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Danubian Animal Genetic Resources

Volume 6, Issue 1 (2021)

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Biodiversity of sheep population in Vojvodina-Serbia

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Abstract

On the territory of AP Vojvodina, there are several autochthonous breeds of sheep: Tsigai, Chokan Tsigai, twisted horned Racka (Zhuya) and various strains of Pramenka. These sheep breeds differ in their characteristics, but with the help of new technologies, the animal population is characterized in an appropriate way, both phenotypic and genotypic. The creation of autochthonous races was influenced by specific climatic factors, so they are adapted to bad environmental conditions and are characterized by good resistance to diseases and a long lifespan. Productivity of autochthonous breeds is low, and they are suppressed in modern production that leads to a reduction in genetic variability. Preservation of indigenous breeds both in situ or ex situ would preserve gene pool, gene variability and biodiversity. In this study, we explored how the racial composition and number of sheep in the area of Vojvodina changed in the period from 2010 to 2020. Data were collected and processed within main breeding organization of the Department of Animal Husbandry of the Faculty of Agriculture in Novi Sad, Serbia. The research included all sheep that are registered and whose records are kept. Based on the analysis, of sheep number by breed, an assessment of the current state, as well as the prospects for preservation and development of autochthonous sheep breeds were given. The population of Tsigai in the period of 2010 was 1757 animals, while in 2020 it was recorded at 5161 individuals. The population of Chokan Tsigai in the period of 2010 was 351, while in 2020 it was recorded at 2092 sheep. The population of twisted horned Zhuya in 2010 was 145, while in 2020 there were 1056 sheep of that breed.

Keywords: biodiversity, sheep, autochthonous, Vojvodina region

Introduction

Process of degradation of natural habitats is very pronounced through various types of human activities (RADOVIĆ and PETROV, 2001). In recent decades, almost all domestic animals have experienced a significant reduction in genetic diversity (STANČIĆ and STANČIĆ, 2013). Preservation of biodiversity in domestic animals is in the interest for the world community survival (PRENTICE and ANZAR, 2011). Biodiversity conservation is a process of genetic conservation through the restoration of degraded

ecosystems and natural habitats with autochthonous animal breeds (STANIVUK et al., 2017). Sheep breeds are mainly bred in economically underdeveloped regions with modest food sources (ŽUJOVIĆ et al., 2011). These genotypes are an important element of regional agro-biodiversity with impact on agro-ecosystems that determine the cultural heritage of a given region (JOVANOVIĆ et al., 2011). The analysis of autochthones breeds population size, in the Republic of Serbia, shows that many of them are endangered and may disappear (STOJANOVIĆ and ĐORĐEVIĆ-MILOŠEVIĆ, 2003). The structure and racial composition of sheep on the territory of AP Vojvodina is quite diverse. Expert report of the work performed in order to control the implementation of breeding programs in AP Vojvodina in 2020 shows greater interest of people in sheep breeding. On the territory of AP Vojvodina, there are several autochthonous breeds of sheep: Tsigai, Chokan Tsigai, twisted horned Racka (Zhuya) and various strains of Pramenka. These sheep breeds differ in their characteristics, but with the help of new technologies, the animal population is characterized in an appropriate way, both phenotypic and genotypic (DRAGIN et al., 2016). The creation of autochthonous races was influenced by specific climatic factors, so they are adapted to bad environmental conditions and are characterized by good resistance to diseases and a long lifespan. Productivity of autochthonous breeds is low, and they are suppressed in modern production that leads to a reduction in genetic variability. Preservation of indigenous breeds both in situ or ex situ would preserve gene pool, gene variability and biodiversity (DRAGIN et al., 2017).

In this study, we explored how the racial composition and number of sheep in the area of Vojvodina changed in the period from 2010 to 2020.

Material and methods

According to the data of the Republic Bureau of Statistics, on the territory of AP Vojvodina for 2020, 286000 sheep of all breeds and categories are bred at the moment. 15 different breeds of sheep are entered into the Main Registry Book of sheep for the territory of Vojvodina (Table 1). According to the data of the Ministry of Agriculture, Forestry and Water Management of the Republic of Serbia, the genetic resources of endangered autochthonous breeds of sheep, bred on the territory of Serbia, include three breeds of sheep: Chokan Tsigai, twisted horned Zhuya and Pramenka with different strains. In this research, we collected and processed data from the main breeding organization of the Department of Animal Husbandry of the Faculty of Agriculture in Novi Sad, Serbia, on the racial composition of registered sheep herd in the territory of AP Vojvodina in the period from 2010 to 2020.

Results and discussion

Table 1 show that there is a slight increase in the stock of sheep in the period from 2010 to 2020 in the territory of Vojvodina. The number of sheep sheds increased from 13034 in 2010 to 167426 in 2020. Such a rapid increase in the number of heads in the breeding stock of sheep in AP Vojvodina is primarily a consequence of the state's subsidy policy.

In 2010, there were 5.11% of sheep in the breeding stock of sheep of AP Vojvodina, out of the total number of sheep in AP Vojvodina, while in 2020 there were 51.69% of sheep in the breeding stock (Expert report and results of performed tasks of control of breeding programs in AP Vojvodina for 2010 to 2020). A continuous increase in the breeding stock is observed in the noble breeds of sheep, especially if we observe the two dominant breeds in this area, Wurttemberg and Ile de France. The autochthonous breeds of Tsigai sheep, Chokan Tsigai and twisted horned Zhuya, in the

Table 1. Population size of registered sheep on the territory of Vojvodina in the period from 2010 to 2020 (heads)

Breed	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020
Bergamo	111	197	351	420	599	1075	1301	2162	3209	2538	2334
Tsigai	1757	1304	1367	1830	2054	2766	3167	4302	5580	5613	5161
Chokan Tsigai	351	724	632	541	632	614	346	696	1098	1834	2092
Ile de France	1681	1944	2256	3682	6614	8987	10094	21542	28455	35922	44183
Suffolk	28	32	56	109	186	276	318	793	1210	1485	1716
Charollais	10	28	51	49	92	215	312	375	364	385	341
Texel	0	14	33	28	67	60	95	184	175	163	171
Racka	145	247	219	302	288	490	62	909	331	492	1056
Wurttemberg	8951	9739	11980	14040	21431	28897	31971	56663	74460	87355	102709
British Milk Sheep	-	-	-	-	33	87	327	287	206	159	121
Romanov	-	-	-	-	-	40	291	768	2135	5029	5188
German Black-headed	-	-	-	-	-	-	-	18	-	-	43
Pramenka	-	-	-	-	-	-	-	61	133	174	1860
German Mutton Merino	-	-	-	-	-	-	-	-	-	248	182
Lacaune	-	-	-	-	-	-	-	-	-	-	269

observed period, had oscillations in their number. The reason is the subsidy policy of the state and the fact that AP Vojvodina is a region with extremely intensive agricultural production suitable for stable system of sheep keeping, so farmers more often decided to breed noble breeds. Indigenous breeds of sheep have found their profitability through the exploitation of the few remaining natural pastures in AP Vojvodina.

In Figure 1, we can notice that the largest part of the sheep population in the territory of Vojvodina in 2020 consists of two noble breeds of combined abilities, Wurttemberg, with 61%, and Ile de France, with 26% representation. While all other breeds occupy only 13% of the total sheep population.

Indigenous sheep breeds in AP Vojvodina make up less than 5% of the total sheep stock. At the selection review in 2020, 8309 sheep were recorded. The most represented breed was Tsigai, which had 5161 registered individuals. The incentive of the Ministry of Agriculture, Forestry and Water Management affects the number of registered breeding animals because funds are allocated to breeders for the preservation of genetic resources, regardless of whether they are registered in the Main register or not. Given that sheep breeding in Serbia is mainly based on meat production, the breed structure does not support this.

Sheep breeds selected for meat production, such as Suffolk, Charollais and Texel make up only 1.32% of the total breeding sheep population. Their number in 2020 was 2228 animals. One of the reasons is that sheep breeding in Serbia and on the territory of Vojvodina does not represent primary production, sheep are bred semi-intensively and extensively, and therefore the most represented breeds of sheep have combined abilities.

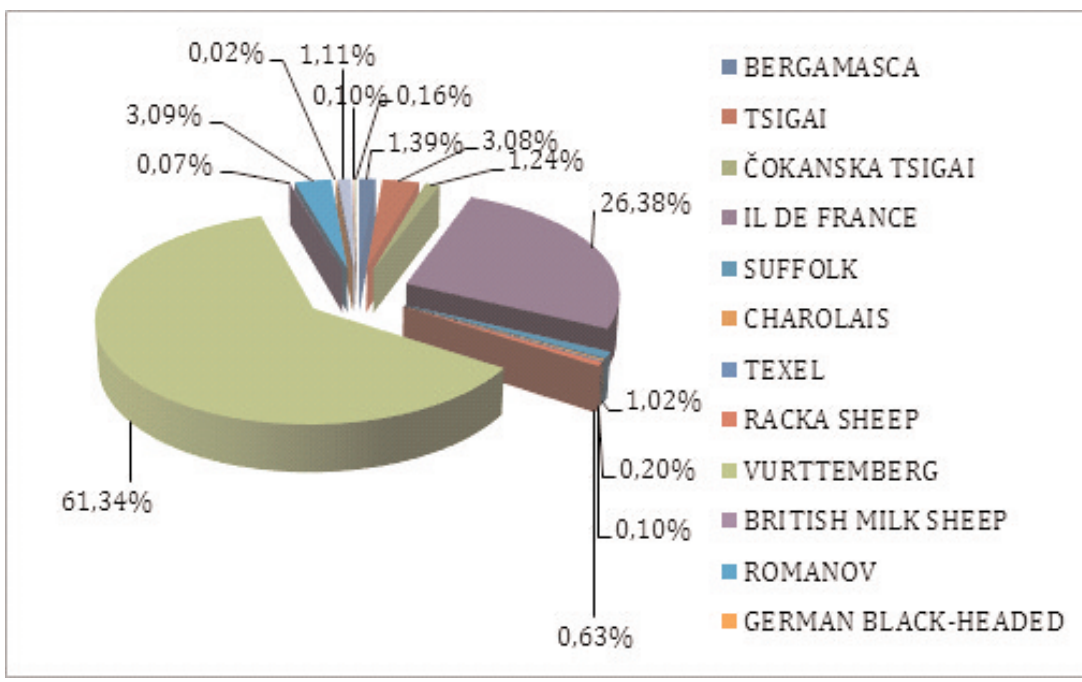

Figure 1. Schematic representation of the racial structure of sheep on the territory of Vojvodina in 2020

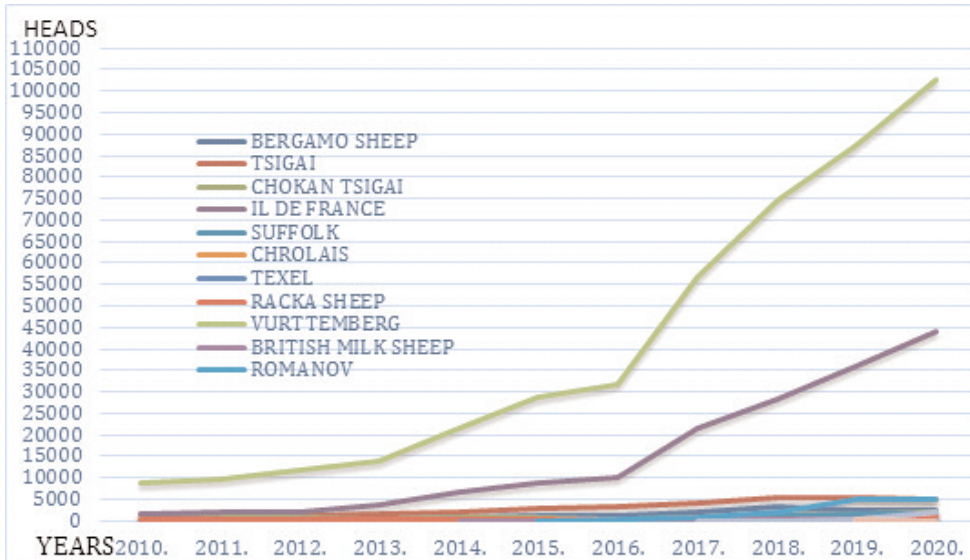

Figure 2. Schematic representation of the racial structure of sheep on the territory of Vojvodina in the period from 2010 to 2020

In Figure 2, we can see that of the total number of the sheep population in the territory of AP Vojvodina in 2020 (which was 167426) , the largest part consists of two noble breeds of combined abilities, Württemberg with 102709 and Ile de France with 44183 sheep. Breeders keep them for the production of mutton and lamb meat. Popularity that these breeds have rise expectation that the number of animals will grow in the coming years.

In Figure 3, our autochthonous breeds of sheep Tsigai, Chokan Tsigai and twisted horned Zhuya are singled out. Their number in a period of 10 years is shown. Tsigai is our most productive breed of sheep, with combined production abilities in the direction of wool-meat-milk. Apart from Serbia, it is grown in Hungary, the Czech Republic, Slovakia, Russia, Romania and Bulgaria. The native population of the Tsigai breed on the territory of Vojvodina increased in the period from 2014 to 2019. Unfortunately, we notice that the number of Tsigai is decreasing from 5613 as it was in 2019, to 5161 in 2020. The reason for that may be that some animals did not meet the criteria for getting government subsidies determined by the breeding program in 2019, which was approved by the Provincial Secretariat for Agriculture, Water Management and Forestry.

Due to the somewhat poorer quality of meat, Tsigai is less popular for the production of lamb, while their potential for milk production has almost never been used. Milk and dairy products are one of the ways to preserve this breed in the future because the market is open for these products. Chokan Tsigai represents our autochthonous breed of sheep, which is also a genetic resource in AP Vojvodina. It is used for meat production although, beside Tsigai, it is our best breed for milk production. If fed adequately, milk production is about 50 to 150 liters in lactation. From Figure 3, we can see that the number of this breed is relatively stagnant and slightly decreased in the period from 2010 to 2017.

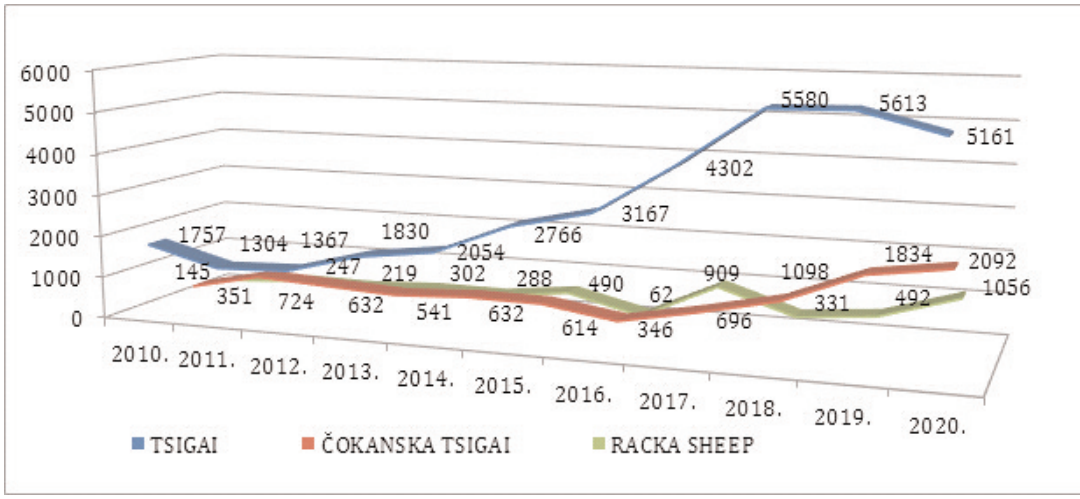

Figure 3. Schematic presentation population of autochthonous sheep on the territory of Vojvodina in the period from 2010 to 2020 in the period 2010 to 2020

In the past few years, we have noticed that that number was growing from 696, as it was in 2017, to 2092, in 2020. Today, its population size is stable.

The twisted horned Zhuya is our autochthonous breed of sheep, which is also a genetic resource in AP Vojvodina. It is a breed of sheep with combined production characteristics, that has been bred in our area since ancient times and it is adapted to traditional housing conditions, which is mostly extensive. From the Graph 3, we can see that the breeding stock of twisted horned Zhuya increased in the period of 10 years (their number was only 145 in 2012, while in 2020, 1056 were recorded). The reason for the decrease in the population in 2012, 2014, 2016 and 2018 is because the sheep were rejected if they did not meet the criteria for subsidies determine by the Main Breeding Program and the Law on animal husbandry (Official Gazette of RS 41/09, 93/12, 14/16).

Today, the number of registered sheep is stable, which means that the conservation program is being successfully implemented and that efforts are made in order to preserve this breed. Subsidy measures of the state (Decree for genetic improvement of animal husbandry issued by the Ministry of Agriculture and Environmental Protection, as well as the Law on Incentives in Agriculture) contributed to the increase in the parent stock.

Conclusions

The subsidy policy of the state (Republic of Serbia) in the last 11 years has led to an explosion in the number of sheep in the registered parental herds of sheep in the territory of AP Vojvodina, but it has not led to a significant increase in the total number of sheep. In addition to the large increase in the number of noble breeds of sheep (in the number of registered parental herds) in AP Vojvodina, the number of autochthonous breeds also increased. We can conclude that the state policy aimed at genetic improvement in sheep breeding has achieved its first goal - a large number of heads are included in the registered

breeding stock and their production capabilities are monitored. The next step is to increase the quality of the breeding stock. especially in autochthonous breeds, which (although their number has increased in the last 11 years) still make up less than 5% of the total number of registered heads in the breeding stock of sheep of AP Vojvodina

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Reproductive performance of Blonde, Red, and Swallow-bellied Mangalica

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Abstract

The indigenous Hungarian Mangalica pig breed group consists of four breeds, namely Blonde, Red, Swallow-bellied, and the recently registered Black Mangalica. In this study, reproductive traits (e.g. total number of piglets born/litter, age at first litter, number of litters farrowed/sow/year) were analysed in Blonde, Red, and Swallow-bellied Mangalica sow populations of production-controlled farms in Hungary between 2008 and 2019. Effect of season of mating was analysed on the total number of piglets born at a nucleus breeding facility between 2009 and 2013. The mean of total number of piglets born per litter was 5.52±0.42, with an average 1.25±0.22 number of litters farrowed/sow/year. On the analysed nucleus breeding farm, the classification by season of mating resulted in non-significant ($P>0.05$) moderate differences in litter size. Regarding reproductive performance Mangalica clearly lags behind commercial breeds and hybrids; however, values associated with genetic conservation and traditional cuisine, as well as superior meat quality provide economic potential for maintenance and future breeding efforts.

Keywords: Mangalica, litter size

Introduction

Twenty-five percent of registered mammalian livestock species is at risk around the world. Overall, more than 700 pig breeds have been registered worldwide, of which approximately 15% became extinct, and further 15% is acknowledged with critical or endangered status (FAO, 2015). Due to substantial transition of consumer preferences, fat-type pig breeds are especially at risk, and only a few breeds remain, with regional or national utilization. Regarding the extended adipose tissue ratio of the carcass, the Hungarian Mangalica is considered as one of the fattest pig breeds in the world (RÁTKY et al., 2013).
The Mangalica group is the sole remaining representative of Hungarian indigenous pig breeds. Mangalica was developed in the beginning of the 19th century from native local pig breeds with influences from the Serbian and Syrmian Sumadia breed. Former local breeds vanished shortly after the appearance of Mangalica. Alföldi, Szalontai, Bakonyi local breeds contributed to the development of Blonde Mangalica, further crosses with Syrmian local pigs produced the Black Mangalica. Recrosses of Black Mangalica with Blonde resulted in the Swallow-bellied breed, whereas the influence of the Szalontai variety

on Blonde Mangalica led to the occurrence of Red Mangalica (MOLNÁR et al., 2013). Based on microsatellite data and high probability values of genetic marker-based breed classification, ZSOLNAI et al. (2006) suggested that colour varieties of Mangalica are to be considered as different breeds. However, MOLNÁR et al. (2013) found that mitochondrial D-loop sequence data was not sufficient to unequivocally differentiate between breeds or colour varieties of Mangalica.

Compared to commercial breeds, Mangalica is a fat-type, slow-growing breed group with superior meat quality and extreme marbling due to the remarkable capability for intramuscular fat deposition. Under identical housing and feeding conditions, higher ($P<0.05$) iron, zinc, manganese, riboflavin, and thiamine concentrations were observed in ham samples of Mangalica compared to Large White × Landrace crossbreds (LUGASI et al., 2006).

There were 4591 Blonde, 1342 Red, and 790 Swallow-bellied purebred Mangalica sows, and 183 Blonde, 105 Red, and 66 Swallow-bellied Mangalica boars registered and in production in 2019 in Hungary (NOVOZÁNSZKY, 2020).

Materials and methods

Reproductive performance data for Mangalica breeds were obtained from annual publications (NOVOZÁNSZKY, 2019; 2020) of the Hungarian breeding authority (National Food Chain Safety Office, NÉBIH) based on the reports of breeding associations (Hungarian Purebred Pig Breeders' Association and Hungarian National Association of Mangalica Breeders). Annual means presented in the yearbooks were weighted by sow and litter numbers to present means for the different Mangalica breeds. Individual reproductive performance data were collected at a nucleus breeding facility to evaluate the seasonal effect of mating on litter size. Mangalica as a long-established Hungarian breed has adapted to local climate and can be less prone to consequences of seasonal infertility (i.e. decreasing litter size from summer mating or insemination) than commercial breeds introduced to Hungary in the 20th century. Seasonal litter size data were analysed by one-way ANOVA in SPSS v.16.0.

Results and discussion

In the analysed period (2008-2019) the Blonde Mangalica was the most prolific, while the Swallow-bellied was the least prolific breed on average (Table 1); however, the Swallow-bellied breed produced the largest average litters in 2008, as seen in Figure 1 with annual data. Sow age at first litter was over two years, although standards of the breeders association states 10-12 months as the preferred age for first mating or insemination. According to EGERSZEGI et al. (2018) Mangalica gilts can reach sexual maturity at 7-8 months of age, thus capable for producing the first litter by one year of age, which age is a general requirement for sows of commercial breeds in intensive production systems. During the history of Mangalica, several prolific lines occurred that were characterized by early sexual maturation, and fortunately, some of these lines can be identified nowadays (EGERSZEGI et al., 2018).

The poor reproductive performance has been associated with elevated progesterone and leptin serum

concentrations in Mangalica gilts compared to Landrace, leading to an altered luteinizing hormone secretion pattern (BRÜSSOW et al., 2008; EGERSZEGI et al., 2018); however, RÁTKY et al. (2006) argued – based on results showing similar hormonal patterns in Mangalica and Landrace – that hormonal changes near or after the ovulation are not the main explanation for the reproductive performance of Mangalica. Leptin gene expression was also significantly ($P<0.05$) increased in Mangalica backfat tissue compared to Large White and Pietrain × Duroc samples (TEMPFLI et al., 2016). The increased leptin expression did not mitigate feed intake and fat deposition in Mangalica because of the developing leptin-resistance in the breed.

Average number of weaned piglets/sow/year was 6.40, whereas modern commercial hybrid sows are capable of producing over 30 weaned piglets or even finisher pigs annually.

Mangalica sows produced 1.25 litters in an average year, whereas commercial sows (i.e. Large White and Landrace) in Hungary averaged with 2.10-2.30, and hybrid sows (e.g. Topigs Norsvin, Hypor, DanAvl) reached 2.32-2.48 on average. EGERSZEGI et al. (2018) mention Mangalica populations with 2.0 annual farrowing frequency from 1918.

Table 1 Reproductive performance of Mangalica sows (2008-2019)

Breed	Total number of litters	Average number of piglets born/litter	Age at first litter (days)	Average number of litters farrowed/sow/year	Number of 21-d old piglets/sow/year
Blonde Mangalica	36509	5.60±0.19	729.77±69.04	1.35±0.16	6.89±0.96
Red Mangalica	8936	5.51±0.40	840.63±105.72	1.16±0.17	5.71±1.25
Swallow-bellied Mangalica	6061	5.06±0.91	823.60±69.73	0.95±0.09	4.44±0.96
Total	51506	5.52±0.42	765.18±91.70	1.25±0.22	6.40±1.32

The Blonde Mangalica was characterized with a rather stable reproductive performance over the analysed years, whereas a notable decrease was seen in Swallow-bellied Mangalica. Surprisingly, this decrease in Swallow-bellied Mangalica can be associated with and partly explained by the growing interest in the breed: while the number of nucleus breeding facilities decreased in the analysed period (from seven to three), the number of Swallow-bellied Mangalica breeding farms remained relatively unchanged (22-27), furthermore, the sow population increased from 650 in 2008 to 1345-790 in 2018-2019 (NOVOZÁNSZKY, 2018; 2019). Throughout the analysed years, there have been nine maintained sire lines in Blonde, seven in Red, and eleven in Swallow-bellied Mangalica, respectively.

Compared to the total, national Mangalica population, remarkably higher average litter size was observed on the analysed nucleus breeding farm (Table 2) indicating valuable genetic potential in the breed group for further improvement without substantial changes in breed characteristics. Housing and feeding conditions may differ greatly among breeders, obviously affecting reproductive and fattening perform-

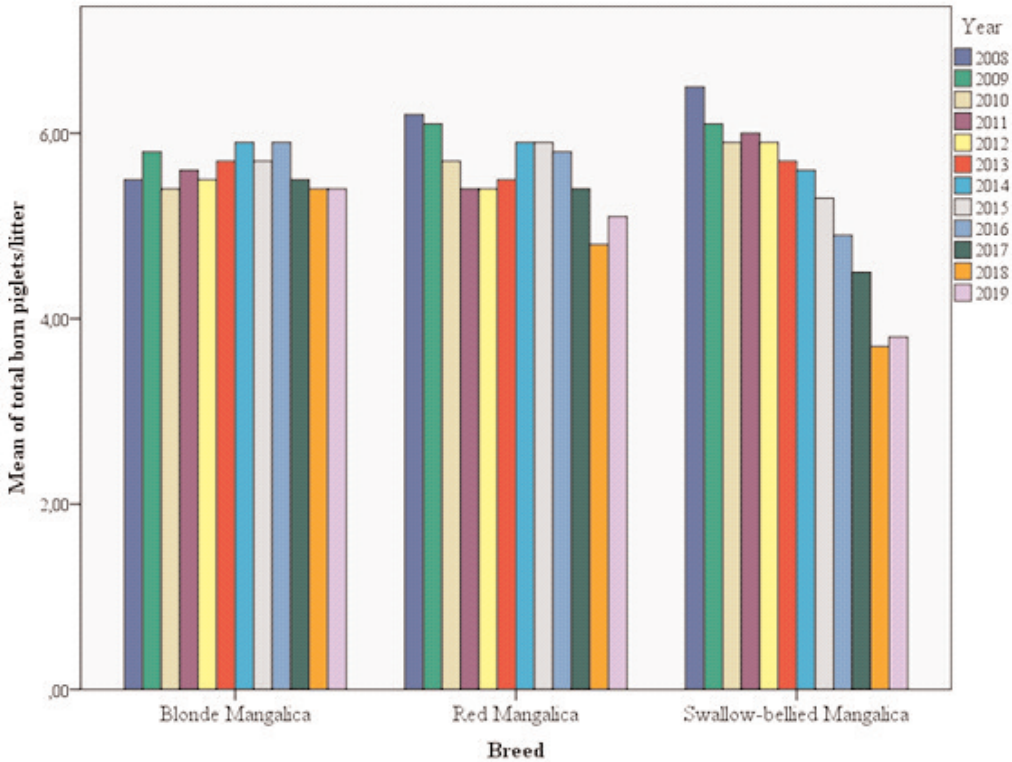

Figure 1. Annual means of total born piglets/litter between 2008 and 2019

ance of Mangalica populations. Though usually kept under extensive outdoor conditions, Mangalica is capable for considerably improved production in semi-intensive systems implementing restricted access to outdoor spaces.

TÓTH (2006) emphasized the role of selective breeding that may improve litter size considerably (up to 9 weaned piglets/litter).

Table 2 Number of total born and stillborn piglets (mean±SD) on a nucleus breeding farm between 2009 and 2013

Breed	Number of litters (and sows)	Total number of piglets born/litter	Number of stillborn piglets/litter
Blonde Mangalica	270 (66)	6.71±1.79	0.51±0.92
Red Mangalica	43 (11)	7.33±1.39	0.40±0.85
Swallow-bellied Mangalica	54 (13)	7.72±1.60	0.35±0.78
Total	367 (90)	6.93±1.76	0.47±0.89

Stillborn piglets were observed with a frequency of 6.78% of total born piglets, similar or moderately less than that in commercial breeds (8-10%). The effects of the mating season were moderate

and not significant (P>0.05) in the analysed population (Figure 2), while commercial farms often suffer substantial consequences of seasonal infertility and a decrease in litter size over 10% of an-

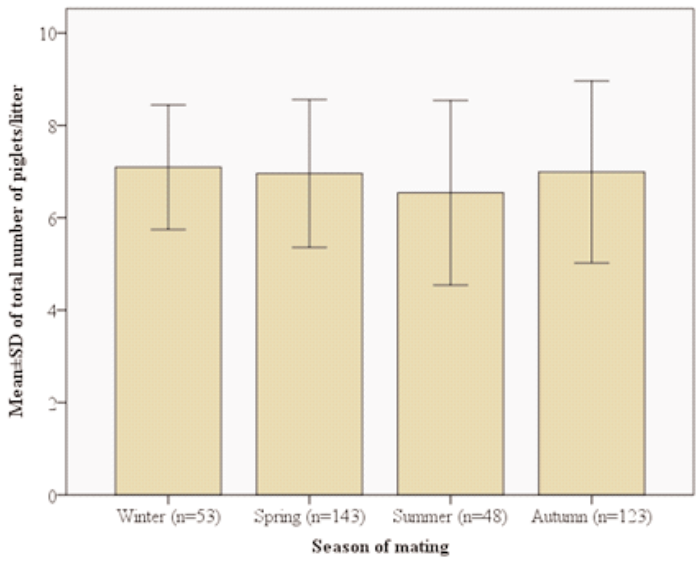

Figure 2. Seasonal means of total born piglets/litter on a nucleus farm

nual average in farrowing from summer mating or insemination.

The potential successful application of genetic markers (e.g. estrogen and prolactin receptor genotypes) has been highlighted for the improvement of the reproductive performance of Mangalica (TEMPFLI et al., 2011); however, the most important objective of genetic preservation is the maintenance of breed characteristics. Molecular genetic data can be applied in commercial quality pork production, where selected prolific Mangalica sows are mated to Duroc boars to increase lean meat ratio of crossbred pigs while maintaining superior meat quality and marbling.

Conclusion and recommendation

The reproductive performance of Mangalica is not comparable to commercial hybrids in intensive production systems; however, it may be improved by the conscious application of pedigree data and prolific lines, because the Mangalica demonstrated impressive performance over the centuries-long history of the breed.

Acknowledgement

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Population trends of Slovenian autochtnonous breed Cika cattle

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Abstract

In recent decades, major changes have occurred in the diversity of autochthonous/local livestock breeds. High-yielding breeds have increasingly replaced local (autochthonous) multipurpose breeds. The genetic diversity of autochthonous breeds, their good adaptation to the environment in terms of disease resistance, heat tolerance and low nutrient requirements have mostly been neglected in the past. In Slovenia 12 autochthonous breeds are conserved and Cika cattle is the only one conserved Slovenian cattle breed. At the end of the second millennium, Cika cattle was almost extinct, when the total population of the breed reached the lowest number in its historical development. Then the national conservation program was adopted and protected the critical and endangered Slovenian breeds. The results are shown in a stable status of the population size of all autochthonous breeds and even in their increase. The Cika cattle population size has increased incredibly in the last twenty years, by about 566%. However, among all cattle breeds in Slovenia, the Cika cattle population represents only 1.14%. The aim of this study was to evaluate the change in the population size of Cika cattle in the last ten years.

Keywords: autochthonous/local breed, Cika cattle, population trend

Introduction

Originally, livestock breeds were selected for their functions, and only those best adapted to the environment, husbandry conditions, and requirements of their keepers survived (MARSONER et al., 2018). The estimated number of livestock breeds in the world is 8774 (FAO, 2015), of which 7718 are local breeds, that is, those that have evolved largely through adaptation to the natural environment and the traditional production system in which they were bred. The proportion of these local breeds has gradually declined due to the introduction and spread of commercial (high-yielding) breeds. As a result, 26 percent of livestock breeds are at the risk of extinction.

Public service for Animal genetic resources in Slovenia is responsible body for all the activities related to the diversity of Slovenian autochthonous (local) breeds. Public service is approved by the Ministry and located at the Biotechnical Faculty, University of Ljubljana. Conservation of animal genetic resources (AnGR) is included in the various sectoral strategies, plans and programmes at national level.

The long-term National Programme for AnGR conservation of (2017-2023) is the government's plan for conservation and priority actions needed to protect farm animal biodiversity. Among 12 autochthonous Slovenian farm breeds, seven breeds are classified as critically endangered, three are endangered, one is vulnerable, and one is not yet classified.

Cika cattle is the only Slovenian autochthonous cattle breed. In the past it was uniquely adapted to the area of high mountain pastures and enabled many people to survive, but in the sixties of the last century it was accepted that Cika cattle would be replaced by Simmental and Brown cattle (ŽAN, 2012). This led to a significant decline in the population number of the Cika breed in the following decades. By the beginning of the 21st century, there were only about 300 purebred females and urgent action was needed to save Cika cattle from extinction as fewer and fewer people bred them. Thanks to conscientious breeders, the breeders' association and the active support of Public Service, professional zootechnical work began. Today, the Cika cattle is classified as an endangered breed and the total size of the purebred population consists of about 5530 cattle (ŽAN and ŽGUR, 2021). This study shows the proportion of cattle breeds kept in Slovenia, the change in the population size of Cika cattle, the number of farms keeping Cika cattle and the age of Cika cattle cows in the period 2010-2020.

Material and methods

The number of farms keeping Cika cattle was estimated on the basis of data from Livestock Identification and Registration Sector of the Ministry of Agriculture, Forestry and Food. The number of animals is always recorded on the same day, i.e. June 1 of the current year. All farms that kept at least one Cika cattle in the period 2010 to 2020 were included in the calculations. The data were analyzed using the SAS software package (SAS/STAT, 2016).

Results and discussion

Cattle breeds population in Slovenia

In 2020, the total number of cattle in Slovenia was 485 608 (Statistical Office RS, 2021). Simmental cattle is the most numerous breed (42%) in Slovenia and account for almost half of all cattle breeds in Slovenia. The smallest proportion among all cattle breeds in Slovenia is Cika cattle (1.14%). A large part of the total cattle population is represented by different crossbreeds (25.90%) (Figure 1).

Number of farms keeping Cika cattle in the period 2010 – 2020

In the last two decades the population of Cika cattle in Slovenia has increased, as a result of well-organised breeding work. Systematic monitoring of all animal genetic resources in Slovenia started in 2003. At that time, the total number of farms keeping Cika cattle was 313 and the number of purebred Cika cattle was 686 (POROČILO, 2004). Since then, the number of farms keeping Cika cattle has increased year by year, reaching the highest value in 2019 (Figure 2). In the last ten years, the number of farms keeping Cika cattle has increased from 697 in 2010 to 1299 in 2019, i.e. by 86%.

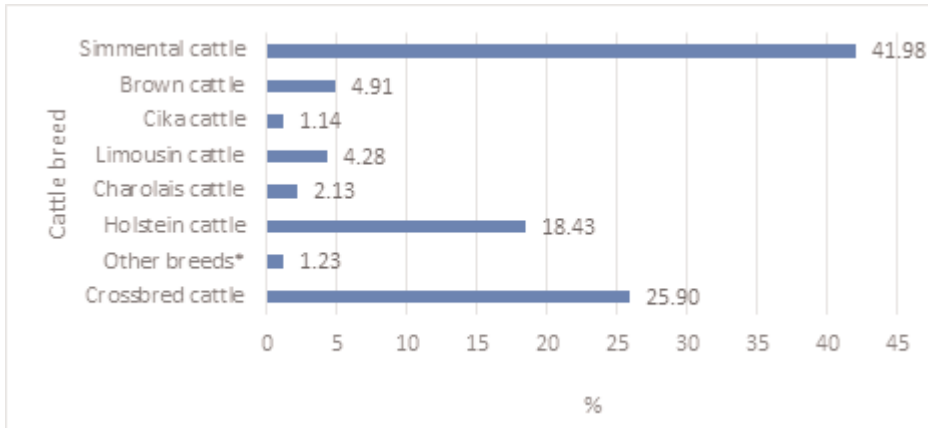

Figure 1. Percentage of cattle breeds population in Slovenia 2020
*Other cattle breeds: pure breed cattle - Scottish Highland cattle, Red Angus, German Angus, Galloway, Aberdeen Angus, Istrian cattle

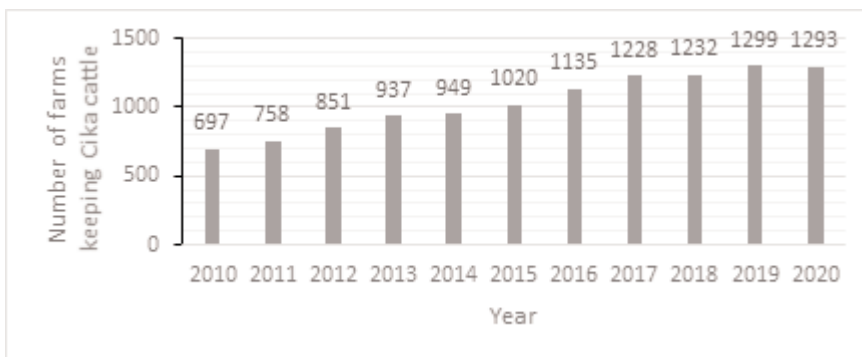

Figure 2. Number of farms keeping Cika cattle in the period 2010–2020

During 2010-2017, the number of farms keeping Cika cattle increased linearly (Figure 2). After 2017, the increase in Cika keeping between years was smaller than in the years before (2010-2017). The last year of our study (2020) was the first time that the number of farms keeping Cika cattle actually decreased (for 6 farms). During the period 2010-2020, the number of farms keeping cows of Cika cattle increased (Figure 3). In 2020, the number of farms keeping cows of Cika Cattle was 915 and in the period 2010-2020, the number of these farms increased by 2.22 times.

The majority of farms that kept Cika cattle (different categories) or only Cika cows in 2020, kept only one animal of this breed (Figure 4). Probably these farms kept also other breeds or crossbreeds of cattle, or they are very small farms. This is followed by farms with two, three, four and five cattle or cows of the Cika cattle (Figure 4). The number of farms with more than 20 head of cattle or 20 cows of Cika cattle was very small. All farms keeping more than 20 head of Cika cattle were only 34 in 2020, while farms keeping more than 20 cows of Cika cattle were only 7.

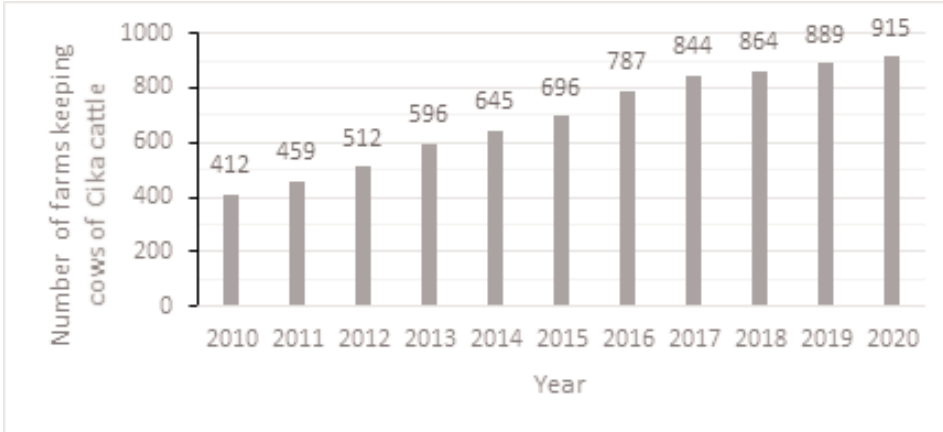

Figure 3. Number of farms keeping cows of Cika cattle in the period 2010–2020

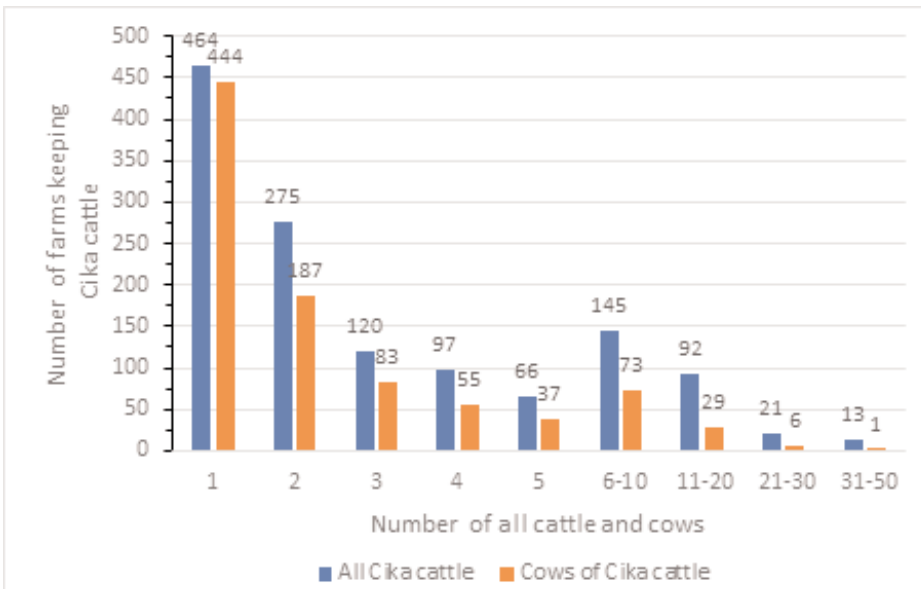

Figure 4. Number of farms according to the number of all Cika cattle in Slovenia and number of cows of Cika cattle per farm in 2020

Number of Cika cattle in the period 2010-2020

In Slovenia, the number of Cika cattle of all categories has increased since 2010 (Figure 5). The total number of Cika cattle in 2020 was 5531 animals and has increased by 236 % in the period 2010-2020. Similar to previous years, cows of Cika cattle accounted for the largest proportion (2561; 46.3%), followed by bull calves up to 6 months of age (1168; 21.1%). There were 505 bull calves aged 6 to 12 months and 718 heifers (13.0%). The index of increase in the number of cows during this period was higher than the total number of Cika cattle and amounted to 254 %.

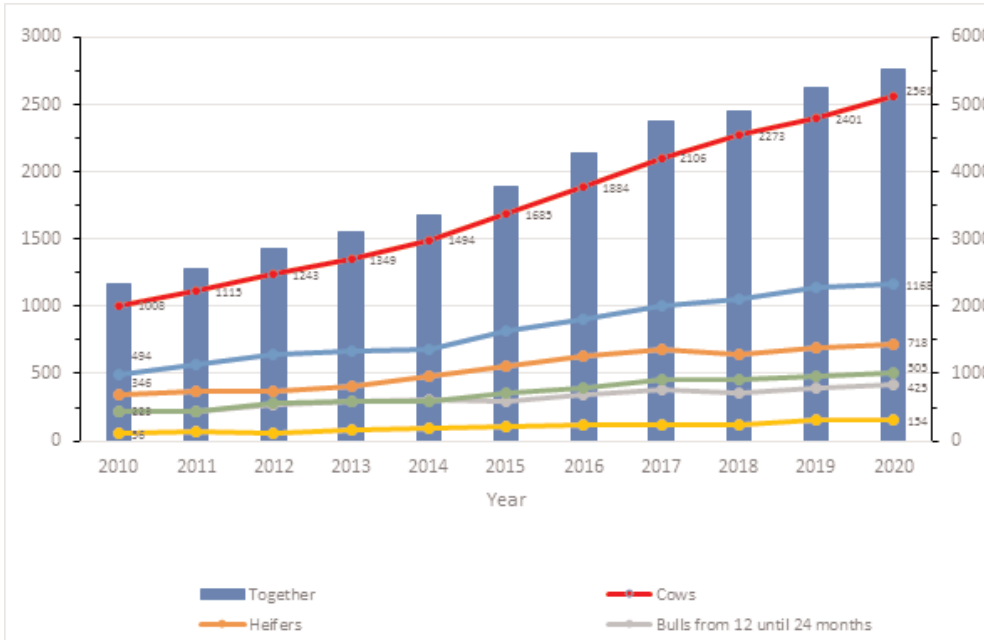

Figure 5. Increase the number of Cika cattle of all categories in the period 2010-2020

Age of Cika cattle cows

Most cows of Cika cattle in Slovenia are between three and four years old (382; 15%), followed by practically the same number of cows aged four and five years (338; 13%) and cows aged five to six years (339; 13%) (Figure 6). The number of cows aged two to three years (255; 10%), and the number of cows aged six to seven years (267; 10) are also very similar. The number of older cows decreases according to age (seven to eight years 9%), eight to nine years 6% and nine to ten years 6%. In 2020, 356 (14%) cows were already ten to fifteen years old. In addition, there were 55 (2%) cows aged 15 to 20 years and also two cows older than 22 years. Thus, a total of 16% of cows in the population of Cika cattle are older than ten years and they are still involved in reproduction, indicating the exceptional longevity of Cika cattle cows.

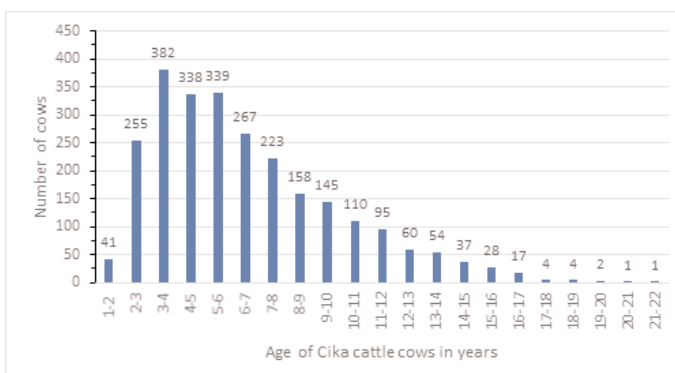

Figure 6. Number of Cika cattle cows according to the age of the cow in 2020

Conclusion and recommendation

The population of Cika cattle has been increasing since the beginning of the 21st century. In the last decade, the number of farms keeping Cika cattle cows increased, as well as the number of farms keeping another category of Cika cattle (85%). The number of breeders and the size of the herd is one of the basic requirements for sustainable breeding programs for management of autochthonous/local breeds. According to the statistical data for 2020, it is known that on average 4.28 Cika cattle were bred per farm in Slovenia, while the number of Cika cattle cows was on average 2.8 per farm.

The number of bulls aged 12 to 24 months (425) and those older than 24 months (154) includes the number of breeding bulls, which is increasing as more breeders use bulls for natural mating. The use of breeding bulls for natural mating is also spreading into the smaller herds, and is particularly prevalent in larger herds of Cika cattle. This is strongly related to the lower cost of insemination and improved pregnancy rate. In earlier years, when the number of Cika cattle was smaller, a large proportion of bulls were used as breeding bulls. In recent years, when the number has been increased, more and more bulls are kept for meat production.

In Slovenia, it can be noted that many breeders choose to keep Cika cattle in the regions where the breed was not traditionally bred in the past. It should be emphasized that very often breeders from farms in areas with limited factors for agriculture choose to keep Cika cattle. This is due to the steep lands. These steep slopes can only be grazed by cattle that are smaller in the body frame.

Acknowledgement

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Slovak national sheep breeds – A review

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Abstract

Sheep, due to its biological and productive properties, has influenced the civilization process of human society. Slovakia is known for wide area of permanent grass covers suitable for breeding of ruminants in sheep farms. Differentiation of local sheep populations into breeds became more pronounced from the 18th century by the use of systematic breeding with well-defined objectives. The current sheep populations display a large diversity of local as well as transboundary breeds adapted to variable environment. There are five national sheep breeds in Slovakia: Native and Improved Wallachian Sheep, Slovak Merino, Tsigai and Slovak Dairy Sheep. Nowadays, sheep farming is in a crisis and their numbers have declined rapidly. Nevertheless, the natural conditions in Slovakia are ideal for sheep breeding, so that it could easily be bred again in twice the current number of sheep. This study describes the characteristic features of national sheep breeds generated by Slovakian breeders.

Keywords: Slovak, sheep, national breed

Introduction

Sheep breeding together with beef cattle breeding were an important part of the Slovakia country in the past and, we believe, that they will also be a part in the coming years, because the variable natural conditions of Slovakia create the conditions for animal production.
Sheep is an animal which, due to its biological and productive properties, has influenced the civilization process of man and human society. Sheep, originated from a wild sheep, was one of the first domesticated animals, farmed since about 9 000 BC. Over the years of domestication, sheep have been bred to have more wool and developed black, white and spotted varieties. Central and northern Slovakia are known for typical high mountains and impressive mountain meadows with sheep farms.
Mountain sheep farming was introduced to our area with Wallachian settlers coming primarily to the central Slovakia in the 15th century. Mountain meadows and mountainous areas in general were unsuited for breeding other animals, moreover, crop yields were largely behind, what could have been harvested

in the lower, more fertile parts of land. However, sheep and goats perfectly fitted to such environment. Therefore, breeding of sheep for wool, milk and milk products such as cheese, bryndza and žinčica, developed in those areas.

The competitiveness of sheep breeding in Slovakia can be ensured only through the permanent improvement of breeding conditions and genetic potential of bred sheep (MAKOVICKY, 2016). The genetic potential of sheep can be improved by using rational breeding programs based on precise and thorough performance control. Differentiation of local sheep populations into breeds became more pronounced since the 18th century by the use of systematic breeding with well-defined objectives. In the past, the representation of sheep breeds in Slovakia was diverse. At the end of the 19th century, sheep farming began to decline and by 1920 the number of sheep fell by four-fifths. Despite the fact, that the natural conditions for sheep breeding in Slovakia are ideal, there are only about 320,000 of sheep at present.

The aim of our study was to describe the characteristic features of the Slovak national sheep breeds generated by Slovakian breeders.

Slovak sheep breeds

Native Wallachian Sheep

Wallachian Sheep were brought to the territory of Slovakia in the 13th and 14th centuries and they were kept for generations at an altitude of 600-1200 m above sea level in the regions of Liptov, Kysuce, Orava, Spiš, Low Tatras, Veľká and Malá Fatra and Spišske Rudohorie (CHRENEK et al., 2019). Apart from Slovakia (gene resource since 1992), the Native Wallachian is also used as a genetic resource in the Czech Republic, where revitalization takes place up to date. The breed is characteristic by a small body frame, with height of 510-550 mm, live weight of ewes 30-35 kg and of rams 40-45 kg. The wool is coarse, (40-86 μm), mixed, composed of several types of hair. The annual production of greasy wool is 1.2-2.4 kg for ewes and 1.8-2.5 kg for rams. The annual production of milk per lactation in the past fluctuated from 60 to 120 litres (excellent ewes - up to 150 l). The fertility rate is 95–105%, the percentage of twins is low (2-15%). Native Wallachian sheep is a typical seasonally polyoestrous breed with a pronounced oestrus appearance in the autumn (October, November). At present, 2,906 animals of this sheep breed are kept in Slovakia, of them 907 are purebred.

Improved Wallachian Sheep

Improved Wallachian Sheep is a perspective breed, mainly for mountain areas. In the Slovak Republic this breed is kept in the sub-mountainous and especially in mountainous areas above 750-800 m (i.e. Orava, Liptov, Spiš and Gemer). This breed is hardy, with a lively temperament, solid constitution, excellent ranging ability and tolerating well the mountain farming method in harsh climatic conditions. Sheep and rams are of medium-sized body frame.

The breed was generated by the intentional combined crossing of Native Wallachian Sheep with rams of various imported semi-fine-wool and semi-coarse-wool breeds (Texel, Hampshire, Cheviot, Leicester and Lincoln). Qualitative and quantitative traits of the wool and the type were improved using breeding

schemes. Improved Wallachian sheep was recognized in 1982 as a new semi-coarse-wool breed. At present, 100,235 pieces of this breed are kept in Slovakia, of them 8,175 are purebred.

Slovak Merino Sheep

Slovak Merino Sheep have a medium-long body frame; the head is finer and longer, with a slightly curved forehead and lively eyes. The sheep are hornless; horns can occur in rams. The average yield of the wool is 43-48%, natural wavelength is 6-9 cm per year. Fertility rate ranges from 115 to 140%. The basic breeding method for merino sheep remains a purebred breeding. At the same time, it is necessary to create the desired utility type with improved meat efficiency by increasing the selective pressure. In the sub-mountain area semi-fine wool sheep breeds are kept. At present, there are 9,149 animals in Slovakia, of them 152 are purebred.

Tsigai

Tsigai is one of the oldest breed of sheep, which is bred in different countries. In Slovakia, they are kept predominantly in the sub-mountainous areas from 500 to 700 m above sea level. They are adapted to the harsher climatic conditions and well tolerate the „chalet" farming method. Tsigai sheep have a medium-sized body frame. The sheep are hornless; in rams horns can occur. Tsigai sheep is a prospective breed in the Slovak Republic with an anticipated expansion of their population size. The main breeding goal is the dual-purpose with a focus on meat and milk production. At present, there are 91,239 animals kept in Slovakia, of them 5,613 are purebred.

Slovak Dairy Sheep

The process of the Slovak Dairy Sheep breeding lasted for 25 years. It is a specialized dairy breed focused on the production of quality milk. It is the newest national breed of sheep (since May 2017), which was created by the crossing of the original breeds (Tsigai and Improved Wallachian Sheep, with a smaller share of Merino Sheep) with specialized dairy breeds like Lacaune and East Friesian Sheep (CHRENEK et al., 2018; MARGETÍN et al., 2017, 2020). The breeding program aims to achieve milk production of over 200 litres per year. The ewe´s fertility rate exceeds 160%. Importantly, the ewes have an udder with excellent functional and morphological traits, which make them suitable for machine milking. At present, there are 8,849 animals kept in Slovakia, of them 3,982 are purebred.

Conclusions

Sheep have a suitable potential for the development of rural tourism and agrotourism, which could become one of the solutions to the economic situation in the mountain and foothill regions of Slovakia. Sheep are often kept in less-favoured areas, where they play a key role in their natural environmental maintenance. They are, therefore, of great socio-economic benefit to these areas. However, many sheep farmers in these areas end up breeding due to economic difficulties, high labour requirements and the high age of the staff.

At present, Slovakia has all the prerequisites for competitive sheep breeding in terms of production conditions. The geographical diversity of Slovakia with its beautiful natural environment and preserved cultural heritage creates favourable conditions for the development of sheep farming. With their multifunctional importance, sheep can not only contribute to the profitability of this sector, but also increase the self-realization of our country compared to other EU countries. Preserving the cultural character of the country, protecting the environment, and also maintaining employment in the countryside are the most important tasks that can be provided by sheep farming.

Acknowledgement

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Studies about the role of local breeds in bioeconomy of Banat Region

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Abstract

The goal of the Association Transylvanian Rare Breeds is the identification and preserving the local breeds with importance in local bioeconomy. Therefore livestock breeders were obliged to look for corrective measures and support comparative studies on the given subject. Our case studies were selected on the basis of sustainable use of more climate-tolerant autochthone breeds, e.g. Hungarian Grey Cattle, the Transylvanian Buffalo and Tsigai Sheep.

Keywords: ethnozootechny, local breed, bioeconomy

Introduction

"Food and farming systems are a fundamental part of the bioeconomy, but they urgently need to be transformed to become more sustainable, nutrition-sensitive, resilient and inclusive in view of a growing world population, climate challenges, including water scarcity and loss of biodiversity and of productive land (EBS, 2018)." "Economic intelligence promotes solutions for maintaining domestic biodiversity by providing tools necessary for obtaining the information that allows farmers to anticipate and defend their economic interests (DIGARD, 2009)."

Less than 20 years animal scientists and environmentalist placed increased emphasis of greenhouse gas (GHG) emission issue in relation with global animal husbandry and the role of ruminants in particular. As time progressed a series of exaggerated studies were published putting the blame on ruminant livestock about extremely high water use and in parallel extreme GHG emission compared to non-ruminant species or edible crops. Therefore livestock breeders were obliged to look for corrective measures and support comparative studies on the given subject. Our case studies were selected on the basis of sustainable use of more climate-tolerant autochthone breeds, e.g. Grey cattle, the Transylvanian Buffalo and Tsigai Sheep.

The theme is rather complex, since biological diversity, grazing and feeding systems as well as production (farming) systems and socio-economic aspects are involved. Innovative and resource-efficient bioe-

conomy can offer economic opportunities to producers and enterprises in rural areas while preserving biodiversity and reducing greenhouse gas (GHG) emissions.
The 2018 update of the EU Bioeconomy Strategy aims to accelerate the deployment of a „sustainable European bioeconomy so as to maximise its contribution towards the 2030 Agenda and its Sustainable Development Goals (SDGs) (EC, 2018)", as well as the Paris Agreement.

Materials and methods

Throughout the years at conferences and symposiums in the country and abroad, Association Transylvanian Rare Breeds presented the creation of local communities in Banat and Transylvania, promoting the local breeds, their monitoring and the ways of protecting the national genetic patrimony. These works have been published in prestigious journals (MATIUTI et al., 2011, 2012a, 2012b, 2013, 2014, 2016; MATIUTI and MATIUTI, 2011).

Results and Discussion

The Figure 1 shows the proposed bioeconomic strategies of Association Transylvanian Rare Breeds for maintaining local breeds in the Banat region.

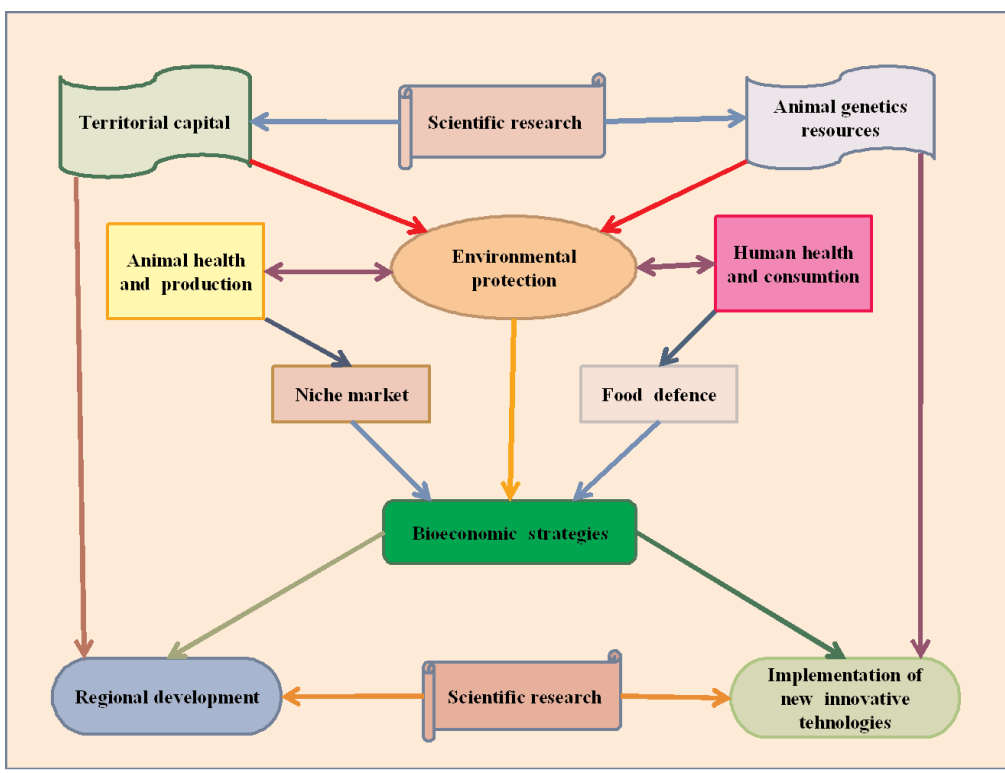

Figure 1. The bioeconomic strategies for maintaining the local breeds in Banat area

The existence of the dwellings makes the work of the field easier, representing a form of integration of plant culture and animal breeding. Breeding animals at a dwelling also had the role of isolating them from epizootics. Including for people, it was the place of refuge in the case of plague.
”The potential of farmers and SMEs to contribute to innovation must be fully recognised. This approach recognises the importance of local knowledge enhancing local capabilities, while also accommodating diversity and complexity. Therefore the bio-economy concept should have a much broader scope than the dominant one in European Commission innovation policy (SCHMIDT et al., 2012).”
"Marketing products from local breeds has two advantages: traditional technical processing - production or manufacturing clothing with a characteristic design (FAO, 2010)."
Socio-economic research is needed to inform strategies, pathways and stakeholder cooperation towards sustainability goals.

Defining the inborn factors takes us to the first stage of using the selection in order to improve the productions. When they are too low, the selection methods become more delicate. The certain genes of the local breed show opposition against various diseases. For example, according to FAO 2009, all over the world there are only 10 kinds of cattle breed, with genes that show resistance to consumption, enzootic, mastitis, which can produce important economic losses. Among these breeds, the Grey Cattle and the Romanian Mountain Cattle are also mentioned. The local breeds, known as rural or home-bred, have production skills in difficult conditions, being less sensitive to weather conditions, fodder, a poor soil, and an irregular and coarse feeding. Therefore, they show resilience, meaning that, when, for a time the fodder is of less nutrients, they come back to normal when the feeding is restored. To all these skills, their toughness is added, meaning a good health and flexibility, on a larger scale, easily adapting to changes of the growth systems. Creating a home-bred index represents a challenge for the improvement of animals.

In some conditions, the local polyvalent cattle breeds may insure a kind of economic independence of a region: it provides food products, raw material for shoes and clothes, organic fertilizers, energy for transport and work, using not only quality fodder, but also waste/refuse coming from the production of alcohol, spirit, sugar, milling, pastry, etc, in other words, it fits very well into the bioeconomy of a region.
The criteria of genetic management of local populations, with small numbers, are sometimes imposed by the products demanded and sold on the market, for example, the smoked pork ham, a recipe from Banat.

Grey Cattle
The Grey Cattle are long-lived and robust animals. They are very hardy and strong animals and well adapted to extensive pasture systems. That’s why they were used as a draught animal in the Middle Ages and early modern times. But currently the breed is mainly used for meat production for exclusive gastronomy. They grow relatively fast and reach maturity fast, and their meat is of very good quality. Grow relatively faster, well adapted to extensive pasture system. Its main feature is climate tolerance and well adaptation to natural conditions. This is the ancient breed of Hungarians which belongs to the Podolian type of cattle group. Although its origin is not completely known, it has probably arrived with

the Hungarian settlers during the 9th century. The Hungarian Grey has emerged as a highly pure-bred form that dominated stocks in the Carpathian Basin during the last centuries. By the 1800's 99% of the livestock were Hungarian grey cattle. These animals are able to use low quality pasture and save better fodder are for profitable cropping. The significance of the species is increasing nowadays because landscape conservation and organic beef production. It has a resistant high quality, organic meat, it's exceptional in calf rearing, favourable fertility, vitality and has a high aesthetic value.

The Transylvanian buffalo

The spectacular images of black buffalo canoes are close to the water's lush pastures. The predecessor of the Transylvanian domestic buffalo was probably the Indian wild, or the Asiatic water buffalo (arni). In the Carpathian Basin, it was most likely that the migration of the population as a wild animal was taken. Its strength is almost unbelievable: two buffalo ox in the towing force, with the power of four grey-headed oxen. The buffalo is able to consume reeds, swampy grasses and is particularly fond of wet moorland areas. It is able to utilize sour grasses, herbs and potatoes in swampy areas. The cold is, however, due to the origin of a delicate species, so that our homeland must be settled in a stable. Besides its milk and meat production, it was perhaps more important to have its draft power and this is evidenced by the fact that after the mechanization the stock of the present territory of Transylvania and Banat has declined greatly. Today we preserve it as a genetic reserve and cultural history.

The Tsigai Sheep

Similarly to the Grey Cattle and the Buffalo, the Tsigai sheep is also able to tolerate extreme climatic conditions and graze well on low quality pasture. Hence contributes to environmental tolerance. The breed originates from Asia Minor. It came to Transylvania at the end of the 18th century through Balkans and Ukraine. It has become widely spread because people bred it for three different things: its flesh, its milk and its soft wool. Lots of Transylvanian farmers changed their ordinary sheep to Tsigai, because people bought its wool much more. Although it was a mountain sheep it adapted to lowlands really fast. Most of the Tsigais were kept between the Mura river and Somes river; this is where they remained breed them after the World War I too. In Republic of Moldova it is the leading breed of sheep, and it is also important in Romania and Slovakia.

The Bioeconomy consideration

Currently an industrial perspective dominates the EU policy framework for a European bio-economy. The Commission's proposal on the bio-economy emphasises greater resource-efficiency, largely within an industrial perspective on global economic competitiveness, benefiting capital-intensive industries at higher levels of the value chain. However a responsible bio-economy must initially address the sustainable use of resources. Many farmers are not only commodity producers but also providers of quality food and managers of the eco-system. A public goods-oriented bio-economy emphasises agro-ecological methods, organic and low (external) input farming systems, ecosystem services, social innovation in multi-stakeholder collective practices and joint production of knowledge.

A sustainable European bioeconomy is necessary to build a carbon neutral future in line with the Climate objectives of the Paris Agreement. For instance, in the construction sector engineered wood offers great environmental benefits as well as excellent economic opportunities. „A sustainable bioeconomy is also essential to the reduction of emissions in the European Energy sector. Bioenergy, currently the EU's largest renewable energy source, is expected to remain a key component of the energy mix in 2030 and contribute to meet the EU renewable energy targets of 20% in 2020 and of at least 32% in 2030 (COMM, 2018)."
Supporting healthy ecosystems is a European priority. The bioeconomy can contribute to restoring ecosystems, for instance achieving introduction of new agricultural practices.

Conclusions

The Banat region bioeconomy needs to have sustainability and circularity at its heart.
By traditions point a view the local animals breeds are part of the Cultural Intelligence of rural communities in Romania. They show the intelligence, work and creativity of the people of this communities. Ethnoastronomy – old recipes, today they are reconsidered. Connecting it with the word traditional, it ensures us with important customers for the products which guarantee, more or less, the basic ingredients. The existence of a various ethnoastronomy ensures a certain area with prestige, finally having a contribution to the making of the Biocultural Protocol, that we insist to create, at first, for the Banat region.

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