sat fat = milk saturated fat content, Cheese = percentage cheese yield.