Cattle Herd book and Record Keeping in Central Serbia

Nenad Mićić[1], Vlada Pantelić[1], Dušica Ostojić-Andrić[1], Nevena Maksimović[1], Dragan Nikšić[1], Marina Lazarević[1], Miloš Marinković[1]

[1]*Institute for Animal Husbandry, Belgrade – Zemun, 11080 Zemun, Serbia*

E-mail: micicnenad@hotmail.com

Abstract

Serbia has a tradition of cattle production, and the area of Central Serbia, as a hilly region is suitable for farming of the combined Simmental and dairy Holstein-Friesian breed. The first Herd Book of Serbia was founded in 1935. The high quality breeding animals registered in the main register and the herd book are under the control of production performance. According to the expert report of the Institute for Animal Husbandry and the results of the implementation of the breeding program in 2017, on the territory of Central Serbia, there were 147,997 high quality breeding animals of the Simmental and 17,192 of Holstein-Friesian breed in the main/parent herd. Both breeds of national interest for rearing in the territory of Central Serbia are included in the breeding – selection programs for cattle for milk production, which are implemented through the cooperation of farmers and local breeding organizations in the field. In the territory of Central Serbia there are 157 registered local breeding organizations that are carrying out the activities of cattle recording/registering and selection. In this paper the data of the Main Breeding Organization in cattle breeding, the Institute for Animal Husbandry, and its annual report are used. A tabular analysis and a five-year trend of animals are presented according to: the number of registered animals, linearly evaluated first calving females, the realized yield of milk, milk fat and protein, as well as the trend of the number of bull dams in the population. Based on the analysis of the results of work on the selection of bovine animals, it can be concluded that some progress has been made in the production of milk of both breeds. It is important to emphasize that the mentioned results are reflected on the productivity of the entire population of cattle in Central Serbia.

Key words: Cattle breeding, Simmental breed, Holstein-Friesian breed, Animal Husbandry.

Introduction

Since ancient times, Serbia has had a cattle-breeding tradition. Geographically, the area of Central Serbia, as mountainous, rich in both farming areas and natural pastures, favours this type of agricultural production. Livestock breeding is the leading branch of agriculture in the Republic of Serbia. The two most important production sectors are milk and meat production. The situation in cattle breeding in recent decades cannot be characterized as satisfactory, and the main problem of Central Serbia is the small number of cattle in the agricultural holdings. It is still dominated by small holdings with < 3 heads that account for 50%, while the share of farms with 20 and more animals is represented by only 3.2%. For comparison, in Germany, the share of small holdings from 1-9 heads is only 0.8%, while the same with 40-60 heads constitute 29.4% and over

60 heads 23.5% (HBOCP, 2014). The unfavourable structure of households affects the increase in the cost of purchasing primary products and the cost of control of their condition and safety (Popović, 2014). In the last few decades, along with the industrialization and colonization of cities, the emptying of the villages has occurred, with the still unfavourable political and economic situation in the country. Hilly and mountainous regions as traditional livestock centres are abandoned, and the population moved to the lower parts of the country (Petrović, 2015). Given the existing problems and challenges in cattle breeding, it is important, along with the measures foreseen in the agricultural development strategy, to consistently implement measures to improve the genetic potential of the most common breeds of cattle (Simmental and Holstein-Friesian). According to FAO (2013), in the last 30 years, milk production in the world has increased by more than 50%, and the main producers of cow milk are the USA, India and China. However, according to the same FAO data (2013), the production of cow's milk, in regard to the realized net value of agricultural production in Serbia, is in the first place. It should be pointed out that often the existing genetic potential of cows is not fully utilized. Therefore, attention should be paid to the impact of paragenetic factors of production (nutrition, housing system, etc.) and improvement of the farm management. The selection of cows for high milk production implies changes in genotype, metabolism and hormonal status of cows that reflect on the reproductive characteristics of individuals (Žolt, 2016).

Perišić (2008) states that Serbia has a total of 1.1 million cattle, where the Simmental makes about 70%. Popović (2014) reports data of the Statistical Bureau of the Republic of Serbia based on the Census of Agriculture in 2012, showing Serbia with a total of 908,102 heads of cattle. Multiannual variations have adversely affected the number of cattle which is constantly decreasing. In the advancement of livestock production, the state participates by providing certain financial resources to breeders for the implementation of breeding programs and the production of high quality breeding animals.

The goal of implementing the current program (2015–2019) is to increase the yield of milk, while maintaining satisfactory reproduction and fitness traits. The paper presents the production performance of cattle in Central Serbia, as well as the main goals of the Breeding program.

The establishment of the Central Cattle Federation in 1892 and the Agricultural Cooperatives in 1894 in Serbia mark the beginning of the cattle recording/registration in the form of the records of the highest quality animals in the country, in that period, predominantly of the imported population of the Simmental breed. The first Herd Book of Serbia was founded in 1935. At the moment, there are 157 registered local breeding organizations in the territory of Central Serbia that deal with the activities of registration/recording and selection of cattle according to instructions and in cooperation with the Main breeding organization and the general records.

Material and methods

In this paper, data of the Main breeding organization for Central Serbia – the Institute for Animal Husbandry were used, and its annual report. The expert report for the previous year – 2017, with the results of the implementation of the Main Breeding Program defines the basic selection measures, procedures and methods of selection, the manner of their implementation, and control of the implementation of these measures for both breed (HBOCP, 2014).

In the organization of the Main Breeding Program, there is a pyramidal system – from assistant controllers who perform direct measurements and sampling in/on animals, through regional centres across the country's administrative districts, to the supreme main entity that performs the analysis of results and data, and compiles the final report subsequently submitted to the competent Ministry. The methodology for the control of the number of animals, their productivity and other results is in accordance with the provisions of the Law on Livestock Production of the Republic of Serbia (Law on Livestock Production, 2009, 2012, 2016) and the rules of

the International Committee for Agricultural Data Processing (ICAR, 2017) are described in detail in the HBOCP (2018). The main record – the *Herd book* contains data on the total number of registered/recorded animals under control for their productivity and known origin, data on the share of newly registered and previously registered animals relative to the total number, also data on registered bulls used in cow fertilization. Control of the productivity of the main cow population includes the results of the realized production of milk, milk fat and milk proteins, as well as the linear assessment of the first calving females of Simmental and Holstein breed (Black and Red Holstein populations). The obtained data are analysed by using the statistical program StatSoft. Inc (2010), while the breeding values were determined by BLUP-Animal Model (SPSS 20).

Results and discussion

Systematic work on breeding and selection of cattle is significant work that should be carried out in a high quality, continuous and adequate manner, in order to achieve maximum results in cattle breeding. In the cattle breed structure in the Republic of Serbia it is estimated that the Simmental breed makes up about 75%, a group of Black and White Holstein-Friesian cattle about 15%, while fattening and autochthonous breeds and crosses account for about 10% of the total number of cattle (HBOCP, 2018). Animals which are linearly assessed, according to the instructions for linear assessment of the type and body condition of cattle (Pantelić, 2010, Seminars of the Breeding organizations of Serbia), which calved regularly, with a service period not exceeding 240 days, and with known origin for a minimum of two generations of ancestors, are selected for the parent herd (Law on Livestock, 2009, 2012, 2016). The share of the parent population in the total population of Simmental cattle in 2013 was 34% and 86% of the total number of registered/recorded animals of all breeds (HBOCP, 2014).

According to the data of the main register presented in Table 1, for the past five year period and the area of Central Serbia, without Vojvodina, there is a trend of increase in the number of registered/recorded animals in both most frequent breeds of cattle. Ostojić-Andrić (2015) cites similar results of the positive trend of cattle breeding in the long period of observation (2005-2014).

The natural resources of the Republic of Serbia are defined by a significantly higher share of the Simmental breed (about 80%), especially in the hilly and mountainous regions of Central Serbia. On the other hand, the Holstein-Friesian breed is mostly reared in the lower parts of Serbia − Vojvodina, while in Central Serbia it represents 10% of the total number of cattle. Although the Holstein-Friesian breed has a relatively minor share in the overall national breed structure, its productive performance as a specialized dairy breed is considered an important factor in the contribution to the dairy sector in Serbia (Ostojić-Andrić et al., 2017).

Linear assessment of type and body development is very important information on the total value of the animal on the basis of which the breeding heads are selected and classified into classes, and also introduced into the main register and registered with the "HB number". Determining the average value of exterior parameters, especially non-measurable properties, is use-

Table 1. Number of registered animals of both breeds in a five-year period (2013-2017)

Breed	Number of registered animals				
	2013	2014	2015	2016	2017
Simmental	96090	107860	120861	133926	147957
Holstein-Friesian	14906	16767	17138	17141	17192

ful information when defining a breeding goal and formulating an effective plan and program (Lazić et al., 2015). A linear assessment of the body conformation of the animal allows identification of the characteristics of dairy animals which are preliminary indicators of milk performance and longevity. In addition, it points to the reproductive capacity of the animal, which is of great importance from the point of view of the economic efficiency of milk production (Pantelić et al., 2006). For the Simmental cattle population, the breeding objective defines the height to withers of adult cows over 140 cm and the body weight over 650 kg. In addition, within the objectives, the desired properties of fitness, functional characteristics and temperament of animals are significantly emphasized, also ease of calving, resistance to disease and an average life production of five lactations. Kebede and Kolmosi (2015) also conclude that linear assessment of the animal is necessary to predict the contribution of cattle performance in programs for improving commercial milk production.

According to the data in Table 2, which shows the results of the linear assessment of first calving females of two breeds that are included in the parent herd after the first calving and the linear assessment of body measures, there is also a trend of increase of the number of animals.

According to the FAO (2016) data in Table 3, the total milk production in Serbia amounts to 1,548,697 tons and shows a slight increase, but also a decrease in the number of dairy cows, which indicates that the average production per cow has increased compared to the trend of the past years.

Table 4 shows the milk performance of dairy cows in the past five-year period. It is clear that

milk production in the reporting period is characterized by a positive trend and that the milk yield of the parent population of the Simmental and Holstein-Friesian breed in Central Serbia is constant at a constant level with a small interval of variation.

Data on milk production for the Simmental population in Croatia (5,028 kg) and Slovenia (5,375 kg) at the start of the observation period in 2013 are higher than in Serbia (CAA, 2013, ICAR, 2013). In Germany, also, where the share of the parent population in the total population is about 50%, the average milk yield of Simmental cows was 7.223 kg with 4.16% milk fat and 3.5% milk proteins (ICAR, 2013). Similarly, the value for the average yield of Holstein-Friesian cows e.g. for year 2016 is behind the same in Croatia (7.633 kg) and Slovenia (7.535 kg) (CAA, 2016, ICAR, 2016a). In Austria, the average milk yield of Holstein cow in year 2016 was 8,809 kg with 4.07% milk fat and 3.3% milk protein (ICAR, 2016b). On the basis of achieved results and estimated possibilities, the goal of breeding for the period 2015–2019 anticipates an increase in the milk yield in the domestic Simmental population to an average production of 6000 kg of milk with a minimum of 4.10% milk fat and a minimum

Table 3. Total milk production and number of dairy animals (FAO statutes 2016)

Year	Dairy animals	Milk produced (t)
2013	446924	1494412
2014	456477	1536808
2015	431761	1546216
2016	426224	1548697

Table 2. Number of first calving females of both breeds with linear assessment scores in the five-year period (2013-2017)

Breed	Number of first calving females with linear assessment scores				
	2013	2014	2015	2016	2017
Simmental	13051	16473	22311	19367	25903
Holstein-Friesian	2924	3401	3808	3796	3889

of 3.60% milk protein. And for the Holstein-Friesian breed, the same program stipulates an increase to an average production of 8000 kg of milk with a minimum of 4.00% milk fat and a minimum 3.50% milk protein (HBOCP, 2014).

According to VHFF data (2016), HF populations in Israel and the US with yields exceeding 11,000 kg have the highest milk production in the world, and the highest yields in Europe have populations in Denmark, Germany and the Czech Republic (9-10,000 kg). In Serbia, the production of milk of this breed at an average level is slightly higher than 7000 kg (Table 4).

European Union (EU) standards stipulate the quality of milk and the total bacteria count of 100,000 bacteria/ml and the somatic cell count of 400,000/ml, while the current average in Serbia for the total bacteria count in milk is 900,000/ml and the somatic cell count 400,000/ml.

For the purpose of production of domestic bulls of both breeds, the best cows are selected to be bull dams, which are at least two standard deviations above the average of the parent population in milk production, but also according to body development and origin (Pantelić et al., 2009). For optimal selection results, these animals account for about 1% of the population (Pantelić et al., 2011), but in Central Serbia this proportion is significantly lower (Pantelić et al., 2005).

The number of bull dams presented in Table 5 accounts for less than 1% of the cow population of both breeds.

Conclusion

The number of registered cows in Central Serbia entered in the main register has slightly increased despite the decline in the total number of cattle in the country.

As for the quality of milk according to the European Union (EU) standards, in Central Serbia, there is a trend towards decrease of the total

Table 4. Production of milk, milk fat and protein of both breeds in the five-year period (2013-2017)

Year	Breed	Number of completed lactations	Milk yield (kg)	Milk fat yield (kg)	Milk fat content (%)	Protein yield (kg)	Protein content (%)
2013		10658	7443	270	3.63	242	3.25
2014		10978	7310	264	3.62	236	3.22
2015	HF	11893	7251	258	3.55	229	3.16
2016		11111	7060	253	3.59	221	3.13
2017		11907	6895	252	3.66	219	3.18
2013		45505	4688	186	3.96	151	3.21
2014		52789	4741	188	3.94	154	3.22
2015	SIM	67619	4773	190	3.97	153	3.21
2016		76864	4713	187	3.97	151	3.21
2017		84213	4810	190	3.97	153	3.19

Table 5. The number of bull dams of both breeds in the five-year period (2013-2017)

Year	2013	2014	2015	2016	2017	2013	2014	2015	2016	2017
Breed	SIM					HF				
Number of animals	394	413	410	365	426	141	168	135	102	129

bacteria count to less than 100,000 bacteria/ml and a lower somatic cell count of 400,000/ml of milk.

Based on the analysis of the results of work on the selection of cattle, in the previous five-year period, it can be concluded that some progress has been made in the production of milk of the main population of the Simmental breed, as well as of the second significant Holstein-Friesian breed. It is important to emphasize that these results are reflected in the productivity of the whole population of both breeds in Central Serbia. However, taking into account the set breeding goal for the parent population of both cattle breeds in Central Serbia, it is unlikely that the breeding goals (6000 kg for SIM and 8000 kg for HF) will be achieved before 2019.

The number of bull dams should be maintained at the level of up to 1% of the highest quality animals in the total population.

Significant efforts have been made in the selection of animals to improve the genetic potential of animals, but for optimal results it is also necessary to improve the nutrition, housing and health care, which in the current socio-economic conditions is not easily achieved. However, bearing in mind that milk production is very important as a strategic agricultural sector in the Republic of Serbia, in the coming period it is necessary to continue the proper implementation of defined breeding programs. An important innovation in breeding programs for the period 2015–2019 is the inclusion of important non-productive traits (health, fertility, life expectancy, etc.)

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