

Predicting the slaughter characteristics of finished beef cattle using a live animal digital image analysis system under typical on-farm management conditions

J J Hyslop¹, D W Ross³, C P Schofield², E A Navajas³, R Roehe³, G Simm³

¹SAC Select Services, Bush Estate, Penicuik, Midlothian, UK, ²Silsoe Livestock Systems Ltd, Wrest Park, Silsoe, Bedford, UK, ³SAC Animal Breeding & Development, SAC, West Mains Road, Edinburgh, UK

Email: jimmy.hyslop@sac.co.uk

Introduction Previous work has suggested that dimensional data obtained from digital image analysis (DIA) has potential to predict the slaughter liveweights of finished beef cattle (Hyslop *et al*, 2008). Both farmers and cattle buyers may benefit from being able to select animals to meet slaughter specifications more accurately on-farm. The objective of the current study was to assess the feasibility of an on-farm DIA system to predict a number of characteristics in beef steers at slaughter.

Materials and methods Top, side and rear view images of finished beef steers were obtained within one day of the animals going for slaughter from two pens, each containing twelve Aberdeen Angus x Limousin (AAxLIM) and twelve Limousin x Aberdeen Angus (LIMxAA) finishing beef steers during late summer/early autumn 2007 where slaughter characteristics were also determined. Continuous images were taken using three multiplexed, high-resolution, colour digital cameras mounted directly above the animal looking straight down (top view), to the side of the animal looking straight-on (side view) and above and to the rear of the animal looking at a 45° angle (rear view). The cameras were positioned in a “cubicle” leading to the water trough in the corner of each straw-bedded pen in which the animals were housed. Images were stored on computer and selected static images were subsequently processed to obtain simple dimensional data using image processing software (Inspector 8) by an experienced operator. Dimensions collected for the body of each of the 48 animals included:- lengths, widths, areas and depths. Derived body volumes and area ratios were also calculated for each animal and examined as potential predictor variables. Simple and step-wise multiple regression (SMRL), partial least squares (PLS) analysis and artificial neural network (NN) relationships between a total of ninety-eight potential DIA predictor variables and steer slaughter characteristics were examined using Genstat 8, SAS and Neuframe analysis software.

Results No major problems were encountered with practical operation of the DIA system in an on-farm environment. The adjusted R² and residual standard deviation (R.S.D) values for the optimum regression relationships between DIA predictors and slaughter characteristics (liveweight {LW}, cold carcass weight {CCW}, killing out proportion {KO prop}, sirloin weight, sirloin proportion {sirloin prop}, fat and conformation gradings on the EUROP grid scale) are given in Table 1. The range in actual data values to be predicted were as follows: LW (534-680), CCW (287-391), KO prop (521-613), sirloin weight (22.7-34.5), sirloin prop (67.6 – 100.1), fat grade (3, 4L & 4H), conf grade (R & -U). Significant (P<0.01) predictive relationships were established for all slaughter characteristics and the RSD figures represent an ability to predict the actual slaughter value with an error of +/- 1.0 - 7.9%. Although on a limited dataset of 2 or 3 categorical EUROP gradings, NN analysis was also able to correctly predict fat and conformation gradings in 47 of the 48 steers. The predicted vs actual slaughter LWs using an optimum multiple regression relationship are shown in Figure 1.

Table 1 Adjusted R² and R.S.D of optimum predictive relationships between DIA dimensions and slaughter characteristics of finished beef steers.

Slaughter characteristic		R ²	R.S.D.
LW	(kg)	0.807	15.7
CCW	(kg)	0.813	10.4
KO prop	(g/kg)	0.909	5.3
Sirloin weight	(kg)	0.584	2.1
Sirloin prop	(g/kg)	0.613	5.1
Fat grading (EUROP)		0.806	
(PLS analysis)			
Conf grading (EUROP)		0.807	
(PLS analysis)			
predictors (R ² = 0.807: R.S.D. = 15.7).			

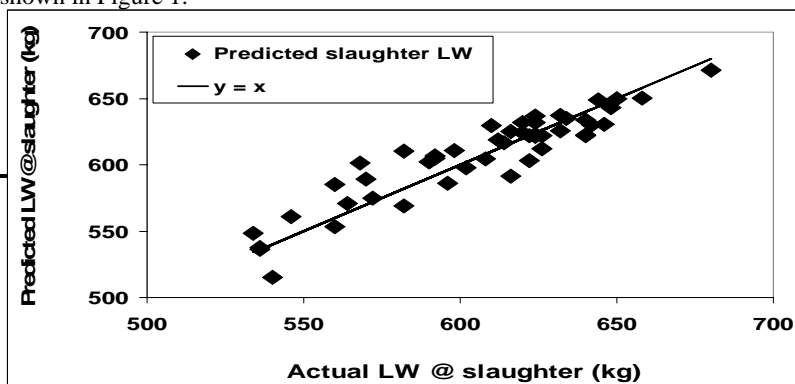


Figure 1 Predicted vs actual slaughter LWs using an optimum multiple regression model from DIA

Conclusions This study has established that live animal DIA systems are feasible under common on-farm management conditions and can be used to predict some important slaughter characteristics. Further studies are required to extend the DIA database to cover additional animal groups (e.g. bulls and heifers, different breeds) and more divergent fat and conformation grading combinations. More robust prediction equations could then be developed to cover this wider range of commercial cattle. The potential of live animal DIA systems in an auction market environment should also be examined.

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Reference

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