

THE PREDICTION OF RETAIL BEEF YIELD FROM LIVE ANIMAL REAL TIME ULTRASOUND MEASUREMENTS

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The use of real-time ultrasound scanning (RTUS) to estimate carcass characteristics has become an important means of live animal evaluation and selection in the beef industry. The aims of this study were to determine the accuracy of the combination of liveweight plus the RTUS measurements of fat depth and eye muscle area on the live animal to predict carcass retail yield and, secondly, to quantify the effects of breed, sex, market category and finishing regime on predictive accuracy.

A total of 570 cattle were used, comprising 418 steers and 152 heifers, and representing 7 breeds (289 Angus, 30 Hereford, 30 Murray Grey, 65 Shorthorn, 74 Santa Gertrudis, 60 Belmont Red and 30 Brahman). The cattle were slaughtered in groups when the average liveweight reached domestic (355 head), Korean (165 head) and Japanese (50 head) market liveweights of 400kg, 520kg and 600kg, respectively. Both pasture (235 head) and grain (335 head) finished animals were represented within each of the market groups.

Liveweight and RTUS measurements of eye muscle area (EMA) and fat depth at the 12/13th rib site were taken 1 week prior to slaughter. The left side of all carcasses were boned out to standard retail specification where the primal cuts were trimmed to 3 mm coverage of subcutaneous fat. Percentage retail beef yield (RBY%) was defined as the total weight of trimmed boneless retail cuts, plus the weight of manufacturing meat which was prepared to an 85% visual lean specification as a percentage of side weight. Results were analysed using the GLM Procedure in SAS. The initial model contained RTUS 12/13th rib fat depth and EMA, and liveweight as predictors, with breed, sex, finishing regime (gram or pasture) and market category (domestic, Japanese and Korean) as fixed effects. All first order interactions were initially included and non-significant interactions ($P>0.05$) were sequentially deleted from the model.

The mean and standard deviation of the predictors appearing in the final model were: liveweight 454.5 ± 80.1 kg; 12/13 Rib fat depth 7.4 ± 3.3 mm; eye muscle area 60.9 ± 9.0 cm². The results in Table 1 show the predictive accuracy of the measurement combination with and without the fixed effects in the model. The final model accounted for 57.7% of the variation in RBY% and contained the significant fixed effects of breed ($P<0.001$), sex ($P<0.001$), market category ($P<0.001$) and finishing regime ($P<0.001$) and the only significant interaction term, breed*market category ($P<0.001$).

Table 1. Regression coefficients, standard errors and R² for the prediction of retail beef yield (%) using liveweight and real time ultrasound measurements of 12/13 rib fat depth and eye muscle area

| Predictors | Including Fixed Effects | | Excluding Fixed Effects | |
|--|-------------------------|----------------|-------------------------|----------------|
| | Coefficient | Standard Error | Coefficient | Standard Error |
| Intercept | 69.96 | 1.002 | 73.35 | 0.633 |
| Liveweight (kg) | -0.001 | 0.002 | -0.004 | 0.002 |
| 12/13 rib fat depth (mm) | -0.412 | 0.038 | -0.513 | 0.033 |
| Eye muscle area (cm ²) | 0.032 | 0.014 | 0.027 | 0.014 |
| Coefficient of determination (R ²) | 0.577 | | 0.421 | |

The significance of the regression coefficients highlights the relative contribution of fat depth and EMA to the prediction of RBY%. The stability of the regression coefficients when the fixed effects are excluded from the model, and the reasonably small reduction in predictive accuracy, confirms that this combination of predictors is quite robust. However, when applying RTUS for the prediction of carcass yield, there are significant differences in the intercept between breeds, steers and heifers, market categories and grain and grass finished animals.