**Supplementary Table S4** *The highest ranked model determined by AIC for each of 13 weather elements or indices refitted using REML*

|  |  |  |  |
| --- | --- | --- | --- |
|  | **Milk yield (kg)** | **Fat content (%)** | **Protein content (%)** |
|  | **term** | ***β*** | **SE** | ***t*** | ***P*** | **term** | ***β*** | **SE** | ***t*** | ***P*** | **term** | ***β*** | **SE** | ***t*** | ***P*** |
| Ts | TD | -0.0039 | 0.0122 | -0.32 | 0.750 | WM | 0.0077 | 0.0036 | 2.14 | \* | TD | -0.0041 | 0.0018 | -2.32 | \* |
| TD^2 | 0.0334 | 0.0013 | 26.22 | \*\*\* | WM^2 | -0.0042 | 0.0004 | -11.23 | \*\*\* | TD^2 | -0.0003 | 0.0002 | -1.83 | 0.068 |
| TD^3 | 0.0015 | 0.0003 | 5.36 | \*\*\* | WM^3 | -0.0005 | 0.0001 | -5.97 | \*\*\* | TD^3 | -0.0001 | <0.0001 | -1.33 | 0.183 |
| TD×m |  0.1541 | 0.0078 | 19.65 | \*\*\* | WM×m | -0.0359 | 0.0027 | -13.41 | \*\*\* | TD×m | 0.0019 | 0.0011 | 1.65 | 0.099 |
| TD^2×m | -0.0530 | 0.0009 | -60.75 | \*\*\* | WM^2×m | -0.0008 | 0.0006 | -1.20 | 0.231 | TD^2×m | 0.0009 | 0.0003 | 3.39 | \*\*\* |
| TD^3×m | -0.0026 | 0.0002 | -15.06 | \*\*\* | WM^3×m | 0.0007 | 0.0001 | 7.57 | \*\*\* | TD^3×m | -0.0001 | <0.000 | -3.70 | \*\*\* |
| THI2 | WM | 0.0086 | 0.0057 | 1.51 | 0.130 | WM | -0.0026 | 0.0017 | -1.47 | 0.143 | 3dM | -0.0044 | 0.0005 | -9.16 | \*\*\* |
| WM^2 | 0.0088 | 0.0004 | 21.44 | \*\*\* | WM^2 | -0.0011 | 0.0001 | -8.79 | \*\*\* | 3dM^2 | -0.0001 | <0.0001 | -1.68 | 0.094 |
| WM^3 | 0.0002 | <0.0001 | 6.93 | \*\*\* | WM^3 | <0.0001 | <0.0001 | -3.80 | \*\*\* |  |  |  |  |  |
| WM×m | 0.0623 | 0.0039 | 15.85 | \*\*\* | WM×m | -0.0161 | 0.0014 | -11.13 | \*\*\* | 3dM×m | 0.0009 | 0.0003 | 2.67 | \*\* |
| WM^2×m | -0.0152 | 0.0003 | -59.93 | \*\*\* | WM^2×m | 0.0003 | 0.0002 | 1.45 | 0.147 |  |  |  |  |  |
| WM^3×m | -0.0004 | <0.0001 | -18.51 | \*\*\* | WM^3×m | 0.0001 | <0.0001 | 3.48 | \*\*\* |  |  |  |  |  |
| Tdb | WM | 0.0324 | 0.0096 | 3.37 | \*\*\* | WM | -0.0048 | 0.0029 | -1.66 | 0.098 | TD | -0.0064 | 0.0007 | -8.81 | \*\*\* |
| WM^2 | 0.0223 | 0.0011 | 20.40 | \*\*\* | WM^2 | -0.0026 | 0.0003 | -7.96 | \*\*\* |  |  |  |  |  |
| WM^3 | 0.0007 | 0.0002 | 4.09 | \*\*\* | WM^3 | -0.0002 | 0.0001 | -3.36 | \*\*\* |  |  |  |  |  |
| WM×m | 0.0716 | 0.0064 | 11.21 | \*\*\* | WM×m | -0.0251 | 0.0022 | -11.18 | \*\*\* |  |  |  |  |  |
| WM^2×m | -0.0386 | 0.0007 | -53.99 | \*\*\* | WM^2×m | 0.0010 | 0.0006 | 1.82 | 0.070 |  |  |  |  |  |
| WM^3×m | -0.0013 | 0.0001 | -12.45 | \*\*\* | WM^3×m | 0.0002 | 0.0001 | 3.02 | \*\* |  |  |  |  |  |
| WS | WM | 0.0458 | 0.0089 | 5.15 | \*\*\* | TD | 0.0042 | 0.0017 | 2.50 | \* | WM | 0.0028 | 0.0014 | 2.03 | \* |
| WM^2 | -0.0083 | 0.0018 | -4.73 | \*\*\* | TD^2 | -0.0008 | 0.0003 | -2.49 | \* | WM^2 | 0.0001 | 0.0003 | 0.47 | 0.639 |
| WM^3 | 0.0003 | 0.0002 | 2.22 | \* | TD^3 | <0.0001 | <0.0001 | 2.68 | \*\* | WM^3 | <0.0001 | <0.0001 | -0.55 | 0.583 |
| WM×m | 0.0615 | 0.0051 | 11.96 | \*\*\* |  |  |  |  |  | WM×m | -0.0134 | 0.0008 | -16.31 | \*\*\* |
| WM^2×m | -0.0087 | 0.0010 | -8.73 | \*\*\* |  |  |  |  |  | WM^2×m | -0.0002 | 0.0002 | -0.96 | 0.338 |
| WM^3×m | 0.0004 | 0.0001 | 4.18 | \*\*\* |  |  |  |  |  | WM^3×m | 0.0001 | <0.0001 | 4.23 | \*\*\* |
| THI1 | WM | 0.0233 | 0.0070 | 3.32 | \*\*\* | WM | -0.0032 | 0.0021 | -1.50 | 0.135 | TD | -0.0045 | 0.0005 | -8.53 | \*\*\* |
| WM^2 | 0.0116 | 0.0006 | 19.81 | \*\*\* | WM^2 | -0.0014 | 0.0002 | -8.07 | \*\*\* |  |  |  |  |  |
| WM^3 | 0.0003 | 0.0001 | 4.46 | \*\*\* | WM^3 | -0.0001 | <0.0001 | -3.70 | \*\*\* |  |  |  |  |  |
| WM×m | 0.0435 | 0.0047 | 9.33 | \*\*\* | WM×m | -0.0179 | 0.0016 | -10.88 | \*\*\* |  |  |  |  |  |
| WM^2×m | -0.0196 | 0.0004 | -51.41 | \*\*\* | WM^2×m | 0.0006 | 0.0003 | 2.10 | \* |  |  |  |  |  |
| WM^3×m | -0.0005 | <0.0001 | -12.54 | \*\*\* | WM^3×m | 0.0001 | <0.0001 | 2.95 | \*\* |  |  |  |  |  |
| Twb | WM | 0.0337 | 0.0106 | 3.18 | \*\* | WM | -0.0050 | 0.0032 | -1.54 | 0.125 | TDb | -0.0065 | 0.0008 | -8.13 | \*\*\* |
| WM^2 | 0.0249 | 0.0013 | 18.82 | \*\*\* | WM^2 | -0.0031 | 0.0004 | -7.85 | \*\*\* |  |  |  |  |  |
| WM^3 | 0.0010 | 0.0002 | 4.60 | \*\*\* | WM^3 | -0.0003 | 0.0001 | -3.78 | \*\*\* |  |  |  |  |  |
| WM×m | 0.0440 | 0.0070 | 6.30 | \*\*\* | WM×m | -0.0252 | 0.0025 | -10.13 | \*\*\* |  |  |  |  |  |
| WM^2×m | -0.0412 | 0.0009 | -47.40 | \*\*\* | WM^2×m | 0.0015 | 0.0006 | 2.52 | \* |  |  |  |  |  |
| WM^3×m | -0.0015 | 0.0001 | -10.79 | \*\*\* | WM^3×m | 0.0002 | 0.0001 | 2.56 | \* |  |  |  |  |  |
| Tg | WN | 0.0317 | 0.0091 | 3.48 | \*\*\* | WN | -0.0049 | 0.0029 | -1.71 | 0.087 | 3dN | -0.0058 | 0.0014 | -4.03 | \*\*\* |
| WN^2 | 0.0166 | 0.0010 | 16.51 | \*\*\* | WN^2 | -0.0012 | 0.0003 | -3.98 | \*\*\* | 3dN^2 | -0.0002 | 0.0001 | -1.81 | 0.071 |
| WN^3 | 0.0007 | 0.0001 | 4.95 | \*\*\* | WN^3 | -0.0001 | <0.0001 | -2.27 | \* | 3dN^3 | <0.0001 | <0.0001 | 0.17 | 0.864 |
| WN×m | -0.0277 | 0.0057 | -4.89 | \*\*\* | WN×m | -0.0192 | 0.0020 | -9.45 | \*\*\* | 3dN×m | -0.0045 | 0.0008 | -5.39 | \*\*\* |
| WN^2×m | -0.0197 | 0.0006 | -30.61 | \*\*\* | WN^2×m | 0.0010 | 0.0004 | 2.46 | \* | 3dN^2×m | -0.0001 | 0.0001 | -1.23 | 0.217 |
| WN^3×m | -0.0004 | 0.0001 | -5.44 | \*\*\* | WN^3×m | 0.0001 | 0.0001 | 2.24 | \* | 3dN^3×m | 0.0001 | <0.0001 | 3.91 | \*\*\* |
| PMSL | WM | 0.0145 | 0.0043 | 3.34 | \*\*\* | WM | 0.0004 | 0.0014 | 0.26 | 0.795 | 3dM | -0.0019 | 0.0005 | -3.80 | \*\*\* |
| WM^2 | -0.0002 | 0.0002 | -1.08 | 0.281 | WM^2 | 0.0001 | 0.0001 | 1.28 | 0.200 | 3dM^2 | 0.0001 | <0.0001 | 5.27 | \*\*\* |
| WM^3 | <0.0001 | <0.0001 | -2.42 | \* | WM^3 | <0.0001 | <0.0001 | 1.24 | 0.215 | 3dM^3 | <0.0001 | <0.0001 | 2.98 | \*\* |
| WM×m | 0.0261 | 0.0027 | 9.81 | \*\*\* | WM×m | 0.0002 | 0.0009 | 0.25 | 0.807 | 3dM×m | 0.0002 | 0.0002 | 0.94 |  |
| WM^2×m | -0.0012 | 0.0001 | -8.63 | \*\*\* | WM^2×m | <0.0001 | 0.0001 | 0.51 | 0.611 | 3dM^2×m | -0.0001 | <0.0001 | -2.93 | \*\* |
| WM^3×m | <0.0001 | <0.0001 | -2.53 | \* | WM^3×m | <0.0001 | <0.0001 | -3.08 | \*\* |  |  |  |  |  |
| RH | WM | 0.0096 | 0.0052 | 1.86 | 0.063 | TD | -0.0010 | 0.0010 | -1.01 | 0.315 | WM | 0.0057 | 0.0008 | 7.63 | \*\*\* |
| WM^2 | -0.0017 | 0.0004 | -4.75 | \*\*\* | TD^2 | 0.0001 | 0.0001 | 1.65 | 0.099 | WM^2 | <0.0001 | 0.0001 | -0.77 | 0.439 |
| WM^3 | -0.0001 | <0.0001 | -2.53 | \* | TD^3 | <0.0001 | <0.0001 | 1.20 | 0.231 | WM^3 | <0.0001 | <0.0001 | -2.06 | \* |
| WM×m | -0.0429 | 0.0029 | -14.69 | \*\*\* | TD×m | 0.0010 | 0.0006 | 1.71 | 0.088 | WM×m | -0.0009 | 0.0003 | -3.19 | \*\* |
| WM^2×m | -0.0039 | 0.0002 | -16.79 | \*\*\* | TD^2×m | -0.0003 | <0.0001 | -5.94 | \*\*\* |  |  |  |  |  |
| WM^3×m | -0.0001 | <0.0001 | -7.91 | \*\*\* | TD^3×m | <0.0001 | <0.0001 | -3.49 | \*\*\* |  |  |  |  |  |
| sun | WX | -0.0661 | 0.0146 | -4.52 | \*\*\* | WN | -0.0253 | 0.0155 | -1.63 | 0.103 | WX | -0.0110 | 0.0011 | -10.16 | \*\*\* |
| WX^2 | 0.0177 | 0.0019 | 9.15 | \*\*\* | WN^2 | 0.0096 | 0.0042 | 2.28 | \* | WX^2 | -0.0008 | 0.0003 | -2.73 | \*\* |
| WX^3 | 0.0022 | 0.0005 | 4.52 | \*\*\* |  |  |  |  |  |  |  |  |  |  |
| WX×m | 0.2571 | 0.0090 | 28.43 | \*\*\* | WN×m | -0.0255 | 0.0038 | -6.75 | \*\*\* | WX×m | -0.0009 | 0.0008 | -1.11 | 0.267 |
| WX^2×m | -0.0250 | 0.0012 | -20.85 | \*\*\* |  |  |  |  |  | WX^2×m | 0.0004 | 0.0002 | 2.00 | \* |
| WX^3×m | -0.0048 | 0.0003 | -16.14 | \*\*\* |  |  |  |  |  |  |  |  |  |  |
| snow | WM | 0.1009 | 0.0270 | 3.74 | \*\*\* | p/a | 0.1307 | 0.0427 | 3.06 | \*\* | NS |  |  |  |  |
| WM×m | -0.3440 | 0.0344 | -9.99 | \*\*\* |  |  |  |  |  |  |  |  |  |  |
| vis | WM | 0.0004 | <0.0001 | 9.23 | \*\*\* | WM | <0.0001 | <0.0001 | 0.17 | 0.862 |  | <0.0001 | <0.0001 | 1.75 | 0.081 |
| WM×m | -0.0005 | <0.0001 | -20.54 | \*\*\* | WM×m | <0.0001 | <0.0001 | -6.22 | \*\*\* | WM×m | <0.0001 | <0.0001 | -5.06 | \*\*\* |
| ppt | WX | -0.0020 | 0.0028 | -0.73 | 0.475 | 3dX | -0.0012 | 0.0011 | -1.05 | 0.294 | 3dN | 0.0067 | 0.0028 | 2.44 | \* |
| WX×m | -0.0175 | 0.0016 | -11.23 | \*\*\* | 3dX×m | 0.0024 | 0.0006 | 3.79 | \*\*\* | 3dN×m | -0.0085 | 0.0019 | -4.49 | \*\*\* |

Parameter estimates (*β*) with standard errors (SE) are given for linear, quadratic (^2) and cubic (^3) weather terms and their interactions with management (×m). Where models received equal support based on AIC, we present parameter estimate for terms given under the ‘Unique term in best model’ column in Table 2 (i.e. models that generated the lowest AIC value, even if these were not significantly lower). Where terms in the aforementioned models were not significant (i.e. for the effects of sun on fat content, and the effects of Twb, THI1, ppt, snow and humidity on protein content), we present estimates for terms from models with the next lowest AIC value, except for models testing for the effects of snow on protein content, where no metric was significant (NS). Ts is soil temperature, Tdb is dry bulb temperature, Twb is wet bulb temperature and Tg is grass temperature, vis is visibility, RH is relative humidity, ppt is precipitation and PMSL is air pressure. TD is the day of milking (Test Day); WM is weekly mean; WX is weekly maximum, WN is weekly minimum; p/a indicates a binary score of presence versus absence.