PREDICTING DRY MATTER INTAKE OF FEEDLOT SHEEP: AN EVALUATION OF CURRENT NUTRITIONAL SYSTEMS AND A PROPOSAL FOR A NEW MODEL

Diego Barcelos GALVANI*[1]

*corresponding author: diego.galvani@embrapa.br
[1]Embrapa Caprinos e Ovinos, Sobral, Ceará, Brasil

Predicting feed intake is a key step to formulate diets and properly meet animals' requirements for nutrients. Several mathematical models are available to estimate dry matter intake (DMI) of sheep, but their adequacy to the conditions of Brazilian production systems has been questioned. The aim of this study was to evaluate the accuracy of mathematical models adopted by the National Research Council (NRC; 2007), the Agricultural and Food Research Council (AFRC; 1993), and the Small Ruminant Nutrition System (SRNS; 2010) to predict DMI of feedlot growing sheep in Brazil. A database of 21 studies, comprising 103 comparisons and 570 animals, was used. Only studies reporting DMI, body weight (BW), average daily gain (ADG), and the composition of diets were included into the database. Model adequacy was verified by regressing observed values on predicted values of DMI, and then testing the hypothesis of intercept = 0 and slope = 1. The root mean square error of prediction (RMSEP) was used to measure model accuracy. The worst estimation of DMI was obtained by using the NRC model (a = 0.867 ± 0.106; b = 0.094 ± 0.127; RMSEP = 0.341 kg) probably because the difficulty of choosing adequate values of standard reference weight for every breed included into the database. The AFRC model did not yielded accurate estimations of DMI as well (a = -0.565 ± 0.130; b = 1.365 ± 0.117; RMSEP = 0.239 kg). In turn, the linear regression between observed and SRNS predicted values confirmed the hypothesis of intercept = 0 and slope = 1, and a more accurate prediction was achieved (a = -0.162 ± 0.072; b = 1.152 ± 0.073; RMSEP = 0.143 kg). Using a meta-analytical approach with study as random effect, and the same model structure as adopted by the SRNS, we developed a model (DMI, kg d^{-1} = -0.573 + 0.1152 × BW, kg$^{0.75}$ + 0.0011 × ADG, g) with a similar accuracy (RMSEP = 0.143 kg). However, a better prediction was achieved by including the total digestible nutrients (TDN) content of the diet in the model (DMI, kg d^{-1} = 0.0918 × BW, kg$^{0.75}$ + 0.0017 × ADG, g – 0.0059 × TDN, %; RMSEP = 0.118 kg). In conclusion, the SRNS model can be used to estimate DMI of feedlot sheep in Brazil, but the accuracy of the estimation is improved by including diet TDN content in the model.

Keywords: feed efficiency, nutrition models, total digestible nutrients, voluntary feed intake