

URUGUAYAN NATIONAL BEEF QUALITY AUDIT-2013: A SURVEY OF BEEF INDUSTRY RELATED TO QUALITY AND VALUE OF CATTLE

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Abstract. The Uruguayan Beef Quality Audit evaluates the industry efforts to improve beef quality every 5 years. The third was held between April and December 2013 in 10 packing plants, assessing breed-type, brands, horn and mud/manure, bruises, offal and carcass condemnation and carcass quality. Breed-types were mainly Hereford (39.4%), British crosses (17.8%) and Aberdeen Angus (25.6%). Most cattle had no mud/manure on their hides (87.1%). Only 70.9% of the cattle had horns but 71% of carcasses were bruised, and Type 2 doubled the incidence registered in 2007 (28 vs 14%). Sex-classes were: steer (61%), heifer (6%) and cow (33%). Considering only steers, permanent incisor number distribution were zero: 2.7%, two: 15.5%, four: 21.4% and more than four: 60.4%. Hot carcass weight was 255 kg in average and fat thickness 0.93 cm. Dark-cutters were 9% showing a slight improvement (11% in 2007). Overall maturities were mainly A (45.8%) and B (29.9%). Marbling score was mainly Slight (49%) and most of the steers were in Standard (34.7%) and Select (23.3%) USDA quality grade. This information helps the Uruguayan beef industry to assess progress on different production issues that affect beef consumer demands, to promote and prioritize future training and research activities.

Key Words: carcass, meat grade, surveys

I. INTRODUCTION

The third Uruguayan National Beef Quality Audit (UNBQA) was held in 2013 following a 5 years period. As well as the first (UNBQA-2002) and the second audit (UNBQA-2007) it was conducted in a cooperative project among Colorado State University, INAC e INIA and it was an important benchmark to assess the current status of quality and consistency of cattle. Five audits were conducted in the U.S., the NBQA-1991 [1], NBQA-1995 [2], NBQA-2000 [3], NBQA-2005 [4] and NBQA-2011 [5; 6]. Canada also has conducted two beef quality audits: the Canadian Beef Quality Audit-1995-96 and 1998-99 [7, 8]. Information from these studies has

shown where improvements in genetics and management have been made and where they may still be needed. Many of the UNBQA-2002, 2007 and 2013 findings were used to implement training practices for all the stakeholders of the meat chain, mainly those related with animal handling practices. But also some marketing demands have occurred since the first, second and/or the third audit in Animal Welfare for EU markets or in carcass aging period (36 hs) due to US market policies. Meanwhile, new certified branded programs were developed focusing in the age of the animals and meat quality attributes (marbling and tenderness levels) and also in the use of concentrate in the diet. The third UNBQA was held in order to monitor and to quantify if the implemented changes improved the quality and consistency of the Uruguayan cattle comparing to the previous 5 years periods, and to identify existing problems and issues for the beef industry and the academy.

II. MATERIALS AND METHODS

Ten packing plants were visited two days in two seasons, Fall (April to June 2013) and Spring (October to December 2013). Practice and correlation sessions were held before data collection was initiated to assure uniformity and consistency of measurements.

Harvest Floor Assessments – Before Hide Removal. We sampled 33 percent of the cattle from each production lot for a total of 7308 animals for the harvest floor assessments. Breed-type was classified based on visual characteristics of each breed (hide color, *Bos indicus* traits as dorsal thoracic humps), beside considering British crosses, Indicus crosses and general crosses. Incidence of hide brands was recorded based on quantity and location. The anatomical region were rump, round, loin, rib-plate, chuck and neck. Cattle were assessed visually for the presence of mud/manure based on the European Welfare Quality Protocol [9]. Horns, if present, were

evaluated visually for approximate length (none, ≤ 10 cm, and >10 cm).

Harvest Floor Assessments – After Hide Removal. Offal (liver and head) were evaluated for wholesomeness by Livestock, Agricultural and Fish Secretary (MGAP) Veterinary Inspection Service personnel, and we recorded the number and reasons for condemnation made by them. Numbers of females carrying fetuses were evaluated at the viscera table and also the time of pregnancy was estimated (1st, 2nd or 3rd third). Carcass bruise information was assessed by INIA and INAC trained personnel, based on presence or absent, considering quantity, severity and location when they were present (round, loin, rib, chuck and flank plate/brisket). Regarding severity, bruises were classified in Type 1 (no tissue removal), Type 2 (tissue removal affecting final product) and Type 3 (Type 2 and including broken bones). Grubs and lesions for injection at the neck were also collected.

Carcass Assessments. Beef carcasses representing 100% of each production lot ($n = 22044$) were used for determination of hot carcasses weight (HCW) and to apply the Official Grading System [10] which classifies the carcasses by sex-classes, dentition by the number of permanent incisors, degree of conformation (muscling) and degree of finishing, these last two variables by visual score. These variables were provided by the slaughterhouses. AUSMeat fat color scale (1 to 8), USDA quality grade factors (overall maturity and marbling), ultimate pH and temperature, visual meat color, Rib eye area (REA, measured by blotting paper) and fat thickness (FT), were measured at ribbing between 10-11th rib. For the former variables 17 percent of carcasses from each production lot were sampled and they were measured by INAC and INIA trained personnel. *Statistical Analysis.* All analyses were performed using SAS (SAS Inst., Inc., Cary, NC). Mean, standard deviation, minimum and maximum values for each trait were generated using PROC MEANS. Frequency distributions were analyzed using PROC FREQ.

III. RESULTS AND DISCUSSION

Harvest Floor Assessments – Before Hide Removal. It was found that the major breed was Hereford (39.4%), maintaining the same frequency registered in UNBQA 2002 and 2007 (data not shown). Aberdeen Angus increased (25.6% in 2013; 16.7% in 2007) and also British

crosses being 17.8% in 2013 and 6.9% in 2007. Other breeds like Holstein and other crosses followed in decreased distribution (data not shown). This assessment is different to US NBQA, where hide color provides an indication of predominant breed and because it is used in branded beef programs that emphasize Angus genetics and/or black-hided cattle [3]. Brand frequencies in the UNBQA 2013 were one (73%), two (24.2%) and more than two (2.8%). Most of the brands (88.1%) were located on the butt (data not reported). This data is different from US NBQA-2011 where McKeith *et al.* [5] reported that unbranded hides were 55.2.3% in this study. Mud/manure is of great concern in cattle coming from feed lot due to carcass contamination. In Uruguay most of the cattle is fattening in pasture, determining that 87.1% of the slaughtered cattle did not have visible mud/manure content, being similar to the values reported in UNBQA 2007 (89.3%). McKeith *et al.* [5] reported that animals without mud or manure from the US NBQA-2011, were only 49.2%. In data not reported in tabular form, we found that 29.1% of the cattle had horns at 2013 being lower than those values reported in 2007 (38.1%). We also found that 20.2% of the animals had horns bigger than 10 cm in length (29.7% in 2007). Decreases in both percentages are positive regarding animal welfare and also meat quality. McKeith *et al.* [5] reported a similar horn incidence in the last US NBQA (23.8%) and the majority of those with horns (71.6%) were between 0 cm and 12.7 cm in length.

Harvest Floor Assessments – After Hide Removal. Inspectors from MGAP Veterinary Services determined that 34.4% of the livers were condemned. This value is lower than those reported in 2007 (46.7%) showing improvements in the incidence of flukes in our production systems. McKeith *et al.* [2012] reported an incidence rate of 20.9% for liver condemnation in US NBQA 2011. Head condemnation in UNBQA 2013 was 0.5% and 1.1% in 2007, both periods showing minor frequencies than those reported for the US NBQA 2011 (7.2% of head condemnation). The number of cattle that had fetuses increased in the last UNBQA (23.5% in 2013 and 13.4% in 2007). This observation is substantially different from US Audit due to the composition of sex classes. In 2013, 29.1% of the evaluated carcasses were not bruised and 28% of the total carcasses had at least one bruise Type 2 affecting the product (Figure 1). The incidence of type 2 bruises was twice as higher as that reported in 2007 (14%). Regarding total bruises location,

29.1% were on the round, 22.5% on the chuck and 16.9% on the rib.

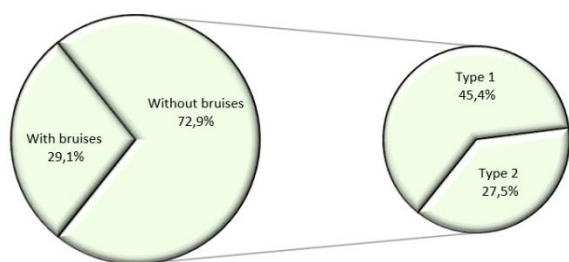


Figure 1. Frequency distribution of carcasses by presence and severity of bruises.

As a direct consequence of this study, INIA and the Industry are developing cooperative research lines in order to identify phases, stakeholders and or practices that could mainly contribute to bruising incidence and severity. As well, many Uruguayan Institutions are coordinating actions for building capacities and for developing training programmes along the meat chain.

Carcass classification - Official Grading System [10]. Related to sex-classes, the composition of the evaluated population was: steer (61%), heifer (6%) and cow (33%), similar to that reported in 2007. Fattening cows is economical viable in Uruguay, being the reason to include them in the National Beef Quality Audit. For INAC System, females with 0 to 4 teeth are classify as heifers meanwhile females with 6 and 8 teeth enter in cow category. Considering only steers, permanent incisor number distribution in UNBQA 2013 were zero (2.7%), two (15.5%), four (21.4%), six (22.3%) and eight (38.1%). It was observed a slight decrease (4.1%) in the proportion of young animals (4 teeth or less) comparing to 2007 values and an increase in the proportion of 8 teeth steers (8%).

Carcass Assessment. Means for carcass traits and meat quality variables are shown in Table 1.

Table 1 - Mean and Standard Deviation of carcass and meat quality traits.

Traits	Steer	Heifer	Cow
HCW (kg)	276.1 (38.4)	207.2 (33.6)	224.7 (33.3)
FT (cm)	0.93 (5.3)	0.86 (4.9)	0.95 (5.7)
REA (cm ²)	62.2 (9.3)	57.0 (8.0)	55.7 (8.8)

These HCW means were higher than UNBQA-2002 and 2007 (data not shown). UNBQA 2013 showed REA means of 62.2 cm² for steers, 55.7 cm² for cows and 57.0 cm² for heifers (Mean=58.3 cm²). The mean REA was 88.8 cm² for US

carcasses in 2011. FT mean in the Uruguayan Audit 2013 for steers was 0.93 cm and the score of fat color was 3-4 for 79.8% of the evaluated carcasses using AUSMeat scale. For US steers FT in the last NBQA, was 1.3 cm [6]. Difference in degree of finishing was observed due to the contrast growth pattern and feeding regimes between countries, as it was expected.

In data not reported in tabular form, 9% of the carcasses were dark cutters, being lower than the 11.1% reported in 2007. However this level of incidence is very important comparing to the US values. The dark cutter in US NBQA-2011 was 3.2% [6]. The age of the steers, the offered diet based on pastures, transport and lairage conditions could partially explain the level of dark cutters incidence in Uruguay. Uruguay is strongly investing in research and people training for improving this trait as well as bruise incidence. Frequencies of marbling scores, carcass maturity and USDA Quality Grade are shown in Table 2.

Table 2 - Frequencies of marbling scores, carcass maturity and USDA Quality Grade in steers.

Steers					
Marbling score	Freq (%)	Overall Maturity	Freq (%)	USDA Quality Grade	Freq (%)
Tr	15.5	A	62.0	Choice	18.7
Sl	48.3	B	33.5	Select	23.3
Sm	26.5	C	2.7	Standard	34.7
Mt	7.1	D	1.1	Commercial	3.4
Md	2.0	E	-	Utility	19.1
SI A	0.3			Cutter	1.8

An improvement was observed in the marbling score from 2007, where carcasses reaching Small or higher levels, increased 6%. An important improvement had been already observed in the score of marbling of steer, from 2002 to 2007, where carcass reaching Small or higher levels increased 7%. McKenna *et al.* [3] reported the need to determine the number of carcasses that were Small⁵⁰ or higher because some of the American certified beef programs include such carcasses. Moore *et al.* [6] reported that in the US of the carcasses had 41.2% of the carcasses with marbling scores greater than or equal to Small⁵⁰, which was numerically greater than that reported by McKenna *et al.* [3] (36.6%) and by Garcia *et al.* [4] (23.6%). Over 62% of the steer carcasses were of A maturity and 33.5% of them were of B maturity. Applying USDA Quality Grade System, most of the Uruguayan steers were in the Standard level (34.7%) but with a lower value than in 2007 (46.1%). Regarding the Select category it was

23.3% (31.6% in 2007), and only 18.7% of carcasses reached the Choice level, being however higher than Choice values reported in 2007 (13.5% of the steers). Frequencies of USDA QG distributions were Prime, 2.1%; Choice, 58.9%; Select, 32.6%; and Standard or less, only 6.3% [6].

IV. CONCLUSION

National Beef Quality Audits are a mean to identify the main problems for the beef industry and how they affect the value of live cattle, carcasses or by-products. Some of the most important trends observed between the two last UNBQA (2007 and 2013) include fewer animals with horn, more carcasses with bruises and increased of bruise severity, more steers with 8 teeth and increased in marbling score. This positive and/or negative evolution of different traits, along with other information registered, helps the Uruguayan beef industry to evaluate the beef quality progress and provide each five years a benchmark to identify carcass and beef quality attributes that could be improved through animal and carcass management. Based on them, future education, training and research programs are being developed.

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