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MANAGEMENT OF ANIMAL GENETIC RESOURCES IN SERBIA - CURRENT STATUS AND PERSPECTIVE: A REVIEW

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ABSTRACT

Serbian agro biodiversity conservation program was prospering in last 15 years in great extent. From the situation when majority of locally adapted breeds and strains for domestic animals were on the edge of extinction, number of all animals was drastically increased. After Ministry of Agriculture, Forestry and Water Management introduced regular compensation measure for farmers growing endangered old breeds, increase of the number of farmers involved and number of animals conserved was fast. The following rehabilitation of some artisan food productions and introduction of few novel value chains as a fundament of the new conservation approach, animal genetic resources in Serbia got a new role regarding satisfying demand of population for high quality food (production in marginal areas, organic production) landscape conservation and integrated development of rural areas. The paper presents the status of animal genetic resources and their production systems.

Key words: animal; genetic; breeds; conservation

INTRODUCTION

The Republic of Serbia is located in the South-Eastern part of Europe, landlocked in Balkan Peninsula. It occupies an area of 88,509 km^2. The Northern part of the Republic occupies the plains (Pannonia Basin) and in the Southern parts are hills and mountains. According to the most recent census, the Republic of Serbia had population of 7,186,862 inhabitants. The average population density is 93 inhabitants per km^2. According to a separate census of Kosovo and Metohia in the 2011 year 1,733,872 residents lived there.

The Republic of Serbia has a total of 631,552 agriculture households and 3,437,423 ha of agricultural land, out of which 73.1 % are arable land and gardens, 20.7 % meadows and pastures, 4.8 % orchards, 0.6 % vineyards, 0.7 % crofts and 0.1 % are other permanent crops.

THE STATE OF PRODUCTION SYSTEMS

In the Republic of Serbia, in all the branches of animal production, there are two basic types of production systems: (1) Highly specialized high input production systems and (2) Extensive low input production systems based on the combined crop/animal or mixed production systems.

Livestock production is present in all regions, however locally adapted breeds last refuges are mainly marginal mountain, partly wetland areas in lowlands with predominant extensive low input production systems. Trend of abandonment of marginal mountain areas, and concentration of livestock husbandry in intensively cultivated lowlands, have serious consequences on survival of locally adapted breeds as much as survival of traditional farming practices. Majority of locally adapted breeds in these areas are attached to semi-natural

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grasslands, which used to make essence of traditional pastoral systems with characteristics of High Nature Value Farming (HNVF). This farming was basis for production of high quality typical products from locally adapted breeds and maintaining high biodiversity value of grasslands, however not properly positioned on the market to be valorized adequately to justify lower productivity (Cooper *et al.*, 2010).

The most significant livestock products in Serbia are: milk and dairy products of cows, sheep, goat and buffalo milk, pork, beef and beef products, poultry meat, eggs, lamb, manure, skin, giblets, manufactured products and wool. Interesting for conservation of animal genetic resources (AnGR) are typical artisan products such as hard sheep and sheep/cow milk yellow cheese, curd, pepers in sour cream, kaymak cream, diverse kinds of smoked meat, sausages and bacon etc. as much as more exotic row donkey milk and cheese which are part of precious value chains mostly related to traditional pastoral systems.

THE MONITORING OF ANIMAL GENETIC RESOURCES

The Republic of Serbia does not have national livestock information system and therefore monitoring of AnGR is still inconsistent, incomplete and superficial. Basically, flow of information regarding AnGR is carried out through network of the national agricultural service and university centers, yet more information is flowing in to the system *ad-hoc*, thanks to annual call for subsidizing animals of locall adapted breeds. Updating of data bases is carried out on the annual basis. Data on the number of animals and production parameters of major breeding organizations are submitted to the Ministry of Agriculture, Forestry and Water Management (MAFWM), and forwarded to European Farm Animal Biodiversity Information System (EFABIS)/Domestic Animal Diversity-Information System (DAD-IS). Updating of the Global database for AnGR is conducted based on Agreement which was signed on 2013 with European Regional Focal Point (ERFP). Herd books for all breeds of economic interest as well as breeding programs exist. For locally adapted breeds there are no breeding programs.

THE CURRENT STATUS OF ANIMAL GENETIC RESOURCES

Activities related to management of AnGR are organised and financed by the state, through MAFWM. Relations between government institutions, various non-governmental organisations, breeders, local communities and stakeholders are therefore good (Stojanović, 2003).

Locally adapted breeds which are endangered, due to the fact that they have no significant contribution to neither nutrition nor agriculture, and therefore under conservation in Serbia are:

Big ruminants: Podolian cattle (225 animals), Busha cattle (776) and Domestic Buffalo (598), primitive breeds which had combined purpose (milk–meat–work) are not profitable due to low productivity and lost the role of working animals.

Horse: Domestic-mountain Pony (113) and *Nonius* horse (106) there basic role of working animals in majority of regions ceased to exist. However, in some hilly-mountainous regions, where horse power is still needed in forestry, attempt to preserve Domestic-mountain Pony with the support of the State.

Donkey: Domestic donkey (383) In many regions, practical application of pulling role of donkey disappeared, which led to a decrease of interest for breeding. New possibility appeared with reintroduction of the idea to use donkey milk as auxiliary medicinal product. In Special Nature Reserve „Zasavica" even some new products were introduced (sausages, cheese, cosmetics-face creams, soaps, liquor, etc.) to provide economic viability to conservation of this breed.

Pig: Mangalitsa pig (753), Morava pig (58) and Resava pig (13). These fatty breeds have lost the battle with more productive hybrids. Long-term promotion of Mangalitsa pig and its products have led to a growing interest in this breed. Some products have been found their path even to big supermarket chains after 15 years of being on the edge of extinction.

Sheep: Vlashko-vitoroga sheep (1243), Lipa sheep (991), Bardoka (130), Pirot sheep (178), Krivi vir sheep (733), Karakachan sheep (234) and Chokan Tsigai (503). Besides partially Bardoka, all mentioned breeds and strains lost importance with the introduction of more productive breeds, but even more due to the depopulation of marginal rural regions where sheep were raised in extensive production systems on mountain pastures.

Goat: Domestic Balkan goat (582). Under the influence of extension services (also media), Alpine and Saanen breeds were promoted, so Domestic Balkan goat vanished from almost every area where better conditions for housing and nutrition could be provided.

Poultry: Naked Neck (1938), Sombor Crested (478), Kosovo Singer, Svrljig hen (200), Domestic geese, Domestic turkey. These breeds are present in extremely small number hence their contribution for livestock production and food is not significant. In general, there is no economic interest for production of any of mentioned breeds; therefore they are raised

purely for hobby and cultural reasons (Stojanović and Đorđević-Milošević, 2003; Stojanović, 2009).

PROGRAME AND CONSERVATION STRATEGY

In the proposed „Strategy for the development of agriculture and rural areas of the Republic of Serbia for the period of 2014-2024" in the part referring to the "Environment and Natural Resources", a series of measures specific to AnGR was designed, with aim of:

- Stabilizing & increasing size of the population & prevention of genetic diversity loss;
- Keeping records of AnGR;
- Development of protocols for monitoring of movement of AnGR and risk;
- Characterization, inventory and monitoring of trends and risks and setting standards for phenotypic and molecular characterization of AnGR;
- Definition of breeding objectives and development of breeding programs for AnGR;
- AnGR sustainable use in traditional agro-ecological systems, fair sharing of benefits;
- Assessing the value and importance of AnGR and production systems;
- Market development of traditional products from AnGR and increase of the participation of public in conservation of AnGR;
- Strengthening the national capacity for sustainable management of AnGR;
- Establishing a national policy for conservation and use of AnGR;
- Establishing and/or strengthening of the capacity for *in situ* and *ex situ* conservation;
- Establishing and strengthening of education and research capacity for AnGR;
- Strengthening international cooperation on the exchange of information about AnGR;
- Provision of funding of AnGR through existing and additional funds.

ALTERNATIVE APPROACHES FOR THE MANAGEMENT OF AnGR

The significance of AnGR within the frames of the new policy of sustainable development in Serbia is considered from the aspect of multifunctionality of agriculture. Among the most important aspects identified so far are some possibilities, which may emerge from the comprehensive utilization of AnGR with the aim of valorization of different food resources, then those related to the food safety, diversification of rural economy and development of non-agricultural activities, and finally the possibilities regarding maintaining of regional diversity and protection of the environment (Đorđević-Milošević and Stojanović, 2005).

1. Production systems based on AnGR in the regions with natural constraints

Mountain marginal rural areas in the Republic of Serbia were abandoned due to the poor soil or rough climate, which was limiting intensification. Locally adapted breeds in these areas are the only option for revitalization of production of typical products required for tourism development. The production of high quality food with ecological labels and geographic indications is possible, however it requires careful modeling. Introduction of contemporary food safety and quality standards require further work for identifying gaps and introduce derogations which are necessary to save artisan production. In some of these areas, locally adapted breeds as much as artisan products are completely lost and need to be reintroduced.

2. Conservation of AnGR to support biodiversity conservation strategies

Modern livestock production over the last decades of the twentieth century caused extinction of number of locally adapted breeds and strains of domestic animals. After the failure of intensification in some areas, livestock production was neglected, leaving waste areas of grasslands, undermanaged or abandoned. Neglecting of livestock production in some regions led to dissipation of (natural) biodiversity. In depopulated mountain regions, for example, grassland communities which were invaded by shrubs in absence of grazing halved the number of plant species, while lowland grasslands as a consequence of ceasing of grazing have lost some small mammals and birds of prey feeding on them.

3. Conservation of AnGR and protection of rural regions and landscape diversity

Traditional farming in the last century maintained tens of types of rural landscapes considered nowadays valuable from ecological, social and economic standpoint. After rural environment become unattractive space for living in last few decades, outmigration have left unmanaged space and number of landscapes was degraded. However, this space is again of public interest for getting closer to the nature and awareness of need for its conservation, has triggered initiatives for conservation of locally adapted animals and their integration into profitable production systems.

4. Improvement of forests and water management in light of conservation of AnGR

The most sensitive relations between agriculture and the nature, environmentalists see with point source pollution related to intensive livestock farming. Pollution

with nitrates and phosphates, eutrophication, emergence of causative agents of some fifty zoonosis in water. Locally adapted breeds might contribute to mitigation of risks from pollution from agriculture in numerous ways. One of them is certainly their genetic potential to resist disease and better utilize the available natural feeds which makes them suitable for organic production.

5. Cultural heritage and conservation of AnGR

Traditional combined farm systems and HNVF in addition to typical artisan products are part of the cultural heritage. This includes conservation of traditional knowledge for processing, but also introduction of tourism. Loss of adequate raw material base originating from the locally adapted breeds of domestic animals is inadmissible. So for example, original Pirot sheep katchkaval cheese, or Pirot rug, is impossible to conserve if Pirot sheep isn't saved from extinction. Since typical artisan products of the kind have profitable market, income can support conservation of AnGR, and vice versa AnGR can support rural economy diversification.

NATIONAL PRIORITIES FOR CONSERVATION AND UTILIZATION OF AnGR

The main priorities are:

1. Characterization of locally adapted breeds, as well as their potentials in the sense of achieving economic justification of conservation of *on farm* conservation systems.
2. Clear definition of the role, utilization and conservation of AnGR, that is, precise definition of current and future needs of the nation in livestock production.
3. Enhancement of capacities of communication and information systems.
4. Establishment of permanent programs for monitoring farm AnGR, which have agricultural, economic, cultural or scientific value.
5. Training of personnel, especially s about the new technologies applied in conservation.
6. Development of permanent and functional relationship with the public (media, publications, public affirmation of scientific and professional papers etc.)
7. Development of legislation and regulations.
8. The increase of the level of international communication.

ANIMAL GENETIC RESOURCES CONSERVATION DEVELOPMENT IN SERBIA

Agro biodiversity conservation program was prospering in last 15 years in great extent. From the situation when majority of locally adapted breeds and strains for domestic animals were on the edge of extinction, number of all animals was drastically increased. After MAFWM introduced regular compensation measure for farmers growing endangered old breeds, increase of the number of farmers involved and number of animals conserved was fast.

Further development was leading to strengthening capacities for introduction of new measures within innovative agrarian policy, which was provided through few projects implement with external financial support. International assistance came as a natural continuation of local efforts, yet limited national absorption capacities were obvious during implementation of all projects and some of established goals were never reached. At the same time additional effort was made by farmers and non-governmental organizations themselves to rehabilitate traditional artisan production and provide adding value to their animal products to increase economic sustainability of the conservation programs. These were promoted on the market with lots of enthusiasm and assistance of enlightened individuals in media. Clever idea leaded to first positive results - increase of consumer interest and increase of breeds population.

Due to intensive migration of Serbian population, locally adapted breeds surviving in economically and environmentally justified traditional low input farming systems are losing ground. Entirely new deals are needed to keep these animals alive, such as introduction of novel models of managing nature protected areas and using of ecological services.

Economic crisis which caused decrease of purchase power of customers prevented market to grow significantly and provoke relevant increase of the number of autochthonic animals and breeders growing locally adapted breeds. Every conservation program for endangered locally adapted animal breeds should have the component which includes education of consumers about the quality of food, healthy diets and characteristics of traditional and sustainable farming practices. Development of curricula for elementary and high school covering these issue is an ideal opportunity to start with education early enough to provide space for old breeds in the future. If consumer taste is not cultivated, the opportunity to raise his awareness about importance of locally adapted breeds is a mission impossible. Consumers have had for a few decades already very few opportunities to get familiar with food deriving from locally adapted breeds. His emotions about these animals derive more from moral and cultural teasers than scientifically proven, exact data. Knowledge introduced through advertisements is less suitable for raising awareness of population and their feelings for conservation programs.

The opportunity which was seen with protected origin for typical artisan products deriving from these products is missed in Serbia, since majority of Serbian typical artisan products were not protected in a way to include origin from defined locally adapted animal breed or a strain. Indigenous property rights for mountain or other rural communities need to be appreciated and protected also to regulate this issue. The conservation of AnGR is their chance to prosper without jeopardizing the rest of their natural and cultural heritage and right to be different. Indigenous rights are also creating emotions of consumers on wider market, which are going in favor of conservation of locally adapted breeds.

Locally adapted breeds of ruminants in Serbia are well adapted to conditions of natural and semi-natural grasslands in marginal lowland and mountain areas. Diverse breeds and strains of sheep, cattle, buffalo, goats and horses and donkeys are suitable for using grasslands, which are in these areas not possible to convert in to arable land, due to its quality and shallow profile. Rehabilitation of the line of traditional HNVF practices which include extensive grazing animals important from the aspect of conservation of AnGR, can bring multiple benefits to the local rural economy, as well as to the landscape and biodiversity conservation of wild species. This HNVF should be supported within agro environmental schemes of the axis 2 type.

AnGR in Serbia are highly vulnerable, no matter of the present status of every individual breed. This primarily because their conservation is organized *in situ*, so there is no back-up in gene banks or any other *ex situ* system if collection is exposed to disease or catastrophe of a different kind. The establishment and inclusion of the gene bank in existing and new programs for the preservation of locally adapted races is of great importance for the sustainability of total genetic resources.

For Serbian agrarian policy agro-environmental issues remain marginal. Conservation of animal genetic resources requires wide community action and should overcome narrow frames of agriculture policy and practice.

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