maintaining

sustainable breeding

Genetic diversity is the basis of agriculture. Adapting populations of domestic animals through breeding is impossible without genetic diversity. Genetic diversity is part of the history of mankind and is essential for future improvements in agricultural production.

Conservation of diversity for future food production
The conditions in animal production systems, and the demand for animal products are changing constantly. Globally, a decreasing number of breeds is producing an increasing part of the total animal production. Many breeds have disappeared and within populations the genetic base is becoming increasingly narrow. Therefore, conservation of genetic diversity is necessary in order to be able to adapt to future situations. To this end, a broad genetic base should be maintained, comprising both visible and invisible traits.

Conservation of our cultural heritage
Domestic animal breeds of Dutch origin are valuable because they are part of the Dutch cultural heritage. Until the middle of the previous century, breeds were developed by Dutch breeders, farmers or herd books from genetic material that had been present in the Netherlands for centuries. Changes in animal production systems and related pressure on improvement of efficiency and production levels have resulted in replacement of local breeds by highly productive breeds. CGN aims at conservation of traditional breeds of Dutch origin in collaboration with breeders and the Dutch Foundation for Rare Domestic Animal Breeds (SZH).

Conservation of genetic diversity and eradication of animal diseases
Outbreaks of contagious diseases as classical swine fever or avian influenza and the subsequent eradication policies result in measures that are very often in contrast with the policy to maintain genetic diversity. Disease eradication programs may even lead to extinction of rare breeds or cause a too high rate of inbreeding. The latter has become evident in the scrapie eradication program, which started in 1998.
CGN supports policy makers and animal breeders to find solutions for these dilemmas.

Activities aiming at conservation of farm animal genetic resources
The cluster Animal Genetic Resources of CGN is involved in the following activities:
- Policy advice on conservation, management and sustainable use of animal genetic resources
- Development and management of gene bank collections of farm animals
- Research on improvement and development of methods for cryopreservation of genetic material
- Research to support conservation decisions and sustainable genetic management of breeding populations (conservation strategies)
- Monitoring of diversity in farm animals and documentation of gene bank collections and live populations
- Enhancement of international collaboration in the above areas

Gene bank collections
CGN is responsible for the management of two categories of gene bank collections of cattle, pigs, horses, sheep and poultry. The first category is the CGN collection of rare or small breeds. These collections belong to the public domain. The second category comprises collections of the Dutch Gene Bank Foundation (SGL). SGL is primarily responsible for the conservation of genetic diversity in commercially or widely used breeds.

Development of methods for cryopreservation
Cryopreservation programs rely on the efficacy and efficiency of methods for freezing, thawing, and post-thaw use of farm animal genetic material. Cryobiological research has rendered adequate methods for low-temperature storage of semen and embryos –as well as tentative successes for oocytes–




the Dutch cultural herit

conservation for future food security

for several species. Current research carried out by CGN is contributing to improvement of efficacy and efficiency of such methods for semen of the species mentioned above.

Dutch gene bank collections of traditional cattle breeds of Dutch origin

Breed name	Number of males	Number of semen doses
Groningen White Headed cattle	23	7000
Deep Red cattle	7	2100
Friesian Red cattle	33	14000
Coloursided White Back cattle	9	2000
Dutch Belted cattle	5	2400
Dutch Friesian cattle	135	28000
Meuse Rhine Yssel cattle	100	24000

Number of breeds/lines per species in Dutch gene bank collections

Animal species	Number of breeds or lines
Cattle	8
Sheep	6
Horse	4
Pig	15
Poultry	6

Strategies for conservation of animal genetic diversity

There are two ways to conserve genetic material: in situ and ex situ. Conservation of live farm animals is generally considered as in situ conservation. Cryopreservation of reproductive material (or other genetic material) in liquid nitrogen (gene bank) is considered as ex situ preservation. CGN carries out research to develop and improve both in situ and ex situ conservation strategies. Moreover, CGN gives advice on improvement of genetic management of (small) populations of farm animals. In this respect, one very important element in genetic management of small populations is to avoid a too high rate of inbreeding. In this context, CGN contributes to (international) initiatives to develop guidelines for conservation.

In general, live (in situ) conservation of genetic diversity in farm animals or breeds is preferred to ex situ conservation of genetic diversity in a gene bank. However, there are several reasons to conserve genetic diversity in a gene bank. Gene bank material can be used:

- in breeding programs in case genetic problems (drift, inbreeding, genetic defects) occur in live populations,
- to reconstruct a breed in case of extinction of the breed, or loss of a substantial number of animals,
- to create new lines or breeds or to quickly modify or re-direct selection of a breed, and
- to analyze genetic diversity for research purposes.

Policy advice

The Dutch government ratified the Convention on Biological Diversity (CBD, 1992) and plays a leading role internationally in implementation of the Convention. CGN supports the Ministry of Agriculture, Nature and Food quality in this implementation process.

The Food and Agriculture Organization of the United Nations (FAO) also plays an important role in supporting conservation and sustainable use of genetic resources. FAO co-ordinates the global assessment of domestic animal

age

development and sustainable use

diversity and the development of a global strategy for animal genetic resources (FAO State of the World's Animal Genetic Resources). Upon request of the Ministry of Agriculture, Nature and Food quality, CGN co-ordinated the development of the Dutch country report on Animal Genetic Resources, which was part of the FAO co-ordinated process, and further supports its implementation.

International collaboration
CGN wishes to contribute to, and promote conservation of domestic animal diversity in the EU. Moreover, CGN supports activities and projects in the Asian region in close collaboration with FAO.

Monitoring and documentation
Gene bank collections are documented by CGN, Also, CGN is monitoring and documenting the status of Dutch breeding populations and collections of genetic material of domestic animals in de Netherlands. Data of Dutch genetic resources are registered in databases and CGN regularly updates national, European and global websites (www.absfocalpoint.nl, www.tiho-hannover.de/einricht/zucht/eaap and www.fao.org/dad-is).

Collaboration
CGN is a public institution and works closely together with different partners and stakeholders:
- Dutch Foundation for Rare Domestic Animal Breeds (SZH)
- Dutch Gene Bank Foundation for Domestic Animals (SGL)
- Herd books, breed societies and breeding organizations
- Animal Sciences Group of Wageningen UR
- Veterinary Faculty of Utrecht University
- Food and Agriculture Organization of the United Nations (FAO)
- European Regional Focal Point for Animal Genetic Resources (ERFP)
- European Association for Animal Production (EAAP)

Number of Dutch rare domestic animal breeds and their status (SZH and ID-Lelystad, 2002)

	Cattle	Horse	Goat	Sheep	Poultry	Duck	Rabbit	Goose	Pigeon
Critical, decreasing								1	2
Critical, stable					1	3	2		2
Critical, growing							1		1
Endangered, decreasing		1					1		2
Endangered, stable				4	23	1	4		6
Endangered, growing	2	1		1	4				
Vulnerable, decreasing		1							
Vulnerable, stable	1		1	1	4		3		2
Vulnerable, growing	2			3		1	1		1

a broad genetic base

WAGENINGEN UR
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Animal Genetic Resources within CGN

The Centre for Genetic Resources, the Netherlands carries out statutory tasks (WOT) related to biodiversity and identity of species relevant for agriculture and forestry, under a mandate of the Dutch Ministry of Agriculture, Nature and Food Quality. Genetic resouces have a current or potential value for food production and agriculture. CGN's mandate includes crops, trees and farm animals. The cluster 'Animal Genetic Resources' focuses on the conservation and promotion of the sustainable utilization of genetic diversity in farm animals.

information

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The Centre for Genetic Resources, the Netherlands is an independent research unit of Wageningen UR that assists the government in its statutory tasks. The reliable and independent implementation of this work is ensured in the Statute for Statutory Tasks.

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conservation and sustainable use of animal genetic resources

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