European Network for Rural Development

Improvement of forest genetic resources in the area managed by Gyulaj Co.

EAFRD-funded projects

HUNGARY

Biodiversity's restoration, preservation & enhancement

Location
Tolna hills

Programming period
2014 – 2020

Priority
P4 – Ecosystems management

Measure
M15 – Forest-environment-climate

Funding (EUR)
Total budget 868 815.00
EAFRD 738 492.75
National/Reg. 130 322.25

Project duration
2018 – 2022

Project promoter
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Preserving forest genetic resources to increase the resilience of forests against the impacts of climate change.

Summary

Gyulaj Forestry and Hunting Co. is the asset manager of the state-owned forests of the Tolna hills in the Southern Transdanubian Region of Hungary. Climate change will intensively affect forests and tree species and consequently tree species, which are more resilient but not commercially exploited, need to be preserved as valuable genetic resources for the future.


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To this end, the project is focusing on developing an inventory and records of genetic resources; involving in situ conservation of genetic resources and establishing gene bank collections (ex situ); and improving forest reproductive material (FRM) for production and use in the forests in the region.

Results

The description of trunks of 180 Quercus virgiliana trees and propagation of thousands of seedlings.

The description of trunks of 30 Quercus robur tree specimens and propagation of thousands of seedlings.

Established 7.90 hectares (ha) of Quercus virgiliana seed plantation.

Established 3.72 ha of Quercus virgiliana gene collection.

Established 1.18 ha of Quercus robur gene collection.

Established 143.38 ha of Quercus virgiliana gene reserve.

Established 3.28 ha of Quercus robur gene reserve.

Lessons & Recommendations

- Without public support and especially the European Agricultural Fund for Rural Development (EAFRD) grants, there would be no financial resources for gene conservation work. Important fragmented populations of trees would slowly disappear as they currently have no economic value in the timber market. Thus, their valuable genetic traits would disappear before the need to use them for climate change reasons would appear.

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Context

Gyulaj Forestry and Hunting Co. is the asset manager of the state-owned forests of the Tolna hills located in the Southern Transdanubian Region of Hungary. The Gyulaj Co. manages nearly 24 000 hectares of forests. The company has 100 employees who carry out the management and supervise forest works, which are carried out by smaller companies.

The managed area has a significant number of public welfare activities: operating guest houses, park forests, a forest school and lookouts. In addition to the tree species black locust (Robinia pseudoacacia), the area has a significant proportion of Turkey oak (Quercus cerris) which is mostly suitable for energy use as a source of firewood and biomass.

Based on the forest climate classification, the area managed by Gyulaj Co. is on the border of the forest steppe (a belt of grassland that extends some 8 000 km from Hungary in the west through Ukraine and Central Asia to Manchuria in the east) and Turkey oak (sub-Mediterranean) climate zones. This means that the predicted climate change would intensively affect forests in the region. Because of climate change, reproductive material of climate-tolerant tree species, such as the native downy oak Quercus virgiliana (Vergilius oak) is in high demand. However, it is extremely difficult to harvest reproductive material in fragmented and unprotected forest stands[1]. Forest reproduction material (FRM) in the form of seed and seedlings, of downy oaks are not currently available throughout the country.

In many cases, due to economic reasons or the lack of local material, afforestation takes place using FRM from non-local basic materials, with no regard to their origin or the environmental conditions of populations. Genetic resources of both stand-forming and admixed tree species, adapted to extremely dry local environmental conditions, are needed to successfully manage the negative consequences of climate change. Overall, the project was necessary to improve the forest genetic resources in Hungary to mitigate damage in forest vegetation, or to even avoid any loss of forested lands due to climate change effects.

Objectives

The implementation of this project will allow forest genetic resources (including basic FRM materials) to improve, both in the short and long term. This can be a solution to the forestry problems caused by climate change.

In situ gene conservation is a simple method to preserve older populations. It makes it easier to collect reproductive material from them directly and allows their gene pool to survive for a longer period of time by helping them to regenerate naturally.

By ex situ gene conservation methods, gene pools are protected in a concentrated, more transparent way. The project will allow experimental comparisons of the genetic value of FRM used (provenance and timber growth tests) to be carried out, and provide the necessary forest reproductive material on a farm scale with more intensive seed production methods, adapting to the changing environmental conditions.

Activities

The first step was to assess parts of forests and individual trees with diverse genetic traits which are well adapted to changing environmental conditions. Firstly, inventories were made of individual trees and small fragmented populations of autochthonous downy oak taxon Quercus virgiliana (Vergilius' oak) as well as natural hybrids, which are native in the region.

Hybridisation and introgression are common between oak taxa, which is a primary source and driving force of oaks' genetic diversity to enable them to adapt to extreme environmental conditions. Based on similar aspects, the project team made inventories of individual 'plus-trees' (a tree with high vigour selected for tree breeding) and forest stands of Quercus robur (pedunculate oak) with excellent morphological characters. Based on different forestry aspects, the plus-trees were recorded in an identifiable way (with a plus tree description sheet), and then reproductive material (acorns) were separately harvested to raise seedlings (half-sib - one parent tree - progeny generations) in a forest nursery.

Meanwhile, in addition to the individual and plus-trees, the fragmented oak populations were also recorded and formed gene conservation units. Fences were established to improve prevention of damage from game. This will make it easier to collect reproductive material and to grow offspring from several trees, as well as ensuring their natural regeneration. Half-sib progenies (seedlings) were planted separately through afforestation or reforestation in forest gene collections and seed orchards, depending on where they will be grown. They may be grown in a closed, forest stand - to gain experience in growth and tree production (gene collection) - or in an open, plantation-like setting - for the purpose of intensive seed production (seed orchard). The most drought-tolerant, climate-resistant trees will also be included in the reforestation process.

[1] A forest stand is a contiguous community of trees sufficiently uniform in composition, structure, age, size, class, distribution, spatial arrangement, site quality, condition, or location to distinguish it from adjacent communities.

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The project was carried out in several phases, as the number of offspring that need to be planted have very different labour requirements over time and the annual yield of acorns is unpredictable.

The schedule was also adapted to include individual trees and populations which were recorded for gene conservation and further breeding projects, so that the activities overlap for several years. The implementation and licensing of the whole project was overseen by the staff of the Department of Forest Reproductive Material of NÉBIH (National Food Chain Safety Office, Directorate of Agricultural Genetic Resources).

Main results

The project is implemented in several phases (Phases I, II and III), of which the individual components are completed at different times. These phases could not be carried out simultaneously. This meant that the applications could not be sent at the same time, as one of the project's main objectives is to search for and assess genetic values, on which the next step can then be based in another application. So far, the project has achieved:

- the description of trunks of 180 Quercus virgiliana trees and propagation of thousands of seedlings;
- the description of trunks of 30 Quercus robur tree specimens and propagation of thousands of seedlings;
- established 7.90 ha of Quercus virgiliana seed plantation;
- established 3.72 ha of Quercus virgiliana gene collection;
- established 1.18 ha of Quercus robur gene collection;
- established 143.38 ha of Quercus virgiliana gene reserve; and
- established 3.28 ha of Quercus robur gene reserve.

As Gyulaj Co was among the first firms to carry out such an activity in Hungary, several people from other forestry companies visited and many have already started to follow the same process Two forestry farms have already received the project's first production of Vergilius' oak seedlings, as an experiment.

The news about this work and its results have already been communicated abroad and the company was approached by the Czech Republic to buy propagating material. The company signed an international cooperation agreement with the Forest Enterprise of Mendel University in Brno (HR) to learn about forestry research on a similar topic. For the purpose of provenance experiments, a smaller amount of Vergilius' oak (Quercus virgliana) reproductive material has already been given to the Mendel University for planting.

Key lessons

It is clear that this kind of gene conservation project usually requires a large state size forest and cannot be carried out in smaller private forests.

Without EAFRD grants, there would no financial resources for gene conservation work. Important fragmented populations would slowly disappear as they currently have no economic value in the timber market. Thus, their valuable genetic traits would disappear before the need to use them for climate change reasons would appear.

It was necessary to pay attention to the acorn production cycles and to react immediately to collect the reproductive material of each individual tree if there was a weak-medium crop in a year. Therefore, the phases as originally planned, had to be reconsidered several times. The acorn crop often varied, not only in time but also by location, so each area had to be inspected several times a year. It was very difficult to collect acorns of the individual trees in the fragmented areas. This job could not be entrusted to less experienced workers who might mix up the seeds, so highly trained forest engineers picked up small numbers of seeds separately.

The project application was prepared by the company's employees with the professional help and advice from the FRM's official body (NÉBIH) on an ongoing basis. Due to the need for significant local knowledge the project application was written by experienced local colleagues, not an application writer. This has meant that the Gyulaj Co. staff are managing the project along with their busy schedules of daily tasks. This is only made possible due to the enthusiasm and professional commitment of the staff.

Additional sources of information

n/a

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