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Ugarte E., Beltrán de Heredia I., Ruiz R.

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# The research and development programmes in dairy sheep in the Basque Country

E. Ugarte, I. Beltrán de Heredia and R. Ruiz

NEIKER-Tecnalia, Campus Agroalimentario de Arkaute, Apdo 46, 10080 Vitoria-Gasteiz (Spain)

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**Abstract.** The paper gives an overview of the different research and development programs (milk recording, breeding scheme, production systems, food quality, animal health, etc.) implemented for the Latxa sheep breed in the Spanish Basque Country. As a result, the system has achieved high levels of professionalization, which can be reflected in the outstanding quality of food products. However, there are still crucial challenges to be faced for the sustainability of the system.

**Keywords.** Latxa – Dairy sheep – Research and development.

## *Les programmes de recherche et développement en brebis laitières dans le Pays Basque*

**Résumé.** Ce document décrit une révision des différents programmes de recherche et développement (contrôle laitier, amélioration génétique, les systèmes de production, la qualité des produits, la santé animale, etc.) abouties pour la brebis laitière de la race Latxa dans le Pays Basque espagnol. Le résultat final est que le système est arrivé à un important niveau de professionnalisation, qui se traduit sur la qualité des produits obtenus. Mais en ce moment, il y a quelques problèmes assez importants qu'il faut faire face pour assurer la durabilité du système.

**Mots-clés.** Latxa – Brebis laitiers – Recherche et développement.

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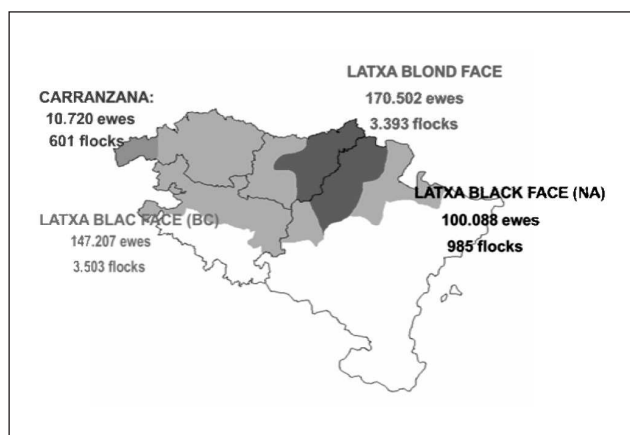
## I – Description

The local dairy sheep breed is called Latxa in the Spanish Basque Country (SBC) and Navarra (NA), and *Manech* in the French Basque Country. Although they are basically the same breed, due to administrative, orographic and political reasons the evolution and development of the R+D programmes has been different in each side of the border. In this work we will focus on the case of the Latxa breed in the Spanish side.

There are three main different ecotypes of Latxa breed: Blond-faced Latxa, Black faced Latxa of the SPB and Black-faced Latxa of NA. The differences are due to the skin colour and the presence or absence of horns. There is also another population of Blond-faced Carranzana featured by a bigger size and more convex face profile. The Fig. 1 shows the population census and geographical distribution of these breeds.

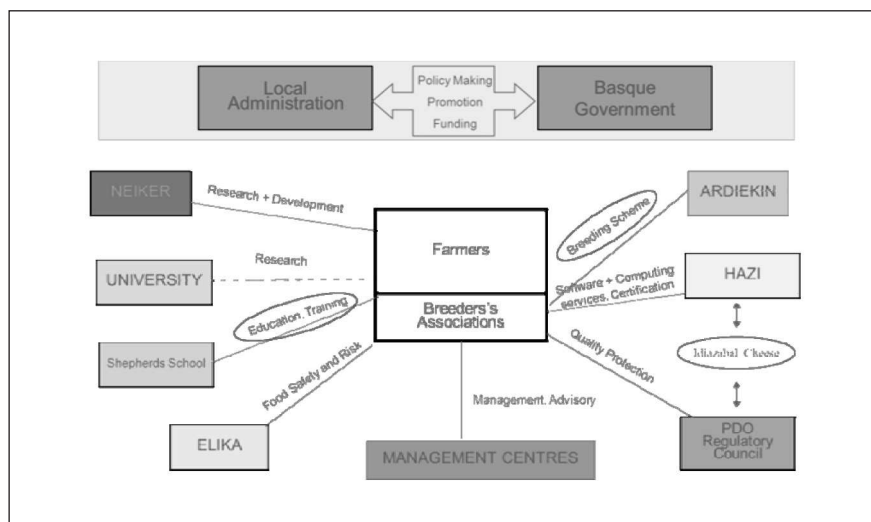
The live weight of the Latxa sheep ranges between 50 and 65 kg in females and between 75 and 90 kg for males. The ewes show a distinctive coarse long wool fleece, and are recognised as being rustic, resistant and well adapted to the local orographic and climatological conditions. This is evident in the marked seasonal reproductive behaviour and the capability to graze and feed from grass and shrubby resources within humid and cold conditions in the sloping grasslands of mountain pastures.

Although until 1980 (Urarte, 1988) it was considered to be a multipurpose breed, nowadays it is widely recognized as a dairy breed. However, comparing with other dairy sheep breeds (like Manchega in Spain or Lacaune in France) average milk production is still lower, around 1.3 l/day



**Fig. 1. Population census and geographical distribution of the Laxa and Carranzana breeds in Spain.**

(ICAR, 2012). Milk is basically used for Idiazabal cheese-making, a traditional product which origin, production process and outstanding quality features are protected and certified by the Protected Designation of Origin (PDO) of Idiazabal. This label and the high degree of structuration of the sector existing in the Basque Country (Fig. 2) have significantly helped to maintain the breed and the production system. The structuration has also canalized the professionalization of producers, technology transfer and R+D programs. This paper gives an overview of the most relevant features of these programs.



**Fig. 2. Organizations involved in the R + D programmes of the dairy sheep sector in the Spanish Basque Country.**

## II – Research and development programmes

### 1. Farmers' associations

The first activity proposed by the Basque Government to advance in the professionalisation of the livestock sector was the creation of breeders' associations in the early 80's. These associations were created to conserve and promote the breed and to allow the implementation of animal health and milk recording programs.

Three farmers' associations were also created by the Latxa sheep breeders, one for each province of the Spanish Basque Country (ACOLin Bizkaia, AGORALA in Araba, and ELEin Gipuzkoa). Together they sorted CONFELAC, the Basque federation of Latxa sheep breeders associations. The association of breeders of NA (ASLANA) joined CONFELAC in 1991.

Around these associations different research and development programs have been developed and they have been essential in the adaptation of technologies and in the application of research results. Most of the research programs regarding animal health, animal production and environmental impacts have been carried out by NEIKER-Tecnalia (the Basque Institute for Agricultural Research and Development), whereas food quality related issues have been the scope of the University of the Basque Country UPV-EHU and AZTI-Tecnalia.

There are also the management centres that work very closely related with the farmers' associations. These centres provide different technical and advisory services to the livestock farmers' associations (sheep, cattle, poultry, pigs, rabbits, etc.), such as: animal nutrition, milk recording, data computerization, herd book management, artificial insemination, installations and facilities, etc. Since the human and technical resources are shared by all the associations, costs are cheaper and the programmes are more affordable than if each association would have their own resources.

### 2. Milk recording

The milk recording program in dairy sheep was started in 1982. The Fig. 3 shows the evolution of the number of flocks and sheep under control.

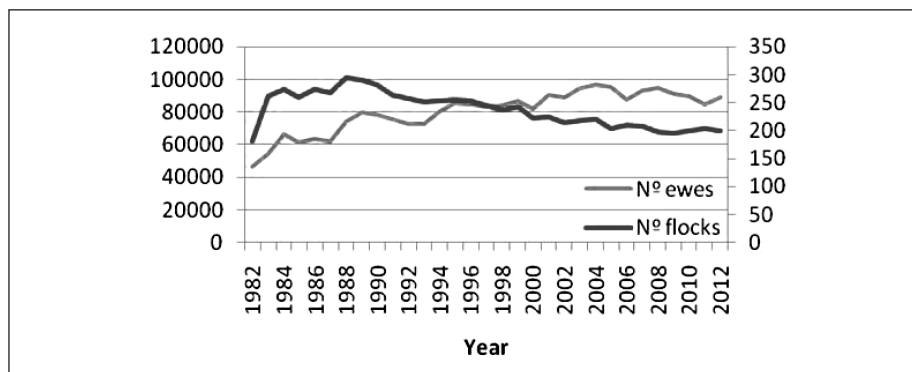


Fig. 3. Evolution of no. ewes and flocks in the milk recording program of the Latxa breed.

The basis of the milk recording program is the individual identification of ewes. At the beginning, the identification was done through double ear tags that ensured the identification of individuals in the event that one of the tags was lost. Such identification was performed with metal tag in one

ear and a plastic tag. After some research projects, from 2006 the animals started to be identified with ruminal electronic devices, although the plastic ear tag is still maintained. The electronic devices ensure the identification of individuals during the milk recording by using an electronic reader. The milk yield is measured with volumetric jars and it is also recorded through the same electronic devices that automatically download the information into a database.

The electronic identification also facilitates data collection for quality and udder morphology traits, since the devices automatically identify the animals that must be controlled for these traits.

In the beginning, the control methodology implemented was the A4 (every month milk production was assessed in both milking: morning and evening). After some research (Gabiña *et al.*, 1986) the method was changed two years later to the AT methodology (alternate recording: one month in the morning and the next month in the evening). Nowadays, the AC methodology is implemented within a limited number of flocks (ICAR, 2012).

### 3. Breeding scheme

The genetic improvement program was initiated in 1984 with the selection of the first males upon the data of their daughters' milk yield. The breeding scheme is based on the pure breed and initially the objective was to increase milk yield per ewe.

The genetic evaluation is performed using the BLUP methodology applying an animal model. There have been numerous studies about the optimization of evaluation models and about the incorporation of new traits (milk quality and udder traits), (Legarra and Ugarte, 2001; 2004). In this sense, genetic groups were introduced in the evaluation model (Legarra and Ugarte, 2005), the genetic evaluation model was modified for milk yield and new models were defined to include new traits (Legarra, 2002) and genetic relationships between traits and economic weights were estimated (Legarra *et al.*, 2007a, 2007b).

The results of the program are clearly satisfactory and the annual genetic improvement is around 3-3.5 l / year depending on the ecotypes and varieties (Fig. 4). Nowadays we are working on the possibility to implement genomic selection and convergence with the breeding program of the Manech breed.

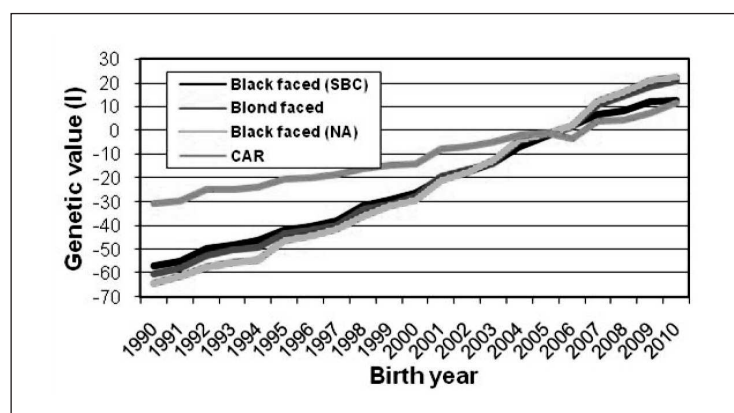


Fig. 4. Genetic trends in the Latxa breed.

## 4. Artificial insemination and reproduction

ARDIEKIN is the selection and artificial insemination centre for the Latxa and Carranzana breeds. The number of inseminations applied per year showed an increasing trend during the first years, but afterwards they have remained stable (around 25,000 inseminations per year, Fig. 5).

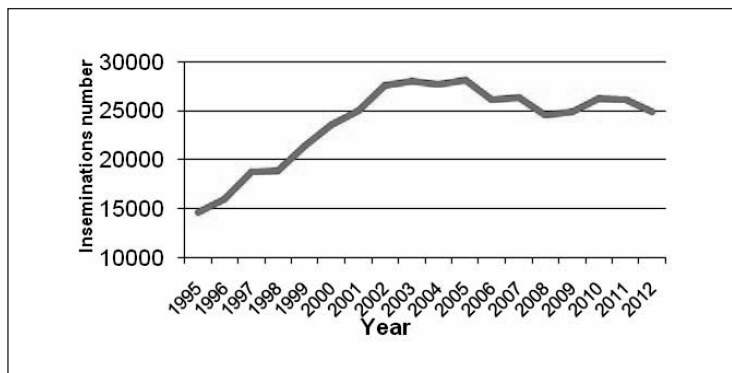


Fig. 5. Evolution of artificial inseminations number in Latxa breed.

Intracervical artificial insemination is performed with raw fresh semen. The studies for the use of frozen semen (Beltrán de Heredia *et al.*, 1989) applied by intrauterine insemination in the Latxa breed, showed a number of technical inconveniences and a lack of improvement of the efficiency and profitability. Similar results and conclusions were achieved when assessing the interest of implementing superovulation and embryo transfer techniques.

There was also a research project that allowed building facilities for the control of photoperiod and temperature. Therefore, nowadays it is possible to achieve higher number of doses per semen collection (it passed from 7 to 9 doses) and better quality of the semen obtained (in terms of mass and individual motility) (Beltrán de Heredia *et al.*, 1998). These results are particularly important since the season of artificial insemination (May to September) does not correspond exactly with the natural period of sexual activity of the Latxa males (August to December). The application of melatonin implants in males was also discarded since the improving results were not maintained throughout all the insemination period. In young males, very good results combining melatonin implants with light treatment were also obtained, but due to economical and management reason they are not being applied (Beltrán de Heredia and Gabiña, 2004).

Many studies have been also carried out in an attempt to enhance the fertility of the females: assessment of the cyclicity of sheep (Beltrán de Heredia *et al.*, 2001), factors affecting natural fertility and fertility in artificial inseminations. In order to help farmers to decide on whether to inseminate a particular sheep or not, and therefore to improve the efficiency of AI, shepherds are provided with a detailed list containing all the necessary information for each ewe: age, reproductive history, date of last lambing and milk yield. Shepherds are encouraged to assess also the body condition score of sheep previous to insemination.

## 5. Food, nutrition and production systems

One of the most important values that the Latxa breed provides is the link with the land through a pastured-based production system based on the use of natural resources. For that reason different research projects have been carried out to study the use of grass as an important element

of the diet (grazing times and patterns) (García-Rodríguez *et al.*, 2012). These studies have showed that it is possible to obtain similar milk yield and higher milk and cheese quality, on the basis of a cheaper feeding strategy (De Renobales *et al.*, 2012). In the same sense some studies show that there might be very interesting local alternatives to soya as a source of protein. For example, with the utilisation of cold-pressed cakes obtained from certain crops such as rapeseed or sunflower, similar milk yields and healthier characteristics can be achieved (Mandaluniz *et al.*, 2012). These studies were completed with the nutritional characterization of these diets and the in-vitro assessment of digestibility (Goiri *et al.*, 2010) and the behaviour of the diets in a RUSITEC equipment (García-Rodríguez *et al.*, 2010).

Nowadays, the interest is placed in the holistic assessment of the sustainability of different farming systems (Ripoll-Bosch *et al.*, 2012), as well as the evaluation of the potential environmental impact of the GHG emissions and the ecosystem services provided by different Latxa sheep production systems.

Finally, the development of software based on simulation and optimisation techniques to provide decision support systems to farmers is another area of research within the existing projects (Villalba *et al.*, 2012).

## 6. Added value and quality products

The Idiazabal Protected Designation of Origin (PDO) was created in 1987. This distinction attempts to protect outstanding quality features of a traditional product, the local breeds, the production systems and the areas of origin (SBC and NA). During the last years, Idiazabal cheese has been awarded with numerous mentions of quality, which shows the great job carried out by the shepherds who transform their own sheep's milk into cheese, especially related to their formation and professionalization. It has to be pointed out that more than 50% of the total Idiazabal cheese is produced on the farms with their own milk.

One of the most innovative aspects of Idiazabal cheese is the use of casein plates with counter labels that ensure the total traceability of the product. Obviously, it is controlled by the corresponding certification entity, HAZI in this case.

The Idiazabal PDO Council, together with the University of the Basque Country (UPV) has formed a professional panel of tasters who provide services for R+D programmes. For instance, they have been involved in some projects related with the use of indigenous natural starters. Nowadays, the PDO is trying to develop techniques to differentiate in the cheese whether the milk was produced by Latxa sheep or from other breeds, in an attempt to avoid potential frauds and to enhance the guarantees for the consumers.

In addition to the PDO label for the Idiazabal cheese, the "Euskal Esne Bildotsa" label was created to identify and guarantee the suckling young lambs produced, exclusively from the Latxa and Carranzana breeds.

## 7. Education and training: the Shepherds' School

There are some professional schools completely linked to the primary sector. In fact, they depend of the Department of Agriculture of the Basque Government, but not from the Department of Education. In these schools a wide diversity of courses are offered in relation to the different aspects of livestock farming: animal nutrition, reproduction, management, food traceability, legislation, health, genetics, etc. This formation has helped to the professionalization of the sector. Into this framework is particularly noteworthy the Shepherds School.

The Shepherd's School has played a particularly noteworthy role since its creation in 1997, since it has hosted more than 170 students, of which 81 have later set as sheepherders in their own

farms. In their courses, students do not only receive theoretical classes directed to the Latxa production system (pasture management, nutrition, genetics, milking, milk processing, quality standards, etc.), but they also have the chance to practice and work at voluntary shepherds flocks.

## 8. Health

Nowadays, the Basque Country is officially free of *Brucella melitensis* and it is on the way to be also declared free of *Brucella ovis*. This is the result of a long-term established compulsory sanitary program implemented every year for every single ewe existing in any farm of the Basque Country.

Many research projects have been carried out related with different illnesses: Q fever, Border disease, bluetongue, scrapie, visna-maedi, paratuberculosis, etc. (García-Perez *et al.*, 2009a, 2009b; Ruiz-Fons *et al.*, 2010; Juste and Perez, 2011). These studies are focused to more efficient early detection methods, programs for control and eradication, epidemiology, vectors, etc. (Juste *et al.*, 1985, 1986; 1987; 1993; Oporto *et al.*, 2006).

## 9. Challenges for the future

There are some common problems that affect to the livestock sector in the SBC:

- The low price of products paid to farmers.
- Access to land, since there is a high competence for other uses (industrial areas, infrastructures, etc.).
- The relatively high dependence on purchased inputs from outside the farms.
- There are some issues related to climate change and the adaptation of the production system and animals to the new conditions. There is a growing concern about emerging diseases affecting animal health.
- The impact of predators (wolves, basically) and the difficulty for coexistence of extensive sheep farming systems with wildlife is also a hot topic.

## III – Final remarks

The work carried out within the framework of the Latxa breed can be considered as an example of success of the collaboration between farmers, local administration and research and technical agencies. However, this fact does not totally prevent from the same problems that are affecting the primary production in most of the developed countries: price competitiveness.

It is necessary to propose new strategies to enhance the sustainability of the primary sector and to enable a better future for the farmers. These strategies will probably involve opening a wider range of production systems and products that help to valorise and differentiate products. In this sense the joint collaboration of the administration, the research and development agencies and the civil society is essential to assess the economic, social and environmental benefits associated to the values of the Latxa breed and the Idiazabal PDO cheese.

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