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Gasconne Beef Breed, an Explorative Study of Trans-Border Differences in Management and Commercialization

Research Article

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ABSTRACT

This study describes the management and products of the Gasconne cattle in two neighbouring countries (Spain and France), as a model study in trans-border breeds, analysing if they are significantly different depending on the place where they are located. Fifty-seven Gasconne breeders were interviewed (32 in Spain and 25 in France). The survey examined several aspects of the productive farming system and trading procedures. Descriptive statistics and multivariate analysis were used to understand the relationships between variables and establish the difference between countries. The herd size was similar in both countries but not the animal age distribution. Moreover, statistical differences were found in the replacement rate and age at weaning, both higher in France. Different reproductive management was also found between countries. Thus, seasonal reproductive control and the use of artificial insemination were only common in France. The herd production system was, in general terms, more intensive in France than in Spain. There was significant percentage of breeders, in both countries, which carried out their own fattening. The main products supplied and their trading channels were also different. Thus, yearlings and calves were the most common products in Spain whereas in France the focus was on cows, young calves for fattening and oxen. With respect to the trading channel, the sale of live animals directly to other breeders or slaughterhouses, was the most common option used in Spain compared to the sales to cooperatives, intermediaries and butchers reported in France. It has been demonstrated that there are significant differences among productive systems of the same breed even between neighbouring regions.

KEY WORDS beef cattle, Gasconne, management systems, questionnaires, structural characterisation.

INTRODUCTION

Breed is a complex notion in continuous evolution and the result of a large combination of several factors. Thus, the FAO defines breed as: “either a sub-specific group of domestic livestock with definable and identifiable external characteristics that enable it to be separated by visual appraisal from other similarly defined groups within the same species, or a group whose geographical and / or cultural separation from phenotypically similar groups has led to acceptance of its separate identity”. Breeds have been developed according to geographic and cultural differences and to meet human food and agricultural requirements (Scherf, 2010). Throughout history, the number and diversity of the different breeds has increased due to human migrations, the mixing of populations and development of

different selection criteria. Thus, the animals of a specific region became homogeneous and each breed was more or less fixed. In this context, the Gasconne breed came into being in the south of France and is one of the main rustic French breeds (Petit *et al.* 1994). A rustic breed has specific qualities enabling the animal to withstand difficult conditions without reducing its performance and showing a high capacity for adaptation to the environment. Gasconne is an autochthonous cattle breed from the Midi-Pyrénées region, near the mountain area of the Pyrenees. The first herd book of the breed dates from 1856, making it the second French cattle breed with a herd record (Dervillé *et al.* 2009). There are currently 67 breeds of cattle recognised in France (Legifrance, 2007). Among these, the Gasconne is classified as a regional beef breed, with a census of 42000 heads (Eurostat, 2009): 22341 heads belong to cows (female more than 3 years), representing 0.53% of the total French beef cattle population (Franceagrimer, 2009). On the other hand, in the official catalogue of breeds in Spain there are 45 cattle breeds (BOE, 2009) although the Gasconne is not yet recognised. Despite being a French regional breed, in 1980s it crossed the Pyrenees. The natural border between France and Spain provided that the Gasconne breed began to spread throughout Spanish territory. In 2009, the total population of this breed in Spain was of 5642 heads, corresponding 2280 to cows that represent 0.09% of the total Spanish cow census (MARM, 2009) and 0.11% of the Spanish beef cow total (Franceagrimer, 2009). Gasconne breed is also present in other European and American countries and it is considered by FAO as a transboundary breed with annual reports from France, Czech Republic, United Kingdom and Chile (DAD-IS, 2011). The aim of the current study was to use Gasconne breed as a model to determine the differences and similarities in the general management, products and trading standards of the same breed in neighbouring territories belonging to different countries.

MATERIALS AND METHODS

Data collection and questionnaire design

The information used in this study was obtained from personal interviews (face to face) based on questionnaires carried out on a sample of Gasconne breeders located in two countries (Spain and France) during summer 2009. The sample consisted of 57 farms: 32 in Spain and 25 in France, situated in different regions of each country. In Spain, interviews were held with all the Gasconne breed farmers that had purchased Gascon Plus (commercial structure of the French Gasconne breed selectors) cattle and also their neighbours to whom they had sold the Gasconne (non probabilistic sampling "snow ball") (Trespalacios *et al.* 2005). The 32 farms surveyed had 1561 cows, more than the half of the total number of Gasconne cows existing in Spain. To achieve a balanced sample, 25 farms in France were randomly selected with proportional allocation by region taking into account the national distribution. Aragón, Cantabria, Castilla y León, Cataluña, Comunidad Valenciana and País Vasco were the 6 Spanish autonomous regions where the surveys were held and Aquitaine, Bourgogne, Basse-Normandie, Languedoc-Roussillon and Midi-Pyrénées were the 5 French regions selected for answering to the questionnaires (Figure 1). To avoid problems with the language, the same dual translation (Spanish-French and French-Spanish) was used in the two countries (Dufour *et al.* 2010). The questionnaire was divided into different sections, providing information on several variables such as:

-Overall farm characteristics: personal information about the breeder, labour structure, farm size and herd composition.

-Productive and reproductive index management: age at first calving, age at weaning, use of artificial insemination, mating period, calving period, twins calving percentage, productive life of cows and replacement rate.

-Fattening and commercialisation: product of fattening, type of products, annual sales distribution and trading routes (marketing channels used by breeders).

Statistical analyses

The field data were introduced into an Excel matrix after checking for missing data and outliers. Subsequent statistical treatment was performed using the Excel program and the SPSS statistical package (version 15). As the questionnaire included different scales in rating the answers, the statistical analyses consisted of univariate, bivariate and multivariate analyses. The univariate analyses focused on calculating averages, standard deviations, modes, frequencies and percentages. Chi- square (X^2) and U-Mann Whitney (U-MW) non parametric bivariate analyses were used due to the variables were not normal. The multiple correspondence analyses was the multivariate test performed, in order to represent in a reduced multidimensional space the relation between the categories of the different non-metric variables (Uriel and Aldás, 2005). It was made a descriptive and an inferential statistic analysis in order to explain the differences between countries. It would be interesting analyze and compare the results between each bordering region of each country, but the size of the sample do not allow us to obtain representative results for that comparisons, so the study compare, as a whole, the Spanish *vs.* the French farms.

RESULTS AND DISCUSSION

Overall farm characteristics

In terms of the breeders, in 84.0% of the cases in Spain and

Figure 1 Distribution of studied farms in Spain and France

73.0% in France, farm's owner was a man. Women are usually farm's titleholder when the main worker develops another activities apart from those related with livestock (Serrano *et al.* 2005). The average age of the breeder was 46.5±9.4 years in Spain and 44.7±10.3 years in France, with ages ranging between 23 and 62 years. These dates are according to other French, Spanish and European studies carried out by Liénard *et al.* (2002a), Martín-Collado *et al.* (2010) and Gandini *et al.* (2010). The average age of the farm was 8.7±5.5 years for Spanish and 24.8±31.2 for French operations. For the majority of French breeders the Gasconne farm was a family inheritance. The average number of workers on cattle farms was 2 (1.7±0.8 in Spain and 2.1±0.8 in France) and they generally presented a family structure (father-son, sibling, husband-wife) although sometimes temporary employees are taken on at times of maximum activity. The average head of animals when starting up the farm was 22.9 in Spain and 27.0 heads in France (Table 1).

In general, the initial distribution was the same in both countries (majority of cows and nearly one bull). However, the analysis showed statistical differences (P<0.01; U-MW) in the number of females for replacement, which was higher in France than in Spain. The farms kept growing until reaching an average size of 82.6 heads in Spain and 119.2 heads in France.

The distribution and herd size of Gasconne farms are similar to the data recently reported in other Spanish cattle breeds (Martín-Collado *et al.* 2010), but the number of cows per herd is slightly lower than the average obtained in extensive livestock located in the South of Spain (Milán *et al.* 2006). The average number of cows and bulls was different in each country but not significantly, as statistical differences were only found in thedistribution of the herd composition in the number of replacement heifers and unweaned calves (P<0.001, U-MW), where the numbers of these types of animals were higher in France than in Spain being this related with productive parameters.

Productive and reproductive index management

The results of the survey showed that the reproductive performance was different in each country. Statistic differences existed between countries in some parameters as: age at first calving (P<0.05; U-MW), age of weaning (P<0.001; X^2), use of artificial insemination (P<0.05, X^2), self life of cows (P<0.05, X^2) and replacement rate (P<0.001, U-MW).

Spain showed lower aged cows at first calving compared to France, 31.6±4.6 *vs.* 34.2±3.3 months, and early weaning of the calves (Table 2). In relation to the age at first calving, values obtained in the present study were lower than those reported in other Spanish studies (Milán *et al.* 2006) and the percentage of twins calving was not statistically different between both countries (1.88±2.5 in Spain *vs.* 2.28±4.1 in France) being this percentage in agreement with the results of other authors (Gordon, 1998).

The percentage of farms using artificial insemination (AI) was small, especially in Spain where natural mating is the typical reproductive method for beef cattle (Milán *et al.* 2006).

While in France the use of AI was more frequent than in Spain; 64.0% of the French breeders interviewed had used AI at least once in their cows compared with 30.0% in Spain. In France, the semen was sourced from reproductive centres and from their own bulls. With respect to the males, 90.3% of Spanish and 92.0% of French farms visited had at least one bull of their own. However, while in France all the males were of domestic (obviously considering that the selection centre is located there) this did not happen in Spain where the number of males from Spain and France was similar (37.0% *vs.* 40.7%), and even the 22% of breeders have bulls of both origins. Farms are frequently found where the bull is sourced from Gasconne breeder neighbours in order to avoid inbred individuals and increase the genetic diversity of the herd. So the data indicate that there is currently a small market for males in Spain. Differences were also found in each country with respect to the mating and calving periods.

Table 1 Number of heads (average) present on Gasconne farms at the beginning of the farm activity and when the survey was carried out (summer 2009)

	Average heads on Gasconne farms			
		Spain	**France**	**P- value**
Heads at the beginning				
	Cows	17.19	20.65	0.101^{ns}
	Bulls	0.58	0.92	0.067^{ns}
	Replacement (female)	5.13	5.44	0.008**
Heads at time of survey				
	Cows	48.78	51.80	0.541^{ns}
	Bulls	1.59	1.84	0.649^{ns}
	Replacement heifers<1.year	4.58	10.72	0.006**
	Replacement heifers 1-2 years	3.78	12.04	0.000***
	Replacement heifers>2 years	4.29	7.80	0.000***
	Replacement male	0.13	1.16	0.206^{ns}
	Unweaned calves	8.68	31.08	0.000***
	Weaned calves	10.75	2.80	0.121^{ns}

Test: U-Mann Whitney; NS: non significant; **= P<0.01; ***= P<0.001.

Table 2 Percentage of farms according to useful life intervals of the cows, age of weaning in calves and replacement rate of cows

	Spain	**France**	**P- value**
Useful life of cows			
<10 years	10.50%	25.00%	
10-15 years	15.80%	45.80%	0.015*
>15 years	73.70%	29.20%	
Age of weaning in calves			
<120 days	33.00%	8.70%	
120-210 days	51.90%	26.10%	0.001***
>210 days	14.80%	65.20%	
Test: Chi-square; *= P<0.05; ***= P-value<0.001 the signification is referred to the distribution of the three intervals.			
Replacement rate (%)			
Average±sd	8.50±5.02	16.73±8.15	0.000***
Median	10	20	
Mode	10	20	

Test: U-Mann Whitney; SD: standard deviation; ***= P<0.001.

While in Spain the mating season was continuous, in France calving is concentrated in winter (January-March) when the animals are housed. These practices have a great influence on the age of weaning, a feature in which statistical differences were also found. According to the description of management methods in cattle beef breeds (Buxadé, 1997), in Spain the Gasconne herd management would be extensive while in France semi-extensive. This semi-extensive management system is the legacy of the ancient Gasconne management system, where the herd was complete housed in winter and in spring, after the snows had thawed, animals would graze in the nearby pastures and at night were stabled again (Naudinat, 1930). D´Hour *et al.* (1998) mentioned the importance of the modification of calving data to provide the behavioural adaptation of the cattle for using the grazing areas and mountainous meadows in the extensive system. On French farms the calves are usually reared in lactation during the winter season and in spring animals start to go out with their dams, feeding on milk and grazing pastures (Table 2). However, on the majority of Spanish farms (51.9% of interviewed), the calves are weaned in the interval between 120-210 days.In Spain, the early weaning (<120 days) could also be considered common practice, being related with the sale of calves to livestock traders and fattening units.

Regarding the useful life of cows, the average value was higher in Spain (14.5±2.9 years) than in France (12.7±3.3 years). Statistical differences were also found in the distribution of the farms classed according to the useful life of their cows. Table 2 show how in Spain 73.7% of breeders responded that it was longer than 15 years, although in France the interval more answered was between 10 and 15 years.

The average replacement rate given was 8.1% in Spain and 16.7% in France (Table 2). However, regarding average productive life of the cows, the theoretical replacement rate should be 6.9% and 7.9%, respectively due to this implies a tendency to increase the size of the herds in both countries, especially in France. There were significant differences between the theoretical replacement rates necessary to maintain the herd size and the actual replacement rate reported. Indeed, it is possible to observe the difference between the number of animals at the beginning of the farm activity and at the moment of the survey.

The expansion in the beef cattle industry since 1990 is a conesquence of direct payments to farmers within the framework of the CAP (Milán *et al.* 2006). On the other hand, the herd composition was slightly different between both countries, In France, the number of replacement heifers was higher than in Spain and the replacement rate was

higher in French farms than in Spanish farms, decreasing the useful life of cows. Our French results are similar to those reported from other beef cattle French breeds (Liénard *et al.* 2002a, b).

These data could be related with fattening and commercialisation because in France there is a high demand for red and infiltrated meat, which comes from older animals, whereas in Spain the number of old or castrated animals slaughtered is practically inexistent.

All this also explains the differences between France and Spain in parameters such as: replacement rate and useful life.

Figure 2 shows the relation between the variables. Thus, the categories of variables related to a specific country were different, with France being closer than Spain to other variables such as the use of AI, shorter useful life of cows (10-15 years and <10 years) and later weaning (<210 days).

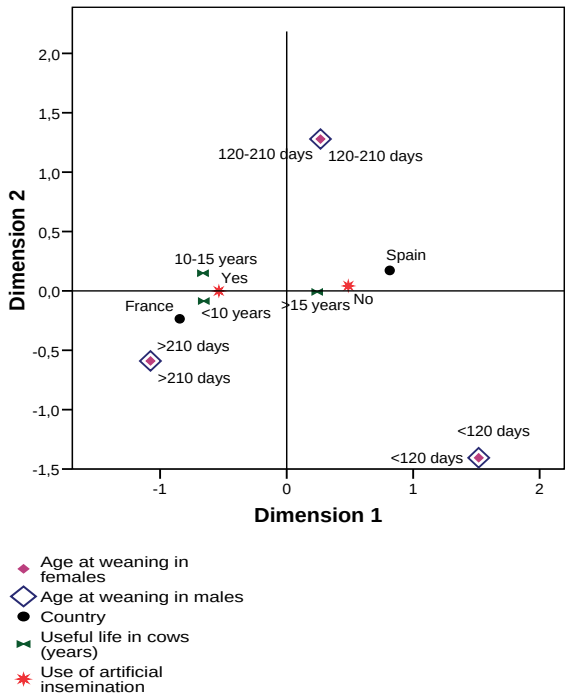

Figure 2 Multiple Correspondence Analysis between productive and reproductive variables

Fattening and commercialisation

As the typical production systems of this breed are either extensive or semi-extensive, there was important percentage of breeders who did their own fattening (46% in Spain and 64% in France). The remaining breeders sell their animals after weaning to livestock traders or fattening units (private or industrial). No statistical differences were found between the numbers of breeders engaged in fattening in each country, although the statistical analysis did reveal differences regarding the type of animal produced (Table 3).

Table 3 Percentage of farms that do their own fattening, and kind of products obtained (Data were calculated based on the total responses obtained)

	Spain	France	P-value
Farms that do their own fattening			
Yes	46.42%	64.00%	0.200^{ns}
Fatten up			
Milk calf (Yes)	15.40%	25.00%	0.525^{ns}
Calf (Yes)	53.30%	43.80%	0.594^{ns}
Yearling (Yes)	68.80%	6.30%	0.000***
Young bull (Yes)	0.00%	12.50%	0.186^{ns}
Ox (Yes)	0.00%	37.50%	0.013^{nv}
Cow (Yes)	28.60%	81.30%	0.004**

Test: chi-square; NS: non significant; NV: no valid; **= P<0.01; ***=P<0.001.
Milk calf: until 8 months, both sex, entire; Young bull: from 24-48 months, both sex entire; Ox: male castrated >48 months.

While in Spain the main products were yearlings and calves on 68.8% and 53.3% of the farms, respectively. In France, the most typical products were cows (81.3%), calves (43.8%) and oxen (37.5% of farms). The types total is more than a hundred (%) because more than one type of animal could be fattened on one farm (Table 3). As for feeding systems, the typical Spanish Gasconne farm is primed with concentrate and cereal straw *ad libitum*. In contrast, in France farmers tend to use more silage, hay, corn and grains for feeding animals. Moreover, in Spain the number of animals slaughtered below 8 months of age is lower than in the other EU countries, because the demand for white meat (veal) is very low in this country. However, in France the ranking of commercial type slaughtered animals were: cows, young calves, heifers and steers (Lacour *et al.* 2008). With all the aforementioned data it may be concluded that the products most consumed in Spain are calves and yearlings while in France old animals and calves.

Finally, the main products of each country are related to the demand and sales of each domestic meat market. Differences were also found with respect to the number and weaning management of calves. Again, this is a factor associated with the production system. Therefore, in Spain (extensive production system) the weaning of calves was earlier than 210 days due to the majority of the farms do not fatten their animals, which are sold on to livestock traders, thus making the system more profitable. In France, the semi-extensive production system and the abundance of green pastures let the calves feed for a longer time without cost, allowing a later weaning, after 210 days.

After that, the calves have three possible destinations: firstly, being kept on the farm (for fattening or replacement); secondly, the sale to cooperatives, where animals will be fattened; and finally, the sale to slaughterhouses.

Regarding fattening, it is important to take into account that the systems were different in each country. Thus, while in Spain mainly concentrate and straw are used, in France silage, hay and grains are more important (Piedrafita *et al.* 2003). The use of natural resources in France make fattening a low cost process without the aid of intensive resources (D´Hourd *et al.* 1998). As shown in Table 4, fattening and commercialisation were closely related.

Table 4 Type of products obtained (percentages with respect to the total of Gasconne farms)

Pastero	Spain	France	P-value
	6.30%	68.00%	0.000***
Calf	28.10%	44.00%	0.213ns
Yearling	34.40%	0.00%	0.001***
Young bull	0.00%	32.0 %	0.001***
Steer	0.00%	4.00%	0.254nv
Ox	0.00%	12.00%	0.044nv
Cow	6.30%	80.00%	0.000***
Bull	0.00%	24.00%	0.003nv

Test: chi-square; NS: non significant; NV: not valid; *** = P<0.001.
Pastero: until 8 months, both sex, entire, feed in extensive system until weaned. Young bull: from 24-48 months, both sexes, entire; Steer: male castrated <48 months; Ox: male castrated >48 months.

Therefore, the same type of animals that are most often fattened in a country are also sold at higher rate in the same country. In Spain, yearlings (34.4% of farms sell this product) and calves (28.1%) are the most common products whereas in France the main products are cows, with 80% of farms selling these animals, with variable destinations:some are sold to livestock traders to be fattened up on another farm while others are sold directly to slaughterhouses or consumers, and pasteros, which were sold to fattening cooperatives in 68% of farms, in high numbers. Figure 3 shows the distribution of sales per type of products and marketing channels used in each country. Table 5 shows the main differences in the marketing channels used by breeders in trading live animals between countries: while in Spain these animals are generally sold to other farmers, slaughterhouses or livestock traders, in France the sale is more related to cooperatives.

The second most common in France was the sale of meat or animals directly to butchers (Figure 3). With regard to direct sale to consumers or consumption of their own meat, these practices are more established in France than in Spain, but the differences, in the percentages, are not significant.

The development of typical products and quality brands facilitates access to markets for farmers (Sepúlveda *et al.* 2010) and increases the profitability of systems. Gasconne breed in 1997 was the first rustic breed to be granted a Label Rouge (official French certification of quality). The animals accepted in Label Rouge are: calves and heifers aged between 24-48 months, cows less than 9 years and steers more than 36 months old.

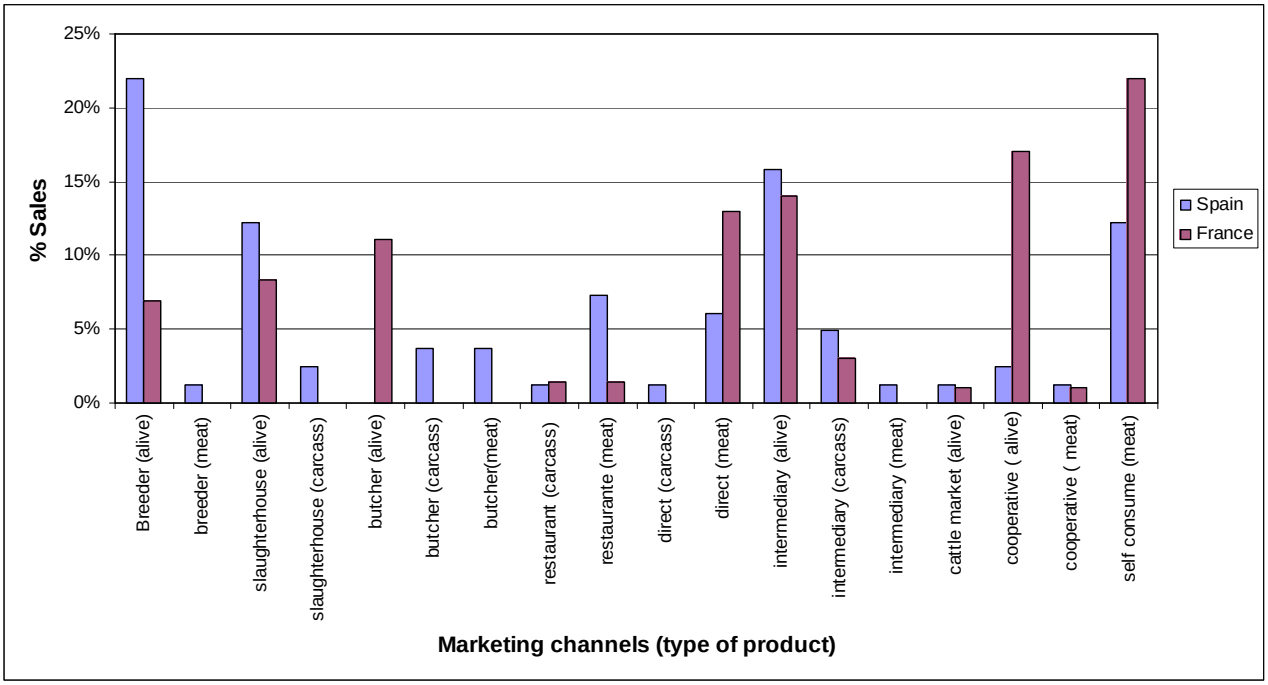

Figure 3 Sales distribution, type of products and marketing channels in Spain and France
Percentages were calculated based on the total responses accumulated (Spain n=82, France n=72)

Table 5 Relationships and differences in the marketing channels and product sales between countries

Type of commercialisation (Marketing channels-product sales)	P-value
Breeders (live)	0.009***
Slaughterhouse (live)	0.043*
Direct sales to consumers (meat)	0.167ns
Intermediary (live)	0.010**
Cooperatives (live)	0.002**
Own consumption (meat)	0.097ns

Test: chi-square; NS: non significant; *= P<0.05; **= P<0.01; ***= P<0.001.

Actually, there are several commercial brands in France (Dervillé *et al.* 2009). Thus, the Gasconne meat in France is very valued. Nowadays, there is a new cross border Indicación Geográfica Protegida (IGP) between France and Spain for Gasconne breed. The systems and farms must now be adapted to: the market, agro-climatic potential of the environment, demography and social context and to the perspectives and projects of each breeder according to their age and future perspectives and continuity of the farm in the short or long term (Liénard *et al.* 2002a).

CONCLUSION

This study provides evidence of differences in the management of the same model breed (Gasconne) when this takes place in different countries, even in bordering regions. The main differences found (reproductive and productive aspects) are linked to the environment, natural resources and national meat markets. Although politic decisions have an important influence in the development of a breed, the adaptation ability is the key to its development in different countries or regions with suitable performances. In both countries of this study (Spain and France), the Gasconne breed presents an adequate performances due to its capacity for adaptation to different scenarios. Despite this study presents results regarding a local breed situation of Gasconne in south Europe, further works may be carried out to compare systems of different breeds all over the world. It would be also interesting to study: 1) this breed in other countries, in order to investigate possible differences in managements and commercialization systems in non bordering countries and 2) other breeds in the same country, in order to analyse if the differences found are repeatable or are more or less country or breed depend.

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