



CAPÍTULO II

FROM FARM TO FORK: THE URUGUAYAN EXPERIENCE

Fabio Montossi¹ & Fiorella Cazzuli²

¹ National Direction, INIA Uruguay. INIA Tacuarembó, Ruta 5 km 386, Tacuarembó,
Uruguay (fmontossi@inia.org.uy)

² National Meat & Wool Research Programme, INIA Uruguay. INIA Tacuarembó, Ruta 5
km 386, Tacuarembó, Uruguay (fcazzuli@tb.inia.org.uy)

ABSTRACT

Uruguay has designed its sustainable intensification strategies over the years, taking into account that one of the goals is to feed 42% more people in 2050 than we do today. In order to succeed in this pursuit, specifically considering meat production, this country has tackled the following issues: traceability, soil utilisation and management plans, animal welfare, climate change mitigation, animal breeding, genomics and conversion efficiency, meat seen as healthy food for human nourishment, taking into consideration rural inhabitant's life quality (automation and reducing supplementation frequency, supply chain integration and brand developing, certification and marketing campaigns. Not only strictly productive, technological or industrial activities must be enhanced and/or adopted, but also beef and lamb meat products must cease to be seen as mere commodities and start to be considered as a highly nutritious healthy food instead. Only through a multidimensional and inter institutional approach, as well as private-public partnerships and constructing State policies based on solid scientific foundations, can this endeavour be performed.

Key words: Uruguay, meat, sustainable intensification, technology, human health



1. INTRODUCTION

Uruguay is a very small and sparsely populated country. In a globalised world, it is difficult for a country like this to pull ahead in global trade using conventional commerce tactics. Nonetheless, every apparent disadvantage has an underlying opportunity within, if we care to think how to use it in our favour. This country acknowledges its size limitations and has learned how to focus on quality rather than quantity in most trade matters.

Both sheep and beef supply chains are examples of this commercial strategy, but this does not mean that it has been an easy road towards the desired goal. Throughout the years, several joint efforts from the private and public sectors have been pulling off successful strategies, one by one. Of course, not everything has turned out exactly as expected, but certainly most endeavours have come to fruition.

This paper aims to present the Uruguayan meat industry experience on tackling issues such as consumer's preferences and demands, while considering ethic considerations about animal welfare and environmental sustainability.

2. CONTEXT AND STRATEGIES

It is well known that the world's population is growing at high rates and that by the year 2050, the agriculture sector will have to increase its production 60% over current levels in order to satisfy global food demand; logically, red meat is no exception to this (FAO, 2014), given that is a strategic source of protein in human diet (Montossi *et al.*, 2013). The challenge lies in adding value to a food, which would otherwise be simply a commodity.



According to Mondelli (2014), in 2005, Uruguay produced food enough to match the demand of 9 million people, in terms of the adequacy of dietary energy supply (KCal/inhabitant/day); nowadays Uruguay produces food for 28 million people and has the potential to feed 40 million people.

Uruguayan is said to be an agri-exporter country, since most exports come from an agricultural origin. Beef meat and its by-products represented the main exported item in 2014 (Uruguay XXI, 2015). Actually, Uruguayan beef has achieved an international status in world beef trade, placing itself as one of the six largest exporters around the globe (Gorga & Mondelli, 2014; Zurbriggen & Sierra, 2015).

Uruguay has managed to open more than 100 markets all over the world, where livestock consumption is placed, especially beef and sheep meat and their by-products. The customers of these markets have highly sophisticated tastes and are extremely demanding when choosing meat products. There are several issues that have been brought up in the last years concerning consumers' attitudes and motivation towards the product they intend to buy. The modern meat consumer prefers origin, product and processes certification and has a strong environmental awareness about global climate change and the environmental impact of the production systems on natural resources. These meat consumers take into account animal welfare aspects as well as animal health and food security issues. It is also taken into consideration the products' quality, its consistency, differentiation and supply continuity. Human health is seen as a very important factor at the time of choosing a meat product and so are its culinary attributes, preparation and cooking easiness. Finally, aspects involving social responsibility influence consumers' choice as well (Montossi *et al.*, 2014).

The Uruguayan meat supply chain has been consistently growing during the last 20 years and present and future conditions are in place for a new productive and competitive



leap (Montossi, 2013). Specifically in the last 10 years, Uruguayan livestock production systems have been intensified using improved pastures, concentrates and improved genetics (Brito *et al.*, 2014).

Uruguay has a temperate climate and an abundance of clean water, which makes it an ideal place to develop outdoor production systems, where livestock graze freely on the open range (Resconi *et al.*, 2008; Montossi, 2014). Actually, the vast majority of Uruguayan production systems are based on native pastures, even though improved pastures and animal supplementation have been advancing in recent years (Realini *et al.*, 2004; Brito *et al.*, 2008; del Campo *et al.*, 2008; Brito *et al.*, 2014).

Modern Uruguayan livestock industry is seen as an economy sector which provides increasingly demanding domestic and foreign consumers the meat products (nutritive food) they ask for, and not just a basic agriculture sector that merely produces finished steers or carcasses (Montossi, 2013).

Some examples of the Uruguayan strategies concerning the improvement of the meat supply chain will be listed and illustrated bellow. Focus will be made on the aspects that imply scientific research and innovation, as well as initiatives that have been brought off by means of inter institutional joint actions.

2.1. Traceability

Osorio (2009) states that Uruguay has had group traceability ever since 1974, but obviously without an electronic device. Nonetheless, since 2010 no Uruguayan meat can enter the UE market unless all animals have been traced from their birthplace to the slaughterhouse, especially meat included in the "Hilton Quota". Nowadays, every livestock unit in the country has two individual ear tags: a visual one and an electronic one. Uruguay



has become the first country in the world with a traceability system with these particular and modern characteristics (Gorga & Mondelli, 2014).

2.2. Soil preservation and Carbon Footprint

Meat consumers are becoming more interested in environmental sustainability (Brito *et al.*, 2008). Uruguay has the earliest long term rotations trial of Latin America, more than 50 years long, and the information generated from this trial in combination with foreign research, was used as the basis to outline a public policy that was later regulated and resulted in the compulsory presentation of Land Use Management Plans (Hill *et al.*, 2008; MGAP, 2013).

On the other hand, Becoña and Oyhançabal (2013) published the first Carbon Footprint study, which includes the beef industry.

2.3. Animal welfare

Every five years, the National Meat Institute (INAC) and the National Agricultural Research Institute (INIA) of Uruguay, carry out the Beef Supply Chain Quality Audits, since 2002. These studies concluded that bruising is a major source of economic loss given that these carcass alterations need to be cut off, and when these bruises are located in high value areas of the carcasses, they are particularly economically relevant. Improper animal handling is closely related to the presence of carcass bruises. Considerable reduction of bruising was observed from the first audit to the second, meaning that animal welfare improved, associated to good handling practices as well as the improvement of facilities (Brito *et al.*, 2011).



2.4. Genetic improvement/genomics and conversion efficiency

In 2014 an inter institutional public-private agreement was signed between the Society of Hereford Breeders (SCHU), the Rural Association (ARU), INAC, the “Clemente Estable” Biology Research Institute (IIBCE), the Ministry of Livestock, Agriculture and Fisheries (MGAP), the National Research and Innovation Agency (ANII) and INIA, to carry out a project which main objective is to improve the beef supply chain competitiveness through the integrated use of livestock information systems (traceability and "black boxes" installed in every slaughterhouse) combined with genomics and classical animal breeding that will allow a faster and more precise way to achieve the desired goal (Pravia *et al.*, 2013). This superior genetic for residual feed intake will have additional benefits to the environment, reducing greenhouse gasses emissions.

2.5. Production systems and consumer´s preferences

The use of hormones and growth-promoters are banned in Uruguay (MGAP, 2015), and this is seen as a positive feature (Brito *et al.*, 2011).

Local research led by Realini *et al.* (2013) found out that European meat consumers presented the higher acceptability scores for Uruguayan beef from grass-fed animals with or without concentrate supplementation than animals fed on concentrate only. This is a clear advantage for Uruguayan livestock production systems, since these are grass-based in their vast majority.

2.6. Trade achievements; branding certification and promotion campaigns

Both "481" (grain-fed animals) and "Hilton" (grass-fed animals) Market Quotas directed to the EU, are clear examples of the achievements of the Uruguayan beef supply chain in terms of trade, through joint efforts.



In terms of branding, several initiatives may be listed: the Natural Meat Certification Programme, Uruguayan Hereford Beef brand, Uruguayan Angus Beef brand, Grasslands Alliance brand and Uruguay Open Range Beef brand, among others.

2.7. Integrating the human factor

Since the beginning of this century, self-feeding supplementation on pastures became more and more popular among farmers, given the workforce shortage triggered partly by the expansion of alternative and attractive economic rural activities. Both self-feeding technologies and infrequent feeding were assessed by local researchers (Rovira, 2012; Quintans et al., 2013; Lagomarsino et al., 2014), validating one and the other. These automatic systems could be seen positive in several ways: better field worker's life quality, improvements in animal feeding and care (animal welfare and animal health) in extensive rangeland conditions given the closer human observations of animals and giving extra time for other social activities, even recreational ones (Lagomarsino et al., 2014).

2.8. Safe, tender and healthy meat

Many consumers, especially those from developed countries, show a growing concern on avoiding BSE, hormones and antibiotics when buying beef. Through traceability controls, tight sanitary state policies and a reputation for being very professional and serious towards animal and human health issues, Uruguay has built over the years an information platform that makes this country highly receptive to these market demands in terms of beef safety. Including forage in the diet of beef cattle should enhance the *n-3* fatty acids concentrations because forages are a good source of C18:3 $n-3$ (Scollan *et al.*, 2001).



Several local and foreign researchers such as Realini *et al.* (2004), Brito *et al.* (2009) and Nuernberg *et al.* (2005), reported that grass-fed animals had higher concentrations of linolenic acid than grain fed steers. These animals presented a clear difference ($P < 0.05$) in long chain polyunsaturated fatty acids (PUFA) in favour of grass-fed beef. Additionally, Uruguayan research teams Cabrera *et al.* (2010) and Saadoun & Cabrera (2013) concluded that most Uruguayan beef cuts have a very interesting mineral composition in terms of selenium, copper, zinc, iron and manganese contents, the latter researchers also found out that grass-fed steers presented higher levels of selenium, CLA, a better $n-6:n-6$ ratio, among other health-related attributes. Realini *et al.* (2015) characterised beef fatty acids and its relation with ruminant diet, while Montossi & Sañudo (2007a) found higher $n-3$ levels, better $n-6:n-3$ ratios and higher Vitamin E levels in Uruguayan beef compared with German and British beef. Montossi & Sañudo (2007b) compared Uruguayan beef from different productive systems, with contrasting pasture proportion on animal diet and concentrate supplementation. Grass-fed only animals presented similar results: higher $n-3$ levels, better $n-6:n-3$ ratios and higher CLA levels. All the evaluated production systems registered similar Vitamin E levels, suggesting similar preservation capacities.

These are only some examples of how Uruguayan Meat Science research made significant progress on scientifically proving the benefit of including grass-fed meat on a healthy human diet.

Even though extensively grass-fed animals have been traditionally associated with higher shear forces, there is ample body of information that demonstrates either that this is not true or even the opposite, at least on the extensive production systems evaluated, which happen to be very representative of the Uruguayan livestock production. Some of these



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research work were performed by del Campo *et al.* (2007), del Campo *et al.* (2008) Brito *et al.* (2008). As for consumer evaluations, according to Brito *et al.* (2014), numerous studies have consistently shown that grain finished cattle has whiter fat colour scores than grass-fed animals.

3. Final comments

The joint and persistent efforts undertaken by both private and public sectors, integrating farming, primary industries, scientific research and trading strategies have reaped several small progresses, that added up together evidence that all these efforts have been worthwhile to move Uruguay in a better position in the beef market place. Not only integrating cutting-edge technology can the Uruguayan meat supply chain keep striding further ahead, but also through the adoption of simple low budget processes-technologies. The only requirement is that - whatever the innovation may be - it has to be brought about considering that meat cannot be thought of as a mere commodity in this scheme, and that other non-food related considerations, such as environmental sustainability, ethics, local labour laws, etc. have to be taken into account.



4. References

- Becoña, G., Oyhançabal, W. (2013). *Primer estudio de la huella de carbono de tres cadenas agroexportadoras del Uruguay: Carne vacuna, lácteos y arroz* (p. 54). Montevideo.
- Brito, G., Lagomarsino, X., Olivera, J., Trindade, G., Arrieta, G., Pittaluga, O., Montossi, F. (2008). Effect of different feeding systems (pasture and supplementation) on carcass and meat quality of Hereford and Braford steers in Uruguay. In *International Congress of Meat Science and Technology* (Vol. 54th). Cape Town, South Africa.: ICoMST.
- Brito, G., Chalkling, D., Simeone, A., Franco, J., Beretta, V., Beriau, E., Iriarte, J.M., Tucci, D., Montossi, F. (2009). Effect of finishing systems on meat quality and fatty acid composition of Uruguayan steers. In: *55th International Congress of Meat Science and Technology (ICoMST)*. Copenhagen, Dinamarca.
- Brito, G., San Julián, R., Lagomarsino, X. (2011). *Segunda auditoría de calidad de carne vacuna del Uruguay*. (p. 92). Tacuarembó: INIA. Serie Técnica N° 185.
- Brito, G., San Julián, R., La Manna, A., del Campo, M., Montossi, F., Banchero, G., Soares de Lima, J. (2014). Growth, carcass traits and palatability: Can the influence of the feeding regimes explain the variability found on those attributes in different Uruguayan genotypes? *Meat Science*, 98 (3), 533–538.
- Cabrera, C., Ramos, A., Saadoun, A., Brito, G. (2010). Selenium, copper, zinc, iron and manganese content of seven meat cuts from Hereford and Braford steers fed pasture in Uruguay. *Meat Science*, 84 (3), 518–528.
- del Campo, M., G. Brito, C P. Hernandez, J. M. Soares de Lima, D. Vaz Martins, R. San Julián, F. Montossi, C. Sañudo. (2007). Effect of different diets on carcass traits and meat quality in Uruguayan steers. In: *Proceedings 53rd ICoMST*. Eds. Zhou, G. and Zhang, W. China Agricultural University. Beijing, China. pp 285-286.
- del Campo, M., Brito, G., Soares de Lima, J., Vaz Martins, D., Sañudo, C., Julián, R. S., Montossi, F. (2008). Effects of feeding strategies including different proportion of pasture and concentrate, on carcass and meat quality traits in Uruguayan steers. *Meat Science*, 80 (April 2006), 753–760.
- FAO. (2014). *Food and Nutrition in Numbers* (p. 245.). Rome: UN.
- Gorga, L., Mondelli, M. (2014). ¿La carne uruguaya ha escalado en las cadenas globales de alto valor? *Anuario OPYPA/MGAP*, 617–636.
- Hill, M., García Préchac, F., Terra, J., Sawchik, J. (2008). Incorporación del efecto del contenido de agua en el suelo en el modelo USLE/RUSLE para estimar erosión en Uruguay Soil water content effect in the USLE/RUSLE model to estimate erosion in Uruguay. *Agrociencia*, XII, 57–67.
- Lagomarsino, X., Luzardo, S., Montossi, F. (2014). ¿Cómo producir terneros con más de 300 kg con edades menores a los 15 meses en sistemas ganaderos de Basalto? In *Estrategias de intensificación ganadera* (pp. 31–36). Treinta y Tres: INIA. Serie Actividades Difusión N° 734.



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- MGAP. Resolución Ministerial Planes de Uso de Suelo (2013). Montevideo: Ministerio de Ganadería, Agricultura y Pesca (MGAP). Retrieved from <http://www.cebra.com.uy/renare/media/Resolución-Ministerial-Planes-de-Uso.pdf>
- MGAP. (2015). Marco Legal. Programa Nacional de Residuos Biológicos. Retrieved May 12, 2015, from http://www.mgap.gub.uy/dgsg/PNRB/PNRB_MarcoLegal.htm
- Mondelli, M. (2014). 2º Foro Cooperativo Agropecuario CAF 2014 Panel I: El agro uruguayo al 2020. *Lineamientos Estratégicos Para El Desarrollo Competitivo Agroexportador*. Retrieved from <http://www.caf.org.uy/IMG/pdf/5-Mondelli.pdf>
- Montossi, F., Sañudo, C. (2007a). Evaluación y promoción de la calidad de la carne y otros productos agroalimentarios uruguayos en base a los estándares de calidad de la Unión Europea y en función de los distintos sistemas productivos del Uruguay: componente carnes. In F. Montossi & C. Sañudo (Eds.), *Cooperación Hispano-Urugaya: evaluación y promoción de la calidad de la carne bovina y ovina del Uruguay en el mercado europeo*. (p. 54). Tacuarembó: INIA. Serie Técnica N° 166.
- Montossi, F., & Sañudo, C. (2007b). *Cooperación Hispano-Urugaya: Diferenciación y Valorización de la Carne Ovina y Bovina del Uruguay en Europa: Influencia de Sistemas de Producción sobre Aceptabilidad y Percepción de Consumidores y Salud Humana* (p. 116). Tacuarembó: INIA. Serie Técnica N° 168.
- Montossi, F. (2013). Innovación e invernada de precisión para el Uruguay. In F. Montossi (Ed.), *Invernada de precisión: pasturas, calidad de carne, genética, gestión empresarial e impacto ambiental (GIPROCAR II)*. (pp. 1–6). Tacuarembó: INIA. Serie Técnica N° 211.
- Montossi, F., Font-i-Furnols, M., del Campo, M., San Julián, R., Brito, G., Sañudo, C. (2013). Sustainable sheep production and consumer preference trends: Compatibilities, contradictions, and unresolved dilemmas. *Meat Science*, 95 (4),
- Montossi, F. (2014). 60th International Congress of Meat Science and Technology, August 17th-22nd, 2014, Punta del Este, Uruguay. Meat Science, Sustainability and Innovation. *Meat Science*, 98 (3), 321.
- Montossi, F., Soares de Lima, J., Brito, G., Berretta, E. (2014). Impacto en lo productivo y económico de las diferentes orientaciones productivas y tecnologías propuestas para la región de Basalto. In E. Berretta, F. Montossi, & G. Brito (Eds.), *Alternativas tecnológicas para los sistemas ganaderos de Basalto*. (pp. 557–568). Tacuarembó: INIA. Serie Técnica N° 217.
- Nuernberg, K., Dannenberger, D., Nuernberg, G., Ender, K., Voigt, J., Scollan, N., Richardson, R. (2005). Effect of a grass-based and a concentrate feeding system on meat quality characteristics and fatty acid composition of longissimus muscle in different cattle breeds. *Livestock Production Science*, 94, 137–147.
- Osorio, G. (2009). Trazabilidad individual a campo. In *Un nodo de cooperación sobre la experiencia de Uruguay en trazabilidad bovina* (pp. 33–37). Montevideo: IICA.
- Pravia, M. I., Navajas, E. A., Fuente, J. De, Lema, M., Ravagnolo, O., Aguilar, I., Montossi, F. (2013). Construyendo las bases para la selección genómica en la raza Hereford: eficiencia de conversión y calidad de canal y carne. *Revista INIA*, 38, 56–59.



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ISBN 978-85-60014-27-9

- Quintans, G., Echeverria, J., Scarsi, A., Rovira, P. (2013). Efecto del suministro de ración en comederos de autoconsumo en terneros destetados precozmente. In G. Quintans & A. Scarsi (Eds.), *Seminario de actualización técnica: cría vacuna* (pp. 207–218). Treinta y Tres: INIA. Serie Técnica N° 208.
- Realini, C. E., Duckett, S. K., Brito, G. W., Dalla Rizza, M., & De Mattos, D. (2004). Effect of pasture vs. concentrate feeding with or without antioxidants on carcass characteristics, fatty acid composition, and quality of Uruguayan beef. *Meat Science*, *66*, 567–577.
- Realini, C. E., Font i Furnols, M., Sañudo, C., Montossi, F., Oliver, M., Guerrero, L. (2013). Spanish, French and British consumers' acceptability of Uruguayan beef, and consumers' beef choice associated with country of origin, finishing diet and meat price. *Meat Science*, *95*, 14–21.
- Realini, C., Brito, G., Montossi, F. (2015). Avances en la caracterización y mejora del perfil de ácidos grasos de la carne vacuna uruguaya: desafíos y oportunidades. In *Jornadas Uruguayas de Buiatría* (Vol. 43°, pp. 259–264). Paysandu: Centro Médico Veterinario de Paysandú.
- Resconi, V., Campo, M., Font-i-Furnols, M., Oliver, M., Luzardo, S., San Julián, R., Sañudo, C. (2008). Effect of different feeding systems in the sensory quality of Uruguayan beef. In *International Congress of Meat Science and Technology* (pp. 4–6). Cape Town, South Africa.: ICoMST.
- Rovira, P. J. (2012). Desempeño productivo de novillos sobre pasturas templadas con suplementación energética en autoconsumo. *Revista Veterinaria*, *23* (1), 3–7.
- Saadoun, A., Cabrera, C. (2013). Nutritional quality of the beef produced in Uruguay. *Archivos Latinoamericanos de Producción Animal*, *21* (2), 119–130.
- Scollan, N., Choi, N., Kurt, E., Fisher, A., Enser, M., Wood, J. (2001). Manipulating the fatty acid composition of muscle and adipose tissue in beef cattle. *British Journal of Nutrition*, *85*, 115–124.
- Uruguay XXI. (2015). Informe de Comercio Exterior: exportaciones e importaciones de Uruguay. Montevideo: Uruguay XXI. Promoción de inversiones y exportaciones. Retrieved from <http://www.inv.gov.ar/PDF/ComercioExterior/InformeEstadiEcuador.pdf>
- Zurbriggen, C., & Sierra, M. (2015). *Redes colaborativas de conocimiento en el agro uruguayo: avances y desafíos pendientes* (p. 45 p.).