NEW DEVELOPMENTS IN LIVE ANIMAL APPRAISAL OF MEAT QUANTITY IN BEEF CATTLE

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INTRODUCTION

The ability of the producer and the buyer of livestock to relate live animal characteristics to carcass characteristics is important for both production and marketing purposes.

Kempster et al. (1982), in a review of live animal and carcass conformation, concluded that "conformation is a poor indicator of carcass composition". The problem relates to the definitions used, the relationship between fat and conformation, and the amount of variation (or lack of it) in sample populations.

Conformation, defined as the shape of the butt profile including fat cover, confounds the relationship of muscle and yield with that of fat and yield. In those studies where fat has been accounted for, conformation has a positive relationship with meat yield (Colomer-Rocher et al. 1980; Kempster, 1986).

In the Australian beef industry over the past decade there has been increased emphasis on liveweight as a selection criterion, as well as increased usage of muscular European breeds and a large emphasis on frame score. At the same time there has been a reduction in the subcutaneous fat levels desired by the consumer.

In light of these changes this paper describes a method of assessing the shape of live animals, and relates this shape to the quantity of saleable meat yielded by the animal. The variation found in sample populations of commercial cattle using this assessment method is also reported.

LIVE MUSCLE SCORES

In 1987 this author and others in NSW Agriculture and Fisheries developed a subjective "live muscle score" based on the thickness and convexity of the body relative to the size of the animal, discounting for subcutaneous fat (Figure 1).

De Boer et al. (1974) defined the terms:

Flesh	-	muscle and inter-muscular fat
Conformation	-	thickness of flesh and subcutaneous fat relative to the dimensions of the skeleton
Fleshiness	-	thickness of flesh relative to the dimensions of the skeleton
Muscle	-	muscle fibres and intramuscular fat
Muscularity	-	thickness of muscle relative to the dimensions of the skeleton.

Muscle scores

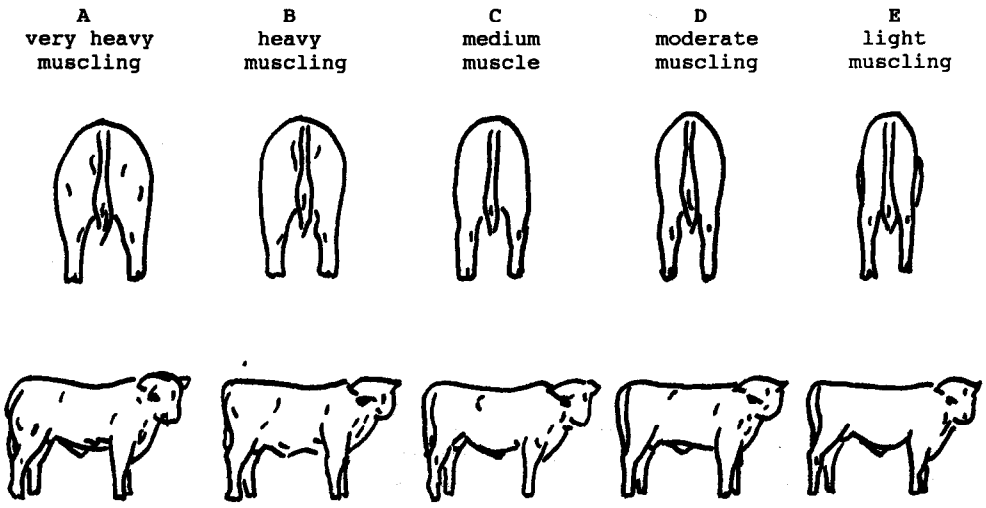


Figure 1. Butt and side profiles showing the difference in thickness and convexity of the body in the different muscle score categories.

According to de Boer et al's (1974) definitions "muscle score", in the context of this paper and in our trials, is in effect a "fleshing score". We have discounted the use of the word "fleshing" in Australia for two reasons:

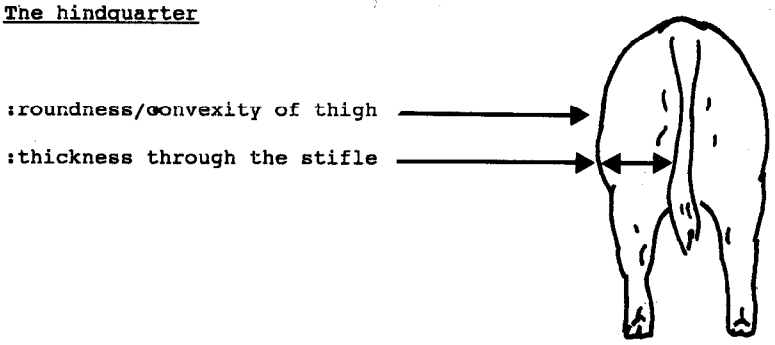
(i) the term has been used extensively in the beef industry in Australia, with varied connotations that lead to confusion
(ii) at the very light levels of fatness usual in the Australian beef industry inter-muscular fat is perceived to play an insignificant part in total shape.

HOW TO MUSCLE SCORE

In practice, when determining muscle score one must first estimate the level of fatness covering the body (e.g. mm. subcutaneous fat at the rib or rump). A score from A (very heavily muscled) to E (lightly muscled) can then be given based on the roundness (convexity) and thickness of the body due to muscle and inter-muscular fat.

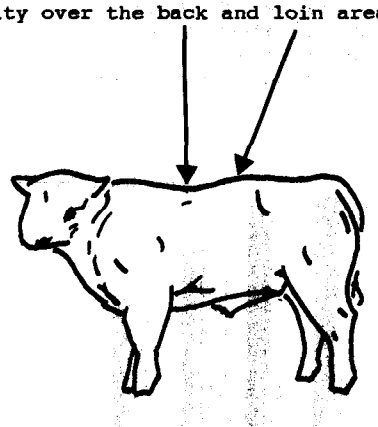
The two areas of reference for estimating muscle score are:

(i) The hindquarter



(ii) Back and loin

: thickness and convexity over the back and loin area



Most animals produced commercially at the moment are classified as average or "C" muscle scores. If an animal varies from that average then the assessor needs to distinguish whether this change is due to an increase in subcutaneous fat cover, or to an increase in muscle and inter-muscular fat. Fatter animals generally do not exhibit the roundness or convexity which is present in more heavily muscled animals. Heavily muscled, leaner cattle, display clearly evident seams between the muscles of the hind quarter.

To help distinguish smaller differences between animals, and add continuity to the scoring system, the five scores can be extended to 15 by adding plus and minus to each score (A+ to E-).

REPEATABILITY OF LIVE MUSCLE SCORES

We tested the ability of two 'scorers' to give similar scores to the same animals over time, and between scorers. 32 two-tooth steers were scored, in random order, three times, using the extended 15 score scale. On a 'within-operator' basis 94% and 96% of second and third scores for each scorer respectively were either the same as the first score (55% and 66%) or within one score of the first.

On a 'between-operator' basis 47% of scores given by both scorers were identical. 43% of the scores given were within one score of each other. Only 10% of the time did the scorers differ by two scores. The range of scores given was from D to B+ (8 scores on the 15 point scale).

ASSOCIATION BETWEEN LIVE MUSCLE SCORE AND YIELD

A trial conducted in 1988 on 136 mixed breed steers found that the "live muscle score" described in this paper improved the estimation of saleable meat yield. Both subcutaneous fat depth and "live muscle score" were significantly associated with differences in the yield of saleable meat. When "live muscle score" was included in a multiple regression equation with subcutaneous fat depth the amount of variation in percentage yield accounted for by the model was increased by 21% (Perry, unpublished).

The correlation of "live muscle score" with a carcass "muscle score" and with eye muscle area was 0.86 and 0.7 respectively.

These results suggest that if subcutaneous fat and "muscularity" (or fleshiness as defined by de Boer et al. 1974) can be assessed with a reasonable degree of accuracy on the live animal, then an animal's worth as a carcass can be more accurately estimated. That is, the producer and the buyer can better match live animal characteristics to those carcass characteristics which contribute to quantity of meat yield.

VARIATION IN LIVE MUSCLE SCORE

Three studies have been carried out since 1987 examining the association between muscle score and both dressing percentage and saleable meat yield. All have dealt with steers only and, with the exception of the Trangie trial, all have consisted of a number of breeds. Figure 2. shows the distribution of muscle scores in each trial.

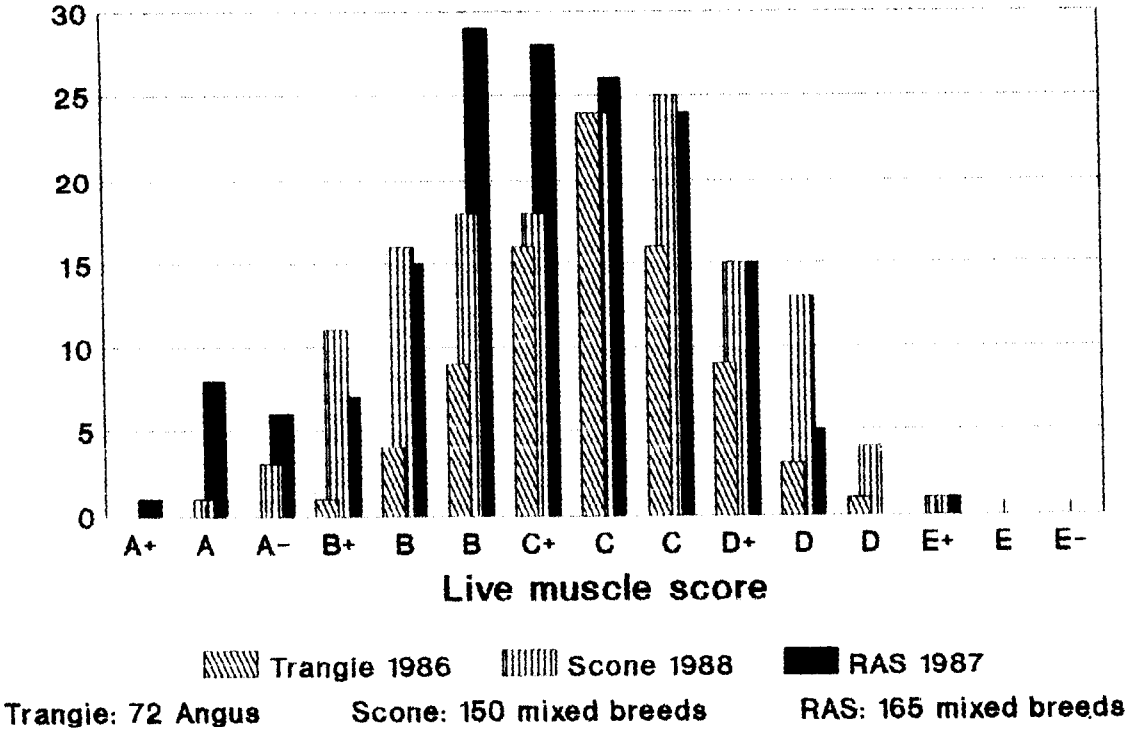


Figure 2. Frequency distribution of live muscle scores (A+ to E-) given to steers in three separate trials.

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