BEEF CARCASES - GRADE OR DESCRIBE?

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ABSTRACT

Beef carcase quality grading systems aim to sort carcases into sets of like tenderness to give some certainty to consumers and to reward cattle producers for the production of desired carcases. They are unlikely to be useful in countries which export large amounts of beef, as grading systems in importing countries can differ widely. It can be simply demonstrated that grading systems cannot be used to determine tenderness, as up to 4 x differences in tenderness of muscles can be produced between contralateral sides by applying different chilling, hanging or electrical stimulation protocols to them. Grading systems have been demonstrated to be slow to respond to customer preferences. Inappropriate grading standards can be enormously costly in both production and trimming costs. An inappropriate system which, say, tells consumers that fat is good, when they want lean beef is likely to reduce rather than increase beef consumption!

Carcase description systems do not impose quality standards and can potentially be applied universally. Changes in consumer preferences present no problems - the free market system operates.

INTRODUCTION

Systems to quality grade carcases have existed in many countries for about 70 years. They were devised to sort carcases into groups of similar eating quality and thereby ensure that domestic consumers could confidently purchase beef of a known eating quality and to reward farmers who produced carcases with required attributes. There are many very important but not always obvious implications in these aims. Firstly, they were never designed to be universal. Secondly, the emphasis was on the eating quality of the 'table meats' in the carcase and the variation in the value of those parts used for manufactured meats was apparently neglected. Within this emphasis was the implication that one could ascribe a tenderness rating which applied to all, or most, cuts on a carcase. To my knowledge no one has yet demonstrated this is possible. Thirdly, there was the most important presumption that the systems did in fact 'reasonably' segregate carcases which had similar within-set tenderness, but with mean tenderness differing between sets.

Historically, the worst feature of most grading systems has been that their originators and proponents (understandably exhausted by efforts to devise and implement a system) have not a priori instigated regular reviews of the system. Consequently, many grading systems became 'set-in-stone' and could not be promptly changed to respond to changes in customer and/or consumer demand.

From a marketing view point, the grading system tells consumers what is good beef. From an economic point of view, grading creates an, artificial, legislated market. Carcase description, or classification, systems are used to do what their name indicates — first describe and then classify carcases into sets. Within sets attributes are similar, but between sets, attributes differ. Such systems are potentially universal. They imply nothing about quality or yield but allow traders to decide what particular combination(s) of attributes best suit their market and to determine yield. They are not used to tell customers what is best. They cannot be used to create artificial markets but can be used to communicate to farmers quite fine detail as to customer/consumer demands.

In this paper I intend to discuss in more detail the points made above and the advantages and disadvantages of the two, apparently similar, but in fact very different, systems.

UNIVERSALITY

As far as I am aware all early, government, grading systems were designed in countries which did not export beef and were designed for one domestic market. A single grading system is virtually impossible to implement in countries like Australia which export the majority of the beef they produce to many (approximately 70) countries. As an illustration, in the Japanese market carcases with very high levels of intramuscular (marbling) fat command the highest price but in other countries (e.g. Sweden) lean beef commands the highest prices. This could be accommodated if you turn the Japanese marbling grade rankings upside down and you would have a system suitable for Sweden! Thus, if grading has a large overall benefit and was therefore used in all countries, exporters could need to use many grading systems on carcases whose meat is destined for export.

TABLE MEATS V. MANUFACTURING MEATS IN THE SAME CARCASE

A number of traits advantageous to the quality of table meats are contraindicated for quality manufacturing meats e.g. the beneficial effect of high ultimate pH on the water- and fat-binding properties of manufacturing meats would be reflected in an unacceptably dark meat colour and high toughness.

"TENDERNESS OF A CARCASE"

When meat scientists or the industry talk about grading it is implied, sometimes I suspect unknowingly, that if one muscle (and it is almost always only the *M.longissimus dorsi* (LD) that has been evaluated) is tough, then all other muscles are likely to be tough. This is despite the fact that both know the tenderloin (*M.psoas major* [PM]) can be tender even in very old animals!

Large differences between muscle in the rate at which toughening occurs with increasing animal age have been demonstrated (see Shorthose & Harris 1990 and others). Accurate grading systems would need to take account of these differences if one is to value carcases based on the weighted tenderness of all table cuts. Simply grading young animals is costly because muscles that are tender in old animals are, theoretically, down-valued.

CAN GRADING IDENTIFY CARCASES WHICH HAVE TENDER MEAT?

It can be simply demonstrated that this is, theoretically, impossible. The demonstration consists of cooling two sides of the same carcases differently. These two sides have an identical quality grade but, depending on the extent of the difference in cooling rate, the loin, or rump or topside of the side chilled fast can be up to FOUR TIMES TOUGHER than their contralateral cuts in the slower chilled side! Similar differences recognised by consumers (Ford 1981) as well as by laboratory taste panels and objective measurements of toughness (Bouton et al 1977), can be achieved by tenderstretching one side (see Table 1) and not the other, or effectively electrically stimulating one side and not the other.

The trusted relationship between marbling and tenderness OF THE LD is not causal but almost totally due to the fact that more heavily marbled carcases are inevitably heavier and/or fatter. On such carcases, muscles that are free to shorten, like the LD, cool more slowly, shorten less and are, therefore, more tender. Even in this 'best case' situation U.S. reviewers have concluded that at most, marbling accounts for only 10% of the variation in tenderness (of the LD?) (Parrish 1974). Even this indirect relationship disappears if sides are tenderstretched or electrically stimulated (see Table 1). The relationship between marbling and tenderness is redundant, because, with correct carcase treatment, tender beef can be produced from lean (desired by health conscious consumers) carcases.

Table 1

*Mean Animal and Carcase Characteristics and Warner Bratzler Peak Shear Force Values (kg) of LD Muscles of Sides of Steers (Left side) Hung Normally [N] or (Right side) Tenderstretched [TS] (N = 240).

AGE (Months)	9	16	27	42
Carcase Weight (kg)	127	162	278	445
Marbling Score[#]	1	1.5	2	3.5
N Shear Force (kg)	11.1	9.1	5.9	4.9
TS Shear Force (kg)	3.5	4.6	4.7	4.2

* From Bouton et al (1978)

[#] 1 = None   5 = High

GRADING AS A MARKETING AID!?

"The U.S. beef industry has been producing over 2×10^9 kg of excess fat (per year?) prior to 1986" (Cross et al 1988). The rapid decrease in fat trim of retail beef cuts in the U.S. from 1986 (13mm) to 1988 (< 3mm) (Cross et al 1988) is surely an indication that institutionalised "imposition" of an historic quality grading system can result in a mispromotion of product with costs of heroic proportions.

GRADING AND FREE MARKET ECONOMICS?

Consumer preference surveys in the U.S. (Cross et al 1988) and Australia (Hearnshaw et al 1993) indicate that urban consumers buy lean beef. Marbling considerably reduced the disappearance rate of loin steaks from urban supermarket displays and had no effect on consumer evaluations of the tenderness of steaks they bought normally and cooked and ate in their own homes! This surely suggests that inappropriate and insensitive grading systems detract from consumer opinions of beef and could reduce rather than increase beef consumption.

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