

The State of Farm Animal Genetic Resources in the Slovak Republic

**National Consultative Committee for the Use and Conservation of Farm
Animal Genetic Resources**

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Introducing the Country – Characteristics of the Slovak Republic and its agricultural sector

The Slovak Republic was founded on January 1st, 1993 as one of the successor states of the former Czech and Slovak Federal Republic. The political system of the country is a parliamentary democracy with a president being its highest representative.

Slovakia is situated in Central Europe, bordering on five states – Austria, Hungary, Ukraine, Poland and the Czech Republic. The geographic location is determined by latitude 48° and 49° North and longitude 17° and 22° East.

With an area of 49035 km² and 5.4 million inhabitants (2000) Slovakia belongs to the countries with a lower population density (110 people per km²), the trend of population development being a stagnating one. Except of southern Slovakia where lowlands prevail, the surface of the country is mainly mountainous and sub-mountainous with relatively high differences in altitude (from 95 to 2655 m). Slovakia lies in the northern mild zone characterized by continental climatic conditions with transitory oceanic influences.

The different natural conditions of the individual regions find their expression in the different conditions for plant and animal production. There are intensive lowland regions as well as extensive mountainous and sub-mountainous regions in Slovakia. In the lowland regions farms with combined plant and animal production prevail. On the contrary, farmers in regions with a lower proportion of arable land (mountainous and sub-mountainous regions) mainly deal with cattle, sheep or goat breeding. Since the rural regions of Slovakia are afflicted with high unemployment rates, a return to self-supplying poultry, sheep, goat, pig and rabbit husbandry has become evident.

In Slovakia there are 2442 ths. ha of land used for agricultural purposes. Arable land covers 1461 ths. ha. Permanent crops cover 125 ths. ha, meadows and pastures cover 856 ths. ha. Proportion of arable land is approximately 60 %.

The share of agricultural production in the gross national product decreased from 8 % in the period before 1989 to 4.8 % in 1999, and even 4.2 % in 2001. Animal production provides for 53 – 55 % of the overall agricultural production.

The decrease in agricultural production was reflected in a decrease of employment. According to official statistical data employment in agriculture decreased from 12 % in 1990 to 4 % in 1999. In 2000 there were about 116 ths. people active in agriculture.

The structural census of farms carried out in 2001 revealed the total number of farms to be 70 ths. (including non-registered farmers) with the average acreage being 30 ha of agricultural land. Of the total, 1830 farms owned no cultivated land. The number of entrepreneurs (individual full-time farmers, private, governmental and communal companies) reached 7 ths.

With respect to education, the rates were as follows: people with elementary education (20 %), secondary education without leaving examination (51.5 %) and secondary education with leaving examination (24.5 %). University-educated people present 4 % of the total number of employees.

In the following tables (tables 1 and 2) a brief survey is given of the numbers of farm animal species as well as of the production and consumption of main animal commodities.

Table 1: Most important farm animal species in figures (official statistical data)

Species	1990	2000
Cattle	1563 ths. heads	650 ths. heads
Sheep	600 ths. heads	348 ths. heads
Pigs	2591 ths. heads	1500 ths. heads
Poultry	16478 ths. heads	13000 ths. heads
Horses	14 ths. heads	9.5 ths. heads

Table 2: Production and consumption of animal commodities

Category	Production (2000)	Consumption per capita and year (2000)
Pigs/pork	241013 t l.w.	32.1 kg
Cattle/beef	81992 t l.w.	9.1 kg
Sheep/mutton and lamb meat	3109 t l.w.	0.2 kg
Poultry/Poultry meat	111461 t l.w.	17.1 kg
Cow milk	1067500 ths. l	161 kg
Sheep milk /sheep cheese	10183 ths. l	0.12 kg
Eggs	1095000 ths. pcs.	211 pcs.

1. State of farm animal genetic resources

1.1 Production systems and biodiversity

Cattle sector

In Slovakia the consumption of milk and beef products has greatly decreased in comparison to the end of the 80ies of the 20th century. Since this decrease was caused by a non-adequate loss of the buying power of the population, it cannot be understood only as a result of natural regulation of the production by real demand under real market conditions. Although decreasing in numbers, the population of cattle is of great interest with respect to the food needs of people as well as its landscape influence. Without adequate number of cattle (and sheep as well) the grassland available in Slovakia (1/3 of agricultural area) cannot provide for the subsistence of people.

Since 1989 the numbers of cattle have tended to decrease. In 1989 there were 1603 ths. heads of cattle (of which 559 ths. were cows). In comparison, 665 ths. heads of cattle were counted in 1999 whereas in 2000 and 2001 the respective numbers slightly decreased to 650 and 645 ths. (630 ths. according to the farm census of 2001) of which approximately 200 ths. were cows. On the other hand, milk production tended to increase i.e. from 3537 l in 1990 to 4101 l, 4336 l, 4653 l and 4909 l in 1999, 2000, 2001 and 2002. This increased yield has been both a result of the breeding work and the improved production conditions.

The highest proportion of animals belongs to crosses of the Slovak Spotted and Slovak Pinzgau cattle with the Holstein breed. Of purebred animals the Slovak Spotted cattle presents the most widespread breed. In the purebred form about 50 ths. cows are being bred followed by the Holstein (35 ths. cows) and the Slovak Pinzgau cattle (5 ths. cows). Mainly with the Slovak Pinzgau breed a drastic decrease in the number of purebred animals can be observed. Of beef breeds high-performing breeds are kept (Charolais, Hereford, Blonde d'Aquitaine etc.). These have been imported for the last 10-12 years. The tradition of breeding beef breeds was not developed before 1989. The number of suckler cows was 31 ths. (2001).

After 1989 the yearly consumption of milk and milk products decreased from 253.2 kg to 163.3 kg in 1999. Another decrease occurred in 2000 when the consumption of milk and milk products was as low as 160.2 kg.

A similar trend could be observed in the consumption of beef which decreased from 22.7 kg in 1989 to 7 kg in 2001.

Sheep sector

Before 1989 wool production was the main commodity in sheep. After that date, as a consequence of transformation and a decrease of the market price of wool,

sheep milk and meat production became essential. Lamb meat belongs to those commodities that can be capitalized not only on the European but on the world market as well. In the export of lambs Slovakia does not fulfil the European Union quotas in spite of the fact that lambs present a commodity that might decrease the negative foreign trade balance of the Slovak Republic. With respect to the non-production aspects sheep grazing permanent grassland play an irreplaceable role in landscape formation.

Between 1990 and 1999 the numbers of sheep in Slovakia decreased from 600 ths. to 340 ths. i.e. by 260 ths. heads, which is 43 %. The counts of ewes decreased from 355.5 ths. to 208.1 ths. heads (decrease by 41 %). Since 1999 a reverse tendency could be seen; in comparison to 1998 a slight increase of counts was recorded (+4.4 %) with the number of ewes increasing in a more pronounced way (+8.1 %). This trend accompanied by a slight improvement of the production and reproduction traits in sheep has been the result of increased care and mainly of economic measures (direct payments per ewe in flocks of more than 20 heads).

The economically most important sheep breeds are autochthonous ones - the Improved Valachian and Tsigai which are widely used for meat and milk production. Another local breed is the Merino which is bred to a considerably lower extent. As supplementary breeds the Lacaune, East Frisian, Oxford Down, Charolais and other specialized meat and milk breeds can be met with. Special attention should be paid to the preservation of the original Valachian breed (currently there is only one herd in Slovakia counting approximately 40 heads).

Goat sector

Goat breeding is a marginal branch of animal production. Most animals can be found in the hands of small keepers (there are only 10 larger flocks in Slovakia) mainly under more difficult agro-ecological conditions i.e. in the poorer sub-mountainous and mountainous regions. The population of Slovakia does not show demand for goat meat, milk and the respective products. This is mainly connected with the cooking habits, the low offer as well as the high price. In Slovakia local breeds are bred like the White Shorthaired and Brown Shorthaired. The latter, however, has merged with the population of the Alpine goat.

Pig sector

Pig breeding is the second most important branch of animal production (after cattle breeding) in the Slovak Republic in spite of the fact that the pork consumption per inhabitant decreased from 44.5 kg (1989) to 30.7 kg (2001). After 1989 transformation resulted in a decrease of pig numbers as well. In 1990 there were altogether 2.5 mil. pigs in Slovakia (of which 180 ths. were sows), by 2001 the stocks diminished to 1.5 mil. (of which 130 ths. were sows).

The breeding basis of pigs in Slovakia consists of productive indigenous as well as imported breeds that comply with the criteria for generating high-yielding

slaughter hybrids. The basic method used is purebred breeding aimed at utilization of productive dam and sire breeds producing pigs in multiplier herds and final hybrids in production herds.

Poultry sector

In consequence of the favourable price relations both production and consumption of poultry meat, mainly slaughter chicken and hens, has been increasing. On the other hand, a decrease has been recorded in the sale of slaughter turkeys and ducks. In 2001 the yearly consumption of poultry meat was 18.4 kg per capita (in 1993 poultry meat consumption was only 11.8 kg per capita). Both production and consumption of poultry meat are supposed to increase in the years to come, but not in a rapid way. In 2001 the consumption of eggs has remained on the level of the previous year i.e. 211 eggs per capita.

Under large-scale conditions meat hybrids are bred in Slovakia (broiler chicken, turkeys and ducks). Small keepers deal with purebred breeds and varieties (mainly as a hobby). Their activities aimed at conservation of genetic diversity and improvement of exterior characteristics and production traits are done under the guidance of the Slovak Association of Breeders.

Horse sector

In Slovakia horses are mainly used for riding; the draught power of horses is used to a lower extent. Recently increased interest has been observed in breeding traditional horse breeds like the Lipitsa, Furioso, Nonius and Hucul.

Since 1989 horse numbers have revealed a decreasing tendency – from 13.5 ths. in 1989 to 9 – 9.5 ths. in 2000. In 2001 a slight increase was stated in the number of breeding mares, thus also in the number of foals born (652 and 735 in 2001 and 2002, respectively).

The Slovak Warmblood and the Shagya-Arabian are the most numerous breeds. With regard to the conservation of historically important horse breeds the Furioso breed should be given special care. Slovakia owns the highest quality herd of the Furioso breeding mares in Europe. Less numerous breeds like the Noric of Murany and Slovak Sport Pony have been preserved as well. The Noric of Murany counts 120 heads, the Slovak Sport Pony 160 heads. With view to the low numbers of animals both the Noric of Murany and the Slovak Sport Pony seem to be endangered.

Rabbit and fur animal sector

In Slovakia both the Slovak Association of Breeders and its Central Commission for Rabbit and Fur Animal Breeding coordinate breeding activities related to purebred rabbits and fur animals. Purebred rabbits are bred in a semi-intensive or even extensive manner (wooden rabbit-hutches, feeding mainly with roughage). For rabbits, a book of breed standard patterns has been compiled on the basis of

which purebred animals are evaluated. Since the beginning of the 80ies broiler rabbit breeding has developed on the basis of breeds of medium live weight. In the early 90ies it became an independent branch of animal production, now producing 250 ths. broilers yearly. The coordination is carried out by the Association of Broiler Rabbit Breeders.

Breeding fur animals is usually provided for under small-scale conditions (nutria, foxes) and partly on farms (mink, chinchilla). From the economic point of view this is a marginal branch of animal production.

In Slovakia the following autochthonous, locally adapted and imported breeds of farm animal species are used:

Table 3: Survey of breeds and species bred in Slovakia

Species	Autochthonous and locally adapted breeds	Newly imported breeds	Adapted imported breeds
Dairy and dual purpose cattle	Slovak Spotted Slovak Pinzgau	Swiss Brown	Holstein
Beef cattle		Charolais, Hereford Simmental Aberdeen Angus Piemontese Limousine Blonde d'Aquitaine	
Sheep	Improved Valachian Tsigai Merino Valachian	Lacaune Charolais Oxford Down Bergschaf	East-Frisian Sheep Suffolk Romanov Sheep Ile de France Berichonne du Cher
Goats	White Shorthaired Brown Shorthaired	Alpine Goat	
Pigs	White Improved White Meat Slovak Meat Black Spotted		Duroc, Hampshire Yorkshire, Pietrain Belgian Landrace
Horses	Thoroughbred Arabian Slovak Warmblood Hucul, Furioso Nonius, Lipitsa Slovak Sport Pony Shagya-Arabian		Czech Warmblood Hafling Hanover Horse Quarter Horse Holstein Horse

	Noric of Murany English Thoroughbred		
Hens	Oravka Hen Plymouth Rock Rhode Island Red New Hampshire Leghorn White Leghorn Brown Sussex White (Slovgal)		Braekel, Naked Neck, Minorca, Amrox, Australorp, Barnevelder, Velsummer, Vyandotte, Brahma, Faverolle, Cochin, Cornish, Orpington, Old English Game, Belgian Game, Malay Game, Shamoo Game, Phoenix, Hamburgh Black Spangled, Holland, Paduan Fowl, Sumatra, Antwerp Belgian, Bantam, Silkie, Milfleur Hen, Sebright, Shaboo
Japanese Quail	(British Range, English White, Tuxedo, Manchurian Golden)		
Ducks	Pekin White Muscovy Duck		Indian Runner Rouen Duck Khaki Campbell
Geese	Slovak White Goose Suchovy Goose Landaisse Goose Pommern Goose		Czech Goose Italian (Roman) Goose
Turkeys	Bronze Turkey		Large White Turkey Large Bronze Turkey

Rabbits	Little Chinchilla Big Chinchilla California Rabbit Nitra Rabbit New Zealand White Slovak Greyblue Rex White of Vienna Black of Vienna Grey of Vienna Blue of Vienna Zemplin Rabbit Angora Rabbit	Belgian Giant, Belgian Giant Albino, Burgundian, Czech Albino, Czech Solver, French Lop, French Silver, Havanna, Hermelin, Dutch Rabbit, Blue of Holitz, White of Hotot, Japanese, Kastorex, Marten, Big Marten, Fox Rabbit, Dwarf Rabbit, Rabbit of Marbourg, Mecklenburg Spotted, New Zealand Red, Tan Rabbit, Russian, Lynx Rabbit, Satin Rabbit, Siamese, Three Colour Spotted Rabbit, Big Light Silver, Hare Rabbit, English Spot, Rabbit of White Guard Hairs, Czech Red, Deilenaar, Thuringian, Lop of Meissen
Fur animals	Red Fox Platinum Fox Silver Fox American Black Mink American Wild Mink American Pastel Mink American Brown Mink Standard Nutria Groenland Nutria Black Nutria	Longtailed Chinchilla

1.2 State of conservation of farm animal biological diversity

The state administration promotes the conservation of the biological diversity of farm animals by passing and sticking to legislative measures the most important of which is Act No. 194 of 1998 on Farm animal breeding. This act specifies the rights and duties of authorized organizations and certified breeders' associations to carry out their professional activities connected with animal breeding (performance testing, evaluating the animals, breeding value estimations, running artificial insemination, embryo transfers etc.).

An amendment of this Act has been submitted for approval in which an independent paragraph „Genetic resources of diminishing and low-count breeds” is included. This paragraph indicates the ways of conservation of animal genetic resources in the form of purebred herds, frozen semen, oocytes and embryos. Detailed instructions on how to deal with autochthonous and endangered breeds from the viewpoint of their preservation will be specified through the respective regulation that is under preparation.

Decisions on the inclusion of low-count or diminishing autochthonous farm animal breeds into programmes aimed at the conservation of genetic resources are taken by the Ministry of Agriculture of the Slovak Republic in co-operation with the breeders' associations. The former also decides on the amount of subsidies granted.

The autochthonous and possibly endangered breeds and species under state incentives are as follows: the Slovak Spotted and Slovak Pinzgau cattle, the Valachian sheep, the Hucul, Lipitsa, Furioso, Nonius, Shagya-Arabian, Noric of Murany and Slovak Sport Pony horse breeds. Since January 2003 state subsidies have covered other sheep, hen and quail breeds like the Improved Valachian and Tsigai sheep, Oravka hens, Japanese quails as well as breeding animals of geese.

With respect to small number of population further breeds are endangered. Of the Slovak White goose 200 females and 100 males are available, of the Suchovy goose 150 females and 75 males are available, of the Slovak Black Spotted pig 68 females are available, of the Nitra rabbit 320 females and 80 males are available, of the Zemplin rabbit 80 females and 20 males are available and of the Slovak Grayblue Rex 40 females and 10 males are available.

1.3 State of utilization of genetic resources

Pursuant to Act No. 194 of 1998 and the Regulation of the Ministry of Agriculture of 2000 on Performance testing, heredity testing, health testing, exterior evaluation of farm animals, establishment and management of herd book, breed registry, record-keeping and verification of the origin of farm animals, the following traits are monitored in charge of performance testing in farm animal species.

In cattle, monitoring is carried out of traits such as milk production traits (milk production, production and content of fat and protein, especially in dairy and dual purpose cattle), beef production and carcass traits (beef cattle), growth traits (weight of calves and young cattle, daily gain etc.) and other traits like milkability, persistence of lactation, number of somatic cells in milk, length of production period, parturition course, ratio of still-born calves or exterior traits. These data present a basis for genetic evaluation and breeding value estimation (for individual traits or aggregate selection indices) using modern genetic and statistical analyses and taking into account all accessible information on the animals.

In pigs, performance testing includes reproduction traits, field and station test, fattening and slaughter value or meat quality traits. The data are used for genetic

evaluation and breeding value estimation on which selection of breeding animals is based.

Performance testing in sheep includes fertility traits, lamb growth intensity and milk production traits. In meat sheep, fattening and slaughter value are tested. At present genetic evaluation of sheep using animal model is being developed. Genetic evaluation of milk performance (animal model – test day model) is being introduced into routine. Genetic evaluation of other traits is under preparation. Goat performance testing includes reproduction and milk production traits.

Performance testing of horses includes performance testing of stallions in the test period in the certified testing facilities or special performance testing of stallions those had not passed tests in the certified testing facilities, performance testing of mares prepared for breeding, performance testing of the English Thoroughbred and trotters in sport riding.

Poultry is evaluated on the basis of the origin of the ancestors, the breed and utility type, constitution and exterior as well as the egg-laying capacity.

There are approximately 15 % of sows, 29 % of ewes and 84 % of dairy cows under performance testing in Slovakia.

The summarized results of performance testing of farm animal species are published at least once a year or in pre-determined intervals. For cattle, pigs, sheep, horses and poultry breeds herd-books are kept in which sires and dams are recorded. In addition to that the animals are centrally registered in special state registries (for sires the registries are running, for dams they are under preparation). Animal identification and labelling is carried out by standard methods according to Act Nr. 488 of 2002 on Veterinary Care.

In cattle, sheep, horses, hens, geese and quails (only few breeds) the molecular genetic methods are used to characterize the genetic variability and to study inter-breed distances.

1.4 Critical areas and reserves

With most farm animal species the use of highly productive breeds and hybrids prevails in animal production in Slovakia. A decreasing tendency in the numbers of animals is observed in the indigenous and locally adapted breeds. The main reason for this is the lower production of local breeds accompanied by the lower ability of effective adaptation to economic pressures. Without any supporting means of breeders' associations and mainly state incentives the existence of these breeds would be endangered. Of the other risk factors affecting the state of farm

animal genetic resources under in situ conditions it is mainly the lack of sufficient direct capital resources that is of great importance.

In most cases the practical use of biotechnologies is aimed at the economically important farm animal species (cattle, pigs), partly also at poultry and sheep. From the viewpoint of the Slovak Republic it was very important that since 1993 (founding of the state) the respective structures had to be built up de novo. This was caused by the fact that not only information sources but also central laboratories, stations and institutions with a federal scope of action were concentrated on the territory of the Czech Republic. For instance, the whole gene bank and the resources for evaluating blood groups and protein polymorphism in horses and sheep were located there.

The above facts show the limitations in the genetic definition of the sources of farm animal biodiversity and populations in Slovakia. With all kinds of animal genetic resources the reserves can still be found in the direct application of biotechnologies (reproduction biotechnologies, sexual cells, DNA storage). Modern biotechnological procedures are used mainly in the field of research whereas their application in practice is insufficient and needs to be expanded.

2. Changes in requirements for the national animal production strategy and programme

2.1 Overview of past policies, strategies and programmes for the utilization of genetic resources

Historically the farm animal genetic resources of Slovakia were connected with the Hungarian, Austrian and Czech breeding culture (from the 19th century to the 30ies of the 20th century). In this period the system of localizing farm animal species in relation to the geography of the area had already been applied in Slovakia: in mountainous regions mountainous breeds, in lowland regions lowland breeds were kept. In 1894 the first regulations on the conservation of biodiversity were introduced by the Act on Agriculture and the field police. As to cattle breeding, the Act established two breeding areas, defining the breeding area of the Red Spotted cattle (the Simmental, Pinzgau, Bern, Bonyhady and their crossbreds) and of the Hungarian Grey Cattle.

The trends proved to be similar with other farm animal species. In all of them, multipurpose production was of great concern (meat–milk–wool–draught power). There was no selection aiming at the improvement of specialized dominant performance traits.

Gradually the process of breed specialization has been developed in all farm animal species. Imports of high-performing foreign breeds (dairy breeds of cattle, meat breeds of pigs, poultry hybrids) started in the 50ies of the 20th century and have continued to the present days.

In the period between 1960 and 1989 foreign breed imports were continued in order to increase production in accordance with the policy of food self-sufficiency; this resulted in a farm economization and a reduced biodiversity in all animal species. Since 1989 global process like holsteinization i.e. upgrading of local cattle breeds with the Holstein, the use of poultry and pig hybrids as well as the collapse on European wool market have greatly contributed to a decline of the biodiversity in Slovakia. Breeding small farm animals on a small-scale basis (poultry, rabbits and other so-called hobby species) is the only area that has resisted these pressures.

The situation is extremely critical in horse breeding and concerns not so much the reduction in number but mainly the rapid decrease of breeds like the Nonius and Furioso. The Black Spotted breed of pigs has principally ceased to exist as well.

2.2 Impact of changes on the utilization and conservation of genetic resources

Currently the conservation of the actual state of biodiversity seems to be difficult, mainly due to a drastic globalization of the market as well as the ambitions of the Slovak Republic to join the European Union and the availability of state subsidies for animal genetic resources. The product quota system, direct and indirect incentives for the development and stabilization of agricultural branches are the main determinants. Economic pressure upon production not only restricts but also gradually eliminates the breeding both indigenous farm animal breeds and those introduced in the past but adapted to the local conditions.

The economy of the production of animal commodities without respect to differences in the geographic and climatic conditions and tradition incurs changes in the composition of the species and breeds kept. Future market requirements, the negotiated quotas and support of certain species and breeds, the extent to which the Slovakian market will open itself to foreign production, the export possibilities of the country as well as the cooking habits of its inhabitants will largely influence the structure of species and breeds. Mainly those products can be expected to survive against competitors on the European market that are not abundant (e.g. lamb meat). Thanks to the harmonization of the legal acts of Slovakia with European legislation local production will fulfil the requirements of the European market as soon as on Slovakia accession to the EU. Survival on the European market will require high-quality meat production of different breed origin (in cattle as well as in sheep) and a different breeding technology (mainly certified biological products).

2.3 Future plans for conservation and utilization of genetic resources

Currently the existence, conservation and use of animal genetic resources are impossible without public financial aid. The activities of the scientific and research base of the Ministry of Agriculture of the Slovak Republic (Research Institute for Animal Production in Nitra) are of great importance. Public financial support is aimed to solve tasks connected with conservation of the biodiversity, designing a computer database, genetic analyses of biological and genetic diversity as well as conservation of specific populations under in situ.

In co-operation with breeders' associations (Association of Breeders of Slovak Spotted Cattle, Association of Breeders of Slovak Pinzgau Cattle, Association of Horse Breeders and Association of Sheep Breeders) so-called protected herds of these species have been introduced. They present in situ conservation. It is very important to underline that present as well as future existence of protected herds are in dependence on the support given from the state.

The cryobank (within the programme of biodiversity preservation) conserves available semen and embryos of cattle and horse breeds. The aim is to extend the supplies of sex cells and embryos also of other farm animals. Cryoconservation and storage of semen and embryos presents the basis of animal genetic resources under ex situ conditions.

It is obvious that in future special attention should be paid to establishing a gene bank of tissues, blood derivatives and DNA samples of farm animal genetic resources.

Special education and training of specialists at secondary schools and universities as well as explaining the importance of conserving the biodiversity of farm animal conservation from the viewpoint of its cultural, production and landscape value to the wide public seem to be of extreme importance.

3. State of national capacities and demand for building them

3.1 Legislation and state support

In the preceding chapters some legislation has already been mentioned – on the level of Acts and Regulations concerning the questions of animal breeding and veterinary care. In accordance with international standards these Acts and Regulations define the basic terms of animal breeding and protection, the rules of animal rearing and performance testing aimed at an improvement of the competitiveness of animal production through genetic improvement of farm animal populations and improvement of the breeding environment. Under the conditions of the Slovak Republic mainly the following legal standards are meant: Act No. 194 of 1998 on Farm Animal Breeding, Act No. 488 of 2002 on Veterinary Care, Act No. 115 of 1995 on Protection of Animals, and the Regulations of the Ministry of Agriculture of the Slovak Republic of 1998, 2000 and 2002 on Breeding, protection and identification of farm animals and management of the Central Registry, health and heredity testing, exterior evaluation of farm animals, implementation and management of the herd-books, implementation and management of the Breed Registry, keeping imposed records and verification of the origin of farm animals.

Currently the Directive of the Ministry of Agriculture of the Slovak Republic has been prepared on the support of agriculture in the forthcoming period. One chapter is devoted to the support of maintenance and improvement of the genetic potential in farm animals. According to this chapter, subsidies may be provided for the conservation of endangered species and breeds of farm animals that had been bred on the territory of Slovakia for a long time, for the purchase of breeding animals, implementation and keeping of herd-books, support to animal breeding activities or production surveys of farm animals. Of cattle, subsidies may be granted to the Slovak Pinzgau breed (up to 3,500 SK per cow, SK=Slovak crowns) and the Slovak Spotted breed (up to 3,000 SK per cow). Of sheep breeds the following may receive support: the Tsigai, Improved Valachian and native Valachian (up to 1,000 SK per ewe) whereas of horse breeds, subsidies are granted to the Hucul, Lipitsa, Shagya-Arabian, Noric of Murany and Slovak Sport Pony breeds (up to 40,000 SK per mare), the Nonius and Furioso horses (up to 20,000 SK per breeding mare recorded in herd-book). Subsidies may be given for the breeding geese (up to 90 SK) as well as the breeding females of Oravka hen and quails (60 SK per female). Such support is mainly related to animals in protected herds. As to the Slovak Spotted and the Slovak Pinzgau breed subsidies are granted for approximately 3 and 2 ths. cows, respectively. As to the Valachian, Improved Valachian and Tsigai breed of sheep support is given for 40, 4 ths. and 3 ths. ewes. Subsidies are also granted to 240 mares of the abovementioned horse breeds as follows: Shagya-Arabian 40, Hucul 25, Furioso 45, Nonius 25, Lipitsa 40, Slovak Sport Pony 25, Noric of Murany 40 mares. With poultry support is related to 500 birds.

3.2 State of national capacities

For several decades the development of the individual farm animal species has taken place by means of breeding and hybridization programmes presenting the long-term process of farm animal breeding. In these programmes stress is laid on estimation of the breeding value of animals which is estimated on the basis of production and reproduction traits involved in performance testing. The organizational and performance basis of farm animal breeding has undergone fundamental transformation with respect to the right of ownership and the deetatization of most activities covered by Act No. 194 of 1998 on Farm Animal Breeding.

This Act defines the rights and duties of licensed persons and authorized breeding institutions. On the basis of this act the Ministry of Agriculture issues breeding licences to natural or juridical persons complying with the conditions of the Act. Similarly the Ministry issues licences to breeding organizations those thus gain the status of an „authorized breeding organization“. The Act also characterizes the principles of activities of breeders' associations, states the volume and tasks of care for the development of animal breeding. It defines the principles of breeding in populations and herds, the conditions of improvement and breeding, the principles of keeping herd registry and herd-books. A considerable part of the Act is devoted to performance testing as well as health and heredity testing. It states the principles of insemination in farm animals and those of operation of insemination stations, obtaining, processing and storage of insemination doses, embryos and ova as well as the principles of the purchase and sale of biological material (breeding animals, embryos, oocytes, semen, hatching eggs). This Act also defines the methods of running and maintaining databases, exchange of information and the respective duties.

Breeding organizations that are responsible for breeding programmes must have educated staff and possess the required technical equipment. Breeding procedures are carried out with respect to the available knowledge, reproduction techniques and equipment.

The paragraphs concerning care for animal breeding deal with the protection of endangered populations and making farm animal gene reserves available. Gene reserves are defined as male and female live animals, sexual cells and embryos of endangered species, types and lines that need to be preserved.

Several institutions are involved in the programme of conservation and utilization of farm animal genetic resources. From the administrative and legislative point of view the programme is run under the guidance of the Ministry of Agriculture. The Breeding Inspection of the Slovak Republic is authorized to supervise breeding activities in Slovakia. The National Consultative Committee for the Use and

Conservation of Farm Animal Genetic Resources was established at the Research Institute for Animal Production in Nitra. In addition to this the RIAP performs intensive work in the field of biotechnologies, molecular genetics and the genetics of quantitative traits. These activities are run in close co-operation with the Slovak Agricultural University in Nitra, the State Breeding Institute in Bratislava, the University of Veterinary Medicine in Košice and the institutes of the Slovak Academy of Sciences.

Management of farm animal genetic resources requires special preparation and qualification of agricultural professionals acting on different management levels as well as of the staff of breeders' associations and other institutions authorized in the field of animal breeding.

A two-level system of education is being prepared and will be run both as distant education using modern communication technologies and as a standard scheme. Some parts of the system are already in operation.

Education will focus on an outline of terms covering the area of management activities in farm animal genetic resources, the determination of criteria for evaluating and monitoring endangered populations, conservation methods and the design of an overall strategy of the development of endangered species. Provision of legal standards as well as of digital text and photographic documentation of the respective breeds will be one of the components of the information system.

4. Setting national priorities

4.1 Sustainability, utilization and conservation of genetic resources

The national strategy and priorities in the field of conservation and utilization of farm animal genetic resources in the Slovak Republic are identified as follows:

- Maintaining and conserving the existing state of genetic biodiversity in farm animal genetic resources and preventing biodiversity loss of farm animal breeds and species which are less numerous or less productive. In co-operation between the Ministry of Agriculture and breeders' associations the protected herds that present conservation of farm animal genetic resources under in situ conditions are established. The aim of these activities is to preserve traditional autochthonous and low-count breeds for generations to come. Nevertheless, the preservation programmes need to be enhanced to other endangered local breeds not only those included at present. Cryoconservation of semen and embryos that is successfully carried out in cattle and horses need to be utilized to a greater extent. In this context such activities as establishment of a gene bank of tissues, blood derivatives and DNA are important. Without the state support and incentives these activities cannot be developed.
- With view to the approaching date of Slovakia accession to the European Community and the resulting quotas on animal production the state policy aimed at support for less productive breeds and species becomes the main factor of their further preservation. In this context two different strategies could be outlined. First, European quotas on milk production could be fulfilled by utilization of high productive breeds as the Holstein. As a result of this attitude, less breeders will be needed to cover this field and breeding will become economically effective. Second, less productive traditional breeds (the Slovak Spotted and Slovak Pinzgau) could become effective from the viewpoint of land cultivation. In comparison to the Holstein these breeds are better adapted to the local conditions. Both the Slovak Spotted and Slovak Pinzgau are able of more effective utilization of permanent pastures the proportion of which counts 30 % of arable land. The landscape role of grazing oxen and traditional sheep breeds is also very important.
- With respect to maintaining the existing state of diversity the state policy needs to be oriented to the support of individual farmers mainly in regions where permanent pastures are heavily accessible and their utilization in different ways due to high costs should not be considered.

- Special opportunities are seen in the inclusion of animal genetic resources into the newly formulated infrastructure of agro-tourism and non-profit sector. Development of both agro-tourism and non-profit sector needs to be encouraged.
- Attention needs to be paid to the management of farm animal genetic resources in relation to the principles of sustainability, reducing the negative environmental impact and accommodating the ethological needs and protection of farm animals.
- Improvement and dissemination of training in the field of management of farm animal genetic resources is needed.
- With respect to capacity building the establishment of an effective National Consultative Committee for the use and conservation of farm animal genetic resources technically and institutionally is of great interest.
- Continuous work is needed in order to prepare regulations within the national programme of animal genetic resources, specifying the individual elements of this programme.

5. Existing international co-operation in the field of the farm animal genetic resources and proposing new activities

Currently Slovakia is involved in international co-operation in the field of farm animal genetic resources by the following activities:

- As a member of DAGENE, an international non-governmental organization of the Danube region countries, Slovakia co-operates with countries having similar farm animal genetic resources.
- Breeders' associations in Slovakia are members of worldwide and European organizations of particular farm animal species and breeds (WORLD and EUROPEAN ASSOCIATION OF SIMMENTAL BREEDERS, INTERNATIONAL ASSOCIATION OF PINZGAU BREEDERS, ENTETE EUROPEENE D'AVICULTURE ET DE CUNINCULTURE etc.)
- Data on the available farm animal genetic resources are contributed to international databases (DAD-IS and EAAP).
- Slovakia also acts as a member of international organizations like the EAAP, FAO, Interbull or ICAR.

In the following paragraphs proposals of international activities in the field of animal genetic resources are summarized:

1. Support of the common formulation and submission of international research projects focused on animal genetic resources (within the 6th Framework Programmes and the European Regional Focal Point for Animal Genetic Resources) in order to increase the multiple advantages issued from the common effort (human and technical resources).
2. Support of the international co-operation aimed at management and conservation of similar animal genetic resources – similar breeds, breeds with regional occurrence (continuous activities within the framework of DAGENE etc.).
3. Collaboration in the harmonization of different source databases on animal genetic resources.
4. Support of forming a compatible and internationally acceptable information system on ex situ cryoconservation of animal genetic resources.

6. Description of the way the report and annexes were prepared

6.1 Preparation of the report

Based on methodology and recommendations of the FAO, the National Consultative Committee elaborated a questionnaire for the individual breeders' associations that contained a batch of questions concerning animal genetic resources. The questions were answered separately for each species of farm animals by a group of representatives of the breeders' associations in close cooperation with experts of the Ministry of Agriculture, the State Breeding Institute, universities, and individual experts.

The working version of the report was a result of close co-operation between the ministry, breeders' associations, as well as educational and research institutions. The final report was submitted for approval to the Ministry of Agriculture of the Slovak Republic.

Two meetings of the National Consultative Committee took place in 2002.

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Association of Swiss Brown Breeders	Ing. Alexander Podmanický
Slovak Holstein Association	Ing. Ivan Hrica
Association of Beef Cattle Breeders	Ing. Jozef Poláček
Association of Sheep and Goat Breeders	Ing. Jarolím Augustín
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6.2 Executive summary

At present animal genetic resources in Slovakia are used to a various extent and with different objectives. On one hand, it is the utilization of highly productive breeds used in the purebred form or through hybrids with the aim to gain profitable and competitive production. On the other hand, breeds are kept that are a part of the world's cultural heritage and the cultural heritage of the state. Breeding these breeds for high production or reproduction traits is not a priority. Stress is laid upon their possible utilization in the future and preservation for the generations to come.

At present knowledge on the state and preservation of animal genetic resources among specialists and among the public in general is on an acceptable level. In spite of this fact public knowledge should be improved by the National Consultative Committee. Material ensuring information on farm animal resources is being prepared in dependence on financial support and an information point for the national agricultural fair Agrokomplex is being prepared as well. Apart from this, education of specialists will be offered in the form of complex training programmes.

In Slovakia there are kept a total 165 breeds and lines (or species and breeds in the case of fur animals, and lines in hens and quails) within the species used for farming purposes. According to FAO terminology local breeds are autochthonous breeds as well as breeds kept for a long time under the given local conditions and adapted to these conditions. As a matter of fact, there are 2 local breeds and 9 imported breeds of cattle, 4 local and 9 imported breeds of sheep, 2 local and 1 imported breed of goats, 4 local and 5 imported breeds of pigs, 10 local and 5 imported breeds of horses, 7 local, 28 imported breeds of hens, 3 Slovak lines of hens, 4 imported lines of Japanese quail, 2 local and 3 imported breeds of ducks, 4 local and 2 imported breeds of geese, 1 local and 2 imported breeds of turkeys, 12 local and 35 imported breeds of rabbits, 10 local species and breeds as well as 1 imported species of fur animals.

Massive import of specialized highly productive foreign breeds, reduction of the original biodiversity, economic pressure to increase the production and gradual globalization on the market are the main reasons for that some local breeds have become endangered. The above facts proved to negatively affect the state of biodiversity in the animal genetic resources of the Slovak Republic. The following breeds have become endangered: the native Valachian sheep, the Hucul, Furioso, Nonius, Shagya-Arabian, Noric of Murany, Slovak Sport Pony, Lipitsa horses, the Brown Shorthaired goat, the Black Spotted pig, the Oravka hen, quails, the Suchovy and Slovak White goose, the Nitra rabbit, the Slovak Grayblue Rex and the Zemplin rabbit.

Preservation of the local animal genetic resources is done either under in situ conditions (by a system of protected herds - the Slovak Spotted cattle or the Slovak Pinzgau cattle, from sheep not only the native Valachian but also the Improved Valachian and Tsigai since these are autochthonous breeds), horses or under ex situ conditions by a bank of deep-frozen cattle and horse semen and embryos. It is the aim to preserve the sex cells and embryos of other farm animal species as well. The next phase the National programme is supposed to define the conditions for breeding those breeds which are not expected to be dominantly used in production but which are important from the viewpoint of sustainable development and inclusion into rural programmes. Considering the climatic and geographical diversity of the countryside, local programmes of breeding these breeds will have to be designed mainly for low input production systems.

Breeding work and conservation of the farm animal genetic resources are based on Act No. 194 of 1998 that regulates the principles of farm animal breeding, protection of endangered populations and management of farm animal gene reserves. This Act complies with international standards and together with the Veterinary Act, the Animal Protection Act and other legal standards it provides favourable conditions for the development of the existing breeds of farm animals. The Act settles the responsibilities and duties of institutions dealing with selection and hybridization programmes, states the conditions of performance testing as well as data processing and storage. Publicly funded scientific and research institutions of the agricultural sector in close co-operation with universities participate in the development of a theoretical and applied basis of farm animal breeding activities.

With respect to the individual farm animal species and breeds breeding measures and the state of their application have been monitored (performance traits, population rates involved in performance testing, extent of genetic evaluation, analysis of selection programmes). In addition biotechnological and molecular genetic procedures have been developed within national and sector scientific and research programmes. These methods are supposed to get included into programmes of conservation of farm animal genetic resources which thus could become much more effective. The extremely high costs of such programmes and the required quality of technical equipment and of the personnel of research institutions are still a problem. This field offers wide possibilities both in making international co-operation more effective as well as to concentrate resources effectively.

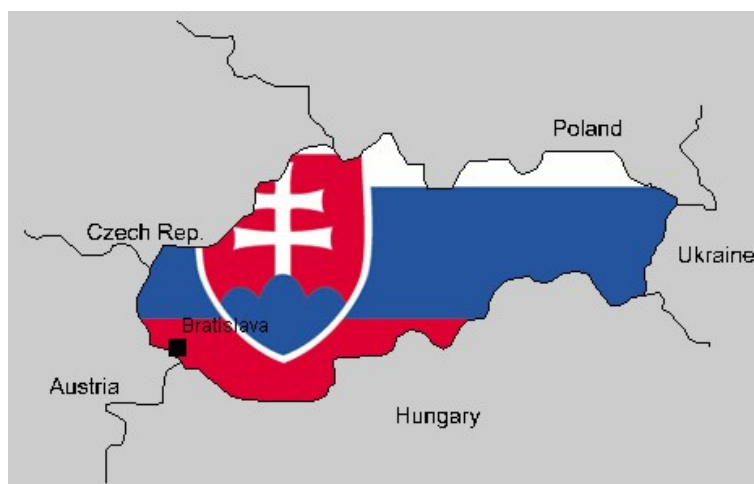
Active participation is expected of all stakeholders in the programme of development and protection of animal genetic resources within long-term plans for sustainable agriculture. Special opportunities can be seen in involvement of animal genetic resources into the newly formulated infrastructure of agro-tourism and the promisingly developing non-profit sector.

6.3 Annexes

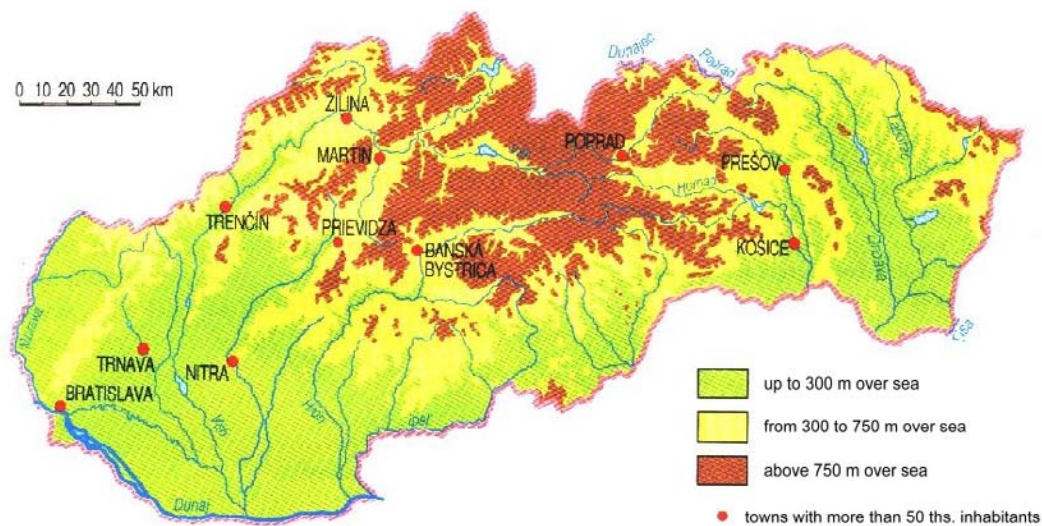
Map 1: Slovakia within Europe



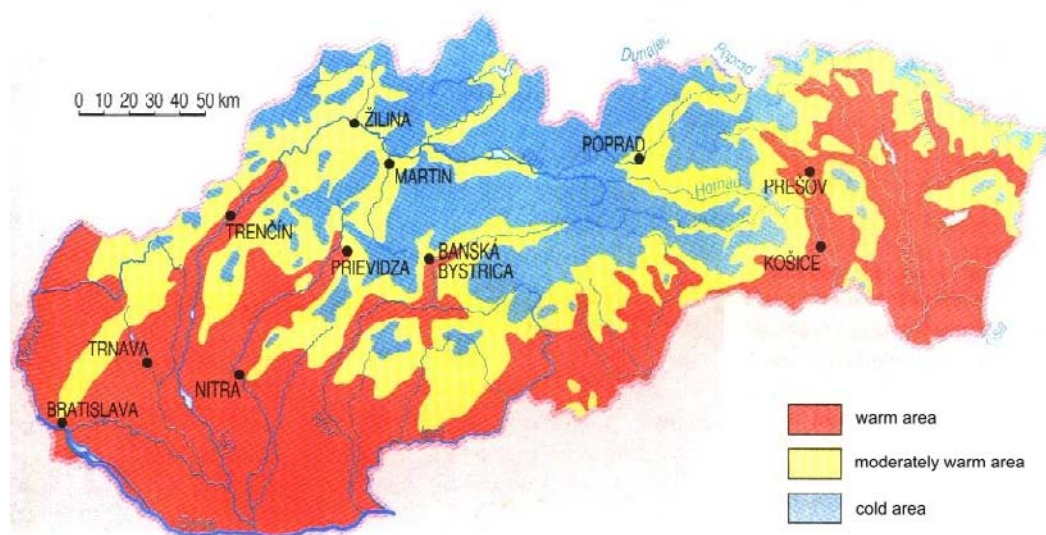
Map 2: Geographical position of Slovakia within Central Europe in detail



Map 3: Map of the Slovak Republic – Territorial differences



Map 4: Map of the Slovak Republic – Climate differences



Survey of traditional breeds reared in Slovakia (involved in conservation programmes or endangered)

Cattle

Slovak Spotted cattle

The Slovak Spotted cattle is the most important local cattle breed in Slovakia. As far as the origin of this breed is concerned, it arose from upgrading the native cattle breeds (the Redbrown, Greybrown Carpathian cattle as well as the Bern, Simmental and other breeds imported in the 17th and 18th century) with the Simmental cattle. In the 50ies of the 20th century the Slovak Spotted breed was recognized as an independent one.

As to breeding work the Act No. 169 from 1925 was very important since it specified the main principles of how to organize breeding activities. Performance testing was also introduced. The Slovak Spotted cattle is spread mainly in the regions of Southern Slovakia, representing the dual-purpose cattle bred for both milk and meat production.

Throughout the period of 1960 - 1990 crossings with the Holstein cattle were carried out. Since 1990 crosses with the Holstein cattle have become prevalent in comparison to the number of the native Slovak cattle breeds. Therefore protected herds of the Slovak Spotted and Slovak Pinzgau cattle (other traditional cattle breed in Slovakia) were established. The main aim is to preserve these breeds by means of purebred breeding under in situ conditions.



Slovak Pinzgau cattle

Another cattle breed traditionally kept on the territory of Slovakia is the Slovak Pinzgau cattle. Like the Slovak Spotted, the Slovak Pinzgau breed also arose from upgrading of the native Red and Greybrown Carpathian cattle with the Pinzgau breed imported from Austria.

Breeding activities were developed after 1870. The breeding area for the Slovak Pinzgau cattle was established by the Act of 1908. This breed is also classified as dual-purpose cattle. It suites the unfavourable conditions, mainly pastures in mountainous and sub-mountainous areas. At present a further increase of milk production is of main interest, therefore crosses with the Holstein (Red) are produced. For comparison, crosses with the Yorkshire and Lowland Red Spotted cattle were predominant in past.



Sheep

Native Valachian

This breed is the native autochthonous sheep breed that has been raised on the territory of Slovakia since the times of the Valachian colonization (mainly the 15th and 16th century). It has become rather rare and can only be found in the northern regions of Slovakia - Orava, Kysuce, Liptov, Spis. The animals are of a smaller body frame. As they are resistant to the unfavourable climatic conditions in mountainous and sub-mountainous regions these sheep are suitable for rearing in difficult conditions. Both rams and ewes are horned. The individuals with black, pied and pure white wool occur. The wool is of tufted structure.

In order to preserve the native Valachian sheep in the purebred form the Valachian Breeders' Club was established. State subsidies provided for purebred

breeding plays an important role in preserving this breed for the generations to come.

Improved Valachian

This breed comes from the native thick wool Valachian breed. The Valachian ewes were mated with rams of various medium fine and thick wool breeds. As a result of upgrading carried out during the period of 1950-1982 animals with higher qualitative and quantitative traits were bred. The production of wool and milk as well as live weight was increased. The exterior traits were also improved. On the other hand, the adaptability to the unfavourable climatic conditions stayed unchanged (it suits the regions at an altitude more than 800 m).

The Improved Valachian was recognized as an independent dual-purpose breed (wool-meat and meat-milk, respectively) in 1982. It is the most numerous sheep breed in Slovakia. Horned males and females are acceptable. In comparison to the native Valachian breed the wool is of a better quality. This breed is supposed to be highly productive in milk.

At present improvement with dairy breeds as the Lacaune and East Friesian is carried out to a great extent. As a consequence of massive migration of other breed genes maintaining this breed using purebred selection proves to be important. In situ conservation methods based on state support have been applied since 2003.



Tsigai

It is one of the oldest black-headed breeds in Slovakia, reared mainly in the Central and East Slovakian regions at an altitude from 500 to 800 m (Turiec, Banská Bystrica, Zvolen, Bardejov). The Tsigai breed is the second most numerous sheep breed in Slovakia. The animals are of a middle body frame, with

a black head and legs and with good adaptability to seasonal open-air rearing. The wool is white with infrequent occurrence of black hair.

It is a dual-purpose breed aimed at milk and lamb meat production. At present gradual crossbreeding (with the Lacaune and East Friesian) aimed at improvement of milk and meat production can be observed. Therefore protected herds are being established in order to reduce the influence of other breed genes (since 2003).



Goats

Brown Shorthaired goat

This brown goat breed is kept in sub-mountainous areas. In the past the population of the Brown Shorthaired goat was quite large on the territory of both Slovakia and the Czech Republic as well. The breed arose from the native brown goats selected for superior production and exterior traits. The influence of imported breeds was negligible. On the contrary, within a short period the population size rapidly decreased in number mainly due to the fusion with the Alpine breed which was imported from France after 1990.

Pigs

Black Spotted pig

This traditional pig breed the origin of which is not known has been reared in the regions of South Slovakia for a long time. It is a breed of outstanding reproduction and milkability. Breeding activities aimed at a further improvement of fertility traits started 50 years ago. The population was influenced mainly using the Prestice Black Pied, German Saddle and White Improved breed. According to the State Breeding Institute of the Slovak Republic the Black Spotted breed is reared only in one herd at present. Due to the continuously decreasing number of population this breed is in danger of extinction and needs to be saved.

Horses

Shagya-Arabian

Breeding the Shagya-Arabian horse is related to the period of Austro-Hungarian Monarchy and Stud Farm of Babolna established in 1790. Since the beginning of the 19th century imported Arabian horses have been bred there. One of them was Shagya (1830), a stallion that became the founder of the most popular and widespread strain of the Arabian horse in Europe. As a result of massive selection, a noble, well-proportioned and elegant horse was created.

Hucul

This mountainous horse breed is an autochthonous Carpathian breed. Rearing the Hucul breed has related to cultural traditions of people in the Carpathian region for many centuries. The first reference of the Hucul horse comes from 1603. With view to the low size of the population this breed has to be saved for the generations to come, consequently international co-operation, gene and information exchange is being developed. Breeders from Romania, Poland, the Czech Republic, Hungary, Ukraine and Slovakia strive to save this breed within the Hucul International Federation (HIF). International co-operation is aimed at improving the genetic quality of the whole population as well as maintenance of the breed.

Furioso

This warm-blooded breed has been reared in Slovakia for a long time which started in the era of the Austro-Hungarian Monarchy (the 19th century). It originated from the half-blooded and English-Arabian lines of Furioso, North Star, Przedswit, Gidran and Catalin integrated with the English Thoroughbred, Arab and Norman breeds. At present genes of these breeds are used to increase the genetic variability of the Furioso small population that is bred in Slovakia.

Nonius

At present the Nonius horse is mainly bred for riding and riding-draught sport. It belongs to the Anglo-Norman line of horses founded by the descendants of stallion Nonius. These horses were mainly bred in Hungary (Stud Farm of Mezöhegyes) but have spread to Slovakia, Yugoslavia and Romania as well. The early breeding activities can be traced back to the 19th century. At first breeding was aimed at the heavy draught type of horse to be available, later selection aimed at an improvement of its riding properties was stressed. For the latter purpose the English Thoroughbred and French stallions are used.

Lipitsa

This horse belongs to the oldest horse breeds in Europe the origin of which derives from old Spanish and Italian horses. The role of the Arabian horse was important as well. Since the 50ies of the 19th century purebred breeding has become dominant in the Lipitsa horse. Due to small number of population in Slovakia preservation of this breed is necessary.

Slovak Sport Pony

This horse originated from mating of purebred mares of the Thoroughbred Arab and the Slovak Warmblood breeds to sires of sport pony breeds like the Wales and German Riding Pony. It is a multipurpose breed of predominantly riding type of horse the exterior of which is similar to that of big sport horses.

Noric of Murany

The Noric horse is bred as a cold-blooded horse of the Noric origin based on 14 blood lines. This breed got its name after the former Roman province Noricum located on the territory of Central Europe. The animals are of a heavy body constitution, adaptable to the mountainous and sub-mountainous regions. They are reared in the region of Gemer at the Stud Farm Velka Luka at present.

Hens

Oravka hen

Breeding the Oravka hen started in the 50ies of the 20th century. It was the aim to produce a breed of high performance traits, adaptable and resistant to the unfavourable conditions, able of effective utilization of grassland. Native hens from the Slovak territory (Zakamenne, Novot) were used as the basic breeding material. They were crossbred with the Wyandotte, Rhode Island Red and New Hampshire breeds. The population was recognized as an independent breed in 1990. In this context the work of the Oravka Breeders' Club (founded in 1968) was very important.



Slovgal

The Slovgal is highly productive meat hybrid bred for broiler production. Final broiler chickens are three-line hybrids of a heavy body weight. Some 250 female and male individuals are available as a gene reserve in the Research Institute for Animal Production (data of 2001 – 2002).



Geese

Slovak White goose

The former name of this breed was the Slovak Danube goose. In the past it was bred mainly in the regions of Southern Slovakia (Nitra, Levice). It originally came from the former region geese breeds, those crossbred with the Hungarian goose that is of a medium body frame as well as the Emdenesy goose which belongs to the big breeds and is considered one of the oldest goose breeds in Europe and in the world as well. Breeding activities related to this breed are conducted under the guidance of the Slovak Association of Breeders and the Club of Slovak White and Suchovy Goose Breeders. The latter was established in 2001.



Suchovy goose

The Suchovy goose is the result of breeding work in Sucha nad Parnou (a village on the Slovak territory). It was bred using crossbreeding with several geese breeds - the Toulouse, Landaisse or Pommern geese. It was recognized as an independent breed in 1995. The animals are of a bigger body frame and of strong body condition, resistant to an unfavourable environment. Similarly to the Slovak White goose breed breeding activities are carried out under the guidance of the Slovak Association of Breeders and the Club of Slovak White and Suchovy Goose Breeders.



Rabbits

The Nitra rabbit was recognized as an independent breed in 1977. Three breeds were involved in forming this breed – the Russian, French Silver and Californian rabbit. It was the aim to produce a highly efficient meat rabbit that would be adaptable to less favourable conditions. The population consists of 400 animals at present.

Due to small number of population, also population of the Slovak Greyblue Rex and Zemplin rabbit are endangered. Of the Slovak Greyblue Rex (on figure) 50 individuals are available. Of the Zemplin rabbit 100 animals are available.

3.3. Predefined Tables

These preformatted tables have been developed by a broad spectrum of experts, for use in assisting the National Consultative Committee (NCC) for the SoW-AnGR process to identify and consider the important Issues broadly and without oversight. Additional tables which provide further comparisons of key variables may need to be developed by NCCs.

Tabulation Tools for the SoW-AnGR Report Preparation

Introduction

The preparation of a *Report on the State of the World's Animal Genetic Resources (AnGR)* was recommended by the Intergovernmental Technical Working Group on AnGR for Food and Agriculture (ITWG-AnGR) in 1998. FAO, in order to facilitate the collection and analysis of the necessary background information at country level, developed these Tabulation Tools, with the following objectives:

- to analyse and report on the state of farm animal genetic resources, on the status and trends of these resources, and their current contribution to food, agriculture and rural development
- to assess the state of the each country's capacity to manage these essential resources, in order to determine priorities for future capacity building
- to identify the national priorities for action in the field of sustainable conservation and utilization of animal genetic resources
- to identify related requirements for international co-operation

Following the Background Questions, the Tabulation Tools cover 6 chapters:

1. Introducing the Country
2. The State of Production Systems
3. The State of Genetic Diversity
4. The State of Utilization of AnGR (Use and Development)
5. The State of Conservation of AnGR
6. The State of Policy Development and Institutional Arrangements for AnGR

General Principles for Using the Tabulation Tools

The Tabulation Tools in the DADIS SOW-AnGR module have been designed for country use to:

- Help in the collection of data coming from Background Questions
- Highlight information needed in the national report
- Be used mainly by NCC Technical Secretariat, and others as appropriate
- A list of the terms used and their definitions can be found at the back of the Guidelines document

There are some general principles to consider when working on these tables:

- The tables are designed to help summarize the supporting data, produced after careful analysis, in order develop a national database, and to report on the state of animal genetic resources and the national capacity to manage them.
- The tables provide an opportunity for policy makers to identify needs, demands, trends and requirements for policy development in all aspects of the management of AnGR.

- The tables are optional and meant to assist countries. Even where it might be difficult to complete some tables, countries should try to develop all of those of importance. Countries are encouraged to develop additional tables which summarize other important information for policy development and action within country.
- A lack of information can be considered an important indicator. All cells in all tables should be filled in with one of the following: a numerical value (including 0 where relevant), NI (indicating no information is available) or NA (not applicable).
- Provide estimated figures where these are considered to be sound, otherwise highlight the important areas of information which should be developed to improve future decision-making and action. This will help the specification of priorities and needs.
- Definitions used in the Guidelines apply to these tables; however, when needed, definitions and appropriate comments are included as footnotes to appropriate tables.
- When providing figures in the tables, look for the most recent information and be careful with the units of measurement.
- When asked to enter scores or percentages, consider the use of the full range of possible values.

Chapter 1. Introducing the Country

Justification and Use

The purpose of this chapter is to get basic information on the livestock sector in general (livestock population, livestock holders and their land resources, livestock contribution to major food products). We expect, from the information gathered in this chapter, to have a clear idea on major use of land, especially for livestock, availability of animal feed resources, and the contribution of the livestock sector in satisfying consumption demands of animal products.

Table 1.1 Importance of livestock to the gross domestic product in agriculture (millions of \$US)

Activity	\$US (millions)	Data from Year
Livestock production (official statistics)	\$416	1999
Other agricultural production (official statistics)	\$340	1999
Best estimate of additional value of livestock	NI	

Comments:

- Best estimate of additional value includes the value of all perceived contributions of livestock to agricultural services, other than food production, e.g. value of fertilizer from animal production, draught and transportation, forage production, etc., which usually are not costed in standard calculations.
- Livestock includes domestic ruminants, non-ruminants, and birds used for food and agriculture.

Table 1.2 Land use and current trends (1000 ha)

	Area (1000 ha)	Area (1000 ha)	Current trend
Category	1990	1999	
Arable land	1509	1461	decreasing
Permanent crops	131	125	decreasing
Permanent pastures	809	856	increasing
Agricultural area	2449	2442	decreasing
Land area	4810	4810	stable
Total Area	4903	4903	1509

Comments:

- Arable land: land under temporary crops (double-cropped areas are counted only once), temporary meadows for mowing or pasture, land under market and kitchen gardens and land temporarily fallow (less than five years). The abandoned land resulting from shifting cultivation is not included in this category. Data for "Arable land" are not meant to indicate the amount of land that is potentially cultivable.
- Permanent crops: land cultivated with crops that occupy the land for long periods and need not be replanted after each harvest, such as cocoa, coffee and rubber; this category includes land under flowering shrubs, fruit trees, nut trees and vines, but excludes land under trees grown for wood or timber.
- Permanent pasture: land used permanently (five years or more) for herbaceous forage crops, either cultivated or growing wild (wild prairie or grazing land).
- Land area: total area excluding area under inland water. The definition of inland water generally includes major rivers and lakes.
- Total area: the total area of the country, including area under inland water.

- Indicate current trends in relation to the latest available year (-- = strongly decreasing, - = decreasing, 0 = stable, + = increasing, ++ = strongly increasing).

Table 1.3 Land use for livestock and current trends

	Area (1000 ha)	Area (1000 ha)	Current trend
Category	1990	1999	
Cropping for food	NA	NA	
Cropping for feed	600	560	decreasing
Cropping for food and feed	200	184	decreasing
Natural pasture	809	856	increasing
Improved pasture			
Fallow	NA	NA	
Forest	NA	NA	
Non-agricultural	NA	NA	
Total			

Comments:

- Natural pastures are the ones grown without any external inputs, while improved pastures may be cultivated, semi-cultivated, fertilized, etc.
- Fallow is a non-cultivated cropping land put on rest.
- Indicate current trends in relation to the latest available year (-- = strongly decreasing, - = decreasing, 0 = stable, + = increasing, ++ = strongly increasing).

Table 1.4 Land tenure for livestock production

Category	Area (1000 ha)	%
Private	1585	99
Government and communal	15	1
Total	1600	100

Comments:

- Private includes the private sector and the long term leasing.
- Include all land for which the primary purpose of its use is livestock production.

Table 1.5 Farm structure and distribution

Category	Number of farms* /	%	Number of farms with livestock	%
landless	515	7	0	0
< 1 ha	861	11	87	3
> 1 to 5 ha	1654	22	330	10
> 5 to 10 ha	678	9	135	4
> 10 to 50 ha	1544	21	620	19
> 50 to 100 ha	479	6	335	10
> 100 to 500ha	704	9	704	21
> 500 to 1000 ha	353	5	353	11
> 1000 ha	722	10	722	22
Total	7510	100	3286	100

*registered farmers and companies

Table 1.6 Livestock population, number of owners/house-holders and employment by species (Official statistical data, farm census of 2001)

Species	Livestock population (1000)	Number of owners / householders	Number of persons additionally employed	
			Fully	Partially
Cattle	630	21000	NI	NI
Buffalo	NA	NA	NI	NI
Sheep	310	24200	NI	NI
Goats	30	15500	NI	NI
Camels	NA	NA	NI	NI
Lamas and Alpaca	NA	NA	NI	NI
Horses	9,5	4800	NI	NI
Donkeys	NA	NA	NI	NI
Pigs	1500	85000	NI	NI
Chicken (only hens)	1240	250000	NI	NI
Quails	2	200	NI	NI
Turkey	320	3500	NI	NI
Ducks	94	3400	NI	NI
Geese	23	2000	NI	NI
Rabbits	6000	150000	NI	NI
Fur animals	72	650	NI	NI

Table 1.7 Human population in the country

Year	Total (millions)	Rural or Farming (%)	Urban or Non Farming (%)	Total
1990	5298	12	88	100
1999	5393	4	96	100
Average annual growth rate	1,8%			

Comments:

- Rural/Urban and Farming/Non Farming populations will be defined depending on the commonly used terminology for demography. For example in developed countries it is meaningful to consider farming and non-farming populations and in the developing world, rural and urban populations.

Table 1.8 Major livestock primary production (1000 tonnes, 1000 litres, numbers)

Species	Meat (t)		Milk (l)		Eggs (t)		Fiber (t)		Skin (No.)	
	1990	1999	1990	1999	1990	1999	1990	1999	1990	1999
Cattle	111	49	1800000	1073183					250000	100000
Buffalo	NA	NA	NA	NA					NA	NA
Sheep	4,5	1,4	17000	10843			2,9	0,9	200000	50000
Goats	0,04	0,2	5000	13200			NI	NI	1000	5000
Camels	NA	NA	NA	NA			NA	NA	NA	NA
Lamas and Alpaca	NA	NA	NA	NA			NA	NA	NA	NA
Horses	0,02	0,03	NA	NA					150	150
Donkeys	NA	NA	NA	NA					NA	NA
Pigs	300	207							NI	NI
Chicken					118	70	NA	NA	NA	NA
Turkey					NA	NA	NA	NA	NA	NA
Ducks	81	83			NA	NA	NA	NA	NA	NA
Geese					NA	NA	NA	NA	NA	NA
Rabbits	6,9	7,5					NA	NA	4400000	4800000

Table 1.9 Major livestock primary product imports (1000 tonnes, 1000 litres, numbers)

Species	Meat (t)		Milk (l)		Eggs (t)		Fiber (t)		Skin (No.)		Animals (No.)	
	1990	1999	1990	1999	1990	1999	1990	1999	1990	1999	1990	1999
Cattle	2	3	0	90000					NI	NI	300	560
Buffalo	NA	NA	NA	NA					NA	NA	NA	NA
Sheep	0	0	0	0			1	1,5	0	0	100	200
Goats	0	0	0	0			NA	NA	0	0	0	40
Camels	NA	NA	NA	NA			NA	NA	NA	NA	NA	NA
Lamas and Alpaca	NA	NA	NA	NA			NA	NA	NA	NA	NA	NA
Horses	NI	NI	NA	NA					NI	NI	50	70
Donkeys	NA	NA	NA	NA					NA	NA	NA	NA
Pigs	11	16,2							NI	NI	360	600
Chicken	3	4,2			0	0,1	NA	NA	NA	NA	700	800
Turkey	0,7	1			NA	NA	NA	NA	NA	NA	100	100
Ducks	1	1,4			NA	NA	NA	NA	NA	NA	100	200
Geese					NA	NA	NA	NA	NA	NA	150	200
Rabbits	0	0					NA	NA	NI	NI	0	350

Table 1.10 Major livestock primary product exports (1000 tonnes, 1000 litres, numbers)

Species	Meat (t)		Milk (l)		Eggs (t)		Fiber (t)		Skin (No.)		Animals (No.)	
	1990	1999	1990	1999	1990	1999	1990	1999	1990	1999	1990	1999
Cattle	3,4	4,8	100	220000					NI	NI	200	500
Buffalo	NA	NA	NA	NA					NA	NA	NA	NA
Sheep	0	0,7	0	4,7			0,5	0,4	0	0	0	0
Goats	0	0,03	0	0			NA	NA	0	0	0	0
Camels	NA	NA	NA	NA			NA	NA	NA	NA	NA	NA
Lamas and Alpaca	NA	NA	NA	NA			NA	NA	NA	NA	NA	NA
Horses	0,01	0,02	NI	NI					NI	NI	0	0
Donkeys	NA	NA	NA	NA					NA	NA	NA	NA
Pigs	0	0							NI	NI	0	0
Chicken	0,9	1,1			0	1	NA	NA	NA	NA	0	0
Turkey	0,04	0,06			0	0	NA	NA	NA	NA	0	0
Ducks	0,02	0,3			0	0	NA	NA	NA	NA	0	0
Geese					0	0	NA	NA	NA	NA	0	0
Rabbits	0,6	0,4					NA	NA	NI	NI	0	0

Chapter 2. The State of Production Systems

Justification and Use

The purpose of this chapter is to get a clear picture on the distribution of livestock species and their role by major production systems. Changes in major production systems over time for major species are monitored. Production systems are defined according to the level of inputs used.

Table 2.1 Distribution of livestock by production system (%)

Species	Production systems			Total
	Low input	Medium input	High input	
Cattle dairy+dual p.	10	5	85	100
Cattle beef	15	55	30	100
Sheep	0	25	75	100
Goats	80	10	10	100
Camels	NA	NA	NA	0
Lamas and Alpaca	NA	NA	NA	0
Horses	15	85	0	100
Donkeys	NA	NA	NA	0
Pigs	5	5	90	100
Chicken	10	20	70	100
Turkey	0	10	90	100
Ducks	0	50	50	100
Geese	0	40	60	100
Rabbits	20	60	20	100
Fur animals	35	50	15	100

Comments:

- Assign a percentage based on thorough analyses of data available.
- **Production System:** all input-output relationships, over time, at a particular location. The relationships will include biological, climatic, economic, social, cultural and political factors, which combine to determine the production of a particular livestock enterprise. Also termed **Production Environment**. Production systems range from areas where there is very little husbandry or human modification of the environment, to very intensive management systems where feed, climate, disease and other factors are controlled or managed by farmers. The level of animal husbandry or intervention varies enormously from region to region and from farm to farm. Thus, a common way to classify production environments is to group them according to the level of human intervention as:
 - **High-input Production System:** a production system where all rate-limiting inputs to animal production can be managed to ensure high levels of animal survival, reproduction and output. Output is constrained primarily by managerial decisions.
 - **Medium-input Production System:** a production system where management of the available resources has the scope to overcome the negative effects of the environment, although it is common for one or more factors to limit output, survival or reproduction in a serious fashion.
 - **Low-input Production System:** a production system where one or more rate-limiting inputs impose continuous or variable severe pressure on livestock, resulting in low survival, reproductive rate or output. Output and production risks are exposed to major influences, which may go beyond human management capacity.

Table 2.2 Changes in the distribution of production systems during the last 20 years

Species	Production systems			Total
	Low input	Medium input	High input	
Cattle dairy+dual p.	-	-	++	0
Cattle beef	+	+	+	0
Sheep	-	+	++	0
Goats	-	+	-	0
Camels	NA	NA	NA	0
Lamas and Alpaca	NA	NA	NA	0
Horses	+	+	-	0
Donkeys	NA	NA	NA	0
Pigs	-	0	++	0
Chicken	-	0	+	0
Turkey	-	0	+	0
Ducks	-	0	0	0
Geese	-	0	0	0
Rabbits	0	0	++	0

Comment:

- Assign a score based on thorough analyses of data available (-- = strongly decreasing, - = decreasing, 0 = stable, + = increasing, ++ = strongly increasing).
- Definitions of production systems are given at the bottom of Table 2.1.

Table 2.3 Type of livestock farm by production system for cattle dairy (%) + dual purpose

Type of operation	Production systems			Total
	Low input	Medium input	High input	
Subsistence	5			5
Smallholder	5			5
Small-scale-commercial			5	5
Large-scale-commercial		5	80	85

Comments:

- **Subsistence:** less than 50% of production is marketed.
- **Smallholder:** small family farms with more than 50% of production marketed
- **Small-scale-commercial:** medium family farms with more than 50% of production marketed
- **Large-scale-commercial:** large farms or companies with all production marketed
- Definitions of production systems are given at the bottom of Table 2.1.

Table 2.4 Type of livestock farm by production system for cattle beef (%)

	Production systems			
Type of operation	Low input	Medium input	High input	Total
Subsistence				0
Smallholder	9	12	9	30
Small-scale-commercial	6	17	11	34
Large-scale-commercial		26	10	36

Comments:

- Definitions of production systems are given at the bottom of Table 2.1.
- Definition of farm type given at the bottom of Table 2.3

Table 2.5 Type of livestock farm by production system for sheep (%)

	Production systems			
Type of operation	Low input	Medium input	High input	Total
Subsistence		11		11
Smallholder		14		14
Small-scale-commercial			15	15
Large-scale-commercial			60	60

Comments:

- Definitions of production systems are given at the bottom of Table 2.1.
- Definition of farm type given at the bottom of Table 2.3

Table 2.6 Type of livestock farm by production system for goats (%)

	Production systems			
Type of operation	Low input	Medium input	High input	Total
Subsistence	80	5		85
Smallholder		5		5
Small-scale-commercial			5	5
Large-scale-commercial			5	5

Comments:

- Definitions of production systems are given at the bottom of Table 2.1.
- Definition of farm type given at the bottom of Table 2.3

Table 2.7 Type of livestock farm by production system for camels (%)

	Production systems			
Type of operation	Low input	Medium input	High input	Total
Subsistence				0
Smallholder				0
Small-scale-commercial				0
Large-scale-commercial				0

Comments:

- Definitions of production systems are given at the bottom of Table 2.1.
- Definition of farm type given at the bottom of Table 2.3

Table 2.8 Type of livestock farm by production system for llamas and alpaca (%)

	Production systems			
Type of operation	Low input	Medium input	High input	Total
Subsistence				0
Smallholder				0
Small-scale-commercial				0
Large-scale-commercial				0

Comments:

- Definitions of production systems are given at the bottom of Table 2.1.
- Definition of farm type given at the bottom of Table 2.3

Table 2.9 Type of livestock farm by production system for horses (%)

	Production systems			
Type of operation	Low input	Medium input	High input	Total
Subsistence				0
Smallholder	5	75		80
Small-scale-commercial	10	10		20
Large-scale-commercial				0

Comments:

- Definitions of production systems are given at the bottom of Table 2.1.
- Definition of farm type given at the bottom of Table 2.3

Table 2.10 Type of livestock farm by production system for donkeys (%)

	Production systems			
Type of operation	Low input	Medium input	High input	Total
Subsistence				0
Smallholder				0
Small-scale-commercial				0
Large-scale-commercial				0

Comments:

- Definitions of production systems are given at the bottom of Table 2.1.
- Definition of farm type given at the bottom of Table 2.3

Table 2.11 Type of livestock farm by production system for pigs (%)

	Production systems			
Type of operation	Low input	Medium input	High input	Total
Subsistence	5			5
Smallholder		5		5
Small-scale-commercial			10	10
Large-scale-commercial			80	80

Comments:

- Definitions of production systems are given at the bottom of Table 2.1.
- Definition of farm type given at the bottom of Table 2.3

Table 2.12 Type of livestock farm by production system for chicken (%)

	Production systems			
Type of operation	Low input	Medium input	High input	Total
Subsistence	5	5		10
Smallholder	5	5		10
Small-scale-commercial		10		10
Large-scale-commercial			70	70

Comments:

- Definitions of production systems are given at the bottom of Table 2.1.
- Definition of farm type given at the bottom of Table 2.3

Table 2.13 Type of livestock farm by production system for rabbits (%)

Type of operation	Production systems			Total
	Low input	Medium input	High input	
Subsistence	10	25		35
Smallholder	10	25	5	40
Small-scale-commercial		10	5	15
Large-scale-commercial			10	10

Comments:

- Definitions of production systems are given at the bottom of Table 2.1.
- Definition of farm type given at the bottom of Table 2.3

Table 2.14 Type of livestock farm by production system for other species (%)
Name of species – fur animals

Type of operation	Production systems			Total
	Low input	Medium input	High input	
Subsistence				0
Smallholder	30	30		60
Small-scale-commercial	5	15	5	25
Large-scale-commercial		5	10	15

Comments:

- Definitions of production systems are given at the bottom of Table 2.1.
- Definition of farm type given at the bottom of Table 2.3

Chapter 3. The State of Genetic Diversity

Justification and Use

The purpose of this chapter is to identify the status of the diversity of breeds within species, in terms of total number of breeds, breeds at risk of being lost, and degrees of their characterization.

Table 3.1 Breed Diversity (Number of Breeds)

Species	Current Total		At risk		Widely used		Others		Lost (last 50 yr)	
	L	E	L	E	L	E	L	E	L	E
Cattle dairy + dual p.	2	2	0	0	2	2	0	0	2	0
Cattle beef		7	0	0	0	7	0	0	0	0
Sheep	4	9	1		3	9	0	0	0	0
Goats	2	1	1	1	1		0	0	0	0
Camels	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Lamas and Alpaca	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Horses	10	5	7	0	3	5	0	0	0	0
Donkeys	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Pigs	4	5	1	0	3	3	0	2	0	1
Chicken	7	28	1	0	6	28	0	0	0	0
Turkey	1	2	0	0	1	2	0	0	0	0
Ducks	2	3	0	0	2	3	0	0	0	0
Geese	4	2	2	0	2	2	0	0	0	0
Rabbits	12	35	3	0	9	35	0	0	0	0
Fur animals	10	1	0	0	10	1	0	0	0	0

Comments:

- L = Locally Adapted or Native; E = Exotic (Recently Introduced and Continually Imported).
- Breeds at risk are those with total number of breeding females and males are less than 1,000 and 20, respectively; or if the population size is less than 1,200 and is decreasing.

Table 3.2 Number of breeds for which characterization has been carried out (Number of breeds)

Species	At population level			At individual level		
	Baseline survey	Genetic distance	Breeds and crosses evaluation	Performance recording	Genetic evaluation	Molecular evaluation
Cattle dairy+dual p.	4	2	4	4	4	2
Cattle beef	7	0	7	7	7	0
Sheep	13	4	13	13	3	4
Goats	2	0	2	2	0	0
Camels	NA	NA	NA	NA	NA	NA
Lamas and Alpaca	NA	NA	NA	NA	NA	NA
Horses	15	2	7	8	0	2
Donkeys	NA	NA	NA	NA	NA	NA
Pigs	9	0	9	9	9	0
Chicken	35	4	0	0	0	4
Turkey	3	0	0	0	0	0
Ducks	5	0	0	0	0	0
Geese	6	2	2	0	0	2
Rabbits	47	0	3	3	0	0
Fur animals	7	0	7	5	0	0

Comments:

- Consider breed characterization during the last ten years.
- Baseline survey summary data describing the identification and observable characteristics, location, uses and general husbandry of the AnGR for each species used in the country for food and agricultural production.
- Genetic distances among breeds computed from molecular analyses.
- ‘Breeds and crosses evaluation’ refers to estimation of direct and maternal additive genetic, and heterosis effects.
- Valuation = description of the extent to which market values of AnGR predict their ‘real’ or ‘fair’ value, accounting for all goods and services they may provide to current and future generations of humankind. In the case of market failures, market prices will differ from the value that society attaches to AnGR.
- **Performance recording is based on individual animal data for milk yield, growth, reproduction, etc.**
- **Genetic evaluation refers to estimation of breeding values.**
- Molecular evaluation includes information of markers, DNA, blood type, protein alleles, etc.

Chapter 4. The State of Utilization of AnGR (Use and Development)

Justification and Use

The purpose of this chapter is to identify the main use of animal genetic resources available in the country, especially the number of breeds that are really active in contributing to food and agricultural products. In addition, it focuses on the status of development of AnGR, their current breeding strategies, gaps and needs, and the involvement of different stakeholders in developing breeding systems.

Table 4.1 Relative importance of livestock products and services within species (%)

Species	Milk	Meat	Eggs	Fiber	Skin	Risk management	Fertiliser	manure	Draught	Culture	Recreation	Fuel	Feather	Environmental management	Total
Cattle dairy+dual p.	80	10			0	0	5	0	0	0	0	0		5	100
Cattle beef		80			0	0	0	0	0	0	0	0		20	100
Sheep	20	25		5	0	0	5		0	0	0	0		45	100
Goats	40	45		0	0	0	1		0	0	0	0		14	100
Camels	NA	NA		NA	NA	NA	NA	NA	NA	NA	NA	NA		NA	
Lamas and Alpaca	NA	NA		NA	NA	NA	NA	NA	NA	NA	NA	NA		NA	
Horses	0	0						25	30	40				5	100
Donkeys	NA	NA		NA	NA	NA	NA	NA	NA	NA	NA	NA		NA	
Pigs		100				0	0		0	0					100
Chicken		60	40			0	0		0	0			0	0	100
Turkey		100	0			0	0		0	0			0	0	100
Ducks		100	0			0	0		0	0			0	0	100
Geese		100	0			0	0		0	0			0	0	100
Rabbits		90			10	0	0		0						100
															0

Comments:

- Think of the food and agricultural outputs as products that have a relative contribution to national production. Therefore, assign relative contributions for the important products listed below, based on a thorough analyses and valuation of data available in the country (sum of each species = 100).

Table 4.2 Relative importance of species within livestock products and services (%)

Species	Milk	Meat	Eggs	Fiber	Skin	Risk management	Fertiliser manure	Draught	Culture	Recreation	Fuel	Feather	Environmental management
Cattle dairy+dual p.	99	5			NI	0	60	0	5	0	0		45
Cattle beef		23			NI	0	8	0	5	0	0		40
Sheep and goats	1	1		100	NI	0	6		5	0	0		5
Camels	NA	NA		NA	NA	NA	NA		NA	NA	NA		NA
Lamas and Alpaca	NA	NA		NA	NA	NA	NA		NA	NA	NA		NA
Horses	0	0		0	NI	0	1	100	70	100	0		5
Donkeys	NA	NA		NA	NA	NA	NA	NA	NA	NA	NA	10	NA
Pigs		50				0	20		0	0			
Chicken		20	100			0	5		10				NI
Rabbits		1		0	NI	0	0		5				
Total	100	100	100	100		0	100		100	100	0	0	95

Comments:

- Assign relative contribution values for each product as a % of total output of that product, based on a thorough analyses of data available in the country (sum of each column = 100).

Table 4.3 Number of widely used breeds with breeding strategies (No. of breeds)

Species	Total number of breeds	Breeding strategies		
		Purebred selection	Cross-breeding	Both
Cattle dairy/dual p.	4	4	4	4
Cattle beef	7	7	7	7
Sheep	12	12	5	5
Goats	1	1		
Camels	NA	NA	NA	NA
Lamas and Alpaca	NA	NA	NA	NA
Horses	8	8	7	7
Donkeys	NA	NA	NA	NA
Pigs	6	6	6	6
Chicken	35	35	0	
Turkey	3	3	0	
Ducks	5	5	0	
Geese	4	4	0	
Rabbits	44	44	11	11

Table 4.4 Number of breeds with current breeding strategies and tools being used (No. of breeds)

Species	Breeding goals	Breeding strategies		Tools				
		Designed	Designed and implemented	Individual identification	Recording	AI	ET	Genetic evaluation
Cattle dairy/dual	4		4	4	4	4	4	4
Cattle beef	7	1	6	7	7	7	4	7
Sheep	12		12	12	10	5	0	3
Goats	2		2	2	2	0	0	0
Camels	NA	NA	NA	NA	NA	NA	NA	NA
Lamas and Alpaca	NA	NA	NA	NA	NA	NA	NA	NA
Horses	15		15	15	8	12	0	0
Donkeys	NA	NA	NA	NA	NA	NA	NA	NA
Pigs	9		9	9	9	9	0	9
Chicken	35		35	1	0	0	0	0
Turkey	3		3	0	0	3	0	0
Ducks	5		5	0	0	0	0	0
Geese	6		6	0	0	6	0	0
Rabbits	47		47	47	3	0	0	0

Comments: AI = Artificial Insemination; ET = Embryo Transfer.

Table 4.5 State of the art of technologies / methodologies used in breeding strategies

Technology or Methodology	Used for:	
	Research	Breeders
Multi-trait selection index construction	100	50
Optimization tools for breeding plans	100	60
Electronic database related to recording schemes	100	95
Genetic evaluation Software for: phenotypic selection breeding values	100	80
Reproductive technologies (AI, ET, etc)	80	55
Microsatellite linkage maps for QTL identification for Marker Assisted	40	0
Other technology (specify)		

Comments: Assign a percentage to indicate the extent that the technology or methodology is being used at research institutions or by breeder's associations in the country.

Table 4.6 Role of stakeholders in the implementation of tools for the development of AnGR

Stakeholders	Breeding goals	Individual identification	Recording	Artificial insemination	Genetic evaluation
Federal Government	NA	NA	NA	NA	NA
State Government	4	4	4	1	1
Local Government	1	1	1	1	1
Breeder's	4	4	4	2	1
Private companies	3	2	4	4	2
Research	4	3	4	2	3
NGO's	1	1	1	1	1

Comments: Assign scores (1 = none, 2 = little, 3 = regular, 4 = more, 5 = high) based on thorough analyses of data available, to indicate the role of involvement of each stakeholder on the implementation of tools that support the development of AnGR.

Table 4.7 Involvement of stakeholders in activities related to the development of AnGR

Stakeholders	Legislation	Breeding	Infrastructure	Human	Farmer's
Federal Government	NA	NA	NA	NA	NA
State Government	4	3	3	3	3
Local Government	1	1	1	1	1
Breeder's associations	4	4	4	3	4
Private companies	3	4	4	2	3
Research	4	4	2	3	1
NGO's	1	1	1	1	1

Comments: Assign scores (1 = none, 2 = little, 3 = regular, 4 = more, 5 = high) based on thorough analyses of data available, to indicate the degree of involvement of each stakeholder on activities that support the development of AnGR.

Table 4.8 Stakeholders preference for animal genetic resources

Stakeholders	Locally adapted breeds	Imported within region	Imported exotic breeds
Federal Government	NA	NA	NA
State Government	3	3	1
Local Government	1	1	1
Breeder's associations	5	4	2
Private companies	3	4	2
Research	4	3	2
NGO's	1	1	1

Comments: Assign scores (1 = none, 2 = little, 3 = regular, 4 = more, 5 = high) based on a thorough analyses of data available, to indicate the degree of preference of the various types of AnGR by stakeholders.

Table 4.9 Priority of needs for utilization of technologies for the development of AnGR

Technology	Needs			
	Knowledge	Training	Financial resources	Breeder's organization
Recording	3	4	4	5
Genetic evaluation	4	4	3	4
AI / ET	3	4	4	4
Molecular techniques	5	4	3	3
Breed organisation techniques	4	4	3	5

Comments:

- AI= Artificial Insemination; ET= Embryo Transfer
- Assign scores (1 = none, 2 = little, 3 = regular, 4 = more, 5 = high) to indicate the priority of solving specific needs in order to use technologies to support the development of AnGR.

Chapter 5. The State of Conservation of AnGR

Justification and Use

The purpose of this chapter is to identify activities in in-situ and ex-situ conservation programmes, the degree of involvement of stakeholders and future needs for such programmes.

Table 5.1 Current number of breeds in managed conservation programmes

Species	Number of locally adapted breeds at risk			
	Total	Managed <i>in situ</i>	Managed <i>ex situ</i>	Both (<i>in</i> and <i>ex situ</i>)
Cattle	2	2	2	2
Buffalo	NA	NA	NA	NA
Sheep	3	3	0	0
Goats	0	0	0	0
Camels	NA	NA	NA	NA
Lamas and Alpaca	NA	NA	NA	NA
Horses	7	7	7	7
Donkeys	NA	NA	NA	NA
Pigs	0	0	0	0
Chicken	1	1	0	0
Turkey	0	0	0	0
Ducks	0	0	0	0
Geese	0	0	0	0
Rabbits	0	0	0	0

Comments:

- *In situ* conservation: includes all measures to maintain live animal breeding populations, including those involved in active breeding strategies in the agro-ecosystem where they either developed or are now normally found, together with husbandry activities that are undertaken to ensure the continued contribution of these resources to sustainable food and agricultural production, now and in the future.
- *Ex situ* conservation: genetic material within living animals but out of the environment in which it developed (*Ex situ in vivo*), or external to the living animal in an artificial environment, usually under cryogenic conditions including, *inter alia*, the cryoconservation of semen, oocytes, embryos, cells or tissues (*Ex situ in vitro*). Note that *ex situ* conservation and *ex situ* preservation are considered here to be synonymous.

No each of breeds given in table 3.1 (considered at risk) receives the incentives from government or nongovernmental, private, market organizations.

Table 5.2 Current number of breeds receiving incentives and for which various tools for management of *ex situ* conservation programmes are used

Species	Incentives			Tools				
	Gov.	NGO	Market	Semen storage	Embryos storage	DNA/Tissue storage	<i>In vivo</i>	Monitoring system
Cattle dairy+dual p.	2	0	0	2	2	0		2
Cattle beef	0	0	0	0	0	0		0
Sheep	0	0	0	0	0	0		0
Goats	0	0	0	0	0	0		0
Camels	NA	NA	NA	NA	NA	NA	NA	NA
Lamas and Alpaca	NA	NA	NA	NA	NA	NA	NA	NA
Horses	0	0	0	7	0	0		7
Donkeys	NA	NA	NA	NA	NA	NA		NA
Pigs	0	0	0	0	0	0		0
Chicken	0	0	0	0	0	0		0
Turkey	0	0	0	0	0	0		0
Ducks	0	0	0	0	0	0		0
Geese	0	0	0	0	0	0		0
Rabbits	0	0	0	0	0	0		0

Comments:

- In vivo, such as zoological garden, farm park, etc.
- Incentives means any kind of support (human and financial resources, tax waving, higher prices, etc.) that stimulates conservation programmes of AnGR
- Monitoring system refers to the number of schemes in which more than 10% of population size is conserved.

Table 5.3 Current number of breeds receiving incentives and for which tools for *in situ* conservation programmes are used

Species	Incentives				Technical tools			
	Gov.	NGO	Market	Private	Recording	AI	ET	Others
Cattle dairy+dual p.	2	0	0	0	2	2	2	0
Cattle beef	0	0	0	0	0	0	0	0
Sheep	3	0	0	0	3	0	0	0
Goats	0	0	0	0	0	0	0	0
Camels	NA	NA	NA	NA	NA	NA	NA	NA
Lamas and Alpaca	NA	NA	NA	NA	NA	NA	NA	NA
Horses	7	0	0	0	7	7	0	0
Donkeys	NA	NA	NA	NA	NA	NA	NA	NA
Pigs	0	0	0	0	0	0	0	0
Chicken	1	0	0	0	0	0	0	0
Turkey	0	0	0	0	0	0	0	0
Ducks	0	0	0	0	0	0	0	0
Geese	0	0	0	0	0	0	0	0
Rabbits	0	0	0	0	0	0	0	0

Comments:

- AI = Artificial Insemination; ET = Embryo Transfer.
- Incentives means any kind of support (human and financial resources, tax waving, higher prices, etc.) that stimulates conservation programmes of AnGR.

Table 5.4 Stakeholders involvement in the management of conservation programmes

Stakeholders	<i>In situ</i> Conservation	<i>Ex situ</i> Conservation
Government	3	2
Breeder's associations	4	4
Private companies	2	4
Research institutions/universities	3	3
NGO's	1	1

Comments: Assign scores (1 = none, 2 = little, 3 = regular, 4 = more, 5 = high) based on thorough analyses of data available, to indicate the degree of involvement of each stakeholder on conservation programmes.

Table 5.5 Priority of needs for utilization of technologies for *in situ* conservation programmes

Technology	Needs			
	Knowledge	Training	Financial resources	Technology
Recording	2	3	3	3
Genetic evaluation	2	3	3	3
AI / ET	1	2	3	3
Molecular techniques	4	3	4	4
Breeder improvement techniques	3	4	3	3

Comments:

- AI= Artificial Insemination; ET= Embryo Transfer
- Assign scores (1 = none, 2 = little, 3 = regular, 4 = more, 5 = high) to indicate the priority of solving specific needs in order to use technologies to support conservation programmes.

Chapter 6. The State of Policy Development and Institutional Arrangements for AnGR

Justification and Use

The purpose of this chapter is to identify policies related to the use, development and conservation of animal genetic resources. It summarises needs and identifies the main priorities to be considered in policy development for animal genetic resources management.

Table 6.1. Effects of existing policies and legal instruments on the utilization (use and development) of AnGR

Species	Urban/peri-urban systems		Rural production	
	Industrial systems	Small-holder systems	Industrial systems	Small-holder systems
Cattle	1	1	2	1
Buffalo	NA	NA	NA	NA
Sheep	3	3	3	3
Goats	3	3	3	3
Camels	NA	NA	NA	NA
Lamas and Alpaca	NA	NA	NA	NA
Horses	3	3	3	3
Donkeys	NA	NA	NA	NA
Pigs	2	1	2	1
Chicken	1	1	1	1
Turkey	1	1	1	1
Ducks	1	1	1	1
Geese	1	1	1	1
Rabbits	1	1	1	1

Comments: Assign a score (1 = none, 2 = little, 3 = regular, 4 = more, 5 = high) to indicate the extent that existing policies and legal instruments support the use and development of AnGR.

Table 6.2 The focus of current policies on activities related to the utilization (use and development) of AnGR

Species	Activities			
	Use of exotic breeds	Use of locally adapted breeds	Training, research and extension	Organization of breeders/farmers
Cattle	2	4	2	3
Buffalo	NA	NA	NA	NA
Sheep	4	4	1	3
Goats	3	3	1	3
Camels	NA	NA	NA	NA
Lamas and Alpaca	NA	NA	NA	NA
Horses	3	4	2	3
Donkeys	NA	NA	NA	NA
Pigs	4	4	2	2
Chicken	2	3	2	2
Turkey	1	1	1	1
Ducks	1	1	1	1
Geese	1	1	1	1
Rabbits	1	1	1	1

Comments: Assign scores (1 = none, 2 = little, 3 = regular, 4 = more, 5 = high) to indicate the extent that current policies support activities related to the utilization of AnGR.

Table 6.3 Prioritising the needs to enable the development of AnGR policies

Needs	Required		
	Immediately	Medium term	Long term
Incentives	4	3	2
AL/ET	4	3	3
Mol. Gen.	4	4	4

Comments: identify the main needs for policy development and specify if it is critical (immediately required) or important in the medium or long term.

Table 6.4 The priority of future needs in policy development for AnGR conservation programmes

Species	Policy development related to:				
	Technology	Infrastructure	Human resources	Financial resources	Organizational structures
Cattle	3	3	4	5	3
Buffalo	NA	NA	NA	NA	NA
Sheep	4	3	4	5	3
Goats	3	3	3	5	3
Camels	NA	NA	NA	NA	NA
Lamas and Alpaca	NA	NA	NA	NA	NA
Horses		3	3	5	3
Donkeys	NA	NA	NA	NA	NA
Pigs	3	3	4	5	
Chicken	4	4	4	5	2
Turkey	4	4	4	5	2
Ducks	4	4	4	5	2
Geese	4	4	4	5	2
Rabbits	3	3	4	5	2

Comments: Assign scores (1 = none, 2 = little, 3 = regular, 4 = more, 5 = high) to indicate the priority for the development of policies to support AnGR conservation programmes.

Table 6.5 The priority of future needs in policy development for the utilization (use and development) of AnGR

Species	Policy development related to:				
	Technology	Infrastructure	Human resources	Financial resources	Organizational structures
Cattle	4	3	4	4	4
Buffalo	NA	NA	NA	NA	NA
Sheep	5	4	4	5	4
Goats	4	4	4	4	3
Camels	NA	NA	NA	NA	NA
Lamas and Alpaca	NA	NA	NA	NA	NA
Horses	4	3	3	3	4
Donkeys	NA	NA	NA	NA	NA
Pigs	4	4	4	3	3
Chicken	5	4	4	4	4
Turkey	5	4	4	4	4
Ducks	5	4	4	4	4
Geese	5	4	4	4	4
Rabbits	4	4	4	5	4

Comments: Assign scores (1 = none, 2 = little, 3 = regular, 4 = more, 5 = high) to indicate the priority for the development of policies to support the utilization of AnGR.