

# Suggestions for a Quantitative Approach to Commercial Beef Carcase Grading

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## I.-INTRODUCTION

Grading of beef carcasses is performed in most countries by eye. Although few would deny the basic advantages, in principle, of appraisal by measurement rather than by eye, no simple, proven, quantitative grading method has been available as an alternative to the subjective approach.

Arising from recent research into general aspects of quantitative carcase definition a measurement technique has emerged which has high discriminatory value, yet is easy and quick enough in its application to suggest possible usefulness for commercial grading. The purpose of the present paper is to describe this technique, to illustrate how it might be used in the classification of carcase type, and to discuss the implications of any such innovation.

## II.-DESCRIPTION OF TECHNIQUE

In a previous study (Yeates, 1952) the concept was advanced of a fleshing index, descriptive of the amount of meat (lean and fat) any beef carcase carries relative to its bony framework, or "scale", as represented by length. The index was established on the basis of the weight-to-length relationship of a large number of first and second grade Australian export quality carcasses.

Comparison of any type of carcase, however good or poor, with this standard weight/length relationship offered an accurate and quick means of characterising its fleshing. Thus arose the term "gross fleshing index", representing the number of pounds by which any carcase is heavier (positive) or lighter (negative) for its length than the average.

While this measure characterised excellently the degree of total soft tissue development, it provided no information on the relative development of fat and lean. Accordingly a measure of fat status was developed. This may be described as the ratio of lean to fat thickness, measured at standard positions near the 10th rib at the position of quartering. Ratio 7 (i.e., 7 parts lean to 1 part fat) was chosen as the upper limit of present-day acceptable fatness (Yeates and Bungey, unpublished data).

An instrument of the slide-rule type was then evolved, this being simply a convenient means of quickly calculating gross fleshing index and of applying, by means of a cursor, an appropriate correction to any over-fat carcase. The cursor subtracts an amount, depending on actual measured fat status, which represents the estimated weight in pounds of fat which would require to be trimmed from the carcase to reduce it to the acceptable level of ratio 7. The scale of corrections was derived by test dissections of standard 3-rib joints, following a technique of Hankins and Howe (1946). These procedures and a description of the slide-rule are reported elsewhere (Yeates, 1959).

As carcase definition by the method for which this slide-rule is intended has continued to give satisfactory results, the desirability

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of using the method as part of a new objective system of commercial grading arises.

Accordingly, suggestions are offered in the ensuing section for adaptation of the system for grading.

### III.-SUGGESTIONS FOR GRADING PROCEDURE

Fleshing and fatness should be assessed independently. This is necessary to give the carcass an adequate description so that all market demands may be precisely met.

Fleshing may be read off from the slide-rule provided weight and length of the carcass are known. Weight is routinely available in abattoirs, so length measurement becomes the only "new" requirement under this heading. The gross fleshing index is expressed as a number. The range of possible fleshing indices is continuous but the following examples from representative values throughout the range are cited, along with their corresponding likely "quality" descriptions, to illustrate the definition which fleshing index provides.

+ 250 and upwards—Extreme thickness of fleshing. Common enough in bull beef, but seldom achieved in steers, even top quality competition animals. Would represent the ultimate in blocky conformation.

+ 175 The more usual prize-winning class in competition beef.

+ 100 Average competition class. About the lower limit of the good "chiller" type.

0 Moderate. Average of the combined 1st and 2nd grade Australian export frozen beef class.

— 100 Plain and rather "shelly". Generally also rather low in fat, nevertheless useful trade beef.

— 175 "Boner" class. Deficient fleshing.

— 250 and downwards—"Canner" class. Very poor to emaciated.

Fatness: With the exception of over-fat carcasses classification of fatness could be performed by eye, according to present custom. The following categories are suggested:—

E<sub>1</sub> Preferred export level of fat; i.e., clearly enough fat, spread evenly over the carcass, to minimise drying out, to cover any dark muscle patches and to combat contamination due or organisms during protracted periods of storage.

E<sub>2</sub> Sufficient fat for export preservation needs, but only just—some few smallish areas of muscle showing through as dark patches.

L Well suited for local trade where long-term storage not involved. Definitely insufficient fat for export storage needs, but enough for the cooking needs of baking and roasting.

X Excessive fat, i.e., that which on measurement is fatter than ratio 7:1 and hence requires trimming. The various levels of excess as shown by measured ratio, and their estimated equivalent trim are as follows:—

X<sub>6</sub> (i.e. ratio of 6:1) Slightly over-fat. 42 lb. trim

X<sub>5</sub> ( " " " 5:1) Moderately over-fat. 97 lb. trim

X<sub>4</sub> ( " " " 4:1) Markedly over-fat. 170 lb. trim

X<sub>3</sub> ( " " " 3:1) Grossly over-fat. 255 lb. trim

(N.B.—The amount of trim is read from the cursor of the slide-rule.)

B "Boner" level of fatness. Some fat, but not enough for purposes of baking and roasting.

C "Canner" level of fatness. Almost devoid of fat.

With fleshing and fat status defined, all that remains, to give a comprehensive description of any carcass, is the usual statement of its sex, age, and weight, with the possible addition of any special information on bruising or yellowness of fat, etc. Whether it will be classified as ox, heifer, cow, or bull beef is readily decided by inspection, as is the age, within such ranges as vealer, yearling, 2, 3, 4 to 5 year old, or "aged".

#### IV.-DISCUSSION

**Grading Staff:** The same authorities and personnel as at present could supervise and implement the grading without any loss of time to normal abattoir procedure. Length measurement could be pencilled on the rib; then as the carcass was weighed, a tally clerk could read off the fleshing index from his slide-rule and record the result both in his log book and on the carcass. A boy, stationed at a convenient position, with an array of brands ranging from say -300 to +300 in intervals of 50, or even 20 for greater sensitivity, could then stamp each fore and hind with the fleshing index to which the carcass most nearly conformed.

Next day, subsequent to quartering of the chilled carcasses, classification for fat status could be carried out. This would be an additional new procedure but would represent a great improvement in final grading precision. A grader, walking down each line of carcasses with a tray of brands could, in most cases after the merest glance, brand the quarters alongside their fleshing index numerals, with the letter appropriate to their fat rating. The only reason to pause would be for a quick measurement in the case of X (i.e. excess fat) carcasses. The time spent in making a measurement which estimates pounds of waste fat trim (possibly hundreds of pounds), seems thoroughly warranted with beef at its present high price.

**Advantages:** The accurate description of carcasses which would result from the separate specification of fleshing index and fat status would assist all sections of the trade.

Exporting countries could group their export carcasses into perfectly uniform lines. Groups of similar weight and fleshing index would all hang to the same length, presenting attractive appearance when displayed and economising on locker space during transport.

Large meat companies could arrange the purchase, sale, and handling of all categories of beef with greater precision of description. Even in the case of overseas transactions, brief specifications sent by cable would be quite specific. For example, a cable might read: Chiller steers or heifers. 2yr., 500-600lb., +120, E<sub>1</sub>; or again, bulls, 5yr., 1100-1300lb., +350, C.

Family butchers, too, could order, without having to sight the carcasses, to cater exactly for their customers' likes: fat specification could be stated, while the butchers would also know that the high fleshing indices would provide thick, blocky joints from quickly grown animals of beef breeding. Traders interested in pre-packaging, and willing to trim their cuts, might require fat cows and order accordingly: cows, aged, 450-600 lb., +100, X<sub>1</sub> to X<sub>5</sub>.

The customer, too, would come to take considerable interest in whether his beef was coming from say +120 or -120 carcasses.

Finally, the cattleman would appreciate knowing that his thick, high-quality cattle, not over-done for fat, received the stamps which would bring them to the top market classifications. Equally, he would see the justice in the allocation of weight penalties for wasteful fat, according to the degree in which it was found by measurement to be present. Especially would all this be so in situations where payment for the cattle could be on the basis of carcass weight and grading.

Producers should also welcome a grading system which could be used in its same form for judging carcase competitions. This would make the competitions more realistic and should promote advances in production methods, through both husbandry and breeding. (The system has already been receiving very favourable comment, following its use in carcase judging at recent Agricultural Shows and competitions.)

**Basis for Payment.** - In abattoirs where this system of appraisal was applied under official supervision, payment for cattle could be made on the basis of dressed weight, appropriately adjusted in the case of over-fat carcasses, at a rate per lb. commensurate with fleshing index within each type.

In the case of wool such sliding scales for payment on quality already operate, even if indirectly, through the auction system in its marketing. In that commodity also, the multiplicity of standardized types offering is regarded, not as a nuisance, but as a great assistance to buyers. Indeed the wool trade offers many illustrations in the thoroughness of its detailed preparation and marketing arrangements which could be emulated in the beef industry.

#### V.-REFERENCES

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- Yeates, N. T. M. (1952). The quantitative definition of cattle carcasses. *Aust. J. Agric. Res.*, 3: 1-58.
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#### DISCUSSION

**Dr. M. C. Franklin (N.S.W.).**—What is the reaction from commercial interests consulted?

**Answer.**—It is too early to give any definite reaction. It seems to be quite promising.

**G. Alexander (N.S.W.).**—How well is boneweight related to length.

**Answer.**—Very well; though for carcasses of the same length, lightness of bone would be an advantage. As yet, however, there is no information available on this latter point.

**N. Tulloh (Vic.)** suggested re-examination of the relationship of weight to length in carcasses of the range of 450-650 lb. carcase weight. He pointed out that with ideal carcasses under the New Zealand system the ideal ratio of meat to fat as measured by Professor Yeates would be of the order of 10 or 11 to 1. He felt that length of body may not be a good indication of the amount of bone in the carcase. It may be more closely related to bodyweight than to bone. He also felt that Dr. Yeates measurement of W describing the amount of meat on the rib may not be the best measure.

**Answer.**—The regression of weight on length is real and justified; the ratio of lean to fat of 7 : 1 is the maximum allowable fatness. The optimum is quite possibly 10 or 11. Length is a more practical approach to indicate the amount of bone in the carcase than other measurements. In relation to depth of eye muscle measurement as emphasised by New Zealand workers, he felt that while this is a useful guide to fleshing, the total muscle development is not satisfactorily indicated by this measurement.