

## GROWTH OF LAMBS OF THE ILE-DE-FRANCE BREED FROM BIRTH TO WEANING AND FACTORS AFFECTING IT

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### Abstract

*The present study examines the growth of lambs of the Ile-de-France breed from birth to weaning (at 70 days old). The research involves 1662 lambs born in the period 2017-2018. The animals are bred under similar technological conditions in three farms located in Northern Bulgaria which are controlled by the Ile-de-France Breeders Association in Bulgaria (AILFB). It has been ascertained that the male lambs are born with an average live weight of  $4.531 \pm 0.042$  kg, they reach  $14.90 \pm 0.078$  kg at 30 days old, and  $27.31 \pm 0.155$  at 70 days old, while the female lambs -  $4.462 \pm 0.043$ ,  $14.74 \pm 0.085$ , and  $27.56 \pm 0.158$ , respectively. The gender is not a reliable source of variation regarding this parameter. The farm, year, season and month of birth, father and mother factors have a complex interrelationship but, as a whole, the farm and the father are the factors which influence significantly the live weight of lambs at birth and their growth until 70 days old. It has been established that it is possible the growth of lambs to be regulated by modelling the genetic and environmental factors influencing it.*

**Key words:** growth until weaning; lambs; Ile-de-France.

### INTRODUCTION

Ile de France breed is a specialized French meat breed. The breed formation process was started by Professor Auguste Yart of the National Veterinary College Maisons-Alfort, France in 1824.

The breed was acknowledged in 1920 and is given the name Ile-de-France. Currently, the breed is reared in 51 countries (INSEM OVIN, 2020) on all continents. According to data of France Génétique Elevage (2020), 210,000 sheep of the Ile-de-France breed are reared in France.

The first import of the Ile-de-France breed in Bulgaria was performed in 1968. The major purpose of the studies during the initial years was ascertainment of the acclimatization and productive characteristics of the breed and the opportunities for crossbreeding with the breeds reared in the country.

The Ile-de-France breed successfully adapts and has therefore been bred under extended reproduction for more than 50 years, being the major specialized meat breed in Bulgaria.

According to data of the Ile-de-France Breeders Association in Bulgaria (AILFB), in 2019 the livestock population was 6,853 full-bred animals and around 2,500 cross-breeds.

The population state, the animals growth and the factors influencing it regarding the Ile-de-

France breed are studied by plenty of authors (Achkanova et al., 2019; Dimitrov, 1991; Dimitrov et al., 2011; Ivanova et al, 2017; Metodiev et al., 2010; Raychev et al., 2010).

The possibility for crossbreeding with Bulgarian breeds and improvement of their meat qualities as well as the economic efficiency of the breeding are also of research interest (Dimitrov, 1988; Marinova, 1976; Slavov, 2007).

In the recent years there has been an increased interest in the Ile-de-France sheep breed in Bulgaria. Deeper and up-to-date studies are therefore necessary for the purpose of maintaining the parameters of the main productive features in compliance with the Selection program for breeding the Ile-de-France in Bulgaria (Dimitrov et al., 2016).

The aim of the present study is to ascertain the growth of the lambs of the Ile-de-France breed until weaning and the influence of basic genetic and paratypical factors on it.

### MATERIALS AND METHODS

The study was carried out in 3 farms rearing pure-breed sheep of the Ile-de-France breed. The farms are situated in Northern Bulgaria.

The animals in Farms № 1 and № 2 are both shed and pasture reared. During the shed period, silage feeds are also added to the main

ration in Farm № 1. Both farms practise natural mating of groups of 30-35 female animals with 1 main ram and 1 substitute ram.

The flock in the first farm is separated into two groups where the first group mates in the period April - May, and the second one - August - September. The mating in the second farm is performed in the period April - May. The animals in Farm № 3 are entirely shed-bred with coarse feed from feeding crib. The flock is divided into two groups where the first group are inseminated in the spring and the second one - in the autumn.

Hormonal oestrus synchronization and hand service are used. Again, the sheep are separated into groups but 1 ram is used for a group of 5 sheep. In 2018, laparoscopic artificial insemination with frozen semen from elite rams was performed in Farms 1 and 3 to, respectively 50 and 100 animals.

The pellets are purchased from "Artificial Insemination and Ram testing Station" in France. Five and respectively ten brood rams of different lineage were used in the first farm and the second farm.

The study involves 1,662 lambs - 851 male and 811 female ones born in 2017 (n - 783) and 2018 (n - 879).

In compliance with the technology used, the ewes generally yearen in the autumn (n - 1042), in September (n - 406), October (n - 613), November (n - 23) and the winter (n - 480) - in January (n - 358) and February (n - 122). 140 are the lambs born in the spring - in April (n - 45) and May (n - 95).

According to the Instruction on the Control of the productive qualities and valuation, endorsed in the Selection program for breeding the Ile-de-France in Bulgaria (Dimitrov et al., 2016), the lambs are weighed at birth, at 30 days old, and at 70 days upon weaning.

The data are processed via one-way (M1) and multi-factor analysis of variance whose models are the following:

$$Y = \mu + Y_i + M_j + F_k + SX_l + YM_{ij} + YF_{ik} + YS_{il} + MF_{jk} + MS_{Xjl} + FS_{Xkl} + YMF_{ijk} + YMS_{Xijl} + YFS_{Xikl} + MFS_{Xjkl} + YMF_{SXi} + e_{ijkl} \quad (M2),$$

$$Y = \mu + Y_i + SZ_m + F_k + SX_l + YSZ_{im} + YF_{ik} + YSX_{il} + SZF_{mk} + SZSX_{ml} + FS_{Xkl} + YFS_{Xikl} + SZFS_{Xmkl} + e_{imkl} \quad (M3),$$

$$Y = \mu + SR_n + MD_o + F_k + SX_l + FS_{Xkl} + SXSR_{ln} + e_{kln} \quad (M4),$$

Where: Y, M, F, SX, SZ, SR, MD are fixed effects of, respectively i - year of birth, j - month of birth, k - farm, l - gender, m - season of birth, n - father and o - mother; YM, Y\*\*, M\*\*, F\*\*, SZ\*\*, SXSR - are random effects of interaction between the respective factors.

The statistical processing is performed via SPSS 21.

## RESULTS AND DISCUSSIONS

The lambs from the population examined by us were born with an average live weight of  $4.497 \pm 0.030$  kg, and the male lambs were 1.5% heavier than the female ones (Table 1), however, the difference is unreliable (Table 2). The variation is in a relatively wide range of 27.0% for the male and 27.9% for the female lambs. Upon studying the population in a previous period, Achkakanova and Staykova (2019) ascertained similar live weight at birth of female lambs - 4.564 kg, which comes to prove that this parameter is stable around that level.

Table 1. Ile-de-France breed live weight at birth, at 30 days old and 70 days old

Age	Gender	Mean	Std. Er.	Std. Dev.
At birth	Male	4.531	0.042	1.225
	Female	4.462	0.043	1.247
30 days	Male	14.90	0.078	2.271
	Female	14.74	0.085	2.424
70 days	Male	27.31	0.155	4.598
	Female	27.56	0.158	4.514

Of all paratypical factors examined by us, the farm is the only one having reliable influence on the live weight of lambs at birth ( $P < 0.001$ ) with an average live weight difference between the different farms from 1.52 to 19.5% (Table 3). There was also a reliable difference in the live weight of the lambs, reared in the different farms, which were born in one and the same month ( $P < 0.01$ ).

Our study corroborates the influence of the farm ascertained by Achkakanova and Staykova (2019), but does not take into account the influence of the year of birth on the live weight at birth of lambs of the Ile-de-France breed and their growth during the next periods. Considerable influence of the year on the live weight at birth and the growth until weaning is

also ascertained by Dimitrov (1978), Dimitrov et al. (1982).

The factors year of birth, month of birth and farm, however, probably have varied impact on the live weight at birth as, within the year, the reliable effect of the “farm” factor turns pale (Table 2).

Similar interactions to those mentioned above are also observed when the months are grouped into seasons. Like the month of birth, the season does not affect the live weight of lambs upon birth on its own, but the farm is a reliable source of variation within the season. The interaction farm\*season\*year of birth is close to the interaction farm\*month of birth\*year of birth- within the year and the season, the farms are not a reliable source of variation in the live weight at birth.

Along with the farm, the father also considerably affects ( $P < 0.05$ ) the live weight at birth (Table 4). The same analysis model indicates differences ( $P < 0.01$ ) between the genders, however, the male and female lambs in the separate farms have not appreciably differed in their live weight at birth. The fathers have not exhibited reliable influence within the different genders which shows that the father influences the size of lambs in general.

Achkakanova and Staykova (2019) have ascertained the influence of the farms on the live weight at birth as well as at all other ages examined.

Along with the reliable difference at birth, the lambs from the different farms also varied in their growth until weaning. The lambs with biggest live weight at birth also had the biggest live weight at 30 days old (Farm № 3). The difference with the other two farms where the live weight at birth is similar is 27.2 and 33.0%. In the second farm, there is a relative slowdown in growth around 30 days old which is compensated in the next period until weaning. The difference with the farm with biggest live weight of lambs at birth, however, is not compensated and even increases to 38.8%.

Dimitrov et al. (1982) and Ivanova et al. (2017) report bigger average live weight at birth, but the values at the other ages are lower, i.e. just like we observed in the second farm, there is a certain slowdown in the growth around day 30 which is compensated until weaning.

The results of Raycheva et al. (200%) are similar - lower live weight at birth (4.370 kg), at 30 days old (11.826 kg) and at 70 days old (20.750 kg), whereas Laleva et al. (2006) publishes data indicating even lower average weight at birth - 3.570 kg but the results regarding the other ages are close to those of Raycheva et al. (2005).

Dimitrov (1978) specifies slightly lower values of the parameter examined at birth and at 1 month old with reference to the lambs of introduced mothers, and results close to ours with reference to the lambs of ewes born and reared in Bulgaria. Achkakanova and Staykova (2019) report observations performed and results gained regarding the live weight parameter as follows- the live weight of lambs of the Ile-de-France breed at birth is 4.457 kg, at 30 days old 15.164, at 70 days old - 23.736 kg, at 9 months - 54.761 kg and at 24 months - 70.939 kg. The results we obtained in the present study on the ascertainment of the growth of lambs of the Ile-de-France breed from birth to weaning are also close to those announced in the Ile-de-France Breeders Association in Bulgaria (AILFB) report for 2018 in which results of the entire population reared in Bulgaria are presented. During all periods examined, the “farm” factor keeps its reliable influence on the live weight of the lambs. Certain differences are also noticed in the growth of the lambs from the two genders born in different months but, as a whole, the gender is not a reliable source of variation of the growth.

A range of specific interactions have a considerable effect on the weight at weaning: the farm within the month and year of birth ( $P < 0.05$ ), the gender within the farms and the year of birth ( $P < 0.05$ ), the gender within the scope of the farm, month and year of birth ( $P < 0.05$ ).

Upon grouping the months into seasons, the specific effects disappear which shows that, upon specifying the breeding value, the factors farm, year and month of birth should be included in the linear models.

The descendants of the different stock-breeding farms differ considerably both in their live weight at birth and in their growth and weight upon weaning.

Table 2. Influence of major paratypical factors on the live weight at birth and the growth of lambs of the Ile-de-France breed until weaning

Model	Factor	Age					
		At birth		30 days		70 days	
		F	Sig.	F	Sig.	F	Sig.
M1	gender	1.287	0.257	1.861	0.173	1.276	0.259
M2	year of birth	0.323	0.570	0.000	0.996	2.884	0.090
	month of birth	0.652	0.753	1.528	0.132	0.537	0.848
	farm	9.958	0.000	137.764	0.000	324.704	0.000
	gender	1.084	0.298	1.527	0.217	0.003	0.956
	year * month	0.718	0.541	1.336	0.261	1.823	0.141
	year * farm	1.280	0.278	15.296	0.000	0.249	0.780
	year * gender	0.529	0.467	4.245	0.040	0.735	0.391
	month * farm	6.291	0.000	5.929	0.000	5.570	0.000
	month * gender	1.511	0.159	2.147	0.036	2.030	0.048
	farm * gender	0.229	0.795	0.364	0.695	0.813	0.444
	year * month * farm	0.136	0.713	0.968	0.325	4.794	0.029
	year * month * gender	1.224	0.269	7.090	0.008	3.369	0.067
	year * farm * gender	1.119	0.327	0.497	0.608	3.188	0.042
	month * farms * gender	1.590	0.123	1.515	0.147	1.806	0.072
year * month * farm * gender	3.330	0.068	0.255	0.613	6.271	0.012	
M3	Year of birth	0.001	0.982	0.012	0.914	0.023	0.880
	Season of birth	0.290	0.748	1.497	0.224	0.798	0.450
	Farm	43.835	0.000	692.576	0.000	1541.587	0.000
	Gender	0.068	0.795	0.000	0.988	1.020	0.313
	year * season	0.003	0.957	0.615	0.433	0.005	0.944
	year * farm	0.444	0.642	16.718	0.000	4.001	0.018
	year * gender	0.337	0.562	4.884	0.027	1.314	0.252
	season * farm	18.936	0.000	11.347	0.000	2.588	0.052
	season * gender	0.447	0.639	2.816	0.060	0.918	0.400
	farm * gender	0.122	0.885	0.711	0.491	0.516	0.597
	year * farm * gender	0.216	0.806	3.241	0.039	0.594	0.552
season * farm * gender	1.324	0.265	1.637	0.179	0.057	0.982	

Table 3. Live weight at birth and growth of lambs of the Ile-de-France breed until weaning in different farms

Age	gender	Farm					
		1 (36)		2 (46)		3 (37)	
At birth	male	4.360	1.286	4.421	1.012	5.241	1.186
	female	4.299	1.352	4.361	0.858	5.110	1.221
	Total	4.329	1.320	4.395	0.947	5.175	1.203
30 days	male	14.41	1.500	13.91	1.639	18.26	2.138
	female	14.25	1.663	13.44	1.577	18.21	2.280
	Total	14.33	1.587	13.71	1.627	18.23	2.207
70 days	male	25.69	2.691	25.44	2.620	35.67	2.301
	female	25.68	2.327	26.01	2.863	35.64	2.168
	Total	25.69	2.509	25.69	2.741	35.65	2.231

Table 4. Influence of the mother and the father on the live weight at birth and the growth of lambs of the Ile-de-France breed until weaning (Model 4)

Factor	Age					
	At birth		30 days		70 days	
	F	Sig.	F	Sig.	F	Sig.
Farm	6.329	0.012	118.699	0.000	343.810	0.000
Gender	7.534	0.006	0.549	0.459	0.014	0.908
Father	1.442	0.021	2.486	0.000	1.438	0.021
Mother	1.223	0.269	4.546	0.033	1.937	0.164
farm * gender	0.128	0.720	3.033	0.082	0.007	0.932
gender * father	0.841	0.770	1.033	0.413	0.803	0.828

## CONCLUSIONS

The male lambs of the Ile-de-France breed reared in flocks in Northern Bulgaria are born with an average live weight of  $4.531 \pm 0.042$  kg, at 30 days old they reach  $14.90 \pm 0.078$  kg, at 70 days -  $27.31 \pm 0.155$  kg and the female ones -  $4.462 \pm 0.043$ ,  $14.74 \pm 0.085$  and  $27.56 \pm 0.158$ , respectively. The gender is not a reliable source of variation of the parameters examined.

The farm year season and month of birth father and mother factors are in a complex network of interaction but as a whole it is the farm and the father that influence considerably the live weight at birth and the growth of the lambs until weaning.

Upon calculating the breeding value in terms of growth of the lambs until weaning the year and month of birth need to be included in the linear model along with the farm.

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