

14th
INTERNATIONAL
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MODERN
TRENDS
IN LIVESTOCK
PRODUCTION



P R O C E E D I N G S

4 - 6 October 2023, Belgrade, Serbia

Institute for Animal Husbandry
Belgrade - Zemun, SERBIA

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POPULATION TRENDS OF GOATS IN SERBIA AND CROATIA FROM 2012 TO 2021

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Abstract: This paper aims to examine the state of goat production and the population trends of goats in Croatia and Serbia from 2012 to 2021. Goat keeping in both countries suffered immensely in the second half of the 20th century as a result of the infamous Law on Prohibition of goat keeping, which was unique of its kind and which led to the almost complete annihilation of the goat sector in countries which were at the time part of Yugoslavia. With the abolition of this law, both countries have made an effort to revive goat production by importing high-producing breeds, crossbreeding domestic breeds, herd book keeping and government funding. In the past ten years, Serbia has experienced a significant rise in the number of herd book goats and a decline in the total number of heads of goats. The Republic of Croatia had a positive trend in the total number of goats which increased by about 10.6%, and a higher percentage of herd book goats compared to the total number of goats compared to Serbia. However, Serbia has about 2.7 times bigger total goat population. Total production of goat milk and meat in both countries is considered low when seen from the perspective of Europe, as only 1.3% and 0.5% of European goats are raised in Serbia and Croatia, respectively. In Serbia, production systems are still predominantly extensive to semi-intensive, and therefore production potential of animals is not exploited to the maximum. Also, Serbia has weak and unstable markets for goat milk and meat, making this production unpredictable and varying. Even though the goat sector has come a long way since its downfall in 1954, it still has a long way to go to become sustainable. On the other hand, in Croatia, goat milk has been a sought-after product in recent years, and farmers have achieved fair prices, establishing the goat dairy industry. After Croatia joined the European Union, goat farmers gained access to several significant sources of financing, making it the most important event for the goat sector in Croatia.

Keywords: goats, Croatia, Serbia, breeds, production, population and trends

Introduction

In Serbia and Croatia, goats have been bred for centuries as an important source of animal products: milk, meat, hair and skin. *Vondraček (1998/1999)* claims that goats have been present even before the Roman times in the Croatian region Istria. Their importance has not diminished over the centuries, and in the 19th century, around 750 000 goats were bred in Dalmatia alone (*Ožanić, 1955*). Just before World War II, there were approximately 1,800,000 goats in the territory of the State of ex-Yugoslavia, which included both Serbia and Croatia, along with the remaining four republics. These were mainly domestic Balkan goats. The number of goats significantly declined during the war, but it increased again after the war to around 1,300,000 heads, as reported by *Memiši and Žujović (2012)*. Unfortunately, a rapid decline in the number of goats in Serbia and Croatia occurred in the second half of the 20th century, precisely from 1954, when the Law on the Prohibition of goat keeping was adopted (*Maksimović et al., 2017*). The consequences of the Law mentioned above are still present. However, in the 1980s, the Law was tacitly abolished, and several highly productive breeds of goats (Alpine, Saanen, German Improved Fawn) were imported into Serbia and Croatia, which laid the foundations for more intensive goat breeding and milk production (*Mioč, 2022*).

Due to decades of neglect and ostracism following the prohibition law, the goat sector in Serbia has suffered, resulting in it being the least favoured livestock sector. For many years, there has been a need for clear strategy or direction for this production, and this continues to be the case. Breeders start with tiny herds avoiding all kinds of risks (*Memiši and Žujović, 2012*). Through the decades of absence of goats and goat products on the markets and rapid industrialisation favouring cow milk, consumers' tastes and habits changed, putting bovine species ahead in dairy. In recent years, the government of the Republic of Serbia has been trying to revitalise and stop further deterioration of goat production, primarily by funding breeders to produce quality breeding animals (*Maksimović et al., 2021*). Most effort has been made to increase the number of quality breeding animals in the past decade. Funding revived the goat sector, and genetics was improved by importing high-yielding breeds such as Alpine and Saanen. However, this is only the first step, as the goat sector needs much more attention in all its aspects.

In Croatia, goat breeding has made significant progress in the last three decades. All breeds were standardised and genotyped (especially the autochthonous breeds), and breeding programs for most breeds were rewritten and published. The procedure for protecting the authenticity of certain goat products like dried goat meat was started (*Mioč and Držaić, 2022*). Protecting originality and achieving geographical authenticity marks helped the farmers make their products more

recognisable, protect them from unfair competitors and increase the product's price. Croatia has been a member of the European Union since 2015. Thus, most of the legislation had to be adapted according to European regulations and new Laws on animal husbandry and veterinary medicine were adopted. Although joining the European market did not bring significant changes in terms of increasing the number of goats or the amount of goat products in the Croatian sector, it did enable farmers to access funding from various European sources. Additionally, progressive farmers received considerable support as a result. Nonetheless, Croatian goat production still falls short of being self-sufficient.

Goat breeds in Croatia and Serbia

In both countries, there are several autochthonous and imported breeds of goats. Of the imported breeds, Alpine, Saanen and Boer are bred in Serbia and Croatia. Croatian autochthonous breeds are Croatian spotted goat (Figure 1), Croatian white goat (Figure 2) and Istrian goat (Figure 3), while in Serbia, there are two breeds, Balkan goat (Figure 4) and Serbian white goat (Figure 5).

Croatian spotted goat

The Croatian spotted goat is a typical Mediterranean-type goat breed known for its resilience, adaptability, longevity and modest production. It is the most numerous Croatian bred, mainly raised in Dalmatia's hill and mountain areas. Formerly, it was known as the Balkan goat. These goats have strong bodies covered with white, black, grey and brown hair. Horns are present in both goats and bucks. The average body weight of adult goats and bucks is 30 to 50 kg and 40 to 60 kg, respectively. The milk production is low, between 150 and 350 litres in the lactation (150 – 220 days) (*Mioč, 2022*).



Figure 1. Croatian spotted goat

(Source of the picture: Hrvatski savez uzgajivača ovaca i koza, 2023)

Croatian white goat

The origin of the Croatian white goat is unknown, but it is supposed that domestic goats were bred with Saanen goats, thus creating this breed. The estimated number of Goats is around 5000. It was mainly bred in small herds, along with sheep, for milk production. The average body weight of adult goats and bucks is 35 to 50 kg and 45 to 70 kg, respectively. The milk production is low, averaging between 250 and 400 litres of milk during the lactation period of 230-260 days (*Mioč, 2022*).



Figure 2. Croatian white goat

(Source of the picture: Hrvatski savez uzgajivača ovaca i koza, 2023)

Istrian goat

Istrian goats have a big physical frame, strong constitution, and strong bones. The base coat colour is white, but grey or cream-coloured hues are allowed. Large, rough, and coarse horns bent backwards in bucks are desirable. The body weight of adult goats is between 57 and 66 kg and adult bucks' is between 70 and 120 kg. Goats produce between 500 and 800 kg of milk during the 220-280 days of lactation (*Antunović et al., 2019; Mioč, 2022*). This breed was officially recognised in 2012, and it is critically endangered, with 100 individuals remaining.



Figure 3. Istrian goat

(Photo: Ivan Vlahek)

Balkan goat

As mentioned in the description of the Croatian spotted goat, the Balkan goat is the same breed, i.e. genetically the same. Balkan goat refers to all autochthonous goats originating from Balkan Peninsula. It is a small goat with long hair that comes in every possible colour or combination of colours. Balkan goats of both sexes have horns, but occasionally some individuals can be without horns. This goat is resilient, healthy, agile, and capable of surviving in harsh environments. Body mass in adult does can vary from 35-45 kg, and in bucks, 45-55 kg. Milk production ranges from 150-350 kg, depending on the duration of lactation, and fertility is around 130% (GOP, 2020). It is bred extensively for combined production, i.e. milk and meat. It can be found all over Serbia, but mainly in the south and southeast regions.



Figure 4. Balkan goat
(Photo: Bogdan Cekić and Ivan Ćosić)

Serbian white goat

The Serbian white goat, also called the Domestic white goat, is an improved version of the Balkan goat, created through the crossbreeding of Balkan does and Saanen bucks to enhance milk production and body conformation. Although the crossbreeding process was unintentional, the Serbian white goat has since been recognised as a distinct breed. Serbian white goat has white to white-beige hair, which is short with patches of longer hair along the back line, on the flanks and on the belly. Its format makes it smaller than Saanen and bigger than Balkan goat. Mature goats weigh about 45 kg, and bucks are 60 kg of body weight on average. Milk yield can vary from 150 to 450 kg in lactation, which also varies in length. Fertility is 130% on average but can be as much as 180% in good rearing practices (GOP, 2020). This goat is mainly found in southern and southeast Serbia and is bred for milk and meat.



Figure 5. Serbian white goat
(Photo: Aneta Lilić)

Goat production systems in Serbia and Croatia

Goat keeping in Serbia is predominantly extensive to semi-intensive. Autochthonous breeds, such as Balkan and Serbian white goats, are kept exclusively in extensive pastoral systems. In contrast, higher productive breeds like Alpine and Saanen are kept in semi-intensive production systems. Fully intensive production systems are rare in Serbia and can be only found sporadically, usually in the northern part of the country, i.e. AP Vojvodina region. Goat production in Serbia is directed towards milk-meat, but predominantly milk (Žujović *et al.*, 2011). Milk is considered the main goat product, but the dairy market is unstable, and prices fluctuate annually. Therefore, producers can turn to kids' production for meat in those years when the milk prices are too low. This means that the milk is then exclusively used to nourish kids. That way, farmers cope with loss from low milk prices, but such practices of discontinuing milk production from year to year lead to lower milk yield in subsequent lactations, and kids suckling for a prolonged period can cause udder problems (Maksimović *et al.*, 2021).

In Croatia, two main types of goat production systems exist. There are two primary types of goat production systems in Croatia. The first type is extensive, mainly located in Dalmatia, where Croatian native breeds of goats (Croatian spotted goat, Croatian white goat) are raised for meat production. The second type is an intensive dairy production system in which the Alpine breed dominates. Most dairy producers are located in central and northern Croatia, gathered by the „Vindija“ company as its cooperators or have their small dairy processing plants. In recent years goat milk has been a sought-after product, and farmers have achieved fair prices. This has, in return, stabilised the goat dairy industry.

Neither Croatia nor Serbia is among the high-producing European countries regarding the goat sector. According to Faostat data, in 2021, total goat milk and meat production in Croatia was 7,003 tonnes and 500 tonnes, respectively, while Serbia produced 35,400 tonnes of milk and 3,256 tonnes of goat meat in total (Table 1.). But, since official statistics do not include home consumption or informal market sales, precise measuring of actual production is impossible. In addition, goat milk is predominantly consumed locally. In contrast, cow milk is usually channelled into formal markets for processing (*Miller and Lu, 2019*), and the same goes for goat meat, even more so.

Table 1. Goat milk and meat production in 2021 in Serbia, Croatia, Europe and the world

Country/Product	Milk (in tonnes)	Meat (in tonnes)
Serbia	35,400	3,256
Croatia	7,003	500
Europe	3,109,796	89,173
World	20,725,282	6,397,747

Source: Faostat (2023)

Total number of goats in Serbia and Croatia

During the observed period, Serbia's total number of goats varied between 231,837 in 2012 and 182,558 in 2017. In Croatia, this number ranged between 65,000 (from 2012 to 2017) and 82,290 (2019) individuals. The general trend in the number of goats in the two countries is opposite; in Croatia, it is ascending, and in Serbia, it was descending from 2012 to 2017 (Table 2; Table 3). *Sredojević et al. (2020)* reported that in Serbia, the number of goats has been declining since 2008, with an average decline of 8.7 thousand per year. According to the recent Faostat data, 15,156,962 goats were raised in 2021 in Europe. Of these, 1.3% and 0.5% were raised in Serbia and Croatia, respectively (*Faostat, 2023*).

In Serbia in 2015, there were 62,930 goat herds, of which 54.21% contained one or two goats. Only 0.09% of herds had 100 or more goats (*Nastić and Potrebčić, 2015*). The average herd size was nine heads of goats (*Sredojević et al., 2020*). *Maksimović et al. (2021)* stated that this structure might be changed recently, but it is clear that most holdings keep less than ten heads of goats which is under any limit that allows sustainable production. Most goats in Serbia are reared in West, East, and South Serbia, located south of Belgrade (*Maksimović et al., 2021*).

In Croatia, 49% of goats are raised in three Dalmatian counties: Split Dalmatia County (20%), Zadar County (19%) and Šibenik Knin County (10%).

Most herds are medium in size, and 72.7% contain below 100 individuals (*Mioč and Držaić, 2022*). More than 200 individuals per herd are present in 7.3% of herds. The most numerous goat breed was the Croatian spotted goat, followed by the Alpine breed (*HAPIH, 2022*).

Table 2. The total number of goats and the number of quality breeding goats in Serbia and Croatia from 2012 to 2016

Year		2012	2013	2014	2015	2016
Country	Parameter					
Serbia	Total number	231,837	225,073	218,603	202,828	200,150
	Quality breeding animals	3,415	3,453	5,072	7,026	8,212
Croatia	Total number*	65,000	65,000	65,000	65,000	65,000
	Quality breeding animals	8,196	6,792	6,480	6,277	6,519

*Total number was estimated

Table 3. Total number and number of quality breeding goats in Serbia and Croatia from 2017 to 2021

Year		2017	2018	2019	2020	2021
Country	Parameter					
Serbia	Total number	182,558	195,932	191,280	202,325	195,037
	Quality breeding animals	12,926	16,512	18,554	19,009	18,571
Croatia	Total number*	65,000	68,000	82,290	71,140	71,872
	Quality breeding animals	6,837	7,395	7,459	7,548	8,735

*Total number in 2017 and 2018 was estimated

Quality breeding animals in Serbia and Croatia

Quality breeding goats have known pedigree and production data. Their production and reproduction are monitored, and the records are used as breeding efficiency indicators. In both Serbia and Croatia, the Alpine is the breed with the most quality breeding animals (Figure 6). From 2012 to 2021, the number of

quality breeding Alpine goats in Serbia increased from 3,000 to 16,000. Croatia's number did not change significantly in the same period and varied by around 5,000 goats or 52% of the quality breeding goat population. This confirms that the Alpine is the primary breed in the two countries' intensive and semi-intensive goat production systems (Figure 9 and Figure 10), where dairy production dominates. The number of quality breeding Saanen goats in Serbia and Croatia was around 700 individuals, significantly lower than that of Alpine goats. In both countries, farmers prefer the Alpine goats because they are considered more resilient and adaptive than the Saanen goats, and their production is similar. Among other non-native breeds, the Boer goat had a minor presence in Croatia, which was recently introduced into Serbia in 2021. From 2012 to 2015, Croatia had a small breeding population of German improved fawn goats. In Europe, the dairy sector based on the Alpine, Saanen, Murciano-Granadina and several other highly productive breeds also dominates. Even though Europe holds only 1.9% of the world's goat population, it produces 15.1% of goat milk and 35.1% of cheese (Morales *et al.*, 2019). Leading European goat milk producers are the Netherlands and Mediterranean countries.

During the observed period, the Croatian spotted goat and Balkan goat were the most numerous native quality breeding goats (Figure 7). Moreover, both breeds had a significant increase in number. The number of quality breeding Croatian spotted goats increased from around 600 in 2012 to 2,300 in 2021, while the number of Balkan goats increased from 200 to about 700 individuals in the same period. Both breeds of goats are reared in hilly and mountainous regions with harsh environmental conditions, primarily for meat production (Maksimović *et al.*, 2019; Mioč, 2022). Croatian white goat and Serbian white goat breeds are less frequent, accounting for 4% and 0.8% of the total quality breeding populations (Figure 4; Figure 5). The Istrian goat is critically endangered, with only 100 individuals left (HAPIH, 2022). However, in 2022 a plan was set to revive, protect and promote Istrian goats, thus preventing their extinction (Vlahek *et al.*, 2023).

The percentage of quality breeding goats from the total number of goats in Serbia and Croatia from 2012 to 2021 is presented in Figure 8. In Croatia, it varied between 9.06% and 12.61%. In Serbia, it was 1.47% in 2012 and had an increasing trend until 2019 (9.7%). However, both percentages are relatively low, and the number of quality breeding animals should be increased in the years to come.

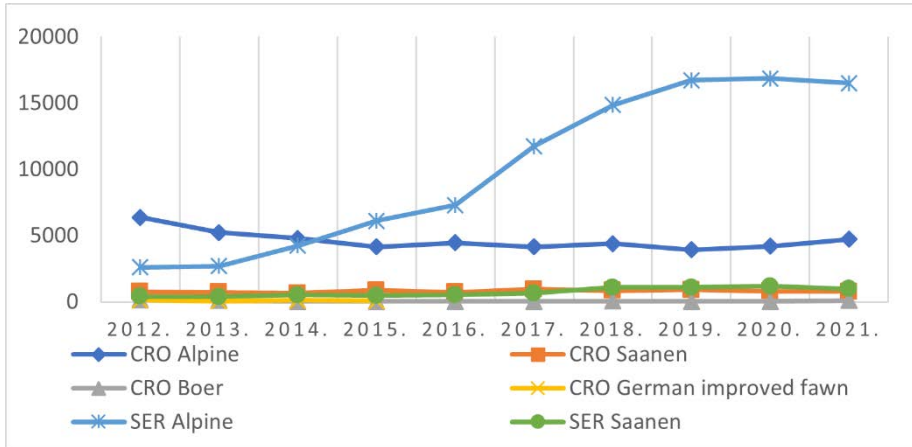


Figure 6. The number of quality breeding allochthonous goats in Serbia and Croatia from 2012 to 2021

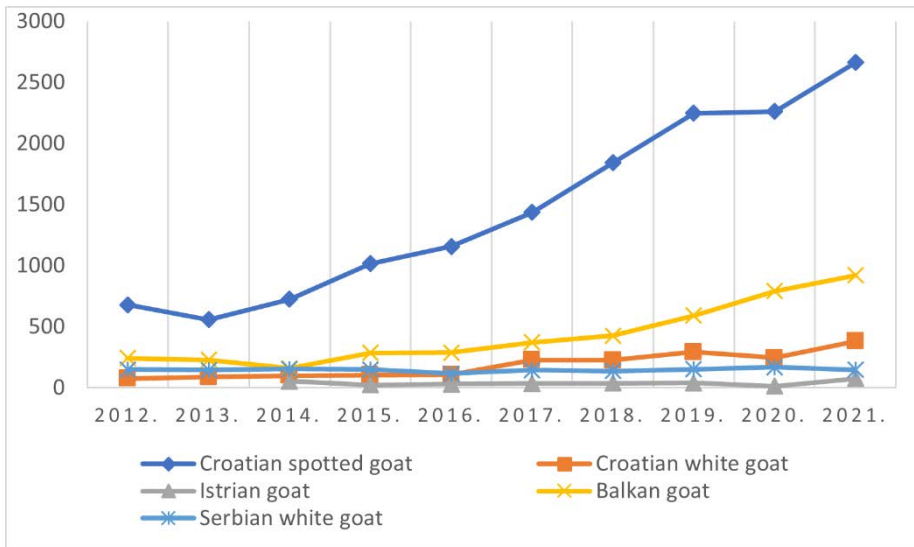


Figure 7. The number of quality breeding autochthonous goats in Serbia and Croatia from 2012 to 2021

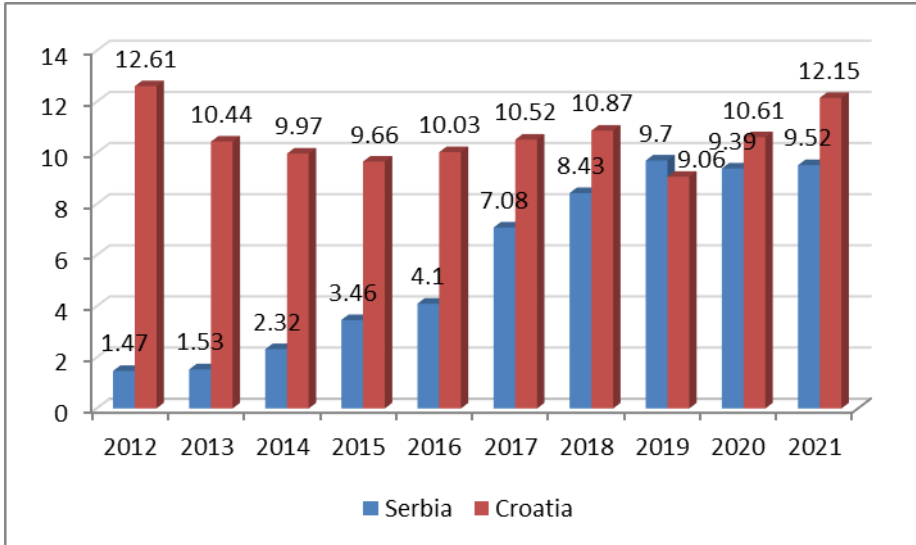


Figure 8. Percentage (%) of quality breeding goats in Serbia and Croatia

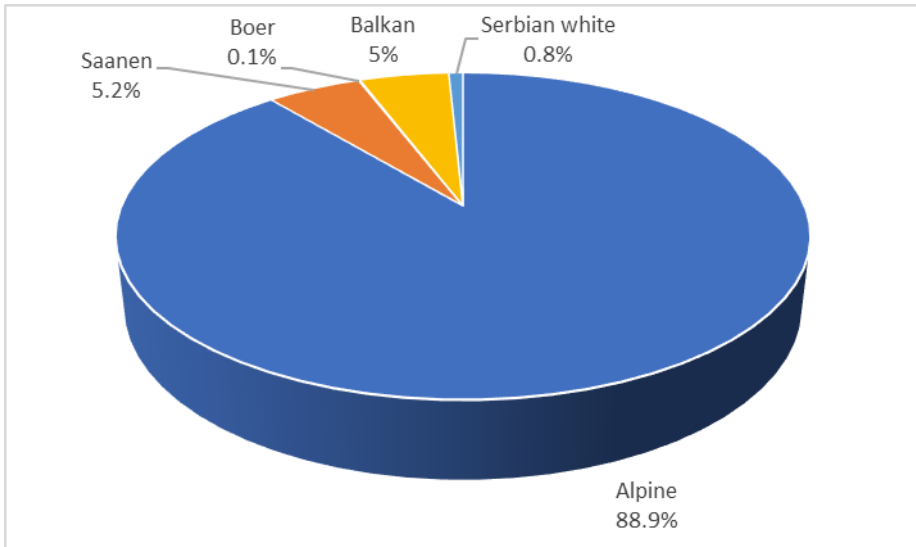


Figure 9. Structure of quality breeding goats in Serbia by breed in 2021

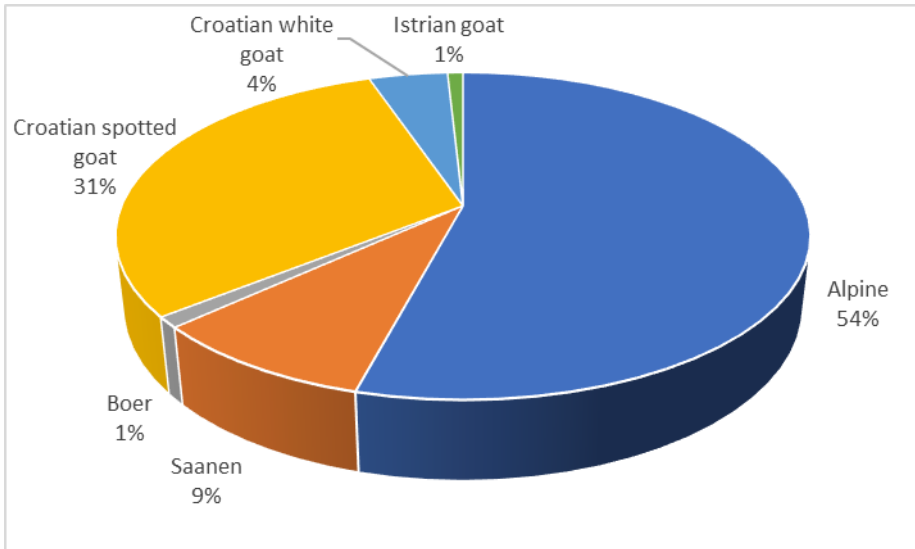


Figure 10. Structure of quality breeding goats in Croatia by breed in 2021

Government funding for the goat sector in Serbia and Croatia

As seen from Tables 2 and 3 and Figure 8, the number and percentage of animals under selection control in Serbia have increased significantly during the past ten years. This period brought an increase of roughly 5.4 times the number of controlled animals. In 2012, the number of registered goats accounted for 1.47% of the total goat population in Serbia, while in 2021, a significant increase to roughly 9.52% was recorded. The main reason behind this increase is the government's founding of goat breeders, currently the leading motivation for farmers to raise goats. So far, all goat breeds of national interest for breeding in Serbia have been included in funding through breeding-selection programs. Farmers receive 59 Euros per year per head for animals registered in the Central herd book and 38 Euros for goats of autochthonous breeds (genetic resources) under performance control (Maksimović *et al.*, 2021). This funding proposes a lower limit of 10 breeding heads of goats that are under productivity control. In addition, in 2017, the funding for producing male breeding animals (bucks) was implemented as a new stimulating measure (Maksimović *et al.*, 2017). Funding was initially established to help revitalise goat production, which was almost on the brink of extinction and has since become a necessity in goat breeding.

Compared to Serbia, Croatian governmental funds for goat keeping are significantly lower. Financial support for the quality breeding of female animals is 17,26 Euros (*APPRRR, 2021*). However, other sources of financing became available after joining the European Union. For example, farmers can apply for support from the European Fund for Agricultural Development. In addition, several measures include the goat sector, like Measure 14 (support for animal welfare), Measure 10 (support for agriculture, environment and climate changes) or Measure 11 (support for organic production) (*APPRRR, 2023*). Many farmers benefited from these measures since some funding was bountiful and allowed them to improve their farms significantly.

Conclusion

Goat production in both countries was revived with the import of highly productive goat breeds. In addition, productivity was improved through planned selection, intensification of production, and better rearing conditions. Despite financial stimulative measures leading to an increase in the number of quality breeding animals, the total number of goats in Serbia has been decreasing over the years, with goat breeders becoming almost entirely dependent on government funding. The unstable market for goat products needs to be addressed to ensure more sustainable production. Keeping autochthonous breeds in Serbia has been almost completely abandoned. However, the genetic potential of imported high-producing breeds still needs to be fully exploited because most production systems are extensive to semi-intensive. Even though the goat sector has come a long way since the 1954 introduction of that notorious Law of Prohibition on goat keeping, it still has a long way to go to become sustainable.

Contrary to Serbia, goat milk has been a sought-after product in Croatia in recent years, and farmers have achieved fair prices, establishing the goat dairy industry. Croatia also showed a positive trend in the total number of goats in the last ten years, which increased by about 10.6% and a higher percentage of quality breeding animals, so-called “herd book goats”, in relation to the total number of goats compared to Serbia. Furthermore, after Croatia joined the European Union, goat farmers gained access to several significant sources of financing. Progressive farmers who capitalised on these resources increased their competitiveness in the market.

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References

- ANTUNOVIĆ Z., MARIĆ I., LONČARIĆ Z., NOVOSELEC J., MIOČ B., KLIR Ž. (2019): Fenotipske odlike različitih dobnih kategorija istarske koze. Zbornik radova 54. Hrvatskog i 14. Međunarodnog simpozija agronoma, 17–22. 2., Vodice, Hrvatska, 429-433.
- APRRR (2021): Agencija za plaćanja u poljoprivredi, ribarstvu i ruralnom razvoju. Program potpore za unaprjeđenje uzgoja ovaca i koza u Republici Hrvatskoj. <https://www.aprrr.hr/>
- APRRR (2023): Agencija za plaćanja u poljoprivredi, ribarstvu i ruralnom razvoju. Ruralni razvoj. <https://www.aprrr.hr/ruralni-razvoj/>
- FAOSTAT (2023): Live animals and livestock processed stats. Rome, Italy: Food and Agriculture Organization (FAO). <http://www.fao.org/faostat/en/>
- GOP (2020): Glavni odgajivački program za autohtone rase koza (2020-2024). Institut za stočarstvo. Beograd, Srbija. <https://istocar.bg.ac.rs>
- HAPIH (2022): Godišnje izvješće: ovčarstvo, kozarstvo i male životinje. Hrvatska agencija za poljoprivredu i hranu, Osijek, Hrvatska. <https://www.hapih.hr/wp-content/uploads/2022/07/Ovcarstvo-kozarstvo-male-zivotinje-godisnje-izvjesce-2021.pdf>.
- HRVATSKI SAVEZ UZGAJIVAČA OVACA I KOZA (2023): <http://www.ovce-koze.hr/ovcarstvo-kozarstvo/ovcarstvo-i-kozarstvo-u-rh/kozarstvo-u-rh/pasmine-koza/>
- MAKSIMOVIĆ N., PETROVIĆ P.M., RUŽIĆ-MUSLIĆ D., CARO PETROVIĆ V., CEKIĆ B., LAZAREVIĆ M., STEFANOV R. (2017): Sheep and goat flock book and herd book record keeping in Central Serbia. Invited Paper. 11th International symposium "Modern trends in livestock production", October 11-13, Belgrade, Serbia. Proceedings, 90-98.
- MAKSIMOVIĆ N., RUŽIĆ-MUSLIĆ D., CARO PETROVIĆ V., PANTELIĆ V., CEKIĆ B., ČOSIĆ I., LAZAREVIĆ M. (2019): Performance records of autochthonous goats in Central Serbia. *Biotechnology in Animal Husbandry* 35, 4, 357-365.
- MAKSIMOVIĆ N., RUŽIĆ-MUSLIĆ D., CARO PETROVIĆ V., CEKIĆ B., ČOSIĆ I., DELIĆ N., LAZAREVIĆ M. (2021): Current state of goat breeding in Central Serbia. Invited paper. Proceedings of 13th International symposium "Modern trends in livestock production", October 6-8, Belgrade, Serbia, 103-116.
- MEMIŠI N., ŽUJOVIĆ M. (2012): Rase koza. Institut za stočarstvo. Beograd, Srbija. Str.170.
- MILLER B., LU D.C. (2019): Current status of global dairy goat production: an overview. *Asian-Australasian Journal of Animal Sciences* 32, 8, 1219-1232.
- MIOČ B. (2022): Uzgoj koza. Hrvatska mljekarska udruga, Zagreb, Hrvatska.

MIOČ B., DRŽAIĆ V. (2022): Ovčarstvo i kozarstvo RH – pregled i izgledi. Zbornik predavanja 24. Savjetovanja uzgajivača ovaca i koza u Republici Hrvatskoj, 24–25. 10., Seget Donji, Hrvatska.

MORALES F.A.R., GENÍS J.M.C., GUERRERO Y.M. (2019): Current status, challenges and the way forward for dairy goat production in Europe. *Asian-Australasian Journal of Animal Sciences* 32,8, 1256-1265.

NASTIĆ L., POTREBIĆ V. (2015): Sustainable Use of Resources in Sheep and Goat Production in Serbia and EU Countries. International Scientific Conference: "Sustainable Agriculture and Rural Development in Terms of the Republic of Serbia Strategic Goals Realization within the Danube Region: Regional specificities. December 10-11th, Belgrade, Serbia. Proceedings, 104-120.

OŽANIĆ S. (1955): Poljoprivreda Dalmacije u prošlosti. Izdanje Društva agronoma NRH – podružnica Split.

SREDOJEVIĆ Z., VUJIĆ T., JEVREMOVIĆ M. (2020): Economic indicators of goat breeding on family holdings in the Republic of Serbia. *Economics of Agriculture* 67, 4, 1297-1308.

VLAHEK I., SUŠIĆ V., MENČIK S., IVANKOVIĆ A., PIPLICA A., ŠUBARA G., ŠURAN E. (2023): Current status and future strategy for Istrian goat protection, conservation and promotion. 32nd annual meeting of „DAGENE“, March 23-24, Bábolna, Hungary.

VONDRAČEK M.J. (1998/1999): Koza u grbu istre. Prilog poznavanju povijesne pozadine grba I istarskog kozarstva. *Studija ethnologica. Croatica* 10,11, 7-28.

ŽUJOVIĆ M., MEMIŠI N., IVANOVIĆ S. (2011): Present status, possibilities and perspective of development of goat production in republic of Serbia. *Biotechnology in Animal Husbandry* 27, 3, 431-443.