THE PRODUCTION AND QUALITY ANALYSIS OF LATVIAN DARKHEAD BREED LAMBS

Dace BĀRZDIŅA, Daina KAIRIŠA
Institute of Agrobiotechnology, Faculty of Agriculture, Latvian University of Agriculture
Liela iela 2, LV-3001, Jelgava, Latvia
Emails: dace.barzdina@llu.lv, daina.kairisa@llu.lv

Abstract. *In Latvia, people predominantly breed Latvian dark head breed lambs with seasonal rutting between July and December. Due to economic reasons, part of the sheep breeders organize the lambing of ewes in spring months, when lambs are born in April, May, shortly before the beginning of the pasture season. The lambing season of ewes affect the development and growth of lambs, predominantly the increase in live weight per day. The aim of the study – to analyse the impact of lambing season of ewes on lamb growth rates during the lactation period. The farm being studied is situated in Latvia, in Northern Vidzeme and mostly breeding Latvian dark heads breed. This study uses the production results for farm-born lambs in 2013 and 2014. For the purposes of data analysis we established 3 groups, depending on the lambing season and lamb gender. By performing the variance analysis of the results obtained, we concluded that the age of ewes had a significant impact on the number and live weight of lambs at birth, and the fertility of ewes had a significant impact on breeding of lambs. The ewes of spring-born lambs were 3 years old on average and 2 lambs per ewe lambed were obtained on average, which differed significantly from winter and summer-born lamb groups. During the study, it was demonstrated that the number of lambs per litter affects the live weight of lambs at birth, the spring-born male (3.8 kg) and female (3.7 kg) lambs were significantly lighter than those born in winter and summer. During the lactation period, the highest increase in daily live weight was obtained from summer-born lambs of both genders. The male lambs reached 287.3 g and the female lambs – 269.0 g. According to the results obtained in the study, we conclude that the largest number of ewes lambed in spring, and they are most efficiently used during this season.*

Key words: *Latvian dark head lambs, lambing season, live weight, litter size at birth, growth gain.*

INTRODUCTION

In Latvia, people predominantly breed Latvian dark head breed lambs with seasonal rutting between July and December. Due to economic reasons, part of the sheep breeders organize the lambing of ewes in spring months, when lambs are born in April, May, shortly before the beginning of the pasture season.

Depending on the sheep mating time, lambing of sheep takes place mainly in two periods, and therefore it is common to divide between lambing in winter and spring months. Lambing of sheep in winter takes place in December, January and February, which is the coldest time of year. In Latvia, lambing of ewes traditionally occurs in winter months. Lambing of sheep in spring takes place in the warmest months: March, April and May. Such organization for lambing of ewes is suitable for sheep farms, where sheep are kept in cold sheds, lightweight construction buildings, or outdoors throughout the year. The advantage of lambing of ewes in spring is the fact that sheep with lambs consume a smaller amount of winter feed, especially fodder, since sheep and lambs are kept in a shed for a smaller period of time. As early as in May, sheep and lambs may be placed on the pasture, where they can consume fresh, protein-rich pasture grass.

The advantage of lambing of ewes in winter is the fact that sheep reach their breeding readiness in the autumn period (during the season of intensive rutting), which is particularly important for selling of breeding animals, since the owners are willing to buy breeding animals as soon as in August. A prerequisite for organising the lambing of ewes in winter is a thermally insulated shed. Some of the shortcomings are larger consumption of fodder and high costs for construction of a shed, since a thermally insulated shed must be built [6].

One of the main characteristics of sheep productivity is production and rearing of lambs. The main factors affecting it are the number of lambs at birth, milkiness of ewes, behaviour of ewes (maternal instinct), lamb health condition and organization of feeding.

The lambing season of ewes affect the development and growth of lambs, predominantly the increase in daily live weight. It is preferable to mate ewes in late summer (so that they would lamb in winter), and maintain a

greater number of old sheep (from 4 to 6 years) in the flock. When feeding the ewes, most attention should be paid to the second half of gestation (100th day), obtaining lambs with higher live weight at birth (3.5-5.0 kg), which will further affect their growth rate [10].

The number at birth has a significant impact on the number of lambs weaned. It is easier to preserve the lambs born as singles or twins, rather than those born as triplets or quadruplets. Preservation of lambs also depends on the technology used for provision of sheep and rearing of lambs applied in the farm.

The aim of the study – to analyse the impact of lambing season of ewes on lamb growth rates during the lactation period.

MATERIALS AND METHODS

The farm being studied is situated in Latvia, in Northern Vidzeme. The farm is breeding Latvian dark heads, Oxford Down and Texel sheep breeds. On 01/01/2015, the total number of sheep of different age was 851. The farm pays great attention to preparation of good roughage. In spring, following the weaning of lambs, ewes and lambs are grazed in good-quality cultivated pastures providing all the necessary nutrients. Based on the fact that the Latvian dark head is the basic breed in Latvia, this study analyses the growth of Latvian dark head breed lambs during the lactation period and quality during the evaluation. This study uses the production results for farm-born lambs in 2013 and 2014. For the purposes of data analysis we established 3 groups, depending on the lambing season and lamb gender, where the highest number of lambs – 83.1% were born in spring, 11.1 % of lambs were born in summer and 5.8% were born in winter (Table 1).

Table 1

Number of lambs of the study seasons

Lambing seasons	Male	Female	Together	%
Winter	10	9	**19**	**5.8**
Spring	147	123	**270**	**83.1**
Summer	15	21	**36**	**11.1**
Together	**172**	**153**	**325**	**100**

The winter season included lambs born in December, January and February, the spring season – lambs born in March and April, and the summer season – lambs born in May, June and July. Data on the number of lambs at birth, live weight at birth, the increase in live weight per day until weaning and adjusted live weight at 70 days of age were obtained from the Agricultural Data Centre database. According to a breeding programme developed in Latvia for Latvian dark head breed sheep, lambs are evaluated between the 60th and the 95th day of life, the live weight of lambs during the evaluation is determined and recalculated to 70 days of age, so that the lambs might be divided into the relevant classes (from Elite – Class II) [2].

During the study, in order to characterise the efficiency of ewes, the live weight of lambs with 70 days of age obtained from a single ewe has been calculated.

The data obtained were processed using the software *MS Excel*, using mathematical data processing methods. The average values, standard error and coefficient of variation of the characteristics listed were calculated. The significance of differences among the average values was determined using the t – test, and the impact of factors – single-factor analysis of variance. In order to describe the significance of differences in the results obtained, we used the following Latin alphabet letters: a; b; and c ($p \leq 0.05$).

RESULTS AND DISCUSSION

Live weight and growth rate during the lactation period is affected by gender and number of lambs at birth, live weight and feeding of the ewe, breed, as well as external environmental factors [9].

By performing the variance analysis of the results obtained, we concluded that the age of ewes had a significant impact on the number and live weight of lambs at birth, and the fertility of ewes had a significant impact on breeding of lambs. Table 2 summarizes the average number and live weight of lambs at birth born in different seasons, as well as information on the average age of ewes.

Table 2

Averages of lamb birth parameter and age of sheep by lambing seasons

The outcomes	Lambing seasons					
	winter		spring		summer	
	male	female	male	female	male	female
	$\bar{x} \pm s_{\bar{x}}$	$\bar{x} \pm s_{\bar{x}}$	$\bar{x} \pm s_{\bar{x}}$	$\bar{x} \pm s_{\bar{x}}$	$\bar{x} \pm s_{\bar{x}}$	$\bar{x} \pm s_{\bar{x}}$
Age of sheep, years	2.8±0.20[a]	3.3±0.29[a]	3.1±0.07[b]	2.9±0.07[b]	1.5±0.13[c]	1.5±0.05[c]
Size at birth	1.7±0.15[a]	1.9±0.11[a]	2.0±0.04[b]	2.0±0.04[a]	1.2±0.11[c]	1.3±0.10[b]
Live weight at birth, kg	4.7±0.34[a]	4.5±0.25[a]	3.8±0.07[b]	3.7±0.07[b]	4.3±0.24[a]	3.8±0.17[b]

[a;b;c] $p \leq 0.05$ – productivity characteristics of lambs of the same gender according to different seasons of birth

As evidenced by the results obtained, the youngest ewes have lambed in the summer season (1.5 years) and are significantly younger than the ewes that have lambed in the summer and winter seasons. The oldest ewes that have given birth to female lambs were 3.3 years old, which is by 0.4 years older than the ewes that lambed in spring ($p \leq 0.05$). The significantly older ewes (3.1 years) that have given birth to male lambs lambed in spring. By mating the breeding sheep from 10 to 12 months of age, the vast majority of young sheep gives birth to only 1 lamb, this can be attributed to a significantly smaller number of lambs per litter during the summer season of lambing, both in male and female lamb groups. In both male and female lamb groups, significant differences were observed in age of ewes between winter and summer, as well as between spring and summer seasons of lambing ($p \leq 0.05$). The results obtained from studies with Merino sheep carried out in South Africa confirmed that age, live weight and year of birth of ewes had a significant impact ($p \leq 0.01$) on lamb productivity characteristics. A significant impact on live weight of lambs weaned (60 days) in the first lambing of sheep was obtained. From sheep born as twins a 7.6% (0.40 lambs) increase in lambs obtained and a 7.4% (0.30 lambs) increase in lambs weaned was observed if compared to their peers born as singles [3]. Similar results were obtained in studies conducted in New Zealand [7].

By analysing the average number at birth in male and female lamb groups, the largest number was obtained in the group of ewes lambing in spring – 2.0 lambs per ewe, but the lowest result – from ewes lambing in summer 1.2 and 1.3 lambs per litter respectively. The number of summer-born lambs at birth was significantly lower than winter and spring-born lambs ($p \leq 0.05$). Significant differences in number at birth were also observed among male lambs born in winter and spring ($p \leq 0.05$). The results obtained from studies carried out in Turkey with local and Romanov breed sheep regarding seasonal effects on lamb growth and development confirmed that the number of lambs at birth in winter season of lambing was higher, 1.27 lambs per litter on average, but lower in spring – 1.26 lambs per litter. A higher live weight at birth was demonstrated by Romanov breed lambs: 4.3 kg in winter season and 3.9 kg in summer season [5].

The studies conducted in Australia found that male lambs were significantly heavier by 0.2 kg ($p \leq 0.05$) on average compared to the female lambs and that lambs born as singles were heavier by 1.1 kg ($p \leq 0.001$) on average than twin lambs [4], [8].

A similar trend was also observed in our study, where the smallest live weight at birth was found among the spring-born male lambs – 3.8 kg and female lambs – 3.7 kg. If compared to the spring-born lambs, significantly heavier lambs were born in winter, 4.7 kg and 4.5 kg respectively, demonstrating a 0.9 kg increase for male and a 0.8 kg increase for female lambs. In male lamb group, significant differences in live weight at birth between winter and spring seasons of lambing ($p \leq 0.05$) were observed. In female lamb group, significant differences in live weight at birth between winter and spring seasons of lambing ($p \leq 0.05$) were observed. Although the number of lambs per litter born in summer constituted 1.3, their live weight was not significantly different if compared to summer-born female lambs. The study carried out in Lithuania using Lithuanian blackhead breed sheep also showed that winter-born lambs were by 0.2 kg heavier – 3.94 kg than those born in spring – 3.74 kg [10].

An important characteristic of meat productivity is increase in daily live weight characterizing the lamb growth ability. By performing a monthly control weighing of lambs, we can calculate the increase in daily live weight of lambs. See Figure 1 for increase in daily live weight of male and female lambs until evaluation.

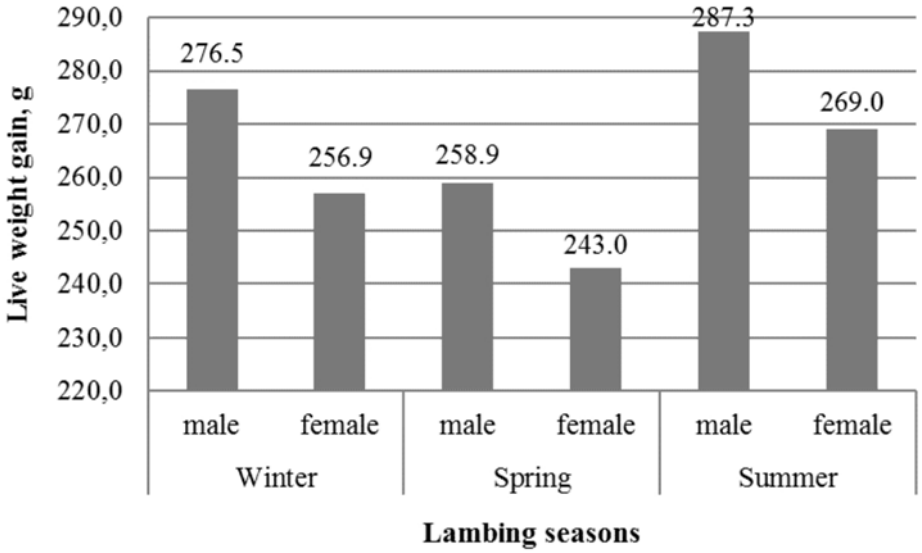

Figure 1. **Male and female average daily live weight gain depending on the season**

As demonstrated by the results obtained, in different seasons of birth, male lambs showed a greater increase in daily live weight until evaluation if compared to female lambs. Increase in daily live weight of summer-born male lambs during the lactation period constituted 287.3 g, which is by 10.8 g higher than for lambs born in the winter season and by 28.4 g higher than for lambs born in the spring season respectively. Increase in daily live weight of summer-born female lambs during the lactation period constituted 269.0 g, which is by 12.1 g higher than for lambs born in the winter season and by 26.0 g higher than for lambs born in the spring season respectively. This can be explained by balanced feeding of ewes and lambs using good-quality grass feed during the summer months. No significant differences in increase in daily live weight of lambs until weaning among different seasons of lambing were observed.

In order to evaluate the quality of farm-grown lambs, the adjusted live weight of male and female lambs at 70 days of age (Figure 2) has been calculated. Based on the requirements of the breeding programme for Latvian dark head breed lambs, lambs born as singles should weigh at least 20 kg, and the lambs born as twins – at least 18 kg.

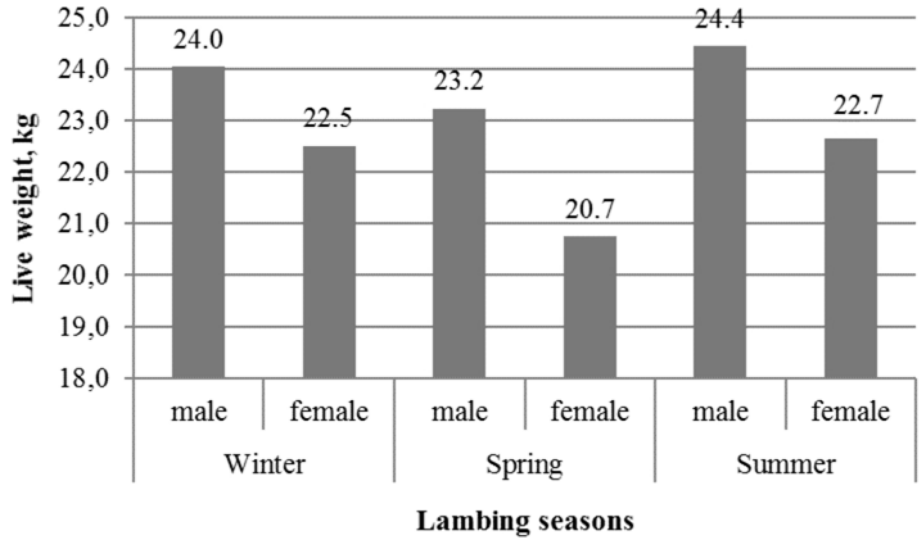

Figure 2. **Male and female average live weight until weaning depending on the season**

The results summarized in the figure show that in all seasons of the study lambs of both genders at 70 days of age have exceeded the requirements specified in the breeding program. Organizing the lambing of ewes in

the farm during the summer months has resulted in the highest adjusted live weight of lambs of both genders at 70 days of age – 24.4 kg for male and 22.7 kg for female lambs, which was by 0.4 kg higher than for winter-born and by 1.2 kg higher than for spring-born male lambs. In the female lamb group, this indicator was by 0.2 kg higher than for winter-born and by 2.0 kg higher than for spring-born lambs. No significant difference in adjusted live weight of lambs at 70 days of age was observed. The study results obtained in Turkey are different from our findings. In studies carried out there on seasonal effects on the growth and development of lambs, the spring-born lambs after weaning (at 60 days of age) were by 1.6 kg heavier (18.3 kg) ($p < 0.05$) than the winter-born lambs – 16.7 kg [5]. The results obtained in Lithuania are similar to our results of the study, where winter-born lambs at 60 days of age reached 26.15 kg, and were by 8.4 kg heavier than the spring-born lambs [10]. The results of studies conducted confirm that female lambs are born with a lower live weight, obtain a lower increase in live weight per day, weighing less than the male lambs at 70 days of age. In studies conducted in Turkey using Akkaraman sheep breed, the weaning live weight of female lambs at 60 days of age reached 15.9 kg, and for male lambs – 17.1 kg [1].

Table 3 summarizes the results calculated for evaluation of ewe efficiency according to lambing seasons.

Table 3

The lamb average live weight to the lambing sheep in different seasons

Parameters	Winter		Spring		Summer	
	male	female	male	female	male	female
Lamb extraction (mother fertility)	1.7	1.9	2.0	2.0	1.2	1.3
Lamb live weight of the 70 days, kg	24.0	22.5	23.2	20.7	24.4	22.7
Lamb live weight to the lambing sheep, kg	40.8	42.8	46.4	41.4	29.3	29.5

Results of calculations made show that ewes have been most efficiently used in the spring season, when 46.4 kg of live weight per ewe were obtained on average in the male lamb group, which is by 5.6 kg higher than for winter-born and by 17.1 kg higher than for summer-born lambs. The most efficient use of ewes in production of female lambs has been observed in the winter season, where the average live weight of lambs at 70 days of age per ewe constituted 42.8 kg, which is by 1.4 kg higher than for spring-born and by 12.3 kg higher than for summer-born lambs.

CONCLUSIONS

1. The ewes of spring-born lambs were 3 years old on average and 2 lambs per ewe lambed were obtained on average, which differed significantly from winter and summer-born lamb groups ($p \leq 0.05$).
2. During the study, it was demonstrated that the number of lambs per litter affects the live weight of lambs at birth, the spring-born male (3.8 kg) and female (3.7 kg) lambs were significantly lighter than those born in winter and summer ($p \leq 0.05$).
3. During the lactation period, the highest increase in live weight per day was obtained from summer-born lambs of both genders. The male lambs reached 287.3 g and the female lambs – 269.0 g. The adjusted live weight of these lambs at 70 days of age was the highest among the study groups reaching 24.4 kg for male lambs and 22.7 kg for female lambs.
4. According to the results obtained in the study, we conclude that the mating and lambing of ewes in the farm is organized in accordance with the strategy developed, – the largest number of ewes lambed in spring, and they are most efficiently used during this season.

ACKNOWLEDGEMENTS

The preparation of the paper was supported by the Ministry of Agriculture, Project “Different breeds of sheep and their crosses suitability of quality lamb carcasses and meat production”, agreement No. 070515/S 37

REFERENCES

1. Aktaş A. H., Doğan Ş. (2014) Effect of live weight and age of Akkaraman ewes at mating on multiple birth rate, growth traits, and survival rate of lambs. *Turkish Journal of Veterinary and Animal Sciences*, 38, pp. 176-182. Available at: http://journals.tubitak.gov.tr/veterinary/issues/vet-14-38-2/vet-38-2-10-1301-10.pdf
2. Ciltsdarba programma Latvijas tumšgalves aitu šķirnei no 2014. gada 1. jūlija līdz 2019. gada 30. jūnijam. (perspektīvā līdz 2024. gada 30. jūnijam) (2013) *Biedrība "Latvijas aitu audzētāju asociācija",* 55 p. Available at: www.latvijasaita.lv/doc/Ciltsdarba_programma_Latvijas_tumsgalves_aitu_skirnei.pdf
3. Duguma G., Schoeman S.J., Cloete S.W.P., Jordaan G.F. (2002) Genetic and environmental parameters for ewe productivity in Merinos. In: *South African Society for Animal Science, South African Journal of Animal Science 2002*, 32 (3) pp. 154-159 Available at: http://www.sasas.co.za/sites/sasas.co.za/files/duguma3vol32no3_0.pdf
4. Gardner D. S., Buttery P. J., Daniel Z., Symonds M. E. (2007) Factors affecting birth weight in sheep: maternal environment. *Europe PubMed Central Journals, Reproduction, Author Manuscript.* 21 p. Available at: file:///D:/Downloads/nihms-962%20(1).pdf
5. Koycegiz F., Emsen E., Diaz C. A. G., Kutluca M. (2009) Effects of Lambing Season, Lamb Breed and Ewe Parity on Production Traits of Fat Tailed Sheep and Their Lambs. *Journal of Animal and Veterinary Advances*, 8 (1), pp. 195-198. Available at: http://docsdrive.com/pdfs/medwelljournals/javaa/2009/195-198.pdf
6. Luik H., Pīrsalu P., Vahejoe K. (2011) Aitkopības rokasgrāmata. *Igaunijas-Latvijas sadarbības projekta "BUY LOCAL" ietvaros*, Ape, Latvia, 45 p. Available at: http://www.apesnovads.lv/wp-content/uploads/2012/03/Aitkop%C4%ABbas-rokasgr%C4%81mata.pdf
7. Morel P.C.H., Wickham J.L., Morel J.P., Wickham G.A. (2010) BRIEF COMMUNICATION: Effects of birth rank and yearling lambing on long-term ewe reproductive performance. In: *Proceedings of the New Zealand Society of Animal Production 2010*, New Zealand, 70, pp. 88-90. Available at: file:///D:/Downloads/Effects%20of%20birt.pdf
8. Oldham C. M., Thompson A. N., Ferguson M. B., Gordon D. J., Kearney G. A., Paganoni B. L. (2011) The birthweight and survival of Merino lambs can be predicted from the profile of liveweight change of their mothers during pregnancy. In: CSIRO PUBLISHING, Animal Production Science, 51, pp.776–783. Available at: http://www.lifetimewool.com.au/pdf/APS/AN10155.pdf
9. Thomson B.C., Muir P. D., Smith N.B. (2004) Litter size, lamb survival, birth and twelve week weight in lambs born to cross-bred ewes. In: *Proceedings of the New Zealand Grassland Association 66,* New Zealand, pp. 233–237. Available at: http://www.grassland.org.nz/publications/nzgrassland_publication_442.pdf
10. Zapasnikienė B. (2002) The Effect of Age of Ewes and Lambing Season on Litter Size and Weight of Lambs. *Veterinarija ir Zootechnika*, 19 (41), pp. 112-115. Available at: http://vetzoo.lva.lt/data/vols/2002/19/pdf/zapasnikiene.pdf