



[doi:10.46793/MAK2025.115L](https://doi.org/10.46793/MAK2025.115L)

STATUS AND PROSPECTS OF LIVESTOCK BREEDING AND ANIMAL FEED PRODUCTION IN THE REPUBLIC OF SERBIA IN THE CONTEXT OF CLIMATE CHANGE

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Abstract: Animal husbandry is the most important branch of agriculture because it produces the most important food for people. Forage plants, grasslands and pastures are a cheap and high-quality source of food for animals. They create a large vegetative mass and are rich in proteins, carbohydrates and other nutrients. The climatic condition in Serbia is favorable for forage production of most important forage crops. The crop structure on arable land is very unfavorable, primarily from the aspect of animal feed production and sustainable land use. The trend of decreasing areas under arable forage plants, meadows and pastures coincides with the trend of decreasing numbers of all types of domestic animals, especially cattle, sheep and pigs. One of the main reasons for the decline in livestock production is the low competitiveness and accumulative nature of this production.

Key words: Animal husbandry, Forage production, Soil, Climate

1. INTRODUCTION

Animal husbandry is the most important branch of agriculture and, in addition to providing important food for people, it reflects the level of its development and the level of living standards in a country. The importance of livestock farming stems from the fact that meat and milk are an indispensable component of the population's diet. On the other hand, livestock production enables balanced exploitation of natural resources and employs a significant number of people, especially in the sparsely populated hilly/mountainous regions of Serbia. Natural conditions in Serbia, and above all the geographical configuration of the terrain, soil quality, agro-ecological conditions are very favorable, both for primary arable agricultural production and for the development of livestock, especially cattle and sheep production. In addition to the existence of a high genetic potential of domestic animals for a certain production, the basic condition for the development of sustainable and competitive animal husbandry is the provision of cheap and high-quality animal feed, especially bulky animal feed as the dominant in the diet of ruminants (Đorđević and Dinić, 2007). As a result of decades of work by scientific institutions in Serbia, there is a high genetic potential for the most economically important traits, both of domestic animals and cultivated forage plants for the production of animal feed (Đukić et al., 2007; Tomić and Sokolović, 2007). Despite all the above, looking at statistical data and trends, the state of livestock production in our country can be characterized as unsatisfactory. Although livestock production is influenced by a large number of factors, the results indicate that one of the causes of the poor state is the insufficient application of scientific results, and especially technological solutions in the sphere of production and preservation of animal feed. As a result of the insufficient application of production technologies, the genetic potential of forage plants for the most important agronomic traits is insufficiently utilized in practice.

If we add to this the high losses in yield and quality during conservation and storage of animal feed, it is clear that these data should be used to find a way to improve the situation in the livestock sector.

The aim of these research was to present the favorable natural resources of the Republic of Serbia (climatic and soil conditions) for the production of animal feed in plain and hilly-mountainous conditions, as well as the negative trends in the number of heads in the last few decades. Also, the goals and the presentation of the recent results of the scientific research in the field of preparation and conservation of animal feed as a basic condition of competitive animal husbandry.

2. CLIMATIC CONDITIONS FOR ANIMAL FEED PRODUCTION IN SERBIA

Serbia extends between 42°15' and 46°11' north latitude and 18°49' and 23°01' east longitude, and 80% of the territory belongs to the Southeast European region, while 20% is located in the Pannonian Plain and belongs to the Central European region. It is characterized by a continental climate in the north of the country and moderately continental climate conditions in the central and southern parts. The level of water deposits and temperatures are largely determined by both the relief and altitude, as well as latitude and longitude.

Average annual temperatures depend largely on altitude, so that in Vojvodina and central Serbia up to an altitude of 300 m they range from 10.5 °C in Palić to over 11 °C in Niš and Belgrade. With increasing altitude, average annual temperatures decrease, so that in mountains higher than 1000 m they range from 6 °C on the Pešter plateau to 2.7 °C on Mount Kopaonik. Multi-year averages indicate that in the plain and hilly regions of Serbia, average temperatures above 5 °C are in March, while they are already above 11 °C in April. In mountainous areas at an altitude of around 1000 m, average monthly temperatures above 10 °C occur only in May, while at higher altitudes above 1500 m in June and July. The highest average monthly temperatures on the entire territory of Serbia are recorded in July and August, and they range from 20 °C to 22 °C up to an altitude of 400 m, while at higher altitudes they range from 11 °C to 16 °C. Spring temperatures in March and April are similar to the average monthly temperatures in the autumn months, November and October.

The average annual precipitation level, considering the long-term average in Serbia, ranges between 540 and 970 mm. The northern, northeastern and southeastern parts of the country record the lowest multi-year average precipitation, ranging from 539.2 mm in the far north (Palić) to 610.5 mm, as recorded in the east (Zaječar). In these regions, the highest precipitation is in May, June and November, and the lowest in February, September and October. In the central parts of Serbia (Šumadija and Pomoravlje), the precipitation level is slightly higher, ranging from 630 to 700 mm, and is characterized by slightly higher precipitation during the summer months.

The western parts of Serbia are characterized by higher average annual precipitation, ranging from 700 to over 800 mm, while in mountainous areas at altitudes above 1000 m, an average of 800 to 1000 mm of water precipitation falls during the year. The above results show that the amount of precipitation in our country is not small, however, its distribution throughout the year is irregular, so that very often during the summer months (July and August) dry periods occur, which have an adverse effect on the production of animal feed (Figure 1).

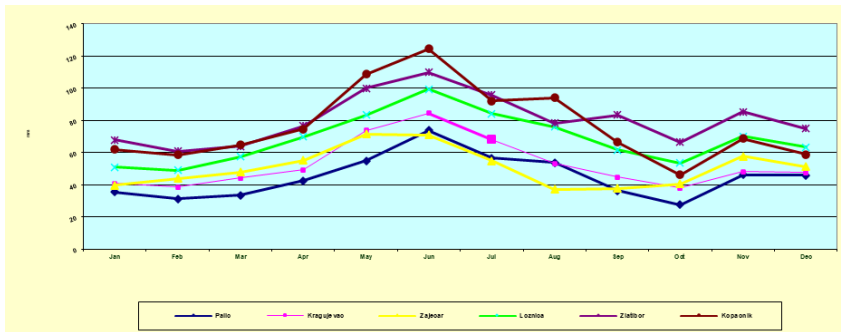


Figure 1. Average precipitation distribution by the months by the location in Serbia (www.hidmet.gov.rs)

Climate change is today's reality with the acceleration of the global warming trend and the occurrence of extreme climate phenomena (droughts, floods, tornadoes, typhoons, etc). It should also be noted that extremely dry years with annual precipitation of 400 to 500 mm, pronounced dry periods and extremely high temperatures exceeding 40 °C in July are not uncommon in Serbia (Figure 2). Such agro-ecological conditions occasionally cause significant oscillations in the production of animal feed, which has an adverse effect on livestock production. Taking into account the fact that very little arable land is irrigated in Serbia, it is necessary to find solutions that will contribute to more stable animal feed production. Solutions must have a multidisciplinary approach and must go in multiple directions, so that their synergy can yield results. First of all, irrigation as a direct measure to prevent the water shortage should be implemented wherever conditions exist. Then, the issue of more efficient use of existing precipitation and soil moisture conservation is related to crop structure, production system and soil cultivation methods. Finally, the creation of genotypes that better withstand stress conditions caused by water shortages and high temperatures, the introduction and cultivation of species from warm regions and other measures could significantly contribute to reducing the risks caused by unstable climatic conditions. The results of monitoring global climate factors in the last two decades indicate an increase in temperatures and temperature instabilities in all parts of the world. However, the largest oscillations and increases in temperatures occur on the European continent and especially in the Pannonian Basin and the Balkan Peninsula (Figure 3). In our country, in the last 20 years, the average temperature has increased by about 1.2 degrees and in the summer period by 1.8 degrees with a tendency for an accelerated increase in temperatures (Figure 4).

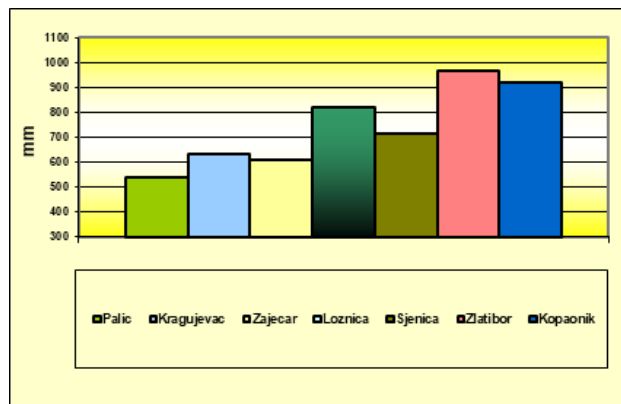


Figure 2. The average level of precipitation by the location in Serbia (www.hidmet.gov.rs)

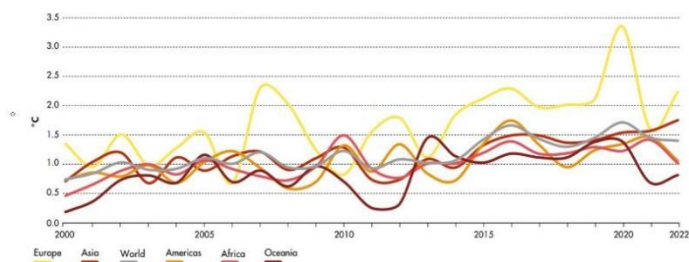


Figure 3. Temperature changes by the region and year (Eurostat, 2023)



Figure 4. Middle global and temperature (°C) for the Republic of Serbia, with comparison to the average 1961-1990 (Vuković Vimić, 2024)

3. LAND, THE BASIC CONDITION OF AGRICULTURAL PRODUCTION

Agricultural, or plant production, provides food for people and animals and has a great impact on soil properties. Intensive agricultural production has long achieved incredible successes and leaps in the production of all agricultural products. The use of large amounts of mineral fertilizers, pesticides and soil cultivation systems has caused great damage, not only to the soil, but also to watercourses, biodiversity and even the health of ecosystems and people. For all the above reasons, it is necessary to adjust the level of land use as a natural resource to the production of sufficient quantities of food, but also to implement measures for its protection and sustainable use. Economically important forage plants (annual and perennial grasses and legumes), thanks to their morphological and biological properties, provide the possibility of efficient land use, production of quality animal feed, but also soil protection from negative processes that modern agriculture entails. The areas under agricultural land as the main resource for plant production in the Republic of Serbia are constantly decreasing. According to data from the Republic Statistical Office (www.stat.gov.rs), there are slightly more than 4 million ha of available land on the territory of the Republic of Serbia (www.stat.gov.rs), of which about 3.25 million ha are used as agricultural land. With about 0.5 ha of arable land per capita, Serbia is among the countries well-provided with this main resource for food production. In the structure of crop production, cereals dominate the area, with an increase in the area under industrial crops and fruits, while there is insufficient area under fodder and other legumes, which makes it impossible to implement crop rotation, as one of the most important agrotechnical measures (Figure 5).

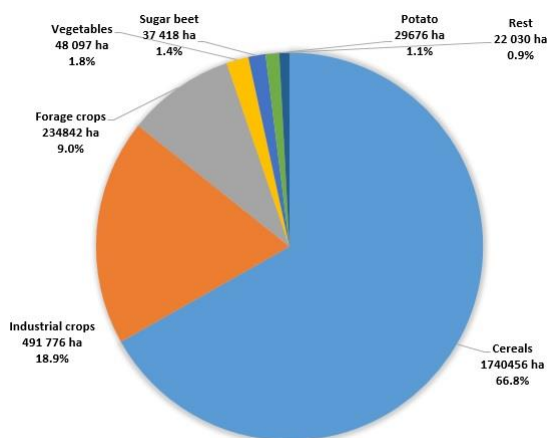


Figure 5. Structure of plant cultures (Statistical Yearbook of Serbia for 2020)
<https://publikacije.stat.gov.rs/G2021/Pdf/G20212054.pdf>

This crop structure allows for the production of corn and stubble grains, but it is absolutely unfavorable from the aspect of producing high-quality protein animal feed, preserving and sustainable use of soil over a long period of time. Soil, as a natural component of the terrestrial part of the Earth's climate system, participates in a series of reactions with human infrastructure and settlements. In addition to exploitation and disruption of soil functionality caused by anthropogenic factors, climate change represents additional stress for soil health, through reduced precipitation and irregular distribution during the growing season (Stričević et al., 2021). Climate can affect soil directly by changing thermal and moisture conditions that are crucial for the formation and maintenance of soil quality and the services it provides to the environment, and indirectly, by degrading vegetation, which is one of the pedogenetic factors and the main source of organic matter for the soil. Climate change has recently had a profound impact on soils in the Republic of Serbia and the wider region of Southeastern Europe. Given the rise in global temperatures, changes in precipitation patterns and increasingly frequent weather extremes, soil health and productivity are under increasing pressure, and climate change is considered the greatest global threat to sustainable development (Hou, 2021).

The impact of climate change on soil is reflected in one of the most direct consequences, which is degradation. Rising temperatures and changing precipitation accelerate the loss of organic matter, which is especially pronounced in the northern parts of Serbia, which directly affects the fertility and water retention of the soil itself. Due to the highly variable amounts and distribution of precipitation in space and time, the basic rule is to economize with soil moisture (Malešević et al., 2021). Degraded soil is devoid of structure and nutrients, which is reflected in reduced yields and makes it difficult to sustain agricultural production. Irregular and intense rainfall, often accompanied by long-term droughts, leads to various forms of erosion and makes the soil more susceptible to compaction and cracking.

Limited soil fertility is caused by high concentrations of H^+ and Al^{3+} ions, as well as some other heavy metals, organic acids, but also by limited nutrient availability and weak microbiological activity (Gudžić et al., 2017). Most of the soil in central Serbia has acidic chemical reactions and is often deficient in phosphorus. Climate change also affects nutrient availability. Higher temperatures lead to an increase in carbon dioxide concentration in the soil, which leads to changes in nutrient cycling, a decrease in soil pH, and the availability of nitrogen, phosphorus, and potassium. These changes often require increased use of chemical fertilizers, which can further contribute to degradation and pollution.

Climate change and unsustainable land use lead to a decrease in soil as a resource and its permanent loss (Dželetović and Simić, 2024). In areas of southeastern Europe, climate change will have a negative effect on crop production and soil, primarily due to possible water deficits and the occurrence of extreme weather events (prolonged heat waves, hail, storms) that will increase the variability of annual production and lead to a reduction in areas suitable for growing plant species (Cosentino et al., 2012).

4. FORAGE PRODUCTION ON ARABLE LAND

The dominant characteristic of forage production in the lowland areas is the high prevalence of maize on over 1.200.000 ha and grain production of around 4.500.000 tons per year. The largest part of maize grain (80%) and a significant part of products, semi-products and by-products of soybeans and sunflowers are used for feeding domestic animals. In addition, the largest part of barley produced and even a part of wheat and triticale grains are used as forage.

Coarse fodder production takes place on 235.000 ha, which makes up 9% of arable agricultural land, which is absolutely insufficient. According to estimates, in order to provide sufficient quantities of coarse fodder, the area under arable forage plants should amount to 20% of arable land. However, this unfavorable situation is mitigated by the fact that of the total area under arable forage plants, as much as 67% is occupied by the two most important and productive perennial forage plants, alfalfa and red clover (Stošić and Lazarević, 2007). In addition to these species, economically important perennial leguminous forage species in Serbia are birdsfoot trefoil and white clover in clover-grass mixtures (CGM), as well as annual forage plants: fodder peas, fodder vetch, fodder sorghum, Sudan grass and fodder rape.

Alfalfa (*Medicago sativa* L.) is the most important perennial forage legume and it is grown on 106.000 ha. Depending on soil type and climatic conditions, alfalfa without irrigation can yield from 6 t ha⁻¹ to 9 t ha⁻¹ in the year of establishment, and in the second year 14-19 t ha⁻¹ of hay with an average crude protein content for four cuts of 217 g kg⁻¹ and an annual crude protein yield of 3.12 t ha⁻¹ (Radović et al., 2007).

Alfalfa is most often grown as a pure crop, although it can also be a component of grass-legume mixtures for hay production (Lazarević et al., 1999). It is used for feeding domestic animals in various forms, most often as hay, but also dehydrated in the form of briquettes, as silage and less often as green forage or for grazing.

Red clover (*Trifolium pratense* L.) is grown as a pure crop in Serbia on about 60.000 ha and it successfully replaces alfalfa on soils of increased acidity in lowland and hilly areas. Thanks to its developed root and intensive biological nitrogen fixation and favorable effect on the soil, it is very important in crop rotation. Due to its poor tolerance to drought conditions, its period of use is short, only 2-3 years, and it is mostly grown in the more humid hilly areas of western Serbia. In conditions without irrigation in the second year it gives high hay yields (14-18 t ha⁻¹), with a high protein content (18-22%) and minerals (Lugić et al., 2001, 2006).

On poorer quality soils, birdsfoot trefoil (*Lotus corniculatus* L.) plays an important role in providing the protein component in animal feed. Although there is no economic justification for this, in some areas on soils with increased acidity this species is traditionally grown in pure culture. Due to its high adaptability, it is grown in various agro-ecological conditions, even at high altitudes (Steiner, 1999).

Annual forage plants have a long tradition of cultivation in Serbia and represent an important source of bulky and concentrated animal feed. The most important annual forage legumes are field pea (*Pisum sativum* L.) and common vetch (*Vicia sativa* L.), which are grown on nearly 30.000 ha and

are used in various ways. In the agro-ecological conditions of our country, these species provide high yields of biomass of excellent quality (Mihailović et al., 2004). Also, rapid growth and high yields of green forage recommend them as very good green manure (Ćupina et al., 2004). However, the reduction of livestock, the dominance of corn in the lowland area, the simplification of the production process, the reduction to a smaller number of crops and the increase in energy prices have led to a decrease in the distribution of these species. However, in recent years, with the introduction of adequate agricultural mechanization and the adoption of conservation technologies, these species are increasingly grown with small grain cereals as support crops and are used for the production of hay, silage and haylage. Together with reduction of livestock number during the last four decades there was a significant reduction in the area under forage crops in Serbia (Figure 6).

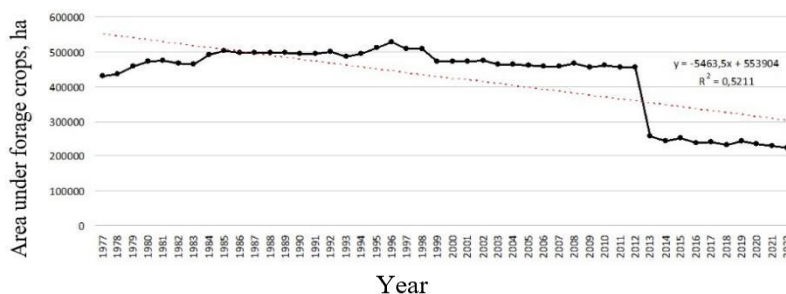


Figure 6. The area under forage crops in last four decades in Serbia (data used from Statistical Yearbook)

5. GRASSLAND FORAGE PRODUCTION

Grasslands are communities of primarily herbaceous annual, biennial and perennial plant species that cover 30% of the planet's land as permanent cover. Their importance as a spontaneous, natural ecosystem is enormous: they represent a habitat for animals, fungi and microorganisms; they participate in pedogenesis and prevent erosion processes; they store carbon in the deeper layers of the soil, making it inert, which contributes to mitigating the "greenhouse" effect. From the perspective of (human) agricultural practice, grasslands are a resource that is the basis for the supply of bulky animal feed, i.e. they ensure the stability of the market supply of dairy and meat products (Mara, 2012). They are a habitat for pollinators, a source of raw materials for the pharmaceutical industry, and an inexhaustible source of genetic material for wild relatives of cultivated plant species (Cousins and Lindborg, 2008). Grasslands in the Republic of Serbia covered an area of 556.446 ha in 2023, which is a significant decrease compared to 2022, when it was 661.578 ha (SORS, 2024).

A large part of the area under grasslands is in the stage of degradation, as a result of depopulation, reduction in livestock, inaccessibility of terrain, low-profitable production of animal feed, lack of infrastructure, as well as inadequate subsidy policy. In addition to these anthropogenic factors of grassland degradation that are associated with local activities, grasslands also respond to global changes in temperature and precipitation (Gobiet et al., 2014). In Serbia, grasslands are most common in the hilly-mountainous area, and it is precisely this altitude zone that is sensitive to changes in abiotic factors. On the one hand, the existing diversity of autochthonous species is decreasing, while on the other hand, the floristic composition is changing towards the presence of thermophilic species whose range is expanding due to changing environmental conditions (Dibari et al., 2021). Grassland degradation is visible throughout Serbia south of the Sava and Danube rivers, and this conclusion was made as a result of the analysis of over 1000 samples of bulky fodder in the past 10 years in the laboratory of the Institute of Forage Crops in Kruševac. Biomass from sown and semi-natural grasslands was analyzed and most often, regardless of whether they are established or natural communities, the attitude of the owner is inappropriate. Mowing grasslands is carried out in the phenological stages of seed maturation or even its complete rejection has occurred. The rest of

the plant - stems and leaves that actually make up the bulky meal have also been modified to the extent that the proportion of unusable components such as lignin has increased and the resulting fodder is in that case not a suitable source of nutrients (Babić et al., 2019).

Due to inadequate fertilization, untimely mowing and other measures, the yield of grasslands is also low and amounts to 2,7 t ha⁻¹ in meadows and 2,4 t ha⁻¹ in pastures, which indicates that they are lowly productive (SORS, 2024). Some research also indicates that grasslands are generally very responsive to fertilization, and that with adequate fertilization, the yield of grasslands can increase several times, thus significantly increasing the usability of this resource (Lazarević et al., 2009).

Grasslands generally have the potential to resist climate change through the local expansion of species that are tolerant to newly emerging conditions. The key to their adaptability lies in their diversity, so the more diverse the communities, the greater their adaptability to changing conditions (Baca Cabrera et al., 2021). Grasslands in the Republic of Serbia are characterized by high diversity (Stošić et al., 2007) but low production, and as such they represent a sustainable but not economical source of animal feed. In contrast, grasslands in Western European countries are low in diversity due to intensive fertilization and exploitation and are mostly dominated by highly productive species. According to research by Zornić et al. (2024), intensively fertilized nitrogen treatments are dominated by species that have increased requirements for water and nutrients and are suitable for lower temperatures. Such characteristics indicate poor adaptability and if fertilization stops, or dry conditions with increased temperatures occur, there is a drastic drop in yield, and as some say, even a complete loss (Piseddu et al., 2021). This fact is supported by the fact that fertilization is necessary to stimulate the natural diversity of lawns, and the best results are achieved by applying phosphorus and potassium fertilizers at lower doses (up to 80 kg per ha) or without nitrogen, and that with higher amounts of nitrogen, there is a drastic decrease in the natural diversity of lawns (Figure 7).

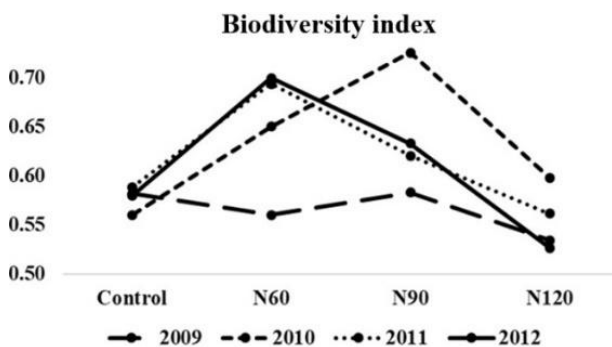


Figure 7. The influence of fertilization on biodiversity index in *Danthonietum calycinae* grassland type (Zornić et al., 2022)

6. SILAGE PRODUCTION

Modern livestock nutrition, especially when it comes to feeding dairy cows, also includes the use of silage. In addition to ensuring cost-effective production in this way, ensiling is also important from the perspective of sustainability and adaptation to climate change. Corn silage is the most widely used silage, both in our country and in the world. Today, 27.340 ha are under silage corn in the Republic of Serbia, which represents 2.96% of the total area under corn (SGS, 2024). These areas are too small to provide sufficient quantities of silage even for the existing number of ruminants, so it is necessary to increase them, especially in a future concept of strengthening livestock production. Silage of green biomass of fodder plants enables their earlier removal from production areas and more intensive use of land (Rakašćan et al., 2019). Ensiling corn provides a significantly higher yield of energy and nutrients per hectare, compared to the production of corn for grain. Corn silage is also important in terms of crop rotation, because by sowing silage corn late, it is possible to ensure

two harvests per year, which is important from the perspective of sustainability. In addition, it is known that dry matter losses during ensiling (5-15%) are significantly lower than losses during hay production (20-40%). So, efficient use of energy sources in agricultural production will prevent destruction of natural resources, minimize environmental problems, and improve sustainable agriculture (Pervanchon et al., 2002). In addition, the production of greenhouse gasses, such as methane (CH₄) could be significantly reduced by decreasing the fibre content of the diet. One of the acceptable ways to do this is the increase in the proportion of high starch components, such as corn silage (Hopkins and Prado, 2007).

Due to the very sporadic production of grass and legume silage, statistical data on their production in our country are mainly presented through hay production. The main reason for this is insufficient knowledge of ensiling technology, especially when it comes to legumes. Considering climate change, the negative side of which is particularly reflected in frequent droughts and floods, the introduction of grass and legume silage has significant potential in reducing the risk of total yield losses, as well as in increasing the quality and yield of coarse biomass. In addition, proper ensiling of grass and legumes contributes to the preservation of nutrients, especially in terms of protein content as the most expensive component of the diet. To this end, a cheap and effective measure for ensiling grasses and legumes is wilting, or short-term drying. In addition, modern research has confirmed that ensiling alfalfa in a mixture with red clover achieves significant protein preservation in alfalfa, which is prone to protein degradation (proteolysis) during ensiling (Li et al., 2018, Lazarević et al., 2023). It is important to emphasize that protein production from natural and sown grasslands significantly contributes to sustainability in terms of soil conservation, compared to protein production on arable land.

Recently, there has been a lot of research related to the production of bacterial inoculants that enable an optimal balance between the values of the basic quality parameters of silage fermentation. Special attention has been paid to the production of new strains of lactic acid bacteria. The advantage of bacterial inoculants over other silage additives is that they do not leave residues and do not negatively affect animal health and the quality of their products. Therefore, they are also allowed in organic agricultural production in Serbia (Đorđević et al., 2024), which is significant in terms of sustainable livestock production.

7. THE STATE OF LIVESTOCK PRODUCTION IN SERBIA

Looking at statistical data for the period from 1977 to 2022, one can see a drastic decline in the number of ruminants for the mentioned period (Figures 8 and 9).

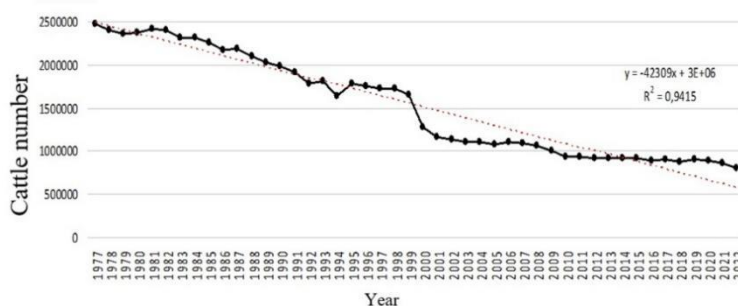


Figure 8. Number of cattle since 1977-2022 in Serbia

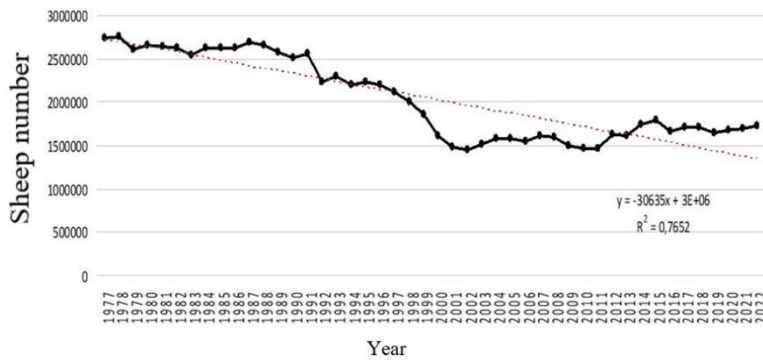


Figure 9. Number of sheep since 1977-2022 in Serbia

This decline was especially pronounced in cows and sheep in the 1990s, when the number of breeding animals was dramatically reduced. This state of affairs was caused by socio-political and social turmoil and economic sanctions that the international community declared against our country. During that period, due to the impossibility of exports and the economic crisis, Serbia lost the markets to which it had exported significant quantities of meat, especially beef, in the 1980s. As an illustration of the situation, we cite the data that in 1990, 165.000 tons of veal and beef were produced in Serbia, while in 2005 this production amounted to only 90.000 tons (FAOSTAT, 2007), while today it is significantly lower. Such data related to the number of cattle are very worrying, especially since these are species in which, unlike the decline, the increase in the number of cattle cannot follow a rapid upward trajectory. The situation is similar with the number of sheep, which after a significant decline in the last few years is slightly increasing. With the rapid decrease in the number of cows, due to the increase in milk production per cow, there was no decrease in milk production for a long period, but a further decline in the number of dairy cattle would certainly cause a deficit in production. The increase in milk production per cow is primarily a result of improved genetic potential of dairy cattle, but also better health care and nutrition. Despite the increase in cow milk production, the situation is not even close to satisfactory and is far behind Western European countries.

Despite negative trends in livestock production, Serbia has a positive balance in foreign trade of agricultural products and is incomparably better than almost all countries in the region that are candidates for joining the European Union (Figure 10). The worrying state of livestock production in Serbia is also indicated by the share of livestock in the value of total agricultural production of only 32%, which places us among agriculturally underdeveloped countries. However, many agricultural economists believe that the situation in domestic livestock production could improve relatively quickly because there is still a significant number of high-quality breeding animals, quality human resources and satisfactory natural resources. When observing the state of livestock farming in the European Union in the period 2002-2022, it can be concluded that the trends are similar and that there is a decline in the number of livestock, especially pigs, sheep and goats (Figure 11). Despite the decline in the number of livestock in the EU, there has been no significant decline in meat and milk production.

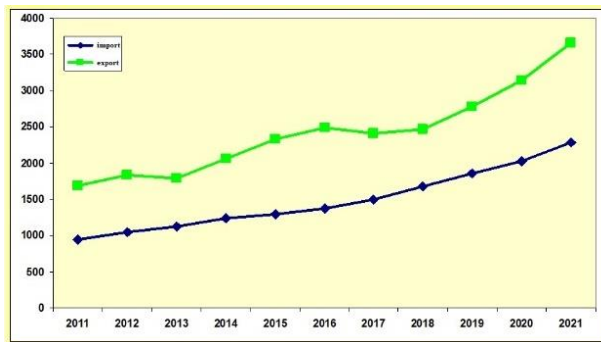


Figure 10. The trade of agriculture products in Serbia 2011-2021 (Eurostat, 2023)

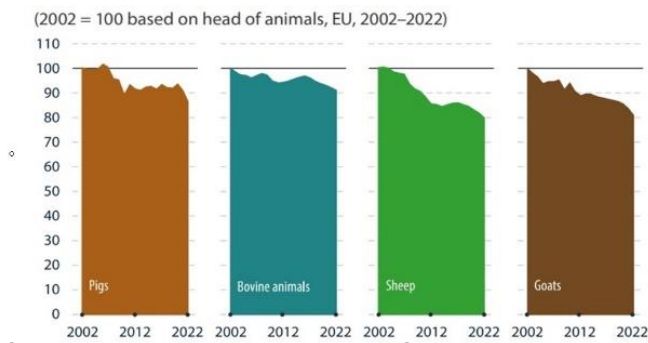


Figure 11. Development of different livestock in Europe 2002-2022 (Eurostat, 2023)

8. CONCLUSION

Serbia has significant areas of agricultural land suitable for crop production, animal feed production and livestock production. Soil and climatic conditions are conducive to the production of fodder plants and high-quality, healthy animal feed.

The crop structure in Serbia is generally unfavourable. Corn and cereals are grown on nearly 68% of arable land, while fodder plants are grown on only 8-9% of arable land with an insufficient share of leguminous plants. This results in overproduction of corn and cereal grains, the inability to respect crop rotation, inefficient land use and questionable quality of animal feed. The situation in livestock production, especially in cattle breeding, is very unfavourable with a multi-decade trend of decreasing headcount. In parallel, the areas under forage plants are decreasing, especially under perennial legumes.

Climate change, i.e. the trend of increasing temperatures and decreasing precipitation during the vegetation period, is increasingly negatively affecting the stability of bulky fodder production and threatens to endanger livestock production.

In such conditions, it is necessary to create and implement agricultural policies that will contribute to increasing the competitiveness of domestic agriculture, and especially livestock breeding. This includes the regionalization of agricultural production, better use and protection of natural resources, the introduction of targeted-linked support measures, increasing the level of knowledge in all segments and other measures that would contribute to the development of livestock breeding as the most important agricultural branch.

9. ACKNOWLEDGMENT

This work was supported by the Ministry of Science, Technological Development and Innovation of the Republic of Serbia (contract No 451-03-66/2024-03/200217).

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