

**SECOND REPORT ON THE STATE OF
ANIMAL GENETIC RESOURCES IN
REPUBLIC OF SERBIA**

MINISTRY OF AGRICULTURE, FORESTRY AND WATER MANAGEMENT

-2014-

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Abbreviation which are used in this report:

AnGR - Animal Genetic Resources

MAFWM - Ministry of Agriculture, Forestry and Water Management

EFABIS - European Farm Animal Biodiversity Information System

DAD-IS - Domestic Animal Diversity-Information System

ERFP - European Regional Focal Point

A.I. - Artificial Insemination

EU - European Union

FAO - Food and Agriculture Organization of the United Nations

Executive summary

Out of the total number of agricultural households on the territory of the Republic of Serbia, the 77 % raise domestic animals. Animal husbandry is widespread in the Shumadia and Western Serbia regions. It should be noted that the average farm in Serbia is small, with an average size of utilized agricultural land of about 5.4 ha. The most common size of the cattle herd is 1-2 cattle, 3-9 pigs and 3-9 sheep. However, the agricultural households, or farms that were primarily registered for livestock production, are much greater with a larger number of bred animals and larger areas to be covered.

All of the family livestock farms, regarding their size may be divided into small, medium and large ones, whereas the intensity of production increases proportionally with the increase in farm size. On the other hand, livestock farms that are part of agricultural enterprises are mostly large and intensive.

The Republic of Serbia never experienced problems related to providing food for existing population. Our country disposes of natural resources for high level of production, for domestic needs as well as exporting. However, these potentials were insufficiently used because of the lack of competitiveness of Serbian agriculture in comparison to highly developed countries, liberalization of markets and importing of cheaper agricultural products. The importance of animal products is fairly high. However, meat consumption was reduced, along with decline of living standards, although from the cultural point of view it still represents, besides bread, the most important food. Lamb and beef which had been one of the major export items, significantly more difficult to export in the last twenty years, because the traditional markets during the crisis of the 90s in the twentieth century are lost. The risks of food shortages are negligible, localized and mainly associated with the appearance of natural disasters (lately extreme droughts during summer months as well as late spring frosts). Risk of drought is extremely significant due to a small number of areas under irrigation systems.

With the increase of standard of living of population, the demand in regard to the quality and quantity of agriculture products increases as well. AnGR will have a significant role regarding satisfaction of future demand of population for high quality food (production of healthy and safe food, organic production), ecological production and integral development of rural areas anticipating combination of agriculture and tourism.

Importance of various livestock products is both economic and social. The most significant livestock products in Republic of Serbia are: milk and dairy products, pork, beef and beef products, poultry meat, eggs, lamb, manure, skin, giblets, manufactured products and wool. Even in relation to economic importance of these products, the order is identical.

The most important actual and potential threats to genetic diversity in livestock of Republic of Serbia are the following:

- Degradation and loss of natural resources
- Import of exotic breeds

- Endangering the locally adapted breeds
- Non-recognition of the importance of preserving AnGR by policy makers
- Inadequate support measures
- Loss of control and monitoring of AnGR
- The weakening of the capacity for *in situ* and *ex situ* AnGR conservation programs
- The emergence of infectious diseases
- Lack of markets for products derived from locally adapted breeds
- Insufficient apply of modern scientific and technological achievements in livestock production
- Insufficient economic development

For the Republic of Serbia, the following aspects of AnGR conservation will be specially emphasized:

1. Production systems in the areas of limited agricultural production and conservation of
2. AnGR for food production
3. Conservation of AnGR serving to biodiversity conservation
4. Conservation of AnGR and protection of regional diversity
5. Protection and improvement of management of forestry and waters in the light of food production conservation
6. Conservation of AnGR serving to environment protection
7. Cultural heritage and conservation of AnGR
8. Maintaining the traditional knowledge and technologies in food production
9. Conservation of AnGR as a support to diversification of rural economy.

The main priorities which should also become the integral part of the National Programme are:

1. Identification of locally adapted breeds, their wild relatives and their habitats, as well as their potentials in the sense of achieving economic justification of model for conservation in active on farm conservation systems
2. Clear definition of the role, utilisation and conservation of AnGR, in livestock production from the standpoint of meeting the national requirements in animal products, as well as conquering the foreign markets
3. Enhancement of capacities of communication and information systems
4. Establishment of permanent programmes for monitoring farm AnGR and their wild relatives, which have agricultural, economic, cultural or scientific value. The monitoring programmes should be made so as to provide feedback to farmers and the rest involved in AnGR conservation
5. Development of permanent and functional relationship with the public
6. Development of legislation and regulations
7. The increase of the level of international communication
8. Increasing the initiative for AnGR to be accepted by economic policy as a development factor.

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1. The state of livestock diversity

1.1 Introducing the Country

The Republic of Serbia is located in the South-Eastern part of Europe in the middle of the Balkan Peninsula. It occupies an area of 88.509 km². The total length of the boundaries with the neighbouring countries is 2.361 km, of which 1.567 km of terrestrial, 751 km of rivers and 43 of lakes. The Northern part of the Republic occupies the plains (Pannonian Basin) and in the Southern parts are hills and mountains. There are over 30 mountain peaks over 2.000 meters above sea level, the highest peak is Djeravica (Prokletije Mountains) with a height of 2.656 meters. The lowest point is on the border with Romania and Bulgaria, at the mouth of Timok in Danube at 28-36 meters above sea level. The most important rivers are the Danube, Sava, Tisa, Begej, Velika Morava (North and South), Tamish, Ibar, Drina and Timok. In addition to rivers, in the Republic of Serbia a range of artificial canals were built, which are being used for flood protection, irrigation, navigation and other purposes. Their total length is 939.2 km.

According to the most recent census, the Republic of Serbia had population of 7.186.862 of which 3.499.176 male and 3.687.686 female inhabitants, 2.487.886 households or 2.88 persons per household. The average population density is 93 inhabitants per km². According to a separate inventory of Kosovo and Metohija, which is not carried out in the northern part of Kosovo and Metohija, in the 2011, 1.733.872 residents lived there. Average age of population was 42.58 years.

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.

Territory of Republic of Serbia, regarding climatic conditions, is very complex and heterogeneous due to its geographical location in the South-East Europe and the fact that it is open to different influences. However, three basic types of zone climate can be recognised in the Republic of Serbia: continental climate in the north, temperate continental climate in the south and mountain climate in the high mountains. Typical temperate continental climate is prevailing, characterised by cold winters and warm summers. All seasons are present. Quantity of annual precipitation is 896 mm, with strongest most frequent deficit in February and October. The average annual air temperature in the Republic of Serbia is: 10.9 °C (the area with an altitude of up to 300 m), 10.0 °C (300 - 500 m), 6° C (1.000-1.500 m), 3° C. (above 1.500 m).

For various purposes of planning, territory of the Republic of Serbia is divided to following regions: most frequently, Pannonian-plain region and hilly-mountainous

region. Pannonian-plain region includes: alluvial plains and terraces along river basins of great rivers (Danube, Tisa), plateaus (Banat, Titel, Telech and Srem) 100 to 140 m above sea level, and hilly-mountainous elevations (Frushka gora and mountains around Vršac). It is very fertile area in regard to plough crop production, with major products such as grain, industrial plants and corn. What characterizes this region is the presence of intensive livestock production, first of all pig, poultry and production of dairy cattle. Hilly-mountainous region is predominantly the region for fruit, livestock and plough-crop production. In regions where hills are predominant, the greatest number of farms engaged in-combined farm production systems, are located. Mountain regions are characterized by great areas under mountain pastures which are suitable for extensive and semi-intensive livestock production in pasture-mow systems.

Major production systems in the Republic of Serbia are represented through private ownership with low or medium level of investment in ploughing crop and livestock production. Plough-crop production is present in the region of Vojvodina and river valleys. Livestock production is present in all regions. Major plough crop products are: wheat, corn, sugar beet, oil plants, fruit products are: plum, raspberry and cherry. Major livestock products are: meat, milk and eggs.

Livestock production is conducted mostly on farms in private ownership of different capacities, whereas farms in other forms of property are represented in significantly smaller percentage. Only 6.245 of agricultural households cover the area of over 50 ha of agricultural land, 134.425 households cover the area of 5 to 50 ha and 480.775 cover the area of 0 to 5 ha of agricultural land.

The Republic of Serbia never experienced problems related to providing food for existing population. Our country disposes of natural resources for high level of production, for domestic needs as well as exporting. However, these potentials were insufficiently used because of the lack of competitiveness of Serbian agriculture in comparison to highly developed countries, liberalization of markets and importing of cheaper agricultural products. The importance of animal products is fairly high. However, meat consumption was reduced, along with decline of living standards, although from the cultural point of view it still represents, besides bread, the most important food. Lamb and beef which had been one of the major export items, significantly more difficult to export in the last twenty years, because the traditional markets during the crisis of the 90s in the twentieth century are lost. The risks of food shortages are negligible, localized and mainly associated with the appearance of natural disasters (lately extreme droughts during summer months as well as late spring frosts). Risk of drought is extremely significant due to small number of areas under irrigation systems.

With the increase of standard of living of population, the demand in regard to the quality and quantity of agriculture products increases as well. AnGR will have a significant role regarding satisfaction of future demand of population for high quality food (production of healthy and safe food, organic production), ecological production and integral development of rural areas anticipating combination of agriculture and tourism.

Approximately 40.6 % of population of the Republic of Serbia lives in rural areas. Old people are left in villages, especially in hilly-mountainous regions. Distribution of population is rapidly changing in favour of cities and migration of inhabitants from rural to great urban areas continues. The interest of the population to return to the village and agriculture is very low, and one of the main reasons for that is the lack of infrastructure as well as poor living conditions. The attitude of the Government is to improve living conditions in rural areas so that each interested inhabitant will have the opportunity to return to village and start their own production. Life standard of rural population is expected to increase in future, especially in plain regions where the intensity of development is the greatest, whereas in the hilly-mountainous regions it will decline.

1.2 The State of Production Systems

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

Public sector, monitored and supported by the state during the period up to the last decade of the twentieth century, had at disposal used the contemporary agro-technical methods and zoo technical knowledge. Basically all public farms were organised in a specialised types of intensive production. In private sector, family households were mainly organised as combined production systems, due to insecurity of market because of the state agricultural policy. Few of the individual farmers applied more modern ways of working and specialized for certain production, whereas the majority stuck to the producing of many different kinds of animals in households.

Since the 90s of the XX century and especially since 2000, the situation begins to change. Today, in the Republic of Serbia, agricultural production is organized almost entirely in the private sector, distinguishing between the two basic forms: (1) family farms on the one hand, and (2) agricultural enterprises in various forms of ownership on the other. Among the agricultural enterprises, agricultural cooperatives, joint stock companies, corporate companies, etc have the highest importance.

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All of the family livestock farms, regarding their size may be divided into small, medium and large ones, whereas the intensity of production increases proportionally with the increase in farm size. On the other hand, livestock farms that are part of agricultural enterprises are mostly large and intensive.

The cattle production in the Republic of Serbia is dominated by two breeds, Simmental and Holstein-Friesian, and therefore the production systems are adapted to those breeds. In addition to those two breeds, in much smaller number beef breeds are represented (Limousin, Charolais, Angus, and Hereford), locally adapted breeds (Busha and Podolian cattle). When it comes to dairy breeds, there is Brown Swiss, as well as a number of systematic and non-systematic cross-breeds between the mentioned breeds. The main directions of the production are dairy and dairy-meat, or exclusively meat, when it comes to beef breeds. Cattle housing systems are generally in stables with dominantly related system on small farms and free system on the medium and large farms. Keeping the cattle on pastures is of seasonal character on land areas that are close to the farm, whereas keeping the cattle on pastures in continuous long period of time is rarely applied. The cow-calf system in fattening production is represented in smaller percentage. On small family farms milk production prevails and the excess of calves are sold as fattening material. On medium and large farms specialization is more present, mainly towards the milk production and less towards the meat production.

As in cattle production, two basic forms of organization of production are represented in pig production, on family farms and on agricultural enterprises. Family farms are of smaller capacity, with semi-intensive and intensive systems of keeping animals, whereas the high-capacity commercial farms are of intensive production. About 45 % of the total pig production is carried out on large, commercial farms of industrial type, whereas the remaining 55 % are allocated on the family farms. The most common breeds are Yorkshire and Swedish Landrace, that are used for production of F1 gilts and that are further cross-breeding with some of the terminal meat breeds, such as the Pietrain, Duroc, Hampshire and German Landrace. Keeping the pigs in the low-intensity systems is not particularly represented and it is mostly related to keeping of locally adapted breeds and production of certain specific, traditional products.

The Sheep breeding is the only branch of livestock production in Serbia based on breeding of locally adapted breeds. The dominant breed is Zackel with multiple of different strains that are specific to certain parts of Serbia. The most dominant strain is Sjenica that is widespread all over the country. From the most popular foreign breeds, there is German Württemberg breed, and in smaller herds Suffolk, Il-de-France, Texel, etc can be found. The dominant direction of production is meat-wool and lamb production, whereas the production of dairy and wool, and although present, of lesser importance. Breeding and keeping of sheep from all branches of livestock production is mostly exposed to the impacts of climate and geographical area. Sheep breeding is mainly represented on the family farms of different capacities with extensive, semi-extensive and semi-intensive housing systems. The largest number of sheep in the Republic of Serbia is in the areas of 250 meters above the sea level. Animals are kept in stables, with longer and more intensive use of pastures during the growing season in parts of the country which are allowing it. In parts of the country where there are pastures which are not spacious enough, sheep holding during the period of vegetation in orchards, yards and on grass areas that are closer to the stables for their accommodation.

Unlike of sheep production, and other branches of animal production, the poultry breeding (chicken farming is dominant, whereas growing of turkey, geese and ducks are significantly less prevalent) is almost entirely based on foreign commercial hybrids. The economic devastation of poultry production during the last decade of the twentieth century resulted in the shutting down of parent and grandparent flocks and almost complete reorientation on the imported hybrids and supporting technology. Commercial and semi-commercial farms and enterprises generate almost 85 % of poultry meat and eggs, whereas about 15 % are on the small family farms, which are produced mainly for their own needs, with possible sale of small surpluses. Commercial and semi-commercial farms are characterized by intensive production systems, whereas the smaller family farms are represented by production systems of different intensity, from extensive to semi-intensive ones.

1.3 Origin and history of livestock diversity

Taking into account the geographical position of the Republic of Serbia, as well as the frequency of migration of people and of various ethnic groups and communities throughout the history, the main characteristics of all locally adapted breeds that are grown in Republic of Serbia is that they all belong to a wider group of breeds that are specific to the Balkan Peninsula, as well as for the entire South-Eastern Europe. In other words, in the Republic of Serbia there are no breeds that can only be grown in its territory, although there are more different strains of sheep whose occurrence is strongly associated with certain geographic areas in Republic of Serbia and as such are unique. Given that these strains belong to the breed of sheep, which is widespread in the whole of South-East Europe, they are more a reflection of adaptation to local geo-climatic, agro-ecological and zoo technical conditions.

In the area of Serbia today, but also in the area of Romania, Bulgaria, Bosnia and Herzegovina, Montenegro, Greece and FYROM, in period between V and IV century BC, Vincha culture was developed (Vincha is a village near Belgrade) which was agricultural society by its arrangement, so that the archaeological excavations determined that during its existence when it comes to domestic animals it had cattle, pigs, sheep, goats and dogs. Given that the Vincha culture was the most technologically advanced prehistoric culture and that it occupied relatively wide area of today's Western Balkans and South-Eastern Europe, it can be assumed that the presence of domestic animals had similar path of development, and therefore maintained certain similarity in their original forms until the present day.

By the XIX century, in the territory of today's Serbia, husbandry was based on primitive breeds of domestic animals that have arisen under the dominant influence of the natural and climatic factors. Men had little impact on their creation, as well as their selection. At that time, certain breeds of domestic animals were present and bred, that later in the XIX and XX centuries disappeared, such as pig breeds Shishka and Shumadinka or Kolubara cattle. During the second half, and especially since the end of the XX century, genetic improvement began, along with systematic crossing of the present primitive breeds of domestic animals. First breeding animals were imported from abroad, primarily cattle.

The only original locally adapted breed of pigs in Serbia is Shishka, now extinct, which is directly derived from the wild-founder, that is, the European wild pigs. From Shishka, over time, in somewhat better conditions of nutrition, housing and health care, arose Shumadinka which participated in the creation of more local breeds. Now lost, and once widespread, pig breed Shumadinka was involved in the creation of Mangulitsa, Resava (result of unplanned crossing of Shumadinka and Berkshire) and Moravian pigs or "Moravka" (created by unplanned crossing of Shumadinka and Berkshire).

In creation of some strains of Zackel sheep, besides dominant influence of natural and climatic factors, contacts, that is mating had partial impact as well, mostly unsystematic, of Zackel and different breeds of sheep from Little Asia and Middle East, which came to the Western Balkans together with the migration of people. Tsigai, the sheep breed that is widespread in the plain parts of Serbia, such as Vojvodina and Morava basin, originate from the sheep from Little Asia, from where they spread to Eastern Europe, whereas in our country it expanded from Romania during the XVIII century.

It is believed that Balkan goat originate from one of the founders of extinct goat, Priska goat (*Capra prisca*). It is believed that one of the centers of domestication of goats was Balkan Peninsula, and therefore a number of similar populations of locally adapted goat breed inhabit the entire area from Western Balkans and South-Eastern Europe.

Busha cattle breed belongs to a group of shorthorn cattle (*Bos brachyceros*). It is also known as the domestic mountain cattle, and in some places as Illyrian cattle and it exists in the Republic of Serbia for centuries. According to historical data and archaeological finding, small brahiceros cattle existed on the territory of Balkan Peninsula even before the big migrations in the period from V to VII century. With migration came along a mixing of local cattle breeds with other small cattle breeds, which led to the fact that similar populations of cattle retain to this day throughout all of the Western Balkans and South-East Europe, even the Mediterranean. On the other hand, Podolian cattle belongs to a group of grey, primigenius steppe cattle (*Bos primigenius*) and directly descends from European wild cattle or Tur (*Bos primigenius Bojanus*).

It is assumed that Buffalos came to the Balkan Peninsula during Middle Age and were brought there by the Crusaders during their warships. They acclimatized to the colder climate and spread to the wider region of Western Balkans and South-Eastern Europe. Buffaloes from areas of the Republic of Serbia and Balkans belong to the Mediterranean type of Buffalo.

Domestic-Mountain horse descends from the wild Tarpan and Przewalsky horses that were crossed with Arabian horses. It is included in the group of ponies and in the literature you may encounter across the term "Domestic-Mountain pony". According to its characteristics, it is very similar to the horses that are bred in Bosnia and Herzegovina, Bulgaria, FYROM and Romania. On the other hand, the origin of Nonius is associated with systematic breeding work from the first half of XIX century in the stables, which were located in the territory of the former Austro-Hungarian Empire. The breed was

made by multiple cross-breeding of Arab, Lipizzaner, Norman and English Thoroughbred mares with stallions imported from Normandy.

The Balkan donkey is one of the species of domestic animals which has one of the longest presences on this area and directly descends from the Nubian ass (*Equus asinus africanus*).

Locally adapted breeds in the Republic of Serbia are:

Cattle: *Podolian cattle, Busha cattle*

Buffalos: *Domestic buffalo*

Horses: *Domestic-mountain pony, Nonius*

Donkeys: *Balkan donkey*

Pigs: *Mangalitsa, Morava, Resava, Domestic Meat pig (Yugoslav Improved breed, or Yugoslav Landras)*

Sheep: *Zackel (Svrljig, Pirot, Krivi vir, Bardoka, Vlashko-vitoroga, Lipa, Karakachan, Sharmountain, Sjenica Improved sheep, Pirot Improved sheep), Tsigai and Chokam Tsigai*

Goats: *Domestic Balkan goat*

Poultry: *Banat Naked Neck, Sombor Crested, Kosovo Singer, Svrljig hen, Sombor geese, Domestic geese, Domestic turkey, Domestic duck and Guinea Fowl*

The population trend of all locally adapted breeds is more-less stable, with slight negative tendencies in certain breeds or strains, but not so severe that at this point threatened the survival of a particular breed or strain.

The exotic breeds in Republic of Serbia are:

Cattle: *Simmental, Holstein-Friesian, European Black and White Improved by Holstein-Friesian, Limousine, Charolais, Angus, Hereford, Brown Swiss*

Horses: *Thoroughbred, Lipizzaner, Trotter, Arab horse, Styrian horse, Holstein, Hanover, KWPN, Trakener, Pinto, Quarter, Haflinger*

Pigs: *Landrace (Swedish, Dutch, German, Belgian, Danish, Norwegian), Large White, Pietrain, Hampshire, Duroc*

Sheep: *Württemberg, Ile-de-France, Bergamo, Suffolk, Charole, Texel, East-Frisian*

Goats: *Alpine, Saanen*

Poultry: *New Hampshire, Brahma, Koshinshin, Sussex, Leghorn, Amrock, Australorp, Italian, Plymouth Rock, Paduaner, Antwerp, Hamburg, Bantam, Japan Silk, Federfist, Arakuana, Sultan, Italian White geese, Egyptian geese, Hungarian White geese, Beijing duck, Indian Runner, Mandurian, Karoline*

The population trend of exotic breeds is mostly stable, whereas at some breeds it is on the rise, due to increased interest of breeders for breeding of these breeds.

Wild relatives and founders of domestic animals in Republic of Serbia are:

- European wolf (*Canes lupus*)
- Jackal (*Canes aureus*)
- European wild pig (*Sus scrota*)
- Mouflon (*Orvis mission*)
- Chamois (*Rupicapra rupicapra*).

1.4 The State of Knowledge and Information Flow of AnGR

Collection of information on current status of breeds within each animal species is of great importance for food production and agriculture of our country. Main, regional and basic breeding organizations, which carry out of breeding programme register, control and carry out the selection measures during the entire year, and report on status, production parameters and reproductive features of certain breeds which are under control of exotic, as well as locally adapted, are submitted at the end of the year to the Ministry of Agriculture, Forestry and Water Management (MAFWM). Large farms are completely included in this program of selection measures, but covering of small farmers is only partial. Throughout the selection measures, the information on breeding structure and organization of each breed is maintained or monitoring is conducted on the number of effective population size. Disadvantage of this system is that those selection measures does not include all of the animals, but only a selected number of them, because the entire program is financed from the state budget. No sufficient interest of breeders exist yet, to finance the program of selection measures themselves and thus improve the quality of their own animals, but they are dependent on government assistance.

The Republic of Serbia does not have national livestock information system. Data on the number of animals and production parameters of major breeding organizations are submitted to the MAFWM. These data are forwarded directly to European Farm Animal Biodiversity Information System (EFABIS)/Domestic Animal Diversity–Information System (DAD-IS). The agreement was signed on 2013 with European Regional Focal Point (ERFP) on updating of the Global database for AnGR, with obligation of provision of information on annual basis.

The studies of molecular-genetic characterization were made for Podolian cattle, Busha cattle, Balkan donkey, Mangalitsa pig, Morava pig, Chokan and Sombor Tsigai, Krivi vir, Svrljig, Lipa and Pirot Zackel, and from poultry, in this studies were included Banat Naked Neck, Sombor Crested and Svrljig hen. Priorities of the Republic of Serbia on capacity building for molecular-genetic characterization are: providing funds for additional laboratory equipments, staff training and the introduction of a unified information system.

1.5 The State of Utilisation of AnGR

In accordance with principles of international law decrees, states have sovereign right to exploit their own resources following the national policies. Republic of Serbia, through its agencies passes and implements laws, other regulations and general acts. The policy and legislation are supporting the foundation of institutional mechanisms in the Republic

of Serbia, enabling and supporting the sustainable management and conservation of AnGR.

For domestic and foreign markets different breeds were used within each animal species. These breeds vary mainly in quantity and quality of products (for instance, light and heavy lambs, etc.), but also regarding breeding method and purpose for individual breeds. Some markets have demands for beef and lamb meat (regions with predominant Muslim population), whereas in other regions consumption of pork is predominant (rest of the Serbia). However, there is no distinct difference in use of individual breeds, considering the quality of product achieved, although market differentiates products deriving from extensive mountain production systems, rural regions (with traditional production system) to industrial ones. This is in accordance with preferring of locally adapted breed, considering the fact that precisely these breeds are predominant in mentioned production systems, however it cannot be stated that market completely differentiates products originating from different AnGR, but more production systems.

Importance of various livestock products is both economic and social. The most significant livestock products in Republic of Serbia are: milk and dairy products, pork, beef and beef products, poultry meat, eggs, lamb, manure, skin, giblets, manufactured products and wool. Even in relation to economic importance of these products, the order is identical.

In case of dairy products, there are certain specific issues related to demand by dairy industry for certain types of milk, depending is it conventional processing or traditional products. All mentioned above has the effect on forcing of certain breeds in particular regions. Consumption of horse and donkey meat, as well as meat products is becoming increasingly interesting for domestic market, but exclusively in big cities. Also, this demand is associated with population standard. Skin is currently not very attractive product, and use of manure (for crop production, and less mushroom production) is traditional and depends on a degree of preservation of combined farming and age of households and their commitment to agricultural production. Although it would make more sense, mushroom production does not affect the choice of breed nor improvement and increase of horse breeding in regions where it already exists, but on the contrary, mushroom growing production appears where there is already horse production, as a way of using of its by-products. . Value of mare's milk is unknown in our country, therefore there is no interest for this particular product, whereas the use of donkey's milk is getting importance in those areas where it is produced, and as a new brand to promote in public.

Tradition related to use of certain AnGR products exists in pig production. In Kosovo and Metohija and Rashka regions, due to the religious choice, pork is consumed in insignificant quantities, contrary to other regions of the country. When it comes to sheep production, various demands in regard to animal products within the country influence the use of different AnGR in a way that there is a greater demand for lambs of certain breeds (for instance, in general, demand for Tsigai sheep is minor compared to lambs of other breeds, especially mountain breeds). In poultry production there is tradition regarding the use of certain AnGR products. In Vojvodina, geese and duck meat are

traditionally used in nutrition, and in Central Serbia–Jagodina and Pozarevac districts, turkey meat is consumed. Hen meat and eggs are equally used on the entire territory of our country.

The state of use of AnGR and their products is following:

- Cattle (milk and dairy products, meat, products-meat and bone, skin, manure, breeding material-calves, pulling power)
- Buffalo (milk and dairy products, meat, butterfat, pulling power)
- Horse (meat, blood-serums, manure, breeding material-colts, pulling power)
- Donkeys (meat, milk, cheese, cosmetics, liquor, breeding material-colts; labour power)
- Pig (meat, dry meat products, semi durable meat products and durable meat products, skin, manure, bristles, products-meat and bone, breeding material-piglets)
- Sheep (meat, milk, wool, skin, manure, breeding material-lambs)
- Goat (milk, meat, skin, manure, breeding material-kids)
- Hen (eggs, meat, breeding material-eggs and offspring)
- Turkey, duck, goose (meat, breeding material-eggs and offspring)
- Fish (processed fish and products, breeding material–spawn, fry, nuts)
- Bee (honey, honey wax, pollen, propolis, royal jelly, bee poison, breeding material–queen bees and clusters)

Current status of technological development and usage of different technologies according to species is following:

In cattle production, predominant specific technique is artificial insemination (A.I.), embryo transfer is used rarely because it is expensive. Significance of A.I. is great as in other countries engaged in modern livestock production since it enables distribution of positive traits in population (usage of this method has resulted in increased milk yield and improvement of other production traits). Apart from selection measures of cows and heifers, and the control of production capabilities (production of milk and meat), obligatory measures encompass also tests of the studs (performance, biological and progeny test), linear evaluation and grading of cows and bulls on exhibitions in centers for A.I. Test of offspring for milking capacity is performed based on control of productivity of daughters in comparison to those of the same age. In horse production, performance and progeny test are used. In pig production, performance test, evaluation of breeding values gained by the method of selection index and use of A.I. are performed for all mentioned pig breeds used in the intensive production system. In sheep and goat production the following technologies are used: recording of performances and control of productivity, and in poultry production registering of performances is conducted (phenotypic evaluation and evaluation of traits within single flock).

Various breeds and breeding systems are developed in the Republic of Serbia, in order to fully provide for domestic and partially foreign markets. Imported breeds adapted to our housing conditions are primarily used and these breeds are considered as more important. It is expected that different markets and different demands for livestock products in the future would influence genetic development of AnGR, due to certain specific traits and

habits of consumers in certain regions. In the case of cattle production, differences regarding needs and habits of consumers specific to our conditions have influenced differently the development of individual breeds depending on the location. In the areas of high standard and certain placement on the market, for instance of milk, highly productive exotic milk breeds are kept, such as Holstein-Frisian (Vojvodina), whereas in other areas cattle of combined milk-meat type (central Serbia) is preferred. In areas with extensive production of livestock food (passive mountain areas of Kosovo and Metohja and Rashka) Busha and its halfbreeds are bred.

In Preševo, Bujanovac, Novi Pazar, Tutin and Sjenica regions, with predominant population of Islamic origin, there is great demand for sheep and buffalo milk products as well as mutton and lamb meat, so that locally adapted breeds combined properties are favoured. In these regions, there is a great impact of market demand for conservation of AnGR.

1.6 Threats to livestock genetic diversity

The most important actual and potential threats to genetic diversity in livestock of Republic of Serbia are the following:

- Degradation and loss of natural resources
- Import of exotic breeds
- Endangering the locally adapted breeds
- Non-recognition of the importance of preserving AnGR by policy makers
- Inadequate support measures
- Loss of control and monitoring of AnGR
- The weakening of the capacity for in situ and ex situ AnGR conservation programs
- The emergence of infectious diseases
- Lack of markets for products derived from locally adapted breeds
- Insufficient apply of modern scientific and technological achievements in livestock production
- Insufficient economic development

1.7 Status of AnGR

Activities related to management of AnGR are organised and financed by the state, that is, within the MAFWM, which is responsible for development of programmes and action plans for conservation of AnGR, update of national database and development of animal gene bank. It is understood that mentioned programmes could not be realised without adequate co-operation of individual breeders, non-governmental organisations, local communities and stakeholders. Relations between government institutions, various non-governmental organisations, breeders, local communities and stakeholders are good due to existing awareness regarding the importance of preservation of biodiversity and conservation of locally adapted breeds. Existing co-ordination mechanisms do not hinder the use and realisation of set objectives regarding AnGR conservation, however, they don't support them adequately and efficiently as well. However, there is a sort of interaction between public and private organisations in the sense of extension service and

education of farmers, with aim to primarily increase the public awareness of AnGR conservation. Recently, great support was given by the media and public communication services regarding activities of private sector and its increased participation in management of AnGR.

Preservation of AnGR resources is institutionalised, although it highly relies on enthusiasm. Science and experts follow the world trends in this field, however in majority of cases there are no financial means to apply this acquired knowledge. There are initiatives relating to AnGR use coming from certain corresponding governmental institutions (relevant ministries) as well as other factors (research institutions, universities, individual breeders, non-governmental organisations, etc.). Initiatives by governmental institutions are mostly directed towards exotic breeds intended to improve production efficiency of domestic populations, but support for locally adapted breeds is becoming more important. Awareness of possible worthiness of AnGR conservation from the standpoint of its utilisation in the future is growing. However, it has been constantly developing, although not intensively enough, under the influence of government institutions on one hand and private farmers-enthusiasts and local communities on the other.

For now, there are no systematic and continuous activities oriented towards the raising of awareness regarding the role and importance of AnGR and need to preserve them for future use and development, but from time to time scientific symposia and congresses are organised where these issues are discussed in the context of development of livestock production and other fields of rural economy. Raising awareness regarding the significance of AnGR is also carried out by publishing articles in magazines as well as daily newspapers (articles on farms with collections of endangered rare breeds).

Basically, flow of information regarding AnGR is carried out through network of the national agricultural service and university centres. Communication with different subjects participating in the process of conservation is conducted by usual ways of communication. Gathering of data is partially computerised and updating of data bases is carried out annually. In certain regions of our country people engaged in activities regarding conservation programmes are still not very well trained in use of computers and sending e-mail messages, therefore communication is considerably limited. Although there are continuous efforts directed towards the introduction of modern means of communication and in spite of great interest for progress, the process is slowed down due to the lack of financial support for obtaining of personal computers.

Breeds existing in the Republic of Serbia with so far no considerable significant contribution in regard to either nutrition or agriculture are:

Big ruminants: Podolian cattle (status—at risk), Busha cattle (status—at risk) and Buffalo (status—at risk). Reasons for their status are following: economically non-profitable primitive breeds with particularly low production, also the need for their use as working animals no longer exists (combined type for milk–meat–work).

Horses: Domestic-mountain pony (status-at risk) and Nonius (status-at risk). In numerous regions, the single purpose of mentioned horse breeds-pulling and working no longer exists, which caused decrease in interest for breeding of these specific horse breeds. However, certain hilly-mountainous regions attempt to find interest in preservation of Domestic-mountain pony, with the support of the State. Current status in regard to number of heads or expression of interest by broad community have caused the "at risk status" of both breeds.

Donkeys: In many regions practical application of pulling role of donkey disappeared, which led to decrease of interest for breeding of them. As the possibility arose the idea of breeding this breed in protected areas, such as "Zasavica" and production of traditional products (donkey's milk, sausages, cheese, cosmetics-face creams, soaps, liquor, etc.) to valuation and economic viability of holding the breed.

Pigs: Domestic Meat pig, Mangalitsa pig (status at risk), Moravka pig (status-at risk) and Resavka pig (status-at risk). There is not enough interest for raising of above mentioned breeds due to predominant hybrids. Long-term promotion of Mangalitsa pig and its products have led to a growing interest in this breed multiplied, and some products have been found on numerous mega market stores.

Sheep: Vlashko-vitoroga sheep (status-at risk), Lipska sheep (status-at risk), Bardoka (status-at risk), Pirot sheep (status-at risk), Krivi vir sheep (status-at risk), Karakachan sheep (status-at risk) and Chokan Tsigai (status-at risk). 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 rural regions where sheep were raised in extensive production systems. Bardoka as the milkiest domestic breed is endangered due to the migration from Kosovo and Metohija region.

Goats: Domestic Balkan goat (status-at risk). Under the influence of extension services, also media, Alpine and Sanska breed were promoted as more productive, in this way Domestic Balkan goat has lost market, almost everywhere where better conditions for housing and nutrition could be provided.

Poultry: Banat Naked Neck (status-at risk), Sombor Crested (status-at risk), Kosovo Singer (status-at risk), Svrljig hen (status-at risk), (status-at risk), Sombor geese, Domestic turkey. These breeds are present in extremely small number hence their contribution for livestock production and food is not significant, and status of mentioned poultry breeds decreasing, therefore urgent measures must be taken in order to preserve and protect these breeds. In general, there is no economic interest for production of any mentioned breeds, therefore they are raised purely for recreational and cultural reasons.

2. Trends in livestock production

General characteristics and trends in livestock production in Republic of Serbia can be shown as follows. There is a steady decrease in strength of all kinds of domestic animals. According to the agricultural census of 2012 in the Republic of Serbia the following

animals are grown: around 900.000 of cattle, 3.4 million of pigs, 1.7 million of sheep, 230.000 of goats, 16.900 of horses, 25.7 million of chickens, 350.000 of turkeys, 245.000 of ducks, 77.000 of geese and around 244.000 other poultry. Significant negative trend in number of domestic animals, with minor fluctuations, is present in Republic of Serbia in the last 2 to 3 decades. On the other hand, the reduction of number of domestic animals is accompanied by improvement the manifestation of production and reproduction traits, so that the total production of major livestock products increased. However, the consumption of primary livestock products, such as meat or milk, in Serbia is still below the average expenditure of the European Union (EU), primarily due to the poor economic situation and the decline in living standards.

In addition to the negative trend in number, fragmentation of holdings it is still predominantly present, with an average of farm size between 5 and 6 ha. In addition, the absence of functional associations and breeder associations with negotiating potential and capacity further affect the expression of negative trends in livestock production. Finally, due to differences arising under the influence of geography, climate, agro-ecological and zoo technical conditions there are some differences in the intensity of livestock production, as well as the breeds composition between Vojvodina and some parts of central Serbia, especially those which are in the South or South-East of the country.

3. The state of capacities in AnGR management

3.1 The state and implementation of the Global Plan of Action (GPA)

The Republic of Serbia is signatory country of the Convention on Biological Diversity. On November 5th, 2001, this document was ratified in our Parliament. With the act of ratification the state has accepted the obligations deriving from this Convention, with the following main goals: conservation of biological diversity and sustainable use of them, access and fair share of benefit derived from the genetic resources.

By development of the First Report on the State of the World's Animal Genetic Resources, at the First International technical conference for animal genetic resources in Interlaken, GPA for AnGR was adopted, which contains 23 strategic priorities. GPA arose as a result of reporting, analysis and discussion of the member states of the United Nations, at the same conference adopted and Interlaken Declaration, which affirms the obligation of the states in the implementation of the GPA.

In order to support the implementation of the GPA in the Republic of Serbia breeding programs were conducted, as well as selection measures on annual basis, which include most exotic breeds. Although some of the locally adapted breeds are included in this program, there are no official breeding programs for breeding of locally adapted breeds of domestic animals. Within certain species of domestic animals, the following measures for genetic improvement of livestock are being conducted: selection shows of cattle, linear evaluations, productivity recording, recording of dams and sires, performance biological and progeny testing and licensing of stallions. In all exotic breeds, due to implementation of breeding programs, there is a genetic improvement of production,

reproduction and functional traits. On the other hand, at indigenous breeds there is no visible genetic progress, given the fact that, there are no clearly defined breeding programs and objectives. The consequence of this is the appearance of occasional, uncontrolled, crossing of locally adapted with exotic breeds, which is particularly evident in certain regions of country.

The financial resources allocated for the implementation of breeding programs were provided from the national budget. Breeders and breeding organizations were not ready to financially participate in the implementation of these programs because they lack the capacity and financial capability.

The relevant institutions in the Republic of Serbia since 2003 constantly work to identify endangered breeds of domestic animals. Completing the data on locations, population status, trends and characteristics of AnGR is partially completed. Institutional responsibility for monitoring of trends of AnGR was established. Basic and regional selection services register, control and implement selection measures during the year. Information on breeding of every breed is collected and regular exchange of information with EFABIS/DAD-IS established. Officially, there is no database in AnGR independent of DAD-IS.

Many projects related to AnGR were completed: Case Study-“The common base management and use of AnGR in traditional livestock farming systems”, “Sustainable rural development in South-East Serbia”, “*In-situ* conservation of agro-biodiversity”, implementation of multifunctional pilot project for integrated conservation of genetic resources, traditional landscape protection, preservation of traditional grazing practices and valorization of natural rural tourism in protected areas. Analysis of the pilot HNVP areas is done, for the purposes of agri-environmental policy and programming and opportunities for sustainable agriculture and rural development in protected areas.

Herd books for all breeds of economic interest existed even before the adoption of the GPA, as well as breeding programs. After the adoption of the GPA, registers were established for locally adapted breeds. Molecular-genetic characterizations in individual breeds of cattle and sheep were conducted before the adoption of the GPA, whereas it is partially conducted when it comes to pigs.

The development of markets for traditional products derived from locally adapted breeds did not give the satisfactory results, even though we actually had an increase in the number of animals and breeders of locally adapted breeds. The main reason is the low standard of living and low purchasing power. Promotion of products derived from locally adapted breeds and their placement is generally conducted on the initiative of individuals who are the manufacturers of these products, because there are no associations. Serbian umbrella organization "Breeding Association of Old Breeds" was established to assist breeders of locally adapted breeds. Many NGOs are involved in the activities of "*on-farm*" conservation of locally adapted breeds and they had very important role in increasing of public awareness and promotion of conservation. These activities are carried out through media appearances, participation in trade fairs, exhibitions, print brochures, etc.

Measures for preservation of AnGR are defined in the rural development program. Basically *in situ* conservation is conducted, whereas the *ex situ* does not have enough funds for financial support. Financial support (subsidies) for keepers of the locally adapted breeds on annual level, in accordance with the available budget and it led to a positive trend regarding increase of the effective population trends. The greatest progress in terms of number of animals was achieved in Mangalitsa pig whose number increased from 60 heads on 2000 to 3.000 heads on 2013, as a result of the promotion breed and traditional products, imports of breeding boars and increased awareness among breeders about the importance of preserving this breed. With regard to *ex situ* conservation there are stocks of semen two Busha bulls about 5.000 doses. The action is performed on the private initiative of the Centre for Reproduction and A.I. from Velika Plana, but is not financially supported by the state. There are no standardized methods and technologies for *in situ* and *ex situ* conservation. Coordination to the establishment of gene bank is implemented through ERFP working group for *ex situ* conservation.

3.2 Breeding programmes

In order that animal production is successful breeding objective must be clearly defined as well as the method of its implementation. Properly defined breeding objective is of significant importance, because it directly directs which way will it implement a breeding program which affects the achievement of the set goal. Improvement of characteristics that are not of importance for realization of the set goal may potentially have a greater negative effect, than if the goal is not set at all. In order to achieve a single, pre-defined breeding objective, it is necessary to define the correct Breeding strategy with all of the components (e.g. selection criteria, breeding structure, mating plan, economic analysis, etc.).

When it comes to exotic cattle breeds the breeding objective and selection program favours breeding in purebreds. From countries of origin or countries that have similar breeding objectives and programs, occasionally bulls or their semen are imported in order to improve certain traits and group of traits or to refresh heard blood, primarily in dairy production. When it comes to crossing of different breeds, on the first place there are Domestic Spotted Cattle of Simmental type ennobles with Simmental with goal of further improvement of existing features. However, this procedure of melioration and somewhere ennoblement crossing as well, lasts for so long, that we may already talk about the population of domestic Simmental. Certain directions of production require crossing in order to achieve better meat grow or specific meat quality is requested and crossing with fattening breeds is conducted in that manner. On the other hand, locally adapted breeds are not crossed or bred as purebreds.

All locally adapted and exotic breeds of horses are breeding in purebreds. The reason for the application of such method of breeding is specific usage and market value of horse breeds that are grown in Serbia. On the other hand, systematically crossing is applied as well, with the aim of improving of the quality of horses in general population. Crossbreeding is planned, for breed improvement of locally adapted and exotic breeds, in order to obtain high-quality half-bred horses.

In pig population breeding in pure breed and cross breed is applied. Breeding in pure breed is applied to the nucleus herds, as in all those herds where manufacturing of F1 gilts were applied, further round cross or crossing with fleshy or terminal breeds to produce two-breeds and three-breeds crossbreeds intended for fattening. Locally adapted breeds are generally bred in purebreds.

When it comes to sheep and goats the exotic breeds in pure breeds are bred, whereas locally adapted breeds are cross or breeding in purebreds. Breeding in purebreds for locally adapted breeds is applied to all herds which are in programme of AnGR protection, whereas in commercial herds crossbreeding is also applied.

In poultry, breeding strategies for exotic breeds is in purebreds, but such clusters are lesser, as breeders are increasingly opting for breeding hybrid lines. Locally adapted breeds are usually self-sufficient, but unplanned crossbreedings are being conducted.

However, some difficulties may arise in defining and implementing breeding objectives and programs in small and/or confined populations of domestic animals. From the perspective of modern livestock production, small and closed population is mostly associated with those species and/or breeds of domestic animals threatened with a certain risk of genetic erosion of population structure, due to small numbers. In our country, small and often confined population is characterized by certain indigenous strains of sheep (Vlachko-vitorogi, Krivi vir or Lipa strain of Zackel), locally adapted cattle breeds (Busha or Podolian cattle), pigs (Moravka or Mangalitsa), horses (Domestic-mountain pony) and poultry (Svrljig hen), and the species of Domestic buffalo and Balkan donkey.

3.3 Programmes and Conservation Strategies

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", designed a series of measures specific to AnGR, with aim of:

- Stabilizing and increasing the size of the population and prevention of loss of genetic diversity,
- 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,
- Sustainable use of AnGR in traditional agro-ecological systems and fair and equitable 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 programs of AnGR,
- 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.

At this point *in situ* conservation program for cattle is carried out with the aim of further stabilization of the number of population, and to the increase of the number of animals allowed to develop local products. Horse is conducted *in situ* conservation with the aim of stabilizing the number of population and prevention of crossing with other breeds. For donkeys there is still no conservation program, because economic interest for keeping donkeys is very small, but the individual breeders or non-governmental organizations already showed interest in their breeding. For pigs *in situ* conservation program is conducted with the aim of maintaining or stabilizing of existing number of animals. When it comes to sheep and goats *in situ* conservation program is carried out on private farms with the aim of stabilizing or maintaining of the existing number of animals and avoiding of crossing that is widely used in commercial herds, which is also a goal with locally adapted breeds of poultry.

Unfortunately, cryopreservation in the Republic of Serbia currently does not exist in neither breeds, except for individual initiatives that semen of Busha bulls and Podolian cattle are stocked in the regime of low temperatures in the centers for A.I., but those are not planned and systematic actions.

3.4 Reproductive and molecular biotechnology

Reproductive technology procedures applied in the Republic of Serbia are related mainly to cattle, pigs and sheep. A.I. is the most common method of reproductive technologies in cattle production. Although there are no accurate statistics, it is estimated that between 60 and 70 % of the population is artificially inseminated, whereas in the rest of the population natural mating is used. The percentage of A.I. in some parts of country is 100 % and directly linked to the degree of intensity of agricultural production. In addition, the other methods of reproductive technology which applied are induction of oestrus and to a lesser percentage synchronization of oestrus. Embryo-transfer is performed only sporadically and is more of an exception than the rule. However, it should be noted that the methods of reproductive technology are almost exclusively applied with exotic breeds. On the other hand, at locally adapted breeds, these methods are generally not applicable and mating is performed in natural way.

When it comes to pigs, in semi-intensive and intensive production systems, A.I. is very common, preceded by the induction and synchronization of oestrus, whereas in low-intensity systems natural mating is represented. As with cattle, with locally adapted breeds of pigs, these methods generally do not apply, so that the mating are performed in natural way.

When it comes to sheep, the most common methods of reproductive technology are induction and synchronization of oestrus and these procedures are associated with a system of production, or the production of primary products. Thus, in systems where the primary products are lambs for meat production, these methods are widely used, whereas in systems for milk production they are avoided. On the other hand, A.I. in sheep production are almost even not applied.

The methods of molecular biotechnology are used sporadically, so that their use is mainly related to the individual scientific research and they have not been integral parts of the breeding programs so far.

3.5 Legislation and regulation

Creators of the agrarian policy in the former period included almost all the objectives which agriculture of a modern country should have. In the Strategy of agrarian development. The agriculture had priority in the development of the country, development on the principles of the free market has been anticipated, as well as modernisation by usage of modern technical achievements, etc. Among all listed priorities, the development of science in the field of creating of high yielding breeds, as well as the development of animal husbandry as a whole and distinctive export orientation and development of market economy have been included. The measures for meeting of these goals have also been anticipated, and these are permanent macro-programmes, measures of agrarian policy, coordination and management of development, education, improvement of agricultural services. In reality, however, implementation of these goals was really slow, for various reasons.

Economic crisis such as the one at 2010, which ended with mass slaughter of livestock due to price disparities and economic feasibility of investment in livestock production, is only one of the setbacks that AnGR suffered due to the lack of concrete Government actions for preservation of husbandry. Cutting of budget funds for conservation of endangered locally adapted breeds in period of 2011-2012 that followed one of a series of moves which on preservation of AnGR leave serious consequences in terms of reducing the number of effective population size of endangered locally adapted breeds. Most of the activities connected with protection of AnGR in Republic of Serbia have been based for years mainly on a moderate of subsidies for helping breeders of locally adapted breeds and moderate research work on them.

The pricing policy in agriculture had the negative impact on animal husbandry and conservation of AnGR. Those breeds of domestic animals breeding in the intensive systems of production, highly dependent on the food market, suffered the most adverse consequences. ., Problems in animal husbandry were partially successfully compensated by small farmers whose production was based on self-sufficiency of the production system. On the long term, on the field of AnGR cattle breeding was mostly affected, considering the fact that decimated animal resources were the slowest to recover.

Harmonization of numerous laws with EU legislation, the adoption of the National Strategy for Biological Diversity, the Agricultural Strategy of the Republic of Serbia, the Strategy for Scientific and Technological Development, the National Rural Development Programme, the National Programme of Agriculture, the Cartagena Protocol etc., contributed to improved implementation of the GPA to the extent that was possible to this programming period, as well as inputs for sustainable use and conservation of animal genetic resources. In the Republic of Serbia policies and legislations that would support and promote the preservation and use of traditional knowledge and practices related to the use of AnGR have not been established. There is no policy or legislation that supports and promotes the sharing of benefits arising from the usage of AnGR. Nagoya Protocol has not been ratified and more intensive cooperation is expected with the Ministry of Energy, Development and the Environmental Protection on this issue.

The Republic of Serbia has a number of laws that directly or indirectly influence the management of AnGR, namely: Law of Livestock-regulates measures and rules related to animal husbandry and AnGR, Law on Agriculture and Rural Development-regulates agricultural policy objectives and ways of implementation, Law on GMO, Law on Organic Production, Law on Geographical Indications, Law on Environmental Protection, Law on Natural Protection, Law on National Parks, Veterinary Law etc.

There are also agricultural extension services financed from the national budget in order to provide expert advices and conduct trainings of farmers in accordance with the approved five-year program. Work of these services is regulated by the Law of Advisory and Professional Activities in the Field of Agriculture.

4. State of the Art in the management of AnGR

4.1 Analysing of future demands and trends

Livestock production is an important branch for agriculture of the Republic of Serbia. For a large part of the farms it is the main source of income. Since the number of farm animals in the Republic of Serbia has been decreasing, it is expected that next few years will be the years for recovery of the branch. Producers and processors will try to fill gaps with imported animals, although local production could be able to meet most of demands, except for terminal breeds needed for improvement of breeds' composition. On the other hand, the increase of demand for meat will affect the increase in meat production. Importation of exotic genetic material with the rise in living standard, the demand of the population for quality products will rise, which may suppress some locally adapted breeds completely.

The problem of slaughter industry, besides the reduction in the volume of production, is reflected in the unfavourable changes in the structure of production, on the account of more quality products with higher processing phase. Strategic interest of the agriculture of Republic of Serbia is to feed their own population, but also to become competitive (regain competitiveness) on the foreign market. However, often it is not able to meet new

standards and food safety rules, which will cause additional problems in animal husbandry.

In recent years, the percentage of our animal products (milk, meat and other products) for domestic and foreign market has significantly changed due to the decreasing of livestock animals, which had their influence on the reduction of the scale of our domestic production so that our livestock products would not get to the foreign markets. In order to increase placement of domestic products on the foreign markets in greater volume, the opportunity is in production of so called »green products« and products with geographically protected origin (Old Mountain cheese, Sjenica cheese etc.) For now, foreign market does not have particularly important influence on the development of locally adapted breeds in the Republic of Serbia.

The policy of opening of market, lack of investments in the production, as well as market for placement of products which would stimulate mobilisation of internal reserves, may slow down the recovery of animal husbandry and further on threaten the conservation of particularly rare AnGR. Among the constraints for faster improvement of livestock production there are property size, poor organisation of producers, but also technical aspects of production management, such as provision of modern technology etc.

A positive turn of events may be influenced by changes in demand for different kinds of products, towards the expansion of the scale of products according to the world trends. It is primarily reflected in the expansion of scale of pork products, offer of quality of lambs is bigger during the whole year, not only seasonal, due to the fact that system of out-of-season mating in the meat production is used. Also, the supply of sheep and goat cheese is higher and more diverse.

4.2 Alternative approaches and strategies for the management of AnGR

The significance of animal genetic resources within the frames of the new policy of sustainable development must be considered from the aspect of multifunctionality of agriculture as a whole. Among the most important aspects there are possibilities which may emerge from the comprehensive utilisation of animal genetic resources with the aim of valorisation 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 as a whole.. The first objective is integration of animal genetic resources conservation with profitable combined farm systems and non-agricultural activities as part of the integral development of village. The second objective is integration of animal genetic resources conservation concept with modern systems of sustainable agriculture (e.g. organic, biodynamic etc.) which enable valorisation of production systems with low yield and high quality.

Production systems in the regions of limited agricultural production and conservation of AnGR for food production

The agricultural production regions which are marginal today in the Republic of Serbia are mostly abandoned due to the poor soil or rough climate. The interest for revitalisation of food production in these regions still exists. These resources are favourable to the production of quality food, especially if it is subjected to the strict standards of ecological production and production with geographic origin.

Conservation of AnGR serving to conservation of biodiversity

Modern livestock production over the last decades of the twentieth century caused extinction of hundreds of locally adapted breeds in all the countries. Neglect of livestock production in some regions led to dissipation of biodiversity. Therefore, in depopulated mountain regions, for example, grassland communities of high biodiversity value are increasingly endangered because of the absence of grazing which created them changed the conditions for development of species and their competition and survival ability. Preservation and revitalisation of traditional systems, as well as conservation of locally adapted breeds and their wild relatives is possible, first of all, by the revitalisation of combined farming. The combined farming implies active relation between agriculture and para-agriculture, traditional handicrafts and rural tourism, and similar activities which can economically valorise biodiversity targeted for conservation.

Conservation of AnGR and protection of regional diversity

Traditional extensive agricultural production in the last century caused extinction of tens of types of regions considered nowadays very valuable from both ecological and economic standpoint. Rural environment in European countries and worldwide become the setting of attractive human activities and working place for millions of people. Their economic valorization is more and more obvious, and perspectives clearer and better with the increase of public interest for environmental preservation and cultural heritage. Increase of public interest for getting closer to the nature again and awareness of need for its conservation, in many countries has triggered initiatives for conservation of locally adapted species and breeds of animals and their integration into profitable production systems.

Protection and improvement of forests and water management in light of conservation of AnGR for food production

With the aspect of conservation and sustainable use of AnGR underexploited are the possibilities of breeding of wild animals, especially in so called agroforestry systems. Locally adapted breeds of domestic animals as well as wild animals (first of all wild boar, roe deer and fallow deer), which are efficiently raised in forestry ecosystems in combination with animal feed production for their feeding, bring about not only the possibility of conserving genetic resources of these animals but also the economically favourable environment for profit making.

Conservation of AnGR serving to conservation of the environment

The most sensitive relations between agriculture and the environment are seen in the need for extensification of agriculture for conservation of water resources. The intensive agriculture of the twentieth century caused many problems with water pollution than any other activity of humans. Pollution with nitrates and phosphates, eutrophication, emergence of causative agents of some fifty zoonoses in water, pollution with pesticides are increasing the cost of water refining and conservation of water reservoirs, natural and artificial, against filling with suspended particles of soil. Conservation of water resources is an imperative and assumes transformation of agriculture towards sustainability. Extensification and integration of agricultural production is seen as the most important mechanism in this transformation. Locally adapted breeds with genetic potential to resist disease and better utilise the available natural feed resources naturally find their place in such systems with application of appropriate technologies of ecological production which imitate biological cycles and use their knowledge in balancing the necessary production.

Cultural heritage and conservation of AnGR

Traditional combined farm systems and agricultural production based on locally adapted breeds are part of necessity of cultural heritage protection. Integration of conservation of AnGR within such systems enables rational connection of population with their material and immaterial cultural heritage. Formation of ethnic complexes gives this sort of integration recognisable shape which may be easily valorised through rural tourism.

Maintaining of traditional knowledge and technologies in food production

Recently, traditional knowledge and technologies in food production have been realised, as well as in production of clothes and other products of raw materials from agriculture, became very interesting direction of transition from quantity to quality. The trends of changing standards in food production, autochthonous products and traditional technologies from our parts either remained unknown to the broader market. The most tragic loss, however, is not neglecting of some technologies of production, but the loss of adequate raw material base originating from the locally adapted breeds of domestic animals. Therefore, nowadays it is very hard to find the original sheep katchkaval, more and more difficult is to find buffalo butterfat, and completely impossible to weave the original Pirot rug, since Pirot Zackel sheep almost became extinct. Since the autochthonous products—products with traditional production technology and geographical origin are extremely appreciated, there is an excellent opportunity to connect conservation of AnGR with typical production of livestock products.

Conservation of AnGR as a support to diversification of rural economy

For the rural regions as they appear today, agriculture is the only one that is responsible. That is the same environment which creates today additional sources of income and working positions for rural population, through different forms of tourism. The role of agriculture in this sense in the Republic of Serbia is seen in a very simplified way, through input in food. That food is called "healthy" as it is, just because it originates from the rural environment, and the improvement and conservation of the environment in

which it is created is in the second place. The work on dimensioning of agricultural production and modelling of combined farm systems and "part-time farming" with activity in rural tourism strongly emphasizes the problem of choice of species and breeds of animals. Different business solutions showed that the use of locally adapted breeds and traditional farm systems may strongly contribute to modelling of economically efficient and socially desirable systems.

5. Needs and challenges in AnGR management

5.1. National Priorities for Conservation and Utilisation of AnGR

The Republic of Serbia still does not have a National programme for conservation of AnGR. There are some initiatives for developing of such programme, which should define the priorities for conservation and management of AnGR. However, the priorities so far were mainly directed to conservation of those breeds which are the most endangered. The aim is to protect, that is, to conserve the locally adapted breeds, for both social and economic values and future research and education, and responsibility for future generation.

For the Republic of Serbia, the following aspects of AnGR conservation will be specially emphasized:

1. Production systems in the areas of limited agricultural production and conservation of AnGR for food production
2. Conservation of AnGR serving to biodiversity conservation
3. Conservation of AnGR and protection of regional diversity
4. Protection and improvement of management of forestry and waters in the light of food production conservation
5. Conservation of AnGR serving to environment protection
6. Cultural heritage and conservation of AnGR
7. Maintaining the traditional knowledge and technologies in food production
8. Conservation of AnGR as a support to diversification of rural economy

The main priorities which should also become the integral part of the National Programme are:

1. Identification of locally adapted breeds, their wild relatives and their habitats, as well as their potentials in the sense of achieving economic justification of model for conservation in active "*on farm*" conservation systems.
2. Clear definition of the role, utilisation and conservation of AnGR, that is, precise definition of current and future needs of the nation in livestock production from the standpoint of meeting the national requirements in livestock products, as well as conquering of the foreign markets.
 - a. In that sense it is necessary to make sure that securing of national safety in nutrition and production of animal products for export must be in accordance

with the concept of sustainable development, as well securing the support to the rural development.

- b. Planning of sustainable use of breeds should assume the development specific for all breeds and agrosystems which exist in the country, that is. To provide continued and exclusive use of locally adapted breeds, as well as the use of exotic breeds as original ones. This is the consequence of the fact that it is necessary to see the perspective in advance of those species and breeds which are not used in the Republic of Serbia anymore, and probably will be imported, or might be used in the future.
 - c. In that respect, within this priority, it is necessary to permanently advance in work the whole net which takes care of livestock production development in the country, in order to provide through initiation of the research work timely and quality information on the species and breeds which may be prosperous in the appropriate conditions and assist the producers in a way to prevent mistakes which were common in previous period.
 - d. For survival of locally adapted breeds and species of domestic animals it is necessary to develop markets of traditional products, ethno, agro and rural tourism, in order to enable creation of added value, which would compensate for the losses due to extensivity.
3. Enhancement of capacities of communication and information systems
 - a. In the first place it is the formation of unique information system and constantly updating of central database.
 - b. Future development of interactive network of non-governmental and governmental organisations, which would be capable of timely forwarding and receiving information on the state of the endangered breeds by holders and local communities.
 - c. Introduction of technically perfected methods of coordination of on-site work on AnGR conservation with establishing of the interactive horizontal communication between the holders for timely reaction to emergency situations.
 4. Establishment of permanent programmes for monitoring farm AnGR and their wild relatives, which have agricultural, economic, cultural or scientific value. The monitoring programmes should be made so as to provide feedback to farmers and the rest involved in AnGR conservation.
 5. Training of personnel, especially when it is about the new technologies applied in conservation. The institutions in the country with real capacities to provide training in AnGR conservation should be identified. These institutions would include all the relevant faculties and research institutions, as well as the network of the non-governmental organisations engaged in this business.
 6. Development of permanent and functional relationship with the public. Through means of public communications, providing appropriate publications, as well as through public affirmation of scientific and professional papers etc., the public would

be continually acquainted with the requirements and significance of conservation of the endangered AnGR and the need for their conservation. The need for protection of AnGR should be also taken through affirmation of the maintaining of traditional knowledge and cultural heritage as a whole, by enabling campaigns of culturological type not primarily directed towards the very AnGR to contain this component whenever possible. Communication with public should develop through affirmation of AnGR through production with protected geographic origin and similar productions in which, e.g. locally adapted breeds have significant place. Development of movement for conserving of tradition should be efficiently connected with ecological movements, insisting on the significance of introducing young people into the activities of protection and promotion.

7. Development of legislation and regulations. Throughout the appropriate ministries, it is necessary to point out the significance of coordination of domestic legislation and regulations with international regulations. When passing the relevant laws and regulations which are missing, it is necessary to use the experience of the developed countries.
8. The increase of the level of international communication. Particularly importance is given to making network of holders of common transboundary breeds in the region and exchange of genetic material and information on production parameters.
9. Increasing the initiative for AnGR to be accepted by economic policy as a development factor.

6. How the Second National Report on AnGR was prepared

On the invitation of the Food and Agriculture Organization of the United Nations (FAO) for our country to participate in preparing of a Second Report on the State of AnGR, the MAFWM accepted to take all of the activities in preparing of this report. Network of domestic institutions was involved, since they had significant role in management of AnGR so far. Their role was to deliver information related to AnGR, according to the instructions obtained from the MAFWM. Also, the working group was established and given mandate to finalize the preparation of this report.

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