



## The threats

Genetic diversity is endangered by modern agriculture and globalisation. Modern production and marketing depends on genetically uniform varieties and animal breeds that deliver uniform food products. In addition, globalisation has resulted in a high uniformity of human diets. As a consequence, in many parts of the world a relatively small number of high-yielding uniform crop varieties and animal breeds have largely replaced the many landraces and local animal breeds that were a feature of earlier times. Moreover, this process of genetic erosion is still continuing.

Meanwhile, climate change will force farmers to change their choice of which crops and varieties to grow and which animal species and breeds to keep. As a result, more of the older varieties and breeds may disappear. Furthermore, the wild relatives of crops that still grow in nature might not be able to adapt or migrate in time.

Genetic erosion is highly undesirable. It deprives us of resources that could be essential in terms of responding to new diseases, creating more sustainable production systems, meeting new consumer preferences and combating the effects of climate change. Genetic erosion also puts global food security and our environment at risk.



Uniformity in the human diet eventually results in genetic erosion.



New preferences reflected in new cabbage varieties offered in the market (to the right at picture by Joachim Beuckelaer, 1564). Source: Staatliche Museum, Kassel



### Our mission

CGN contributes to the conservation, development and sustainable use of plant, animal and forest genetic resources, and hence to global food security, a more sustainable production, rural development and the conservation of cultural heritage.

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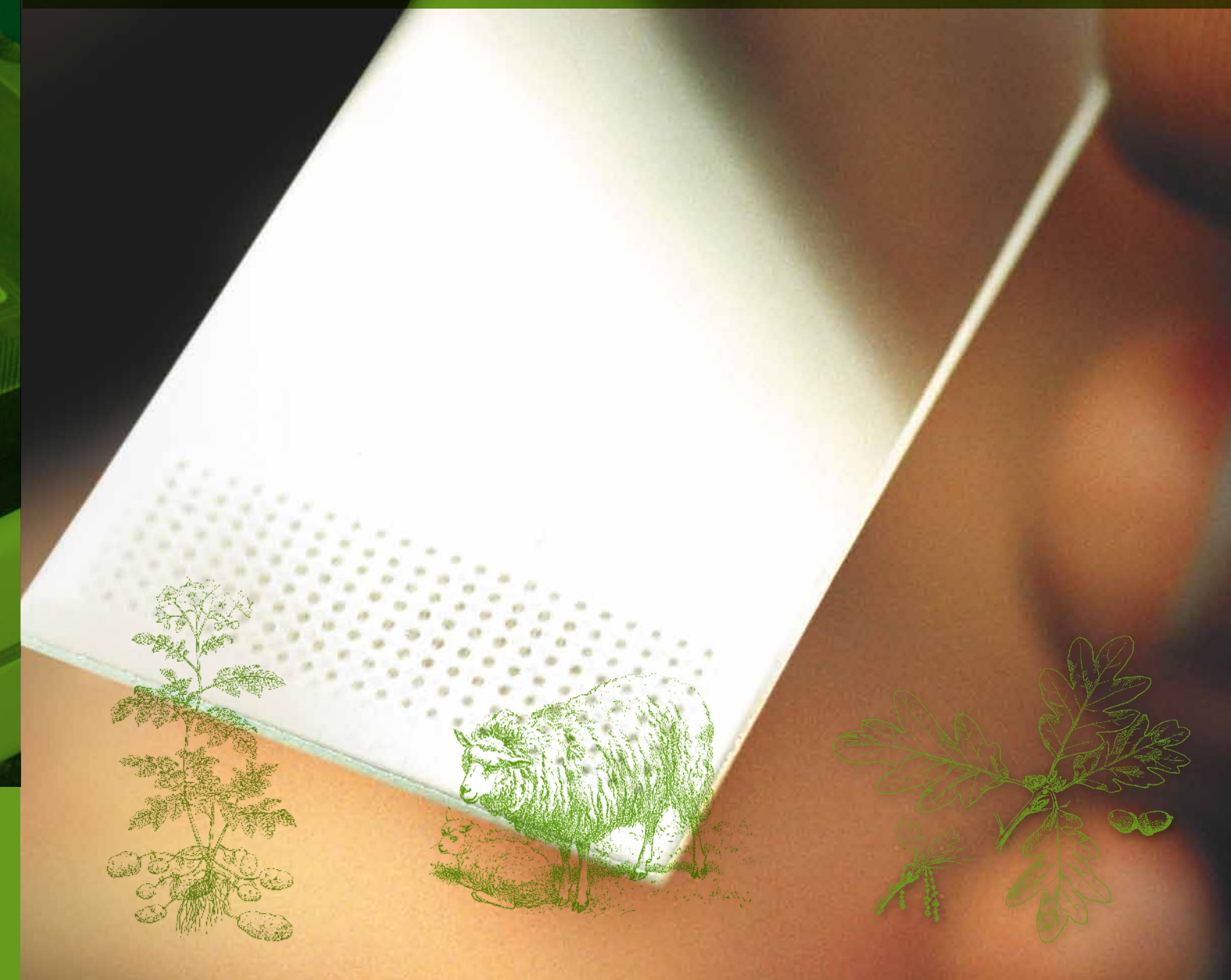
The activities of CGN are certified according to NEN-EN-ISO 9001: 2008

Wageningen UR is a leading, internationally renowned research organisation active in the areas of food and nutrition, health, sustainable agro-systems, durable green environments and social change processes.

The Centre for Genetic Resources, the Netherlands is an independent research unit of Wageningen UR that assists the Dutch government in carrying out legally required tasks.

# CGN

Centre for Genetic Resources, the Netherlands



## The value

Genetic resources form those components of the world's biodiversity that are used or may be used in future. These useful plants and animals were taken from nature by humans, and then selected, improved, stored and exchanged. Genetic resources therefore lie at the basis of our food, fibre, shelter, timber, herbal medicines and draught animals. The ancient process of adapting plants and animals to human preferences and practices is called domestication and first started 10,000 years ago in areas where resources for food were diverse and abundant. Over the course of this development, humans gradually changed from hunters and gatherers into farmers.

Once humans had developed agriculture, plant and animal genetic resources started travelling around the world. Exchanged by traders or carried by migrating people, these resources adapted to new environmental conditions and human practices. Farmers developed knowledge about the properties of their crops and farm animals, and how to use them for food and other purposes. This resulting genetic diversity of domesticated plants and animals is part of humankind's shared culture and history. Farmers shaped crops and farm animals until the last century when specialised breeders partially took over this role. Breeding is impossible without genetic diversity, and breeding is needed to meet the demands for food from a growing world population.

In addition to plant and animal genetic resources that provide us with food, forest genetic resources provide us with timber, they shape our landscapes, facilitate recreation and provide wider environmental support functions.



"The symbolic transfer of the potato". A romantic impression of Sir Francis Drake receiving a potato from a New World representative. Source: Kartoffelmuseum, Munich.



"Landscape in Gelderland" (1818) by Hendrikus van de Sande Bakhuisen. Source: Source: Collection Rijksmuseum, Amsterdam



## The opportunities

Programmes have been developed to support farmers in maintaining genetic diversity in their fields and foresters to use better adapted resources. In addition, genetic resources have been collected. Gene banks have been established to conserve our genetic diversity in living collections, and to study and use the properties contained in these collections. Materials from the collections are made available for research, breeding, propagation and other purposes.

Two international agreements provide a framework for efforts to conserve genetic resources and to promote their use: the 1992 Convention on Biological Diversity (CBD) and the 2001 International Treaty on Plant Genetic Resources for Food and Agriculture. FOREST EUROPE (The Ministerial Conference on the Protection of Forests in Europe) provides a regional policy framework for forests and forestry.

### Efforts in the Netherlands

The Centre for Genetic Resources, the Netherlands (CGN) was established in 1985 to support conservation efforts related to food crops. Since 1999 and 2002 it has held a mandate from the Dutch government related to animal and forest genetic resources. CGN maintains ex situ collections (i.e. not in farm fields or nature) of crop and farm animal genetic resources, and it supports the State Forestry Service, non-governmental organisations and farmers in the management of their genetic resources. It also provides policy support to the Dutch government. All this is done in close collaboration with institutes elsewhere and with international organisations, and CGN actively participates in the European plant, animal and forest genetic resources networks.



## A vegetable gene bank

As the majority of Dutch crop breeding is devoted to horticulture, CGN is primarily focused on vegetable crops. The genetic resources included in its vegetable crop collections stem from all over the world. In addition to genetic resources of major vegetables such as lettuce, tomato, cabbage and onion, the collections also include more neglected species such as asparagus and salsify. In addition, CGN supports Dutch farmers, gardeners, breeders and hobbyists who are interested in working with traditional crop diversity.

Currently, CGN holds approximately 23,000 accessions belonging to over 20 different crops. Genetic materials are carefully selected for inclusion in the collections, accurately described, optimally stored, and evaluated in close collaboration with breeders for useful traits. All CGN's collections are duplicated, including in the Svalbard Seed Vault in Spitsbergen.

Information about the background and properties of the materials is collected, verified and stored in the CGN databases. A well-managed website allows on-line searches in these databases and includes an electronic ordering system that further facilitates the use of the collections.

CGN's collections include commercial varieties, landraces and farmers' varieties, and wild crop relatives, originating from more than 100 countries. In turn, materials are distributed across the world under the Standard Material Transfer Agreement of the International Treaty on Plant Genetic Resources for Food and Agriculture.

Research into seed longevity, the optimisation of the composition of crop collections, the nature and extent of genetic erosion, the use of biotechnology and bio-informatics, and the functioning of seed systems and intellectual property right systems is undertaken to increase the quality of CGN's work.



## Securing diversity and our living heritage

The global livestock sector is increasingly dominated by a small number of highly productive breeds. To maintain those native breeds 'at risk' and to conserve genetic diversity within farm animal species, complementary *in situ* and *ex situ* conservation approaches (inside and outside the farm field and nature respectively) are needed. CGN therefore maintains a farm animal gene bank, and supports the conservation of farm animal genetic diversity *in situ* in various ways.

The main focus of CGN is on farm animal species most relevant for food production: cattle, sheep, goats, pigs and chickens. In addition, CGN supports the conservation of diversity in other livestock species that belong to our living cultural heritage (horses, ducks, geese, farm dogs, pigeons and rabbits). All these rare domestic animal breeds are cryo-preserved (*ex situ*) in the CGN gene bank for farm animals. CGN also facilitates the Dutch breeding industry and mainstream breed societies to cryopreserve a genetic back-up of their breeding populations in the CGN gene bank. The majority of the gene bank collections

consist of semen, with more than 300,000 insemination doses of the current seven species and 61 breeds.

CGN collaborates closely with the Dutch Foundation for Rare Breeds (SZH) and with a range of breed societies and other stakeholders in developing effective strategies to improve the conservation of farm animal breeds *in situ*. In partnership with stakeholders, CGN keeps track of the status and trends for all breeds in the Netherlands. Information is uploaded to the European and global (FAO) databases that provide an overview of animal genetic resource breeds.

Research by CGN is devoted to the further development of new or improved freezing methods for cryopreservation and to breeding programmes for small populations optimising conservation. In addition to the genetic and phenotypic characterisation of *ex situ* collections and breeding populations, CGN will apply genomic technologies for conservation purposes.



## CGN forest genetic resources

## Our forest heritage

Most forest species take a long time to grow, mature and produce progeny. Trees that naturally occur in our environments have adapted to the local climatic conditions over time, often as a result of recolonization of territories following the Last Ice Age. For example, Dutch indigenous oaks originate from Spain and Italy.

As trees take much longer to grow than plant and animal genetic resources, a carefully considered selection of well adapted reproductive material for re-forestation is important to secure the long-term future and sustainable management of our forests. CGN advises users on the best possible reproductive materials based on its research into Value for Cultivation and Use (VCU). This research focuses on the extent to which forest genetic resources adapt to their current environments, reflected by their growth capacity, timber quality, health and the level of genetic diversity. CGN also informs target groups via the five-yearly National List of Varieties and Provenances of Trees.

