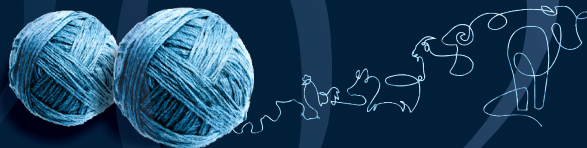


13th
INTERNATIONAL
SYMPOSIUM

MODERN
TRENDS
IN LIVESTOCK
PRODUCTION



P R O C E E D I N G S

6 - 8 October 2021, Belgrade, Serbia

Institute for Animal Husbandry
Belgrade - Zemun, SERBIA

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CURRENT STATE OF GOAT BREEDING IN CENTRAL SERBIA

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Invited paper

Abstract: This paper describes the present state of goat production in Central Serbia, discussing the challenges and future prospects for this livestock system. Number of goats in the country is decreasing and it has been so throughout the years now. Production systems in goat sector in Serbia are predominately extensive or semi-intensive, especially in hilly-mountainous areas and goats are kept in small herds. The majority of goats raised in Central Serbia region are of French Alpine breed, which takes the most dominant place in breed structure. In addition to French Alpine breed, there are also Saanen, Balkan and Domestic white goats. Production of goats in Serbia is directed towards milk-meat, but primarily milk and there are no typical meat (fattening) breeds of goats in Serbia. In Central Serbia, herd books are kept for goats raised on this territory. Quality breeding animals are registered at Central herd book and are under productivity control. However, this is only a small portion of animals and the productivity of majority of goats is unknown. Productivity of high yielding breeds such as Alpine and Saanen goat is inconsistent and not high, especially milk production. Indigenous goat breeds are considered endangered and their breeding was almost completely abandoned. Goat sector in Central Serbia is almost completely dependent on government founding. The only sustainable prospects for preserving goat sector in Central Serbia for the future are clean organic production, reinforcement of markets for goat products and smart government founding.

Key words: dairy goats, Serbia, local breeds, production, herd book

Introduction

Despite resources and historical heritage, nowadays, goat breeding in Serbia is not developed. In fact, it is probably the least popular livestock production (*Maksimović et al., 2015*) which is almost completely dependent on government funding. Goat production in Serbia went through some difficult

periods in the last few decades, especially in the second half of 20th century with the adoption of 1954's Law on the Prohibition of goat keeping, which resulted in decrease in number of these animals and consequently led to lack of their products on the market (*Maksimović et al., 2017*). In recent years, the government has been trying to revitalize and prevent further deterioration of this type of farm animal production, mostly by funding breeders for production of quality breeding animals. One of the most important problems of goat production is the difficult adequate marketing of goat products, especially milk. The purchase price of milk is usually unrealistically low and it varies from year to year, which makes this production very uncertain. Also, consumers in Serbia prefer cow's milk and cheese over goat's or sheep's, because of the stronger flavour. This is also the case with goat meat. Statistical yearbook of Republic of Serbia shows no data referring to goat meat production, nor can number of heads of goats slaughtered in slaughterhouses, slaughtered for own consumption on farms, forced slaughter on farms and other slaughtering out of slaughterhouses be found. This alone tends to be very indicative of the state of goat production in the country. Recently, with the world wide promotion of healthy food and the rise of fitness industry, as well as the growing market of organic products, goat production is gaining increased attention in the country due to its nutritionally valuable and safe products. Organic production in the European dairy sector has grown considerably and goat producers are increasing their presence with products such as cheese, different types of milk and yoghurt (*Dubeuf, 2010*). Based on the EU Regulation, organic goat milk production increased by 47.2% in the period from 2012 to 2017 (*Ruiz Morales et al., 2019* referring to *EUROSTAT* data). The total number of goats in organic production (including both meat and milk) was 833,087 heads with production of 49.4 million litres of milk. In 2019 that number was 1,015,399 heads of goats in European countries, with Serbia having 536 heads of goats in organic production (*EUROSTAT*). However, number of heads of goats in total is not increasing in Serbia and farmers are still almost completely dependent upon government funding and therefore goat production in the country is still not sustainable.

Goat population and production in Serbia

According to the latest data published in the Statistical yearbook of the Republic of Serbia, 2020 there were 191,000 heads of goats in Serbia, of which 145,000 are bred in Central Serbia region, and the remaining 46,000 heads belonging to Vojvodina region, i.e. North Serbia.

Table 1. Number of goats raised in Serbia for period 2013 to 2019

Year	Heads of goats	
	Serbia	Central Serbia
2013	225,000	180,000
2014	219,000	165,000
2015	203,000	150,000
2016	200,000	155,000
2017	183,000	137,000
2018	196,000	148,000
2019	191,000	145,000

Source: RZS, *Statistical yearbook of the Republic of Serbia, 2020*

Table 2. Number of goats raised in Central Serbia in 2019 by category

Year	Category			
	Kids	Multiparous goats	Primiparous goats	Other goats
2019	28,000	99,000	11,000	7,000

Source: RZS, *Statistical yearbook of the Republic of Serbia, 2020*

According to the Agriculture Census, which was conducted in 2012, there were 231,837 heads of goats in Serbia, of which 171,774 were raised in Central Serbia region (RZS, *Statistical Office of the Republic of Serbia*). If compared to the number stated in Statistical yearbook of the Republic of Serbia for 2019 (191,000) it is clear that the number of goats decreased. The number of goats has been declining since 2008 with an average decline of 8.7 thousand per year (Sredojević *et al.*, 2020).

Nastić and Potrebić (2015) report the number of holdings keeping goats, stating a total number of holdings to be 62,930, of which 54.21% are holdings with only 1-2 heads of goats, 40.55% are holdings with 3-9 heads, while the share of holdings in which 10-19 heads of goats are kept was 3.76%. Also, somewhat larger holdings with 20-49 heads of goats have a share of 1.20%, those with 50-99 heads have a share of 0.18% (115 of these holdings) and only 0.09% (56) of holdings have hundred or more heads of goats in the entire area of the Republic of Serbia. Although these data are not as fresh and perhaps this structure has changed a bit in the meantime, but it is clear that the majority of holdings keeps less than 10 heads of goats which is under any limit that allows sustainable production. In the Republic of Serbia, goat breeding takes place on 8% of agricultural farms (45.7 thousand).

Table 3. Number of goats in Serbia by regions in 2019

Year	Vojvodina region	Belgrade region	Šumadija and West Serbia region	East and South Serbia region
2019	46,000	8,000	68,000	70,000

Source: RZS, *Statistical yearbook of the Republic of Serbia, 2020*

As seen from perspective of the region, the majority of goats are raised south from Belgrade, i.e. in Šumadija (central part), West, East and South Serbia. Basically, Vojvodina and Belgrade constitute northern part and all the other regions constitute southern part of the country. The average herd size within the northern part of Serbia is 5.4 heads and 4.5 heads within the southern part. In both parts of Serbia, most represented are the farms with a herd consisting of up to 9 heads of goats (*Sredojević et al., 2020*).

The majority of goats raised in Central Serbia region are of French Alpine breed, which is the most dominant breed. In addition to French Alpine breed, there are also Saanen, Balkan and Domestic white goats (also referred to as Serbian white goat), as well as different crosses between these breeds. The latter two are local breeds, both of which are of lower productivity, but well adapted to modest conditions of care, housing and nutrition, usually raised in high lands and are considered endangered, although the real number of these animals is unknown (*Maksimović et al., 2019*).

Production systems in goat sector in Serbia are predominately extensive or semi-intensive, especially in hilly-mountainous areas. Just a small portion of farms implements confined systems with completely mechanized production process and this is usually based on keeping Alpine or Saanen goats.

Production of goats in Serbia is directed towards milk-meat, but predominantly milk (*Žujović et al., 2011*). There are no typical meat (fattening) breeds of goats in Serbia. Despite the nutritional value, goat meat is still less appreciated due to the specific odour and flavour, especially if the animal is older (*Ivanović et al., 2011*). According to *FAOSTAT* in 2019 there was milk production of 32,046 tonnes of milk from 98,685 milk heads in Serbia. Statistical yearbook of the Republic of Serbia's officially published data for year 2019 was 31,000 tonnes of goat milk. Territorially, most of the sheep's and goat's milk is produced in the Region of Eastern and Southern Serbia, followed by the Region of Šumadija and Western Serbia (*Sredojević et al., 2020*). Goat meat production in Serbia was 3,192 tonnes from 238,591 producing/slaughtered animals (*FAOSTAT, 2019*).

The value of goat's milk and head for slaughter is only 0.7% of the total value of livestock production. In the total milk production in Serbia, cow's milk makes 96.84%, then goat's milk 2.20, and in a smaller amount sheep's milk with 0.96% (*Sredojević et al., 2020*). However, since official statistics do not include

home consumption or informal market sales where records are not kept, it is complicated to measure the real value of goats. In majority of countries, goat milk is more likely to be consumed locally, whereas cow milk is more likely to enter formal markets for processing (Miller and Lu, 2019), and that is no exception in Serbia.

Goat population and production in Europe

European countries leading in regard to their goat populations are Greece (3,580,000 heads), Spain (2,659,110), Russian Federation (1,992,896), Romania (1,598,800), France (1,242,000) and Italy (1,058,720). As for Eastern Europe, the highest-ranking countries in regard to goat populations are Russian Federation and Romania, followed by Ukraine (FAOSTAT, 2019).

When looking into Serbia's neighbouring countries, Romania and Bulgaria are ahead of Serbia, while other countries have fewer goats (Table 4). The same accounts for milk production.

Table 4. Number of goats in Serbia's neighbouring countries in 2019

Country	Heads of goats	Milk production (in tonnes)
Hungary	63,000	3,010
Bulgaria	228,490	37,000
Romania	1,598,800	236,400
Croatia	82,000	9,000
Montenegro	28,700	No data
Bosnia and Herzegovina	72,362	No data
North Macedonia	87,581	16,865

Source: FAOSTAT, 2019

Europe is characterized by the widest caprine biodiversity, compared to other continents, with 187 goat breeds making up 33% of the goat breeds recognised worldwide (Gahal, 2005). There are breeds which are large in population sizes, characterised by high milk production leading to exports to other countries, as is the case with Saanen and French Alpine, or the Murciano-Granadina from Spain. On the other hand, there are breeds in the opposite position, with small population sizes, often in a critical situation and on the brink of extinction (Dubeuf and Boyazoglu, 2009; Ruiz Morales et al., 2019). In this context

of genotype diversity, traditional systems of meat–milk production co-exist with intensive milk production systems.

Europe accounts for only 1.9% of world goat population, but produces 15.1% of the world’s goat milk and 35.1% of the world’s goat cheese (*Ruiz Morales et al., 2019* referring to FAOSTAT data). So, milk is dominant product of goat farming in Europe and most of goat milk is transformed into cheese. According to *FAOSTAT (2019)* data, Europe has 11,100,356 heads of dairy goats producing 3,075,264 tonnes of milk.

Table 5. Dairy goat population and milk production in leading European countries

Country	No of heads (milk animals)	Milk production (in tonnes)
France	1,058,000	656,740
Spain	1,896,890	535,790
Netherlands	509,000	386,000
Greece	2,588,000	355,760
Romania	1,297,600	236,400
Russian federation	775,204	247,728
Ukraine	422,600	200,500

Source: *FAOSTAT, 2019*

As can be seen from Table 5, France is an absolute leader in Europe’s goat milk production with 656,740 tonnes of milk produced in 2019 from 1,058,000 dairy goats. Spain comes second when it comes down to overall quantity of goat milk production in Europe, but Netherlands, which comes third on this list with overall quantity of milk yield, produces more milk from fewer dairy animals. Production systems in France and Netherlands are more based on the use of high-yielding breeds kept in confined systems which provide more intensified production and therefore more milk from fewer animals. The dairy goat sector in the Netherlands has been expanding since 1984 when many farmers transitioned from cows to goats due to quotas for cow milk (*Van Dijk, 1996*), and so the Dutch became important producers of goat milk in Europe. Because of their experience with intensive dairy cow management, Dutch dairy goat breeders use more technology, such as artificial insemination, confinement rearing, and computerized record-keeping, compared to other European farmers (*Miller and Lu, 2019*).

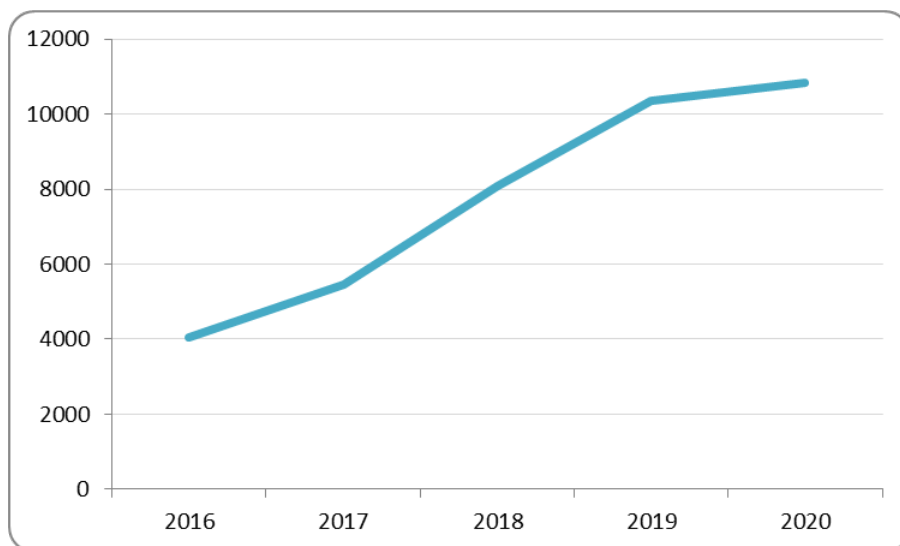
Spain and Netherlands are exporting great amount of their goat milk to France for processing, as France is the leader in goat milk processing and cheese

production. In Spain, goat milk is used for making mixed cheese (with cow or sheep milk) and in Greece traditional “feta” cheese is made of goat milk.

As for goat meat production, in 2019, Europe produced 96,310 tonnes of goat meat from 8,460,324 heads of goats, with Greece being the leader in this sector with 26,480 tonnes of meat from 2,367,770 heads, followed by the Russian federation and Spain with 18,676 and 10,420 tonnes of goat meat produced in 2019, respectively (*FAOSTAT, 2019*).

Herd book goat population in Central Serbia

In Central Serbia, herd books are kept for goats raised on this territory. Quality breeding animals are registered in the Central herd book and are under productivity control. In 2020 there were 10,851 heads of goats and 368 bucks under productivity control (*IAH, 2020*). This accounts for 7.73% of total number of goats raised on this territory. Contrary to decreasing goat population in total, in the country, number of herd book animals has been increasing constantly.

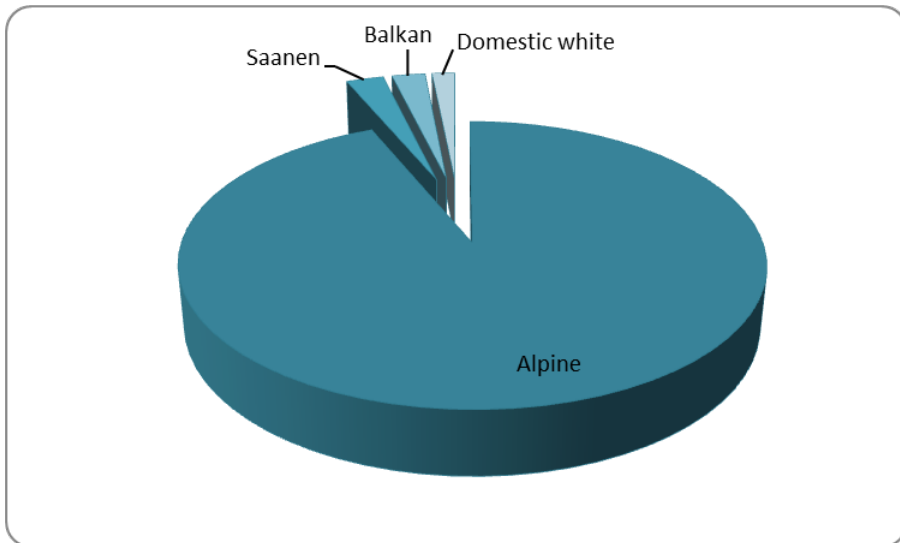


Graph1. Number of goats (♀) under selection control in the period 2016 to 2020;
Source: IAH, 2020

As seen from Graph 1, number of animals under selection control has increased significantly during the past 5 years. This period brought increase of roughly 169% in the number of controlled animals. In 2016, number of registered goats accounted for 2.35% of total goat population in Central Serbia (*Maksimović*

et al., 2017), while in 2020, a significant increase to roughly 7.7 is recorded. The main reason behind this increase is government founding of goat breeders, which is currently almost the only thing keeping goat sector alive. Farmers receive roughly 59 Euros a year per head for animals registered in the Central heard book plus additional 38 Euros for goats of endangered breeds (genetic resources) that are under selection control.

Within breed structure, the most dominant breed of registered goats is Alpine which accounts for 93.65%, while the rest is divided among three other breeds, with Saanen breed participating with 2.54%, Balkan with 2.26% and Domestic white goat with 1.55% (IAH, 2020).



Graph 2. Breed structure of registered goats in Central Serbia

All animals registered in the Central herd book are under productivity control, including milk production, body development and reproductive traits. Controls are conducted annually and are done following ICAR Recording Guidelines. Tables 6 and 7 include the production data for heard book animals under productivity control.

Table 6. Average values for body weight and fertility of goats of different breeds in 2020

Breed	Body weight of goats (kg)	Fertility	Body weight of kids (kg)		
			at birth	30 days of age	at weaning
Alpine goat	50.97	1.5	2.63	8.23	18.06
Saanen	53.46	1.33	3.49	8.96	18.60
Domestic (Serbian) white goat	50.15	1.63	2.56	7.07	14.43
Balkan goat	41.55	1.22	2.48	6.72	15.30

Source: IAH, 2020

Table 7. Average milk production and composition of different goat breeds in 2020

Breed	Lactation duration (days)	Total milk yield (kg)	Milk fat (%)	Protein (%)	Daily milk yield (kg)
Alpine goat	219	459.52	3.66	3.18	2.10
Saanen	231	651.37	3.59	2.99	2.82
Domestic (Serbian) white goat	230	484.04	3.64	3.31	2.11
Balkan goat	245	255.19	3.98	3.15	1.04

Source: IAH, 2020

The presented data shows that the productivity of high yielding breeds, such as Alpine and Saanen goat, is not high, including all recorded traits, i.e. their body weight, fertility and milk production. The reason behind this is that these animals are mostly reared under traditional systems of milk–meat production in more extensive or semi-intensive manner and therefore their genetic potential is not completely utilized. Also, milk production is not consistent because of the inconsistent market which imposes its rules on primary production through prices and demand for goat products. When the raw milk price is low, producers don't milk goats and let kids suck for long period of time. This can cause some udder problems and leads to lower subsequent production. As for local breeds, their productivity is within standard for each breed and is considered good due to the fact that both breeds are reared almost exclusively extensive.

Prospects for goat breeding

There is a rich diversity in goat breeds in European countries. Due to the very different environments and cultural peculiarities many different breeds of goats were formed across the Europe. In fact, alongside sheep, goats are probably the most diverse livestock species in Europe. And therefore they represent particularly important biodiversity factor, not just within world of fauna (i.e. animal sector), but also for ecosystem in general. According to *Gahal (2005)*, Europe is a continent with the widest caprine biodiversity, with 187 breeds making up to 33% of the goat breeds recognized worldwide. Majority of these European goat breeds are of local character and importance, low in their productivity, but very resilient and well adapted to harsh conditions of environment and nutrition. Unfortunately, they are considered endangered and/or at the brink of extinction. And yet, they are of most importance as genetic resources. On the other hand, there are breeds large in population sizes, characterised by a high milk production exported to other countries, as is the case with Saanen and French Alpine, or the Murciano-Granadina from Spain (*Ruiz Morales et al., 2019*).

As pointed out previously, in Serbia there are both local and imported breeds, with local being very small in population size and imported ones (French Alpine in particular) dominating the breed structure. While high yielding breeds are important for closed intensive production systems, it is necessary to preserve these local genotypes and to utilise them in organic and ecology friendly production systems. Goats in general are important socio-economic factor in marginal and remote rural areas, as they provide entire families' incomes, but also have socio-cultural impact for the rural community. In these less favoured and remote areas, raising small ruminants can often be the last possible economic activity. In Serbia, as in most other European countries, goat milk could never compete with cow milk in terms of both consumption and the price, as bovine dairy industry is far more advanced. However, goats are perfect resource for cleaner organic production. When reared extensively in natural grazing systems, goats help manage the land, shape the landscape and reduce biomass fuel, reduce non-renewable energy used as well as net greenhouse gas emissions (*Mancilla-Leyton et al., 2013; Perez-Neira et al., 2018; Gutiérrez-Peña et al., 2019*). In terms of cleaner ecological production, indigenous breeds are of most importance as they are well adapted to a range of pasture-based ecosystems. They also help maintain cultural and ethnological traditions and typical products. In order to contribute to the economic sustainability of goat farming, it is important for the environmental and social role to be recognized, but it should also be paid for, thus diversifying and increasing the income received by farmers.

One of the most important and applicable prospects for goat breeding in Central Serbia should be conservation of goat genetic resources and their utilisation in clean ecological farming systems. Production of so called typical products with geographical origin and creation and reinforcement of markets for such products should be priority in goat sector in Central Serbia. Goats and sheep are the only domestic species left in Serbia that are still so called grass fed, which makes their products, i.e. meat and milk, valuable for healthy human nutrition. Government founding should be directed toward environmental and social role of goat production, rather than just giving the money for herd book animals in equal amounts. Preserving of animal genetic resources is investment in future.

Conclusion

Number of goats in the country has been decreasing for years. Goats are kept in small herds, with very small number of specialized goat farms. Small portion of goat population is involved in nucleus breeding, while the productivity of majority of goats is unknown. Contrary to decrease of goat population in total, in the country, number of herd book animals has been increasing constantly. But, even though there is a positive trend, this number needs to be even higher and more animals need to be included in record-keeping. The market for goat products is poorly organized, with meat market being particularly weak. Milk is the dominant income source for most goat farms, but meat becomes the main product in some situations, such as is the case in those years when the purchase price of milk is low for example. Producers are vulnerable to market fluctuations, which makes goat production unpredictable and insecure. High yielding breeds are not fully exploited and their productivity is far below their genetic limits. Local indigenous goat breeds are considered endangered, although the real number of these animals is not known. Their breeding was abandoned mostly because of their lower productivity and also because of the changes in demographic dynamics and abandonment of mountainous rural areas.

The only sustainable prospects for preservation of the goat sector in Central Serbia for the future are clean organic production, reinforcement of markets for goat products and smart government founding. Scientific, as well as commercial promotion of healthy and safe goat products for human nutrition should be a priority.

Trenutno stanje kozarske proizvodnje u Centralnoj Srbiji

Nevena Maksimović, Dragana Ružić-Muslić, Violeta Caro Petrović, Bogdan Cekić, Ivan Ćosić, Nikola Delić, Marina Lazarević

Rezime

U radu je prikazano trenutno stanje kozarske proizvodnje u Centralnoj Srbiji uz osvrt na izazove koji su prisutni i prospekte za budućnost ove grane stočarske proizvodnje. U Srbiji je prisutan trend smanjenja ukupnog broja grla iz godine u godinu. Proizvodni sistemi u kozarskom sektoru su predominantno ekstenzivni ili poluintenzivni, a koze se gaje u malim stadima, naročito u brdsko-planinskim regijama. U Centralnoj Srbiji najzastupljenija su grla alpske rase, a u znatno manjem broju gaje se još i sanska, balkanska i srpska (domaća) bela koza. Kozarska proizvodnja je usmerena u pravcu mleko-meso, ali je mleko dominantno. U Centralnoj Srbiji nema tipičnih tovnih rasa koza, a meso se proizvodi uglavnom samo kao alternativa u formi jaradi za klanje. Matična evidencija vodi se za koze koje se gaje na teritoriji Srbije. Kvalitetna priplodna grla koza upisuju se u Glavnu matiču evidenciju i nalaze se pod kontrolom proizvodnih svojstava. Ipak, tu spada samo jedan mali deo koza dok je većina koza van sistema kontrole i nepoznate produktivnosti. Proizvodnost visokoproduktivnih genotipova poput alpske i sanske koze u Centralnoj Srbiji je niska, posebno proizvodnja mleka. Autohtone rase koza se smatraju visoko ugroženim u svom opstanku i njihovo gajenje je gotovo potpuno napušteno. Čitav sektor kozarstva je gotovo potpuno zavistan od subvencionsanja od strane države. Jedan od najrealnijih prospekata za održivu kozarsku proizvodnju u budućnosti na teritoriji Centralne Srbije je čista organska proizvodnja uz jačanje tržišta za kozarske proizvode i pametno državno finansiranje upravo ovakvog vida proizvodnje.

Ključne reči: mlečne koze, Centralna Srbija, autohtone rase, produktivnost, matična evidencija

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