

Protecting our forests' genes

Thousands of European forests have been designated gene conservation units. These locations are home to populations of indigenous trees and shrubs with valuable genes exceptionally. 'Indigenous trees and shrubs have come under pressure over the past few centuries.'

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It is raining cats and dogs in the Heksenbos. But Hielke Alsemgeest, a forest warden for the Dutch State Forest Service (*Staatsbosbeheer*), doesn't let that put him off. 'Nature decides what happens here, and just look, what a beautiful forest,' says a beaming Alsemgeest. Stepping out boldly, he leads the way through the dripping wet forest near Winterswijk, on the German border, to the old taxus trees that grow here. The taxus is mainly familiar as garden or graveyard vegetation, but the Netherlands' only indigenous conifer is only really in its element here: in the shade of oak, hornbeam and ash trees. With its primroses and various species of ferns, the Heksenbos is a special Natura2000 area, explains the forest warden – who turns out to be a Wageningen alumnus – but these original taxus trees lend the forest some extra status. The Heksenbos is a link in a chain of 3406 European forests and copses which have been designated gene conservation units.

What grows here is part of our national biological heritage and of international importance too. Including the taxus.

INDIGENOUS TREES

In the Netherlands, the Centre for Genetic Resources (CGN), which is part of Wageningen University & Research, has designated 13 such units – places with significant populations of indigenous trees and shrubs – in the past 10 years, at the behest of the ministry of Economic Affairs. We should take good care of these remnants of forest, says Joukje Buiteveld of the CGN. She is responsible for policy support for the Dutch government in relation to the conservation and use of genetic resources from trees.

'In the past centuries, indigenous trees and shrubs have come under pressure,' she explains. 'By the beginning of the 19th century, the amount of forest had decreased to 4 percent of the total land surface area, mainly due to deforestation and overexploit-





tation.' The species mix in forests, copses and hedgerows was also tampered with. Exotic species that are good for timber production, such as pine, larch, Douglas fir or Norway spruce, were planted in vast numbers. And since the 1950s, cheap seeds and saplings of many indigenous trees and shrubs have been purchased abroad. Our native trees and shrubs have therefore been pushed back to the margins of Dutch nature. If they give up the ghost, unique gene combinations that have adapted to the growing conditions in the Netherlands in the course of evolution will be lost. The common oak in this wet country, for example, differs somewhat from the same species in Poland, where conditions are drier and colder.

VITAL

The international Convention on Biological Diversity (CBD), signed in Rio de Janeiro in 1992, boosted international interest in this genetic biodiversity. Plants and animals can only cope with changes such as global warming, new environmental conditions or diseases and pests if they have plenty of genetic diversity to draw on. Genes which do not seem very important now can end up playing a vital role.

In 2002 the Dutch government published a policy memo called 'Sources of Existence' which made clear that preserving genetic diversity is necessary not just for plants such as agricultural crops but also for trees and shrubs. Buiteveld: 'In many countries, the forest is of great economic importance, for timber and biomass for instance, as well as for recreation, water supply, soil conservation and CO₂ sequestration. Many trees and shrubs are also key species for the visual impact of a landscape. The characteristic riparian forest along the rivers would not be the same without the black poplar. So we should watch out that indigenous genetic material does not get lost or squeezed out. In Europe, more than 30 million hectares of forest is protected for the sake of biodiversity conservation, but no attention is paid to the genetic sources of trees.' >

Storing seeds in a gene bank, as is done with many agricultural crops, is not an option for most woody species, explains the Wageningen researcher. These seeds are 'recalcitrant': if they are frozen, they lose some of their germinating capacity. A good alternative is to create a tree garden: a collection of living trees that is properly protected and managed. The Dutch State Forest Service established a national tree archive in Roggebotzand in 2006, using grafts or seedlings from indigenous trees and shrubs. Seeds harvested there are used to establish new nature areas.

'This kind of tree garden is a snapshot, with all the genetic diversity there was at that moment put into the collection,' says Buiteveld. 'But we also want to keep populations in their natural habitats, to allow evolutionary processes to take their natural course. Hence the gene conservation units, where those populations can adapt to local conditions from generation to generation. The aim of this conservation strategy is to maintain the adaptive potential of the population, and not just of individual trees.'

These two conservation strategies – ex situ and in situ, in the tree collection and in nature – complement each other, says

Buiteveld. 'An ex situ collection is easy to manage and you can easily harvest seed to use elsewhere. In situ, it is more difficult to harvest seed, but you do create a dynamic situation.'

Buiteveld is the national coordinator of Euforgen (European forest genetic resources programme), which combines European collaboration on the conservation of genetic resources with national obligations. In principle, each country is responsible for its own genetic diversity, but many woody crops are found throughout Europe and even beyond its boundaries, in a wide variety of climates. 'So European collaboration is extremely important. If every country tackles this for itself and with its own method, it will be impossible to find out for a particular tree species whether we are on the right track in our efforts towards the conservation of genetic variety.'

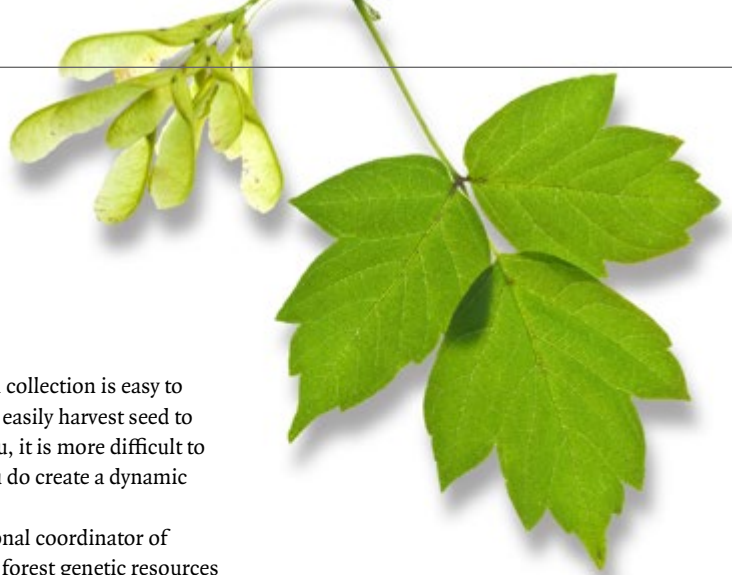
MOST THREATENED

Additional measures will be necessary in the long run, Buiteveld predicts, in order to protect those genetic resources which are under most threat from climate change, such as marginal populations found on the borders of the species' habitat. 'So this could mean

INDIGENOUS WOODY SPECIES

The Netherlands has established 13 gene conservation units: for the field maple, the white birch, the beech, the ash, the common juniper, the black poplar, the sessile oak, the common oak, the taxus, the European white elm, the mountain ash and the hornbeam. But that is not the end of the story. There are ultimately 46 indigenous woody species for which the Netherlands wants to designate conservation units. There is no unit yet for the small-leaved lime tree, for instance, nor for two species of prunus, the common alder, the five species of indigenous willow, the water elder, holly, hawthorn and honeysuckle.

'We want to establish units for at least the main tree and shrub species in the Netherlands in the next few years,' says Buiteveld. 'Just like in other countries, the emphasis has been on the tree species that are the most economically valuable, that are common, and that form stands. The less economically valuable species have come in for less attention. The strategy will now be extended to these neglected species.'



that material gets carried across national borders in future, in order to be able to conserve it.'

For Euforgen, Europe is divided into 10 climatic zones, mainly based on temperature and precipitation. Each of the 35 participating countries is expected to protect one population of each indigenous species within each climatic zone. So the Netherlands has a relatively easy time of it because the entire country falls within one ecological zone, described – this will come as no surprise – as cool and humid. Italy, by contrast, has five ecological zones within its borders, from hot Mediterranean to cold alpine.

In the Netherlands, the designation and establishment of the gene conservations is financed by the ministry of Economic Affairs. Because this kind of unit does not have a special conservation status, and genetic conservation is for the very long term, preference goes to putting ownership and management of the tract of woodland in the hands of a public party which is prepared to protect the population long-term. 'If you have a private landowner, he could decide tomorrow: I'm going to do something else with it,' says Buiteveld. 'And there goes your conservation unit.' Of the 13 Dutch units established to date, 11 are managed by the State Forest Service, and only the population of the European white elm (Limburgs Landschap) and the beech (Arcadis) are in the hands of 'well-intentioned' private parties.

FELLING ALLOWED

The protected trees are not 'off limits': forestry interventions are allowed in a unit. Older trees may be felled, as long as there is enough rejuvenation. Although the aim is for the populations to take care of themselves, some help is needed at times, explains Buiteveld. 'If you see that there is not enough regeneration in a population, it is okay to give it a helping hand. By freeing the target species, for instance. If the seed is not germinating properly, perhaps due to drought or lack of light, you can harvest it,

sprout it and then plant it. The disadvantage of this is that you lose the natural selection at the seedling stage.'

The conservation of indigenous genetic material is no easy matter in the Netherlands, says Buiteveld. Populations of indigenous trees, preferably on public land, are rare and often very small. Species such as the wild apple or the small-leaved lime tree were always quite sparsely distributed, but there are other species too of which the Netherlands only has the remnants of woods left. Nowhere do we reach the 500 adult trees which Euforgen sees as the minimum for preserving local diversity in the long term. 'We have a very fragmented landscape, so we no longer have those large populations,' says Buiteveld. 'A great deal of the forest is plantation, often with material from elsewhere.'

A BIT OF PAMPERING

Hielke Alsemgeest is conscious of the State Forest Service's responsibilities. 'It is very important to conserve genetic diversity,' he

believes. 'It is best if you can let nature take its course but sometimes you have to pamper it a bit, although we are not going to give the trees in the Heksenbos artificial fertilizer or go around with a watering can.'

No more than 100 metres away from the taxus trees, the woodland goes over into Willinks Weust, an area where indigenous juniper grows and which is part of the same gene conservation area. The juniper grows here in dense thickets surrounded by wet grasslands featuring devil's bit scabious, marsh gentian, potentilla and heather. This special grassy vegetation has to be mown annually, at the risk of cutting back young juniper bushes in the process. 'That requires a lot of care. You can see that there are now hazel bushes in amongst the trees, as well as some birches; we are going to take those out to prevent the junipers from being overrun. It's OK to do a bit of gardening now and then.' ■

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