

**Univerzitet u Beogradu
Fakultet veterinarske medicine**

**ZBORNİK PREDAVANJA TREĆEG SIMPOZIJUMA
ZAŠTITA AGROBIODIVERZITETA I OČUVANJE
AUTOHTONIH RASA DOMAĆIH ŽIVOTINJA**



Dimitrovgrad, 25-27. jun 2021.

UNIVERZITET U BEOGRADU – FAKULTET VETERINARSKÉ MEDICINE
SRPSKO VETERINARSKO DRUŠTVO

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PRESERVATION OF AUTOCHTHONOUS ANIMAL BREEDS THROUGH SUSTAINABLE PRODUCTION AND AMBIENTAL PROTECTION*

OČUVANJE AUTOHTONIH RASA DOMAĆIH ŽIVOTINJA KROZ ODRŽIVU PROIZVODNJU I ZAŠTITU AMBIJENTA

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Summary

The growth of livestock production and consumption of animal products is increasing during the last decades, worldwide. Upon the FAO data (2004), global meat consumption increased by over 30%, primarily due to increased consumption. At the same time urban population is growing, while rural settlements are undergoing depopulation trends. Conventional - intensive livestock production is intensified through specialized industrial breeding of certain highly productive breeds in controlled conditions, in aim to obtain large production and to increase profit. At the same time domestic animals unsuitable for intensive production are becoming rare and many breeds and types became endangered and extinct. Unfortunately, intensive agriculture became the most important factor that led to the loss of biodiversity, increase of environmental pollution and loss of biodiversity. Due to the pronounced negative effect of intensive animal production on the environment, the Paris Climate Agreement (2015), described methods that could mitigate climate change.

The possibilities to preserve animal resources through utilization and to allow sustainable development of rural communities in Serbia in aim to preserve environment, agrobiodiversity, animal genetic resources and to create opportunity for rural and eco-tourism in Serbia are presented in the paper.

Key words: AnGR preservation, rural development, Serbia, sustainable livestock production

*Invited lecture

Kratak sadržaj

Rast stočarske proizvodnje i potrošnja životinjskih proizvoda se tokom poslednjih decenija, povećavaju širom sveta. Prema podacima FAO (2004), globalna potrošnja mesa je porasla za preko 30 procenta, pre svega zbog povećane potrošnje. Istovremeno, gradsko stanovništvo raste, dok selo prolazi kroz trend depopulacije. Konvencionalna – intenzivna stočarska proizvodnja se razvija kroz specijalizovani industrijski uzgoj određenih visoko-produktivnih rasa u kontrolisanim uslovima zatvorenog držanja, u cilju postizanja velike proizvodnje i povećanja prihoda na tržištu. Istovremeno, domaće životinje, neprikladne za intenzivnu proizvodnju postaju retke i mnoge rase i vrste postaju ugrožene i izumiru. Nažalost, intenzivna poljoprivreda je postala najvažniji faktor koji je doveo do povećanja zagađenja životne sredine i gubitka biodiverziteta. Zbog izraženog negativnog efekta intenzivne životinjske proizvodnje na životnu sredinu, Pariski klimatski sporazum (2015), je opisao metode koje bi mogle da ublaže klimatske promene.

U radu su predstavljene mogućnosti za očuvanje životinjskih resursa kroz uzgoj za tržište i omogućavanje održivog razvoja ruralnih zajednica u Srbiji u cilju očuvanja životne sredine, agrobiodiverziteta, životinjskih genetičkih resursa i stvaranja mogućnosti za ruralni i eko-turizam u Srbiji.

Ključne reči: očuvanje AnGR, održiva stočarska proizvodnja, ruralni razvoj, Srbija

During the last decades, the growth of livestock production in the world accelerated, which is a consequence of increasing meat consumption. Thus, at the beginning of the millennium, global meat consumption increased by over 30%, primarily due to increased consumption in developing countries (FAO, 2004). Furthermore, the United Nations estimated that two thirds of the global population would live in cities before 2050. The expected decline of the rural populations will increase the demand for agricultural products in a situation where resources such as available land and water are a major obstacle to further growth of animal production. Thus, the concept of sustainability, i.e., sustainable production has become increasingly important due to the multidimensional approach to agriculture/animal production as it combines economic, environmental, social and institutional aspects of rural development.

The concept of sustainable livestock production emerged in the early twentieth century (King, 1911), and gained attention in the 1980s when it became

apparent that the accelerated intensification of agriculture led to the irreversible loss of a significant part of natural resources. The idea of sustainability began to infiltrate all human activities at the end of the twentieth century, when agriculture, including livestock production as a field of the most significant direct impact on the environment, came into focus because of increasing pollution from agriculture. Sustainability of conventional livestock production is primarily achieved by intensification through specialized industrial breeding of restricted number of highly productive breeds in controlled conditions. Due to the pronounced negative effect of intensive animal production on the environment, the Paris Climate Agreement described methods that could mitigate climate change in accordance with the Conclusions of the Convention on Biodiversity. Agriculture, and especially livestock production, is considered one of the most important sources of greenhouse gases, contributing to global warming, melting of the polar caps, and climate change on Earth (FAO 2008).

There are about 390 definitions of the term sustainability in the world (Rigby and Caceres, 2001) and the interest in sustainable domestic animal breeding that allows establishment of balance between farm production, natural environment, sociological and cultural traditions and economic results is growing. In practice, sustainability of the production is the most demanding task in any agroecosystem, allowing both intensification and animal genetic resources preservation within the habitat.

Sustainability of individual systems of domestic animal breeding is possible only if the intensity and production are adjusted to the local conditions, meaning that if livestock production is intensified through self-renewing ecosystem capacity, serious negative effects of pollution from agriculture and livestock can be controlled. This means that it is necessary to select and encourage farm systems which, if they do not improve the environment, must not pollute the ecosystem (Nardone et al., 2004).

A holistic and ecological approach in the organic farming system provides conditions for sustainable development of agriculture while respecting natural cycles and preserving the environment used for the production of high-quality food. The animals are raised in a system based on a diet available in the habitat natural with supplementation from certified sources, and that the breeding system focuses on maintaining good health to reduce stress and improve well-being in conditions of limited conventional treatment, which is regulated by the Law on Organic production (2010) in accordance with the EU Directive (EC 889/2008). Due to specific limitations, primarily in terms of health care, nutrition, as well as population density, highly demanding an-

imals of highly selected breeds that favor conventional breeding systems are considered unsuitable in an organic farm that relies on resistant and locally adapted - indigenous breeds. Apart from the huge contribution to agrobiodiversity conservation programs, organic farming focused on ruminant and equine breeding, is in line with bioclimatic conditions in mountain regions of Serbia and represents the only legal possibility for rural development in protected areas. The holistic approach to organic farming also allows sustainable AnGR conservation through utilization.

The aspect of preserving animal resources, rural tradition and settlements within the natural habitat through utilization can allow development of rural community and niche organic production of livestock.

Sustainable production of domesticated ruminants

Domestic animals: cattle, sheep, goats, pigs, etc. are a significant source of food for people of different traditional and religious beliefs.

Therefore, domestic ruminants are a significant source of animal proteins (milk and meat) in human nutrition and also consume fibrous plant nutrients that are not suitable for human and other farm animal (pigs and poultry) consumption. The growing needs of the growing human population, mainly in cities, for meat, milk and dairy products pose a huge challenge to modern cattle, sheep and goat farming, primarily due to the need to increase production, then ensure both economic and environmental sustainability required by global a strategic approach that will ensure the intensification of ruminant farming while preserving product quality, animal welfare, ecosystem preservation, biodiversity and environmental health. Meat production is increasingly based on intensive fattening of poultry and then pigs, while the production of ruminants, both cattle and sheep and goats, is less promoted (FAO, 2011). Breeding of domestic ruminants is extremely important because they feed on fibrous plants on pastures, they are adapted to almost all environmental conditions, and the income from ruminant breeding is significant in underdeveloped parts of the world, even in regions affected by desertification.

It is considered that for the preservation and development of the rural community in mountainous regions it is necessary to strategically encourage production systems that suit small farms and limited arable land with the existence of natural meadows. Therefore, an increasing number of developed countries provide conditions for the development of so-called production niches, i.e., a holistic approach allowing sustainable development and preservation of traditional rural community. So, sustainable organic production

is very suitable for hilly and mountainous regions and development of organic production enables the survival not only of mountain villages but also contributes to the well-being of the rural population and environment. The grazing animals are very suitable for breeding in nature protected areas, since controlled grazing can be considered as a tool for preservation of the landscape. Extensive livestock farming, based on the exploitation of natural green areas, so that farms are in dynamic relation to habitat conditions, is a foundation of a traditional mountain village in the entire Mediterranean (Eichhorn et al., 2006; Moreno and Pulido, 2009).

The main problem of organic production in the conditions of a mountain village is the economic viability to the extent that would enable the renewal and stability of human communities in this area. The economic viability of organic livestock production relies on proper animal selection. Due to the natural conditions in the habitat, it is considered that the cultivation of herbivores, primarily cattle, sheep and goats, and to a lesser extent pigs and poultry in order to obtain high quality organic milk and meat is a suitable choice for mountain units. Equine breeding for transport, tourist rides and drives and production of milk is a bonus. Breeding of the locally adapted, autochthonous and indigenous breeds resistant to climate stress and local pathogens and parasites, adopted to use available food in their natural habitat, implies organization of mountain farms with simultaneous breeding of several species of domestic animals and controlled grazing through rotation and pasture rest (Van Diepen et al., 2007).

Sustainability of cattle, sheep and goat genetic resource breeding is based on the assessment of factors that positively contribute to production and defining the risks. Factors that promote production are:

- proper selection of resistant animals – autochthonous, indigenous and locally adapted breeds and types of cattle, sheep and goats in order to minimize the risk of disease outbreaks;
- reliance on local and available sources of organically certified food – natural grassland;
- encourages the development and preservation of traditional processing of cow, sheep and goat milk, meat and other products on the farm and in the rural community. Also introducing the geographic certification of animal products which provides conditions for the promotion of small traditional production, market niche formation and development of rural tourism;
- providing employment and income for the entire rural community; and

- economic stimuli for organic production, for breeders of autochthonous breeds, and for grazing on public grassland, etc., increase the interest of the rural community for organic production which significantly contributes to the development of eco-tourism and preservation of agrobiodiversity.

Risk factors that endanger sustainability, AnGR and biodiversity conservation, and rural development are:

- lack of human resources due to pronounced negative population trends in the vulnerable mountain villages;
- abandonment of livestock breeding tradition, i.e., grazing of cattle, sheep and goats, as well as traditional processing of animal products on the farm;
- small, vulnerable endangered populations of autochthonous and indigenous breeds of domestic animals limit wide spreading of sustainable rural development together with small and limited productivity of autochthonous and indigenous animals combined with insufficiently developed market for organic products and for small craft products;
- low income of the urban population which does not ensure adequate market prices of products from organic farming;

The problems faced by organic and traditional production and preservation of animal genetic resources that have been identified in Serbia were also described in developed European countries (Nardone et al., 2004; Escribano et al., 2016. Savić et al., 2014).

Specific bioclimatic characteristics such as steppe-continental climate, mountain climate, but also extreme subpolar climate of Alpine type, as well as the expansion of the Sub-Mediterranean area in the extreme southeast of Serbia represent the condition that allows recommendation of locally adapted autochthonous breeds for free-ranging, extensive and semi-extensive and organic farming. Unfortunately, autochthonous farm animals were not selected in order to increase production, so they are unattractive for intensive production and therefore became endangered, so the plans for conservation of animal genetic resources in Serbia is in action. Therefore, animal resources appropriate for sustainable organic breeding and conservation of agrobiodiversity are insufficient for massive production.

The most interesting cattle breeds for agroecological/organic breeding in Serbia would be Busha and Podolian gray, both resistant, with modest requirements in terms of care and keeping, and perfectly adapted to the climat-

ic and orographic characteristics of the mountain and lowland area, respectively. In addition to autochthonous cattle breeds, the traditional breeding of Balkan and Carpathian Buffalo types has become rare and should be renewed and two traits: milk and meat production should be promoted, and also the use of buffalos as working animals can supplement tourism in the region.

Grazing rotation systems enable the use of the same green areas by large and small ruminants, equines and wild fauna. Therefore, the holistic approach led to the promotion of breeding of autochthonous sheep and goat breeds, helping the conservation of autochthonous Zackel (Sr: pramenka) types, native Balkan goat, and autochthonous pigs and poultry. The status of autochthonous Zackel types and Tzigai sheep in Vojvodina is endangered, but populations of some Zackel types are vulnerable and threatened. Most endangered Zackel in Serbia are Pirot sheep, Karakachan sheep, Krivovirska sheep, Lipska sheep, Bardoka, Ratzka (Sr: Vlaška vitoroga) sheep. Svrljishka and Sjenicka ovca are undergoing uncontrolled outbreeding, while types from Kosovo are under threat of extinction and there are no transboundary conservation programs concerning these animals. Tzigai sheep types in Vojvodina are also endangered due to intensification of agriculture and loss of grazing land. Sustainable rural economy depends on small stakeholders and can be achieved only by preservation of traditional production of meat and processed meat, woolen carpets and clothing, sheep and goat milk cheese processing and promotion of production on farms.

Goat breeding is reviving and Balkan goat breeding became a conservational challenge in Serbia. Milk and meat of these extensively bred goats is highly valued in the convalescent diet, while health, while long, colorful coat attracts curious tourists.

Pig breeding

Throughout the history of pig breeding, this animal has been kept on the waste and remnants of the human table and has been domesticated and bred as a “garbage can” kept in small numbers in households. The way pigs are produced has undergone radical changes over the last 50 years, so that modern pig breeding is based on densely populated closed facilities. The goal of this production is to get pork at the lowest possible price. At the beginning of the 21st century, the consumers began to develop dissatisfaction towards the industrial technology of pig production (Oborn et al., 2002). Public concern about welfare of animals in modern pig production has grown especially in Western European countries (Kanis et al., 2003). The general conclusion is that the market of Western Europe requires that the production of domestic

animals, especially pigs, be more sustainable and animal friendly, and that the low price of pork must not be the only goal of pig breeding.

The highest consumer support in spite production price of pork was achieved in an open pig breeding system dedicated to animal welfare. The well controlled open pig breeding, especially the pasture breeding is favored by animal welfare activists. By the end of the twentieth century one of the basic goals in pig production was defined as switching to open system (Sather et al., 1997). Free-range pig meat is considered tastier than intensively reared pig meat and has beneficial effects on human health due to the increased content of n-3 and n-6 polyunsaturated fatty acids (PUFA), neutral fats and vitamins.

Today, the alternative: "Free-range" pig breeding system, which is the only acceptable in the case of organic pig production, is increasing in North America and Europe. The organization is based on the use of simple and prefabricated shelters and fenced pasture / forest area for pigs. Pig keeping in the open system and organic breeding, demands breeding of locally adapted pigs and promotes conservation of autochthonous pig breeds (Miao et al. 2004). These farms should be located in regions with limited atmospheric precipitation, the slopes should be relatively flat, with light soil that has good drainage characteristics, with trees and shelters protecting pigs from excessive insolation and burns, i.e., from heat stress. If nutrition and satisfactory level of behavioral needs for pigs is appropriate and animals are relocated in aim to prevent degradation of pastures, main differences in comparison to confined pig breeding is slow, season depending growth of animals and prolonged fattening mostly due to late-growing of indigenous pigs and to lower intensity of the diet. In principle, free-range pigs are calm and there are no aggressive outbursts and they move significantly more. Of course, the parasitic load is a very significant problem in the open breeding system, which is a risk that can negatively impact the idea of the absolute safety of free-range pig meat. Diseases can be controlled to some extent by rotations with ruminants and equines, with mandatory pasture rest. In order to reduce nitrogen load of the soil and soil pollution, it is necessary to limit the population density very carefully. All food that is additionally supplied usually comes from local sources, which provides good conditions for organic certification. In our country, Mangalitza, and to a lesser extent Moravka and Resavka are used for open system pig breeding.

Sustainable poultry breeding and preservation of poultry resources

Sustainable poultry breeding has been developed in intensive, industrial confined system, where densely kept domestic birds were exploited for fast

production of meat and sometimes eggs. So, intensive poultry farming systems for meat are more or less very similar, regardless of the type of bird raised (chickens, turkeys or ducks). In contrast, commercial egg producing farming has undergone tremendous changes, especially in the developing countries, due to the growing need to ensure the welfare of egg-laying birds. Species that were not suitable for confined, dense keeping throughout the life span have been marginized, so, the populations of gees, guinea fowl, e.tc., decreased around the globe.

At the end of the twentieth century, awareness began to develop about non-economic indicators of sustainability: bird welfare, specialization and loss of biodiversity in poultry, reduced resistance of highly productive poultry to diseases, pollution from conventional production and other potential risks for poultry production were recognized. These non-economic components of sustainability have been studied and it has been established that without the consumption of energy resources, as well as without precisely implemented health protection measures, it is impossible to maintain conventional production and provide quality, palatable and healthy products without drug residues and growth stimulants.

Semi-extensive and extensive breeding systems of all domestic birds have shown that there is a need for preservation of high-value farming that is not intensified. Geese, guinea fowl, and other domestic birds breeding within established, holistic farming system allows production of more resistant birds that preserved the ability to adapt to natural conditions. So free-range farming with cohabitant domestic animal species was recognized as welfare acceptable farming if conditions like careful nutrition and good health care were met.

At the end of the twentieth century, alternative breeding and production in poultry based on the experiences of semi-extensive and extensive breeding tradition, began to develop. Free-range farming, organic farming, turkey egg production, quail (eggs, meat), partridge, eggs with reduced cholesterol content, etc., were promoted as niche poultry production systems designed in aim to obtain high-quality food. Free-range products and organic products are highly valued in developed markets, both because of the standards of welfare and nutrition of birds, and because of the general attitude of consumers that quality of the products is significantly better. The promotion of alternative breeding opened the space for preservation of the biodiversity of domestic birds, as well as the integrity of villages and rural communities. In the developed world where there is an awareness of the ecological sustainability of poultry production, the importance of rural traditions for society is pro-

moted, and the idea of natural food production opened the market niche for alternative poultry farming. The sustainability of alternative poultry farming, including organic production, is endangered only from the aspect of economic parameters, and only in the conditions of insufficiently informed breeders and consumers.

Open breeding systems and organic poultry breeding, demands careful selection of birds based on the characteristics important for adaptation to external conditions and resistance to pathogens and parasites. The most suitable birds for organic and alternative farms are locally adapted breeds and strains of chicken, turkeys, geese, and free range and organic hybrids. For example, it is considered impossible to breed geese in a confined intensive system so, all geese breeds are suitable for organic/free range system.

Of course, the fact that the population density of poultry shelters, the need for rotation on pastures, providing special conditions, such as water surfaces for geese and floats, increased risk of disease when kept poultry outdoors, as well as the fact that alternative productions in poultry farming is basically small and increases the price of the obtained products demands the promotion of free-range and/or organic poultry products on the market in aim to establish sustainability of alternative production.

CONCLUSIONS

Animal breeding is a key activity of the rural population, important for the conservation of agroecosystems and the villages, especially in mountain and in protected areas both globally (Bernues et al, 2011) and in our country,

As the availability of labor and arable land is limited, the intensification of agricultural production is restricted in the mountain villages, so, the income is small and producers are dependent on state aid. The benefits of controlled, ecological agriculture are huge in terms of preserving biodiversity, preserving tradition, maintaining the landscape and creating conditions for the development of eco-tourism and the promotion of the country at the international level.

Bioclimatic and biogeographical conditions in the mountain region of Serbia with characteristic wide spread grassland and forests allowed the development of the tradition of sheep, goats and, to a lesser extent, cattle and buffalo breeding. This tradition resulted in the traditional processing of milk, meat, wool and other products, with attractiveness of manufactured, traditional products such as Sjenica cheese, Kraljevo kaymack, Pirot kachkavaj, and

other products with clear geographical determination on the market. Due to adaptation and resistance to environmental conditions and pathogens, the production process based on traditional, autochthonous breeds is of crucial importance, especially if the fact that Serbia is among of countries affected by climate change is considered.

Due to limited production resources and the fact that autochthonous animal products deviate from international quality standards, economic self-sustainability of small rural farms in Serbia can be achieved only by promoting geographical and organic certification of the local production. The formation of a market niche for these products outside the borders of our country, in more developed and richer markets is possible only through promotion of ecotourism and rural tourism. In order to preserve and revive villages, as well as natural environment of global importance, economic support is needed for production through conservation of autochthonous breeds of cattle, buffalo, sheep, goats, pigs and poultry, and equines. Also, economic support for grazing in public areas is necessary in aim to provide conditions for maintenance of the landscape. In addition, assistance and support is needed during geographical and organic certification.

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