

## LAMB MEAT QUALITY IN URUGUAY: SECOND AUDIT 2007

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**Abstract**— During 2007, INAC and INIA started the 2<sup>nd</sup> Uruguayan Lamb Meat Audit. The aim was to determine the quality of lambs, of carcasses, and of by-products in the Uruguayan Lamb Meat chain, defining quality as those factors affecting the value or the acceptance of the lamb, its carcass and products and by-products. The aim was to determine and to quantify the main factors responsible for the losses of value. The phase II of the Audit was carried out at 4 slaughter houses, including about 70% of the total national slaughter of lambs, by registering two complete days of activity on each plant. The study included just heavy lambs. The work had 5 stages on each plant: 1) before hide removal, 2) carcass bruises, 3) condemnation, 4) hot carcass weight and 5) carcass evaluation after 24 hours of chilling. A number of 14.953 lambs was evaluated. It was observed a substantial reduction in the proportion of carcasses with bruising from 2002 Audit (57%) to 2007 Audit (30%) and of Type II bruises; the values registered are still high. About 47.5% of the evaluated livers was condemned, and this result is lower than the one reported in the 2002 Audit (60.0% of condemned livers), which represents an important improvement. The proportion of carcasses with conformation “M” and lower (27.3%) is too high according to the type of heavy lambs required and defined in Uruguay for the Heavy Lamb Market currently in place. More than 42% of the lambs presented excessive fat content (grading 2), not desirable for this type of animals, representing an important loss for the lamb meat chain. The results of this 2<sup>nd</sup> Lamb Meat Quality Audit are determining a very important improvement in the definition of the final value of the product compared to the results obtained in the first Audit (2002).

**Index Terms**— lamb carcass, grading system, meat quality audit.

### I. INTRODUCTION

Quality refers to the characteristics of a product or service that satisfy the needs or requirements of the customer (Castro, 2002). The quality concept includes aspects that go beyond the product, as the sanitary status of the country, the certification of processes and products and the offer of products of constant quality, between others. There is some knowledge at the meat industry that shows the incidence of quality problems (bruising, condemnation, inadequate pH) affecting the potential value of the meat cuts, the costs of production and the commercialization of the same ones, reducing their consistency and therefore the demand of the meat markets, generating losses of competitiveness in the whole meat chain of Uruguay. In the year 2002, INAC and INIA both decided, based on the success of the US Beef Audit experience and with the collaboration of the Colorado State University (USA), to carry out the first Sheep Meat Quality Audit to determine and to quantify the main factors responsible for the losses of value. This methodology includes the repetition of the Audit every five years (Montossi and Pigurina, 2003). During 2007, INAC and INIA started the 2<sup>nd</sup> Uruguayan Lamb Meat Audit. The aim was to determine the quality of the lambs, of the carcasses, meat and of the by-products in the Uruguayan Lamb Meat chain. For this study, the term quality was defined as those factors that affect the value or the acceptance of the lamb, its carcass, meat and its by-products. Additionally, it was tried to identify and to quantify the current problems of quality, defining the levels required for the future, as a way of improving the competitiveness of the lamb meat chain. Finally, it was considered to compare the results obtained between both Audits and to evaluate the observed changes, as part of a continuous improvement process.

## II. MATERIALS AND METHODS

It is presented information obtained at the Phase II of the Uruguayan Lamb Meat Quality Audit 2007, which was developed in a group of selected slaughter houses. The phase II was carried out at 4 slaughter houses, which were selected for representing about 70% of the total national slaughter of the qualified plants for exporting. The information was obtained by registering two complete days of activity on each plant. The period of evaluation was from October 17 until November 11, 2007. The study was realized just in heavy lambs. The work was divided on 5 stages on each plant: 1) before hide removal, 2) carcass bruises, 3) condemnation, 4) hot carcass weight and grading and 5) carcass evaluation after 24 hours of chilling. There were evaluated a total of 14.953 lambs, varying on the sample intensity on every stage between 14% (stage 5) to 100% (stage 4), being 23% de proportion of carcasses measured in the other 3 stages. Most of the techniques and procedures applied during this Audit were described by De Barbieri et al. (2003).

## III. RESULTS AND DISCUSSION

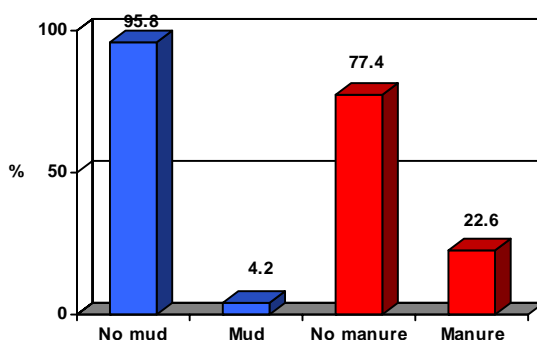
**Stage 1:** It was located after the bled of the animals and before hide removal of the same ones. From the evaluated variables we present only breed, sex and potential contaminants on hide, because these are the most important ones at this stage.

**Breed:** Of the total number of evaluated animals the pure breed Corriedale lambs were the ones that predominated (68.0%), followed by crossbreeding lambs (17.5%) and Merino ones (12.4%). Compared with 2002 Audit, it was found a decrease (from 83.6% to 68.0%) of the Corriedale lambs as well as a very important increase in crossbreeding lambs (from 5% to 17.5%).

**Sex:** Castrated males predominated (52.4%) and were followed by females (36.0%). In 2002 Audit, females were only 25.5%, no recording important changes in castrated males.

**Potential Contaminants on hide:** It was evaluated according to the presence or absence of mud and manure on hide. As it is observed in the Figure 1, the presence of manure was more frequent than the presence of mud. The level of mud or manure on hide was lower than the one registered in the 2002 Audit, when 58% of the lambs presented some kind of hide potential contaminants.

Figure 1. Potential contaminantson hide as a percent of total animals.



**Stage 2:** At this stage the evaluation of the carcass was carried out after the hide removal and before removal of fancy meats.

**Presence of strange agents:** The classification of strange agents on the carcass was based on the type of agent found: wool/skin, gastrointestinal content, feces/others. About 46 % of the total carcasses evaluated did not present any type of strange agent. Similar result was obtained at the 2002 Audit.

**Presence and severity of bruises:** The determination of bruising considered the type of crushing (Type I: minor or subcutaneous, its removal does not imply loss of value, and Type II: major, its removal produces an important loss of the value) and the region affected by bruises (shoulder, short loin saddle, rack saddle, leg).

In Table 1 appears the proportion of carcasses that presented bruising and the type of bruising.

Table 1. Proportion of carcasses (%) with presence, absence and type of bruising.

Bruising	n	%
Absence	2409	69,8
Presence	1044	30,2
Type I	961	27,8
Type II	83	2,4
Lamb carcasses	3453	

It was observed an important reduction in the proportion of carcasses with bruises from 2002 Audit (57%) to 2007 Audit (30%). It was also registered a reduction in the severity of bruising, where type II bruising was reduced from 2002 Audit to 2007 Audit. These results are determining a very important improvement in the definition of the final value of the product.

**Stage 3:** The information of condemnations was done in the table of offal. Information of condemnation was determined by the technical personnel of the Official Veterinary Inspection of the Ministry of Agriculture, Livestock and Fishing (MGAP) of Uruguay. About 47.5% of the evaluated livers was condemned, and this result is sensibly lower than the one reported in the 2002 Audit (60.0% of condemned livers), which represents an important improvement.

**Stage 4:** The data at this stage was recorded using information given by every slaughter house..The average of hot carcass weight was of 16.9 kg. It is very interesting that about 86% of the carcasses fell in a range between 14.0 and 23.7 kg of hot carcass weight.

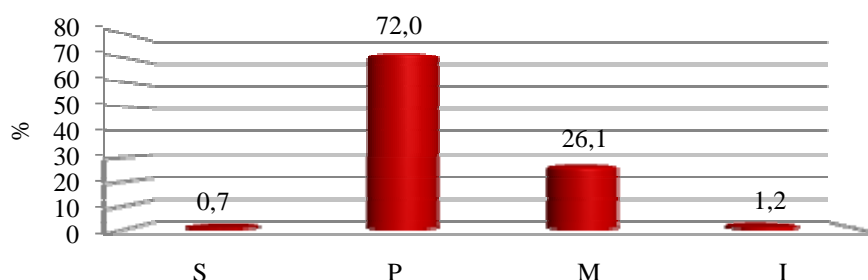
**Stage 5:** It was determined a carcass evaluation after 24 hours of chilling after slaughter in the chiller. The variables considered were related to carcass conformation and carcass fattening, ultimate pH, fat color and strange agents.

**Conformation and fat cover:** It was done using the current Grading System of Sheep Carcasses (Robaina, 2002), applying the following scales:

- Conformation: S (excellent), P (good), M (median) and I (deficient) (Figure 2).
- Grading (fat cover): 2 (excessive), 1 (moderated) and 0 (insufficient) (Figure 3).

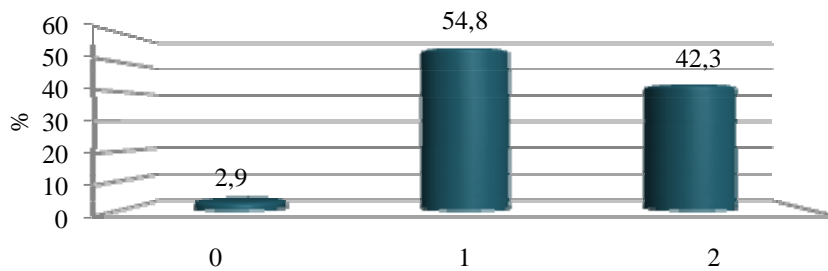
The results were obtained in the 2056 carcasses evaluated. It was registered a proportion of carcasses with conformation “M” and lower (27.3%), which is too high according to the type of heavy lambs required and defined in Uruguay for the Heavy Lamb Market currently in place

Figure 2. Frequency (%) of conformation score of lamb carcasses.



According to the grading score we found that more than 42% of the evaluated lambs presented an excessive fat content, which is not desirable in this type of animals, and represents an important loss for the lamb meat chain.

Figure 3. Frequency (%) of fat cover score of lamb carcasses.



The thickness of subcutaneous tissues measured at the GR point is a good estimation of the total fat cover of the carcass, which is measured at the 12<sup>th</sup> rib at 110 mm of the medium line of the animal. From the 2056 carcasses evaluated, it was observed that the average GR was 9.3 mm and that only 46.6 % of the animals was between 6 and 12mm, level of fat required for a well finished lamb.

**Ultimate pH and temperature:** The ultimate pH and the temperature of the carcasses were registered in the muscle *Longissimus dorsi*, between 12<sup>th</sup> and 13<sup>th</sup> ribs, approximately at 24 hours postmortem. The average values of pH and temperature were 5.65 and 4.85 °C, respectively.

**Color of fat cover:** The fat cover color of the lamb carcasses was evaluated in a subjective form, by using the standards of AUS-MEAT's color. The values observed for the fat cover color of the total number of carcasses (n=2056) were between 0 and 3, not recording high values for this category which might be considered a reason for rejection. More than 93 % of the carcasses gave a color equal or less than 3.

**Strange agents:** The classification used for determining the strange agents on the carcass during chilling process was the same as the one applied on the carcass on Stage 2. (wool/skin, gastrointestinal content, feces/others). About 92.1% of the total number of carcasses (n=2056) did not present any type of strange agent.

#### IV. CONCLUSION

The results of this 2<sup>nd</sup> Lamb Meat Quality Audit are determining a very important improvement in the definition of the final value of the lamb meat product compared to the results obtained in the first Audit (2002). It has been generated and processed all the information on such a form that it is possible for all the members of the lamb meat chain to speak a similar language. Through the information available after the completion of the 2<sup>nd</sup> Lamb Meat Quality Audit all participants made an important contribution to the knowledge and to the development of a process of constant improvement.

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