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THE BREEDING PROGRAM OF LATXA BREED**

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**Plenary invited paper. CONFELAC (Latxa breeders association's confederation) has supplied data of Latxa sheep breed

Abstract:The present paper describes the breeding program of Latxa breed in Spain. Latxa's breeding program has been on-going since 1984 and it is focused on increasing milk yield. As a consequence of its implementation, an annual genetic improvement of 3% in milk yield has obtained. Currently, new traits are being considered in the selection breeding goal.

Key words: Latxa breed, dairy sheep, breeding program

Introduction

The Latxa breed (called Manech in France) is a dairy sheep breed, native from and located in the Basque Country. Two ecotypes can be distinguished: Blond-faced and Black-faced, that are specially differentiated by their skin colour. Nowadays, there are approximately 800,000 ewes between France and Spain (350,000 in the French Basque Country). There are about 190,000 Black-faced ewes distributed across approximately 4,000 flocks, and 220,000 ewes of Blond-faced strain distributed across other 4,000 flocks. Two different strains into Black faced can be differentiated on the basis of morphological differences: Black faced of Spanish Basque Country (SBC), with around 126,000 ewes in 3,700 flocks, and Black faced of Navarre (NA) with 63,000 ewes in 425 flocks. While each Black-faced strain has its own breeding program, Blond faced ecotype has only one program.

Nowadays, milk yield is the most important aspect in the economical output of Latxa breed (*Gabiña et al.,* 1999). 95% of milk produced is transformed into cheese. The 60% of this cheese is protected by the *Idiazabal cheese* Mark of Origin which establishes some constraints, like the breed and the geographic area of production. There is also a label mark that protects milking lamb but, in this case, only the 5% of the lambs are marked under the label.

In this work we describe the general aspects of the production system of Latxa breed in Spain and the details of its selection scheme: degree of implementation, objectives, progress and new objectives.

Production system

The production system of the Latxa breed is based on the seasonal use of mountain pastures *(Ruiz et al.,* 1997). This management adds ecological and social values to the economic values of this production system. Unfortunately, these values are very difficult to measure. The shepherd is usually the owner of flock, the manpower is familiar and it is not common to contract personal.

The flocks have an average of 10 Ha. of land. During the winter, the shepherds rent more land, and in summer, a high percentage of flocks uses the communal land. Feeding has generally two times: In summer and autumn, the animals graze in high pasturing of communal mountains (800-1000 m); meanwhile in winter and spring (period of lambing and lactation), the feeding is based on land and on a minor proportion of grass silo. These products are complemented by others that are brought from outside of the farm: alfalfa silo, beet pulp, soybean and concentrated feeds.

Weaning occurs around 29 days (*Arranz et al.,* 1995). After that, lambs are slaughtered, when they have a live weight of 10-12 kg. After weaning period, their dams are milked, because the mixed system of milking and suckling is not common in this production system. In relation with rearing lambs, they are weaned between 30 and 45 days of live with 16-19 kg. of live weight.The length of milking period is between the range of 130 and 140 days.

Reproduction system

The reproduction system is traditional. Approximately 43% of the shepherds do not breed the ewe lambs (*Urarte,* 1989) and as consequence the average age at first lambing is around 20 months.

As in other sheep breeds located in temperate latitudes, the ovulation seasonally occurs when the day length decreases. However, due to economical and environmental constraints, the production system tends to organise the reproduction out of the natural breeding season by using hormonal treatments.

Table 1 shows the reproductive results of last year (August 2005-September 2006).

Table 1. Average reproductive results of Latxa breed

	BLACK-FACED SPC*	BLOND-FACED	BLACK-FACED NA*
Fertility (%) of young ewes	35.5	53.4	51.8
Fertility (%) of ewes older than 2 years	79.2	84.6	80.7
Average lambing date	29-jan	5-jan	21-jan
Prolificacy	1.27	1.23	1.26
Mortality of lambs (%)	3.01	4.17	5.41
Numerical productivity	0.88	0.93	0.90

*SBC: Spanish Basque Country ; NA: Navarre

The low average fertility of the young ewes is a consequence of the extensive farming system, as it was indicated before. The fertility increases with the age, reaching its maximum value when the ewes are 4-5 years old.

Birth weight is 5.1 kg. for single lambing and 4.2 kg. for twin lambing, and higher for the males than for the females (*Arranz et al.,* 1991*, Oregui,* 1992). Lamb growth rate is 250 gr per day.

Milk recording program

The milk recording program started in 1982. Since 1985, the controls are made by AT method (alternating monthly the morning and afternoon controls) (*Gabiña et al.,* 1985, 1986). The lactations standardized to 120 days are calculated using the Fleischmann method. The number of ewes in milk recording represents a 26% of total ewes, being a 25 % in Black-faced SBC, a 11% in Black-faced NA and 15% in Blond-faced.

In 1999, some flocks started to be controlled by applying AC methodology (monthly is controlled morning milking and the total day tank milk of milked ewes) in order to set up a qualitative recording program.

The number of ewes in milk recording, number of ewes lambing, number of estimated lactations and number of flocks in 2006 can be seen in Table 2.

Table 2. Details for milk recording program of Latxa breed.

	BLACK-FACED SPC*	BLOND-FACED	BLACK-FACED NA*
Number of ewes	37,889	26,843	13,853
Ewes lambing	27,138	21,159	10,475
Estimated lactations	18,969	15,765	7,311
Number of flocks	106	61	34

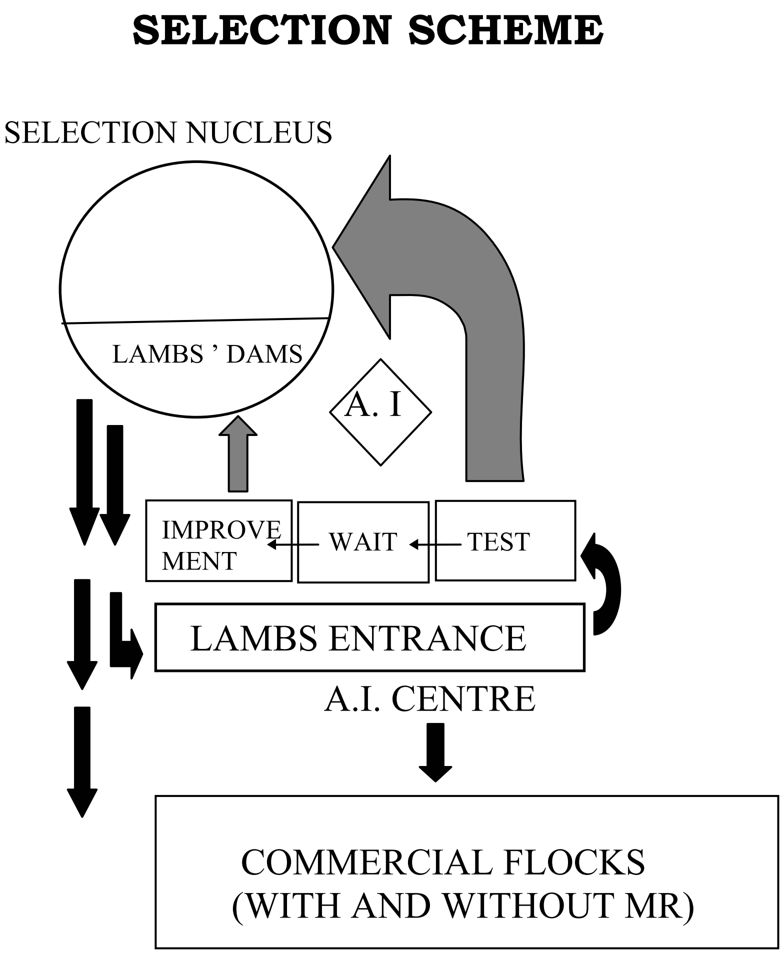
*SBC: Spanish Basque Country ; NA: Navarre

Breeding program

The breeding program, which is based on pure breed, started in 1985. The best 35 rams according to their pedigree index were selected to be progeny tested by Artificial Insemination (AI) (Hanocq et al., 1993).The selection criterion was based on 120 days milk yield and the breeding goal is to increase milk yield per ewe.

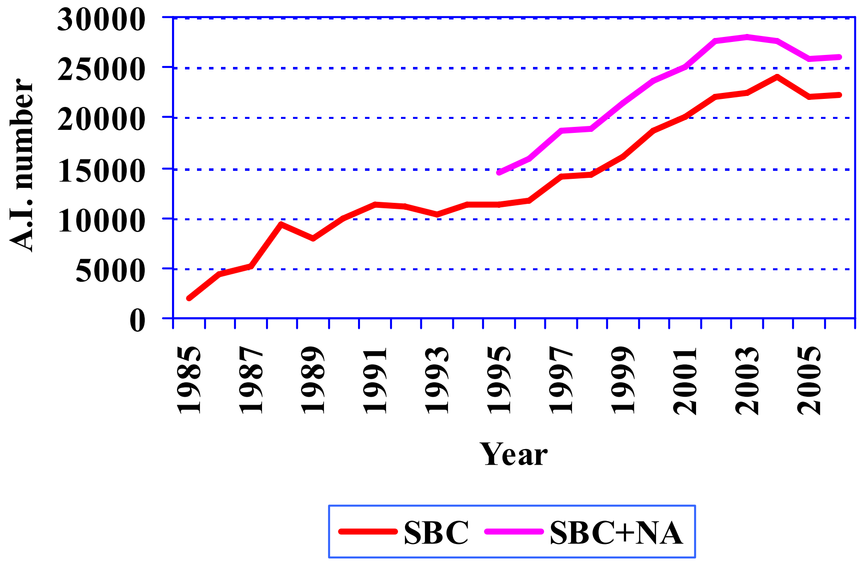
Next figure represents the genetic breeding program.

Figure 1 Selection scheme of Latxa breed



The use of AI is very important in order to test young males and to spread the genetic improvement. The lambs enter to the AI centre approximately when they are 3 mo old , and they are tested during the next year. There are two AI centres: one for Black-faced SBC strain and Blond-faced ecotype, and other for Black-faced NA strain. Figure 2 shows the number of AI made since 1984.

FigurE 2 A.I. activity



Approximately, a 55 % of AI are carried out with semen from proven rams and the 45 % with semen from testing rams.

The main points of the breeding program are the selection of males to be incorporated to the AI stud; the rearing of females and, as it has been mentioned before, the use of AI to spread the ameliorating genes and to obtain proved animals. Only the rams used in AI are recognized as sires.

The genetic evaluation is carried out using the BLUP methodology of mixed models with an animal model with repeatability. The software BLUPF90 is used (Mistzal and col., 2002) and the following model is applied (Legarra, 2002):

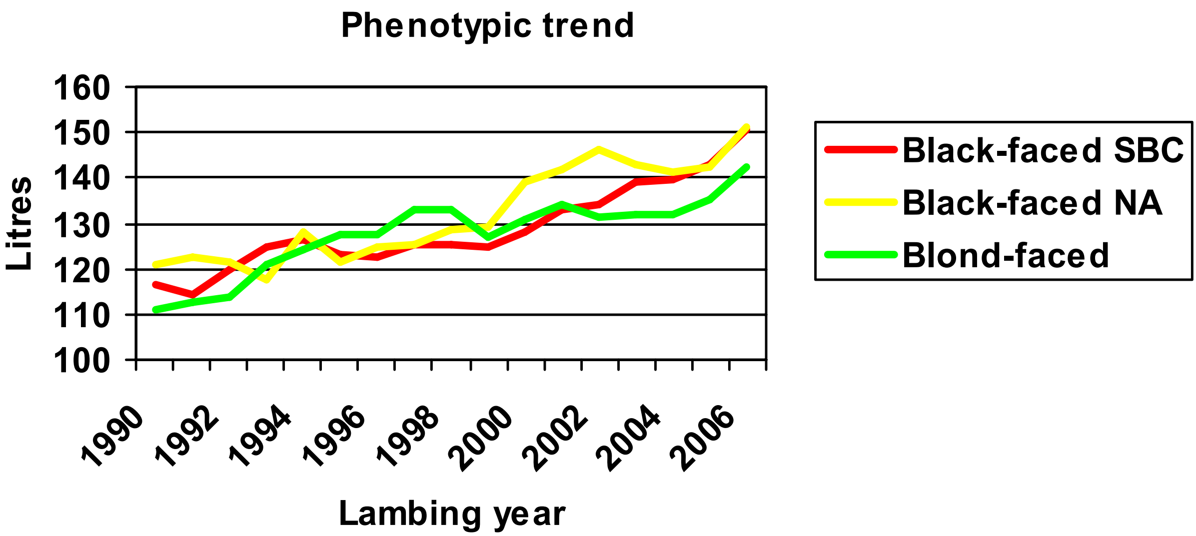
$$\mathbf{Y_{ijklmn} = FY_i + NA_j + NL_k + IL1C_l + A_m + P_n + \varepsilon}$$

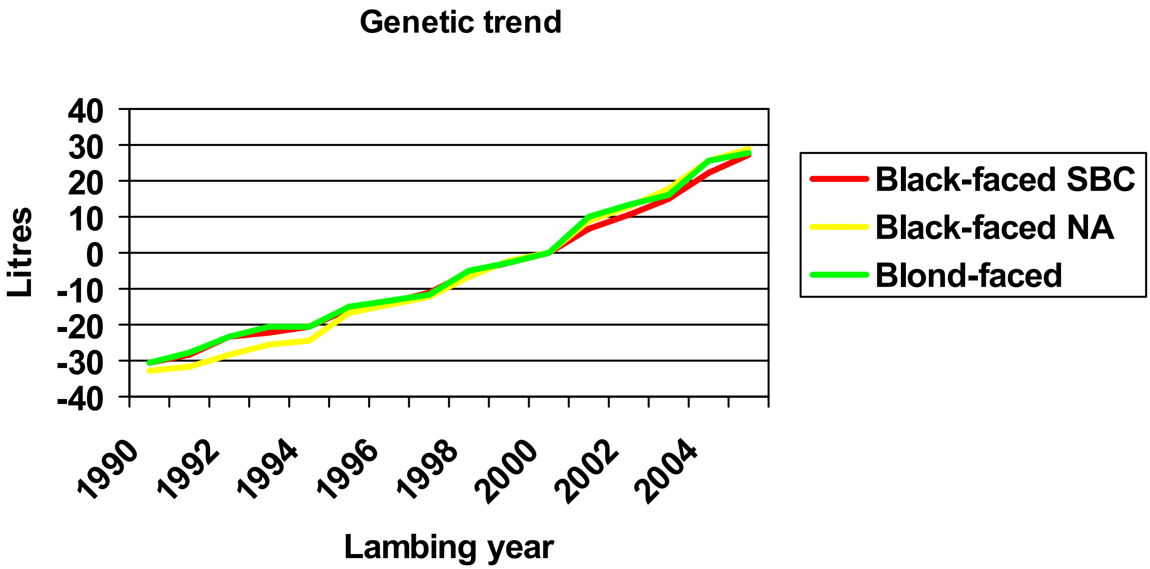
Where :

Y_{ijklmn} represents the 120 days standardised milk yield,
HY the combination of flock-year (fixed)
NA the combination no. of lambing-age (fixed)
NL n of alive lambs at lambing (fixed)
IP1C interval between lambing and first control (fixed)
A genetic additive effect (random)
P permanent effect (random)
ε residual term for each observation (random)

The estimated heritability is between 0.21 and 0.20 depending ecotypes (Legarra, 2002). Nowadays, the genetic program is well implemented with an annual gain around of 3%. Figure 3 shows the phenotypic and genetic evolution of the different ecotypes and strains.

Figura 3. Phenotypic and genetic trends of Latxa breed





However, it is known that the selection focused only on milk yield can produce changes in genetically correlated traits and it is interesting to consider other aspects as milk composition or functional traits. Moreover, the economical relevance of these traits has increased quickly in the last years. Thus, it was decided to study the introduction of milk composition, and udder morphology traits into the breeding goal with the main objective of increasing general profitability of the Latxa flocks, along with the maintenance of the traditional production system.

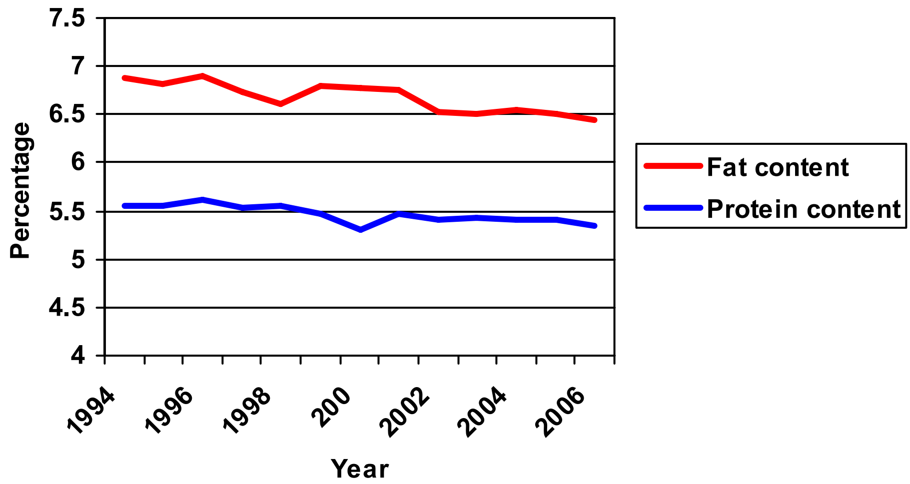
New traits into genetic breeding program

Milk composition: fat and protein content

Estimates of genetic correlations between milk yield with fat and protein contents have been reported as negatives (Barillet, 1997; Sanna et al., 1997). Thus, fat and protein contents will decrease affecting the capacity for cheese transformation, when selection is focused only on milk yield. Moreover, since the genetic covariances between milk yield and fat and protein contents have different values, fat: protein ratio in the raw milk will be affected. This ratio is strongly related with the fat:total dry matter ratio in the final cheese, which has to be higher than 45% to accomplish *Idiazabal cheese* regulation.

Therefore, cheese factories (which collect 50% of the total milk production) take into account the fat and protein contents in order to establish the price of the milk. As we have mentioned, the breeding program of Latxa breed has achieved a 3% annual genetic improvement of milk yield (with a genetic standard deviation of 0.18) during the last years. And, as consequence we hope a decrement of fat and protein contents. Figure 4 shows the decrease of fat and protein contents during this time.

Figure 4. Fat and protein contents of milk tank



A qualitative milk recording program was set up in 1999, with the objective of keep under control the composition of the milk.

The fat and protein yields are analysed using the same effects as those used for the analysis of milk yield and a slightly different model that takes into account the combination of controls inside each lactation where an individual milk sample been taken (Barillet, 1989) was used for fat and protein contents. Table 3 shows the results of those analyses.

Table 3. Heritabilities (diagonal) and genetic correlations (above diagonal) between milk yield and milk composition traits.

	Milk yield	Fat yield	Protein yield	Fat content	Protein content
Milk yield	**0.19**	0.85	0.93	-0.27	-0.35
Fat yield		**0.17**	0.89	0.25	-0.09
Protein yield			**0.18**	-0.057	0.01
Fat content				**0.17**	0.56
Protein content					**0.47**

Genetic estimates obtained for Latxa breed are lower than those reported in other breeds, with the exception of that for protein content. This can be due to the use of partial sampling and to the higher environmental variability associated to the production system.

Genetic correlations estimates are quite similar to those obtained in other breeds. They indicate that fat and protein contents might decrease in the long term. As a consequence, these traits must be taken into account in the selection criterion. The high genetic correlation between fat and protein contents gives the possibility of including only protein content into the selection criterion avoiding the problem linked with low estimated heritability of fat content..

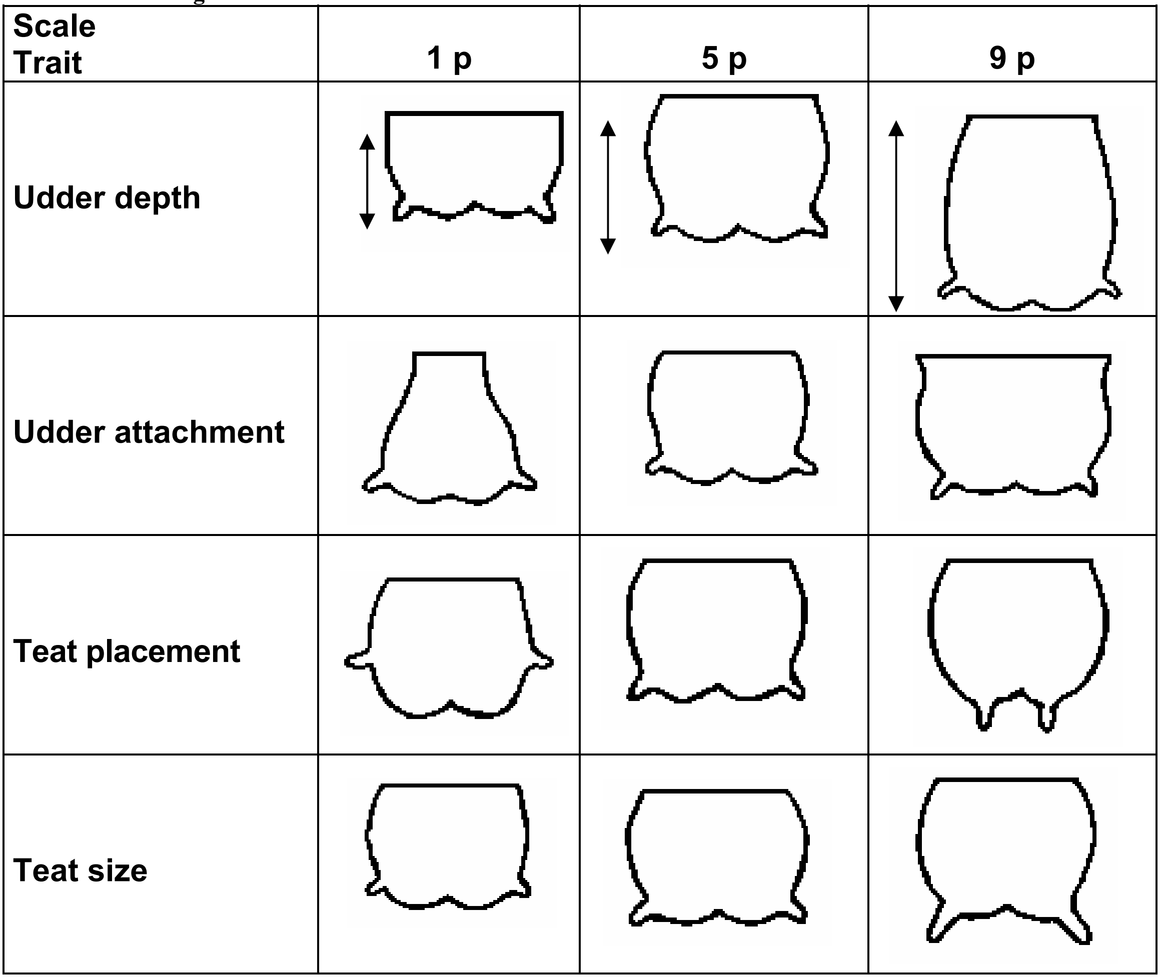
Udder morphology

There is a need of studying the relationships between milking machines, udder morphology and milking ease, as a consequence of the increasing implementation of milking machines. *Fernández* (1995), and more recently *Marie-Etancelin et al.* (2001) have described several of these aspects. *Marie et al.* (1998), showed that udder morphology traits are not very genetically related to milking traits (milking time, milking speed), and that they can be considered as different traits. However, udder morphology is interesting per se because it makes easy the milking labour of shepherds. This will help to improve their quality of life and, as a consequence it will help to the maintenance of the activity.

From an economical point of view, udder traits affect milk yield, milking ease, udder health and length of productive life. We must not forget that with the increasing use of machine parlours the udder morphology is becoming more and more important. The percentage of flocks using milking machine in the Latxa breed is increasing during the last years. Currently, 80% of flocks taking part in the breeding program use milking machines, so that the shepherds have a higher interest in udders well adapted to mechanical milking.

In the Latxa breed, the first works dealing with udder morphology started in 1988 (*Arranz, et al,* 1989). More recently, in 1997, the classification system defined by *De la Fuente et al.* (1996) was implemented in Latxa and other Spanish dairy sheep breeds. This system scores udder traits from 1 to 9 (see figure 5) and four traits are being measured: udder depth, udder attachment, teat placement and teat size. *De la Fuente et al.* (1998), *Legarra et al.* (1999), *Legarra et al.* (2001) and *Ugarte et al.* (2001) show some of the obtained results.

Figure 5. Linear score for udder traits



The recording of udder traits started in 2001 on 26 flocks, nowadays it is consolidated

The model used to analyse the udder traits considers the following fixed effects: the flock-year combination; the combination between age and parity; the stage of lactation and the effect of the milk yield corresponding to the day of udder scoring, that it was included as a covariable. Table 4 shows the obtained results.

Table 4. Heritabilities (diagonal) and genetic correlations (above diagonal) between milk yield and udder traits

	Milk yield	Udder depth	Udder attachment	Teat attachment	Teat size
Milk yield	**0.22**	0.57	0.07	-0.39	-0.11
Udder depth		**0.23**	-0.43	-0.33	0.01
Udder attachment			**0.20**	0.29	0.14
Teat attachment				**0.40**	0.38
Teat size					**0.36**

In general, heritabilities are within the same range that those obtained in other breeds, although some differences were found. These differences might be explained by the inclusion in the model of the milk yield effect, the subjectivity of the scoring system, the different scoring systems used in the breeds (*Marie-Etancelin et al.,* 2001) and, of course, the differences between udder morphology of the breeds. As for the genetic correlations between udder traits and milk yield, the highest value was found for the genetic correlation between milk yield and udder depth. This result has also found in other dairy sheep breeds.

Taking into account the present situation of udder traits in the Latxa breed and the correlated genetic response that we expect focusing the selection on increasing milk yield, at the present moment we have decided not to include these traits into the selection criterion. However, udder traits are recording in order to: control its evolution, use this information when future AI rams are selected (according to their pedigree index for milk yield) and, eventually, detect males transmitting bad udder morphology.

Discussion

Although the previous experiences of other breeds can be of high interest, our work clearly shows that it is necessary to study the situation of each breed. The production system, the methodology employed and the breed characteristics make great differences between breeds. The interest and convenience of the introduction of new traits into the breeding programs is also different between breeds and it is evident that each breeding program should take their proper decisions. The economical relevance of these traits in each breed determines both their inclusion and importance in the selection criterion.

Nowadays, genetic evaluations are made for production, composition and udder traits. Latxa breeding program is considering the inclusion of the composition milk traits in the selection criterion. However, the genetic evaluation for udder morphology will be taken into account for the selection of AI rams in order to control its evolution. We can't forgot that the inclusion of new traits in the breeding goal makes necessary to estimate the economic weights for those traits and this is our next work.

ODGAJIVAČKI PROGRAM RASE OVACA LATXA

E. Ugarte

Rezime

U ovom radu se opisuje odgajivački program rase Latxa u Španiji. Odgajivački program ove rase postoji od 1984. godine i u centru pažnje se nalazi povećanje prinosa mleka. Kao posledica njegove implementacije ostvareno je godišnje povećanje prinosa mleka od 3%. Trenutno se razmatraju nove osobine odnosno njihovo uključivanje u odgajivačke ciljeve selekcije.

Ključne reči: Latxa rasa, mlečne ovce, odgajivački program

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