COMPARISONS BETWEEN THE 1ST AND 2ND URUGUAYAN BEEF QUALITY AUDITS:
The economical progresses achieved and the challenges and priorities addressed by industry representatives

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Abstract— Two Beef Quality Audits (BQAs) were conducted in Uruguay (2002/2003 and 2007/2008) for indentifying quality defects in animals, carcasses, dress-off/offal items, and meat and defining tactics and strategies for improvements. The BQAs included the three phases of development: Phase I (includes a survey for indentifying the top-10 meat quality defects according to the perceptions of the representatives of the beef industry), Phase II (includes to characterize and to quantify defects in animals, carcasses, dress-off/offal items, and meat in processing plant) and Phase III (working in a strategy workshop with representative of the whole Uruguayan beef industry (UBI) for quantifying monetarily the incidence of the quality defects detected in Phase I and design tactics and strategies to reduce or solve them). As a result of both BQAs, bruises, high pH/dark cuts, hide damage, condemnations, fat color, injection-site and slaughter age defects were the most relevant economical problems detected. At prizes of 2008, the value losses per head slaughtered were 40.82 and 29.51 US$ for the first and second BQAs, respectively. This resulted in a recovery value of 29% between BQAs, resulting in 25.139.783 US$ gain. This positive progress is mainly associated with the best management practices and investments in infrastructure, equipment, technology and training applied by the UBI during 5 year period. UBI representatives addressed new challenges and priorities for the next 5 year period, where a Beef Quality Assurance Program is underway for reducing the incidences of the most important quality defects detected. The definition of priorities and challenges between the key participants of the UBI is an important step to create innovation, competitiveness and healthy beef industry. The information obtained also resulted in priorities for the research and technology transfer organizations involved with UBI and promoting cooperation between the public and private sectors.

***Index Terms*—audits, beef, Uruguay, quality defects, strategies.**

I. INTRODUCTION

The evaluation of meat quality depends on the position of each agent within the beef industry. This is the reason why different attributes are used to measured quality along the meat chain. For some industry operators like farmers and plant processors, the quality refers to carcass traits (weight, fat cover and distribution, conformation). For others, it can be added cut size and weight, meat and fat colour, meat pH, marbling). At consumer level, visual and sensory attributes, cultural aspects, nutritive value, food safety, animal welfare and meat tenderness are becoming more relevant. The plant processors claim about quality problems (carcass bruises and condemnations, inadequate pH, etc.), which affect the potential value of meat cuts, manufacturing costs, and commercialization, reducing product consistency and demand from international markets. This affects beef industry competitiveness. These faults have to be identified and quantified, and then developing tactics and strategies for minimizing economical losses. In this context, in 2002, INIA and INAC (Uruguay) and Colorado State University (USA) conducted the first Beef Quality Audit (BQA) of Uruguay. The main objective was to determine and to quantify the principal quality factors responsible of loosing value in the Uruguayan beef industry. On 2007, the second BQA was performed by INIA and INAC, where the main goals were to indentify the progress achieved during the 5 year period (2003 vs. 2007), and to detect new quality defects and to evaluate the effectiveness of the strategies taken in the previous BQA and defying new ones to improve in the new scenario analyzed.

II. MATERIALS AND METHODS

The first and second Uruguayan BQAs were performed in 2002/2003 and 2007/2008, respectively. Both BQAs were developed in three main phases described below:

Phase I: Six INIA and INAC researchers developed questionnaires for personal interviewing of 99 key representatives of the different sectors of the Uruguayan Beef Industry considering cow/calf producers, backgrounder and finisher producers, and/or cow/calf-backgrounders-finisher producers, cattle sellers, transport managers and owners, packers, leather processors, meat distributors, purveyors, retailers, restaurateurs, government leaders, research-innovation-technology transfer managers and brokers. Some of the most relevant questions asked to them were related to each

sector problems, taken into account products, processes and industry areas of improvements and addressing the main challenges that they could have in the future to be more competitive. From these interviews were possible to indentify the top-ten quality problems faced by each sector and the whole industry for both BQAs, and compared them. The procedures and methodologies applied during this phase is described by INIA, CSU and INAC (2004) and INIA and INAC (2009).

Phase II: Twelve well trained INIA and INAC researchers conducted both BQAs at 10 processing plants, which represented at least 75% of the total annual beef slaughtering of Uruguay. For considering the seasonal influences on carcass and meat quality, two periods of colleting information were considered: autumn-winter and spring-summer. The information gathered came from 20.887 and 28.323 animals slaughtered for both BQAs (2002/2003 and 2007/2008, respectively). There were 6 stations where the intensive measurements took place, and in each one of them accomplished different objectives for evaluating quality losses and generate general information during this phase. In each station, at least 10% of the animals/carcasses processed were evaluated. These measurements are described in detail in other article written by Brito et al., in this 56th IcOMST congress publication.

Phase III: This phase involved the development of a strategy workshop in both BQAs, where all the representatives (81) of the Uruguayan beef industry participated for: a) discussing the findings of Phases I and II, b) to know the perceptions of the different agents of the beef industry, c) to quantify, and to define priorities, and to value the quality problems found, and d) to identify and define priorities, different strategies and tactics to solve the problems found. The development of tactics and strategist is a key issue to the industry for continuous improvements in quality in the short, medium and long terms. In the last BQA strategy workshop (2007/2008), other additional goal was established to compare the progress achieved between both BQAs. This activity took between 1 or 2 day of working in groups in isolated places specially chosen for focusing on achieving the goals set by the organizers. The procedure involved working in group and in plenary sessions. The industry representatives defined the top-ten priorities in meat quality defects that have to be solved in the short and medium terms. Then, they ranked these again according to their economical impact for the industry. For calculating the individual and industry economical losses due to defects, these were estimated on the frequency and incidence at each defect occurred (obtained in Phase II) and by the products and co-products prizes provided and discussed by the packer directors with the rests of the members of the workshop. The next step was to establish the main strategies and responsibilities to recover the losses found. For solving each problem, the participants of the workshop identified and defined the ”causes, goals, solutions, leadership and responsibilities, and timing”. The procedures and methodologies applied during this phase are described by INIA, CSU and INAC (2004) and INIA and INAC (2009).

III. RESULTS AND DISCUSSION

Table 1 shows the comparisons between the first and second BQAs (2002/2003 vs. 2007/2008) in Phase I. The first column (“problems”) describes the list of the most important problems perceived during the first and second BQAs. The second column indicates (mark “√”) the list of the 10 most important problems addressed during the first BQA. The column called “perception” represents the perceptions that the industry representatives of the second BQA have about the progress achieved in relation to the first one. Comparing the first and second BQAs, the interviewers in 2007 were asked about their perceptions of the progress made in the problems identified, responding if they have improved, aggravated, or maintained during the 5 year interval. There was no one opinion suggesting any aggravates. The brand excess is the only defect where the interviewers suggested that this problem was maintained between BQAs. In the area of improvement, ”insufficient fatness and product presentation” problems were the defects of major progress, followed by ”lack of uniformity of cattle, carcasses, and cuts, bruises, dark cut/pH” problems, with minor advancements for the rest of the problems mentioned in 2003. The last column of the Table 1 shows (mark “√”) the list of the top-10 most important problems addressed during the second BQA. During this second BQA, despite of the progress mentioned from the previous one, where 7 out of the 10 defects (e.g. lack of uniformity of cattle, bruises, dark cut/pH, etc.) which are still considered like problems and need improvements. The ”x” defects were mentioned like problems, without considering them within the top-10. However, three new defects appeared during this BQA (e.g. yellow fat color).

The results of Phase II (in-plant measurements) are showed, developed and discussed in the article written by Brito et al., which is presented in this 56th IcOMST congress publication. The information gathered during this phase is the main data source used in the strategy workshop (Phase III). During the Phase III, having the objective information presented to the industry representatives, they have chosen the 10-top quality defects for the second BQA, and compared them with those of the previous BQA (Table 2). After 5 year of interval, the results of the last BQA showed that 5 out of the 10 defects indentified in the first BQA are still present in the second one, changing their position of importance between BQAs. However, bruises and dark cut/high pH are situated within the top-3, where liver condemnations fell into this range in 2007/2008. Lack of uniformity of cattle-carcasses-cuts, hide damage and injection-site lesions problems are

relevant in both BQAs. Undefined standard for dressing, tenderness and grading and classification carcass system problems were considered in the first BQA but were not in the case of the second one. On the contrary, for the second BQA, dirtiness/temperature control/food safety, insufficient marbling and small rib eye area defects got a place at the top-10.

When the information about the incidence of quality defects presented in Tables 1and 2 is compared, the perception of the problems identified by the industry is generally aligned with those objectively measured.

The value-losses identified between both BQAs are presented and compared in Table 3. The average loss of value associated with the presence of the defect was computed for each animal slaughtered, being 40.82 versus 29.51 US$/head for 2002/2003 and 2007/2008, respectively. This represented a reduction of 29% (11.31 US$/head). When the comparison is associated with the annual slaughtering for both BQAs (e.g. 2.222.335 heads slaughtered in 2007/2008), the differences were 90:723.455 versus 65:583.672 US$, representing a recovery of 25:139.783 US$. In the Audit 2002/2003, 84% of the losses were explained by bruises, high pH/dark cuts and condemnation defects, while, in the Audit 2007/2008, 86% of the losses were associated with bruises, high pH/dark cuts, yellow fat colour and hide damage defects. In the last BQA, most of the defects presented a substantial improvement, with the exception of yellow fat color and hide damage defects. The major reductions were observed in condemnations, bruises, and high pH/dark cuts. These positive changes could be associated with better best management practices applied in the whole industry and investments in infrastructure and equipment in the packer sector, and others.

IV. CONCLUSION

Between both BQAs, there was a substantial improvement in the reduction of value losses in quality defects recovering 11.31 US$/head slaughtered (29%). This represented a saving of 25.139.783 US$ for the UBI. The implementation of the BQAs in Uruguay has been a successful experience and joint work, where the different representatives of the UBI shared and discussed objective information and defined problems, priorities, and challenges for the future, setting tactics, strategies and responsibilities for making more competitive their business. The information obtained also resulted in priorities for the research and technology transfer organizations involved with UBI and promoting cooperation between the public and private sectors.

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Table 1. Uruguayan Beef Quality Audit – Phase I. Comparisons between the first and second BQAs (2002/2003 vs. 2007/2008).

Problems	Phase I (2002/2003)	Perception	Phase I (2007/2008)
Lack of uniformity of cattle, carcasses, and cuts	✓	● ●	✓
Bruises	✓	● ●	×
Dark cuts / pH	✓	● ●	✓
Product presentation	✓	● ● ● ●	✓
Undefined Standard for dressing	✓	●	×
Condemnations	✓	*	×
Brand excess	✓	●	✓

Injection-site lesions	✓	●	✓
Insufficient fatness	✓	●●●	✓
Management of temperature	✓	●	✓
Yellow fat colour			✓
Roads and cattle handling facilities			✓
Lack of training			✓

Note:

The defects in italics are not strictly considered a quality defect, they can cause them, but the authors respect the opinions of the participants of the workshop.

Maintained *

Improved ●

Table 2. Main problems detected in Beef Quality Audits: Comparison between years (2002/ 2003 vs. 2007/2008).

	Audit 2002/2003	**Audit 2007/2008**
1	Bruises	Bruises
2	Lack of uniformity of cattle, carcasses, and cuts	Liver Condemnations
3	High pH/Dark cuts	High pH/Dark cuts
4	Liver Condemnations	Injection-site lesions
5	Injection-site lesions	Lack of uniformity of cattle, carcasses, and cuts
6	Yellow fat color	Insufficient fatness
7	Hide damage	Hide damage
8	Undefined *Standard for dressing*	Dirtiness/Temperature control/Food safety
9	Grading and classification carcass system	Insufficient marbling
10	Tenderness	Small rib eye area

Table 3. Beef Quality Audits: Comparative evaluation of economical losses (US$/slaughter animal and industry) between audits (2002/2003 vs. 2007/2008).

CONCEPT	**Audit 2002/2003***		**Audit 2007/ 2008***	
	Lost/Animal	**Industry**	**Lost/Animal**	**Industry**
Bruises	18.90	41.995.509	10.76	23.908.636
High pH/Dark cuts	10.14	22.542.244	7.69	17.080.467
Yellow fat color	1.41	3.123.359	3.51	7.808.396
Hide damage	3.38	7.520.382	3.43	7.632.387
Condemnations	5.60	12.448.625	2.94	6.537.068
Injection-site	0.79	1.757.443	0.69	1.528.211
Slaugther age	0.60	1.335.895	0.49	1.088.507
Total Lost	**40.82**	**90.723.455**	**29.51**	**65.583.672**

Note: Values-losses are calculated in US$ based on year 2008 prizes. This allows comparisons between different periods.