

Out of season sheep milk production in Sardinia

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ABSTRACT: Sheep breeding in Sardinia is based on two lambing seasons: in autumn for adult and in late winter for primiparous ewes. The milk production is concentrated within the winter-spring period, determining a break in the cheese factories' activities from the middle summer to the middle autumn. In order to have a continuous milk production over all the year an out-of-season sheep farming model was tested in Sardinian irrigated lowland. 52 Sarda dairy ewes, 20% of which primiparous, were mated in October with a lambing season in March. The experimental flock grazed rotationally a forage model based on 66% of irrigated surface. Flock fertility and prolificacy resulted 100% and 1.58, respectively. During the suckling period the average lamb growth rate was 255 ± 0.08 g head $^{-1}$ d $^{-1}$. The average milk yield resulted 279 l head $^{-1}$ in 180 milking days (290 and 258 l head $^{-1}$ for adult and primiparous ewes, respectively). Average milk fat and protein contents were 5.8% and 4.7% respectively. The study suggested that it is possible to integrate an out of season milk production with the traditional breeding system in Sardinian irrigated lowlands.

Key words: Out-of-season, Milk quality, Grazing ewes, Irrigated forage crops.

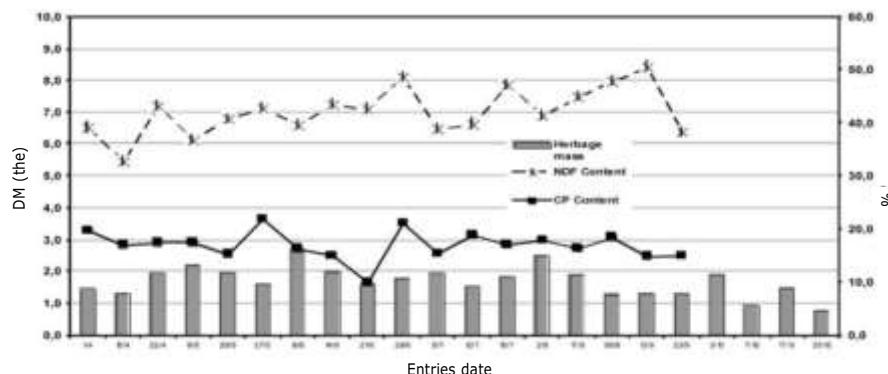
INTRODUCTION – In the past sheep breeding in Sardinia was based on a mating season in autumn and a lambing season in spring. This system, known as “archaic”, followed the natural cycle of Sardinian ewes, which have their highest sexual activity in autumn. Lambs suckled for two months and milk production lasted from spring to early summer (Fois *et al.*, 1999). Around the end of the XIX century the increase for cheese demand induced a modification of the original breeding model. As a result there was a modification of production system based on lambing season in autumn for adult sheep and late winter for primiparous, thanks also to the progressive improvement of animal management. Milk production and cheese making are therefore concentrated during the winter – spring period. However this model still shows some limits. Indeed the system seasonality determines a pause of cheese production, from mid summer to mid autumn, which heavily affects cheese factories profitability. In order to improve the efficiency of cheese factories and exploit the greater market demand during the summer tourist flow, a lambing season plan to have production season also in summer and early autumn was supposed (Casu 1986; Pulina *et al.* 1993; Fois *et al.*, 1997). The objective of our trial was to verify the feasibility of an out-of-season dairy sheep production system in irrigated lowlands.

MATERIAL AND METHODS - The trial was carried out at the Bonassai research station of the Istituto Zootecnico e Caseario per la Sardegna, located in North West Sardinia (32 m a.s.l.), on flat clay calcareous soil, pH 7,5 with low N and P₂O₅, and adequate K₂O contents. The climate of the area is classified as Mediterranean, with a mild winter and an average annual rainfall of 582 mm. In 2004, 31 Sardinian ewes (20 adults and 11 primiparous), enlarged to 52 in June, were managed according to a farming model with mating season in October and lambings in March. After the suckling period (30 – 35 days) the ewes were machine milked twice a day from April to October 2005. The animals were managed at pasture. The stocking rate was 8,5 ewes ha $^{-1}$. During summer, the ewes were housed during the daylight and grazed during the night. Water was always available to the animals. The forage system (6 ha surface, 66% irrigated) was constituted by 2 ha of irrigated chicory (*Cichorium intybus* L, 1 and 2 years old), 1 ha of irrigated annual forage crops: a mixture of Italian ryegrass (*Lolium multiflorum* Lam.) and Persian clover (*Trifolium resupinatum* L.) in winter-spring followed by pearl millet (*Penisetum glaucum* L.) in summer, 2 ha of sulla (*Hedysarum coronarium* L., 1 and 2 years old) and 1 ha of lucerne, irrigated and out of rotation. Herbage mass, determined by cutting 12 quadrates ha $^{-1}$ of 0.5 m 2 , crude protein (CP) and NDF content (AOAC,

1984) were measured before grazing. Individual body weight (BW) and body condition score (BCS; Russel *et al.*, 1969) were assessed fortnightly; number of born lambs and their birth and weaning weight were recorded; individual milk yield was recorded fortnightly and at each occasion milk fat (Gerber method) and protein (N*6.38; infrared method, Milkoscan, Foss Electric, Hillerød, Denmark) content were determined. Lactation milk yield of the all flock, as well as of primiparous and adult ewes separately, was calculated by applying the Fleischman method to the average test day yields of each group.

RESULTS AND CONCLUSIONS - The average herbage mass during experimental period was 1.7 ± 0.47 t DM ha⁻¹ resulting lower than 1 t DM ha⁻¹ only twice in early autumn. The average irrigation volume during summer was 5505 m³ ha⁻¹. The average CP and NDF content of herbage on offer were 16.9 ± 2.73 and 42.12 ± 4.53 , respectively. The pattern of CP content oscillated around 20% during grazing season showing the lowest value in June (9.9% in chicory 2 year old) and the highest value at the end of May (21.9% sulla 1 year old and mixed annual forages). The NDF content was higher than 50% twice in July (sulla 1 year old) and September (pearl millet and chicory 2 year old). The NDF lowest value (32.7% in chicory 1 year old and sulla 2 year old) was recorded on the 15th of April (Fig. 1).

Figure 1. Herbage mass and its CP and NDF content during 2005 grazing season.



The herbage availability resulted comparable with that of rainfed semi intensive forage systems of winter spring in Sardinia (Fois *et al.*, 1996; Molle *et al.*, 2002).

Flock fertility and prolificacy resulted 100% and 1.58 ± 0.62 , respectively. During the suckling period the average lamb growth rate was 255 ± 0.08 g head d⁻¹. Similar lamb performances were found by Fois *et al.* (1997) in a trial with lambing period in February. Beside the physiological decline due to lactation stage, average milk yield showed a high level in early lactation probably due to the photoperiod effect (Bocquier *et al.*, 1997) and to the high herbage availability in early spring, whereas during June and July the milk yield registered a marked drop (Fig. 2).

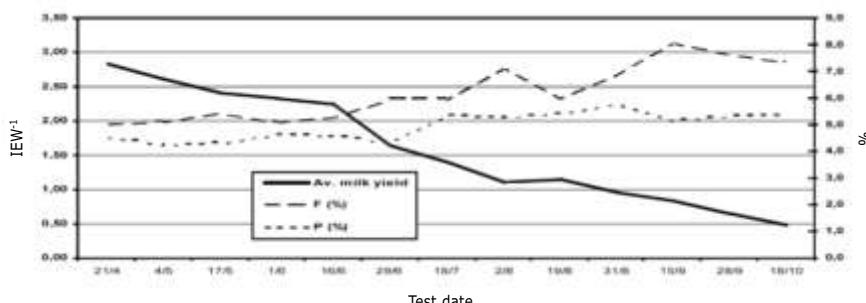
Milk yield of primiparous ewes resulted lower than that of adult ewes, representing 89% of that.

The milk production obtained from experimental ewes was similar to that of a flock managed at pasture with an autumn lambing season at the Bonassai station that resulted 263 l head⁻¹ in 163 milking days. Productive data of the experimental flock are reported in table 3.

Table 3. Average milk yield and fat and protein content in 180 milking days.

	Average milk yield (l ewe ⁻¹)	Fat content (%)	Protein content (%)
Experimental flock	279	5.8	4.7
Adult ewes	291	5.7	4.7
Primiparous ewes	259	5.9	4.8

Figure 2. Out-of-season average milk yield.



Forage production of the tested system, based also on some novel species for Mediterranean area as chicory and pearl millet, utilized in summer, resulted satisfactory. The milk yield during the trial shows the feasibility of the out of season breeding system, that should integrate the traditional farming system in order to have a continuous milk production all over the year.

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