AN EVALUATION OF METHODS USED TO ASSESS FAT COVER IN LIVE CATTLE

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SUMMARY

Five methods of assessing subcutaneous fat cover were compared using male and female Bos indicus-Bos taurus beef cattle. None of the methods was able to accurately predict fat depth. The ESTD FAT technique has the greatest potential because it requires minimal handling. Use of the TRANS site may assist to improve accuracy with the ESTD FAT technique.

INTRODUCTION

Fat cover is a major economic trait of the beef carcass and is easily measured on the carcass but not on the live animal. A method of fat assessment that is rapid and needs minimal cattle handling is required when large numbers are being selected for slaughter.

Visual assessment of fat depth of groups of live animals is reasonably well related to actual carcass fat but when assessment is on individual animals relationship with carcass fat is often poor (Naughtin 1980). This type of error leads to inefficiencies in marketing cattle because a proportion has unacceptable fat cover for the market supplied.

This paper reports an experiment designed to evaluate the accuracy of using visual and tactile methods to estimate fat depth in live animals.

MATERIALS AND METHODS

Bos indicus-Bos taurus crossbred steers aged from 2.5 to 4.5 years and mixed aged cows from Swans Lagoon Beef Cattle Research Station, Millaroo, North Queensland were assessed for fat cover. The number, mean liveweight ($\pm$ SD), mean carcass subcutaneous fat depth ($\pm$ SD) of the steers observed each year were 78, 452 $\pm$63 kg, 4.5 $\pm$2.7 mm in 1980; 99, 446 $\pm$44 kg, 3.9 $\pm$2.3 mm in 1981 and 133, 448 $\pm$51 kg, 4.7 $\pm$2.2 mm in 1982 respectively. In 1982 there were 74 non pregnant mixed age cows with a live weight of 381 $\pm$64 kg and 5.3 $\pm$3.7 mm fat depth. All these fat depth measurements were at the 12th-13th rib site.

The five assessment methods evaluated are described below. The Livestock Market Reporting Service (LMRS) is an industry accepted standard used to describe body condition at sale and ranks animals into one of five categories by a standard visual guide. Similarly, the National Beef Recording System (NBRS) is a visual method using a scale from one to eight. The ESTD FAT method is a visual assessment of fat depth over the ribs, the transverse processes of the loin and the tail head area and from this assessment a fat depth in (mm) at the 12th-13th rib site is estimated. The Modified Tactile (MT) method is based on palpation of the ribs and transverse processes of the loins then recorded on a scale of 1 to 6, whilst the TRANS method is scored by varying hand pressure on the transverse processes of the loin and rated using a six point scale (Loxton et al. 1982).

Each animal was weighed unfasted and fat depth assessed by each method on day 1, transported to the meatworks on day 2 and slaughtered on day 3. Subcutaneous

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fat depth was measured at the sacral crest rump site (Johnson and Vidyadaran 1981) of the hot carcass on day 3, or measured 24 hours post slaughter between the 12th-13th ribs, on each side of the carcass using the Australian Beef Carcass Appraisal System.

Serial and partial correlations were calculated using the formulae of Snedecor and Cochran (1967). Analysis of variance was carried out on carcass fat depth measurements for each liveweight range. Differences between score means were tested using the protected least significant difference method. A Chi squared test of independence to determine the proportion of animals ranked by operators in the different scoring categories was carried out.

RESULTS AND DISCUSSION

Table 1 shows mean fat depth for a given score of the LMRS and MT methods from 1980 and 1981 observations using steers.

TABLE 1 Mean carcass fat depth (mm) at the rib site by liveweight category and mean live animal score for two methods and two years observations using steers

Liveweight range (kg)		290 - 400		401 - 480		481 - 560	
Years		1980	1981	1980	1981	1980	1981
LMRS Score	2	1.66a (11)	3.13 (8)	1.97a (9)	2.86 (14)	-	-
	3	3.00b (3)	3.72 (8)	5.04b (25)	3.73 (43)	5.03a (17)	4.44 (9)
	4	-	-	6.83b (3)	4.60 (5)	7.30b (10)	5.73 (12)
	(± SD)	0.59	2.41	1.92	1.90	2.59	2.81
MT Score	2	1.65 (5)	-	1.00a (1)	-	-	-
	3	1.82 (7)	3.25 (1)	2.48a (12)	2.20a (5)	3.85a (5)	6.75a (1)
	4	3.13 (2)	3.12 (13)	5.17b (15)	3.32a (43)	5.57ab (14)	4.47a (8)
	5	-	5.50 (2)	6.22b (9)	4.98b (14)	7.66b (8)	4.68a (11)
	6	-	-	-	-	-	14.75b (1)
	(± SD)	0.68	2.37	1.84	1.78	2.52	1.84

Treatment means down columns and within each method followed by different superscripts differ significantly ($P<0.05$)

Figures in parenthesis denote the number of steers in each category

Mean fat depth generally increased with increasing live animal scores with gross inconsistencies associated with cells of one animal. However, the standard deviations show considerable overlapping of fat depth between live animal scores for both methods. This resulted in relatively poor discrimination between animals in terms of fat depth. The NBRS method gave results with similar inconsistencies.

The correlation coefficients between assessment score and fat depth at the rib site were moderate to low in all steer observations (P<0.01). Correlation coefficients and number of operators for the LMRS method were 0.61 to 0.66, 4; 0.33, 1; 0.29 to 0.46, 2; in 1980, 1981 and 1982 respectively. Comparable values for the MT method were 0.63 to 0.69, 3; 0.42, 1; and 0.53 to 0.58, 2; for the same years. An alternative visual method, the NBRS recorded values of 0.60 to 0.69, 4; and 0.29, 1; in 1980 and 1981 respectively. Two additional methods, the ESTD FAT and TRANS method were observed in 1982. Values recorded were 0.48 to 0.53, 2; for the ESTD FAT method and 0.54 to 0.56, 2; for the TRANS method.

When cows were observed in 1982, the correlation coefficients (P<0.01) between assessment score and fat depth and number of operators for the LMRS method were 0.61 to 0.64, 2; for the MT method, 0.69 to 0.72, 2; for the ESTD FAT method 0.65 to 0.73, 2; and 0.68 to 0.71, 2; for the TRANS method. Cows were more successfully assessed than steers. The most likely reason is that cows had a greater range of fat cover than the steers.

Correlation coefficients of the range 0.85 to 0.98 (P<0.01) were recorded between TRANS scores and MT scores for both sexes in 1982. We suggest a single TRANS score could give an indication of subcutaneous fat depth as reliable as the MT method. When using a tactile method, use of only one palpation site i.e. the TRANS would reduce the amount of handling required for each animal.

In 1982 correlation coefficients (P<0.01) for both sexes and between the LMRS and ESTD FAT scores recorded were 0.75 to 0.85, between the LMRS and MT scores of 0.30 to 0.65 and between the LMRS and TRANS of 0.28 to 0.60. Comparable values recorded between ESTD FAT and MT scores were 0.36 to 0.70 and between ESTD FAT and TRANS scores of 0.32 to 0.67.

Our results show that correlation coefficients between ESTD FAT and carcass fat depth for both sexes are similar to the tactile methods and higher than the LMRS method, even though the LMRS and ESTD FAT methods are reasonably correlated.

TABLE 2 Frequency of scoring by operators for the LMRS and MT methods - 1980 steers

Score	Method Operator	LMRS A	B	C	D	MT E	F	G
2		.28	.24	.22	.28	.07	.17	.03
3		.51	.54	.31	.55	.22	.32	.33
4		.21	.22	.47	.17	.39	.32	.42
≥ 5		not applicable				.32	.19	.22

LMRS $-X^2$ = 24.69 (6df), MT $-X^2$ = 15.07 (6df). All P<0.01

Table 2 shows that operators ranked animals differently in the 1980 observations. This variation was greatest with the LMRS method. The range in the correlation coefficients between assessment score and fat depth indicates there was similar variation in the later years.

When the correlation coefficients between assessment score and carcass subcutaneous fat depth were adjusted for final liveweight, correlation coefficient values were lowered irrespective of method. We suggest liveweight has an influence on the operators ability to rank individual animals, although liveweight was unknown to an operator when assessing.

Simple correlation coefficients between final liveweight and carcass subcutaneous fat depth at the 12th-13th rib site were r = 0.54 in 1980, r = 0.22 in 1981, r = 0.44 and 0.41 for steers and cows in 1982 respectively. These results are in agreement with reported correlations varying from 0.23 (McReynold and Arthaud 1970) to 0.52 (Wood et al. 1979). Weighing animals could be an alternative to live animal fat depth assessment for inexperienced operators, but live weight will not explain any more of the variation in fat cover than we have documented for the type of animals in our studies. Operator inexperience may have influenced these results. Crouse et al. (1974) found experienced operators accounted for a greater proportion of the variation in fat depth of animals than inexperienced operators.

Fat measurement at the sacral crest site is now preferred to measurement at the rib site because there is less fat damage during processing (Johnson and Vidyadaran 1981). These workers reported a high relationship (r^2 = 0.78) between fat depths at these two sites, therefore the change in site for fat measurement should not alter the significance of our results.

Our results show that whether visual or tactile methods were used there was poor assessment of fat depth. Inconsistencies between operators represents another problem area. People involved in this area should be aware of the difficulties involved.

Probably the ESTD FAT method offers the best potential because correlations between this estimate and fat depth were equal to or marginally better than for other methods. Additionally, visual methods are easier to implement.

ACKNOWLEDGEMENTS

We wish to thank Mr B. Garbutt, LMRS reporter Townsville, staff of QDPI Swans Lagoon Beef Cattle Research Station, Thos Borthwicks and Sons, Bowen, F.J. Walkers Pty Ltd, Townsville, Mr J. Bond QDPI, Bowen and Mr J. Round QDPI, Townsville for their assistance and cooperation.

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