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Body weight estimation from linear measures in Cornigliese sheep breed

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In sheep meat breeds it is important to accurately estimate the animal body weights, in order to slaughter them at the most convenient time. However, especially in extensive farms, it is really challenging to accurately measure this parameter, since scales are not usually on site. Thus, it is useful to estimate the body weight (BW) from equations obtained starting from body measures. The aim of this research is to propose equations to estimate the BW from body measurements in the Cornigliese sheep breed, a local breed raised in Emilia-Romagna region, used for meat purpose, with a limited number of heads and a late development. Body weight and linear body measures were submitted to correlation analysis and, subsequently, to multiple regression analysis. Two datasets were used: 1) 303 animals (178 females and 125 males, BW 4.00-117.80 kg), on which height at withers (HW), chest circumference (ChC) and body length (BL) were detected; 2) 156 animals (109 females and 47 males, BW 5.15-117.80 kg) on which, in addition to the previously mentioned measures, height at croup (HCr), chest width (ChW), chest depth (ChD) and croup width (CrW) were also considered. On each dataset, two models were applied, containing all variables (model 1 and 3, respectively for dataset 1 and 2) or a group of variables, selected by means of the stepwise procedure (model 2 and 4, respectively for dataset 1 and 2).

Body weight resulted highly correlated with all linear measures (from 0.852 for ChW to 0.950 for ChC; $p < .001$). Models 1 and 3 fitted the data better than models 2 and 4, both for all animals and for the subsamples of females and males. The proposed equations, for all animals are as follow (body measures in cm):

Model 1: $BW(\text{kg}) = 0.184 \text{ HW} + 0.980 \text{ ChC} + 0.236 \text{ BL} - 61.708$ (SE: 8.21kg; R^2 : 0.910) for dataset 1;

Model 3: $BW(\text{kg}) = 0.321 \text{ HW} + 0.744 \text{ ChC} + 0.319 \text{ BL} - 0.206 \text{ HCr} - 0.305 \text{ ChW} + 0.911 \text{ ChD} + 0.448 \text{ CrW} - 71.454$ (SE: 7.19kg; R^2 : 0.936) for dataset 2.

Model 4 gave best fits, showing lower AIC values, compared to model 2, both for all animals (778 vs 1586) and for the subsamples of females (563 vs 942) and males (140 vs 622). We concluded that BW could be predicted by means of linear body measures in Cornigliese sheep breed. The best fits were obtained when the highest number of body measures was included in the model. Nevertheless, models 1 and 2 can be used more easily in practice in the extensive sheep breeding, since they require less parameters measured in the population.

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