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Determination of Carcass and Live Body Weight of Finishing Cattle from Front Body Weights Taken at a Scale—Electronic Identification Equipped Water Fountain

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Abstract

A water fountain oriented cattle weight monitoring system was designed to automatically identify cattle and weigh cattle when they approached the in-pen water fountain to drink. This system provides a labor free means to monitor cattle in terms of daily weight gain and also provides an objective method to evaluate the health of cattle based on frequency of drinking and deviations from their normal pattern.

Keywords

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Introduction

A water fountain oriented cattle weight-monitoring system was designed to automatically identify cattle and weigh cattle when they approached the in-pen water fountain to drink. This system provides a labor free means to monitor cattle in terms of daily weight gain and also provides an objective method to evaluate the health of cattle based on frequency of drinking and deviations from their normal pattern.

The e-id tag value is captured by the radio antenna when the animal steps on the scale-reader system. Because the system is located in a feedlot where a large scale platform may not work well due to animal traffic issues, only the front half of the animal is weighed on a compact floor scale. This progress report addresses the effort of establishing the relationship between whole body weight and the weight of the animal if only the front two feet are on the scale.

Materials and Methods

Two groups of yearling steers of British and Continental influence were tagged with a half duplex, electronic ID tag, weighed, and put on a finishing ration of corn, dry ground hay, and supplement. Whole body weights, body condition scores (BCS), hide cleanliness scores (MUD), and cattle disposition scores (DISP) were collected each month while on feed. The weights were compared with the front end weights collected automatically at the water fountain. The first group of 17 head was started on feed in December 2007 and fed through early spring of 2008. The second group of 19 head was placed on feed in late spring of 2008 and fed until August 2008. At the end of the time on feed, cattle were processed at Tyson Fresh Meats (Denison, IA) where carcass weight, ribeye area, back fat, KPH fat, quality grade, and yield grade were collected. A PC SAS 9.1 regression procedure was used to evaluate significance and terms considered significant at $P \leq = 0.05$.

Results and Discussion

Estimation of live weight from front end weight (FWt) measurement was improved only with the use of the BCS estimate. So far with the results of this portion of the trial, it was summarized that the relationship of front body weight to whole body weight was quite accurate, especially when BCS was taken into consideration. Equation 1.0 describes the relationship. This relationship would probably require some adjustment to accommodate heifer weights based on previous study observations.

Equation 1.0. Estimation of Actual Weight
Live weight = -60.02 + 0.84 × FWt + 88.02 × BCS

$R^2 = 0.91$		Std. error	$P > t$
Intercept	-60.02	47.04	0.21
FWt	0.84	0.07	< 0.0001
BCS	88.02	10.70	< 0.0001

Estimation of carcass weight (CWt) from the FWt measurement is also a possibility with high accuracy. Initially, the measures used in estimating actual weight from the FWt were used for determining CWt, but unlike the actual weight estimate, which improved with the use of BCS, carcass weight estimation did not show an improvement. Utilization of the REA improved accuracy as shown in Equation 2.1, however, REA is a measure that is not known until slaughter and the purpose of this exercise was to determine the carcass weight prior to slaughter. Therefore, the only measure that could be used was the FWt and this weight described the majority of variation observed between individual animal carcass weights (Equation 2.2). In fact, this measure may be more reliable for estimating CWt than using an actual whole body weight since the effects of gut fill are not as extreme with a front end measurement. This is likely since the gut fill load would tend to weigh down the back half of the animal, especially in situations where the front half is weighed on fixed six inch incline.

The next step was to check these estimates by utilizing the derived equations to calculate a dressing percentage and compare this calculated value to the actual measured dressing percentage. Table 1 outlines the measured and calculated values. The results indicate a good fit with the measured “t” value not indicating a significant difference between the value measured and value calculated.

Equation 2.1. Estimation of Carcass Weight

Carcass Weight = 83.21 + 0.70 × FWt + 7.69 × REA

$R^2 = 0.89$		Std. error	P > t
Intercept	83.21	55.17	0.14
FWt	0.70	0.05	< 0.0001
REA	7.69	3.48	0.03

Equation 2.2. Estimation of Carcass Weight

Carcass Weight = 167.44 + 0.72 × FWt

$R^2 = 0.88$		Std. error	P > t
Intercept	167.44	42.20	0.0004
FWt	0.72	0.04	< 0.0001

The next step is to apply an independent data set to test these equations to see whether what was observed continues. Also, when estimating actual weight from the front end weight, an adjustment may be required to more accurately accommodate heifers because previous studies indicated a larger proportion of body weight was in the front quarters of heifers when compared with steers. Likewise, based on the influence REA has on improving carcass weight estimation from a front weight, further adjustment would probably be advantageous when measuring light muscled cattle such as dairy type animals or extremely heavy muscled animals. From the minor differences observed in these tested cattle regarding REA relative to total carcass weight, heavier muscled cattle would have an upward adjustment in carcass weight from the estimate used since much of this increased muscling, and subsequently extra weight, occurs in the rear quarters.

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Table 1. Actual versus calculated dress.

	Measured	Calculated
Avg. dressing %	59.9 %	60.3%
Std. deviation	1.6%	1.2 %
Minimum %	57.2 %	58.2%
Maximum %	63.5 %	63.0 %

t < .05, statistically no difference detected.