

# Development of a French marbling grid for the visual evaluation of beef meat quality

Christophe Denoyelle, Jerome Normand, Aubert Nicolazo De Barmon

*Institut de l'Elevage (IDELE), France*

**Objectives:** Marbling can be defined as white flecks of intramuscular fat distributed between muscle fibers. Marbling is one of the major attributes of beef sensory quality including flavour, tenderness and juiciness. It contributes to the economic value of carcasses and meats in some countries. For example, it is taken into account in the grading of Australian or North American carcasses; the more marbling there is, the higher the grade, within certain limits.

Thus, in the meat industry, a rapid, non-invasive, and non-destructive evaluation and prediction of marbling is desired. The gold standard for marbling evaluation is the chemical analysis of intramuscular lipid content. However, this method has two major drawbacks: the destruction of the piece of muscle required as well as the time and cost of the analyses. Thus, without available reference for marbling adapted to French cattle breeds, the French beef interbranch (Interbev) has decided to develop a new marbling grid to assess meat quality visually. Simultaneously, several studies are conducted to enhance beef marbling levels and to test alternative instrumental methods to manage and predict this feature, including for example Meat@appli; This is an application for smartphones to measure in real time intramuscular fat in a piece of meat at the carcass stage. The aim of this paper is to present the experimental results of grid development.

**Materials and Methods:** Firstly, 50 pictures of *Longissimus dorsi* representing a wide variability of marbling levels were presented to 4 carcasses assessors from the French meat industry. According to Interbev specifications, they had to build a grid based on these pictures to assess the marbling on the 5<sup>th</sup> rib. The number of classes desired should be comprised between 5 and 10.

Secondly, the 4 assessors used this new grid to assess marbling of *Longissimus dorsi* on 57 new pictures. The evaluation was realized 3 consecutive times in a blind manner. Each time, the order of the pictures was changed because of the influence of the marbling level of the first picture on the assessment of the 2<sup>nd</sup>. The repeatability and the reproducibility were then calculated.

Thirdly, the grid was tested in real conditions in cold storage in 5 different companies. First, 10 carcasses representative of the whole range of marbling were evaluated individually by at least 3 assessors (one from the company and 2 from Idele). Then, each score of the 10 carcasses was discussed to choose one carcass representative of each grade to help the assessors for the future evaluations. After that, 50 carcasses were selected with a large variability of marbling levels. They were evaluated individually 3 times by each assessor in order to calculate the repeatability and reproducibility levels.

## **Results and Discussion:**

*Development of the Marbling grid:* Based on the pictures, a marbling scale was built with 6 grades from 1 (no visual marbling) to 6 (large visual marbling). The results of repeatability and reproducibility were pretty good. The repeatability varied between 57% and 80% with a mean of 68% for the 4 assessors. On average, an assessor was mistaken of 1 grade in 30% of cases. Differences of 2 grades represented only 1% of the assessments. The reproducibility varied from 42% to 56%, with a mean of 48% for the 4 assessors. Mistakes between 2 assessors represented 45% of the assessments with a gap of 1 grade. The results were judged sufficiently satisfactory to validate the grid and test it in the field.

*Test of the new grid in real conditions:* Marbling was evaluated on 326 carcasses (78% of cows, 14% of young bulls, 6% of heifer and 2% of steer) in 5 different companies. 64% were dairy breeds and 36% suckler breeds. 6 different assessors from meat companies and 4 from Idele were involved in the experiment. The repeatability varied from 65% and 76%, up to 92% when the number of carcasses evaluated is low. The reproducibility varied between 48% and 67%, up to 70% with a low number of carcasses scored. These values were similar or slightly lower than those obtained with other classification systems like the carcass EUROP classification or color classification for veal in France. This was probably explained by the novelty of the grid and the lack of training. Moreover, the marbling grid was judged easy to use and very clear by the companies' assessors. This experiment was useful to determine standardized conditions to assess meat marbling on the 5<sup>th</sup> rib in France.

**Conclusions:** Considering these results, Interbev has validated the new marbling grid. A new regulation is currently being prepared obliging meat companies which want to assess marbling to use only the validated grid. The evaluation conditions have been standardized and described in a specific document. To get equivalent evaluations of marbling, all the assessors must be trained once a year. This experiment was funded by Interbev.

**Key words:** Intramuscular, Fat, Visual, Assessment, Grid