**Supplement Table 2.** TheBayesian network’s coefficients per node as calculated using the BCN models; n=88 observations.

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| Parameters of node Fat and Protein Corrected Milk (FPCM) (Gaussian distribution)  Conditional density: **FPCM**  Coefficients:  (Intercept)  78.2203  Standard deviation of the residuals: 11.58089 |
| Parameters of node Total Dry Matter Intake (DMI) (Gaussian distribution)  Conditional density: **Total DMI** | FPCM  Coefficients:  (Intercept) FPCM  28.3775795 0.3224253  Standard deviation of the residuals: 4.516563 |
| Parameters of node FPCM/DMI kg (Gaussian distribution)  Conditional density: **FPCM/DMI kg** | FPCM + Total DMI  Coefficients:  (Intercept) FPCM Total DMI  1.47507928 0.01902453 -0.02801125  Standard deviation of the residuals: 0.01948446 |
| Parameters of node Total Diet Crude Protein (CP) % (Gaussian distribution)  Conditional density: **Total Diet CP %**  Coefficients:  (Intercept)  17.84691  Standard deviation of the residuals: 1.162531 |
| Parameters of node Total Diet Acid Detergent Fiber (ADF) % (Gaussian distribution)  Conditional density: **Total Diet ADF %**  Coefficients:  (Intercept)  20.2871  Standard deviation of the residuals: 2.040401 |
| Parameters of node Total Diet Amylase Neutral Detergent Fiber (aNDF) % (Gaussian distribution)  Conditional density: **Total Diet aNDF %** | Total Diet ADF %  Coefficients:  (Intercept) Total Diet ADF %  9.008380 1.098193  Standard deviation of the residuals: 1.637275 |
| Parameters of node Partially Mixed Ration (PMR) Lignin % (Gaussian distribution)  Conditional density: **PMR Lignin %** | Total Diet ADF%  Coefficients:  (Intercept) Total Diet ADF%  -0.9961413 0.1997748  Standard deviation of the residuals: 0.549463 |
| Parameters of node Total Diet Starch % (Gaussian distribution)  Conditional density: **Total Diet Starch %** | Total Diet aNDF %  Coefficients:  (Intercept) Total Diet aNDF %  57.811874 -1.033708  Standard deviation of the residuals: 2.142431 |
| Parameters of node Total Diet Ash % (Gaussian distribution)  Conditional density: **Total Diet Ash %**  Coefficients:  (Intercept)  8.138579  Standard deviation of the residuals: 1.161032 |
| Parameters of node Total Diet Fat % (Gaussian distribution)  Conditional density: **Total Diet Fat %**  Coefficients:  (Intercept)  3.987545  Standard deviation of the residuals: 0.6818754 |
| Parameters of node Total Diet Non-fiber Carbohydrate (NFC) % (Gaussian distribution)  Conditional density: **Total Diet NFC %**  Coefficients:  (Intercept)  42.48067  Standard deviation of the residuals: 4.975737 |
| Parameters of node % Energy Offered @ Robot (Gaussian distribution)  Conditional density: **% Energy Offered @ Robot**  Coefficients:  (Intercept)  20.85592  Standard deviation of the residuals: 3.738343 |
| Parameters of node PMR Mcal Conc. (Gaussian distribution)  Conditional density: **PMR Mcal Conc.** | Total Diet CP % + Total Diet aNDF % + PMR Lignin % + Total Diet Fat % + Total Diet NFC % + % Energy Offered @ Robot  Coefficients:  (Intercept) Total Diet CP % Total Diet aNDF % PMR Lignin % Total Diet Fat %  0.269393251 0.005049416 0.003302540 -0.012250681 0.018546518  Total Diet NFC % % Energy Offered @ Robot  0.006313048 -0.001959676  Standard deviation of the residuals: 0.008996488 |
| Parameters of node Mcal Conc. of Robot Feed (Gaussian distribution)  Conditional density: **Mcal Conc. of Robot Feed** | PMR Mcal Conc.  Coefficients:  (Intercept) PMR Mcal Conc.  0.3678654 0.5852473  Standard deviation of the residuals: 0.03187818 |
| Parameters of node Milk Speed (Gaussian distribution)  Conditional density: **Milk Speed** | FPCM + Average Boxtime/Visit + Average Fat Indication  Coefficients:  (Intercept) FPCM Average Boxtime/Visit Average Fat Indication  11.02597008 0.05645431 -0.69625831 -0.97853180  Standard deviation of the residuals: 0.5380213 |
| Parameters of node # Milkings/Cow/Day (Gaussian distribution)  Conditional density: **# Milkings/Cow/Day** | FPCM + Log # Refusals  Coefficients:  (Intercept) FPCM Log # Refusals  1.7950616 0.0129026 0.2229200  Standard deviation of the residuals: 0.1595855 |
| Parameters of node kg Conc./100kg Milk (Gaussian distribution)  Conditional density: **kg Conc./100kg Milk** | FPCM/DMI kg + % Energy Offered @ Robot + Average Fat Indication + Average Feeding Rate  Coefficients:  (Intercept) FPCM/DMI kg % Energy Offered @ Robot Avg. Fat Indication  3.2287096 -9.1807594 0.3765527 2.8681852  Avg. Feeding Rate  0.4750188  Standard deviation of the residuals: 1.09914 |
| Parameters of node Average Boxtime/Visit (Gaussian distribution)  Conditional density: **Average Boxtime/Visit** | # Milkings/Cow/Day  Coefficients:  (Intercept) # Milkings/Cow/Day  10.231363 -1.237215  Standard deviation of the residuals: 0.4448517 |
| Parameters of node Average Fat Indication (Gaussian distribution)  Conditional density: **Average Fat Indication**  Coefficients:  (Intercept)  3.754886  Standard deviation of the residuals: 0.3218616 |
| Parameters of node Average Protein Indication (Gaussian distribution)  Conditional density: **Average Protein Indication** | Average Fat Indication + Average Fat Protein Ratio (FPR)  Coefficients:  (Intercept) Average Fat Indication Average FPR  3.0755585 0.7907837 -2.4323673  Standard deviation of the residuals: 0.0075027 |
| Parameters of node Average Fat Protein Ratio (FPR) (Gaussian distribution)  Conditional density: **Average FPR** | Average Fat Indication  Coefficients:  (Intercept) Average Fat Indication  0.7352781 0.1314523  Standard deviation of the residuals: 0.0528309 |
| Parameters of node Cows/Robot (Gaussian distribution)  Conditional density: **Cows/Robot**  Coefficients:  (Intercept)  55.83177  Standard deviation of the residuals: 7.881545 |
| Parameters of node FPCM/Milking (Gaussian distribution)  Conditional density: **FPCM/Milking** | FPCM + # Milkings/Cow/Day  Coefficients:  (Intercept) FPCM # Milkings/Cow/Day  27.3193483 0.3566383 -9.7406012  Standard deviation of the residuals: 0.2817609 |
| Parameters of node Average Feeding Rate (Gaussian distribution)  Conditional density: **Average Feeding Rate**  Coefficients:  (Intercept)  11.09971  Standard deviation of the residuals: 1.987186 |
| Parameters of node Log # Refusals (Gaussian distribution)  Conditional density: **Log # Refusals**  Coefficients:  (Intercept)  0.2351556  Standard deviation of the residuals: 0.5958887 |
| Parameters of node Log Rest Feed Conc. (Gaussian distribution)  Conditional density: **Log Rest Feed Conc.** | # Milkings/Cow/Day  Coefficients:  (Intercept) # Milkings/Cow/Day  4.0050936 -0.8339053  Standard deviation of the residuals: 0.3421076 |
| Parameters of node Log Free Time (Gaussian distribution)  Conditional density: **Log Free Time** | Average Boxtime/Visit + Cows/Robot  Coefficients:  (Intercept) Average Boxtime/Visit Cows/Robot  6.8192456 -0.2281958 -0.0442606  Standard deviation of the residuals: 0.3605175 |

1Variable definitions:

Fat and Protein Corrected Milk (FPCM) kg: (0.337 + 0.116 × Fat % + 0.06 × Protein %) × milk yield (kg/d).

Total Dry Matter Intake (DMI) kg: represents the combined total of PMR intake and robot concentrate offered.

FPCM/DMI: fat and protein corrected milk/ total dry matter intake

Total Diet Crude Protein (CP) %: percentage of crude protein from the combined total of PMR intake and robot concentrate offered.

Total Diet Acid Detergent Fiber (ADF) %: percentage of acid detergent fiber from the combined total of PMR intake and robot concentrate offered.

Total Diet Amylase Neutral Detergent Fiber (aNDF) %: percentage of amylase neutral detergent fiber from the combined total of PMR intake and robot concentrate offered.

Partially Mixed Ration (PMR) Lignin %: percentage of lignin for the partially mixed ration intake.

Total Diet Starch %: percentage of starch from the combined total of PMR intake and robot concentrate offered.

Total Diet Ash %: percentage of ash from the combined total of PMR intake and robot concentrate offered.

Total Diet Fat %: percentage of fat from the combined total of PMR intake and robot concentrate offered.

Total Diet Non-fiber Carbohydrate (NFC) %: percentage of non-fiber carbohydrate from the combined total of PMR intake and robot concentrate offered.

% Energy Offered at the Robot: % Mcal offered at robot of total ration.

PMR Mcal Conc.: amount of energy from the partially mixed ration.

Mcal Conc. of Robot Feed: amount of energy from the offered robot concentrate.

Milk Speed kg/minute: average speed of milk flow during the milking.

# Milkings/Cow/Day: average number of milkings per cow per day.

kg Conc.Offered/100 kg Milk: amount of concentrate feed offered to the cows per 100 kg of milk produced.

Average Boxtime minutes/Visit: average time spent by the cow in the robot per milking.

Average Fat % Indication: average percentage of fat in the milk.

Average Protein % Indication: average percentage of protein in the milk.

Average Fat Protein Ratio (FPR): the average percentage ratio of fat/protein in the milk.

Cows/Robot: number of cows per robot.

FPCM/Milking: fat and protein corrected milk/milking.

Average Feeding Rate kg concentrate Offered/100 kg milk: average feeding rate of the amount of concentrate feed offered to the cows per 100 kg of milk produced.

Log # Refusals: log-transformed average number of times that a cow visits the robot before she is allowed to be milked per day.

Log Rest Feed Conc. kg: log-transformed percentage of the allowed concentrate robot feed which was not dispensed to the cow during the day.

Log Free Time %: log-transformed average percentage of time during the day that the milking robot is doing ‘nothing’ (No milking or cleaning).