National Report on Animal Genetic Resources, the Netherlands

A strategic policy document

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Contents

Foreword

The conservation and responsible use and management of genetic resources are currently major topics from both a political and policy perspective. This report is a strategic policy document for the Netherlands covering the subject of animal genetic resources, prepared at the request of FAO (the Food and Agriculture Organization of the United Nations.

This report has been completed under the auspices of the Ministry of Agriculture, Nature Management and Fisheries. A substantial group of stakeholders made a contribution.

Now that this report is complete, I would like to express my intention to continue supporting the policy regarding Dutch animal genetic resources, nationally and internationally, in both word and deed. In addition, I hope that the private sector and social organisations will take responsibility for their respective roles.

I trust that you will find this report a pleasant read. Additionally, may I also express my hope and expectation that it will result in actions that make a substantial contribution to the conservation, development and sustainable use of genetic diversity in farm animals.

The Minister of Agriculture, Nature Management and Fisheries of the Netherlands,

prof.dr. C.P. Veerman

Summary

In March 2001, the FAO invited the Dutch Government to prepare a national report on animal genetic resources in connection with the State of the World's Animal Genetic Resources process. The Dutch National Report will contribute to forming a regional and global strategy concerning animal genetic resources. It is also a significant report for the Netherlands itself.

The National Report is a strategic policy document, starting with an inventory of the existing genetic resources and a profile of the livestock sectors within the Netherlands. This inventory is followed by an analysis of the policy regarding animal genetic resources and the existing capacity and infrastructure, including a summary of the expected changes and developments within the livestock sector. Following this analysis in Chapters 1 to 3, policy priorities for both national issues and international cooperation are determined in Chapters 4 and 5.

Chapter 1 starts with a description of the agricultural sector within the Netherlands, including developments in the animal production sectors. Dutch livestock farming developed tremendously during the second half of the 20th century, a period when economies of scale, specialisation and intensification were significant trends. Animal production within the Netherlands is much focused on export. Growth has currently levelled out across virtually all sectors. Initially, the environmental policy, combined with the introduction of the milk quota system, stabilised the volume of animal production. Following the swine fever and foot and mouth disease outbreaks, however, expansion of the national pig and poultry sectors was restricted. Sheep stock has substantially decreased after the initial growth due to the milk quota system. Various farm animal breeds increasingly fulfil different functions, such as nature and landscape management, recreation, sports and health care farms.

The variety of farm animal breeds, as well as the genetic diversity within the breeds, has significantly decreased over recent decades. Worldwide, as well as within the Netherlands, an increasingly small number of highly productive breeds or lines produces a rising proportion of the food. Breeds disappear or become endangered for financial and economical reasons, as a consequence of the liberalisation of world trade, and due to far-reaching globalisation and the standardisation of production systems.

The Dutch animal breeding sector enjoys an established international position with respect to poultry, pigs and dairy cattle. Diversity within the principal dairy cattle breed (Holstein Friesian) has decreased significantly and its genetic basis is considered to be narrow worldwide. Globally, only a limited number of breeding organisations are active within the poultry sector. The major part of commercial production utilises a limited number of breeds or lines. A similar development is taking place within the pig sector, although there are currently more active breeding companies than within the poultry sector. Due to their different structure, a greater diversity

exists within beef cattle, sheep and horses. An increasing diversity of breeds is employed both within nature and landscape management and for other (new) farm animal functions.

During the last decade of the 20th century, ex situ conservation of the existing genetic diversity (between and within breeds) was introduced using a gene bank. There is an increasing trend for stimulating in situ conservation of old Dutch farm animal breeds. However, it must be concluded that the attention for ex situ is too limited, and that in situ conservation would also benefit from further stimulation.

Chapter 2 deals with the national and European policy related to the conservation, development and use of genetic diversity. The EU's agricultural policy has had a major influence on developments within animal production and, therefore, on farm animal diversity, and this is unlikely to change in the future. At the beginning of 2002, the Dutch Government submitted a policy document called *Sources of Existence: Conservation and the sustainable use of genetic diversity* to its Parliament, determining the basis of the policy regarding genetic resources (plant, animal and microbial).

Both the Government and the private sector are responsible for ex situ conservation. Government policy regarding in situ conservation of farm animal breeds is limited. However, a subsidy scheme for rare breeds has been introduced, and nature and landscape management boards increasingly employ rare Dutch breeds. The policy of the Rare Domestic Animal Breeds Foundation (SZH) has substantially contributed to the conservation of old Dutch breeds. Meanwhile, an area of tension has been identified between veterinary and biodiversity policies. The policy of (large) breeding organisations is increasingly focused on limiting the increased incidence of inbreeding. This subject also deserves greater attention within rare breed populations.

The second part of Chapter 2 summarises the main trends and visions regarding the future of animal production. The first robust trend is further globalisation and liberalisation of world trade, and increasing international competition. In addition to the globalisation trend, there is also a shift towards regionalisation. Worldwide demand for animal products is increasing. The expectation is that the diversification of products of animal origin will increase, with a greater focus on added value. Differentiation and variety of products, production methods and production systems will gain in importance. The functions of farm animals will expand. There is increasing attention for the animals' natural resistance and behaviour (animal well-being).

Chapter 3 includes an analysis of the capacity and infrastructure regarding the conservation, development and the sustainable use of animal genetic resources within the Netherlands. Although the capacity and extensive infrastructure are adequate, changes in priority regarding knowledge development are required in order to support conservation, sustainable development and the use of genetic resources. Furthermore, the knowledge available should be transferred more extensively and widely, and used more in practice. There is room for improvement in terms of cooperation between the Government, research sector, private sector and NGO's (Non-Governmental Organisations). Finally, yet significantly, the importance of international cooperation is stressed.

After the analysis in Chapters 1 to 3, the policy priorities are outlined in Chapters 4 and 5. First, a number of basic principles for the policy are determined. In brief, these entail that the diversity currently still in existence must be effectively and efficiently safeguarded, and that the Netherlands is primarily responsible for genetic resources of Dutch origin. Genetic diversity is a shared responsibility of the Government, the private sector and NGO's. In most cases, a combination of in situ and ex situ conservation is required. The international context has a major influence on policies, and may sometimes limit the effectiveness of national policies.

The National Report is based on the general policy principles, which are expressed in the *Sources of Existence: Conservation and the sustainable use of genetic diversity* policy document. This policy document includes a recommendation for establishing a National Information Centre for Genetic Resources and a Platform for Genetic Resources. It also states that ex situ conservation (gene bank) for farm animals should be further developed, and that multilateral cooperation with the FAO, OECD and CGIAR should be increased. The Netherlands supports the EU policy principles regarding the integration of the sustainable use of animal genetic resources within the Common Agricultural Policy. It stresses the importance of prioritising knowledge transfer within the framework of development cooperation, and considers it imperative that indicators are developed for better monitoring of the policy progress.

The Dutch National Report determines the following policy priorities for the subjects below. These priorities are of a national or international nature, and sometimes a combination of both:

- Stimulating ex situ conservation (national and international);
- Establishing a platform for genetic resources (national);
- Harmonising veterinary and biodiversity policies (national and international);
- Stimulating in situ conservation (national and international);
- Determining the value of genetic diversity (national);
- Stimulating nature and landscape management to use Dutch breeds (national);
- Monitoring and characterisation of genetic diversity (national and international);
- Knowledge and technology development (national and international);
- Stimulating transparency within breeding policies (national);
- Stimulating public awareness (national);
- Stimulating desired production systems (national);
- Stimulating international cooperation;
- Establishing cooperative breeding programmes (international).

Introduction

In March 2001, the Food and Agriculture Organization of the United Nations (FAO), requested the Dutch Government to contribute to the State of the World's Animal Genetic Resources process by preparing a strategic national report on animal genetic resources.

The National Report structurally follows the FAO's guidelines, which aim for worldwide collation of national reports and information. The report starts with an inventory of the existing national genetic resources and a profile of livestock production within the Netherlands. This is followed by an analysis of current and past policies, and a summary of the expected changes and developments within the livestock sector. Based on this inventory and the analysis of the current situation, strategic policies and priorities regarding animal genetic resources are presented.

The National Report can be regarded as a new starting point for the policy regarding animal genetic resources and its implementation. It is considered to be a building block for the FAO's State of the World's Animal Genetic Resources, which will be used as a basis for a Global Plan of Action. Last but by no means least, the National Report is also of major importance for the Netherlands.

The current document is a report from the Minister of Agriculture, Nature Management and Fisheries. A diverse group of stakeholders contributed to the report, supporting the principles of the policy. These stakeholders are not merely interested in the subject; they have a partial responsibility for the conservation, development and use of animal genetic resources. This is of vital importance considering the Netherlands' position, knowledge and ambitions regarding these issues. This report can be seen as a new 'starting point' for the country's animal genetic resources policy and its implementation.
The content of this report is limited to those farm animals that are important to the Netherlands (mammals and poultry) as far as future food production is concerned. However, the report is not limited to this primary function of farm animals. Some breeds or varieties of farm animals, especially those that were important for food production in the past, are currently employed in other functions, such as in landscape or nature management. A number of these breeds are being further developed further in lieu of a different function, and in situ conservation is taking place. Although these breeds are currently not primarily interesting for food production, it ensures that the genetic material (breeds, genes) will be available for any future food production, other functions or combinations thereof.

The difference between in situ and ex situ conservation regarding farm animals requires clear definitions. In situ conservation is defined as the conservation of ecosystems and natural habitats, including conservation or recovery of viable populations or breeds within their natural environment (CBD, 1992). Domesticated or cultivated breeds are best maintained in the environment where they developed their

characteristic features. The Netherlands generally supports this line of thought: conservation of ecosystems and natural habitats is paramount; breeds and varieties deserve more attention if, for example, the volume of the population is reaching a critical limit, and/or the restoration of their environment has not yet been completed.

In practical terms, conservation via gene banks (sperm, embryo, DNA in liquid nitrogen) and zoos, for example, is considered ex situ conservation. All other forms of conservation are considered to be in situ, albeit that discussion remains regarding certain forms. For example, should the keeping of farm animals outside their original farm environment within private estates, children's zoos, nature and landscape management be considered in situ, or is this actually a form of ex situ conservation.

The Dutch report includes breeds, varieties (various colours) and lines (pigs, poultry). For definitions of, among others, breeds, varieties and lines, we refer to FAO publications (2000, 2001). For a list of abbreviations used in this report, please see Appendix 2.

1. The state of agricultural biodiversity in the farm animal sector

This chapter outlines the agricultural sector in general and, more specifically, the livestock sectors. It then describes the current status regarding the use and development of breeds, lines or varieties of farm animals, and summarises the history of farm animal diversity within the Netherlands. Finally, a review of in situ and ex situ conservation efforts is given. The chapter concludes with a summary of the main points.

1.1 The Netherlands and the agricultural sector

The Netherlands is part of Western Europe, and is located in the delta of the rivers Rhine and Meuse. It borders Belgium in the south, Germany in the east, with the North Sea forming the western and northern borders. The Netherlands enjoys a mild sea climate, with average rainfall of approximately 800 mm per year. Its precipitation is distributed quite evenly over the year. The Netherlands' surface area amounts to 41,500 square km, 18% of which is water. The total land surface therefore amounts to 34,000 square km, 60% of which is taken up by agriculture, 10% forested and the other 30% infrastructure and residences. The Netherlands has a population of approximately 16 million with an average life expectancy for men and women of 75 and 80 years respectively. This makes it a densely populated country, with approximately 400 persons per square kilometre.

The agricultural sector (vegetable and animal production combined), including the agricultural industry and trade, is an important part of the national economy. Agriculture accounts for 5% of the GNP and 4.5% of employment. The agricultural sector in total, including its trade and foodstuffs industry, contributes 11% to GNP and 10% to employment. The Netherlands is the world's third largest exporting country of agricultural products, surpassed only by the USA and France. The high level of organisation, a strong focus on international markets and the country's unique geographical position within Europe are essential factors benefiting access to export markets. The EU countries are the Netherlands' most important export markets for agricultural products. While the export of vegetable and animal products significantly contributes to its economic prosperity, the Netherlands is also a major importing country of agricultural products. Dutch agriculture is approximately five times more intensive than the EU average.

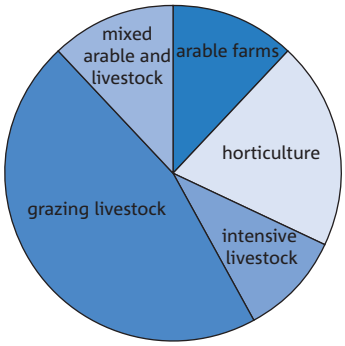
In 1989, the export value of agricultural products amounted to US$ 23 billion (25% of the Netherlands' total exports). With US$ 14 billion worth of imports (15% of the total imports), the trade surplus amounted to US$ 9 billion. By 1999, these figures had increased to US$ 35 billion (21%), US$ 21 billion (13%) and US$ 14 billion respectively. Although the volume of the agricultural sector is still growing, its relative importance is decreasing. Its contribution to the national trade surplus is still substantial. In 1999, the animal production accounted for 24% of agricultural exports and 19% of imports, compared to 38% and 22% in 1989. This indicates the declining importance of the agricultural sector.

Agricultural export, import and trade surplus value (billion US$)

	1989	1999
Export value	23	35
Import value	14	21
Trade surplus	9	14

Of the agricultural businesses, 12% are arable farms, 20% horticultural, 10% intensive livestock farms, 46% grazing livestock and 12% mixed arable and livestock farms. These percentages have hardly changed during the last decade. The total number of businesses with farm animals was 80,000 in 1990, and about 65,000 in 1999.

Distribution of farm types in the Netherlands



1.2 Animal production in the Netherlands

Over the past 50 years, livestock farming in the Netherlands has undergone major changes due to intensification, specialisation and economies of scale. This enabled the sector to establish a strong competitive position. The majority of Dutch animal products are intended for export. Intensification and economies of scale have not been applied to the same extent in all livestock sectors. The pig and poultry sectors have been most intensified, cattle breeding to a lesser extent, and the sheep sector has hardly been intensified at all.

Up to the 1970s, mixed farms (arable and livestock farms) abounded in the Netherlands, especially in the south and east of the country. Subsequently, significant specialisation occurred, resulting in large, highly specialised pig and poultry farms. In contrast to most cattle farms, these are not soil-bound. The number of farms with cattle, pig and/or poultry as its core business has continually decreased over the last 50 years, while production per company has rapidly increased. The move towards economies of scale in the livestock sector was accompanied by a strong trend for concentration and integration of the associated supply and processing industries. Since the 1990s, organic livestock farming has emerged, and the intention and expectation is that the organic sector will grow from 1% of the total in 2000 to about 10%.

Due to production quotas and economies of scale, a further decrease in the number of livestock farms is expected in the future. Agriculture developed so quickly in recent decades that the Government felt compelled to implement various measures to limit production. This will have a major influence on Dutch agriculture in the years to come. The introduction of the milk quota system in 1984 stabilised milk production. The implementation of strict environmental legislation, which started in the 1990s, halted the growth of pork meat production. A major outbreak of classic swine fever in 1997 revealed the vulnerability of the pig sector in its current form. A foot and mouth disease outbreak during 2001 demonstrated that this applies to all livestock sectors. The expansion of the pig and poultry sectors has been restricted by the Dutch Government via the introduction of production rights. Pig farmers willing to retire were allowed to enter a 'Purchasing Programme' introduced by the Government. This made a significant contribution to a major decrease of the pig stock.

The following sections describe the various animal production sectors. The cattle, pig, poultry, sheep and goat farming sectors may be regarded as the main livestock sectors in the Netherlands. The other sectors are less important with respect to volume, use of land, added value and contribution to food production. Although the economic importance of the horse-breeding sector is quite substantial, its importance to food production is limited. The last sections deal with the use of farm animals in nature and landscape management and other farm animal functions.

The pig sector

Pig farms can be divided into two sectors: sow herds (piglet production) and finishing farms (pork production). There are approximately 6000 sow herds with an average stock of 225 sows: the largest average number of pigs per farm in Europe.

The number of farms with sows has been halved since 1990, whereas the total number of sows has remained virtually stable. There are approximately 13,000 finishing farms in the Netherlands with on average 500 finishing pigs. The number of finishing farms has been halved since 1990, while the number of pigs per farm has dramatically increased. The gross domestic production of pork has remained approximately the same during the period 1991-1999. The total annual production amounts to 1.8 billion tons, 60-70% of which is destined for export. The volume of the total pig stock is gradually decreasing, mainly as a consequence of the *Purchasing Programme* and the *Restructuring the Pig Sector Act*, introduced after the outbreak of classic swine fever in 1997. The number of pigs within the Netherlands has meanwhile decreased to less than 13 million.

Number and average size of pig farms (1999)	
Number of sow herds	6000
Average number of sows per farm	225
Number of finishing farms	13000
Average number of pigs per farm	500

The poultry sector

The poultry sector can be divided into the egg sector and the poultry meat sector. In 1990, 70% of laying hens were divided over 779 specialised egg farms, resulting in an average of 29,500 animals per farm. In 2000, most laying hens (83%) were divided over 667 specialised egg farms, resulting in an average of 37,500 animals per farm. The number of egg farms is still declining, while the size of the farms continues to increase. Production of eggs for the consumer market was relatively stable between 1991 and 1999 at around 9.5 billion Dutch guilders. Approximately 70% of eggs for the consumer market are destined for export.

Number and size of specialised egg farms (2000)	
Number of specialised egg farms	779
Average number of laying hens per specialised egg farm	29,500
Percentage of total laying hens on specialised egg farms	83%

The poultry meat sector can be divided into the production of broilers and the production of eggs for hatching by broiler breeders. In 2000, most broiler breeders (85%) were divided over 281 specialised farms, with an average size of 16,200 animals. An increasing proportion of broiler breeders are located on a decreasing number of larger farms.

In 2000, most broilers (66%) were divided over 543 specialised farms with an average of 62,400 chickens. The remaining 34% are mostly located in mixed farms, combined with pigs, cattle or arable farming. The number of farms has decreased since 1990, while their size increased. The total number of broilers has risen from 40 million to 50 million between 1990 and 2000, with annual fluctuations of up to 10%.

Number and size of specialised broiler breeders and breeder farms (2000)	
Number of specialised farms producing eggs for hatching (broiler breeders)	281
Average number of animals per specialised farm	16,200
Percentage of total animals on specialised farms	85%

Number of specialised farms with broilers	543
Average number of animals per farm	62,400
Percentage of total animals on specialised farms	66%

Approximately 70% of all poultry meat is destined for export. The growth of poultry breeding in the Netherlands is restricted due to the introduction of production rights. Hobby farmers provide a wide range of (old) poultry breeds and varieties.

The cattle sector

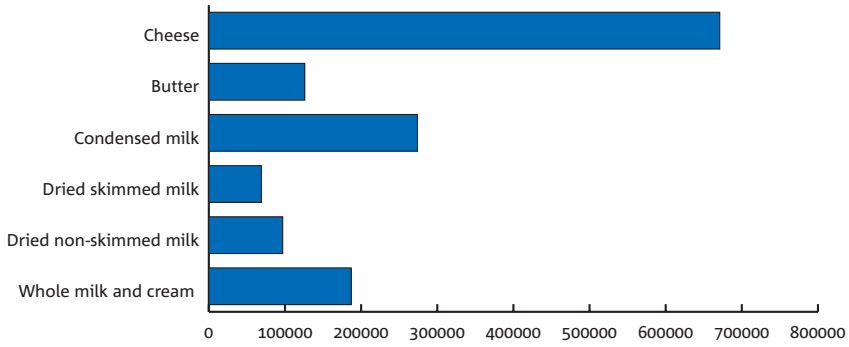
The cattle sector primarily provides meat and milk, with the latter mostly being produced on specialised dairy farms. The number of dairy farms (30,000) is declining, while the average size (54 dairy cows) is increasing.

Due to the milk quota, total milk production has remained fairly stable over the last 10 years, fluctuating between 10.5 and 11 billion tons. During the period between 1990 and 1999, the average milk production per cow increased from 6873 kg, containing 538 kg of fat and protein, to 8418 kg, containing 661 kg of fat and protein. The increased milk production per cow and the milk quota have resulted in a gradual decrease of the dairy cow stock. In 2000, the number of dairy and breeding cows amounted to some 1.5 million.

Number, size and production level of dairy farms (2000)	
Number of dairy farms	30,000
Average number of dairy cows per dairy farm	54
Average kg milk production per cow	8418
Average kg fat and protein production per cow	661

Approximately 15% of the total milk production is destined for the consumer market. Over the last 10 years, cheese production has increased to 671,000 tons. During 2000, butter production amounted to 126,000 tons, condensed milk production 274,000 tons, dried skimmed milk 69,000 tons, dried non-skimmed milk 97,000 tons, and whole milk and cream production 187,000 tons. These figures represent a decrease over the last decade of 29%, 32%, 1%, 43% and 45% respectively.

Approximately 75% of milk production is destined for export in the form of various dairy products. Two major dairy concerns with a combined turnover of approximately US$ 4 billion are responsible for the majority of dairy products, and mainly serve foreign markets.



Dairy production (2000) in tonnes

In addition, another ten smaller enterprises concentrate on specialist and non-food production. Beef is mainly produced on meat farms and comes from culled cows derived from dairy farms. Most beef animals are located in specialised farms with an average size of about 300 animals. Over 10,000 farms keep young livestock (especially bulls) for meat production. The average size of these farms is approximately 25 animals. The total gross production volume of beef and veal fluctuated around 500,000 tons during the period between 1990 and 1999. Meat and prepared meat product exports increased from 300,000 tons to 400,000 tons over the same period. Approximately one third of this total consists of veal.

The sheep and goat sector

After the introduction of the milk quota system in 1984, the sheep stock volume doubled over a six-year period to 1.7 million sheep and lambs in 1990. Subsequently, the sheep stock decreased again to about 1.3 million by 1999 due to lower price levels and the restriction of subsidy schemes. Most sheep (60%) were, and still are, located on cattle farms with an average of 75 sheep. One fifth of farms holding sheep stock are specialised sheep farms with an average size of 220 animals. A large proportion of the lamb production is destined for export.
During the last decade of the 20th century, the goat stock has roughly tripled to 180,000 animals.

The milk of 100,000 milk-producing goats is mainly processed industrially. This is in contrast to the modest sheep milk production, which is mainly processed on the farms where the animals are located.

Cattle farms appreciate sheep for their use in grassland management. This offers opportunities to the sheep sector in soil-bound (cattle) farms. Additionally, there are possibilities in nature and landscape management, and the grazing of marginal or less profitable lands such as dike grassland.

The horse sector
The Dutch horse sector is mainly focused on recreational use and equestrian sports, featuring a large number of riding stables, livery stables, stud farms, training stables and horse traders. The vast majority of the 500,000 horses in the Netherlands are under private ownership for use in equestrian sport, recreation or breeding.
The Netherlands exports a large number of horses for use in equestrian sports and breeding. Horse meat production is not a priority within the Dutch horse sector, being produced from horses that are no longer suitable for equestrian or recreational use.

Other livestock sectors
In the Netherlands, a limited number of ducks, furred animals, turkeys, rabbits and geese provide meat, eggs, feathers and skins. These sectors are of limited importance.

Nature and landscape management
The intrinsic and functional appreciation of farm animals without 'agricultural' functions is rather high within the Netherlands. The Netherlands still counts a fair number of characteristic breeds of farm animals, the majority of which is related to certain forms of land use. The productivity of most of these breeds, for example the milk production of the Dutch Belted and the Deep Red cattle breeds, is inferior compared to modern breeds such as Holstein Friesian. Especially from a cultural and historical point of view, characteristic Dutch genetic resources are maintained and increasingly used for functions other than food production. For example, rare cattle and sheep breeds are increasingly employed in nature and landscape management, thus establishing their importance in recreation and tourism.

Two objectives must be discerned within the nature and landscape management function: nature and landscape management in its proper sense, and its cultural and historical importance. These two objectives may be combined. Cattle, sheep, goats and horses are employed in maintaining and grazing nature reserves. In the past, large numbers of sheep (and sometimes cattle) were herded on heathland. Although the emergence of fertiliser has caused this form of livestock farming to all but disappear, some sheep herds remain. Initially, these herds were maintained from a folklore point of view, although recently they have increasingly been used as a management tool with respect to heathland conservation. In addition to sheep and goats, cattle and horses are increasingly employed for this purpose. Various models exist: sheep and goats are often herded, whereas private cattle owners often turn out cattle on small, fenced-in nature areas. Terrain management organisations increasingly purchase cattle and horses, employing rare (old) breeds for landscape maintenance. If autonomy and independence are required, for instance in the case of larger terrains, robust breeds with hardy properties are utilised. Generally, breeds similar to the original ancient cattle or horse are selected, such as Heck cattle or Scottish Highland cows, and Iceland or Konik ponies. None of these are Dutch breeds.

The majority of nature and landscape management within the Netherlands is in the hands of the Association for Nature Monuments (VNM), the National Forest Service (SBB) and Provincial Landscapes. In addition, the agricultural sector plays a vital part in landscape management and agricultural nature management. The agricultural landscape has considerable influence on the Dutch citizen/consumer's perception of nature and landscape.

Other functions for farm animals

Private owners increasingly own farm animals as a hobby. This form of livestock holding can be regarded as a new function for farm animals. Additionally, small numbers of farm animals are kept for recreation in children's zoos and on human health care farms. There are approximately 200 children's zoos in the Netherlands, which focus on education and recreation. Many own a wide variety of animals and keep rare domestic breeds. This constitutes a variety of new functions for farm animals. The aforementioned private parties own a fair amount of horses, small herbivores (sheep, goats) and rare poultry. The total number of animals held by this informal sector is substantial.

1.3 State of use of domestic animal diversity

Worldwide, an increasing proportion of our food is produced by a declining number of highly productive breeds/lines. According to FAO's 2000 World Watch List, many breeds have been lost, narrowing down the genetic diversity among farm animals. The survival of a large number of breeds is threatened.

Internationally, the Netherlands enjoys a prominent position in breeding farm animals, with Dutch animal breeding considered world class. The total trade value of these breeding efforts is estimated to be approximately 500 million euros (IKC, 1999). Dutch companies have an established position regarding animal starting material on the world market. Internationally, Dutch companies play a major part in laying hens, broilers, pigs and dairy cattle breeding. Breeding is of importance in other sectors as well, albeit on a more national level.

The Dutch livestock breeding sectors are highly organised, with a heavy concentration of breeding in almost all sectors. Between the various breeding organisations, the level of cooperation and integration has continually increased in order to realise cost reductions and increase the international competitiveness of their organisations. The cattle, pig and poultry breeding sectors in the Netherlands are dominated by one or two breeding organisations.

The breeding of farm animals is influenced by national and international market forces. The international market for genetic resources, in conjunction with the competitive positions of international breeding firms, determines the developments of genetic diversity in farm animals. On a global scale, the number of breeding organisations is decreasing, while the average size of the remaining ones increases. Livestock farmers choose breeding stock from these breeding programmes for the superior economic qualities of their products, leaving less opportunities for local breeding programmes.

Within the poultry sector, breeding is in the hands of just six companies (egg and meat sector combined), serving the entire world market. One of these breeding companies is established in the Netherlands. The majority of the chicken and turkey breeding material used within the Netherlands is bred outside the country. A similar development can be detected within the pig sector. The Dutch breeding organisations (except for poultry) are mainly operating within a cooperative structure. This means that the genetic resources are almost entirely in the hands of farmers or a large number of private parties.

The aforementioned scenario is an important factor for any trend analysis of animal genetic resources within the Netherlands and the evaluation of these trends.

Breed and lines (with breeding populations within the Netherlands) making a major contribution to food production

	number of breeding animals		number of breeding animals
Dairy cattle		**Scheep**	
Holstein Friesian	1650000	Texel	30000
Meuse Rhine Yssel	30000	Swifter	8500
Dutch Friesian Black & White	6000	Zeeland and Friesian dairy sheep	5500
Beef cattle		**Dairy goats**	
French, Italian and Belgian breeds	30000	Dutch dairy goat	20000
Broilers		**Pigs**	
White Plymouth Rock lines		Great Yorkshire lines	15000
White Cornish lines		Dutch Landrace lines	40000
Laying hens			
White Leghorn lines			
Rhode Island Red lines			

What follows is a description of developments per sector regarding the use and development of genetic resources in the Netherlands.

Dairy cattle

Until 1970, dairy livestock breeding in the Netherlands was quite clearly defined along breeds and colour lines. There was Holstein Friesian Black & White, Meuse Rhine Yssel (Red & White) and Dutch Friesian Black & White. Today, few pure breeds occur due to substitution crossing with the North-American Holstein Friesian. The Friesian Red and White , the Dutch Belted, Coloursided Whiteback cattle and Deep Red Cattle have always been small populations.

The genetic diversity within the pure Holstein-Friesian population has dramatically decreased due to the strict selection on a limited number of characteristics. A small

number of breeding bulls dominate worldwide breeding. The effective size of the Holstein-Friesian population is presently estimated at less than 100 animals. The same applies to other cattle breeds with worldwide occurrence, such as the Brown Swiss, Guernsey and Jersey (Weigel, 2001). Recently, some breeding programmes have been adjusted to include the conservation of genetic diversity, or minimise the increase of inbreeding as a requirement for genetic improvement. The algorithm applied in breeding programmes in order to limit inbreeding in selection programmes (Meuwissen, 1997) should in this respect be regarded as a breakthrough. In addition to the reduction of genetic variation between breeds, it must be mentioned that crossbreeding between the Holstein-Friesian, Monbeliardes, Brown Swiss and Jersey occurs on a small scale. This slightly enlarges the genetic basis, insofar as this does not include commercial crossings.

There are two main reasons for striving to conserve the old cattle breeds of the Netherlands: cultural and historical considerations, and conserving the total genetic diversity that currently exists. From research (H. Eding's thesis, 2002), it is apparent that the majority of rare cattle breeds contribute, albeit on a limited scale, to the total genetic diversity of cattle. This is caused by the fact that rare breeds (partially due to their limited populations) have relatively little variation within the breed compared to breeds with a larger population. Additionally, the genetic variation between the Dutch cattle breeds is limited compared to cattle breeds that occur in other parts of the world. This does not preclude that rare breeds can and should have unique properties, and should be conserved for cultural and historical reasons.

Meat breeds among cattle

After the introduction of the milk quota system in the 1980s, the volume of beef cattle stock and the number of various beef cattle breeds in the Netherlands substantially increased. Of all beef cattle breeds, the only one of Dutch origin is the Improved Red & White; its population currently includes approximately 4,000 cows and 50 bulls. The main foreign beef cattle breeds are the Belgian Blue, the Blonde Aquitaine, the Piemontese and the Limousin. The beef cattle stock has decreased from 65,000 animals to approximately 48,000 over the past ten years. The number of breeds is still increasing, however, which results in a greater diversity of products and more niche markets.

Pigs

Since the 1970s, most pigs are crossbreds resulting from three or four breeds/lines. The breeding organisations usually have two groups of pure lines: dam and sire lines. The main starting breeds in the dam lines are Landraces, specified by region (the Netherlands, Norway and Finland), and the Large White or Great Yorkshire. The Great Yorkshire, Duroc and Pietrain breeds are mainly used for the sire lines. Due to the closed nature of the pig breeding sector, the selection policy includes restrictions on the extent of inbreeding. Therefore, the genetic variation of the various breeds and lines seems to have been secured. The existing genetic variation is continuously monitored, and various sire and dam lines have been developed in order to serve new markets. In the past, the Dutch pig breeding organisations imported various foreign breeds for use in their breeding programmes. For the future, there is less introduction of foreign genetic material expected due to the

material that would contribute positively to commercial pig breeding programmes is available outside breeding organisations.

Poultry

At present, the basic lines among broilers are (White) Cornish and White Plymouth Rock. These breeds are the result of crossbreeding. Cornish are named after the English county of Cornwall, where the local Cornwall breed was crossed with the Malay (Indian Ruff) during the 19th century. The breed was further developed in the United States during the end of the 19th century and given the name Cornish. The Plymouth Rock was developed around 1850 in the United States by crossbreeding Asian breeds, such as Java, Brahma and Cochin, with the local American Dominque breed. As a result, the basis of present broilers is rather diverse. The question is whether new genes, breeds, lines or biodiversity have been included in breeding organisations' breeding programmes, and to what extent. Public information on this subject is not available.

Laying hens can be divided into breeds laying white eggs and breeds laying brown eggs. During the second half of the 19th century, the White Leghorn was developed in the USA from imported Italian and Spanish breeds. The Rhode Island Red forms the basis of the lines presently used for hens laying brown eggs. The Rhode Island Red originates from the USA, and was developed at the end of the nineteenth century by crossbreeding Cochin and Malay breeds imported from Asia.

The breeding organisations continually develop new lines that are better suited to the requirements of the market and/or the production system. It is safe to assume that breeding businesses will do everything possible to prevent any decrease in genetic improvement due to inbreeding. New lines are formed, and other lines disappear if they are not sufficiently competitive. It is not known to what extent the breeding organisations conserve the diversity of their lines. On one hand, conserving diversity is in the long-term interests of the private sector; on the other hand, the diversity of lines that do not survive the market mechanism will not be conserved for economic reasons.
The Netherlands possesses a wealth of old cultivated and domestic breeds outside the commercial circuit. Examples of old cultivated breeds are the Barnevelder, the Welsummer and the North Holland Blue (all results of crossbreeding). These are predominantly in the hands of hobby farmers and can be seen at country fairs and animal shows. The selection process within this informal sector focuses on exterior properties rather than performance and vitality (reproduction).

The expectation is that the extent of inbreeding within the old cultivated breeds and land races has greatly varied over the decades. Relations and genetic diversity have not been systematically recorded. Although a wide variation can be detected in a phenotypic respect, research shows that the contribution of rare poultry breeds to the total genetic diversity of poultry is relatively limited (Crooijmans, 1996 and Eding, 2002).

Turkeys, ducks, geese, rabbits
No breeding programmes exist within the Netherlands for these relatively small sectors. Genetic material is derived from foreign breeding organisations. There are populations of several old indigenous breeds of duck and rabbit present in the informal sector.

Sheep and goats
Over 40 sheep breeds and a number of goat breeds can be found within the Netherlands. The majority of sheep breeds originate from foreign countries, especially Great Britain. The sheep breeds include authentic dairy sheep, heath sheep and breeds that are primarily suitable for lamb meat production (Texelaar).

Heath sheep can be classed as a rare breed. Toggenburger and Saanen goats and the white goat, which is bred from the Saanen goat, are the main goat dairy producers. Two authentic Dutch goat breeds remain: the Dutch land goat and the Dutch spotted goat. The informal sector has a substantial number of pygmy goats.

Horses

A wide variety of horse and pony breeds are used primarily for equestrian sports and recreation, such as hacks, trotters, racehorses and draught horses. Three old Dutch horse breeds can be classed as rare breeds: Gelders horse, Groninger horse and Dutch draught horse. The Gelders and Groninger horses were crossbred with foreign blood, thus forming part of the basis for the current KWPN riding horses. Other Dutch horse breeds, such as the Friesian horse, increasingly attract domestic and foreign attention. Additionally, herd books for horse and pony breeds with foreign origins abound in the Netherlands.

Breeding programmes and selection

Breeding programmes and (natural) selection determine to what extent genetic diversity is lost or conserved. This applies equally to commercial breeding populations, stock holders, rare breeds and (semi) natural populations. Until the 1940s, genetic progress depended on the master's touch of the breeder, or breeder cooperations, with the emphasis being on the phenotype (appearance). Breeding made quantum leaps following the emergence of new techniques (artificial insemination, embryo transfer and hybridisation) and methods such as index selection.

Male cattle and female poultry reproduction capacity stimulate genetic erosion, since the best breeding animals can provide a large amount of offspring. The fact that the products of dairy cattle, pigs and poultry (meat as well as egg sector) are sold on very competitive international markets contributes to genetic erosion. An additional problem regarding dairy cattle is the international system for breeding value estimates (Interbull). In contrast, the breeding objectives of beef cattle and sheep breeds are based on regional and/or national regulations, and the breeds occur in a wide variety of environments. For these breeds, natural serving is common, which helps conserve a wide diversity of breeds, lines and varieties.

Over past decades, breeding programmes concentrated on efficient production and uniform quality of the product, especially within the pig and poultry sectors. Although other selection criteria played a role within these breeding programmes, this had substantial consequences for the number of breeds/lines that maintained a role in commercial breeding programmes. Within the poultry sector this effect was reinforced by the decrease in the number of international breeding operations due to mergers and take-overs.

Dutch breeding organisations are increasingly focused on realising genetic progress with respect to the desired breeding objectives, while conserving genetic diversity within the breeding population (minimising inbreeding). Recently, selection has focused on a larger number of characteristics, with health, well-being and life expectancy increasingly included in breeding objectives.

Nature and landscape management
Cattle, sheep and horse breeds are increasingly employed in grazing nature reserves and landscape management. Over 150 nature reserves of 100 hectares or more in the Netherlands use herds of farm animals for their management. Additionally, a large number of smaller areas use farm animals for nature and landscape management (about 300 areas in total). See Appendix 5 for details on the relative importance of cattle, sheep, goat and horse breeds for nature and landscape management within the Netherlands. The number of breeds, including those of Dutch origin, that are employed for these purposes is increasing.

1.4 State of conservation of domestic animal diversity

Genetic diversity can be conserved in a variety of manners: conservation by development and use, in situ and ex situ conservation. All breeds/lines that are (still) employed in commercial animal production can be conserved by development and use. Additionally, a breed or line can be conserved in situ or ex situ. Development and use may also be regarded as a form of in situ conservation.

Conservation by development and use
The best guarantee for conserving and maintaining genetic resources is to use them. The world market for livestock breeding products and the owners of animal genetic resources play a key role in this respect. The breeding objective, the selection method and the question as to which genetic resources are maintained as basis populations are decisive for whether genetic diversity is sufficiently safeguarded.
For example, the population of the world's dominant dairy cattle breed, Holstein-Friesian, is quickly declining in terms of effective numbers, possibly with negative consequences regarding inbreeding. The decrease in the number of enterprises marketing genetic material for poultry and pigs is a threat to genetic diversity due to widespread use of a limited number of parent animals and lines. The fact that an increasing proportion of the world food total is produced using a limited number of breeds is not necessarily a problem in itself. The core issues are: how do breeding organisations manage the risks of a decreasing genetic basis, and what safety net is available should 'calamities' occur?

The Dutch Product Boards for Livestock, Meat and Eggs (PVE) are co-administrators for the implementation and inspection of EU regulations pertaining to certification of breeding organisations. Herd books are assessed for the extent of inbreeding, using a minimum number of male animals per herd book. Each herd book is expected to indicate the status of the use of all registered male animals in its annual monitoring report.

In addition, an evaluation phase has been explicitly integrated in the selection programme for scrapie in sheep in order to ensure that desired properties have not been deselected in the process - particularly for breeds with smaller populations. This evaluation does not only apply to herd books that are aspiring to be certified as a pure breed herd book. It also applies to breeding organisations pursuing a certain commercial type or breeding hybrid lines. In general, it is safe to conclude that

EU criteria for certification and inspection of breeding organisations are clearly defined, and make a substantial contribution to the conservation and genetic improvement of breeds. However, EU certification and its associated inspections have limited relevance for the objective of limiting inbreeding in breeding populations and conserving genetic variation.

In situ and ex situ conservation

An increasing number of breeds or lines that were formerly of primary importance to food production can only be conserved currently if the animals fulfil a different function, or if they are supported through an in situ or ex situ conservation programme. These programmes should be seen as safety nets, guaranteeing the conservation of sufficient animal genetic resources.

The table below summarises how many rare farm animal breeds of Dutch origin should be regarded as endangered, vulnerable or close to a critical limit.
See Appendix 3 for more details on all rare breeds, including definitions of the terms critical, endangered and vulnerable.

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, declining								1	2
Critical, stable					1	3	2		2
Critical, growing							1		1
Endangered, declining		1					1		2
Endangered, stable			4		23	1	4		6
Endangered, growing	2	1	1		4				
Vulnerable, declining		1							
Vulnerable, stable	1		1	1	4		3		2
Vulnerable, growing	2		3			1	1		1

Considering the status of rare breeds, the breeding policies associated with these breeds deserve greater attention. Inbreeding is often a (potential) problem, occurring more often than is the case with commercial lines or widespread breeds.

Ex situ conservation using cryogenic conservation of genetic material in a gene bank was formally introduced in the Netherlands with the establishment of the Gene Bank Foundation for Farm Animals (SGL) in 1993. The management costs (the structural management of SGL) have always been sponsored by the private sector. The Ministry of Agriculture, Nature Management and Fisheries granted a lump sum subsidy at SGL's inception, and has financed a number of 'making up arrears' projects for rare breeds. Since 2000, the Ministry has been making a structural contribution to the gene bank activities.

As per 1 July 2002, the total gene bank collection consisted of sperm stock (and a limited number of embryos) of cattle, pigs, horses, sheep and poultry. See Appendix 6 for an overview of the genetic material conserved ex situ per 2002 within SGL's or DLO's gene bank collections in the Netherlands.
The gene bank's cattle collection is the most expansive. Sperm of all rare and commercial dairy cattle breeds has been cryogenically conserved within the gene bank. The quantity of sperm from rare cattle breeds is relatively limited. Regarding pigs, so-called 'snapshots' have been stored of all breeding lines represented in current pig breeding groups. For both horses and sheep, a special 'arrears' project was launched in order to conserve the sperm of three rare horse breeds and five rare sheep breeds. The quantity of poultry sperm (research lines and rare breeds) in the gene bank is still very limited.

Due to a number of reasons, the gene bank mainly contains sperm, and, in contrast, very few embryos, for example. Technically, cryogenic conservation of sperm is a tried and tested method, and logistically it is the most obvious method, since a number of sectors routinely use artificial insemination. Sperm storage in a gene bank can adequately safeguard the genetic diversity of commercial populations. Additionally, it is possible to regenerate a breed using substitution crossing. Although freezing embryos is a good alternative, it is relatively expensive. Its advantage is that it allows for conservation of the maternal as well as the paternal properties. Freezing ova is generally less reliable at this point in time.

1.5 Summary of main points

Sections 1.1 to 1.3 give an impression of animal production in the Netherlands, genetic diversity in farm animals and the conservation of genetic diversity in farm animals. This section summarises the key factors, which are used to determine policy priorities in Chapters 4 and 5.

- Animal production in the Netherlands, particularly the breeding sector, has a competitive international position. Commercial animal production in the Netherlands is not expected to further increase due to Government-imposed production ceilings for dairy cattle, poultry and pigs.

- The market mechanism and internationalisation form the main driving forces - or limitations - of developments regarding the conservation, development and use of animal genetic resources. As a consequence of globalisation, an increasing proportion of animal products is produced by a decreasing number of commercial breeds. This results in a reduction in the diversity of genetic material.

- In order to be certified, herd books and breeding organisations must comply with a number of requirements based on EU regulations. Despite this system, however, there is generally a limited insight into breeding with animal genetic resources or the management of animal genetic resources. This applies both to rare breeds and commercial populations.

- The uniqueness, variations and degree of contribution to the total genetic diversity of many breeds, lines and varieties have not been fully determined.

- The Netherlands has a substantial number of rare farm animal breeds, whose survival is basically continually threatened, mainly due to companies ending production, mass culling, and crossbreeding with and substitution for more productive breeds. Particularly from a cultural and historical perspective, is it worth conserving rare breeds in situ. There are numerous ways of finding added value for these breeds by giving them a function other than food production.

- Genes or genetic diversity can be stored in a gene bank - ex situ - for future generations at relatively low cost. Since selection in breeding programmes and in situ management by definition decrease genetic diversity, a gene bank is necessary to serve as a safety net or insurance contract. All the present genetic diversity of farm animals with a Dutch background has yet to be conserved in a gene bank.

2. Changing demands on livestock production

This chapter starts by evaluating the policies of the past few decades. There then follows a summary of the factors that were crucial to animal production development and, in conjunction, to animal genetic resources.

The second part of this chapter explores the (distant) future. The core issue in this respect is: what are the expectations for animal production within the Netherlands and beyond, what are the likely consequences of this, and which opportunities does this offer to the conservation, development and use of animal genetic resources?

2.1 Lessons from the past

This section contains a summary of the policy, strategies, management and breeding practices of recent decades, and the related consequences for animal genetic resources.

Agricultural policies and the European Union
From the 1960s onwards, agriculture, including animal production, developed at an extremely fast pace and transformed into a large-scale and efficient primary production, supply and processing industry. The foundation of the EC in the 1950s improved market access, which enabled a number of sectors to expand quickly. Supporting EC measures contributed to this development, including market support for sugar, glucose, milk and beef, but not for pork, poultry and eggs. Technological developments regarding breeding, stabling, food and animal care were equally influential to the volume and manner of animal production.

These developments resulted in increased production volumes and efficiency improvements. Achieving uniformity in starting material and final products was the objective. Diversification of consumer products continues to be the main priority for the processing industry today. An increasing proportion of commercial animal production involves a decreasing number of productive breeds or lines.

Within the Netherlands, the majority of livestock breeding is conducted on a high technological level. However, some counter trends exist. LTO (Agricultural and Horticultural Organisation) chose cows belong in meadows as its slogan for dairy livestock production. The most important driving force is maintaining a good image. Certain stabling systems are prohibited, partially due to European regulations. This applies, for example, to poultry batteries and tied sows in the pig sector. Additionally, free range systems and organic livestock farming have gained in importance.

Unfortunately, environmental problems accompanied progress. After the stimulation policy for the agricultural sector, from just after World War II up to the 1980s, it became apparent that livestock growth had reached its limits. Initially, the Government focused on environmental issues, followed by animal well-being, animal welfare and food safety, which were placed high on the political agenda at a later stage.

Policy genetic resources

The Dutch Government supports the treaty regarding biological diversity (CBD, Rio de Janeiro, 1992), aspiring to enable the unencumbered exchange of genetic resources and fair benefit sharing of the use of genetic resources. This perspective is expressed in numerous policy documents. At the beginning of 2002, the Dutch Government submitted the policy document *Sources of Existence: Conservation and the sustainable use of genetic diversity* to the Parliament. The basic CBD treaty philosophy is that countries have sovereign rights to their national genetic resources, but at the same time have an obligation to care for and provide responsible access to these genetic resources. With regard to the obligation resulting from the treaty concerning biological diversity, extra attention is required for the in situ conservation of genetic resources characteristic to the Netherlands. The cause of biodiversity conservation is served best by using these resources in a sustainable fashion.

Approximately 50 countries recently passed legislation, or introduced regulations, to implement the treaty's obligations on a national level. So far, the Dutch Government has assumed that additional legislation is not necessary and that access to, exchange and use of genetic resources can be based on the existing regulations under public law, supported by measures within the scope of private law.

The Netherlands holds a substantial economic interest in the accessibility of genetic material both worldwide and within the Netherlands. Storing genetic material within the Netherlands is important for a variety of reasons. It ensures access to the material, the material contributes to international networks, the quality of the starting material can be controlled, and conserving and testing genetic starting material for Dutch agriculture is best carried out under Dutch conditions. Regarding animal genetic resources, CBD's core items 'From common heritage to national sovereignty' and 'Access to and sharing the benefits of using genetic resources' are still to be worked out in detail.

Within livestock breeding, genetic resources (farm animal breeds and lines) are typically the property of cattle farmers or breeding organisations. Access to animal genetic resources is regulated by selling and purchasing genetic material. A proportion of the worldwide animal genetic resources are available to third parties, i.e. purchasable. The price typically includes all rights to the genetic material, which then transfer to the buyer. Supplementary conditions are normally not included in the terms and conditions of genetic material sales. Breeding organisations and cattle farmers determine to what extent genetic material is available to third parties and to what extent they protect their breeding populations. In general, pure breeds and lines are not available, in contrast to products resulting from these pure breeds and lines. In the case of poultry, the base lines have additional protection in the

form of hybrids that are available on the market.
Animals (or animal genetic resources) cannot be patented. In contrast, genes can be patented in the sense of the products that arise from them and the methods of detection. In principle, farm animal genetic material can be purchased under certain conditions, and is therefore available to third parties. Breeder's exemption has been defined for farm animal breeding. This means that cattle farmers are at all times allowed to breed with a product obtained from a different breeder, or from other parties in the market, in order to breed new varieties or sub-varieties for use on their own farm.

More extensive protection of genetic material by means of breeder's rights has yet to be deemed necessary. On the one hand, there is a need among breeding organisations to protect their breeding efforts and, therefore, their competitive position. On the other hand, it has been concluded that the structure within the sector offers sufficient protection, or that an open structure is desirable in order to retain access to an extensive pool of genetic material.

Ex situ conservation (gene bank)
The establishment in 1993 of the Gene Bank Foundation for Farm Animals (SGL) constituted the formal start of ex situ conservation of farm animal genetic material. The various sub-sectors of the private breeding sector, as well as the Foundation for Rare Domestic Animal Breeds (SZH), are represented within SGL. The Government, in the form of the Ministry of Agriculture, Nature Management and Fisheries, granted a lump sum subsidy at SGL's inception and has since financed a number of 'making up arrears' projects for rare breeds. By the end of the 1990s, SGL decided to transfer the management of its gene bank to ID-Lelystad, including a duplicate location within the Faculty of Veterinary Science.

In 1998, a committee advised the Ministry's Directorate of Agriculture to establish a policy for the management and conservation of agricultural biodiversity in Dutch gene banks. This advisory report was influential for the Ministry's decision to structurally contribute to conservation of farm animal genetic material in a gene bank via programme financing to DLO. In practical terms, this translated, for example, into structural contributions from the Ministry to cryogenic conservation of boar sperm derived from the commercial breeding sector.

After some time, all parties involved (the Ministry, SGL and DLO) concluded that the position, organisation, financial management and operational methods of the gene bank activities for farm animals were not sufficiently defined. Therefore, a discussion took place during 2001 on the topics of private and public (Ministry) interests, property issues concerning gene bank material, and intake and issuing policies. As a logical result of this discussion, the positions of SGL and the Ministry were clarified and specified regarding a better distribution of tasks with respect to ex situ conservation. The new positioning was accompanied by new, efficient and effective operational processes, which meet both parties' objectives. SGL specified its objectives during 2002, selecting ex situ conservation of commercial breeds and lines as its primary responsibility. The Government primarily focuses on rare and threatened breeds, and is responsible for biodiversity conservation in general.

Breeds and lines per species in SGL and DLO's gene bank collections (2002)

Cattle	**Horse**
Groningen White Headed cattle	Gelderland horse
Deep Red cattle	Dutch Draught horse
Friesian Red cattle	Groningen horse
Colourside White Back cattle	KWPN riding horse
Dutch Belted cattle	
Dutch Friesian cattle	**Pigs**
Meuse Rhine Yssel cattle	Over 15 breeding lines of Holstein
Friesian cattle	Dutch breeding organisations
Sheep	**Poultry**
Drente heath sheep	Welsummer
Schoonebeek sheep	Barnevelder
Mergelland sheep	Drente Fowl
Kempen heath sheep	Friesian Fowl
Veluwe heath sheep	North Holland Blue Fowl
	Twente Fowl

In 2002, the Ministry transferred the implementation of its Genetic Resources programme to the WOT unit (Legal Research Tasks) of the Centre for Genetic Resources, the Netherlands (CGN), which falls directly under DLO and carries out conservation activities regarding animal genetic resources. CGN is a separate DLO unit, which is independent from the ID-Lelystad and Plant Research International institutes. It is the only party carrying out legal research tasks regarding animal genetic resources and associated activities for the Ministry. The independence of this unit results from the Minister's wish to prevent any conflict of interest regarding other activities of Plant Research International (plants) and ID-Lelystad (animals). CGN proposed to SGL to store and manage SGL's gene bank collection in addition to the collections it manages for the Ministry.

In situ conservation

The Dutch Government supports the obligations of the CBD treaty by giving special consideration to in situ conservation of genetic resources that are characteristic for the Netherlands. Conservation under natural circumstances is paramount. The opinion that agricultural biodiversity is best served by its sustainable use (and not just agricultural use) prevails. Breeds and varieties should be given extra attention if, for example, a population's volume has reached a critical limit and/or the restoration of their natural environment has not been completed.

The Government has formulated very little policy regarding in situ farm animal conservation. Apart from a limited subsidy scheme for rare breeds of farm animals, in situ conservation is left to private initiative. The Dutch Rare Breeds Foundation (SZH) has played an important role in stimulating the conservation of old Dutch breeds during the past 25 years.

Policy regarding Rare Domestic Animal Breeds
The Subsidy Scheme for Rare Farm Animals, which applies in all EU countries under the European Regulation 2078/92/EEG, was first introduced in the Netherlands in August 1998. The objective of this scheme is to stimulate parties owning rare breeds to help conserve them by maintaining or expanding the current number of animals. The scheme was introduced for a second time in March 2002.

The foot and mouth disease crisis in 2001 resulted in a constructive cooperation between large-scale area management organisations (VNM, Provincial Landscapes, SBB) and SZH. This is regarded as an opportunity for the conservation of rare grazing breeds, the more so if the aforementioned organisations carry out an active policy in this respect. The current positive attitude may lead to a substantial increase in the use of Dutch breeds in terrain management.

Veterinary policy
There are an increasing number of examples that illustrate the tension between veterinary regulations and the objective of conserving biodiversity. During the foot and mouth disease outbreak in the Veluwe National Park in 2001, herds of rare sheep breeds were subject to mass culling. This foot and mouth outbreak demonstrated the vulnerability of rare breeds to disease outbreaks, the more so if a breed is concentrated in a certain region. As a consequence of the foot and mouth crisis, the Ministry's Department of Nature Management created the possibility to store sperm of five rare sheep breeds in a gene bank using a special emergency process as a form of additional conservation insurance. The Ministry is currently evaluating how the veterinary policy may be better attuned to nature and biodiversity policies.

The national veterinary policy regarding collection, trade and usage of sperm virtually coincides with the EU's veterinary policy, which was primarily designed for trade within the EC. Regarding cattle, the use of sperm extracted from bulls that have not been checked for the IBR disease is prohibited. The strict veterinary regulations may cause individual cattle breeders and small-scale breeding groups to resort to natural serving.

Sperm of older bulls with an uncertain health status is stored in the gene bank. Since diseases may be transferred via sperm, using this genetic material of unknown status is, in principle, not allowed under the current regulations. These regulations do not even permit setting up a duplicate location in a different country as part of risk management. The gene bank, or the genetic material in the gene bank, currently has no official legal status. Consequently, the gene bank must be granted a continuous exceptional status for most of its activities. In 2001, ID-Lelystad described such safety aspects of animal gene banks, indicating which possibilities exist for the gene bank to safely manage intake, management and issuing processes.

Reducing sensitivity to scrapie in sheep will become a European obligation. This will be realised by excluding all rams from the breeding process that are genetically susceptible to the disease. Due to the foot and mouth crisis and the possible relationship to scrapie, the implementation of the plans to eradicate scrapie will probably be accelerated. This is only possible by breeding with rams that are genetically r esistant. Little is known about the frequency of various scrapie genotypes among various breeds, including rare sheep breeds. Without adequate insight, allowing only resistant rams for breeding may mean the loss of vital hereditary variation. Therefore, it is important to chart the situation and status of each breed and subsequently decide on specific action plans.

The mandatory scrapie eradication programme may have far-reaching consequences for certain breeds; it may cause an increase in inbreeding levels and certain positive features may disappear if these are connected to the scrapie-sensitive genotype. An additional problem is that the genetic coding for resistance is (almost) non-existent in the case of some rare breeds. In most cases, however, scrapie has not been detected in these breeds.

Nature and landscape management - other functions for farm animals
The Government's policy stimulates conservation of authentic animal breeds as cultural and historical elements within a landscape, albeit to a rather limited extent. Major owners of nature reserves and culturally important landscapes within the Netherlands, such as VNM, SBB and Provincial Landscapes include this issue into their policy.

VNM's policy is based on three core issues:
1. Important natural and cultural landscapes;
2. Semi-natural landscapes;
3. (Managed) natural landscapes.

Old Dutch breeds are increasingly employed for the conservation of the first two types of landscapes. VNM endeavours to use threatened breeds if the terrain is suitable, although only in areas where they originally lived, historically and geographically.

The possibility of making authentic Dutch breeds more suitable to graze semi-natural landscapes for the purpose of nature management and year-around grazing is currently being investigated. SBB manages the largest amount (measured in surface area) of nature reserves and cultural landscapes. Its policy mainly focuses on using non-indigenous breeds, such as the Heck and Scottish Highlander breeds, for grazing and nature management, since these breeds are pre-eminently suited to these tasks. However, the question arises as to whether certain types of old Dutch farm animal breeds would also fit into this profile. There is a wide range of landscapes (usually small to medium-sized) to be managed. In addition, these organisations increasingly include conservation of rare breeds into their policy.

Breeding programmes and practice
Herd books and organisations for hybrid breeding have a direct interest in limiting the increase in inbreeding. The prevention of hereditary defects has been granted a higher priority, therefore, especially after a number of incidents among cattle. This cannot disguise the fact that the number of effective animals among the Holstein-Friesian breed is globally decreasing due to the high frequency of a limited number of breeding bulls (sires of sires), which increases the risks.

The increase in inbreeding is an issue among both hybrid lines and rare breeds. Inbreeding is prevalent among rare breeds, mainly due to breeding programmes that focus on a high level of uniformity despite the small number of animals. In the case of rare breeds, limiting inbreeding is essential. Although SZH has an advisory role regarding this issue, practical change takes time.

The Dutch Product Boards for Livestock, Meat and Eggs (PVE) are co-administrators of the implementation and inspection of EU regulations pertaining to certification of herd books and breeding organisations. The certification regulations include criteria regarding breeding objectives and minimum requirements for the population of each herd book or breeding organisation.

The EU regulations for breeding organisations and herd books, including Dutch regulations, currently allow breeding in animals of other breeds/herd books using ancillary registers and herd books. After two generations, the descendants of those animals can be registered in the main herd book or main register.

Obstructions to policy and legislation
Various policy issues have not been adequately harmonised with each other. Legislation and regulations are often restrictive, and do not always stimulate con-

servation of old breeds or conservation of genetic diversity. The most characteristic example is the tension between veterinary and biodiversity objectives (see specific section above). In addition, the administrative consequences of environmental regulations and the Identification and Registration Regulation often reduce the enthusiasm for conserving rare breeds.

2.2 Future demands and trends

This section focuses on the future, including global, European and national developments.

Global developments
It is expected that worldwide demand for products of animal origin will increase dramatically due to the growth of human population, rising incomes and urbanisation (FAO, Livestock to 2020, The Next Food Revolution, 1999). In addition to this growth, changes will occur in consumer food patterns. Developing countries are likely to show the largest increase in demand, while growth is expected to stagnate in richer countries, including in Europe. However, greater consumption diversification or changes in food patterns are likely to occur in the latter countries, as a larger proportion of consumers require a more varied menu of a higher quality. Product properties such as quality and safety, and increasingly the production method (environment and well-being), will influence the choice of products.

Further liberalisation of world trade is expected. This means that products that are now largely produced in the Netherlands or in Europe may, in the future, increasingly be purchased from elsewhere. Competition for Dutch and European producers will increase, which will further pressurise price levels.

European policy
The EU's (agricultural) policy has been, and will remain, highly influential on animal production in the Netherlands. Dutch livestock farmers benefited from the market support on sugar, glucose, milk and beef. The pig and poultry sectors mainly benefited from improved access to EC markets. The reforms of common agricultural policy will be continued during the years to come. Export subsidy schemes will be further reduced as a result of world trade liberalisation.)

In addition, the accession of Central and East European countries is expected to have a major influence on agricultural policy. These reforms will have consequences for the development of rural areas, the competitive position of Dutch animal production, the market for animal products and farm animal functions. Clearly, European agricultural policy has direct and indirect consequences for the conservation, development and use of animal genetic resources.

Restructuring Dutch animal production
In recent years, the Government commissioned and published a number of policy documents indicating long-term visions for animal production and green areas. Livestock sectors have also published their own long-term visions, which largely

agree with that of the Government. There are some issues where the Government and the private sector have different opinions, especially in relation to the desired volume and economic viability of current and future livestock production. Both parties are convinced that social acceptance is vital, as illustrated by the efforts of the dairy sector and the Government to increase pasturing for dairy cows: 're-establishing the cow in the landscape'.

The Ministry's visions are based on a cohesive green area, including integration of the quality of landscape, nature, agricultural products and production methods. This perspective is also the basis of European agricultural policy. The future will see a vital role for quality agriculture, expanding agricultural entrepreneurship and more rural area policies. Agriculture has a major part to play in managing and (re)vitalising rural areas. The Dutch Government envisions a sector that works in a sustainable manner and autonomously develops its international competitiveness. Sustainability in this context includes ecological, economic, social and cultural aspects.

Animal production is increasingly reaching its social, economic and ecological limits, particularly after the 1997 classic swine fever and 2001 foot and mouth outbreaks, and the fertiliser issue. Society places increasing demands on the development of green areas and the quality of rural areas. Rural areas are no longer the domain of agriculture: the agricultural sector must operate in a context of social responsibility, understanding and appreciation. In the Netherlands, which is highly urbanised, the recreational function of rural areas is important, and diversification makes rural areas more attractive. A multifunctional green area allows for a wide range of animal production systems.

Dutch consumers set ever-higher standards regarding their food, and an increasing proportion of consumers seem willing to pay more. Consumer acceptance is increasingly important when developing new products and production methods. Information on controlling and safeguarding food safety, product quality and animal welfare is increasingly an item within the chain. Multiple animal production systems are expected to develop, ranging from systems for agricultural nature development and nature management to industrial animal production systems, from developing large-scale bulk production to small-scale niche production, and all variations in-between.

The animal production sector must earn a social 'licence to produce'. In the eyes of society, the livestock sectors have exceeded the limits of what is acceptable and tolerable; the social license to produce is at stake. Respect for the natural environment and animals is paramount. Transparency, individual responsibility and new forms of cooperation are key words. Dutch animal production must fit into the context of a highly developed, urbanised environment. The sector must reduce its focus on prices and homogenous products, focusing instead on product differentiation and added value. The sector's future includes a wide variety: organic products as well as current production methods, regional produce as well as export produce, intensive animal production as well as soil-bound. Livestock breeding systems must be based on the animals' behavioural characteristics, and should stimulate the animals' resistance to various disorders.

The Netherlands is on the verge of making fundamental decisions regarding the sustainable and socially acceptable development of its animal production sector. Animal production restructuring is, and is expected to remain, a major issue in the Netherlands.

2.3 Summary of main points

This section summarises sections 2.1 and 2.2, especially the factors that were or will be most influential for developments in the livestock sectors, and in particular for animal genetic resources.

- During the second half of the 20th century, European and Dutch stimulation policies, in conjunction with technological developments, resulted in a cost price reductions, economies of scale, an increase in production efficiency and greater uniformity of starting material and end products. The result was a loss of genetic diversity.
- Internationalisation of the markets for animal products and genetic material continues. The Dutch breeding sector has a competitive position in the international market for breeding material. The market mechanism increasingly determines which genetic resources remain available within the Netherlands, and which genetic resources are used. The proportion of international, national social and private sector interests fluctuates continually, yet it remains an important basis for national policy regarding animal genetic resources.
- The consequences of CBD's basic philosophy on conservation, development and use of animal genetic resources must be worked out in detail.
- The (economic) driving forces for the conservation of less productive breeds are insufficient. The policy to promote in situ conservation of rare breeds has hardly been implemented. Although farm animals are increasingly used in different functions, these functions have not sufficiently matured, thus remaining unsustainable in an economic respect.
- Breeding programmes increasingly appreciate the limitation of inbreeding and the expansion of the breeding objectives. On the other hand, the number of commercial breeds (dairy cattle, poultry, pig) is decreasing. This is mainly due to internationalisation of livestock breeding and the open world market for livestock breeding products.
- The efforts towards the ex situ conservation of farm animals in a gene bank have been limited.
- Various policy areas, legislation and regulations are insufficiently coordinated on a national as well as an international level, which has a negative effect on the conservation of genetic diversity. Veterinary regulations are especially ill suited to the policy on the conservation of biodiversity.
- The global, European and national trends and expected changes can be summarised as follows:
    1. Increasing globalisation, liberalisation of world trade and international competition;
    2. Globalisation as well as regionalisation;
    3. Increasing diversification of animal products and more added value;
    4. Worldwide increase in demand for animal products;
    5. Differentiation and variety in production methods and production systems;
    6. Expansion of functions for farm animals;
    7. Greater attention to resistance and natural behaviour of animals (animal well-being).

3. State of national capacities

This chapter describes the institutional set-up, including which organisations are active and whether the available capacity is sufficient to realise the policy objectives regarding the conservation, development and use of animal genetic resources. The end of the chapter contains a summary of the bottlenecks.

3.1 Overview of Dutch capacity

This section summarises the quantity and quality of capacity available from the public and private sectors, research, education and NGO's.

National Government
On behalf of the Dutch Government, the Minister of Agriculture, Nature Management and Fisheries is responsible for implementing the Convention on Biodiversity (Rio de Janeiro, 1992) and the general Government policies regarding genetic resources. Compared to plant genetic resources, the attention for animal genetic resources within the policy is limited.

The Product Boards (PVE) are jointly responsible for animal genetic resources. PVE implements EU regulations regarding certification of breeding organisations, and is responsible for the associated inspections. In compliance with EU regulations, the implementation of EU regulations is entirely the responsibility of the private breeding sector.

In the 1990s, FAO launched the development of a Global Strategy for the Management of Animal Genetic Resources. At the request of FAO, the Ministry of Agriculture, Nature Management and Fisheries designated a National Focal Point for Animal Genetic Resources, being the Institute for Animal Science and Health (ID-Lelystad) and a national coordinator for animal genetic resources (also at ID-Lelystad).

Within the framework of EU regulations, the Ministry introduced a scheme allowing farmers to obtain a subsidy for keeping rare farm animal breeds. In line with its objectives to conserve farm animal breeds of Dutch origin, the Foundation for Rare Domestic Animal Breeds (SZH) is closely involved in drafting and implementing this scheme.

Centre of Genetic Resources, the Netherlands
In connection with the Dutch Government's international obligations (CBD), the Ministry structurally contributes approximately 1.3 million euros per year to the Centre of Genetic Resources, the Netherlands (CGN), a part of the DLO Foundation. This is within the framework of the Ministry's 366 "Genetic Resources" programme. These funds support the conservation of genetic resources in gene banks for plants and animals, and policy advice concerning genetic resources. Some 20% of the total

amount is currently spent structurally on animal genetic resources. About half this amount (in 2002) is available for actual conservation, management, documentation and the issuing of genetic material of farm animals in the gene bank. Additionally, the Ministry finances a number of 'arrear projects' for the conservation of genetic diversity among rare farm animal breeds.

The CGN also functions as the National Focal Point for genetic resources within the CBD framework. This Focal Point is responsible for a website providing an overview of genetic resources available in the Netherlands (www.absfocalpoint.nl).

Education and public information
The attention paid to the conservation, development and sustainable use of animal genetic resources in secondary, higher and university education is limited. There is room for improvement in terms of knowledge transfer from research to education, and communication with society regarding genetic resources is very limited. There are centres for Nature and Environmental Education, however, which circulate relevant information.

Research
The majority of research regarding animal genetic resources within the Netherlands is conducted at Wageningen University and Research Centre (Wageningen UR). Its animal genetic research has a leading position on both a national and an international level. Algorithms developed in order to prevent inbreeding in selection programmes (Meuwissen and others) can be regarded as an international breakthrough. Various researchers have developed this concept. They are part of an extensive international network and participate in various EU projects. This solid knowledge base enables responsible management of animal genetic resources, and providing national and international consulting on this subject.

Wageningen UR was privatised in 2000 and serves a wide variety of clients in addition to the Ministry of Agriculture Nature Management and Fisheries. The research directly related to conservation, development and sustainable use of animal genetic material (financed from the Ministry's 352 Programme) amounts to 225,000 euros over 2002. This involves support research in the field of genetics and cryobiology pertaining to the conservation of animal genetic material. The current capacity for transferring knowledge and technology to various users, breeders and breeder organisations is insufficient.

Breeding - private sector
The Dutch private breeding sector has developed a strong international position due to continuous long-term efforts to further develop farm animal breeds and marketable products. The Government's relatively influential involvement during the last part of the previous century has now been transformed into full privatisation and independence of the breeding sector and related activities such as public information and research. The Government focuses on its core tasks. Apart from direct governmental involvement regarding the gene bank for farm animals, the private sector (including breeding organisations, herd books, cattle farmers and

owners of genetic sources) independently determines the extent to which genetic variation is conserved and developed, or abandoned.
Most parties keeping Dutch and foreign breeds within the Netherlands are organised via herd books, breed associations or breeding organisations. This particularly applies to sheep, cattle, horses, and to a lesser extent to poultry and pigs.

The commercial breeding sector's objective is the continuous development and marketing of breeding material, nationally and internationally. The cattle and pig sectors mainly consist of cooperative companies employing a pool of genetic material from its member cattle and pig farmers. The poultry sector mainly features private companies using their own breeding lines.

Although state-of-the-art knowledge and technology on the responsible management of genetic resources is readily available within the Netherlands, it should be applied better or more expansively within breeding organisations, herd books and breed associations.

The Foundation for Rare Domestic Animal Breeds (SZH)
SZH has represented the interests of authentic Dutch farm animal breeds for the past 25 years. As well as promoting the conservation of rare breeds and colour varieties by various means SZH's core activities are:

- Public education via publications;
- Organising shows and trade fairs, such as "Vorstelijk Vee" (Royal Cattle);
- Certifying breeding centres
- Support herd books and breeding associations regarding breeding;
- Preparing and supporting policy regarding agricultural biodiversity in general and rare Dutch farm animal breeds in particular.

SZH is committed to conserving rare farm animal breeds of Dutch origin. The foundation is mainly run by volunteers, and includes one part time employee. Thanks to the volunteers, the personnel capacity of SZH, herd books and breed associations for rare breeds exceeds the number of people on the payroll.

Although SZH does not receive structural Government funding, the Ministry does provide project-based financial support. SZH's management costs are paid from donations and sponsorship. The available budget is not sufficient to both promote the conservation of rare breeds and advise on and supervise responsible genetic management of rare populations.

Nature and landscape management organisations
The three main nature and landscape owners in the Netherlands are the Association for Nature Monuments (VNM), Provincial Landscapes and the National Forest Service (SBB). These organisations are increasingly devoted to using rare breeds in nature and landscape management. They contribute to the sustainable management of nature and landscape, including responsible management of farm animal populations employing limited financial resources and a limited number of people.

3.2 Summary of main points

Although the Netherlands has substantial (personnel) capacity and a solid (knowledge) infrastructure, a number of bottlenecks exist with respect to the responsible management of animal genetic resources:

- The knowledge available regarding genetic management of animal populations is insufficiently utilised in practice. This applies particularly to smaller organisations that predominantly operate with volunteers.
- The cooperation between the Government, private sector, NGO's and research regarding the conservation, development and promoting sustainable use of animal genetic biodiversity must be worked out in detail.
- The input available for the farm animals gene bank (intake, management, issuing, documentation, characterisation, rationalisation, etc.) is quite limited.
- The Foundation for Rare Domestic Animal Breeds (SZH) has only a limited capacity for advice and support for in situ conservation and for genetic management of small populations of farm animals.
- Reduced research funding, especially from the public sector, is a threat to both the long-term availability of knowledge and to the continuity needed for supporting responsible genetic management of the animal genetic resources present in the Netherlands.
- Knowledge transfer and public education regarding genetic diversity in farm animals deserves greater attention.
- International cooperation (sharing knowledge, development, coordination, scope) must be stimulated.

4. National priorities

This chapter determines policy priorities based on the inventory and analyses of Chapters 1 to 3. The policy priorities are preceded by a number of basic assumptions for policy.

4.1 Basic principles for policy

- The general objective of the animal genetic resources policy is to secure the existing genetic diversity in an effective and efficient manner, and promote sustainable use and responsible management of the current genetic diversity. Diversity has dramatically decreased on a worldwide scale, with the loss of breeds and genetic diversity. The genetic variation between and among breeds or lines of farm animals that are still in existence must be secured. Consider for example the importance of conserving genes or gene combinations that determine resistance to disease and stress, quality and composition of the products and adaptation capability. As a result of selection, the genes associated with these properties may become lost unnoticed. At the same time, it is also possible that a new variation may emerge due to mutations. It is important to secure genetic diversity from the past as well as (desirable) mutations for posterity.

- It is of cultural and historical importance to conserve (rare) breeds that occur in the Netherlands. The Netherlands is primarily responsible for genetic resources and breeds of Dutch origin and breeds that have been developed in the country in the past. This responsibility also applies if the relevant breed (or a variation of it) still occurs outside the Netherlands. The Netherlands is not expected to take the initiative in supporting a breed that was imported from another country in the recent past, and occurs in the country of origin or in other countries. The Netherlands does take seriously its international responsibility to conserve genetic resources of non-Dutch origin if the relevant breed is exclusively present in the Netherlands. National and international priorities for conservation or support should be based on inventories and characterisation of breeds or lines. How rare or how threatened a breed is should be determined from an international perspective. Measuring whether certain unique breeds are at risk is possible via worldwide and regional inventories or analyses. If countries of origin cannot give priority to protecting these breeds, then the need for international support and cooperation is obvious. In such cases, the Netherlands will take its share of the responsibility.

- The public and private sector, as well as NGO's, are responsible for securing genetic diversity and the sustainable use of genetic resources. Although their responsibilities may vary, they also have a shared responsibility. There are several reasons for securing genetic diversity. Pure commercial interest and pure cultural and historical interest are the two extremes in this respect. From their

own specific or general responsibility, stakeholders will choose their own perspective regarding the conservation, development and use of animal genetic resources. The majority of these resources are in the hands of the private sector and foundations. Conserving genetic diversity will depend largely on the choices and activities of these owners.

- Genetic differences emerge between and among breeds due to (natural) selection focused on adapting individuals to their environment. The genetic diversity within populations of a limited volume is decreasing due to drift and selection. Mutations, in contrast, can provide an increase in a population's genetic diversity. However, it is not entirely clear under which conditions and with which population volume genetic variation can be considered constant (van Arendonk, 1999). In the case of relatively small breeding populations or populations conserved in situ, genes will be lost. These genes can only be conserved if stored in an ex situ gene bank. Current breeds and their properties are therefore only secure using a combination of in situ conservation or development and ex situ conservation in a gene bank. Despite the fact that ex situ conservation is often regarded as a safety net for breeding programmes and in situ conservation, it deserves greater attention in order to secure genes and their associated properties.

- Dutch policy has mainly been focused on setting (legal) frameworks for animal production and stimulating desired focal issues regarding animal production developments within those frameworks. The international dimension, in particular the market mechanism, has the greatest influence on animal genetic resources. The influence of national policy is limited .

4.2 Policy priorities

The Dutch Government has stressed in several policy documents the importance of the responsible use of genetic and natural resources. The 2002 policy document, *Sources of Existence: Conservation and the sustainable use of genetic diversity*, includes three basic elements regarding this issue:

1. Measures towards conservation;
2. Promoting sustainable application possibilities;
3. Cooperation towards a fair benefit sharing of the use of genetic resources.

Sources of Existence also indicates a number of priorities for further elaboration:

- Developing indicators in order to monitor and evaluate the progress of policy implementation;
- Establishing a National Information Centre for Genetic Resources;
- Establishing a Platform for Genetic Resources in order to stimulate social involvement;
- Developing the farm animals gene bank with input from both the public and the private sector;
- From an international perspective, expanding multilateral cooperation with FAO, CGIAR and OECD. Within the EU framework, the Netherlands aspires to increase the integration of the sustainable use of genetic resources within the Common Agricultural Policy. This includes the role of farm animals in multifunc-

tional agriculture, the cultural, historical, recreational and educational importance of farm animals, and the relationship between genetic erosion and animal diseases. Knowledge transfer, information and compensation are also topics with regard to cooperation with developing countries.

This Dutch policy document focuses specifically on animal genetic resources, and is based on the above-mentioned *Sources of Existence* policy document. It also includes a number of additional policy priorities specifically for animal genetic resources, which are listed below.

Ex situ conservation (gene bank)
While ex situ conservation in a gene bank has until now predominantly been positioned as a safety net for in situ conservation, this position deserves further elaboration. Compared with in situ conservation, ex situ conservation is more suitable to the purpose of securing genes and properties while minimising risks - at a lower cost. Storing genetic variation in a gene bank can limit the risk of recession in genetic variation by selection and drift. A well set-up and efficiently organised gene bank serves as an insurance policy for the future, especially for unforeseen circumstances. Moreover, the gene bank material can be used to support breeding programmes, especially for smaller populations. For these purposes, the Netherlands gives a high priority to ex situ conservation.

The Ministry of Agriculture, Nature Management and Fisheries and the Gene Bank Foundation for Farm Animals (SGL) both have specific responsibilities for ex situ conservation of genetic diversity of farm animals in a gene bank. The Government sees itself as responsible for conserving the total genetic diversity, specifically the genetic variation in rare breeds with a cultural and historical value. Via SGL, the private breeding sector is primarily focused on securing the genetic variation of its commercial breeding populations in order to record the attained genetic progress or to protect against calamities in the near or distant future. The public and private sector both expect NGO's to accept their share of responsibility for both in situ and ex situ conservation.

As a consequence of limited capacity and financial resources, the gene bank's objectives have not been completely met, especially with respect to non-commercial breeding populations. An expansion of gene bank activities with financial support from various stakeholders is required in order to store an accurate representation of all available genetic variation in the gene bank. Additionally, the farm animals gene bank may be expanded to include other types of genetic material in the future, such as embryos, ova and DNA, and possibly genetic material from other species, such as zoo animals, wild animals and pets. It is possible to rebreed a breed using conserved sperm and substitution crossing. All properties, including maternal properties, can be stored via ova or embryos. Storing other tissues or body cells offer possibilities in conjunction with current and future technologies, albeit that it will be expensive to recover an individual. When storing genetic material, it is important to plan in terms of possible technological progress regarding reproduction.

This policy document proposes the transfer of management and responsibilities regarding the organisation and positioning of gene bank activities to the Centre for Genetic Resources, the Netherlands (CGN). As of 2002, the Ministry outsourced the implementation of its Programme for Genetic Resources to the WOT (Legal Research Tasks) unit CGN, which falls directly under DLO Foundation, which is also responsible for the activities supporting conservation of animal genetic resources. CGN is independent from the DLO institutes (ID-Lelystad and Plant Research International), yet it is part of the DLO Foundation. CGN is the only organisation designated by the Ministry to conduct Legal Research Tasks regarding animal genetic resources and associated activities.

SGL mainly concentrates on serving the (long-term) interests of the various animal production sectors, including the private breeding sector, and will enter into an agreement with CGN (DLO Foundation). This situation means that CGN has a contract with the Ministry as well as with SGL regarding ex situ conservation of animal genetic resources. The contract includes an agreement on which activities must be conducted under the auspices of CGN, and the associated funding levels.
CGN's operational plans and contracts with respectively the Ministry and SGL must be coordinated annually. In this respect, it is important that both parties intend to enter into a long-term contract with CGN.

CGN signs an annual contract with ID-Lelystad for conducting the activities commissioned by the contracts with the Ministry and SGL. ID-Lelystad provides facilities and expertise (capacity) to CGN in this area. CGN may also outsource activities to other third parties in order to ensure optimal realisation. CGN reports to both the Ministry and SGL regarding property, intake and the issuing of genetic material. The genetic material stored at SGL's request remains the sole property of SGL. With respect to the SGL collection, CGN will comply with the terms and conditions for issuing genetic material defined by SGL, including, for example, the embargo period.

CGN will manage the collection of genetic material managed and funded by the Ministry without claiming property, under the understanding that the material is,

in principle, freely available for issuing to and use by third parties. This can be regarded as a logical consequence of funding these collections from public resources. It is, however, possible to agree on an embargo and/or set additional conditions for issuing this genetic material.

Platform Genetic Resources

The Dutch Government's policy document *Sources of Existence*; conservation and the sustainable use of genetic diversity reports the establishment of a Platform of Genetic Resources. This platform should explicitly focus on the further development and implementation of the policy regarding animal genetic resources. The Platform Genetic Resources can direct sub-workgroups representing (groups of) stakeholders. Among others, the Platform, or its associated sub-workgroups, will determine criteria for conservation programmes, priorities and responsibilities, as well as working out details of the current policy. It has a directive role, initiating new activities regarding the conservation and sustainable use of genetic diversity in farm animals.

Coordinating veterinary and biodiversity policies

From various examples (see Chapters 1 and 2), it is apparent that veterinary policy may be implemented at the expense of genetic diversity in farm animals.
The following adaptations in the national and international policy have a high priority:

- The emergency scenarios for controlling highly contagious animal diseases must explicitly include how the associated unique genetic material may be secured;
- On intake of genetic material, the health status of both the donor animal and the genetic material must be fully known. When issuing gene bank material, the health status must be fully known. When the EU directives regarding genetic material (including sperm and embryo directives) are revised, the possibility of using gene bank material should be included. Gene bank material should actually be granted a separate veterinary status;
- Rare breeds must be distributed more widely in a regional or international area, and genetic material of all breeds must be stored in a gene bank. Regional distribution must be included as a condition for the certification of and subsidy programmes for breeds or herd books;
- Control programmes for animal diseases with possible genetic consequences must be monitored for undesirable side effects before and during the implementation of the programme (compare with the scrapie control programme).

Other policy regarding biodiversity

Within the framework of the environmental policy, farmers should be more widely stimulated to retain old breeds if these show a good usage of minerals.
Additionally, the pleasure of breeding and keeping old breeds must be stressed. Increasingly stringent regulations and the associated administration and costs have diminished the incentives for keeping rare breeds within the informal sector. These bottlenecks should be removed, and it is crucial to provide customised information to the informal sector regarding legislation.

Stimulating in situ conservation of rare breeds

The main advantage of in situ conservation is that farm animals can be seen 'alive', which is attractive from a cultural and historical point of view. Additionally, it allows the associated ecosystem to evolve, and helps maintain both the breed and the ecosystem, as in the example of heath sheep.

There must be one or more supportive purposes (economic viability, hobby, social appreciation) in order to conserve populations in situ. Examples are creating niche markets, subsidy schemes, combining in situ conservation with nature and landscape management, children's zoos and the informal sector. The aim of the Netherlands is that rare breeds lose the label "rare" without any structural Government funding. Sufficient income to conserve the old breeds should be generated from the market (in a broad sense). Integrating conservation of rare breeds into comprehensive concepts on a regional or local level may be an opportunity, including combining functions: recreational, cultural and historical value, nature and landscape management or added value chains, such as local produce or niche markets, or so-called 'Green Services'.

The Dutch Government will support initiatives that contribute to conserving old rare breeds in situ. This particularly applies to activities by organisations that have conservation and promotion of rare breeds as a core objective. Publicity and public information must increase in order to raise enthusiasm among potential breeders or hobby farmers, as well as to inform them regarding associated administrative obligations. The existing Government frameworks and schemes can also be employed towards this goal, and any bottlenecks must be revised and resolved.

Valuation of genetic diversity

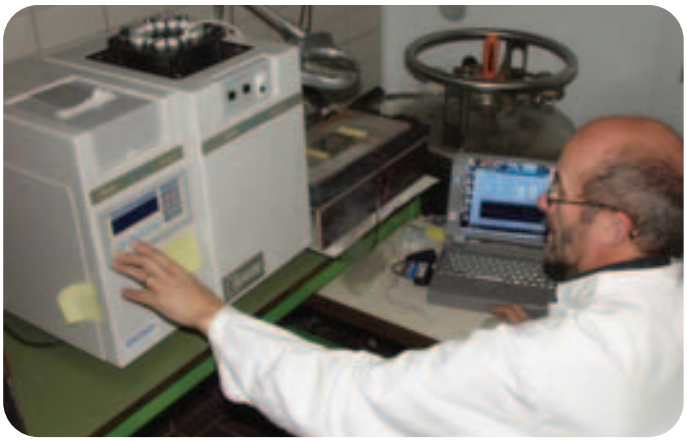
In general, the insight into the value of old breeds and conservation of genetic diversity is quite limited, or the value has a limited definition. An increase in appreciation and valuation of economic, ecological, cultural and historical values is required.

Nature and landscape management using Dutch breeds
Although nature and landscape management organisations are increasingly using Dutch rare farm animals, this is still usually on a very limited scale. Dutch rare breeds should be employed more extensively for the conservation of culturally important natural landscapes and semi-natural landscapes. Although Dutch breeds are not as suitable for conserving (managed) natural landscapes, the Government will continue to stimulate private owners, the Association for Nature Monuments (VNM), The National Forest Service (SBB) and the Provincial Landscapes to integrate old Dutch breeds into their policy and practices. The Government will select policy programmes suitable for stimulating the conservation of rare farm animal breeds.

Monitoring and characterisation
There is no clear understanding of the genetic diversity still in existence, the genetic diversity that is being lost or the value of conserving diversity in farm animals. With this in mind, commercial populations as well as rare breeds should be monitored. More extensive research (quantitative and molecular genetic) into 'invisible loss' by drift, selection, crossing and its consequences is therefore a requirement. Additionally, there is insufficient insight into the genetic and phenotypic differences between and among farm animal breeds between countries and continents. Characterisation is required in order to obtain this insight.

This should include recording the current and past biotope, environment and circumstances of the relevant animals, including previous generations. It is imperative that agreements on a European and worldwide level are concluded regarding the method of characterisation (universal standard) and the method of recording information. Characterisation is required in order to support national and international policy decisions regarding the conservation and development of breeds. This will enhance the efficiency of conservation programmes and ensure better use of the limited (financial) resources.

Development of knowledge and technology
State-of-the-art knowledge and technology are a requirement for efficient and effective conservation efforts. Developments in genomics, breeding and cryobiology are promising, and may offer substantial benefits for the conservation, development and sustainable use of animal genetic resources. Research priorities must be determined on a national and European level. It is vital that knowledge and technology development, linked directly to conservation, development and sustainable use of animal genetic resources, is included in research priorities. In this respect, it is commendable to further develop cryological conservation methods, molecular screening techniques, methods for genetic analyses and tools to support breeding population management.



Transparency in breeding policies
Responsible management of the Netherlands' animal genetic resources (CBD) should start with an overview of the genetic resources and transparency regarding their management. The national Focal Point on Access and Benefit Sharing within the CBD framework, CGN, must coordinate the periodical inventory and updates of the animal genetic resources present in the Netherlands. This requires thorough communication with owners and managers of genetic resources.

Transparency in breeding policies has room for improvement, especially sections related to conservation of genetic diversity. This applies to all populations of farm animals present within the Netherlands, including populations of commercial breeding groups, herds of rare farm animals and other categories of populations. The breeding policy should be evaluated based on Good Breeding Practice (GBP). Part of the GBP evaluation is conducted when SZH certifies breeding organisations, herd books, breed associations or breeding centres. This certification process could be extended to include a code indicating if the certified party manages genetic resources responsibly.

The certification process and the code, as a whole, is referred to as GBP in this report. GBP should at least include the following elements:

- Number of breeds/lines and the approximate stock volume per breed/line;
- Increase of inbreeding per generation per breed/line;
- Phenotypic and genetic diversity within and among breeds/lines;
- Selection method and characterisation criteria for lines;
- The presence of a safety net such as ex situ conservation.

The Dutch Government will help the private breeding sector to translate the GBP principle into practice, and present the principle on a European level.

Awareness

Citizens, consumers, cattle farmers and various other stakeholders are comparatively unaware of national and international objectives regarding biodiversity (based on CBD) and the importance of biodiversity conservation, especially regarding farm animals. It is essential to increase communication on biodiversity, conservation, development and use of genetic diversity, for example by means of education and public information. Various stakeholders, such as the public and private sector and social organisations, can play a part in this respect by discussing various aspects of biodiversity (ecosystems, breeds, species, varieties, DNA) and various purposes of genetic diversity (production, landscape, etc.). It seems logical to integrate this into existing systems, such as the Centres for Nature and Environmental Education. These have so far been mainly focused on ecosystems and the variety of species, paying little attention to the importance of conserving genetic diversity in farm animals.

Stimulating desirable production systems

Using genetic diversity is a good way of conserving it. The nature of and variations within production systems largely determine which genetic diversity will actually be used. Therefore, the Dutch and European Governments stimulate conservation of genetic diversity by promoting socially commendable production systems. Breeding organisations will anticipate this through their breeding policy.

5. International cooperation

As indicated in Chapter 4, the Dutch Government's *Sources of Existence* policy document forms the general framework for policy regarding animal genetic resources. This policy document includes a number of priorities concerning international cooperation:

- Multilateral cooperation with FAO, CGIAR and OECD will be reinforced;
- Further integration of sustainable use of genetic resources within an EU context. This will include the role of farm animals in multifunctional agriculture, including the cultural and historical, recreational and educational meaning of farm animals and the relationship between genetic erosion and animal diseases;
- Expand the topic of knowledge transfer, information and compensation in the context of development cooperation.

This chapter further explores international policy priorities regarding animal genetic resources, partially overlapping with Chapter 4.

International cooperation in general

A major proportion of the world's valuable animal genetic resources are located in poorer countries. Many breeds, especially in developing countries, have entered a critical phase. It is essential to support these countries in conserving, developing and using their genetic resources for two reasons. Firstly, their financial resources are limited. Secondly, the genetic resources located in these countries make a substantial contribution to the total genetic diversity of farm animals worldwide. The Netherlands is prepared to contribute financial resources, knowledge and technology to global conservation, development and use of genetic resources. The Netherlands will enter into bilateral relations with a number of countries, the choice of which will be determined or proposed by the Platform of Genetic Resources.

Collective breeding programmes

The breeding of dairy cattle, pigs and poultry is led by a number of internationally operating breeding companies. Fusions and mergers have caused their numbers to decline, and the same breeds and breeding programmes are increasingly utilised within a larger part of the world.

Breeds with a smaller population and a regional or national presence can dip under the critical number of animals required for efficient breeding programmes. Regional produce with specific properties may be a solution for permanent development of breeds, and preventing breeds from entering the critical zone. New initiatives to establish comprehensive breeding programmes for authentic Dutch breeds that are rare, or in danger of becoming rare, will be supported, under the condition that the relevant breed is sufficiently discernable from other breeds, featuring unique properties or a unique combination of properties. In the case of cross-border initiatives, it must be determined if policies in various countries are sufficiently coordinated and if there are any obstructions.

Gene banks for farm animals

A number of European countries have established national gene banks. Other countries have opted to distribute cryological conservation throughout the country and over various organisations and/or companies. Cooperation between countries is

limited, yet it makes the set-up and management of gene banks more efficient and effective. The Netherlands prioritises the following in this respect:

- Unambiguous forms of organisation and management regulations for gene banks;
- Documentation of collections and information exchange;
- Exchanging knowledge and experiences regarding collection expansion, method and protocols for cryological conservation, intake and collection of genetic material, etc.;
- Regulations allowing for an extensive degree of diversity within the smallest collections;
- Exchange of genetic material;
- Recording the characterisation of gene bank material, using basic information in compliance with a universal standard;
- Rationalising collections and distributing core collections over various countries;
- Managing collections: protocols, procedures, etc.

In situ conservation

Countries are primarily responsible for genetic resources that originally occurred in that country. Many breeds, including rare breeds, occur in various countries, often making it difficult to determine the extent of actual genetic difference between breeds with different names in different countries.

The EU provides its member states with the possibility to subsidise their own old breeds. In this respect, it is a difficult matter to decide whether animals from the same or similar breed in another country should be taken into account during the subsidy decision. From the perspective that countries are primarily responsible for their own old breeds, the population in their own country should have a leading role in the decision. However, there are cases where the international total of the relevant animals does not require support. The Netherlands is of the opinion that a

country can only be excused from its primary responsibility if there is international agreement regarding shared responsibility for the relevant breed.

Characterisation of breeds, lines or varieties on an international level, based on a universal standard, should form the basis of stimulating and subsidising conservation activities. Characterisation should be a combination of (molecular) genetic and phenotypic characterisation and a description of environmental or animal production characteristics. The Netherlands supports further development of criteria for rare breeds within FAO or EAAP frameworks and stimulates European coordination of activities regarding animal genetic resources (ERFP).

Research and technology development
The Netherlands stimulates the establishment of centres of excellence and integrated projects within the EU's Sixth Framework Programme for research and development and supports the implementation of the EU regulations regarding Genetic Resources (GENRES). The national research and WOT programmes are fully in line with the EU's priorities.

Veterinary policy
Exception and escape clauses regarding prevention and control of animal diseases, including highly contagious ones, should be added to the EU policy, particularly if irreversible loss of biodiversity is inherent to disease control. On the other hand, in situ and ex situ conservation of genetic diversity in farm animals should be designed to avoid the risk of total annihilation of populations or breeds, for instance by means of regional or international distribution.

The current EU veterinary regulations do not grant a separate status to genetic material, which is therefore liable to general directives. This implies that genetic material or animals without a fully recorded health status cannot be traded within the European Community, making the exchange of genetic material from gene banks between countries impossible. The Netherlands is striving at a European level to grant gene banks a separate status, enabling exchange and use of genetic material from gene banks.

Appendix 1

How this report was compiled
Project organisation and the organisations and persons involved

In March 2001, the Dutch Government received the FAO's invitation to submit a national report. The responsible ministry, the Ministry of Agriculture, Nature Management and Fisheries, and the Directorate of Agriculture in particular, subsequently requested the national coordinator for animal genetic resources at ID-Lelystad to prepare a proposal for a project organisation and the process to be employed. The national coordinator, S.J. Hiemstra, accepted the role of project leader. After consultation with C.M.M. van Winden, of the Directorate of Agriculture, a core group of stakeholders forming the National Consultative Committee in order to contribute to a process resulting in the Dutch national report.

The project was launched by the end of September 2001, when the core group held its introductory meeting. This meeting was used to extensively discuss the desired content of the Dutch national report and which process would best lead to an optimal result. Report drafts were then prepared by the project leader supported by a 'writing group'. After discussing a number of draft reports within the core group, a workshop was organised in April 2002 for a large and diverse group of stakeholders. During this workshop, the content of the draft report was extensively tested. The comments and suggestions resulting from this workshop were subsequently used to prepare the next draft. After a last test among various Departments of the Ministry of Agriculture, Nature Management and Fisheries, and a final test among the core group (the 'National Consultative Committee'), the report was submitted to the FAO in August 2002.

The national report does not include an action and communication plan; work on such a document was underway at the time of completing this report.

The composition of the core and writing groups are listed below, together with a list of participants at the workshop in April 2002.

Project leader
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Workshop animal genetic resources (April 2002)
Representatives from the following organisations participated in the workshop:

- Sector, Breed and Species interest groups
- Centre for Agriculture and Environment
- Animal Welfare Society
- Faculty for Veterinary Science
- Breeding Organisations
- Animal Health Care Organization
- Ministry of Agriculture, Nature Management and Fisheries
- Nature and Landscape management organisations
- Product Boards for Livestock, Meat and Eggs and Dairy products
- Gene Bank Foundation for Farm Animals
- Foundation for Rare Domestic Breeds
- Herd books and Breed associations
- Wageningen University and Research Centre

Appendix 2

List of Abbreviations

ABS	Access and Benefit Sharing
CBD	Convention on Biological Diversity, Rio de Janeiro, 1992
CGIAR	Consultative Group International Agricultural Research
CGN	Centre for Genetic Resources, the Netherlands
COP-6	6th Conference of Parties of CBD
DLO	Department of Agricultural Research (DLO Foundation)
EAAP	European Association for Animal Production
EC	European Community
ERFP	European Regional Focal Point for Animal Genetic Resources
EU	European Union
FAO	Food and Agricultural Organisation of the United Nations
GBP	Good Breeding Practise
GENRES	Genetic Resources
GNP	Gross National Product
ID-Lelystad	Institute for Animal Science and Health, Lelystad, Netherlands
IKC	Information and Knowledge Centre of the Ministry of Agriculture, Nature Management and Fisheries
IPR	Intellectual Property Rights
LNV	Ministry of Agriculture, Nature Management and Fisheries
LTO	Agricultural and Horticultural Organisation Netherlands
OECD	Organisation for Economic Cooperation and Development
PVE	Product Boards for Livestock, Meat and Eggs
SBB	National Forest Service
SGL	Gene Bank Foundation for Farm Animals
SoW-AnGR	State of the World's Animal Genetic Resources
SZH	Foundation for Rare Domestic Animal Breeds
VNM	Association for Nature Monuments
WOT	DLO's Legal Research Tasks
WWL	World Watch List (FAO - Food and Agricultural Organisation)

Appendix 3

Size, status (*) and trend of rare breeds of Dutch origin
(SZH and ID-Lelystad, 2002)

Breed	Nr of adult male animals	Nr of adult female animals	Totaal nr of animals	Status	Trend
Cattle					
Groningen White Headed cattle	38	2165	2203	vulnerable	growth
Deep Red cattle	30	100	130	endangered	growth
Friesian Red cattle	43	119	162	endangered	growth
Colourside White Back cattle	39	1000	1039	vulnerable	stable
Dutch Belted cattle	80	1700	1780	vulnerable	growth
Sheep					
Black Blazed sheep	250	2500	2750	vulnerable	stable
Drente Heath sheep	87	1312	1399	endangered	stable
Schoonebeek sheep	23	1277	1300	endangered	stable
Blue Texel sheep	250	3500	3750	vulnerable	growth
Mergelland sheep	35	600	635	endangered	stable
Kempen Heath sheep	30	1544	1574	endangered	stable
Zeeland Heath sheep	50	3000	3050	vulnerable	growth
Friesian Milk sheep	60	2500	2560	vulnerable	growth
Veluwe Heath sheep	60	1400	1460	endangered	growth
Goats					
Dutch Landrace goat	375	1600	1975	vulnerable	stable
Horses					
Gelderland horse	10	500	510	endangered	decline
Dutch Draught horses	50	1100	1150	vulnerable	decline
Groningen horse	14	200	214	endangered	growth
Pigeons					
Oud-Hollandse Tuimelaar	1000	1000	2000	vulnerable	growth
Hollandse Show-Homer	300	300	600	endangered	decline
Hollandse Hoogvlieger	75	75	150	endangered	decline
Hagenaar	30	30	60	critical	decline
Nederlandse Helmduif	30	30	60	critical	decline

Breed	Nr of adult male animals	Nr of adult female animals	Totaal nr of animals	Status	Trend
Amsterdamse tuimelaar	30	30	60	critical	growth
Gelderse slenk	30	30	60	critical	stable
Nederlandse Krulveerkropper	20	20	40	critical	stable
Holle kropper	700	700	1400	vulnerable	stable
Groninger slenk	125	125	250	endangered	stable
Hyacinthduif	150	150	300	endangered	stable
Oud Hollandse meeuwen	1600	1600	3200	vulnerable	stable
Voorburgse schildkropper	450	450	900	endangered	stable
Hollandse kropper				endangered	stable
Oud-Hollandse Kapucijnen				endangered	stable
Amsterdamse tipler				endangered	stable
Geese					
Twentse goose	5	10	15	critical	decline
Ducks					
Overbergse duck	10	30	40	critical	stable
Hook Bill duck	50	110	160	endangered	stable
North Holland White	25	75	100	critical	stable
Bibbed duck					
Crested duck	20	40	60	critical	stable
Call duck	400	750	1150	vulnerable	growth
Poultry					
Polands (non bearded)	35	130	165	endangered	stable
Polands (non bearded) bantam	50	150	200	endangered	stable
Polands (bearded)	30	75	105	endangered	stable
Polands (bearded) bantam	40	125	165	endangered	stable
Welsummer	80	250	330	endangered	growth
Welsummer bantam	150	400	550	endangered	stable
Barnevelder	120	400	520	endangered	growth
Barnevelder bantam	100	300	400	endangered	stable
Groninger Mew	150	650	800	endangered	growth
Groninger Mew bantam	60	180	240	endangered	stable
Drent Fowl	75	150	225	endangered	growth
Drent bantam	70	200	270	endangered	stable
Friesian Fowl	340	700	1040	vulnerable	stable
Friesian bantam	250	430	680	endangered	stable
Lakenvelder Fowl	50	150	200	endangered	stable
Lakenvelder hoen kriel	60	170	230	endangered	stable
Lakenvelder bantam	1500	1800	3300	vulnerable	stable
Booted bantam	1500	1800	3300	vulnerable	
Brabanter Fowl	85	150	235	endangered	
Brabanter bantam	60	130	190	endangered	
Breda Fowl	50	110	160	endangered	

Breed	Nr of adult male animals	Nr of adult female animals	Totaal nr of animals	Status	Trend
Breda bantam	15	35	50	critical	
Owl-bearded Fowl	100	200	300	endangered	
Owl-bearded bantam	75	135	210	endangered	
Chaam Fowl	50	100	150	endangered	
Hamburgh	50	130	180	endangered	
Hamburgh bantam	50	150	200	endangered	
Assendelft Fowl	35	100	135	endangered	
Assendelft bantam	20	90	110	endangered	
North Holland Blue Fowl	50	250	300	endangered	
North Holland blue bantam	30	80	110	endangered	
Dutch bantam	1000	1000	2000	vulnerable	
Twente Fowl / Kraienkoppe	100	2000	2100	vulnerable	
Rabbits					
Havana	100	150	250	endangered	stable
Gouwenaar	25	75	100	critical	stable
Beige	150	300	450	endangered	stable
Poolkonijn	1000	1000	2000	vulnerable	stable
Nederlandse Kleurdwerg	1000	1000	2000	vulnerable	stable
Klein Lotharinger	740	2100	2840	vulnerable	growth
Sallander	50	75	125	endangered	decline
Eksterk	25	40	65	critical	stable
Thrianta	100	100	200	endangered	stable
Hulstlander	30	40	70	critical	growth
Nederlandse Hangoordwerg	1000	1000	2000	vulnerable	stable
Deilenaar	150	200	350	endangered	stable

* According to FAO norms	Status	Female animals	Male animals
	normal	>10.000	
	uncertain	5.000-10.000	
	vulnerable	1000-5000	
	endangered	100-1000	<20
	critical	<100	<5

The SZH designates a breed as rare - and sets it on the ‘red’ list’ - if there are less than 1500 cattle, horses or goats available (a figure of 2000 applies to female sheep).

Appendix 4

Total number of breeds and lines in the Netherlands
Summary table

For more detailed information on breeds and lines in the Netherlands, see the following websites:

- www.absfocalpoint.nl
- www.fao.org/dad-is
- www.tiho-hannover.de/einricht/zucht/eaap/

Animal	Number of original Dutch breeds (locally adapted)	Number of imported breeds (exotic)	Number of lines	Number of extinct breeds before 1950	Number of endangered Dutch breeds (locally adapted)
Cattle	13	20		2	2
Sheep	16	43		2	5
Ducks	5	38		0	5
Pigs	2	5	23	9	
Chicken	34	125	20		32
Pigeon	16	82			13
Geese	1	30			1
Rabbit	12	40			9
Horse	7	24			2
Goat	6	8			0

Appendix 5

The relative importance of farm animal breeds for nature and landscape management

(= limited importance; **** = major importance)*

(Source: VNM and SBB

	Relative importance		Relative importance
Cattle		**Horses/pony's**	
Heck	**	Groningen	*
Scottish Highlander	****	Shetlander	***
Galloway	***	Haflinger	**
Exmoor	**	Yslander	***
Dutch Belted	*	Konik	***
Deep Red	**	New Forest	*
Groningen White Headed	*	Fjorden	**
Coloursided White Back	*	Exmoor	*
Dutch Friesian	***	Welsh	*
Meuse Rhine Yssel	*	Friesian	*
Blonde d'Aquitaine	**	Gelderland	*
Limousin	***	Dutch Draught	*
Charolais	**	Przewalski	*
Piemontese	*		
Hereford	**		
Salers	*		
Dexter	*		
Glan	*		

Sheep		**Goats**	
Drenthe Heath	****	Dutch Landrace	*
Mergelland	**		
Veluwe Heath	**		
Kempen Heath sheep	**		
Schoonebeek	**		
Soay	**		
Texel	*		
Friesian Milksheep	*		
Zeeland Milksheep	*		
Flanders	*		

Appendix 6

Ex situ conservation of Dutch farm animal breeds in a gene bank
(surveyed June 2002)

Gene bank collections of the SGL and DLO Foundation (2002)

Name	Number of male animals	Number of sperm doses
Cattle		
Groningen White Headed cattle	23	7000
Deep Red cattle	7	2100
Friesian Red Cattle, Red Pied cattle	33	14000
Coloursided White Back cattle	9	2000
Dutch Belted cattle; Black & White;	5	2400
Red & White		
Dutch Friesian cattle	135	28000
Meuse Rhine Yssel cattle	100	24000
Holstein Friesian cattle	1400	35000
Poultry		
Welsummer	18	100
Barnevelder	7	100
Drent Fowl	8	100
Friesian Fowl	22	400
North Holland Blue Fowl	7	100
Twente Fowl / Kraienkoppe	7	100
Horses		
Gelderland horse	5	400
Dutch Draught horses	3	250
Groningen horse	5	400
KWPN riding horse	5	50
Sheep		
Drenthe Heath sheep	2	15
Schoonebeek sheep	12	1144
Mergelland sheep	21	2600
Kempen Heath sheep	15	2300
Veluwe Heath sheep	5	750

Name	Number of male animals	Number of sperm doses
Pigs		
Dumeco lines		
S-line	32	750
D-line	34	700
Y-line	20	350
W-line	38	850
L-line	40	700
F-line	37	700
N-line	26	450
Topigs lines		
2222-line	9	350
3333-line	5	250
8888-line	17	700
FFFF-line	7	250
NNNN-line	9	300
SSSS-line	5	400
ZZZZ-line		
Fomeva Z1 line	11	1600
Meishan line	25	750

Appendix 7

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