POPULATION AND BREEDING STATUS OF THE BULGARIAN DAIRY SYNTHETIC POPULATION, CONTROLLED BY THE BREEDING ASSOCIATION OF THE BULGARIAN DAIRY SHEEP BREEDS

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Abstract

The present study examines the dynamics of the population and the breeding status of the Bulgarian dairy synthetic population, controlled by the breeding association of the Bulgarian dairy sheep breeds as of 2011, when the breeding organisation was established, until now. It has been ascertained that during the first 5 years, the number of sheep under selection control increased 8.4 times- from 7035 to 59243 but after that it decreased and in 2020 it is 34868. The controlled sheep are reared in 212 farms- approximately 164 sheep in each of them. When compared to the initial period, the number of farms has increased by 8.5 times but the average number of sheep has decreased by 13.7%. The number of young animals secures the reproduction of the ewes- 18.2%, and the rams- 16.8%. This low reproduction percentage along with the small difference in the productivity of the elite and controlled units of the breed point to a relatively low genetic progress in the main productive features. So as the selection effect to be increased, it is recommended that the potential fathers selection be performed in the entire controlled part of the breed under the open nucleus breeding system, more young animals to be left for breeding which in turn will provide the opportunity for refining of the group, and a system for assessment of rams based on the qualities of their progeny be elaborated and applied.

Keywords: dairy sheep, breeding, population status, breeding status

INTRODUCTION

The sheep farming is a traditional sector in Bulgaria. Since prehistoric times until today, sheep have been the most popular species in the country and their number has always exceeded that of the other mammals. The earliest archaeological findings of domesticated sheep date back in Neolithic times (Hinkovski et al. 1984). Not only we have established traditions in sheep farming and lamb production but we are also one of the few countries in

Europe and the world as a whole where the sheep are also milked. Until the middle of the last century, the meat breeds, which around 1957 were 72.7% of the sheep in Bulgaria,

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were also used for milk (Hinkovski et al. 1984). After this period, the

sheep farming in our country was directed to wool production and the aboriginal breeds population was reduced to 5.9% (1982) (Stoyanow, 2013).

At the beginning of the 1980s of the previous century- 1974, a new methodology was elaborated which marked the beginning of breeding activities aimed at the creation of synthetic population of highly productive dairy sheep. The initial stages included the use of continuous hybridization scheme at different bases 'endnig with different final breeds' (Hinkovski, 2015). In 2005, the array of dairy sheep created in the above mentioned way was recognized as a new breed

<Synthetic population Bulgarian dairy> with a certificate 10645 of 30.06.2005, property of Agricultural institute Shumen. The certificate states that the <The population is created as a result of the hybridization scheme applied on the basis of fine-wool, semi-fine wool and partly specialized dairy breeds and types *'Blackhead', 'Stara Zagora' and 'Mariza'* with the use of rams from the breeds /*'East Friesian', ' Blackhead, 'Awassi' and 'Stara Zagora'.* /

It has been ascertained that as of the end of the last century, the animals of the dairy population have been bred chaotically. The breeding schemes have not been observed. Random crossing with foreign dairy breeds has been performed (Stancheva et al., 2014). As a result, the dairy population in the country varies in type, size of the animals, colour, productivity and so on. The flocks of the

institutes of the Agricultural academy, in which activities are performed for the purpose of maintaining the dairy sheep created and their improvement, are the ones to make an exception (Ivanova et al., 2015, Stancheva et al., 2014). Due to the small volume of the nucleus flocks, however, the genetic progress is relatively low and the economic effect-negative (Slavova et al., 2015). The milk yield change in the flock of the Agricultural Institute of Stara Zagora over the period 2006-2010 fluctuated- in 2006, the milk yield of the first lactation of the sheep is 111.7l, and in 2010- 112.9l (Slavova et al., 2015). In 2013, the milk yield of the sheep of the flocks of the institutes per 120-day first lactation was 92.5l for the flock of IAS Kostinbrod, 117.7 l for that of AI Stara Zagora, 119.3 l for that of AI Shumen and 119.8l for the flock AI Karnobat (Stancheva et al., 2014) despite the fact that the potential was considerably higher (Ivanova and Raicheva, 2017). The results of the experimental crossings of the Bulgarian Dairy Synthetic Population sheep (BDSP) with the Awwasi (Ivanova et al., 2015) and Lacaune (Ivanova, 2019) breeds were also unsatisfactory. The low milking productivity per 120-day period of the purebred animals of 80.02l and of the crossbreeds F1- 78.49l is explained by the negative effect of the environment in the case of the former.

At a larger scale, after the establishment of the breeding associations, the work with dairy ewes has started to acquire a certain targeting. Currently, there are 4 breeding associations working with the dairy sheep.

The aim of the present study is to

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ascertain the population and breeding status of the Bulgarian Dairy Synthetic Population, controlled by the breeding association of the Bulgarian dairy sheep breeds, and to assess the development potential on the basis of their dynamics throughout the years.

MATERIALS AND METHODS

The materials used include the herd records of the breeding association of dairy sheep breeds for the period 2011-2020, the original breeding documentation, herd books, studbooks, the breeding association reports for the above mentioned period, the information systems of the Bulgarian Food Safety Agency and Executive Agency of Selection and Reproduction in Animal Breeding. Subject to study are the dynamics of the number of the controlled sheep and flocks, the average size of the flocks, the breeding status of the flocks and their average productivity as well as the territorial distribution of the farms in the country. An analysis of the breed differentiation and the reproduction capabilities of the flocks as well as of the breeding schemes applied has also been performed.

RESULTS AND DISCUSSION

The breeding association of dairy sheep breeds was established in 2011 under art. 8 of the Animal Breeding Act and performs breeding activities with sheep- Bulgarian Dairy Synthetic Population on the grounds of license No 53 of 05.05.2011, issued by the Ministry of Agriculture, Food and Forestry under art. 29b, para. 3 of the same Act.

Upon commencement of its activities, the breeding association worked with a relatively small number of flocks (37) and animals (7035) (table 1). In the next 5 years, the number of farms is 9 times bigger, and the controlled animals- 8.4 times, reaching a maximum of 59243 animals in 2015. The main reason for the sharp increase is the stimulating state policy for inclusion of more animals in the breeding activities.

In 2016, due to liquidation of some of the farms, the number of the controlled animals decreased with 20% and during the following 2 years it remained stable regardless of the continuing reduction in the number of farms (table 2).

Table 1. Dynamics of the controlled population 2011-2015.

Category	2011	2012	2013	2014	2015
Sheep- total	7035	10953	11216	17714	59243
Ewes	5773	8817	9236	14401	49406
Rams	177	264	239	358	1059
ewe lambs	1036	1762	1657	2828	8442
ram lambs	49	110	84	127	336
Number of farms:	**37**	**49**	**52**	**84**	**335**
Average size of the flocks, number	190	224	216	211	177

Table 2. Dynamics of the controlled population 2016- 2019.

Category	2016	2017	2018	2019
Sheep- total	**47375**	**47650**	**48379**	**40984**
Ewes	35417	39300	39765	33812
Rams	1004	860	860	886
ewe lambs	10757	7362	7611	6167
ram lambs	197	128	118	149

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Number of farms:	299	254	241	233
Average size of the flocks, number	159	188	201	176

The next more considerable reduction in the number of the controlled animals was observed in 2019. The number of the farms reached the one during 2015 but the sheep were 30,8% fewer. This negative trend continues in 2020, too. At the beginning of the year the breeding association has signed breeding activities contracts with 212 farmers which is 9% less when compared with the preceding year. The number of the controlled animals decreases even more significantly- by 15.5% reaching 34686. Even though it is less dramatically, the average number of sheep in the farms is also diminishing- to 164.

The decrease in the number of the flocks and the sheep in the recent years is a general trend in the entire country. In its new history, Bulgaria used to be among the countries with the largest number of sheep per capita and per decare. In the periods 1962-1966, 1972, 1976, 1978-1985 there were over 10 million sheep in the country, and their maximum was recorded in 1984- 10 978 289 (FAOSTAT, 2020). As of the period stated before until 2002, the number of sheep falls annually. There was a fluctuation of around 1.6 million in the period 2002-2008, and after that it decreased again to reach its lowest point of 1 316 784 sheep in 2018. The trend remained the same in 2019, when, following data provided by department 'Agrostatistics' of MAFF (2020), until September 2019, the total number of sheep is 1 281 000. When compared to the previous year, the number of the dairy sheep

has decreased by 3.9% and has reached 950 000. The reduction in the number of sheep leads to the reduction in the sheep milk production. In 2019, 66 967 tonnes of sheep milk are produced in the country which is 7.1% of the total production (MAFF, 2020). When compared to 2018, the milk production has decreased by 6.4%, and when compared with 2010- by 21.2%.

The breeding association controls sheep on the entire territory of the country (table 3). Most of the farms and animals controlled are in Haskovo and Targovishte provinces; there are also provinces where there is only one flock controlled.The tendency for consolidation of farms is favourable for the sheep-breeding selection in Bulgaria.

The average size of the flocks in 2019 was 72 sheep. 74.7% of the sheep were reared in farms with more than 100 ewes, and almost 1/3 (28.7%) were reared in farms with more than 300 ewes. Having this in mind, it can be stated that the flocks, controlled by the breeding association are relatively big with an average number of sheep per flock throughout the years ranging from 159 to 224 animals.

There are some flocks where up to 1 000 sheep are reared. The largest numbers of animals in 2019 were recorded in the flocks of 'Agrofarmer- 2000' Ltd- Dimitrovgrad- 975, AC 'Edinstvo'- Komoshtitsa (Montana) - 635, APPS 'Napredak'- Byala Voda (Pleven) - 630, Ivan Karaivanov- Krivnya (Ruse)- 623, Miroslav Chilingirov- Rodopi (Haskovo) - 607, Teodora Valova- Pisarevo (Pleven)- 570 sheep.

The breeding association commences activities with a relatively non-typicized

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population. In some of the flocks there is an internal breeding and selection applied based on milk yield. In others, the crossbreeding continues with the use of mainly rams of the Assaf and Lacaune sheep breeds.

Currently, the sheep controlled by the association may be provisionally divided into two types. The first type comprises the sheep in flocks of fine- wool, semi-fine wool, and such including the East- Friesian and Stara Zagora breed. Rams from the Agricultural institutes of Shumen and Stara Zagora are used in most of these flocks. In a considerable part of the flocks the rams used are of the Assaf and Lacaune breed. As a whole, the exterior of the animals from these flocks corresponds to the information listed in the breed certificate. The animals are white, and they rarely have some small coloured spots on their faces and legs (picture 1). The second type of sheep is predominantly made up of Pleven Blackhead Sheep and the Awassi and the animals have black and brown spots mainly on their faces and legs. The fleece is often coloured (picture 2).

Table 3. Territorial distribution of the controlled population in 2019

№	Province	flocks, No	Main flock, no			Weaned lambs, No	
			Total	**Mothers**	**Rams**	**male**	**female**
1	Varna	1	350	346	4		
2	Veliko Tarnovo	8	2570	2129	57	350	34
3	Vidin	11	1600	1207	27	359	7
4	Vratsa	2	188	150	3	35	
5	Dobrich	1	173	136	4	30	3
6	Kardzhali	2	230	154	11	65	
2	Lovech	1	98	59	2	37	
7	Montana	15	3229	2543	95	586	5
8	Pleven	6	2246	1529	71	625	21
9	Plovdiv	1	131	103	2	26	
10	Razgrad	6	802	689	18	95	
11	Ruse	18	3586	3296	77	187	26
12	Silistra	16	1829	1538	29	262	
13	Stara Zagora	3	557	440	15	94	**8**
14	Targovishte	40	6416	5135	122	1158	1
15	Haskovo	95	16746	14172	343	2187	44
16	Shumen	1	150	126	4	20	
17	Yambol	1	83	60	2	21	
	TOTAL:	**233**	**40984**	**33812**	**886**	**6137**	**149**

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As a whole, both types have an exterior typical for the dairy sheep- fine and compact constitution, tall, with long body, and elongated and thin shape and bones. The exterior corresponds to the one described by Stancheva et al., (2014): 'The typical BDSP sheep have long and wide body. The udder is well-developed, the teats are properly positioned and suitable for machine milking. The head is elongated, without horns or wool. There are animals with coloured heads or black pigments on them. The neck is long, the back and the croup are straight. The tail is moderately long, thin and covered with wool; rarely it may be woolless. The fleece is white or coloured with uniform or mixed wool.'

The sheep of the controlled population are divided into two structural breeding units depending on the level of selection-pure-breed activities- national genetic fund (elite unit) and controlled unit (table 4).

The elite unit of the breed (the national genetic fund) includes 6195 ewes which are highly insufficient in terms of satisfying the ram-producing needs regarding the entire breed. The number of the young animals for breeding is relatively small. The female weaned lambs are 18.2% of all sheep which points to an

Picture 1. White sheep of the Bulgarian Dairy Synthetic breed

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Picture 2. Sheep of the Bulgarian Dairy Synthetic breed with coloured spots

Table 4. Breeding structure of the breed, 2019.

№	Province	flocks, No	Main flock, No			Weaned lambs, No	
			Total	**Ewes**	**Rams**	**Female**	**Male**
National Genetic Fund							
1	Veliko Tarnovo	5	1408	1122	33	219	34
2	Lovech	1	98	59	2	37	
3	Montana	1	634	485	26	118	5
4	Pleven	3	1084	763	33	267	21
5	Razgrad	2	384	310	8	66	
6	Ruse	9	2137	1895	39	177	26
7	Stara Zagora	1	291	223	9	51	8
8	Haskovo	6	1676	1338	23	271	44
	Total:	**28**	**7712**	**6195**	**173**	**1206**	**138**
Controlled unit							
1	Varna	1	350	346	4		
2	Veliko Tarnovo	8	1162	1007	24	131	

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3	Vidin	11	1600	1207	27	359	7
4	Vratsa	2	188	150	3	35	
5	Dobrich	1	173	136	4	30	3
6	Kardzhali	2	230	154	11	65	
7	Montana	14	2595	2058	69	468	
8	Pleven	3	1162	766	38	358	
9	Plovidv	1	131	103	2	26	
10	Razgrad	4	418	379	10	29	
11	Ruse	9	1449	1401	38	10	
12	Silistra	16	1829	1538	29	262	
13	Stara Zagora	2	266	217	6	43	
14	Targovishte	40	6416	5135	122	1158	1
15	Haskovo	89	15070	12834	320	1916	
16	Shumen	1	150	126	4	20	
17	Yambol	1	83	60	2	21	
	All:	**205**	**33272**	**27617**	**713**	**4931**	**11**
	TOTAL:	**233**	**40984**	**33812**	**886**	**6137**	**149**

approximate length of use of about 5.5- 6 years.

The relative share of lamb rams when compared to that of the rams is even smaller- 16.8%. Furthermore, in two of the national genetic fund flocks, there are no lamb rams at all. So as higher intensity of the selection to be secured, and after the breeding cost assessment is performed, it is necessary the number of the young female animals to be at least doubled.

The current structure of the population implies a relatively long generation interval. What is more, due to the enhancement of the elite unit of the breed in 2019, the selection differential between it and the controlled unit diminishes. Data of the breeding association about the above mentioned year show that the average milk yield of the sheep from the elite unit per 120- day lactation was 133.2l, and that of the controlled unit was 128.2l. When the relatively low genetic diversity of the milk yield trait in sheep (Stancheva, 2013; Collins and Conington, 2020; David et al., 2008; Othmane et al., 2002) and the generation interval of the population are taken into account, it is ascertained that the annual genetic progress would be 0.23l. This effect might be achieved provided that the population is reproduced entirely throughout the elite breeding unit which is not so and is currently impossible, and therefore the genetic progress will be even lower. At present the rams assessment in view of progeny is also not organized.

Meanwhile, both in the elite and in the controlled units of the breed there are flocks with milk yield which is considerably higher than the average. Such flocks are the flock of

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Atanas Karalashev- the village of Tsenovo, Ruse province- milking productivity- 181.5l, milk yield per 120 days- 165l; AC 'Edisntvo'- the village of Komoshtitsa, Montana province- with a milk yield of respectively 183l and 165l; Radoslav Mitev from the village of Drenov, Lovech province- 170.4 l and 150 l; Galina Mircheva- Pleven, Pleven province- 163.5l and 150.0 l and so on. These flocks should be used more intensively than others for the purpose of ram production. This dynamics in productivity comes to indicate that highly productive sheep which are valuable for the selection may be found in all flocks and the selection of potential fathers must be performed in the entire controlled unit of the breed under the open nucleus breeding system.

In order the selection effect to be increased the following steps are also necessary:

- introduction of breeding cost evaluation of all sheep categories with the purpose of increasing the accuracy of the selection criterion (elimination of the influence of the environmental factors and the use of information from several sources);
- optimization of the selection intensity by introducing productivity criteria for the potential ewes depending on the planned number of ram lambs to be born;
- the enhancers, designated by progeny, to be used as a priority

upon insemination of ewes

The lines of the institutes of the Agricultural Academy which have been created as a result of a targeted selection and have a good development capacity may be used for the establishment of a linear strucutre (Dimov 2013; Raicheva and Ivanova, 2015, Stancheva, 2013, Ivanova et al., 2019).

CONCLUSION

The breeding association of the Bulgarian dairy synthetic population breeds controls a relatively big population of 40 984 sheep of which 33 812 ewes and 886 rams distributed in 233 flocks, which provides the opportunity for organization of an effective breeding-enhancement activities. Depending on the level of the breeding activities, the population is divided into two structural units- elite which includes 7712 animals and controlled unit.

Although the total number of sheep is favourable for selection, the number of young animals suitable for breeding is relatively low, securing the reproduction of ewes- 18.2% and that of rams- 16.8%. This, along with the small difference between the productivity of the elite and the controlled units of the breed, comes to show that there will be a relatively low genetic progress with reference to the main productive traits.

So as the selection effect to be increased, it is necessary that the selection of potential fathers be performed in the entire controlled unit of the breed following the open nucleus breeding system. Furthermore, more young animals should be left for breeding which in turn will provide the opportunity to refine the selection. Finally, a system for rams evaluation in terms of progeny should be also elaborated and applied.

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