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# MANAGEMENT OF FARM ANIMAL GENETIC RESOURCES IN THE CZECH REPUBLIC

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## ABSTRACT

The paper describes the development of management of farm animal genetic resources in the Czech Republic, its development, achievements and experience. It mentions also recent policy of access to and exchange of animal genetic resources.
Management of genetic resources for food and agriculture in the Czech (Czechoslovak) Republic developed under very various conditions over time. For decades, like the economy generally, it has been under state administration and planning. In 1950, according to the law the control over breeding was taken by the state and the system of the State Breeding Authority was fixed up by the Breeding Act in 1959. A list of authorized breeds was specified with designated breeding regions for each of them, according to production and natural conditions; except these any import was allowed only for testing in our local conditions and for experimental and scientific purposes.

**Key words:** farm animal genetic resources; local breeds; conservation program; access and exchange policy

## INTRODUCTION

After 1990 this system was gradually decomposed. Free access to markets, privatization of breeding services and the invasion of foreign breeding companies resulted in huge expansion of foreign genetics, not something what could be called "responsible imports". In 2013, there we have for example 35 horse breeds and about 40 sheep breeds, while most of them are low-numerous, several tens or hundreds of heads.

The Breeding Act No. 240/1991 first ever declared a support to preservation of gene pools and forming gene reserves in low-numbered and endangered original breeds. A list of 29 national breeds was agreed and the first National Program on Conservation and Utilization of Farm Animal Genetic Resources established (1995).

Later amendments (No. 154/2000) respecting the EU framework recognized breeder's associations as carriers of stud books and charged them to formulate and warrant breeding programmes. The management of genetic resources of the mainstream breeds is since therefore completely dependent on the decision of farmers. But this is largely influenced by the market situation, trade policy and interests of breeding companies most of which are in foreign hands. In the utilisation of mainstream breeds, awareness of the importance of intra-breed diversity and of agricultural biodiversity generally is still low and setting of different measures and subsidy rules mostly ignores it.

Where the law there does mention preservation of animal genetic resources, definition „genetic resource" shall apply to animals and genetic material of autochthonous or locally adapted breeds only, which are filed into the National Programme. The program has been upgraded every 5 years, most recently in 2012. Since 1995 in the National Program there were gradually included 11 local livestocks and 2 poultry breeds, 10 rabbit and nutria breeds, 9 freshwater fish breeds and one honey-bee population.

In 2005, 34 source-lines of laying hen and water fowl used in hybridization programs and special experimental inbred populations of poultry for the

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**Table 1: Breeds included in the National Program**

| Species | Breeds |
|---|---|
| Cattle | Czech Red and Czech Spotted cattle |
| Horses | Old Kladruby Horse, Bohemio-Moravian Belgian horse, Silesian Noriker Horse, Hutsul horse |
| Pigs | Black-Spotted Prestice pig |
| Goats | White Shorthaired goat and Brown Shorthaired goat |
| Sheep | Sumavska sheep, Valachian sheep |
| Poultry | Czech gold brindled hen, Czech goose |

purposes of scientific research were also included into the National Program.

National Program is open to all breeders and the membership means an agreement between the program participant and the State. It establishes rules for breeding animals, i.e. respecting specific breeding schemes, keeping records and providing data, evaluation performance and utility traits upon the agreed method and providing samples and genetic material for a gene bank. The participant is to grant the material; costs of material collection, transport, testing and storage are covered by the State.

**Early warning system and inclusion into protection mode**

Data for breeds, as provided by breeders associations, are evaluated annually and breeds concerned are included into the various conservation modes, which confer specific measures and also affect the amount of support provided. The value of Critical population size Nek (limit for inclusion in protection mode) is based on the current size of the active population (Na) with regard to other indicators, like the generation interval, the average number of offspring, the length of productive life and the inbreeding coefficient of the concerned breed and is determined by the respective Breed Project.

The essence of the National Programme is the conservation of existing intra-breed diversity and the development and support of possibilities for its exploitation and in accordance with the globally-accepted procedures, both in-situ and ex-situ methods of conservation are applied. The *in situ* conservation is consisted in the regulation of breeding concerned individuals or groups (virtual nucleus) which are kept under purebred mating scheme according to given plan with the purpose to include their off-springs into the genetic nucleus.

The conservation *ex situ in vitro* is secured by conserving reproduction material (sperm doses,

**Table 2: Setting conservation provisions by actual population size (Na)**

| Na | Categories of endangerment | Conservation provisions |
|---|---|---|
| Na > 2 Nk | not endangered | regular monitoring, occasional collection samples for gene bank |
| Na = 1,2 to 2 Nk | vulnerable | random preservation of genetic material (semen doses, embryos, somatic cells) |
| Na < 1,2 Nk | | inclusion of breed (population) into protection mode |
| Na = 0,8 to 1 Nk | endangered | controlled mating system *in situ*, systematic cryopreservation of reproductive material *ex situ* |
| Na = 0,8 to 0,5 Nk | critically endangered | use of embryo transfer event. other biotechnology |
| Na < 0,5 Nk | not sustainable | considering the effectiveness of breed reconstruction |

embryos, somatic cells) in gene bank. Populations are continuously sampled for building a genomic collection (DNA).

**Access to and exchange of animal genetic resources**

Access to genetic resources is not specifically regulated by domestic legislation. A fundamental for this topic is that private persons, e.g. farmers and breeders, own the individual animals. This property right implies a right to use and sell it for propagation purposes. The access to genetic resources is then based on and regulated by private (commercial) law agreements and a common understanding among breeders of the rights associated with the material, and is functional. Export of live individuals claimed as genetic resources has to be reported and confirmed by the Ministry and in some cases access to animals which have been supported within the NP therefore might be limited. Usually, if the animal concerned left progeny qualified as breeding stock, there are no obstacles to confirm the export.

Ownership and disposition rights to the samples collected and stored in gene banks is governed by contracts between the provider of sample and gene bank; samples obtained with a financial support from the state are owned by the state. Genetic material from gene banks is provided after approval by a designated person. Provision of genetic material to regenerate/ reconstruct breed has the obligation to return back the same number and type of samples corresponding to biological and reproductive capabilities of the respective breed. Providing samples of genetic material for other purposes, for example for non-commercial research and education, is limited by the amount of disposable material, i.e. material can be granted if the stock will remain above the minimum values given in Table 3.

**Table 3: Minimum safety stock of cryopreserved material**

| | cattle | horse | pigs | sheep and goat |
|---|---|---|---|---|
| ID: minimum number of the doses remaining | >500 | >50 | >80 | >50 |
| Embryos: Minimum number of stored embryos | >100 | > 100 | >100 | > 100 |
| and minimum size of current female population | >500 | > 500 | >300 | > 500 |

**Achievements and lessons learned**

Achievements in conservation genetic resources can be assessed by internationally accepted indicators. The FAO evaluation criteria based on estimate of effective population size (Ne) are used.

Changes in seemingly non-problematic population can occur very quickly. At the beginning of the program, the number of the Czech Spotted cattle reached nearly 250 000 and in the year 2000 there about 30 000 dams still remained. After conserving 12 000 semen doses of 22 bulls and 950 embryos and the breed remained in the monitoring mode.

Then the breeder‘s association agreed to recognize mating the Czech Spotted dams to Montbéliarde and Fleckvieh bulls as purebred and reported the progeny still as Czech Spotted. After this period of massive upgrade breeding in 2009 from the newly licensed young bulls 76 % were sons of two top-ranked and partly related German Fleckvieh sires. In female population, only last 63 cows of wholly Czech origin remained. Testing the quality of semen doses of some bulls stored previously in the gene bank showed average to very low motility and unsatisfactory conception rate. Therefore, in 2011 the last 30 suitable dams were collected to a conservation nucleus with the aim to multiply the number to 100-150, dispersed into smaller groups across farms for *in vivo* conservation.

Marketing products from local breeds are considered to be the best support of conservation projects. Establishment of goat dairy farms and building market for their products after 1990 halt rapid decline in goat numbers and allowed the conservation of two local goat breeds. During the last decade, however, goat dairy farms due to continued growth in market demand for dairy products and meat rely on use exotic breeds, like Anglo-Nubian and Boer goat in the attempt to increase their production. Total goat numbers are growing, but the proportion of the two original breeds falls with a rather disturbing trend.

Therefore, we try to compensate for this disadvantage of the local breeds by facilitating access to innovative breeding methods. We provide breeders

**Table 4: Development of population parameters of breeds included in the National Program**

| | starting year | n fem | Ne | breed status | n fem 2013 | Ne 2013 | breed status |
|---|---|---|---|---|---|---|---|
| Cattle | | | | | | | |
| Czech Red cattle | 1995 | 16 | 10 | critical-maintained | 175 | 24 | endangered-maintained |
| Czech Spotted cattle | 2011 | 30 | 8 | critical-maintained | | | |
| Horses | | | | | | | |
| Old Kladruby horse | 1995 | 320 | 79 | endangered-maintained | 520 | 144 | endangered-maintained |
| Bohemio-Moravian Belgian horse | 2003 | 740 | 106 | endangered | 1 012 | 162 | not at risk |
| Silesian Noriker horse | 2003 | 320 | 88 | endangered-maintained | 476 | 103 | endangered-maintained |
| Hutsul horse | 1995 | 580 | 57 | endangered-maintained | 145 | 45 | endangered-maintained |
| Pig | | | | | | | |
| Black-Spotted Prestice pig | 1995 | 1 600 | 221 | not at risk | 120 | 105 | endangered-maintained |
| Goat | | | | | | | |
| White Shorthaired goat | 1995 | 32 000 | 4 318 | not at risk | 14 000 | 3 564 | not at risk |
| Brown Shorthaired goat | 1995 | 160 | 55 | endangered | 1 100 | 760 | not at risk |
| Sheep | | | | | | | |
| Sumavska | 1995 | 1 800 | 45 | endangered-maintained | 3 800 | 326 | not at risk |
| Valachian | 2004 | 170 | 36 | endangered-maintained | 500 | 97 | endangered-maintained |

n fem = number of active females
Ne = effective population size according to the formula Ne = (4MF/(M+F)) (Wright, 1931), where M and F are respectively the number of breeding males and females, modified by the model of Santiago and Caballero (1995) which takes in account selection in populations and is implemented in a simplified way as Ne x 0.7.
breed status = according to the FAO rank

with casein genotype analysis of their breeding bucks so that they select preferred genotypes which exhibit higher levels of milk protein and higher cheese yield. At the same time, however, we must ensure that within the population also other genotypes are used in a sufficient range.

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