Zerasca sheep: environment, characteristics and production

M. NOVELLA BENVENUTI[1], J. GORACCI[2], L. GIULIOTTI[1]

[1] Dipartimento di Scienze Veterinarie, Università di Pisa, Italy
[2] Agronomist

SUMMARY

The Zeri ewe is an indigenous Italian breed that is spread throughout the homonymous area located in northwest Tuscany. This article presents the history and evolution of Zerasca sheep, describes the breed's characteristics in terms of somatic and productive traits, managerial and health practices, meat quality; moreover it underlines its contribution to the preservation of the rural land and population of the Zeri district. First documentation on this breed dates back to the 19th Century (Antonelli, 1845). Zerasca breed has a medium-large size with white fleece. Males present horns while in females can be absent. Currently Zerasca ovine population totals more than 2,000 heads. Sheep husbandry is currently predominant in Zeri area thanks to the great availability of woody vegetation (oak, chestnut, hazel, alder and beech trees), meadows and pastures. Animals' nutrition depends mostly on grazing pastures, infact flocks are generally supported only with a little nutritional supplementation. The first typical production is the heavy lamb that is gaining more and more relevance thanks to its excellent meat quality, unique in taste; infact, Zeri lamb is included in the list of Slow Food *Presidia,* reflecting the recognized quality of this product in the world. Most of shepherds jointed in a consortium for the valorization and safeguarding of Zerasca sheep and lambs, whose regulation points towards the implementation of extensive farming systems with an optimal exploitation of local pasture resources. One of the most important problem that Zerasca sheep farmers often complain is represented by gastrointestinal parasitism, almost endemic in sheep husbandry and particularly in sheep raised under extensive systems. Today, "Zeri lamb" has a considerable economic impact on its territory, ensuring increasing profits for shepherds. The aim of this review is to collect information about a native breed in endangered status that it is gaining importance thanks to the high-quality of products.

KEY WORDS

Sheep, Local breed, History, Farm characteristic, Quality of products.

INTRODUCTION

Small-ruminant husbandry plays a fundamental role in preventing the decline of rural land and populations. However, ovine livestock systems must ensure an acceptable level of sustainability regarding animal health, environmental impact, quality of products and profits[1].

Zerasca sheep is an indigenous Italian breed with endangered status that has a primary position in safeguarding Tuscan biodiversity, typical production improvement and agricultural district protection. Its area of origin is located in northwest Tuscany at an altitude of 600-1,200 m a.s.l., in the Massa-Carrara district called Lunigiana. This region has an area of 7,344 ha scattered throughout four valleys that count 1,217 inhabitants, grouped into 671 families. A total of 192 farms and nearly 300 agricultural workers (23% of the total population) gives an idea of the importance of animal husbandry and agriculture in that region[2].

Current trend shows that Italian counties are too often characterized by the exclusion and abandonment of outlying territories, which also suffer progressive depopulation, especially of young people. Instead, Zeri district is an example of the younger generation's determination to keep sheep breeding closely connected to the territory. Thus, after a period of total abandonment and serious risk of extinction, Zerasca breed has begun to recover, thanks to public intervention (Pisa University, Mountain Communities, Local Administration and Agencies) and to the determination of some individual farmers - mostly women - organized into a *Consortium* ("Consortium for the Valorisation and Safeguarding of Zerasca Sheep and Lambs") created in 2001.

The aim of this review was to gather the information regarding the Italian native Zerasca sheep.

ENVIRONMENT

Zeri is located along the crest of the Appennines in Tuscany Region, nearly Liguria and Emilia Romagna; it is characterized by geographical isolation and by its long distance from industrial centres, thus guaranteeing unpolluted air and clean environment. In this context, natural pastures and woods of chestnut, beech, alder, hazel and acacia can be found and they represent important sources for animal nutrition. The area is typified by a climate midway between Mediterranean and Continental conditions, with extremely variable temperatures and yearly rainfall estimated to be around 2,000 mm. The inconstant quantitative and qualitative production of grazing land forces breeders to move the flocks to high-altitude terrain in summer, when there is grea-

Autore per la corrispondenza:
Maria Novella Benvenuti (novella@vet.unipi.it).

ter availability of grass, and to provide supplements in winter[3]. Generally, mothers lead their lambs to pasture all year round, except during particularly adverse climatic conditions when they are kept indoors[4].
During the last years, several studies have been developed on the possibility of controlling gastrointestinal parasites burden using homeopathy as environment sustainable method[5;6;7;8;9;10]. Studies pointed out the advantages of both parasites monitoring and homeopathy treatment in the control of gastrointestinal nematodes. These results allowed to reduce the number of anti-parasitic drugs limiting the release of dangerous chemicals in the environment.

HISTORY

A few years ago, Zerasca ovine enterprise was only a small supplement to a family's total income, whereas today it often offers a solid earnings base. At the same time, in the past, Zerasca sheep farming was subordinated to bovine activity, while this situation has been now completely reversed. In fact, at the beginning of the 1990s there was a generational change and young people took over the farms of parents or grandparents, improving managerial practices and giving new thrust to the sector.
The first written documents regarding Zerasca sheep date from the early 19th century[11]. The breed derived from crosses between native breeds, both northern Italian (particularly Bergamasca and Biellese) and Appennine breeds[12]. In the past, Zerasca was crossbred with the Massese breed in order to increase milk production and twin birth rate, but this practice negatively affected the animals' rusticity and was abandoned. The influence of Massese breed is confirmed by the high genetic identity between these two breeds[13].
The breed has been listed in the Herdbook since 1992. The current Zerasca sheep population totalled 2,143 subjects[14]. The consistency was subjected to a steady decrease during the period of depopulation of the countryside, which carried the breed to a serious risk of extinction and consequently the declaration of its endangered status. After that period, either public institutions such as the University of Pisa, or private initiatives such as farmers joined in a "Consortium", began to develop safeguard programs and strategies of market expansion.
Recent studies on genetic characterisation of this breed[13] focused the heterozygote deficiency (17.1%) caused by the high level of inbreeding.

BREED CHARACTERISTICS

The most recent source of information about the breed refers to studies conducted in 2004 on a sample of 83 animals[4;14].
Zerasca sheep (Fig. 1) is a sturdy animal of medium-large size with the aptitude to meat production: withers height is around cm 76 in adults and live weight is kg 55 and 88 respectively in females and males.
The skin is consistently fair (white or pink), but the colour of the fleece presents a certain heterogeneity: 88% show the characteristic white, while the others are brown or black spotted, confirming a certain influence of early Zerasca x Massese crossbreeding. Heads are completely white in more than half the cases but brown tints are displayed. Limbs present many cases of dark colouring (brown or black). Horns are always present in the males but can be absent in females. Table 1 summarizes the zoometric traits collected during farm inspections carried out in 2004[14]. These results showed some differences comparing studies studies previously carried out[2]: narrower head, longer and more convex muzzles, lower chest width and longer body weight pointing an evolution in the biometric traits during the time.

Figure 1 - Zerasca ewes.

Growth performance of lambs was quite unique in free-range ovine husbandry: the birth weight is 5.3 and 4.7 kg respectively for the males and the females. The lambs reached 20-24 kg live weight in 60-70 days, with 230-375 g daily gain[15;4;16], thanks to the sheep's milk quality and pasture characteristics. Some farmers prolong lamb growth in order to obtain heavier carcasses, appreciated by some consumers.
Ewes begin their reproductive career at around 12 months while rams begin earlier. Verità et al.[2] retained that Zeri sheep come to somatic maturity at the time of the second birth. Twin births occurred with rate between 30-60% and up to 75%, which could be considered a peculiarity of Zerasca sheep. Normally females live more than 8 years while rams

Table 1 - Zoometrical indexes of Zerasca.

Traits	Lambs mean±s.d.	Ewes mean±s.d.	Rams mean±s.d.
Head width, cm	11.0±0.58	12.1±0.97	12.0±1.41
Arc*, cm	23.0±1.15	25.6±1.38	24.7±2.06
Ear length, cm	10.3±3.99	12.5±1.54	10.2±2.22
Withers height, cm	73.7±3.20	76.0±4.54	77.2±3.40
Rump height, cm	76.1±2.85	79.0±2.71	78.6±3.49
Chest height, cm	33.6±3.31	35.7±1.45	34.2±5.74
Chest width, cm	20.9±3.02	23.2±2.60	23.2±5.31
Chest girth, cm	90.3±15.04	102.3±5.71	104.0±11.34
Body length, cm	79.1±7.45	85.4±4.74	83.7±7.41
Back width, cm	19.5±5.38	21.6±0.58	22.7±3.09
Ischiatic width, cm	15.1±2.67	17.0±1.00	17.5±1.00

*Forehead-nose bridge

are generally bred for less than 5 years to avoid problems of inbreeding[14]. An investigation aimed at studying the influence of *post partum* on some haematological, biochemical and immunological parameters in Zerasca ewes[17] noticed that Zerasca ewes manifest a stable metabolic and immune profile during this physiological stage.

FARM TYPOLOGY

Zerasca sheep farms number around 37; the mean animal consistency is 58 head, varying from 32 to 177.
Purebred Zerasca are raised in 90% of the farms; crosses are present in only a few cases. In many cases other species are reared in the farms, mostly crossbreed cows for milk and meat production, but also pigs and horses.
The property extension of farms is not wide, with an average area of 9 ha, but many farmers rent fields and it is customary to use state property areas for breeding or grazing purposes. There are several types of housing: in some cases they are ancient small buildings renovated for the animals, in others they are simple structures or new barns: mean indoor space allowance is 1.5 m^2/head and in many cases there are fences to protect against wolves[14].
The age of the sheep breeders is quite young, infact 22% of farmers are younger than 40 years old and the mean is 49 years; more than half are women[14].

MEAT CHARACTERISTICS

Meat is the main production of Zerasca breed. Regarding meat characteristics, studies carried out on this breed underline a good quality for both compositional and rheological traits[18]. Chemical composition of meat is characterized by low fat content (1.35%) although the age at slaughter is older than 60 days. At histological dissection of pelvic limbs, lambs show favourable muscular development with high percentage of lean cuts; moreover, dressing percentage and carcass firmness confirm the good meat production aptitude of this breed[19] (Table 2).
Fatty acids composition reveals good properties (Tab. 3)[20].
About 70% of unsaturated fatty acids are characterized by MUFA, mostly oleic acid, well-known for its beneficial properties. The PUFA content is not high, so that the rate PUFA/SFA is slightly under the recommended threshold of 0.4[21]. PUFA content is particularly high in fatty acids n6 (not always of benefit for humans health); however, the rate n6/n3 is satisfactory and under 4, the recommended limit that should not be exceeded in a proper diet[22]. CLA level in Zerasca lamb meat is higher than in other Tuscan native breeds[23]. The quantity of cholesterol is very low, similar to that present in bovine meat[24].

Table 2 - Live performance and carcass characteristics.

Traits	mean±s.d.
Birth weight, kg	5.6±0.55
Carcass weight, kg	11.3±2.03
Dressing percentage	53.1±5.58
Carcass firmness	20.05±3.10
Lean/bone	2.52±0.21
Lean/fat	13.02±4.23

Table 3 - Profile of fatty acids classes of intramuscular lipids of *Longissimus Dorsi* muscle (mg/100g fresh meat).

Fatty acids classes	mean±s.d.
CLA	10.51±3.27
SFA	434.78±130.98
MUFA	409.55±159.13
PUFA	170.03±28.81
BCFA	9.51±3.72
TFA	23.85±9.34
PUFA n3	43.85±11.19
PUFA n6	115.02±19.06
PUFA n6/PUFA n3	2.71±0.63

CLA = conjugated linoleic acid; SFA = saturated fatty acids; MUFA monounsaturated fatty acids; PUFA = polyunsaturated fatty acids; BCFA = branched chain fatty acids; TFA = trans fatty acids.

PROJECTS OF SAFEGUARD AND DEVELOPMENT

The first local action aimed at Zeri lamb promotion in the market has been the constitution of the "Consortium for the improvement and safeguarding of Zerasca sheep and lambs" in 2001.
This organization coordinates more than twenty farms and it is trying to restore this ancient production with traditional breeding techniques and land use, stabilizing some basic technical rules in the production's policy for example semi-extensive breeding techniques, lamb feeding based exclusively on maternal milk and natural pasture, and utilization of local hay, in order to guarantee a viable future and economic returns for the farmers.
An interesting possible project in the view of meat quality improvement could be the activation of an on-site abattoir. That would avoid expensive and stressful trips to the present slaughterhouse, located more than 20 km away from the farms, over a winding and rutted road that is quite dangerous for the animals' welfare and consequently for meat quality.
The project of the Consortium also implies the overall improvement of land resources, promoting either secondary sheep production such as cheese and wool or natural yield such as chestnut meal, potatoes, mushrooms, etc.
Milk is principally used to feed lambs but some farmers make traditional cheese by mixing ewe's and cow's milk[25]. The development of cheese factories could drive further positive economic and market evolution. Milk characteristics are not still well known. Data on milk composition reveal high variability for fat and protein content with mean values of 5.5 and 6.4% respectively[26].
Regarding wool products, it is important to underline another typical production associated with sheep breeding: the "*mezzalana*", a mixture of wool and hemp used for manufacturing socks, sweaters, carpets, mattresses, pillows and special long full skirts (the traditional women's clothing).

Among the projects aimed to improve this breed, there is also the participation of Slow Food, which included the Zeri lamb on its *Presidia*, a record of hundreds of traditional products from all over the world, listed for documentation, guarantee and advertising purposes.

CONCLUSIONS

Zerasca sheep is an important example of the close connection between Italian husbandry and environment. Zerasca is one of the most interesting sheep breeds with endangered status, and it now seems to be making a comeback, thanks to the resolution of young farmers and strong traditions. However, assistance and cooperation are still required to preserve the special Zeri lamb.

References

1. Ronchi B., Nardone A. (2003) Contribution of organic farming to increase sustainability of Mediterranean small ruminant livestock system. Livest Prod Sci, 80: 17-31.
2. Verità P., Martini M., Leotta R., Cecchi F., Colombani B. (1993) Studi biometrici della popolazione ovina Zerasca. Proc XXVIII Simp Int di Zootecnia, Torino, 14 may 1993, Milano (Italy): 479-494.
3. Verità P., Corleto A., Martini M., Cazzato A., Giuliotti L. (1990) Relation between environment and sheep farming system: food resources management and yield results. Proc. VI Meeting FAO, European Sub-Network on Mediterranean Pasture and Fodder Crops, Bari (Italy): 201-209.
4. Verità P., Benvenuti N., Goracci J., Giuliotti L. (2006) Zerasca. In Risorse genetiche autoctone della Toscana. ARSIA, Tuscany Region: 175-182.
5. Benvenuti N., Giuliotti L., Goracci J., Verità P. (2005) Study of gastrointestinal parasite dynamics in zerasca sheep aimed at reducing anthelmintic treatment. Int Symp on comparative advantages for typical animal products from the Mediterranean areas. Vale de Santarem (Portugal) 119: 283-287.
6. Giuliotti L., Benvenuti M.N., Goracci J., Verità P. (2005) Observation on gastrointestinal strongylosis resistance in Zerasca breed. XVI Congr. Naz. ASPA: 373-373, Torino (Italy).
7. Benvenuti M. N., Pisseri F., Goracci J., Giuliotti L., Gugliucci B., Macchioni F., Gavazza A., Guidi G. (2007) Feasibility of homeopathy in a flock of Zerasca sheep. European Traditional Medicine: 10, Vinci - Florence (Italy).
8. Benvenuti M. N., Pisseri F., Goracci J., Giuliotti L., Macchioni F., Verità P., Guidi G. (2011) Use of homeopathy in parasites control plans in a flock of Zerasca sheep.In "New trends for innovation in the Mediterranean animal production", 129: 296-300.
9. Macchioni F., Pisseri F., Benvenuti M. N., Giuliotti L., Goracci J., Paoletti S., Guidi G. (2008) Parasitological monitoring in a flock of Zerasca sheep treated with non conventional drugs. XXV Congress SOIPA, Pisa (Italy) 50: 213 suppl. 1.
10. Benvenuti M. N., Pisseri F., Azzarello B. M., Terracciano G., Cavallina R., Lai O., Giuliotti L. (2012) Clinical, productive and welfare parameters in Zerasca sheep treated with homeopathy. In "Animal farming and environmental interaction in the Mediterranean region", 131: 169-176.
11. Antonelli A. (1845) Consistenza e descrizione dei capi suini ed ovi-caprini nella provincia di Massa Carrara. Comizio Agrario Apuano.
12. Pasquali P. (1989) Prima indagine sulla popolazione ovina da carne del Comune di Zeri. Caratteristiche morfo-funzionali della pecora Zerasca. ETSAF. Tuscany Region.
13. Bozzi R., Degl'Innocenti P., Rivera Diaz P., Nardi L., Crovelli A., Sargentini C., Giorgetti A. (2009) Genetic characterisation and breed assignment in five Italian sheep breeds using micro satellite markers. Small Rum Res 85: 55-57.
14. Goracci J., Giuliotti L., Benvenuti N., Verità P. (2006) Characterisation of Zerasca ovine population: breeding management and zoometric data. In"Animal products from the Mediterranean area", 119: 267-271.
15. Martini M., Verità P., Cecchi F., Ricci G., Giuliotti L., Colombani B. (1993) Prove di accrescimento e rese alla macellazione della popolazione ovina Zerasca. In Proc. XXVIII Simposio Internazionale di Zootecnia. Ed Dip. Sci. Zoot. Torino (Italy): 365-380.
16. Verità P., Russo C., Preziuso G. (2001) La produzione dell'agnello zerasco: indagine preliminare sulla qualità della carcassa e della carne. In "Parliamo di… zootecnia e sviluppo sostenibile", Ed. Greppi G.F. & Ciceri A., 11-12 Oct. 2001, Fossano, Cuneo (Italy): 181-186.
17. Giuliotti L., Azzarrello M. B., Cavallina R., Lai O., Benvenuti M. N. (2011) Influence of post partum on some haematological biochemical and immunological parameters in Zerasca sheep. XIX ASPA Congress. Cremona (Italy) 7-10 June: 77.
18. D'Agata M., Russo C., Serra A., Mele M., Preziuso G., Verità P. (2006) Qualification of Zerasco lambs: 2. Meat quality. 14 Congreso Internacional de la Federacion Mediterrànea de Sanidad y Produccion de Rumiantes, Lugo (Spain) 12-15 July: 663-666.
19. Russo C., Preziuso G., D'Agata M., Verità P. (2006) Qualification of Zerasca lambs: 1. Live performance and carcass quality. 14th Congreso Internacional de la Federacion Mediterrànea de Sanidad y Produccion de Rumiantes. Lugo (Spain) 12-15 July: 659-662.
20. Serra A. (2012) Personal comunication.
21. Wood J.D., Richardson R.I., Nute G.R., Fisher A.V., Camp, M.M., Kasapidou E. (2003) Effects of fatty acids on meat quality: A review. Meat Sci 66: 21-32.
22. Scollan N. D., Hocquette J-F., Nuernberg K., Dannenberger D., Richardson R. I., Maloney A. (2006) Innovation in beef production system that enhance the nutritional an health value of beef lipids and their relationship with meat quality. Meat Sci 74: 17-33.
23. Secchiari P., Serra A., Vitti J., Conte G., Casarosa L., Mele M., Martini M., Sargentini C. (2006) Componente lipidica delle carni di agnello di tre razze ovine autoctone toscane. Atti SISVet LX: 483-484.
24. AAVV (2007) Salvaguardia e valorizzazione del patrimonio zootecnico autoctono della Toscana con riferimento alle seguenti razze: bovini: Calvana, Garfagnina e Pontremolese; ovini: Garfagnina bianca, Pomarancina e Zerasca. http://zootecnia.arsia.toscana.it/UserFiles/File/zootecnia/scheda%20qualit%20zerasca.pdf
25. Berti G. (2009) Valorizzazione della diversità e sviluppo nella campagna contemporanea: la costruzione del web rurale in Lunigiana. Tesi di dottorato "Cooperazione internazionale e politiche per lo sviluppo sostenibile" ciclo XX Università di Bologna.
26. La pecora Zerasca: una popolazione autoctona da conoscere, proteggere, valorizzare. Benvenuti N., Bottoni L., Verità P. (1998) "L'allevatore di ovini e di caprini". 1:9-11.