# SEQUENTIAL SCANNING OF CROSSBRED FEEDLOT STEERS

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## SUMMARY

Substantial benefits could accrue to the Australian beef industry if carcass composition could be specified on live steers at entry and during a feeding program. Ultrasound was used to estimate fat depth, eye muscle area and marbling on 204 steers during a feedlot period. Very high correlations between scan measurements and scan and carcase measurements were obtained for fat depth measured at both the P8 and rib sites. High correlations were also obtained for estimates of loin eye muscle area but relatively low values were obtained for estimates of marbling.

## INTRODUCTION

The Australian beef industry has entered an era where total quality management, objective measurement of livestock and tight product specifications are necessary to maintain and increase market share. If individual cattle can be identified early and separated into management or marketing groups on the basis of their propensity to reach specifications it will enable considerable savings in feed costs, and enable cattle to be drafted into appropriate slaughter categories and encourage the payment of price premiums.

Ultrasound technology has been used to measure live animal characteristics such as fat depth and eye muscle dimensions for more than 30 years. Recently, Brethour (1990) used ultrasound techniques to score cattle on their marbling potential as long as 148 days before slaughter. Our study provided data on heavy weight steers, which are outside the weight ranges found in the literature. The objective of this study was to predict marbling, fat depth and eye muscle area in 204 steers during post weaning growth in order to match live animals with carcass specifications.

## MATERIALS AND METHODS

Steer calves representing a range of genotypes from very early maturity, (eg Jersey Hereford) to very late maturity (eg Charolais Simmental Hereford) were assembled at Struan Research Centre. In December of each year, the calves were weaned and grazed pasture until transfer to the feedlot at about 15 months of age. Eye muscle area and fat measurements (P8, 12/13 rib and marbling) were taken on the live steers at commencement of lot feeding and at intervals of approximately 50 days. Marbling was scored on the live steers as outlined by Brethour (1990) ie based on the degree of speckling on the visual display unit. Eye muscle areas were determined on live steers at the 12/13th rib interface but at the 11/12 quartering site on carcasses. In 1990 both an Ausmeat accredited assessor and an assessor trained by the works were used to assess carcass marbling. Ausmeat assessors measures of eye muscle area determined by a computer linked scanner were checked manually from tracings on acetate sheets. [Trace in Table 2 (c)]. Carcass measurements and quality evaluations were taken at slaughter (after approximately 300 days in the feedlot). Quality evaluations included eye muscle area, marbling, P8 and 11/12 rib fat. Ultrasound scanning was performed by an accredited operator using an Aloka 500 and 17cm probe. See Table 1 for an overall description of the steers.

Table 1

| | 1990 | | | | 1991 | | | |
|---|---|---|---|---|---|---|---|---|
| | **Mean** | **SD** | **Min** | **Max** | **Mean** | **SD** | **Min** | **Max** |
| Wt. on entry | 303 | 30 | 245 | 390 | 270 | 49 | 175 | 375 |
| Final weight | 682 | 70 | 535 | 870 | 634 | 74 | 485 | 790 |
| Carcass weight | 382 | 45 | 285 | 512 | 352 | 47 | 254 | 453 |
| Carcass Fat thickness P8 mm | 19 | 7 | 6 | 43 | 19 | 7 | 8 | 41 |
| Carcass Rib Fat Thickness mm | 18 | 5 | 8 | 31 | 16 | 5 | 7 | 30 |
| Carcass Marbling score | 2.2 | 0.6 | 1 | 4 | 2.3 | 0.6 | 1 | 4 |

## RESULTS

Correlation between ultrasound estimated carcass characteristics and measured carcass traits.

Table 2(a). Correlation coefficients between fat measurements at the P8 site at various times

| 1990 Intake (killed 9/4/91) | Days to kill | Scan 14/9/90 | Scan 2/11/90 | Scan 15/2/91 | Scan 4/4/91 | Carcass Hot | Carcass Cold |
|---|---|---|---|---|---|---|---|
| Scan 18/12/89 | 477 | 0.61 | 0.69 | 0.71 | 0.68 | 0.57 | 0.54 |
| Scan 14/9/90 | 207 | | 0.74 | 0.72 | 0.70 | 0.56 | 0.48 |
| Scan 2/11/90 | 158 | | | 0.90 | 0.86 | 0.77 | 0.63 |
| Scan 15/2/91 | 53 | | | | 0.94 | 0.81 | 0.62 |
| Scan 4/4/91 | 5 | | | | | 0.77 | 0.61 |
| Hot carcass 9/4/91 | - | | | | | | 0.72 |

| 1991 Intake (killed 5/2/92) | Days to kill | Scan 20/11/91 | Scan 24/1/91 | Carcass Hot | Carcass Cold |
|---|---|---|---|---|---|
| Scan 12/8/91 | 177 | 0.80 | 0.78 | 0.74 | 0.69 |
| Scan 20/11/91 | 77 | | 0.93 | 0.87 | 0.82 |
| Scan 24/1/92 | 12 | | | 0.86 | 0.81 |
| Hot Carcass 5/2/92 | | | | | 0.89 |

Table 2(b). Correlation coefficients between measures of scanned 12/13 rib fat and carcass 11/12 rib fat

| 1990 Intake (killed 9/4/91) | Days to kill | Scan 14/9/90 | Scan 2/11/90 | Scan 15/2/91 | Scan 4/4/91 | Carcass |
|---|---|---|---|---|---|---|
| Scan 18/12/89 | 477 | 0.66 | 0.59 | 0.72 | 0.69 | 0.39 |
| Scan 14/9/90 | 207 | | 0.67 | 0.67 | 0.69 | 0.45 |
| Scan 2/11/90 | 158 | | | 0.79 | 0.76 | 0.59 |
| Scan 15/2/91 | 53 | | | | 0.90 | 0.62 |
| Scan 4/4/91 | 5 | | | | | 0.65 |

| 1991 Intake (killed 5/2/92) | Days to kill | Scan 20/11/91 | Scan 24/1/91 | Carcass |
|---|---|---|---|---|
| Scan 12/8/91 | 177 | 0.80 | 0.72 | 0.70 |
| Scan 20/11/91 | 77 | | 0.86 | 0.65 |
| Scan 24/1/92 | 12 | | | 0.68 |

Table 2(c). Correlation coefficients between measures of eye muscle area

| 1990 Intake (killed 9/4/91) | Days to kill | Scan 14/9/90 | Scan 2/11/90 | Scan 15/2/91 | Scan 4/4/91 | Carcass Ausmeat Assesor | Carcass Trace |
|---|---|---|---|---|---|---|---|
| Scan 18/12/89 | 477 | 0.49 | 0.46 | 0.44 | 0.48 | 0.37 | 0.37 |
| Scan 14/9/90 | 207 | | 0.74 | 0.62 | 0.62 | 0.52 | 0.52 |
| Scan 2/11/90 | 158 | | | 0.52 | 0.69 | 0.61 | 0.59 |
| Scan 15/2/91 | 53 | | | | 0.72 | 0.66 | 0.65 |
| Scan 4/4/91 | 5 | | | | | 0.72 | 0.71 |
| Ausmeat Carcass | | | | | | | 0.96 |

| 1991 Intake (killed 5/2/92) | Days to kill | Scan 20/11/91 | Scan 24/1/91 | Ausmeat Assesor | Trace |
|---|---|---|---|---|---|
| Scan 12/8/91 | 177 | 0.62 | 0.64 | 0.70 | 0.71 |
| Scan 20/11/91 | 77 | | 0.74 | 0.76 | 0.78 |
| Scan 24/1/92 | 12 | | | 0.75 | 0.76 |
| Kill 5/2/92 (Hot) | - | | | | 0.95 |

Table 2(d). Correlation coefficients between measures of marbling two times before slaughter

| 1990 Intake (killed 9/4/91) | Days to kill | Scan 2/11/90 | Ausmeat Assesor | Works Assesor |
|---|---|---|---|---|
| Scan 14/9/90 | 207 | 0.55 | 0.32 | 0.44 |
| Scan 2/11/90 | 158 | | 0.35 | 0.42 |
| Ausmeat | | | | 0.75 |

| 1991 Intake (killed 5/2/92) | Days to kill | Scan 20/11/91 | Scan 24/1/91 | Carcass |
|---|---|---|---|---|
| Scan 12/8/91 | 177 | 0.43 | 0.53 | 0.35 |
| Scan 20/11/91 | 77 | | 0.62 | 0.34 |
| Scan 24/1/92 | 12 | | | 0.37 |

## DISCUSSION

(a) There was a high correlation (approximately 80%) between repeated scan measurements (see Table 2) pre slaughter and measured hot P8 fat. However, the correlation between scans and fat measures taken on cold quartered carcasses were lower in both years. This may be explained by the relatively low correlation between hot fat measurement and cold fat measurement for the 1990 intake.

(b) Correlations between ultrasound scans and carcase measures of fat at the rib site were considerably lower (0.65 to 0.68) than for the P8 site. The difference is likely to be due to a combination of factors including the following: Measures were taken at the 12/13 rib on the live animal but at the 11/12 on the carcass; rib measures were taken on cold carcasses but P8 measure were on hot carcasses; the influence of ribs in the scanning process.

(c) Correlations between the last scan and eye muscle area (longissimus dorsi) were higher e.g. r = 0.72 than the results reported by Smith et al (1992).

(d) Correlations between estimates of marbling scores and scores determined from carcasses were not as high as fat and eye muscle area estimates (ranged from 0.32 - 0.37). However, these apparently low values were statistically significant. When estimates of breed mean marbling scores were plotted (not presented here) the ultrasound measures ranked the breed groups the same as the marbling assessments based on carcass measures. However, it was noted that two independent assessors (one Ausmeat trained and one works trained) differed in their assessment such that the correlation between assessments was 0.75. It is likely that the different distribution of fat between carcasses (e.g. marbling vs intermuscular seams) affects the ultrasound assessment. It is also likely that the narrow range of marbling scores resulted in a relatively low correlation. At this stage it would appear that the technique is not accurate enough to predict individual performance, but can be an indicator of performance of groups of steers. More work needs to be done on this aspect.

## ACKNOWLEDGMENTS

This project involved a major cooperative team effort by Peter Gretgrix and John Spriggs at the Charlton Feedlot, Lex Crosby and Pat Nolan of Hannam Livestock and Rob Hart of NSW Agriculture. Ultrasound measurements were performed by Jim Green of Combined Livestock Services, Holbrook, N.S.W. Assistance with the preparation of this paper by Alex McDonald and Dorothy Robinson at the Animal Genetics and Breeding Unit, Armidale. Thanks to Heather Parker for processing the manuscript.

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