

# Grading and Classifying Meat: An International View

David W. Sim\*, Leader  
John C. Forrest, Cooperator  
Jimmy W. Wise, Recorder

I appreciate the opportunity to be invited once again to address the Reciprocal Meat Conference. Since time is short, I will move directly into the presentation. First, I would like to define the purpose of grading so you have some idea of the basis upon which I have built my comments.

Fundamentally, the purpose of grading is to sort carcasses into classes exhibiting similarities in traits that are economically important. In effect, you are attempting to group the product into standard units so buyers and sellers can, sight unseen, negotiate sales and prices with some certainty that they are speaking the same language. In effect, the grading system becomes the language of the market place.

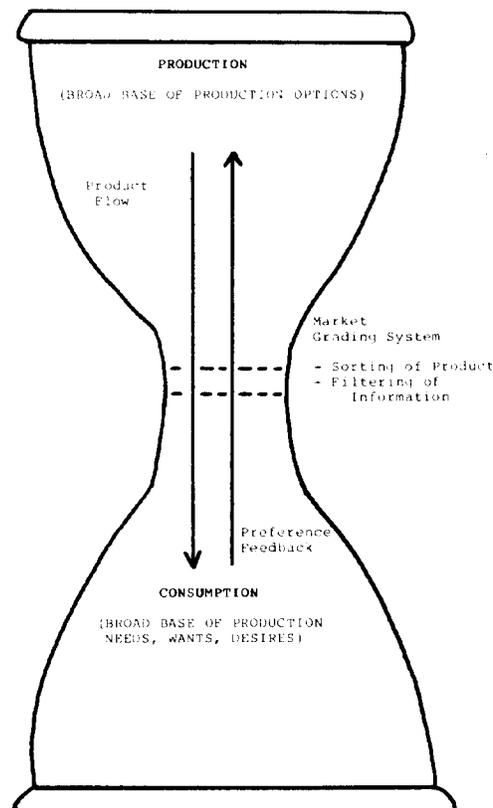
To illustrate, let's look at a theoretical model (Figure 1). At the upper end of the hour glass, you have a broad production base with a multitude of production options. At the bottom, you have a broad consumption base with again a multitude of consumer desires or wants. In order for production at the top to reach consumption at the bottom, the product must flow through a constriction at the middle. We call this the market. It is at this market constriction that grading operates.

First, it should sort out the product into classes that the consumption portion, or market intermediaries, can use to express their desires through price differentials. Second, because it allows the consumption portion to express these desires, it should provide feedback to the production portion that allows that sector to choose production options which result in production of the most desirable option, thus maximizing the producers' net income. In effect, grading provides a language of trade within the marketplace.

So, we've established what grading should do. But what do we mean when we say grading should be based on

economically important characteristics? To me, this means characteristics that the consumers want and based upon which they are prepared to pay price differentials.

Figure 1  
Grading Model



In meat grading, these boil down to two general characteristics: quality and quantity, or palatability and cutability.

But here we begin to run into difficulty. How do we define quality and quantity? Even if we accept traditional definitions of quality as being: tenderness, flavor and juiciness; and quantity as being: some form of meat yield expressed as a percentage of carcass weight; we then encounter another conundrum. How do we measure these parameters?

Here, internationally, we are all over the map. I've summarized the parameters used in grading regulations from Aus-

---

\*D.W. Sim, Saskatchewan Agriculture, Regina, Canada S4S 0B1

J.C. Forrest, Purdue University, West Lafayette, IN 47907

J.W. Wise, U.S. Department of Agriculture, Washington D.C. 20250

G. Harrington, Meat and Livestock Commission, Buckinghamshire, England MK2 2EF

Reciprocal Meat Conference Proceedings, Volume 38, 1985.

**Table 1. Factors Used in Grading Beef and Lamb**

Quality (Palatability)	Determined By
● Maturity	● Visual Assessment of Bone Ossification
	● Dentition
● Lean Color	● Visual Assessment
● Fat Color	● Visual Assessment
● Muscling (Conformation)	● Visual Assessment
● Marbling (Feathering)	● Visual Assessment
● Lean Texture	● Visual Assessment
● Sex	
<b>Quantity (Cutability, Yield)</b>	
● Beef	
● Fat Thickness	● Ruler Measurement
● Muscling (Conformation)	● Visual
● Lamb	
● Fat Cover	● Visual Assessment
● Conformation	● Visual Assessment

tralia to the EEC (Table 1). Let me draw your attention to two things.

A) We aren't directly measuring the factors of interest. We use proxies.

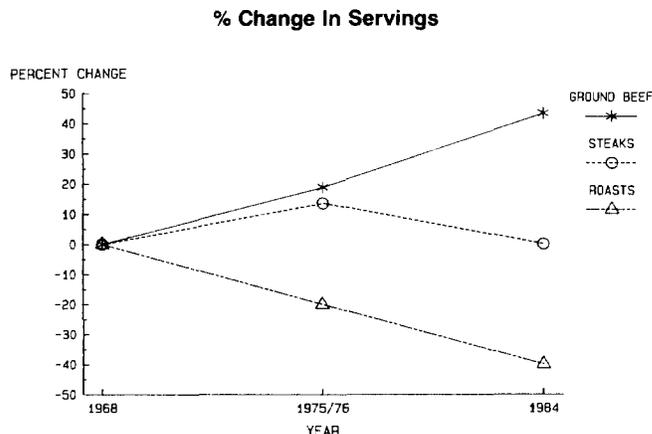
B) We don't measure anything. We assess; usually, visually. What other industry in the world uses such imprecise techniques for establishing market differentials?

Let's go back again to our model. We believe that the criteria used in grading should be factors that the consumer will use to differentiate the product. So the question becomes – Are we using the right factors? What is acceptable quality is different for different markets. The U.S. beef grading system assumes that quality, measured by marbling, is the single most important factor in the consumer's mind. In a society with greater sensitivity to healthy eating and convenience, does it make sense to continue grading this way?

Figure 2 tells me that even if we could adequately measure quality differences, the products in which such differences are manifested (steaks and roasts) are a shrinking portion of beef consumption. Given such data, should we even bother to attempt to sort carcasses based on quality? Do we know enough about consumer buying preference? Maybe we should just add the quality to the product after slaughter through carcass handling technology. Or better yet, why not put the fat into the product in controlled doses like the turkey processors do? Furthermore, since consumers buy meat and not carcasses, maybe we're wasting our time trying to determine quality on carcasses.

Finally, there is one thing that a good grading system should not be and that is a marketing gimmick. Unfortunately, the nomenclature used in most systems, especially in North America, carries with it the connotation of superiority/inferiority. What consumer in her right mind wants to be seen buying "inferior" B or Good grade beef in spite of the fact that a rational evaluation of her needs would indicate that this grade is the one she should be buying?

Figure 2



Source: National Eating Trends

I really believe that, in some countries, the grading service and industry traders have done the industry a disservice by promoting certain grades. The result is the perception that this grade is the be-all and end-all of organoleptic orgasms when, in reality, it doesn't satisfy their needs. Perceptions become more important than reality.

In summary, from an international perspective, I see the following changes being needed in grading:

- A) Develop ways to measure more directly the criteria we are interested in so we can quit using proxies.
- B) If we can't do a better job measuring quality differences, let's get out of the business and devote more effort to finding ways to improve quality post-slaughter.
- C) Let's get the gimmickry surrounding "superior/inferior" type grading systems out and get back to the basics: sorting carcasses into classes showing similarities in economically important traits.

*NOTE: The following paper by Geoffery Harrington of the Meat and Livestock Commission, UK, is also included in the proceedings although Mr. Harrington was unable to serve as leader, due to unforeseen circumstances.*

### Grading Developments in the European Economic Community

In the short time available, I obviously cannot review the whole range of grading and classification schemes in operation around the world. My colleagues and I attempted to do that a couple of years ago and although that review\* could be updated in matters of detail, I think it still stands the test of time as an analysis of the principles and techniques that have been adopted worldwide.

What is clear is that those who set up and administer grading and classification schemes, do so with a variety of

\*Carcass Evaluation in Livestock Breeding, Production and Marketing by A.J. Kempster, A. Cuthbertson and G. Harrington. Granada Publishing.

motives; in view of this and the diverse pattern of production, it is not surprising that the shape and scope of the various schemes differ so widely.

Although it is not possible for us each to draw technical inspiration from the development of schemes in other countries and their industrial applications, at the end of the day technical experts will find themselves in discussion in their own countries with farmers and meat traders and, in many cases, politicians and non-technical administrators. What the carcass specialists regard as desirable from a technical point of view may not stand a chance of being accepted in the trading and political climate of a particular country.

Perhaps the limited time available would be best spent in drawing the attention of this audience to some developments that have been taking place within the European Economic Community. This is an example of attempted international cooperation to devise schemes which are truly effective in domestic trade, in intra-community trade and in price reporting and other aspects of market management.

### Pigs

The pig grading scheme adopted by the six original countries of the Community related to a fairly standard type of pig production and of pig carcasses. This had a strong subjective element because of the importance attached to shape and muscularity of the carcasses by traders in those countries. Although maximum fat was different, little importance was attached to shape except that measurements in the mid-line were specified for each grade in the original Community scheme, the carcasses were seldom measured and it was clear that the subjective shape assessment dominated the final grade, rather than precise fat measurement. When Britain, Denmark and the Irish Republic joined the Community, a whole new dimension was added in that for the pig production in those countries, the extremes and pig carcasses were routinely individually measured to determine grade. Indeed, these countries had already adopted (or were experimenting with) more sophisticated measuring devices with which probes were made off the mid-line. The amalgamation of these two different approaches into a common EEC classification system to provide a basis for common price reporting and eventually to facilitate intra-community trade has proved a major task.

We now see, following a period of uneasy compromise, a growing disenchantment with the subjective approach throughout the Community countries, while interest has developed in automatically recording probing devices. These allow tighter control of measurements when these are made by abattoir staff (as opposed to independent graders), as well as assisting in-plant management by providing an instant detailed report on the day's kill, coupled with quicker feedback of carcass information to producer suppliers. The common grading scheme is being modified to accommodate these developments.

Automation of probing will facilitate the adoption of sliding scales of payment for carcass quality (as used in Canada and Denmark), rather than the cruder systems of wide bands for each grade. Further, the new generation of probes based on optical fibers allows, for the first time, a fairly precise measure of the depth of the muscle to be made routinely, while their automation allows this measurement to be inte-

grated with fatness and weight to produce an instant estimate of carcass lean percentage. Britain and Denmark share this interest with other countries because of their current experimentation in meat-type sires with exotic blood as opposed to the traditional but improved bacon types of the white breeds which currently form the basis of the commercial output.

The key question technically is how well these combinations of measurements will identify degrees of muscularity and so finally remove the remaining inclination towards the subjective element in the grading of pig carcasses. Video-imaging methods have not so far proved sufficiently accurate in differentiating pig carcasses by shape or muscularity. Much more likely to be put into operation over the next few years are robotic measuring techniques whereby information provided by a large number of measurements per carcass can be integrated to provide better estimates of meat yield and lean content – particularly of individual joints – that can be provided by one or two manually-probed measurements.

The second key issue in the development of pig grading in European countries, and in the common EEC scheme, concerns the growing importance of quality characteristics and the difficulties of measuring color, the potential for drip and intramuscular fat of the slaughter line. At the moment, the latest generation of probes seems able to provide estimates of these traits but only on second day of slaughter as the physiological changes lead to color variations before then. The measurement of each carcass, both on the day of slaughter and on the day after, is clearly impractical; research workers must strive to improve the techniques by which these assessments can be made on the slaughter line if we wish to see these traits incorporated into grading and payment schedules.

Finally, while on the subject of pigs, we should mention that "boar taint," as an issue, is now back in the melting-pot in Europe. Young boars are widely used in Britain and Ireland and exclusively in Spain (shortly to become an EEC member), and under intense investigation in Denmark. Elsewhere, where heavier carcass weights are favoured, they find no support and are not eligible for trade across borders within the European community. The only thing that will change the attitude in most European countries to young boars for pig meat production would be the development of an on-line system of screening carcasses. The technology for such testing has been developed for the Danish abattoirs, although the emphasis has moved from androstenone as the important element in taint for some sensitive people, to skatole, which is more generally detected and found unacceptable.

### Sheep

Historically, the most important sheep carcass grading schemes have been those of the major exporting countries, particularly New Zealand, in which conformation and fatness were jointly (rather than separately) assessed. Attempts to base descriptive classification on separate judgments of these two traits have proved surprisingly difficult. "Better conformation" usually means a fatter carcass, even within a fat class.

We feel that this will never be resolved until we can obtain an accurate fatness measurement. So far, simple probes do not give as accurate a measure of carcass fatness as visual

judgments, but the new generation of automatic probes is being modified for sheep carcasses and there are signs that probed measurements between the ribs, in a rather more lateral position than is usual with beef or pig carcasses, will prove a valuable addition to the visual assessment – particularly as the consumer demand for leaner meat and the production response by lamb producers will require much better discrimination among lean carcasses.

With lamb, as with pork and beef, the long-standing debate about the relation of carcass fatness to palatability is likely to be renewed with vigor as consumer rejection of fat pushes carcass fatness down to levels previously considered unacceptably “plain” by the meat trade.

## Beef

A major contrast between beef production in the United States and in Europe is that in the United States the industry is dominated by one virtually standard method of production with only a few secondary systems, while in Europe there is no standard method, only a wide variety of systems, particularly those whereby cattle are finished on grass whether grazed or conserved.

The whole basis of the U.S. beef grading system historically has been the differentiation of beef from dairy types, the differentiation of “fed” from “non-fed” beef and identification of the changes in lean-meat appearance which arise with longer periods of finishing on high-energy rations – all in the hope and expectation that the higher grades would be better and less variable in palatability. The grading tradition historically favoured traditional beef types, “fed” for at least 100 days, with other types and other systems producing carcasses which seldom could attain the higher quality grade because of lacking of marbling or conformation; excessive external finish and poor muscle thickness are penalized through the yield grade.

It is interesting that there is really no parallel approach anywhere else in the world, or indeed much interest in developing such a system. Of much greater concern in Europe, for example, is thickness of meat, the muscle-to-bone ratio and the yield of saleable meat from the carcass, and the extent to which the latter is influenced by the level of fatness of the carcass and the conformation. Both of these traits are subjectively assessed throughout Europe, and there has been considerable difficulty in agreeing on the basic definitions in the context of a common scheme. In making a visual appraisal of the fatness of the carcass, for example, how much emphasis should be attached to external fatness in contrast to depots within the body cavity? Similarly, in assessing conformation, how much emphasis should be attached to total shape or silhouette and how much to estimates of underlying muscularity in particular parts of the carcass?

It was clear to us in MLC in the early 1970s that the only practical system of carcass classification which under our conditions could have some value in trading, and of some significance to farmers’ production and marketing decisions, would involve a separate judgment, initially subjective, of carcass fatness and conformation. Hence the concept of the “grid” or “grille” was developed.

Eventually the MLC beef carcass classification scheme was modified to fit in with a European scheme built on the

same lines, but decided in detail around the committee tables of Brussels. Neither scientists nor meat traders in Europe have ever considered that one could add further visual judgments of carcasses in abattoirs which could give any more information about expected eating quality than through a statement about the level of carcass fatness and of the conformation which (with age, sex, and weight) differentiates dairy types both from traditional beef types and from the more muscular continental types.

Meat traders vary in the weight they attach to these individual factors as influences on eating quality – hence the preference for descriptive classification as opposed to quality-ranking grading systems. They are able to express this through their buying specifications, setting upper and lower fatness limits and ranges of conformation that they are prepared to buy among carcasses of particular weight and sex. Moreover, it is widely recognized that what goes on at the abattoir is potentially more important as an influence on eating quality than production system. Hence we are seeing some interest in the development of quality assurance schemes that combine these factors and set standards of procurement and handling, compliance with which allows participation in a regional or breed “brand” and its associated promotion.

In contrast to this, there are other moves in the beef market, whereby the production system is in many ways seen as the most important feature of the carcass. Some consumers are becoming concerned about how their meat has been produced in terms of the nature of the farming system and the stimulants applied to encourage growth and carcass leanness. These concerns, if they gather impetus, will create new problems for and place new strains on the distributive system and change the very basis of “quality.”

As for predicting the beef carcass lean content, we have shown that equations similar to those used in USDA yield grading provide reasonable predictions on our cattle, provided that the fatness is determined by visual score, rather than by one or two measurements at fixed positions. However, knowledge of the breed or cross involved gives a big improvement in the predictive accuracy, although this information will not generally be available to the classifier operating on a line in a modern abattoir drawing on a mixed population of cattle.

Indeed, since we in the MLC begun work on this project in the 1960s, we have had to alter the emphasis we attach to conformation as a factor influencing the meat yield because of the changed breed structure in Britain. At one end of the scale, we have seen the relatively blocky British Friesian dairy type progressively infiltrated by the angular Canadian Holstein; this is crucial since two-thirds of our beef comes from the dairy herd as a pure breed or crossbred. At the other extreme, the traditional beef breeds of Angus and Hereford have been substantially replaced as crossing sires by Charolais, Limousin and Simmental. The range of conformation has therefore visibly widened in this period, and the effect is all the more apparent due to the trend down in the level of beef carcass fatness. However, in Britain we remain intermediate between the U.S. and continental Europe in the level of carcass fatness we have to deal with.

The development of our beef classification schemes is ten years behind that of pigs and we have a much more variable

product to deal with. It can be argued that developments in technology are likely to make classification progressively more difficult and also less relevant. For example, as more and more cutting, boning and trimming takes place at the meat plant in conjunction with a degree of automation and the computerization of records, then it should become possible to advise producers of the actual yields of saleable meat from the carcasses they supply, rather than estimates, and to

pay accordingly. However, down-stream moves towards more cut and boxed meat, possibly in some cases following hot-boning, create a greater need for the purchaser to have an accurate idea of the type of carcass from which the cuts come.

All this adds up in our view to a data capture, transfer and analysis problem for the years ahead, rather than carrying us into fundamentally new areas of carcass evaluation.

## Discussion

*John Forrest:* One area you mentioned that hits us pretty hard when we think of our system was the question of whether or not the assessment of quality is really valid, whether it is something we put too much emphasis on. Therefore, it is something we need to explore just a little bit more fully. If we are going to look at where our grading system ought to be, that is a question we are going to have to face directly and answer, and then move ahead. Do we think this is very important and the consumer does not?

I am reminded that we have been merchandising pork in this country for quite some time without a quality grade other than "acceptable" or "unacceptable," really without even any grading in the first place. At one time, I used to think that beef had a major advantage over pork simply because it had a grade. Today I am not so sure if it is still doing as good of a job or whether it has become a rock around our neck at times. It depends on your point of view, what you are trying to merchandise and how you are trying to merchandise it. It is something that we have to grapple with and think about.

You question the validity of quality values, then come back and say that maybe one of the things we need to do is add fat as they are doing in the poultry industry with turkeys. Yet we have animals that have marbling naturally, so aren't we still concerned about fat that we need for juiciness?

*Dave Sim:* I think that is a valid point. The point I was trying to make was this. Do we worry about measuring quality or add it and control it? I think we should put our effort into doing what we can with carcasses or meat in terms of controlling it. Maybe you can still produce the fat inside the animal at least cost. But maybe the simplest and best way would be to produce a very youthful, fast-growing animal that would have relatively tender meat with no fat in it. Then we could do everything with the carcass subsequently to control cold shortening. We handle it with tender loving care, and add what fat is necessary in controlled amounts to give us the juiciness and palatability we are looking for.

The other thing in terms of your comments that I think has been a disservice to the industry, and I think it applies equally to the U.S. and Canada, is that the grading systems and people using them have tended to promote this concept of superiority. I think that is a disservice. It creates a niche for one grade; then no one wants the rest so we can not find a way to market it. It creates sort of an aura which may not be valid. This is the epitome of eating quality — an organoleptic orgasm, if you will — something that we just can't do without. As a result, your grading system becomes inflexible. It should be left to the merchandisers and the marketers to create that aura; let the grading system sort things out. I think that we should be striving to try and control quality as opposed to

assessing and differentiating it. And I am not convinced there is that wide a range of quality differences manifested by differences in production systems that are beyond our control, say at post-mortem or by pre-slaughter handling. Obviously, we are going to have to assess those that are or, preferably, measure them. But let's differentiate between which ones we need to measure and which ones we can control; then get on with the job of controlling those we can and develop measuring systems for the ones we can't.

*Forrest:* Are you suggesting that the post-mortem route for quality control in terms of different systems, such as controlled chilling rate or electrical stimulation, as methods of reducing quality variation is the right way to go?

*Sim:* Right. Let's take PSE for an example. I don't know how many of you have been to Denmark. Regardless of how far the farm is away from the packing plant, they truck their hogs for an hour. They found that this pre-slaughter handling process helps them control PSE. They figure it is cheaper than changing their genetics completely. We probably need to do some more things in these areas.

*Forrest:* I would like to hear from those who are working in this area. Are we to a point where we are ready to forget about quality in our grading systems? I am not ready to give up myself.

*Harold Dupuy:* What impact does health and the emphasis on leanness have on our grading system?

*Sim:* I can't speak for the U.S. because I think there are people here more cognizant of the situation in the U.S. than me. In Canada, it is a pretty fundamental part of our thinking as we move into the future. For example, our consumers are exposed to American information constantly. Most of our magazines for homemakers are American publications. Most of them talk about marbling. This year we threw marbling out of the grading system and everyone seems to like meat with a lot of lean. We sure haven't heard any responses. Nobody is complaining. Our standard trim specification at retail probably is less than 0.2 inch now, and I gather that is a lot less than the American specification. For example, we could not sell in Canada some of the product that shows up in your retail cases because it would have too much marbling in it. People see it as being fat. Whether that is going to happen in the U.S. or not, I don't know.

*Forrest:* Fatness is actually a perception, because the actual amount of fat probably isn't much greater in some of the well-marbled beef as compared to the lower-marbled beef.

*Sim:* I agree, but perception equals reality. Regardless of how rational you are with consumers, what they perceive as being fat becomes fat in their minds. Even if we could