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Workshop de la Commission Economique des Nations Unies pour l'Europe sur les marchés durables de la viande de ruminants, le commerce transfrontalier et la qualité sensorielle de la viande ovine et bovine

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Compte-rendu du Workshop international sur les normes et les marchés de la viande

Workshop de la Commission Economique des Nations Unies pour l'Europe sur les marchés durables de la viande de ruminants, le commerce transfrontalier et la qualité sensorielle de la viande ovine et bovine

Mots-clés : Viande bovine, Viande ovine, Qualité sensorielle

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Après les deux jours de ce workshop, il est apparu que les travaux sur la qualité de la viande ovine et bovine et la coordination des acteurs scientifiques et professionnels sur ce thème avaient considérablement progressé.

Résumé :

Le Teagasc (institut irlandais de recherche-développement en agriculture) a organisé un workshop de la Commission Economique des Nations Unies pour l'Europe (CEE-ONU) sur la qualité sensorielle de la viande et la classification des carcasses ovines et bovines pour une meilleure satisfaction des consommateurs et la diffusion des normes de la CEE-ONU. Le workshop a également été soutenu par le "Meat Livestock Australia" (MLA). Par ailleurs et en parallèle, une formation a été organisée pour les participants intéressés par les marchés de la viande, la qualité de la production et les normes (de la CEE-ONU notamment) pour le commerce international. Ce workshop a eu lieu avant le 63^{ème} Congrès International de la Science et de la Technologie des Viandes (ICoMST) et est, en partie, la continuité de workshops comparables préalablement organisés en Corée du Sud et en France à l'occasion des 56^{ème} et 61^{ème} ICoMST respectivement. Ce workshop a rassemblé 118 experts du secteur public ou du secteur privé (chercheurs, professionnels de la viande, etc) intéressés par le classement de la viande bovine et ovine selon son niveau de qualité. Les présentations des orateurs invités sont disponibles sur le site <http://www.unece.org/index.php?id=45629>. Les objectifs de ce workshop étaient de faciliter les collaborations internationales à venir sur l'évaluation de la qualité sensorielle et les initiatives professionnelles permettant le classement des carcasses afin de satisfaire les consommateurs de viande bovine et ovine. Ce workshop avait aussi pour objectif de faciliter le développement des marchés durables et l'intégration des pays d'Asie centrale ou des Balkans dans le marché mondial.

Abstract: Sustainable Meat Markets, Cross-border Trade and Eating Quality

Teagasc (Irish R&D institute in agriculture) hosted a United Nations Economic Commission for Europe (UNECE) workshop focusing on eating quality, beef and lamb carcass grading to underpin consumer satisfaction and the implementation of UNECE standards. The workshop was also supported by Meat Livestock Australia (MLA). In addition and in parallel, a training workshop was organized for participants interested in meat markets, quality production and standards for international meat trade particularly, the UNECE standards. This workshop took place before the 63rd International Congress of Meat Science and Technology (ICoMST) and is, in part, a follow up to similar workshops held in the Republic of Korea and France associated with the 56th and 61st ICoMST respectively. This workshop provided a dedicated forum bringing together researchers with an interest in beef and lamb grading for eating quality. The Conference gathered 118 public and private experts including regulators, scientists and meat professionals. The presentations by the note speakers are available on <http://www.unece.org/index.php?id=45629>. The objectives of the workshop were to facilitate further the international collaboration on sensory evaluation and industry systems underpinning carcass grading for consumer satisfaction of cooked beef and lamb. It also aimed to facilitate the development of sustainable meat markets and the integration of Central Asian and Balkan countries into international meat trade.

INTRODUCTION

This workshop was hosted by Teagasc (from a Gaelic word meaning “instruction” or “learning”), the Irish Agriculture and Food Development Authority, an autonomous state agency established in 1988 as an amalgamation of two separate bodies embracing Research, Education and Advisory/Extension.

Teagasc’s goals (presented by Dr Declan Troy) are to improve the competitiveness of agriculture, food and the wider bio-economy, to support sustainable farming and the environment, to encourage diversification of the rural economy and enhance the quality of life in rural areas and to deliver value for public money.

Teagasc focuses on 1) Economic sustainability, which means that there is a viable future in farming, 2) Social sustainability, which means that the benefits of economic sustainability are shared amongst all of those who contribute to it and 3) Environmental sustainability, which means careful and efficient use of natural resources such as water, soil and nutrients; thereby minimising the negative side-effects of farming on our own.

The workshop was organized by the United Nations Economic Commission for Europe (UNECE) together with Teagasc. Meat and Livestock Australia (MLA) represented by Prof David Pethick supported the workshop (the previous eating quality meeting (Pethick *et al.*, 2015), had been co-organized by MLA and INRA).

The role of UNECE (presented by Ms. Liliana Annovazzi-Jakab, Head, UNECE Agricultural Standards Unit) is to develop standards for international meat trade. UNECE (an inter-governmental organization) was created in 1949 and so was the predecessor of today’s Working Party on Agricultural Quality Standards which aimed at harmonizing national standards into international standards and providing a mechanism for their practical use and implementation.

UNECE’s standards and guides go through an important trial phase and consultative process. They include industry concerns to develop standards that reflect trading practices,

rather than normative ideals of what the product requirements should be. This increases the use of standards by industry. Standards are developed through a demand-driven, inclusive and open development and adoption process. This flexible, inter-active, responsive process (with revisions when needed) ensures that standards reflect emerging new or changing production, marketing, trading and regulatory practices. Standards can be revised at any moment per request and decisions are taken on a consensus basis. Over the years, UNECE has evolved into a platform for the development of agreed international best practice for international and national trade in agricultural produce.

UNECE Standards are developed to:

- define common trading language for all participants in the supply chain
- simplify international trade
- create market transparency
- prevent technical barriers to trade
- facilitate fair international trade
- avoid bad quality products on the markets
- guide producers to meet market requirements
- build trust and market opportunities
- encourage high quality production
- improve producers’ profitability
- protect consumers’ interests

UNECE’s Specialized Section on Standardization of Meat has developed 16 standards for meat. The bovine meat standard has already been published in Viandes & Produits Carnés (Trypuz *et al.*, 2014).

The aim of this article is to report the main discussions during this workshop except the scientific work on the “Meat Standards Australia” grading scheme which is reported in a separate paper together with the description of an international database on beef and lamb eating quality.

SESSION 1: INTERNATIONAL COLLABORATION ON SENSORY EVALUATION AND INDUSTRY SYSTEMS SUPPORTING CARCASS GRADING FOR CONSUMER SATISFACTION OF COOKED BEEF AND LAMB

In this session, Dr Andrew Cromie (Irish Cattle Breeding Federation) gave the first presentation entitled “Lessons learnt from the Irish beef genetics central data collection and use system”.

Then, Dr Linda Farmer (Agri-Food & Biosciences Institute, United Kingdom – Northern Ireland) gave a presentation entitled “Grading to satisfy consumer aspirations” with the main points below.

Red meat is an expensive item in the household shopping basket and the consumer may reasonably expect a high quality experience. However, there is evidence for beef that the quality delivered is sometimes disappointing; 19% of grilled sirloin, 25% of grilled rump and 53% of roasted topside was found to be “unsatisfactory” when assessed by European consumers (Farmer *et al.*, 2016). As all the income that supports the beef supply chain is ultimately derived from the consumer, this is a vital challenge for the beef industry.

A recent review by Henchion *et al.* (2017) has ranked the attributes that consumers find most important based on the

findings from 15 research papers. The top 10 attributes are, in descending order: origin, price, branding, visible fat, flavour, animal welfare, production system, freshness/shelf-life, natural/organic and tenderness. Unsurprisingly, the top four of those attributes are those that the purchaser can assess at the store. After that, palatability parameters (from past experience or claimed on the label) and other aspects of quality play an important role.

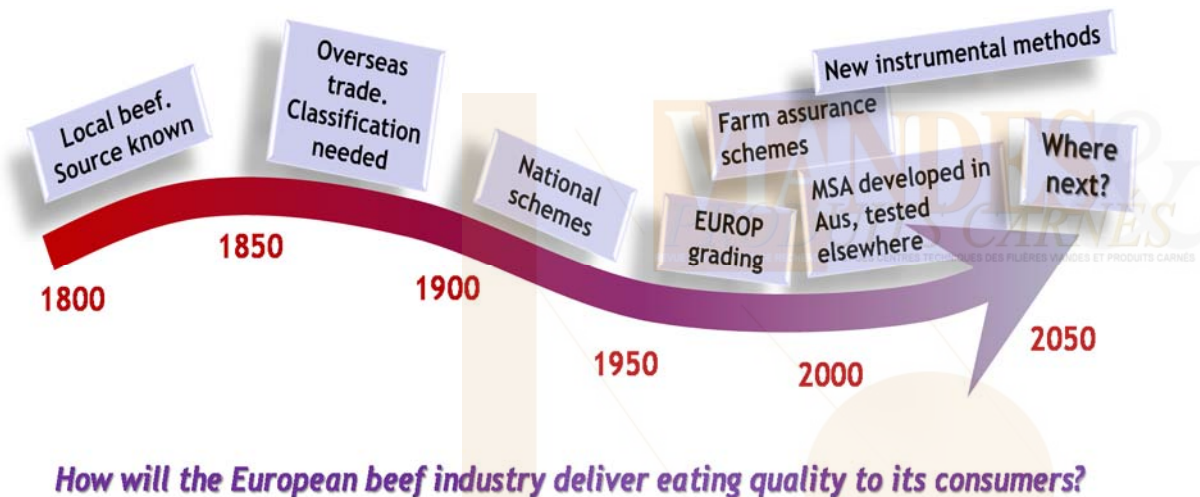
Various methods have been used to try and assure the quality of beef. These include beef classification schemes (designed to describe beef to distant buyers), beef grading systems (to value carcasses for pricing purposes) and farm quality assurance schemes (to quality assure production systems) (Polkinghorne and Thompson, 2010; AHDB 2008). More recently, grading systems have been developed or adapted to predict eating quality. These include the USDA grading system, the AHDB/Meat and Livestock Commission systems and the Meat Standards Australia (MSA) system. The first two of these are based on the carcass, while MSA is based on individual cuts. The MSA system has been found to predict

effectively the eating quality of beef in South Korea, Northern Ireland, Ireland, Japan, South Africa, USA, New Zealand, France and Poland as well as Australia.

A considerable body of recent research has also evaluated a wide range of instrumental assessment techniques for their ability to predict aspects of quality (Farmer and Farrell, 2018). At the moment, these methods work well for the measurement of compositional aspects of quality such as

intramuscular fat, saleable meat etc, but less well for consumer-perceived attributes such as tenderness and flavour. Thus, to date, the most effective system for predicting beef eating quality is the MSA system, and this is now used for 38% of all Australian beef cattle. It generates a 10% premium in Australia. A version is also in use in New Zealand, where a high premium is attained, and related systems are under development elsewhere.

Figure 1: Beef Eating Quality – a European Journey



Many in the European beef industry are now considering how they will assure the quality of their beef to retailers and their consumers. Will they continue with retailer and company specifications, which are not always delivering consistency? Will they adopt a version of MSA, and if they do, how do they market all the resulting grades of product? Would on-line instrumental measurements provide the assurance needed? Or do they need a new system? Whichever approach is adopted, it will need to be commercially viable, simple at the point of operation, flexible (to support new and

existing brands and to adapt to new requirements) and of course effective at delivering consistently good eating quality to consumers.

At the end of this session, Michael Crowley (Meat and Livestock Australia) emphasized the need to transform the beef meat language to focus on the consumer and Ian King (AUSMEAT, Australia) described the benefits to industry of the UNECE Bovine Language.

GRADING AND MEAT QUALITY

This session was organized in three presentations. The first one by Dr Graham Gardner (Murdoch University, Australia) was entitled “Carcass grading – accurate determination of yield and its value to industry”.

The Australian lamb and beef industries currently use single point measures of fat depth (P8 and rib fat in cattle) or tissue depth (GR site in sheep) to reflect lean meat yield of a carcass (Williams *et al*, 2017). These measures have poor precision and accuracy for predicting lean meat yield, eroding the transparency of livestock trading in the Australian industry. Hence, trading is based largely on carcass weight alone, thus eliminating any price signal for carcass composition.

Therefore a project has been initiated called the Advanced Livestock Measurement Technologies project which aims to accelerate the development of technologies that can measure

both eating quality and carcass composition within Australian abattoirs.

A number of lean meat yield technologies are being developed, key among these being dual energy x-ray absorptiometry (DEXA). In lamb, this system has demonstrated excellent precision for measuring carcass composition. Trained against computed tomography (CT), the precision for determining CT fat% demonstrated a root mean square error of 1.31 (Figure 2). Validation testing demonstrated little bias, with only small differences shown across the fattest and leanest breed types, at the extremes of breeding values, or between slaughter days, with all of these biases less than 1 CT Fat% unit. There were also no effects of processing factors like spray chilling, temperature, or time after slaughter.

Figure 2: Association between actual CT Fat% versus DEXA prediction of CT Fat%

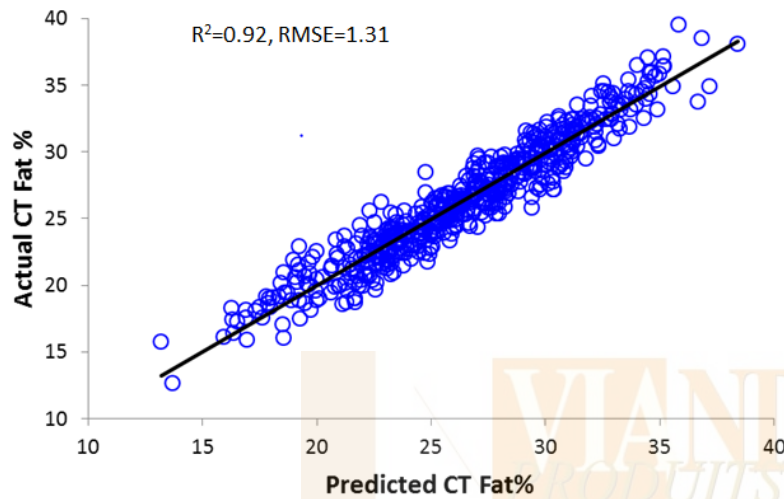
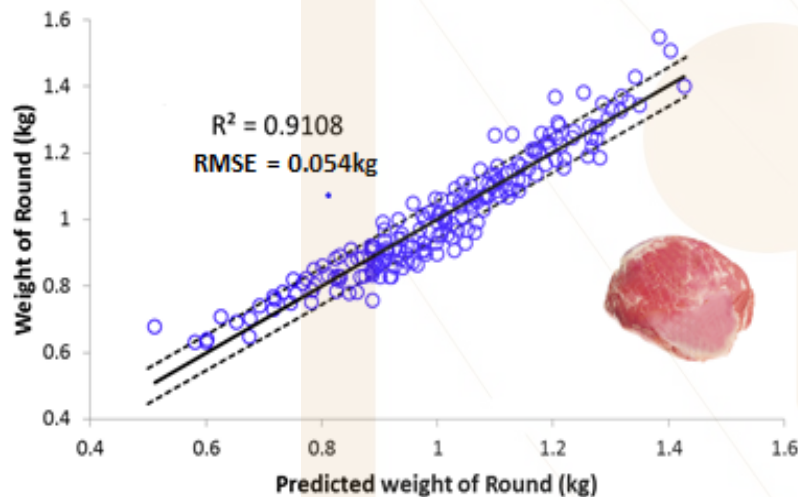


Figure 3: Association between actual round weight versus DEXA prediction of round weight



During the DEXA calibration phase, a subset of genetically and phenotypically diverse carcasses (n=200) were boned-out enabling a broad range of commercial cut weights to be estimated from the DEXA measurement. The precision of these estimates were high, with the prediction of most commercial cuts demonstrating R^2 values in excess of 0.85, as demonstrated by the prediction of round weight (see Figure 3). Supply chains that can accurately estimate the weight of commercial cuts prior to bone-out will have the capacity to optimise the selection of cuts procured to maximise profit from each carcass.

Development of the DEXA system is also underway in Beef, taking a similar approach to lamb DEXA in hardware design and calibration across genetically and phenotypically diverse animals. An early prototype DEXA design has shown good precision for predicting CT Fat%, with further work planned once a commercially installed device is available. Plans are in place to implement DEXA across the Australian lamb and beef industries, and will enable more accurate carcass feedback to producers, optimised processing decisions, and future value based trading that reflects both the quality and quantity of saleable meat in the carcass.

Then, Dr Tom Maguire (Teys-Cargill) gave its vision of value based marketing for yield and consumer satisfaction.

Dr Jean-François Hocquette (INRA) and his collaborators S.P.F. Bonny, D.W. Pethick, I. Legrand, J. Wierzbicki, P.

Allen, L.J. Farmer, R.J. Polkinghorne and G.E. Gardner) argued in favour of a European eating quality model and presented a new French beef brand underpinned with eating quality grading.

The current assessment of beef is far from consumers' expectations: the most important quality areas for future research are lean meat yield, eating quality and human nutritive value (Pethick *et al.*, 2011). More precisely, no strong relationship is observed between eating quality and price as observed in France (Normand *et al.*, 2014). The aim of this group of scientists is to create a reliable and consumer-driven prediction model of beef eating quality for Europe, based on the principles of the Meat Standards Australia (MSA) grading scheme, which needs some adaptations to suit the European beef chain.

Beef carcasses are currently traded based on the compulsory EUROP grid, which uses visual and/or instrumental assessments to give scores for both muscling and fatness. We found that there was no substantial relationship between the EUROP system and eating quality (Bonny *et al.*, 2016a).

Additionally, carcasses from entire males and from dairy breeds are important in the European beef industry. These carcass types are under-represented in the MSA model. We found that a separate adjustment for entire males and dairy breeds is required to accurately predict eating quality for these groups (Bonny *et al.*, 2016b).

As an animal matures, beef quality decreases. In Australia, this is estimated through an assessment of bone maturity called 'ossification' whereas the European beef industry has accurate age records available to it. Ossification score is more appropriate for young animals but as animals get older, animal age becomes more appropriate in an eating quality prediction model (Bonny *et al.*, 2016c). Thus, both measures are required to optimise accuracy.

Finally, we observed that there were no major demographic effects on consumer evaluation of eating quality and willingness to pay (Bonny *et al.*, 2017).

Despite these limitations, a new French brand for premium Limousin beef was launched in 2016 with marbling

tenderstretch and ageing time as key factors to ensure a high sensory quality level. This brand is called Or Rouge (http://www.lamontagne.fr/limoges/ruralite/animaux/2016/10/25/une-marque-en-or-pour-la-limousine-et-un-record-de-france_12126731.html).

In conclusion, a beef eating quality grading system, similar in design to the Australian MSA system, is highly applicable to both the European beef industry and the European consumers, despite the need for some adjustments. Further work is needed to determine the optimum statistical model for such a system.

TRAINING AND WRAP UP

In this session, Sarah Strachan (Meat & Livestock Australia) emphasized the importance of training, more precisely, education and continuous training.

In 2016-17, there were 2.8 million cattle MSA graded, representing 40 percent of the Australian adult cattle slaughter through 42 processors who supply almost 4,000 end user outlets in Australia (supermarkets, butchers and foodservice). There are now over 48,000 producers registered and eligible to supply cattle into the MSA program.

This growth has occurred over a 20-year period. A structured educational program has been critical to support commercial adoption of MSA and ensure all parties in the supply chain are aware of their responsibility in meeting consumers' expectations. Not any one stakeholder in the supply chain is solely responsible and therefore MSA education has focused on value chain partnerships.

The education programs have been customised to suit the audiences and focus on their impact on the end product. The training aims to give knowledge to provide a sense of empowerment and confidence. These programs range from short, skills based tutorials to week-long advanced meat science courses for senior management. The MSA program has enabled commercial price signals for eating quality to emerge and therefore understanding how to comply to MSA specifications and improve eating quality can have financial rewards. For example, in 2015/16 non-compliance to MSA requirements was estimated to cost producers \$13.5 million (AUD). With education and systems to support producers, compliance to MSA requirements improved by 1.2% in 2016-17, estimated to be worth an additional \$2 million in farm gate returns.

MSA education is focused on the supply chain rather than the consumer. MSA is a quality mark to support brands being able to get close to their consumer with their own story whilst ensuring they meet their expectations for eating quality. By working across supply chains, benefits have been achieved by all sectors. In a 5-year evaluation of MSA from 2010-2015, the eating quality program was determined to yield current and future benefits of \$679 million and a benefit cost ratio of 12.5:1 from an investment of \$54 million into the MSA program.

The continuous development of tools to support supply chains to make improvements in eating quality has seen the release of carcass feedback systems including the MSA Index, prediction calculators and e-learning initiatives. These have had impressive engagement from producers and processors.

The MSA education program has been a good example of bringing individual stakeholders in a supply chain together to drive practice change.

Prof Mark Miller (Texas Tech Uni, USA) described how to train the future leaders for the global meat industry.

The global meat industry faces a major crisis due to a major shortage of human capacity. The lack of capacity of skilled and qualified people to fill critical jobs in management, processing lines and in academia and government positions challenges the global meat industry. The shortage of the skilled human capacity makes the future of the global meat industry unsustainable.

How do we get students interested in Meat Science?

It is difficult to get a positive message out to attract the best and brightest into our industry. We must be innovative and creative to make it fun and competitive. If you asked most people who work in the meat industry how would they say they managed to get interested and work in the industry, most would say they did not intend to work in this industry. Unfortunately, we do not sell the opportunities and exciting things happening in the global meat industry.

We need to use the following to help attract the best and brightest people into the industry.

1. Competitive Teams: The ability and the desire to compete is very necessary and can be attractive to future leaders for the industry. Examples of teams which are used to attract students are: Meat Judging Team, Meat Animal Evaluation Team, Meat Science Quiz Bowl Team, Processed Meat Judging Team, Livestock Judging Team, Horse Judging Team and Product Development Teams. The fun of the competition and developing unique and innovative ideas in a team setting allow many soft skills to develop as well as teamwork skills.

2. Experiential Learning Opportunities: The ability to have students learn in the meat industry where their passion is primarily focused is very important. The experiences in sales, marketing, promotion, production and relationship development and management help to attract students into this global industry. Our formation of Raider Red Meats, which is a for-profit company, provides students real world experiences with customers.

3. Three Truths, which attract the best people. People have a basic need to be a part of something that is bigger than themselves. The ideals we put in front of them will affect their desire to be a part of the global meat industry.

a. Pursuit of Excellence: The passion for Excellence defines the global meat industry. The passion to be the best, to do everything with perfection and the

highest quality define the global Meat Industry. Students will want to be part of this excellence and desire to be the best.

- b. Striving For Honor: The need for honor and integrity in the world is a foundational principle, which attract people to an industry. The global meat industry must have the highest level of ethics.
- c. Serving Unselfishly: The need for team players who are unselfish and living to make the teams needs a

higher priority than their own is very important to many people. People wish to know you care about them and the global meat industry needs unselfish service.

In summary, the need for human capacity building is a global need for the meat industry and should be the highest priority for Industry Investment to ensure a sustainable future for the meat industry.

CONCLUSION

In the area of eating quality research, this workshop made it possible to identify two major trends in the concerns of participants (public sector, researchers, traders, producers and international organizations).

The first concern is the need to better satisfy consumers, which means developing innovative carcass classification systems, innovative meat grading schemes as well as international standards to spread out the best practice for the international and national meat trade. Some of the innovative trends which were discussed at this workshop include dual energy x-ray absorptiometry, computed tomography, the recent developments of the Meat Standards Australia grading

scheme and the meat standards proposed by the UNECE's Specialized Section on Standardization of Meat.

The second area concerns education and training in the use and implementation of standards and related areas such as traceability or market development as well as in meat technologies and, attracting the younger generation to the meat industry. Furthermore, the continuous development of innovative tools such as those mentioned above require specific training and education programmes. All these should take into account the United Nations Sustainable Development Goals (SDGs) and the development of sustainable meat trade.

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