European Association for Animal Production (EAAP)
57 Annual Meeting. Antalya, Turkey, 17-20 September 2006

Sheep and Goat Commission. Session 14: Awassi Sheep.
Paper S14.2 (e-mail: *gabina@iamz.ciheam.org*)

The Awassi and Assaf breeds in Spain and Portugal

L.F de la Fuente[1], D. Gabiña[2*], N. Carolino[3], E. Ugarte[4]
[1]*Departamento de Producción Animal I, Universidad de Leon, 24071 Leon (Spain), fernandodelafuente@unileon.es;* [2]*Mediterranean Agronomic Institute of Zaragoza / CIHEAM, Apartado 202, 50080 Zaragoza, Spain, gabina@iamz.ciheam.org;* [3]*Dpto. Genética e Melhoramento Animal, Estação Zootecnica Nacional, 2005-048 Vale de Santarém (Portugal), carolinonuno@hotmail.com;* [4]*Dpto. Agrosistemas y Prod. Animal, NEIKER, Granja Modelo ARKAUTE, 01080 Vitoria-Gasteiz, eugarte@neiker.net;*
[*]*Corresponding author*

Summary

The Awassi was introduced into Spain in 1971, reaching a population size of between 150,000 and 200,000 practical purebreds, besides a large number of crossbreds. Today the population has greatly decreased to 6,000 purebred ewes and a further 80,000 ewes crossed with Assaf, Churra or Castellana. Production is high (approximately 300 l of milk per lactation) however it is being substituted by the Assaf breed.

The Assaf was introduced in Spain in 1991 and has achieved great success with 600,000-700,000 ewes more than 80 % pure and approximately 500,000 crossed ewes. The reasons for success lie in a higher milk production than local breeds (278 l vs. 127 l in the Churra), although it is not so rich in fat and protein. It's prolificacy size is good, it is well adapted to intensive systems and it is easy to obtain purebred animals.

The Assaf was first introduced in Portugal in 1991 and nowadays there are around 15,000 purebred Assaf and some 15,000 F_1 Assaf crossed with local breeds. Average milk yield is 359 l in 220 days of lactation, with milk of 7.2% fat and 5.5% protein.

Introduction

Spain is one of the EU countries with the highest number of sheep, with a population size of 22.5 million in 2005 (FAOSTAT data, 2005)**.** From this data it has been estimated that about 2.361 million are dairy ewes (Astruc et al., 2004) producing 400,000 Mt of milk in 2005 (FAOSTAT, 2005). Churra, Manchega and Latxa are the most important local dairy breeds, with 300000, 650000 and 280000 milked ewes respectively.

Portugal has also a considerable number of sheep (3.5 million head) of which 590 thousands are dairy ewes producing 104,000 Mt of milk in 2005 (INE, 2006). The most important local dairy breeds are Serra Estrela, Churra Terra Quente and Saloia, with 25000, 33000 and 7200 ewes in Flockbook.

In general the local breeds from Spain and Portugal are well adapted to the predominantly harsh environments of the areas of production, but their milk yields are

relatively low, with averages around 1 or less l/day of milked milk. Once the farmers have decided to invest in order to modernise the farms, introducing management technologies as concentrate supplementation or machine milking they need a higher genetic production potential in order to pay for these investments, particularly labour. The increase in the genetic level of the populations is being achieved through the implementation of pure breed selection programmes or by crossing or absorption of local populations with high yielding breeds.

Selection programmes are undergoing interesting development and providing good responses in some of the breeds (Ugarte and Gabiña, 2004) with up to 2-3 l/year. Nevertheless, these results only affect flocks involved in selection programmes, which normally are a small part of the population, and may also be considered too low when a rapid increase in the yields is required.

The other way to increase the genetic level of local populations, crossbreeding or absorption with high yielding breeds, is being widely used in Spain, especially in the Churra and Castellana producing area (Castilla-León; Northwest Spain) and in Portugal. Several breeds have been used for this purpose: Sarda, East Friesian, Lacaune, Awassi and Assaf but the latter two breeds, particularly Assaf, have the largest impact in the Spanish and Portuguese dairy sheep industry.

In this presentation we will focus particularly on the use of the Awassi breed in Spain and the Assaf breed in Portugal and Spain and, with a short description of the history of their introduction, an evaluation of their technical and economic results, and an assessment of their current impact on the Portuguese and Spanish dairy sheep industries.

The Awassi breed in Spain

Introduction of the breed. The Awassi is a sheep breed of Israeli origin, introduced into Spain in 1971. The Duke of Arion imported 150 ewes and 50 rams to Malpica de Tajo (Toledo), and later in 1974 imported 120 ewes and 130 rams. From this nucleus flock, the Awassi breed began to spread, fundamentally in the Castille-León region. Furthermore, Awassi semen of Israeli origin was imported from Portugal in 1988.

The Awassi breed was imported by the Duke of Arion to take advantage of the sale of F_1 ewes (Manchega ewes x Awassi males), known by the commercial name of Malpica-200 ewe. This business was not very successful. However, the sale of rams to be crossed by absorption with the autochthonous breeds was successful with the Churra and Castellana breeds in Castille-León during the 1980s, when the Assaf breed was not yet widespread.

Extension and population size of the Awassi breed. The interest in the Awassi breed lies in the improvement in milk yield in the semi-extensive systems of the plateau of Castille, to which the Awassi breed adapts easily, as it is a hardy breed. Thus the Awassi breed began to spread over the Castille-León region through crosses by absorption into milk yielding flocks in extensive or semi-extensive systems, Zamora being the province with the greatest number of Awassi flocks. Mention is made of the Awassi breed reaching a population size of between 150,000 and 200,000 ewes in Spain, besides a large number of crossed ewes. At present it is hard to be precise as there are no statistics that include the population size of breeds that are not officially recognised. It is estimated that in the Castille-León region (mainly in Zamora) there are about 6,000 purebred ewes and a further 80,000 ewes that can be considered to be Awassi but that are very much crossed with Assaf, Churra or Castellana.

Decline. However, the low reproduction rates, inferior quality of the suckling lambs (fat tail and deficient meat conformation) are all drawbacks in comparison to the Assaf breed. Thus, since the arrival of the Assaf breed in Spain, the Awassi population size declined, particularly in the 1990s. The determining factor for the decline of the Awassi breed in Spain was the evolution of the extensive systems towards the intensive systems based on permanent stabling, to which the Assaf breed is very well adapted.

At present the Awassi breed is in full regression, since the farmers that are producing milk in extensive systems are retiring and the younger farmers only work intensive systems where Assaf or Lacaune are the breeds of choice.

Concerning the Awassi breed, in Spain, no genetic improvement work has been carried out as no breeders' associations have been set up through which this breed could be promoted or improved. Furthermore, there is no flock book. The Awassi breed is not recognised in Spain, even as a breed from another country.

Awassi breed yields in Spain. Table 1 shows the results of estimations made for the Awassi breed based on different sources, whereas the Churra and Assaf results are mean results obtained in 2003 and 2004 by the University of León from a survey of 14 Assaf farms and 15 Churra farms. The reproductive results indicate that the Awassi breed matures later than the Churra (18 vs 14 months of age at first lambing) and is also less prolific (1.4 vs. 1.2 lambs/parturition).

The Awassi more than doubles the Churra milk yield, with 297 and 127 litres respectively, although the milk has lower fat (6.97 and 7.24) and protein (5.45 and 5.62) contents. The somatic cell content is slightly higher (900 and 700 x 10^3).

The Assaf breed in Spain and Portugal

The Assaf in Spain

Introduction of the breed. The Assaf breed was introduced into Spain for the first time by José Luis Moncada, a farmer located in Gordoncillo (León), who imported from Israel 320 ewes and 77 rams between 1977 and 1980. Later on, the Spanish Ministry of Agriculture and Food (MAPA) banned further imports from Israel for health reasons, under the pretext of prevention of Bluetongue. Since the import of Assaf sheep up to 1985, J.L. Moncada sold off his sires to other farmers in the area. Afterwards, through crosses by absorption with the Churra and Castellana breeds, the Assaf breed began to spread first of all throughout Castille-León and later over the rest of Spain. However, although the exclusive sale of Assaf males seemed to be a flourishing business, it was not so successful for J.L. Moncada, who, between 1985 and 1987 sold off his foundation flock to several livestock farms in successive lots, the largest being of 300 ewes to Serafín Roman in Ledesma (Salamanca), and others to Valdemora (León) and another was exported to Portugal.

Afterwards, the breed gradually scattered out from Ledesma over the provinces of Castille and León, a lot of 201 ewe lambs were sold to the Regional Government Farm in León in 1990, other lots went to Villaralbo (Zamora), and Valderodrigo (Salamanca), Arcos de la Polvorosa (Zamora), etc.

Besides the Assaf population imported by J.L. Moncada, a second import of animals, semen and embryos was later made into Spain via Portugal (Farm of Herdade do Martinho, in Castelo de Vide). This Portuguese farm has sold many rams to Spanish flocks during the 1990s. Furthermore, the Reproduction Department of the Faculty of Veterinary Science of León in 1993 imported 23 rams from Portugal, from which

24,193 doses of semen were extracted and distributed throughout the Regions of Castille-León, Madrid and Castille La Mancha.

Besides the entry of Assaf animals from Portugal, semen of Israeli origin was introduced to overcome the sanitary barrier, therefore in 1993 Carlos Alonso Guerra imported 4,000 doses of semen and in following years other cooperatives from Zamora also imported semen.

Another genetic source which has contributed to the Spanish Assaf breed has originated from other farmers from Castille-León, who provided F_1 ewes from crosses between Milchschaf rams and Churra or Castellana ewes, passing through the Assaf breed which furthermore had a white coat, a phenotype preferred by a large number of farmers.

Therefore, during the 1980s and 1990s, the Assaf breed spread across the whole of the national territory, even though the largest concentration is to be found in the Castille-León region, particularly in the province of Zamora.

Extension and population size of the Assaf breed. The data presented hereafter are estimations made by different authors, since the last census of breeds carried out by the MAPA dates from 1986 and the situation has changed a great deal since then.

The population size of dairy ewes in Castille-León is 1,600,000, of which 300,000 are estimated to be Churras, (plus 350,000 non-milking ewes), 30,000 Castellanas (plus 250,000 non-milking ewes), 500,000 Assaf, 6,000 Awassi, 14,000 Lacaune and the rest 770,000, most of which are crosses in very heterogeneous flocks (Awassi, Assaf, Churra, Castellana, Lacaune, etc.). In 2000, in Castille-León, 62% of the milk yield came from imported breeds (Assaf, Lacaune, Awassi), however this percentage has increased with the intensification of the production system.

In the Latxa production area, it is estimated that there are about 1,600 Assaf ewes in the Basque Country distributed among 6 flocks whereas in Navarre there are 18 flocks with only 7 flocks registered in the National Assaf Sheep Breeders' Association – ASSAF.E (see below), with 4,100 ewes.

At present, the Assaf breed population in Spain is approximately between 600,000 and 700,000 ewes (1,060-1,300 flocks) more than 80% pure and about 500,000 ewes crossed with Assaf, and that are evolving towards Assaf in purity, due to successive crosses with Assaf rams. These figures give an idea of the extraordinary dimension acquired by the Assaf breed in Spain.

Status of the breed. The Assaf breed was officially recognised in Spain on 5 August 2003 in the Official Catalogue of sheep breeds in Spain (BOE, 5-9-2003) as a breed from a non-European country. Later, on 23 February 2005, MAPA officially recognised the National Association of Assaf Sheep Breeders of Spain (ASSAF.E) as a collaborating institution in the maintenance of the Flock Book. On 22 March 2005, the specific regulations of the Assaf Flock Book were approved in Spain. The Foundation Flock Book was created and the sheep in the flocks were registered. The ASSAF.E headquarters are based in Zamora and the Association has 213 members, with approximately 124,000 sheep presently registered in the Foundation Flock Book. Although at present the ASSAF.E does not include all the Assaf farmers in Spain, it is hoped that most of these farmers will join the association in the near future.

Since 2000 the Regional Government of Navarre has recognised the Assaf Sheep Association of Navarre – ASAFNA, with about 18 farms.

The selection programme. The Assaf breed in Spain (Spanish Assaf) has been subject to an adaptation-selection process that probably will lead it to be genetically differentiated from the original Assaf from Israel.

The first differentiation is that the flock imported by J.L. Moncada - the Assaf nucleus from which the Spanish population began - was subject to selection during the 8 years the flock was on his farm, both for their white coat (preferred by some farmers to differentiate it from the Awassi), and for the milk yield and fat and protein content.

The second differentiation is that a considerable number of head in the population today known as the Spanish Assaf comes from the Churra and Castellana breed, as the individuals resulting from two generations of crosses with rams from the Assaf breed have been accepted as pure Assaf. Besides, the F_1 ewes resulting from the cross between autochthonous ewes and Milchshaf rams have been included as Spanish Assaf ewes.

The third differentiation is that it is presupposed that the Assaf breed due to its origin (cross from a small lot of Milchschaf rams with improved Awassi ewes) and the small pure population in Israel must present little genetic variability. However, in Spain the Assaf breed is highly variable due to the mixture with the autochthonous breeds and the large population size, in comparison to the Assaf breed in Israel.

A turning point in the evolution of the Assaf breed in Spain occurred in 2005, when on the 22nd March the regulations of the Assaf Breed Flock Book were approved, as well as the selection programme, organised by the ASSAF.E.

From the opening of the Flock Book of the breeders' association a genetic improvement programme of national scope was initiated, in order to select for improved milk production. For this purpose official milk recording was implemented, as well as the presentation of the aforementioned selection programme based on ram progeny testing. The aim of the programme is to use the Insemination Centre of the sheep genetic improvement centre of Zamora (OVIGEN), located in Toro (Zamora), besides other authorised centres that may collaborate.

What has happened up to 2005? During the 1980s and 1990s, the different Assaf farmers selected for milk yield, first of all individually and then, in the 1990s they joined together in groups with different links between them, either cooperatives, milk recording groups, services firms etc. The greatest difficulties that had to be overcome in order to implement a national genetic improvement programme were the absence of the Flock Book, the fact that the breed was not officially recognised, and the organisation of their selection programmes by services firms. The groups of farmers mentioned previously, from the decade of the 1990s to 2005, have been organising the milk recording, artificial insemination, etc. as well as the ram progeny testing on an unofficial basis. As a whole they present a large selective activity, with 156,710 ewes in milk recording programmes, 84 rams progeny tested per year and 13,652 inseminations in 2004.

However, with the foundation of the ASSAF.E Association (National Association of Spanish Assaf breeders) on 17 April 2002 and the opening of the Flock Book in 2005, the official selection programme of the Assaf breed had commenced in Spain. In January 2006, there were already 30,000 ewes from 46 flocks registered in the Flock Book (foundation register) and it is hoped that by the end of 2006, the 124,000 ewes that at present belong to members of ASSAF.E. will be registered, besides it is expected that more farmers that are not associated today may join ASSAF.E and participate in the selection programme through the Association.

However, it is estimated that only 15% of the Assaf farmers are members of the ASSAF.E association, therefore it is expected that once the selection programme is completely operational more farmers will join the association, particularly farmers of other regions that to date have been less related with the national association.

Regarding the technical characteristics of the selection programme. The programme is based on ram progeny testing. The only selection a criterion at present is the amount of standardised milk at 150 days of lactation. However, since the creation of the Flock Book and the implementation of official milk recording, quantitative analysis has been incorporated into milk recording, which is why in future years the % of useful material or cheese extract (% fat + % protein) will be incorporated as a selection objective. Other selection objectives to be included in the near future are mammary morphology traits and body morphology.

The genetic evaluation method used by different programmes has always been an BLUP-Animal Model, with repeatability using a lactation model. The trait for which the genetic value has been estimated is the amount of milk in standardised lactations at 150 days.

Assaf breed yields in Spain. For the Assaf breed in Castille-León the mean production in the milk recording groups in standardised lactations at 150 days oscillates between 220-300 litres, these same productions in total lactations being 280-350 litres.

Table 1 includes the results obtained in 2003 and 2004 by the University of León from a survey of 36 Assaf (14), Churra (15) and Castellana (7) farms respectively. The reproductive results indicate that the precocity of the Assaf is similar to that of the Churra, with a mean age at first lambing of 15 and 14 months. The Churra seems to be more fertile than the Assaf although undoubtedly this data has to be placed within the context of accelerated reproduction systems in which the Assaf ewes are put to mating with much higher milk production than the Churra ewes. The Assaf litter size (1.5) is slightly higher than that of the Churra (1.4) with a higher lamb mortality (11% and 6% respectively).

The Assaf milk yield is more than double that of the Churra, with 278 and 127 litres respectively, although the milk has a lower fat content (6.82 and 7.24) and protein content (5.43 and 5.62). The somatic cell content is slightly higher (800 and 700 x 10^3).

The growth of the Assaf lambs is higher than that of the Churra breed (260 and 195 g/day) during the suckling period, which, together with a greater weight at birth (5.3 vs 4.0 kg) brings them to market weight (11 and 10 kg respectively) in a shorter time (22 vs 24 days respectively). The adult weight of the Assaf breed is higher than that of the Churra in ewes (75 vs 63 kg respectively) and especially in rams (125 vs 90).

Regarding particular susceptibility to a given disease, the Assaf appears to be more sensitive to Pastereulosis than the Churra. The mean longevity of the Assaf is considerably shorter (5 years) than the Churra (8 years)

Economic results. The most rigorous profitability study (comparing Assaf, Castellana, Churra) is being carried out through the previously mentioned survey among 36 Assaf, Churra and Castellana farms. Provisional results are presented, corresponding to the years 2003 and 2004. The Assaf income is much greater than those of the Churra for milk sold (176.51 vs 62.72 € /ewe and year). The Churra fetches higher figures for lamb sales (56.17 vs. 47.61 €/ewe and year) due to a higher sales price for the autochthonous lambs, some of which are sold as lambs under a designation of origin label and also because more lambs are sold per year. The Assaf farmers also obtain greater income for

the sale of replacement animals (11.51 vs. 3.33 €/ewe and year). In total, the income per ewe and year is much higher for Assaf (282.04 €) than for Churra (166.26€).

However, expenses are greater for the Assaf ewes, especially for feed (122.51 vs 39.19 € /ewe and year) and to a lesser extent for health care (11.97 vs 5.84).

Regarding margins per ewe, both the gross margin for manger feeding and the net margin are much higher in Assaf in comparison to Churra (125.69 vs 96.03 and 68.51 vs 33.51). However, as we have indicated previously, the number of sheep that can be handled per unit of labour and per farm is higher in the Churra than in the Assaf breed (719 vs 489 ewes/flock in the farms included in the survey cited) therefore the total income and margins per flock and per unit of labour attenuate the large differences in income per ewe and year.

These results confirm the conclusions that have been drawn from various studies that have been carried out in the area of Castille and León, most unpublished. The first and main conclusion reached by all is that the most decisive factor of profitability is the farmer and not the breed. The second conclusion is that in intensive systems, the Assaf are more profitable and in the semi-intensive system the autochthonous breeds are more profitable. The third conclusion is that both types of breed (autochthonous and Assaf), each in their own system can obtain similar profitabilities when the profitabilities are analysed per farm and not per sheep. The Churra flocks compensate for their lower profitability per sheep by handling more ewes per flock and having less feeding expenses since they can use pasture and other natural resources.

In the Basque Country, although there are no economic studies published, the Assaf farmers interviewed confirm the previous statement. In order to have farms with a good quality of life and work (reasonable income, without excessive working hours, days off) they need to have well technified farms and hire labour. In order to do so, a highly productive breed that provides higher income than the autochthonous breed is necessary, and the Assaf best responds to those requirements. Furthermore, is it easier to obtain animals of this breed.

The Assaf in Portugal

Introduction of the breed. The Assaf was first introduced in Portugal in 1991 with the purchase from Israel of 5,000 doses of semen and 260 frozen embryos by the Sociedade Agrícola da Herdade do Matinho. The embryos were implanted in Awassi x Manchega ewes and the semen was used to inseminate the resulting offspring. Parallel to these imports, 1,854 doses of semen were purchased by several Portuguese farmers in 1992 (Rummel et al., 2005)

Extension and population size of the Assaf breed. It has been estimated that in the regions of Alentejo, Beira Interior and Extremadura there are 15,000 purebred Assaf in 15 flocks and some 15,000 F_1 Assaf crossed with Saloia, Merino Beira Baixa and Serra Estrela. Globally, it has been estimated that the Assaf affects several hundred thousand sheep in Portugal (Rummel et al., 2005).

Status of the breed. Assaf has an officially recognised Breeders Association, ACOSSAF, and a closed flock book with about 5,000 registered head. There is an established selection programme for milk yield which involves one single flock with 1,000 ewes. BLUP – Animal Model is used for estimating breeding values and Artificial Insemination is regularly practised.

Assaf yields in Portugal. The data below are estimations obtained through a survey. Age at first lambing for purebred Assaf is 13 months and fertility is 75% in Spring and 85% in Autumn. Litter size is 1.4 and the mortality of lambs 10%. Average milk yield is 359 l in 220 days of lactation, with a milk of 7.2% fat and 5.5% protein. The growth rate of lambs is 350 g/day from birth to four months. Mature weights are 110 and 80 Kg for males and females. The longevity is estimated at 7 years.

Conclusions

The results presented show that just as the Awassi breed does not appear to have a clear future, the Assaf breed looks as though it will become the most numerous in Spain. The reasons lie in its high milk productivity, good prolificacy and adaptation to the intensive systems as well as facility to obtain animals of that breed through the existence of a National Assaf Breeders' Association that enhances improvement and promotion of the breed. Furthermore, and once the selection programme has become fully operational and given the great number of head involved, the Spanish Assaf population could have a considerable genetic progress and wide diffusion even outside Spain, given the good general state of health of the sheep population of the area and therefore there would be a great availability of material of high genetic value.

In Portugal, the Assaf breed has also increased its census over the last few years, mostly due to its high production potential, as well as a good adaptation to local conditions. The selection program currently underway in Portugal is mostly based in a small number of farms, which base their genetic-pool in the animals originally imported as embryos, and have followed sound breeding practices since then. These farms have contributed to the diffusion of the breed throughout the country, both as live animals and through artificial insemination.

References

Astruc J.M., Barillet F. , Fioretti M., Gabina D., Gootwine E., Mavrogenis A.P., Romberg F.J., Sanna S.R., Stefanake E., 2004. Report of the working group on milk recording of sheep. 34th ICAR Session, Sousse, Tunisia - 30 May-3 June 2004

FAOSTAT data, 2005. http://faostat.fao.org/faostat/

INE (Instituto Nacional de Estatística, Lisboa), 2006. Indicadores estatísticos gerais - Agricultura, Produção Animal, Silvicultura e Pescas. Instituto Nacional de Estatística, Lisboa, Portugal (http://www.ine.pt)

Ugarte E., Gabiña D., 2004. Recent developments in dairy sheep breeding. Arch. Tierz., Dummerstorf 47. Special Issue, 10-17

Rummel T., Valle Zárate A. Gootwine E., 2005. The worldwide gene flow of the improved Awassi and Assaf breeds of sheep from Israel. Verlag Grauer, Beuren, Stuggart. 43p.

Table 1. Productive and economic results of Assaf flocks in Portugal and Assaf, Churra and Awassi flocks in Castilla-León (Spain).

	Portugal	**Castilla y León**		
	Assaf	**Assaf**	**Churra**	**Awassi**
Reproduction				
Age at first lambing (month)	13	15	14	18
Fertility in spring (%)	75	50	60	
Fertility in autumn (%)	85	80	90	
Litter size	1.4	1.5	1.4	1.2
Lamb mortality (%)	10	11	6	9
Milk production				
Lactation length (d)	220	190	140	212
Total milk yield / lactation (l)	350	278	127	297
Fat content (%)	7.2	6.82	7.24	6.97
Protein content (%)	5.5	5.43	5.62	5.45
Somatic cells / ml		800×10^3	700×10^3	900×10^3
Lamb growth rate (g/d)	350	260	195	174
(Period in days)	(0-120)	(0-22)	(0-30)	(0-90)
Mature weight (kg)				
Males	110	125	90	
Females	80	75	63	
Disease susceptibility		Pastereulosis		
Longevity (years)	7	5	8	7
Income (€/ewe/year)				
Milk		176.51	62.72	
Meat		47.61	56.17	
Breeding animals		11.51	3.33	
Subsidies		41.64	34.05	
Other income		4.77	9.99	
Total income		282.04	166.26	
Expenses (€/ewe/year)				
Fixed expenses		57.18	62.52	
Feed		122.51	39.19	
Sanitary		11.97	5.84	
Other		21.36	19.84	
Total expenses		213.53	132.75	
Margins (€/ewe/year)				
Gross margin		125.69	96.03	
Net margin		68.51	33.51	