



UNISS

UNIVERSITÀ
DEGLI STUDI
DI SASSARI

**Mondina F. Lunesu, Antonio Fenu, Antonio
Mazza, Roberto Rubattu, Maria R. Mellino, Silvia
Carta, Gianni Battacone, and Anna Nudda**
Dipartimento di Agraria, University of Sassari, Sassari, Italy



75th EAAP Annual
Meeting
1/5 September 2024 -
Florence, Italy

Evaluation of crossbreeding potential in heavy suckling lambs obtained by crossbreeding Sarda dairy ewes with Dorper rams

Introduction

- ✓ In the dairy sheep farms, **lambs** are usually slaughtered at the age of **4–5 weeks**



- ✓ The early slaughtering age depends mainly on the shepherds' **interest for selling milk**



- ✓ Sardinia, with more than tree millions of Sarda dairy sheep, **produce** about **75%** of the **Italian suckling lamb** meat

Introduction [2]

- ✓ **Protected Geographic Indication** (PGI) "Agnello di Sardegna" label
- ✓ It provides indications to produce heavy "**cutting lambs**"
- ✓ From **Sarda** purebred **or** by **its crossing with specialised meat breeds** (Reg. CE 138/2001)
- ✓ Carcasses weighing between **10 and 13 kg**



X



Introduction [3]

Heavy suckling lambs produced with dairy breeds could cause excessive fat accumulation and could be seasonal

Crossbreeding between **dairy and meat sheep**:



- ✓ opportunity to obtain **lambs with higher commercial value and to increase its accessibility during the year** (*Ellies-Oury et al., 2022*)

No information for lambs obtained by crossing dairy breed as **Sarda ewes** with **Dorper rams** to produce a **heavy suckling lamb** (around 20 kg of BW at selling 60 days of age)

Aim

Evaluate the **crossbreeding potential** in terms of growth performance, carcass characteristics and meat quality of lambs obtained by crossbreeding **Sarda** dairy ewes with **Dorper** rams



Materials and Methods

- ❑ 19 single-born **Sarda** purebred lambs
- ❑ 20 single-born **Dorper x Sarda** lambs
- ❑ Selected from autumn lambing season
- ❑ Lambs housed with the mothers all day
- ❑ Lambs nourished by suckling milk from birth until reaching 20 kg of BW (at 11 weeks of age)



N=10



N=9



N=9



N=11

Materials and Methods [2]

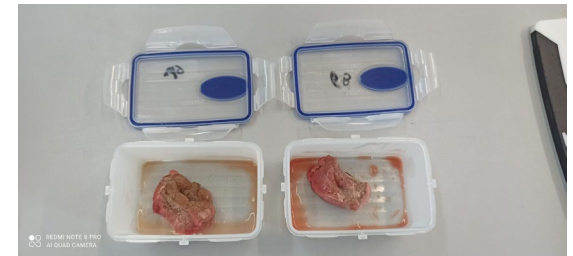
- ✓ **Body weight** of lambs (at birth and every 15 days)
- ✓ **Hot and cold carcass weights**
- ✓ **Rib fat thickness** (measured between the 12th and 13th rib, using an electronic caliper)
- ✓ **Colour measurements** (L^* , a^* , b^* CIE, 1986, 45 min and 48 h *post-mortem* using a Minolta colorimeter)
- ✓ **pH** (45 min, 3 h, and 48 h *post-mortem*, using a temperature-compensated pHmeter)



Materials and Methods [3]

The *longissimus thoracis et lumborum* (LTL) muscle samples were taken from the carcasses at 48 h *postmortem* and used for:

- ❑ **Drip loss** (*Honikel, 1998*)
- ❑ **Cooking loss** (*Nudda et al., 2013*)
- ❑ **Proximate composition** (moisture, total protein, and fat contents (*Folch et al., 1957; AOAC, 2000*))
- ❑ **Fatty acid profile** of intramuscular fat (*Folch et al., 1957; Nudda et al., 2011*)



Materials and Methods [4]

Data on birth weight, slaughter weight, hot and cold carcass weights, carcass traits, colour, pH measurements, drip loss, cooking loss, proximate composition, and FA profile were analyzed by the PROC GLM procedure of SAS:

$$Y_{ijk} = \mu + \boxed{GT_i} + \boxed{S_j} + \boxed{(GT \times S)_{ij}} + e_{ijk}$$

Y_{ijk} = observation (birth weight, slaughter weight, etc.);

μ = general mean;

GT_i = fixed effect of genetic type i ($i=2$);

S_j = fixed effect of sex j ($j=2$);

$(GT \times S)_{ij}$ = genetic type and sex interaction;

e_{ijk} = residual error.

Materials and Methods [5]

Data on ADG were analyzed by a PROC MIXED of SAS:

$$Y_{ijklm} = \mu + GT_i + S_j + T_k + (GT \times S)_{ij} + (GT \times T)_{ik} + (S \times T)_{jk} + A_l + e_{ijklm}$$

Y_{ijklm} = observation (ADG);

μ = general mean;

GT_i = fixed effect of genetic type i ($i=2$);

S_j = fixed effect of sex j ($j=2$);

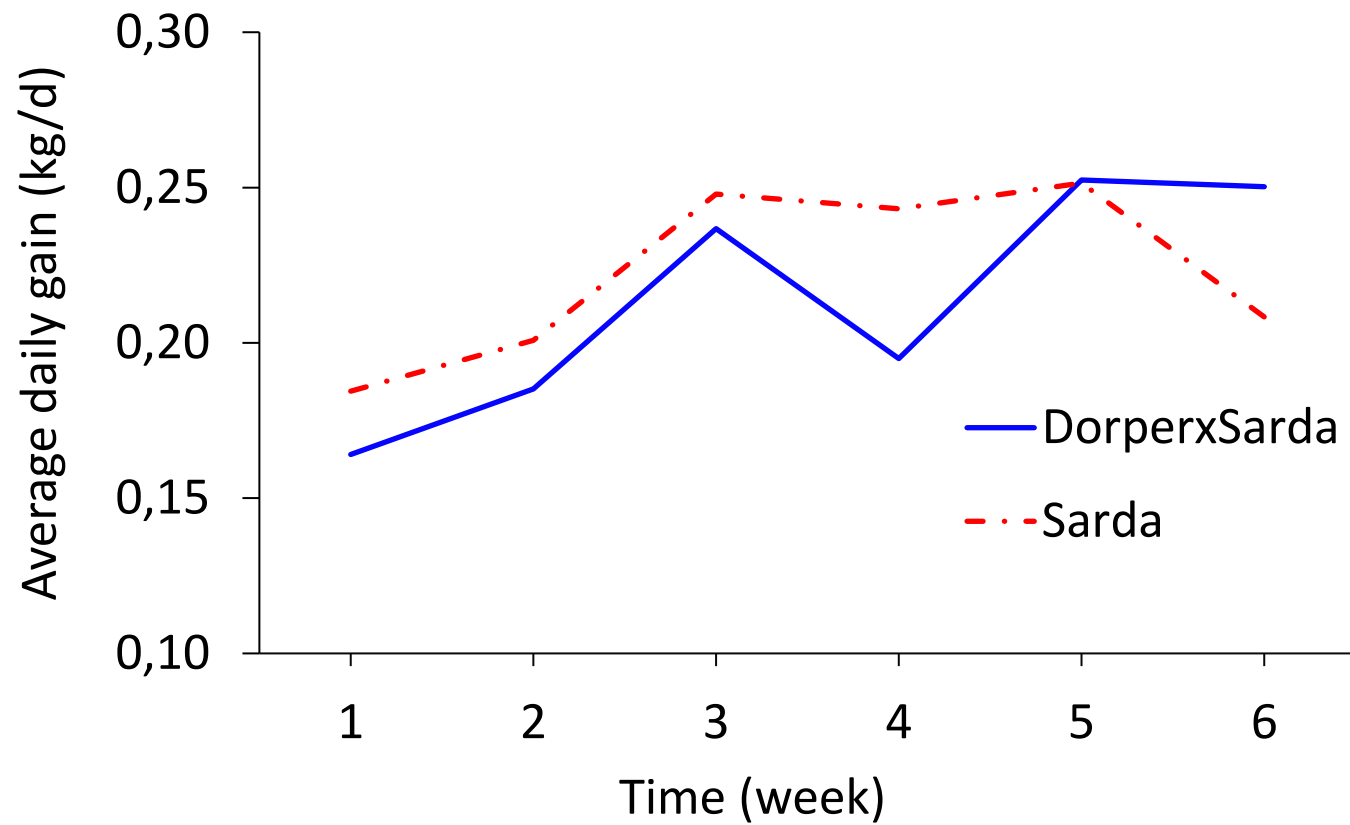
T_k = fixed effect of time;

$(GT \times S)$, $(GT \times T)$, $(S \times T)$ = interactions;

A_l = random term for animal;

e_{ijklm} = residual error.

Results: **Average daily gain**



Effect of GT

P=NS

Effect of Sex

P=NS

Effect of Time

P=0.001

Results: Growth performance and carcass traits

Item	Genetic type		Sex		SEM	P-value ¹		
	Dorper x Sarda	Sarda	Males	Females		GT	Sex	GT x Sex
Birth weight, kg	3.90	3.71	3.82	3.87	0.09	ns	ns	ns
Slaughter weight, kg	19.50	20.46	20.41	19.59	0.29	ns	ns	ns
Hot carcass weight, kg	11.91	12.51	12.23	12.20	0.21	ns	ns	ns
Cold carcass weight, kg	11.67	12.29	11.99	11.99	0.20	ns	ns	ns

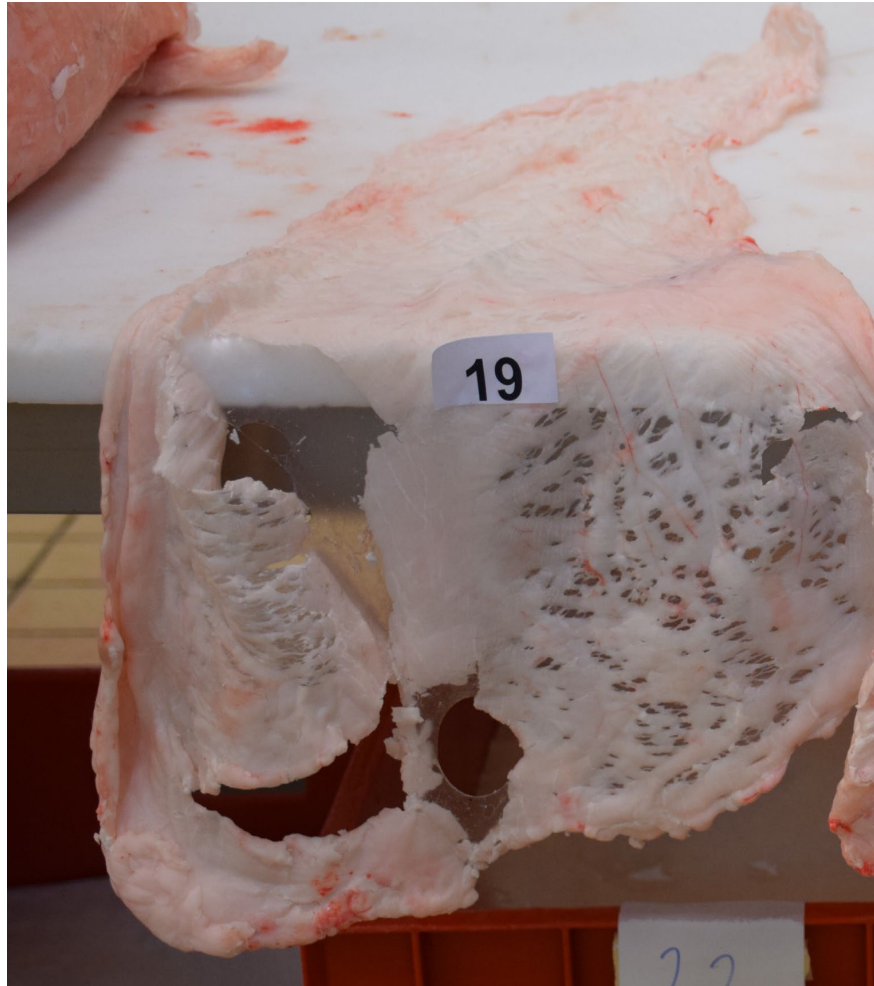
¹ ns = not significant.

Results: Body fat deposition

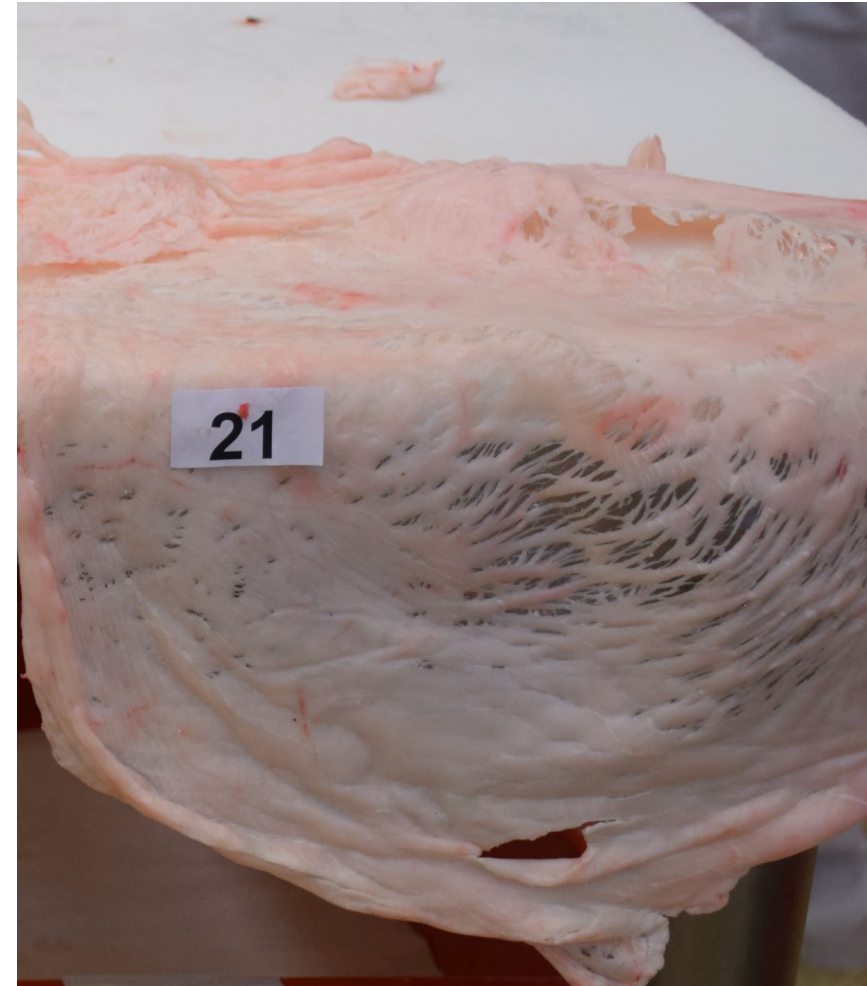
Item	Genetic type		Sex		SEM	P-value ¹		
	Dorper x Sarda	Sarda	Males	Females		GT	Sex	GT x Sex
Peritoneum weight, kg	0.20	0.28	0.21	0.26	0.02	*	*	ns
Perirenal fat weight, kg	0.12	0.20	0.13	0.19	0.01	**	**	ns
Rib fat thickness, mm	2.31	4.15	2.76	3.72	0.30	***	*	*

¹ * $P \leq 0.05$; ** $P < 0.01$; *** $P < 0.001$; ns = not significant.

Peritoneum



Dorper x Sarda 0.196 kg



Sarda 0.276 kg

Results: Body fat deposition

Item	Genetic type		Sex		SEM	P-value ¹		
	Dorper x Sarda	Sarda	Males	Females		GT	Sex	GT x Sex
Peritoneum weight, kg	0.20	0.28	0.21	0.26	0.02	*	*	ns
Perirenal fat weight, kg	0.12	0.20	0.13	0.19	0.01	**	**	ns
Rib fat thickness, mm	2.31	4.15	2.76	3.72	0.30	***	*	*

¹ * $P \leq 0.05$; ** $P < 0.01$; *** $P < 0.001$; ns = not significant.

Perirenal fat



Dorper x Sarda 0.120 kg



Sarda 0.196 kg

Results: **Body fat deposition**

Item	Genetic type		Sex		SEM	P-value ¹		
	Dorper x Sarda	Sarda	Males	Females		GT	Sex	GT x Sex
Peritoneum weight, kg	0.20	0.28	0.21	0.26	0.02	*	*	ns
Perirenal fat weight, kg	0.12	0.20	0.13	0.19	0.01	**	**	ns
Rib fat thickness, mm	2.31	4.15	2.76	3.72	0.30	***	*	*

¹ * $P \leq 0.05$; ** $P < 0.01$; *** $P < 0.001$; ns = not significant.

Rib fat thickness



Dorper x Sarda 2.307 mm



Sarda 4.150 mm

Results: meat color



Item	Genetic type		Sex		SEM	P-value ¹		
	Dorper x Sarda	Sarda	Males	Females		GT	Sex	GT x Sex
L* 45 min	60.8	60.5	61.5	59.8	0.46	ns	*	ns
a* 45 min	5.8	6.0	5.5	6.3	0.33	ns	ns	ns
b* 45 min	11.9	12.6	12.0	12.5	0.37	ns	ns	ns
L* 48 h	39.2	38.0	39.1	38.1	0.52	ns	ns	ns
a* 48 h	15.4	14.7	14.9	15.2	0.32	ns	ns	ns
b* 48 h	12.6	12.2	12.6	12.2	0.21	ns	ns	ns

L* (brightness)
a* (red–green component)
b* (yellow-blue component)

¹ * P ≤ 0.05; ns = not significant.

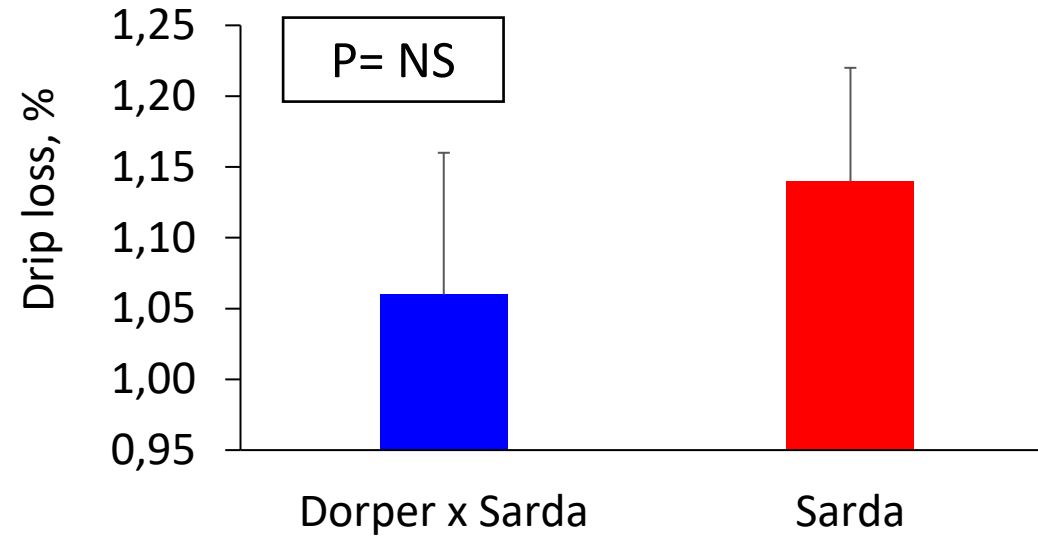
Results: meat pH



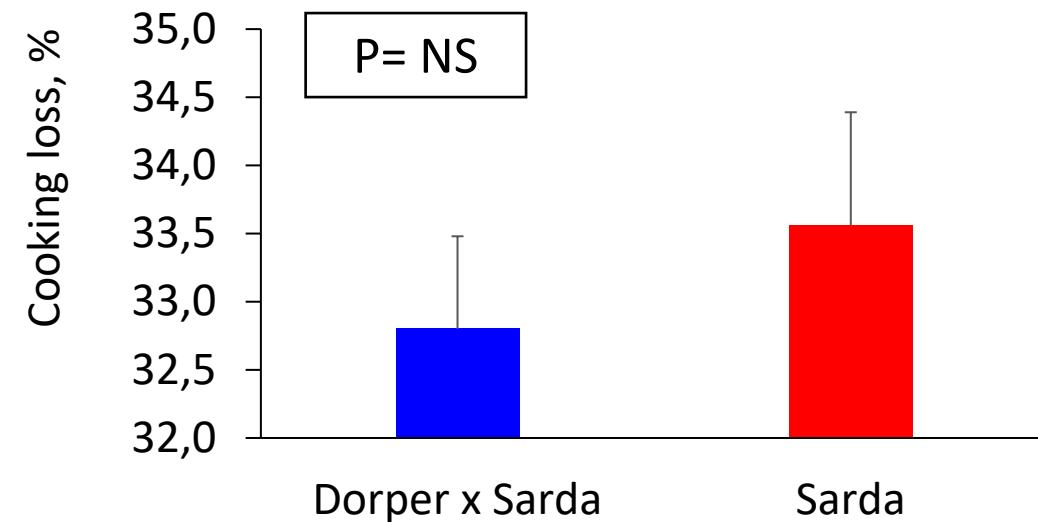
Item	Genetic type		Sex		SEM	P-value ¹		
	Dorper x Sarda	Sarda	Males	Females		GT	Sex	GT x Sex
pH 45 min	6.13	6.38	6.29	6.22	0.06	*	ns	ns
pH 3 h	5.57	5.86	5.80	5.63	0.07	ns	ns	ns
pH 48 h	5.55	5.55	5.54	5.56	0.01	ns	ns	ns

¹ * $P \leq 0.05$; ns = not significant.

Results: cooking and drip losses



Effect of sex
P= NS



Effect of sex
P= NS

Results: Proximate composition and fatty acid profile

Item	Genetic type		Sex		SEM	P-value ¹		
	Dorper x Sarda	Sarda	Males	Females		GT	Sex	GT x Sex
Moisture, %	72.98	71.20	72.35	71.79	0.33	**	ns	ns
Protein content, %	18.47	18.22	18.27	18.42	0.44	ns	ns	ns
Fat content, %	6.90	9.32	7.85	8.41	0.12	**	ns	ns
SFA	50.43	49.07	50.53	49.05	0.364	*	*	ns
MUFA	41.10	42.61	40.93	42.70	0.359	*	**	ns
PUFAn-3	1.19	1.10	1.13	1.16	0.032	ns	ns	ns
PUFAn-6	5.54	5.51	5.74	5.33	0.165	ns	ns	ns
OCFA	1.96	1.74	1.84	1.86	0.034	**	ns	ns
BCFA	2.17	2.02	2.08	2.11	0.029	**	ns	ns
OBCFA	4.13	3.76	3.92	3.97	0.058	**	ns	ns
n-6/n-3	4.70	5.06	5.10	4.67	0.128	ns	ns	ns

¹ * $P \leq 0.05$; ** $P < 0.01$; ns = not significant.

Results: Proximate composition and fatty acid profile [2]

Item	Genetic type		Sex		SEM	P-value ¹		
	DorperxSarda	Sarda	Males	Females		GT	Sex	GT x Sex
14:0	8.19	7.60	8.15	7.67	0.154	*	ns	ns
c9-14:1	0.30	0.34	0.31	0.33	0.010	*	ns	ns
14:0iso	0.08	0.06	0.07	0.07	0.003	***	ns	ns
15:0iso	0.22	0.20	0.21	0.21	0.004	*	ns	ns
15:0ai	0.31	0.25	0.28	0.28	0.009	***	ns	ns
15:0	0.75	0.61	0.68	0.69	0.019	***	ns	ns
16:0iso	0.28	0.25	0.26	0.27	0.006	**	ns	ns
16:0	25.38	25.16	25.40	25.15	0.177	ns	ns	ns
c7-16:1	0.49	0.46	0.48	0.47	0.007	*	ns	*
c9-16:1	1.99	2.28	2.02	2.23	0.051	**	*	ns
17:0iso	0.56	0.55	0.57	0.54	0.006	ns	*	ns
17:0ai	0.58	0.56	0.55	0.59	0.010	ns	ns	ns
17:0	1.15	1.07	1.11	1.12	0.020	ns	ns	ns
c9-17:1	0.71	0.67	0.65	0.73	0.011	*	***	ns
18:0iso	0.15	0.15	0.14	0.15	0.003	ns	ns	ns
18:0	11.06	11.26	11.46	10.87	0.185	ns	ns	ns
t9-18:1	0.22	0.27	0.26	0.23	0.008	**	ns	ns
t10-18:1	0.59	0.50	0.57	0.51	0.067	ns	ns	ns
t11-18:1	0.67	0.65	0.66	0.67	0.025	ns	ns	ns
t12-18:1	0.26	0.28	0.28	0.26	0.006	ns	ns	ns
c9-18:1	33.57	34.83	33.37	34.96	0.385	ns	*	ns
c11-18:1	0.98	0.96	0.94	0.99	0.020	ns	ns	ns
c12-18:1	0.25	0.29	0.28	0.26	0.009	*	ns	ns
c13-18:1	0.09	0.11	0.09	0.11	0.003	**	**	ns
t16,c14-18:1	0.20	0.20	0.21	0.20	0.004	ns	ns	ns
18:2n-6	4.17	4.26	4.38	4.05	0.108	ns	ns	ns
18:3n-3	0.59	0.57	0.57	0.59	0.013	ns	ns	*
c9,t11-18:2 + t7,c9-18:2	0.48	0.47	0.46	0.48	0.013	ns	ns	ns
20:2n-6	0.02	0.02	0.02	0.02	0.001	ns	ns	ns
20:4n-6	1.06	0.97	1.04	0.99	0.054	ns	ns	ns
20:3n-3	0.01	0.01	0.01	0.01	0.001	ns	ns	ns
20:5n-3	0.11	0.10	0.10	0.11	0.006	ns	ns	ns
22:0	0.022	0.017	0.02	0.02	0.001	*	ns	ns
22:4n-6	0.11	0.08	0.10	0.09	0.004	**	*	ns
22:5n-3 (DPA)	0.33	0.28	0.31	0.30	0.011	*	ns	ns
22:6n-3 (DHA)	0.12	0.10	0.11	0.11	0.005	*	ns	*

¹ * $P \leq 0.05$; ** $P < 0.01$; *** $P < 0.001$; ns = not significant.

Conclusions

- ❑ **Our data** confirm the suitability of Sarda breed ewes for the production of heavy dairy lamb and **show that crosses with Dorper meat rams could provide better carcass traits**, as the carcasses of Dorper x Sarda lambs had a **lower fat accumulation** and a **better FA profile than purebred lambs**.
- ❑ Crosses between dairy ewe breeds, such as the Sarda, and meat breeds, such as the Dorper, **may help to improve meat value and accessibility**, although the commercial viability of producing this new type of lamb remains to be determined.



Contents lists available at ScienceDirect

Meat Science

journal homepage: www.elsevier.com/locate/meatsci



The heavy suckling lamb of Sarda dairy sheep and its crossbreed with Dorper rams: Performance, meat quality and consumer perceptions

Mondina Francesca Lunesu, Gianni Battacone^{*}, Maria Rita Mellino, Silvia Carta, Giuseppe Pulina, Anna Nudda^{*}

Dipartimento di Agraria, University of Sassari, Viale Italia 39a, 07100 Sassari, Italy

ARTICLE INFO

Keywords:

Dorper x Sarda lamb

ABSTRACT

The increase of meat production in dairy sheep farms, has been evaluated by the extension of the suckling period from the traditional 28 days to 75 days to obtain a new product, the heavy suckling lamb. Nineteen single-born



UNISS

UNIVERSITÀ
DEGLI STUDI
DI SASSARI

Thanks for your attention



75th EAAP Annual
Meeting
1/5 September 2024 -
Florence, Italy

