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Beef Cattle Composition Simulation — Model Development and Evaluation

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Abstract

Body composition simulation is an important component of beef production models. Empty body fat percentage (EBF %) and empty body weight (EBW) are the most changeable and relevant variables to simulate. Estimations of steers EBF % allow predicting sale timing and grade. EBF % of dams relates to reproductive efficiency, which mainly determines animal productivity in cow-calf systems. Additionally, the number of input variables required by this animal model should be kept at a minimum to allow a correct integration in the beef production model. The objective of this work is to develop a model that simulates EBW growth and composition, from a description of the animal and feed consumed which do not differ from most existing feeding standards. The proposed model is based in three main assumptions. First, animal growth is driven only by energy intake. Second, EBW is comprised by three components: (1) fat free matter (FFM); (2) normal fat (fatty tissue for moderate fatness); and, (3) excess fat (additional fatty tissue). Each EBW component has a given potential growth curve determined by the frame score and sex of the animal. The third assumption relates to the priority of accretion and mobilization of components. In the proposed model resources are allocated firstly to build up FFM; secondly to increase normal fat; and, lastly to accrue excess fat. Mobilization occurs following this priority scheme when resources do not allow meeting maintenance requirements. Published results were used for model evaluation. These cases comprise females, steers, and entire males, and with feeding regimes from low (next to maintenance) to high (ad libitum) energy intakes. The difference (D) expressed as a percentage ($|\text{observed} - \text{estimated}|/\text{observed} * 100$) was used as the accuracy indicator. EBW was estimated accurately within the whole range of cases (D: 5.8 %; N = 71). Accuracy of EBF % prediction was lower (D = 27.5 %; N = 59) than EBW estimations. Level of accuracy demanded by the whole beef production model where the animal model is integrated should be established before estimates are assessed as accurate or not. However, preliminary analysis indicates that EBF % accuracy should be improved or body composition proxy changed before integration is performed.

Keywords: Animal growth simulation, body composition, empty body fat, empty body weight

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