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SUMMARY - The breeding programme for the Spanish Churra sheep breed is presented. It was designed in 1984 and started in 1986, coordinated by the National Association of Breeders of Selected Churra Sheep (ANCHE) with technical support from the Department of Animal Production of the University of Leon. Out of a census of over 1.7 million of animals, 26,000 ewes in 87 herds had their productions recorded in 1994. The programme progeny tests 50 rams per year. To achieve this, 11334 laparoscopic and 4660 cervical inseminations were performed in 1994. Rams on test are donors to 50% of the inseminations, the rest are done with semen from 10-15 rams with top Estimated breeding values (EBVs) in previous editions of the Sire Catalogue. The genetic evaluation is performed by means of an animal model accounting for repeated measurements and using BLUP methodology. Infrastructure available, scientific and technical support, costs and first results are described.

Key words: Churra sheep, milk ewes, breeding programme.

RESUME *- Le schéma de sélection pour la production laitière en la race ovine Churra a été conçu en 1984 et mis en oeuvre à 1986 par l'Association Nationale d'Eleveurs de la race Churra (ANCHE) avec la collaboration du Département de Production Animale de l'Université de Leon. Environ 1,7 x 10^6 de brebis Churra sont élevées dans la région de Castilla-León en Espagne. En 1994, 26 x 10^3 brebis appartenant à 87 troupeaux ont été contrôlés. Cependant, le noyau de sélection concerne 43 troupeaux. Ce programme réalise un testage sur descendance de 50 mâles/an. En 1994, 11334 inséminations intra-utérines et 3660 cervicales ont été réalisées, 50% de ces inséminations ont été effectuées avec de la semence de mâles en testage et 50% avec de la semence des 10-15 mâles de plus haute valeur génétique. L'évaluation génétique est réalisée par un BLUP modèle animale avec mesures répétées. Le support scientifique et technique, financier, les coûts et les premières résultats sont aussi présentés.*

Mots-clés : *Churra, lait, brebis, amélioration génétique.*

Breed characteristics

The Churra sheep is an autochthonous breed raised in Castile and León, in north-western Spain. It is a milk production breed of great hardiness, well suited to the continental climate of Castile and Leon, with long, severe winters, very short springs, and hot dry summers.

Body size varies with geographical location. Rams weigh 65 to 75 kg, and ewes 45 to 55 kg. In the most favourable locations, rams may reach 100 kg, and ewes 70 kg,

while in harsh, abrupt, most adverse ones rams weigh 40 to 50 kg and ewes 28 to 30 kg.

Population and distribution

A recent survey showed that the total number of Churra sheep was 1770530 (Ministry of Agriculture, Fisheries, and Food, 1993). This represents 10% of the total number of sheep in Spain. Despite the fact that Churra may be considered a dairy sheep, in most of the herds ewes are not milked. It has been estimated that only 520000 ewes are milked at present.

The Churra population may be subdivided into three strata: a) Selection Nucleus Herds regularly tested for milk yield: 43 as of January, 1995; b) Herds regularly tested for milk yield, but not in the Selection Nucleus: 44 as of January, 1995; c) remaining population, not being tested.

Production system

Herd size

The average number of sheep per herd is around 450 for associative and community herds, and 250 for the rest.

Housing

Most of the herds follow a mixed husbandry system consisting of a mixture of grazing and indoor-housing. Sheep are penned during the night, and graze during the day. Selected herds keep animals indoors in the coldest season and during lambing.

Feeding

The animals are fed almost entirely on agricultural by-products such as cereal and beetroot remains after harvest, etc. Supplementary feeding with feed, concentrates and roughages, is provided depending on the physiological status of the animals and the farmer's criteria.

Breeding

There are three lambing seasons: November, February and July. Lambs are weaned within 30 days. Female lambs born from the best ewes are kept for replacement. At present, ewe replacement rates are 15 to 20% of the total per year. Some of the herds keep these lambs with their mothers for a month and a half and then in a half-milk system for a further month, until weaning at the age of 2.5 to 3 months.

Milking

Machine milking is not widely spread but is slowly increasing as farmers join associations and cooperatives. As an example, 85% of the farms in the Selection Nucleus Herds machine-milk their ewes.

Average milk yield of ewes under official yield testing is around 112 l for a 120 d lactation, and 131 l for complete lactations that in turn average 145 days. Milk yield shows very high variability, both within and between herds. There is a documented individual production of 451 l in 120 d and 539 l in a whole lactation of 173 d.

Between-herd differences are mostly due to handling and feeding specific to each herd, and not to differences in genetic background. There seems to be a compromise between the availability of resources and the production attained by each herd. Farms of scant resources present sheep that rear a single lamb, sacrify their milk potential and adapt to the seasonal availability of pastoral resources. This explains why a high (2/3) proportion of ewes is not milked, and maximum yields are over 500 l per lactation.

Anche (National Association of Breeders of Selected Churra Sheep)

ANCHE is an association of owners of Churra sheep herds. It was created in 1971 and was commissioned to keep the breed book in 1975 by the Department of Agriculture. Introduction of animals in the breed books started on March 30th, 1977, and 18867 sheep were registered in that year.

ANCHE is responsible as well for the selection scheme of the Churra breed. Its staff consists of two technical officers (veterinarians), a secretary and two clerks. At present, there are 145 members with 71917 sheep registered.

Breeding programme

The breeding programme for Churra sheep was designed in 1984 and started in 1986. It is based upon progeny evaluation of sires. Its objectives are the genetic evaluation of 50 rams per year. The first genetic evaluation was performed in 1990 and the first Sire Catalogue was published in 1991.

Selection Objectives

The breeding objective for the Churra sheep breed is an increase in milk yield, measured in kg of milk produced over a lactation period of 120 d. In order to maintain the breed's hardiness, the breeding scheme must achieve this with no loss of present adaptability to harsh environments, as this differentiates it from other dairy sheep breeds. There are other non-autochthonous breeds being reared in Castile and

León such as Assaf, Milschaf, Lacaune, Awassi, etc., which may be better producers but are not well-suited to the climate and pastoral resources of the region. This fact is made clear when animals of both breeds are kept in the same herd. In order to attain the same production level, nutrient requirements may need to be satisfied in the pen at much higher rates for foraneous breeds than for Churra sheep, given conditions of drought.

We believe that the genetic potential for milk production of the Churra breed may be increased with no loss of its highly valued hardiness. There are several reasons for this:

- At present, great differences in milk yield can be detected between ewes within the same herd an under the same handling conditions, with no visible differences in adaptability and grazing ability.

- Rams are genetically evaluated in a broad range of management systems.

Organization of the milk recording programme

Milk recording is organized around 6 nuclei which correspond to provinces: Burgos, León, Palencia, Valladolid, Zamora and Segovia. The nuclei operate independently under the supervision of a stockman. Nuclei hire and pay for the testing teams and get a State subsidy on a per lactation basis (presently, 650 pts/lactation).

Only ewes producing over 90 l in 120 d (80 l for first lactations) are considered. The testing teams are paid per head, proportional to distance. Table 1 shows the figures for herds and sheep in the recording programme.

Table 1. Evolution of the milk recording program

Year	Herds	(recorded)	Ewes	(recorded)
1981	61	31	24144	1548
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1986	72	47	32301	8698
1987	80	50	30178	9196
1988	84	55	36782	10548
1989	93	62	40815	13814
1990	102	58	39317	13895
1991	115	72	45391	16635
1992	135	89	53278	23537
1993	134	86	65196	26099
1994	135	87	70017	25861

Selection regime

Selection of young rams to be taken to the AI stud

ANCHE technicians choose among the offspring of the best 2% of ewes, ranked by estimated breeding value, and take them to the AI stud when they are 8-9 months old.

Selection of males to join the Progeny Test Program

Rams that join the Progeny Test Program are acquired by ANCHE. Those that cannot have their semen collected (using an artificial vagina, by mounting of a dummy female), or repeatedly fail semen quality tests, or show any other defect so far undetected, are excluded at this stage.

Genetic evaluation of rams

Progeny tested rams are kept at the AI stud until their evaluation is ready. There is an evaluation of genetic merit for all of the animals in the milk recording programme every six months. The best 10-15 rams will be selected on the basis of results of the last evaluation, to be used as disseminators of genetic merit among the population; the rest of them will be slaughtered.

Organization of the progeny tests

The technical staff at ANCHE programme the progeny tests on demand from the owners of the selection nucleus herds. Table 2 shows the evolution of the number of inseminations and donor rams since 1986. Rams on test are donors to 50% of the inseminations, the rest being done with semen from the above-mentioned top 10% rams. Insemination figures have largely been the programme's limiting factor. The objective of progeny-testing 50 rams a year with a minimum of 150 inseminations was met in 1994. For 1995, the goal is to test rams with over 200 inseminations.

Table 2. Evolution of the number of inseminations

Year	No. AI	Cervical	Laparoscopic	Ram
1986	1035	1035		13
1987	1391	1391		15
1988	2475	2475		27
1989	2243	2243		22
1990	2404	2404		28
1991	7839	6802	1037	47
1992	10869	8239	2630	47
1993	14867	10977	3890	51
1994	15994	4660	11334	61

Laparoscopic inseminations are carried out with fresh semen and cervical ones with frozen semen. Respective fertilities, as found by ANEL *et al.* (1992), were 65% for laparoscopic AI and 38% for cervical AI. The low fertility and wide variablity among herds of the latter have caused great concern. Differences among herds are probably due to a) handling at the breeding season, b) average body condition at insemination. Infertility caused by good body condition selectively affects the best herds, usually those in the nucleus. This is not the case for laparoscopic insemination, which may also use frozen semen, extending storage times dramatically. These two facts have made laparoscopic AI the method of choice for ewe insemination since 1991.

As of 1994, approximated costs are as follows: synchronising ewes in oestrus - 525 pts/ewe; cervical AI - 520 pts/ewe; Laparoscopic AI - 1200 pts/ewe.

Participating herds

Only 72 out of 145 herds in ANCHE are entitled to collaborate with the selection programme, based on their participation in the milk recording and artificial insemination programmes. Of these 72, only 43 are considered as technically suitable for joining the selection Nucleus, after taking into consideration other criteria (Table 3).

Table 3. Evolution of the number of herds and ewes included in the evaluation of genetic merit

Year	Herds		Ewes	Lactations
	AI	Nucleus		
1986	19			
1987	17			
1988	29			
1989	32			
1990	35	11	11593	19264
1991	35	16	19828	32341
1992	62	20	24127	43868
1993	63	22	31622	64424
1994	68	33	38581	75909
1995	72	43	44920	85199

Methodology for the evaluation of the genetic merit

The genetic evaluation is performed by means of an animal model accounting for repeated measurements and using mixed model methodology. Resulting breeding values have BLUP properties.

The model included effects for: Herd-Year, Age at lambing, Lambing season,

lambing (single/multiple), permanent environmental effect and additive genetic effect. It accounts for all known relationships among individuals and assumes heritabilities previously estimated to be 0.25., repeatability 0.40.

Since 1995, the model includes effects for: Herd-year-season, lambing-1st test interval, Age at lambing, lambing, permanent environmental effect, and additive genetic effect.

Available infrastructure

Housing. ANCHE headquarters at Palencia: coordinates the co-operative work, receives and processes the information generated by the programme.

Farms. IA stud, located in Valladolid, with capacity for 300 rams, semen collection installations, and semen analysis lab.

Laboratories. Semen is frozen and packed at the CENSYRA (Center for Animal Selection and Reproduction, of the Department of Agriculture), León.

Computing. Genetic evaluations are performed at the computing centre of the University of León, on an IBM ES/9130 mainframe running VM/SP v 5.0.

Scientific and technical support

Even though ANCHE performs the organization and development of the breeding programme, there is an assistance agreement between ANCHE and the University of León to perform the technicalities of the selection regime. The Reproduction Unit (Dept. of Animal Pathology) is responsible for reproduction-related tasks, such as laparoscopic AI, semen freezing, etcetera. The Animal Breeding Unit (Dept. of Animal Production) is in charge of the six-monthly genetic evaluations, pedigree checking, organization of courses for the formation of classifiers, sample checking of the milk yield recording program. Research for the improvement of the breeding programme was funded by the CICYT (Projects GAN90-0577 and AGF93-0273).

Financing

As of 1994, the breeding programme costs add up to 31682500 pts. per year: Ram acquisition: 3675000 pts.; Hormonal treatment: 7500000 pts.; Semen freezing: 7500000 pts.; Semen refrigeration: 600000 pts.; Artificial insemination: 2362500 pts.; Insertion of progestagen sponges: 525000 pts.; Diagnosis of pregnancy: 787500 pts.; Genetic evaluation: 577500 pts.; Paternity control: 525000 pts.; Advertising: 630000 pts. The cost of the milk recording scheme was 6500000 pts. and ANCHE administration costs 22000000 pts. Financial support comes from: ANCHE, Provincial Councils of Burgos, Zamora, Palencia, and Valladolid, Local Government of Castilla y León, and the Spanish Ministry of Agriculture, Fisheries, and Food.

Results

Ewes which are offspring of the IA stud rams, either proved or on test, have average milk yields of 121 l in 120 d lactations and that is 9 l above the general mean for the whole of the population. Milk yield average is 117 l in the selection nucleus, 5 l above the general mean.

Despite the fact that artificial insemination with semen from test rams started in 1986, it was not until 1991 that AI reached an important proportion of the Churra population. Only after 1995 are noticeable increases in the breeding value of the selection nucleus herds expected.

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